

Current Donkey Production & Functionality

Relationship with humans

1st Edition

Francisco Javier Navas González

Juan Vicente Delgado Bermejo

Julio César Vargas Burgos



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Editor

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Relationship
with
Humans

Book 1

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Editorial Note

All the content included in the Curious Facts sections of every chapter edition and production belongs to the editors and founding authors, not the authors of the chapter. In the same way, the purpose of this book in general and of each chapter separately as an independent unit is educational and non-lucrative or profitable, acquiring the necessary requirements to that effect.

Preface

This whole project started when, given the apparent functional mislocation of the donkeys and asses are participants worldwide, we considered the possibility to get people and organizations working with donkeys worldwide join forces and work together. Whenever we think of endangered species, we think of tigers, bears, birds of prey, lynxes, but domestic species like the donkey will never come to mind, some of whose breeds and variants have come to even disappear from the Earth surface. There are many people who daily profess their love for this species and each of their efforts to preserve it counts. When we came up with the realization of this book and given the interest of the human species to find a use for all that is between their hands, we only had to answer a question. What a donkey is used for?, here you have the answer.

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Chapter 1

Introduction: Donkey Breeds And Genetic Management Of Their Populations

Phil Sponenberg, Jeannette Beranger y Alison G. Martin

1. INTRODUCCIÓN

Donkeys have long served humans in a wide variety of roles. Donkeys have greatly extended the ability of humans to expand into different regions and climates, especially challenging dry areas. They have also been essential to human expansion by contributing to the success that comes from many different human survival strategies including crop production, sedentary livestock production, pastoralism, and also caravan trade. Donkeys are rarely given the credit they so richly deserve for their many contributions to human survival—especially the survival of marginalized communities in difficult environments.



Figure 1. Listia (2012) Super Stud Donkey [Sticker] Accessed from <http://www.listia.com/>

Donkey populations offer examples of a wide range of breed types and styles all the way from the wild species to highly standardized breeds. A first important detail is that relatives of the wild ancestors are still extant in limited ranges from northeast Africa as well as in various zoo populations. The subspecies most commonly thought to be the ancestor of the domesticated donkey (*Equus africanus atlanticus*) is now extinct.

The Somali wild ass, *Equus africanus somaliensis* still survives in a limited range.



Figure 2. La Finestra de Fidel (2004) Two Atlas wild asses (*Equus africanus atlanticus*), also known as Algerian wild ass, being attacked by a tiger, El Djem (Tunisia). El Djem is a town home to some of the most impressive Roman remains in Africa, like the "Roman amphitheater of Thysdrus" [Mosaic] Accessed from <http://lafinestrade Fidel.blogspot.com.es/>



Figure 3. Charles Roffey (2005) Himba girl with donkey [Photography] Accessed from <http://www.flickr.com/>

CURIOUS FACTS

INVISIBLE HELPERS, FOUR LEGGED WORLD DEVELOPERS

Largely neglected from mainstream discourse, donkeys have been sorely underrated as significant contributors to the process of development. There are currently about 44 million donkeys across the world, with half in Asian countries, about a quarter in Africa and the rest mainly in Latin America. Within these countries, donkeys are most often used for transport and agriculture, yet their social and economic benefits frequently go without recognition. The donkey is a multi-purpose animal, able to carry out a wide variety of tasks under very limited circumstances. Donkeys are fast learners, surprisingly strong (although inadvisable, they are able to carry loads about half their body weight), more resistant than any other species to many diseases, have a long working life, require little water, and are easier to handle.

CURIOUS FACTS

Most importantly to many animal owners in developing countries, donkeys are much cheaper to purchase than oxen, horses and other animals used for working purposes. Further, donkeys are able to withstand heat and dry conditions, of clear relevance to developing nations (but find difficulty in cold and wet climates). While traditional agricultural practices in the global South have changed considerably as a result of modernization and globalization, donkeys still play a central role in the benefit of the livelihoods of many small-scale farmers. Their roles differ from country to country and farm to farm, but in general, donkeys help increase farmers' productive potential and positively contribute to their welfare.

In addition, there has been growing global awareness of the role of donkeys in changing gender power relations. Women have experienced increasing access to the ownership of donkeys, which they often use to fulfill household needs that are otherwise more difficult to accomplish. Since women are able to contribute more to the family unit, they are experiencing an increasing status within traditional family structures.

In May, 2014, a report launched by the animal welfare organisation *the Brooke*, highlighted the extent to which women in developing countries rely on donkeys and other working equids. This report entitled, *Invisible Helpers*, calls for greater recognition of the role of working equine animals in supporting women and their families, and emphasizes the importance of looking after the health and welfare of these valuable animals. In 2013, *The Brooke* initiated the *Voices from Women* research project to explore the role of working horses, mules and donkeys in supporting the lives of women from the perspectives of the women themselves basing on discussions with focus groups and individuals in Ethiopia, Kenya, India and Pakistan. The main conclusion reached was that working equine animals help lessening the burden on women's lives, providing a 'support system'.

77% of the groups, including all of those in Kenya and India, ranked donkeys, horses and mules as the most important of all their livestock. They generate income, help with household chores, give women an increased social status and help women collect food and water for other livestock. If these animals are sick or die, the impact can be devastating on women and their families. As one of the study participants said, *"It is a pain to live a single day without a donkey. That is because donkeys are the base for our life. So if we lose our donkey, we will buy another one by selling one of our calves, goats, sheep or even a heifer."* (Urigo Yassin, Gedeba, Ethiopia).



Figure 3. Casas-Rodríguez Collection (2009) Algerian Kabyle on the March (c.1906). Vintage photographic postcard, circa 1906, uncirculated, divided back, published by Jean Geiser, Alger, Algeria. [Photography] Accessed from <http://www.flickr.com/>

The research shows that good equine welfare is essential for women and their families since working animals in poor health are less able to help with physically demanding chores or to generate income. Unfortunately, while working equine animals are not necessarily excluded from donors' and policy makers' definition of "livestock", they are rarely acknowledged, as the emphasis is on animals that primarily produce "food or fibre outputs". As a result they may be absent from livestock related policies, standards, guidelines, programmatic interventions, livestock statistics and animal health systems, and excluded from livestock vaccination campaigns.



Figures 5, 6, 7 & 8. (Figure 5) Elvis and Arlo, (Figure 6) Thinkstock, (Figure 7) IFAD/FAO/Government of Japan & (Figure 8) Thorsten Overgaard (1998-2008- 2009-2013) (Figure 5) A woman on her donkey in Abyaneh (Iran), (Figure 6) Women walking with donkeys, (Figure 7) Women's farming in Africa: A case for donkey power & (Figure 8) Girl with donkey, Burkina Faso, West Africa [Photographies] Accessed from (Figure 5) <http://elvisandarloiniran.com/>, (Figure 6) <http://www.enfemenino.com>, (Figure 7) <http://www.ifad.org> & (Figure 8) <http://www.lightstalkers.org>

Yet despite the donkey's vital economic importance to people in developing nations, these animals are still looked upon as indicators of backwardness and underdevelopment. This devaluation of donkeys by the process of modernization has sorely limited the donkey's potential, all in the name of keeping up to date in a globalized world. Will the day of the donkey ever come?



The lack of attention to equine welfare is reflected in the training of vets, which rarely includes an equine element. The health and welfare of working equine animals in developing countries is often poor. For example, a recent assessment of the welfare of working donkeys in Mekelle City, Ethiopia, showed that many of the donkeys working in the area were experiencing multiple welfare problems and that 57.9% of diseased donkeys did not get any help from their owner and were forced to work regardless of the disease.

The Brooke's study found that despite the important role of women in managing and keeping working equine animals, they have limited access to equine training and extension services. By helping women to become 'agents of change', improving the lives of working horses, donkeys and mules by providing training on equine management, welfare and primary treatment, *The Brooke* is calling for a clear link in policy and practice to be made between working equine welfare and human development; working donkeys, horses and mules to be recognised in gender and livestock policy and programming; and for women's access to training and extension services which include working equine welfare to be improved.



Figures 9 & 10. (Figure 9) S. Kalyanaraman & (Figure 10) Swiatoslaw Wojtkowiak (2014) (Figure 9) Mould for lead figurine. 1830-1700 BCE. Steatite. Ankara museum of Anatolian civilisations. Meluhha hieroglyphs: donkey caravan trader & (Figure 10) Carrying water is hard daily labour for Konso women, sometimes labelled locally "Konso donkey" as no donkeys can be used here as in other parts of Ethiopia, because they destroy stone fenced terraces on which Konso agriculture is based. Karat Konso, Ethiopia [Photographies] Accessed from (Figure 9) S. Kalyanaraman, 2014 & (Figure 10) <http://swiatoslaw.photoshelter.com/>

The Nubian wild ass (*Equus africanus africanus*) is now recently extinct or extremely rare. These last two may have contributed to the domesticated animal in some areas.



Figure 11. J. Smit (1884) Somali wild ass in London Zoo, stallion, supposed holotype of *A. t. somaliensis* Noack, 1884 and syntype of *E. a. somalicus* Sclater, 1884; a Nubian ass in the background [Lithograph] Accessed from Sclater, 1884: pl. 50.

Domestication of most species (see *Book 1, Chapter 2*), and the donkey follows this pattern, involves taking a very small sample of the wild species and adapting it to the domesticated state. It is debated whether this is entirely deliberate on the part of humans, or whether certain small numbers of animals essentially choose this relationship by tolerating and adapting to human-influenced environments. Regardless of which path was taken, only a very small number of animals from the wild species made the transition to the domesticated state. This results in only a very small genetic sample of the wild species that is present in the early form of the domesticated species.

Once the transition is made the function of domesticated populations takes interesting developments. The usual progression is an initial expansion of the population into different regions that radiate out from the center of domestication. This acts to subdivide the population into different local

groups that are isolated by geography, communication, and culture. In some species (sheep) this isolation is pronounced, in other species (horses) less so due to the animal's role in human mobility. Donkeys fit somewhere in between, as certainly they were important in human mobility, but not to the extent that far-ranging horses and camels have been. A discussion of breeds and their management needs to consider these peculiarities of the way that populations interact.



Figure 12. Daniel T. Potts (2012) Painted ceramic sherd (TNP 1331) from level A19 at Tol-e Nurābād in the Mamasani district of western Fars, 5th millennium BCE, showing what appears to be a long-eared donkey with a saddle blanket or saddle bag on its back [Photography] Accessed from <http://www.iranicaonline.org>



Figure 13. Birgitta Kimura, Fiona Marshall, Albano Beja-Pereira, Connie Mulligan (2013) Map showing the historic distribution of African wild asses, their hypothesized ancient range (in pale shadowing) and sites; in this case the Tibesti region in Chad, the Red Sea Hills, and the Atbara region in Sudan, A Atlas wild ass, B Nubian wild ass, C Somali wild ass. Donkeys are one of the least studied large domestic animals, even though they are economically important in many regions of the world. They are predominantly used as transport animals. Consequently, they are not kept in large numbers and this limits the number of archaeological specimens available for study. The donkey's closest relative is the African wild ass, and genetic studies and zooarchaeological analyses of early donkeys indicate domestication of two genetically separate groups (clades) of wild asses in Africa. Maternal relationships revealed by mitochondrial DNA show that one group of donkeys was derived from the Nubian wild ass and that one was derived from an unknown ancestor distinct from the Somali wild ass. Unfortunately, Kimura et al. (2011) were unable to recover genetic material from archaeological samples of Atlas wild ass or equids from Yemen. However, 3,000- year-old domestic donkey samples from Uan Muhaggiag and an historic Nubian wild ass specimen from the Tibesti area yielded DNA. Both mitochondrial control region sequences fell within clade 1, as did seven other historic Nubian wild ass samples from Eritrea and Sudan (Kimura et al. 2011). The presence of clade 1 animals deep into the Sahara makes it less likely that the Atlas wild ass ranged into northeastern Africa, where the ancestors to clade 2 are likely to have been domesticated. The role of the Atlas wild ass as an ancestor of the domestic donkey is, therefore, unclear but perhaps less likely. The possible wild asses found in Yemen are closer to the putative domestication area, but modern donkeys on the Arabian Peninsula show much lower nucleotide diversity than those in Northeast Africa, 0.0028 versus 0.0976 (Vilà et al. 2006), suggesting Arabia is a less likely place of domestication. Furthermore, the equids in Yemen could be early domestic donkeys from across the Red Sea in Eritrea or Ethiopia. An extinct relative of Nubian and Somali wild asses is not unlikely as an option for the ancestor of clade 2 donkeys. When the Sahara became hyperarid, pastoralists with their domestic animals moved south into the remaining grasslands of the Sahel and Eastern Africa. Although better adapted for arid conditions than many ungulates of the Sahara and Horn, African wild ass would still have been vulnerable to the effects of habitat loss and fragmentation, as well as competition and interbreeding with pastoral donkeys. Wild ass population numbers must have been substantially reduced by these continental-scale processes. So, local groups could have been driven to extinction. [Map Accessed from Birgitta Kimura, Fiona Marshall, Albano Beja-Pereira, Connie Mulligan (2013).

Expansion of donkeys into new environments is coupled with the selection forces imposed by humans to result in selection pressure that increases genetic variability. So despite a relatively constricted sampling of the wild species, the fostering of genetic variability following domestication results in fairly wide genetic variation in domesticated animals. Donkeys are no exception to this rule, with the result that the various domesticated types and breeds are now much more variable than the original wild species was.



Figure 14. Anna Maria Maresca (2013) Stamp showing Italian endangered donkey breeds [Stamp] Accessed from <http://penandoink.com/>

2. FACTORS IN BREED DEVELOPMENT

“Breed” has no convenient definition that fits all cases. In a genetic sense, breeds can usually be considered to be populations of animals that share recognizable characteristics that are transmitted generation to generation. By this definition breeds can serve as predictable genetic resources. This predictability is in large part the value of breeds to agriculture and other aspects of human life.

Breeds usually develop their genetic heritage from the combined results of foundation, isolation, selection, and function. Each of these has important consequences for breeds.

Foundation refers to which specific animals started the population. Foundation constrains the variants that are present in the population, and through that constrains the variation that is possible in the descendant breed. It is a powerful force in shaping the final form of the breed, and for most breeds the foundation event is more by happenstance than by considered strategic forethought.



Figure 15. Volkan Yuksel (2003) Donkey Island (Turkey)
[Photography] Accessed from <http://www.panoramio.com/>

Isolation implies that the population experiences limited or no additions that are different from the foundation population. This assures that there is limited ongoing genetic mixing which would dilute the genetic package set in place by the foundation events. Without some high degree of isolation it is impossible for a population to

achieve the consistency that is characteristic of a breed in the genetic sense of the word. Isolation is also important in providing a consistent genetic pool that can respond to selection pressures without the disruption that would occur with frequent introductions into the genetic pool from external genotypes.

CURIOUS FACTS

THE FIRST CASTAWAYS

The Caribbean donkey is many things, but among all those they are the first true castaways. First brought to the Caribbean on the second voyage of Christopher Columbus, the donkey was used as a working machine for the exploring conquistadors. They would act as the beast of burden to carry supplies through dense jungles and unload heavy arms from tall sailing ships. Once sugarcane was introduced to the Caribbean, donkeys would help transport the cane to the mills for the processing of sugar and distillation of rum. On the arid, non-growing islands, the donkeys would be used in the blazing hot salt flats to carry the heavy mineral to the waiting ships for export to both the new and old worlds. Now with tourism the main industry in the Caribbean, donkeys have been left to the wild. They roam the islands freely, looking for their next meal and posing for vacation photos. A life much easier than that of their island ancestors.



Figure 16. JeremyWilbur (2011) *Caribbean feral donkey* [Photography] Accessed from <http://www.flickr.com/>

Selection further shapes the population that has been set in place by foundation and isolation. Selection involves both natural and human elements, and it is essential to understand how each of them works to perpetuate breeds. Some breeds, especially those in harsh or challenging environments, must constantly adapt to the environment. In these breeds natural selection provides the major pressure on selection and reproduction.

Most donkeys fit into this category. For a handful of other donkey breeds, human selection can be more important in deciding which animals reproduce and which do not. Human selection can be especially important for deciding size, color, temperament, and gait in the more highly developed breeds.



Figure 17. Ken Priebe (2004) Boys turned into donkeys at Pleasure Island from the Motion Picture "Pinocchio" by Walt Disney, 1940 [Video Caption] Accessed from <http://www.hollywoodjesus.com>

Finally, function refers to the fact that any breed's genetic package that is formed by foundation, isolation, and selection exists in an environment where it is asked to perform in partnership with people. This situation is unique to agricultural environments, and is the element that makes sense of the other components of breed identity.

Without ongoing function in a specific environment the breed can lose relevance,

the selection environment can change, and the resulting genetic package can also change. This process occurs in donkey breeds where function changes over time. For example, the American Mammoth was once almost entirely used for the production of draft mules. In recent years this has become a minor use, and the production of saddle mules and saddle donkeys has become more important. This change has resulted in changes in type, conformation, gaits, and temperament.

Understanding the role of these four factors in breed development helps to identify and conserve breeds successfully. Each of these four has a role to play, but in some breeds one or the other of them takes precedence over the others. How breeds evolve from that early domestication event is generally one of subdividing populations from a larger initial group.



Figures 18 & 19. (Figure 18) NatGeo & (Figure 19) BBC News (2002-2014) (Figure 18) Donkey embryo & (Figure 19) Uterine subrogation. A horse gave birth to a Poitou donkey in a scientific experiment that pointed the way to saving rare breeds and endangered species but also to breeds selection, in Australia [Photographies] Accessed from (Figure 18) <http://worldofwonder.net/> & (Figure 19) <http://news.bbc.co.uk/>

3. STAGES OF BREED DEVELOPMENT

The first stage of subdivision of a species into breeds is usually called landrace development. In this stage, populations are loosely separated by factors such as geographic area, lack of communication or transportation infrastructure, and cultural practices of the owners. Isolation allows local adaptation to drive animal selection and survival, coupled with some selection by human caretakers. The end result is usually a product that is consistent enough to be identifiable but that still retains a fair bit of variability. Most donkey populations fit the landrace model. Defining these and conserving them is a very large challenge. For most landraces the most important factors are foundation and isolation, because human selection tends to be minimal.

The next stage is standardized breed development. This usually involves breed associations, as breeders band together and decide on which features of the animals are allowed and which are not.

This process makes the population even more identifiable and uniform. Usually the genetic background of the animals becomes important to the breeders, so that pedigrees are kept.

In addition, the characteristics of the animals are restricted to a few options from the more broad options available at the landrace step of development. Selection, and specifically human selection, along with function, are the main drivers of standardized breeds and their development and conservation.

A final stage of breed development is industrial strain development, where selection becomes very scientifically driven for production. This is typical of poultry, swine, and dairy cattle, and no donkey breeds fit in here.



Figures 22, 23 and 24. (Figure 22) Yeguada Miguel Sánchez, (Figure 23) Laurie Shields and (Figure 24) Holly Poll (2013-2014) (Figure 22) Adalusian donkey breed, (Figure 23) White Astro-Hungarian donkey. These donkeys have blue eyes. White blue-eyed horses and donkeys present the coat named 'cream'. Two cream parents will always produce a cream foal and (Figure 24) American spotted donkey. This popular donkey breed is bred for its conformation, temperament and over all, its coat [Photograph] Accessed from (Figure 22) www.yequadapre.com and (Figures 23 and 24) <http://www.pinterest.com>

This entire process of domestication can then be reversed as animals revert to a free-living feral existence (see Book 2, Chapter 10). This has happened many times with various types of donkeys. Feral populations are interesting because natural selection largely takes over from human selection.

The end result is never quite the same as truly wild animals, but the process does provide insight into environmental adaptation. Foundation and isolation are the main determinants of the genetic variation of feral populations, with selection having reverted entirely to natural selection. Foundation is an especially important aspect of the final character of the animals in these populations.

A more detailed discussion of each of these types of populations can be helpful in

understanding how these populations function genetically, and the consequences for effective conservation of these resources. Starting with the most developed and working backwards can help to outline the concepts involved.



Figures 25, 26, 27 & 28. (Figure 25) Klein-Hubert/KimballStock, (Figure 26) Andrew Johnson , (Figure 27) Dejan Stanisavljevic & (Figure 28) Pest and Disease Information Service (2014) (Figure 25) Feral donkey colt standing near cholla cactus in Mojave Desert, (Figure 26) Mick Everett from AGWEST fits a donkey with a tracking collar. The donkey can then be tracked to locate other animals. The adaptation of modern tracking technology, including solar- powered devices has proved a boon for a major program to eradicate feral donkeys in the southern Kimberley (Australia). The Judas program, begun in 1994, achieved a major milestone recently when it reached Bow River station 150 kilometers from Kununurra. Over the last several years the program has expanded to include 38 pastoral leases, two major reserves and the Bungle Bungle National Park. This encompasses an area half the size of Victoria. AGWEST's Andrew Johnson said coordinated control of feral donkeys has been under way since 1978. The program has evolved from using broadscale shooting to utilising the latest wildlife tracking technology for feral animal control. This has reduced the population of feral donkeys and horses in Kimberley by over half a million animals since the 1970s. What has become known as the Judas technique involves placing VHF radio-transmitting collars on donkeys, which are tracked via the radio signal once a month. Other donkeys then found with the Judas donkey are humanely culled, leaving the Judas donkey so that it can help locate and pinpoint other donkeys in the area. More than 270 radio collars were fitted in across southern Kimberley, which meant the halfway mark for the

project, taking into account the total area occupied by feral donkeys. A pastoral station is gradually cleared of donkeys over a two to three-year period. The station is then assessed for a non-breeding population of donkeys after strict criteria have been met. The reduced grazing pressure resulting from the removal of feral donkeys in the Kimberley enabled pastoral business to use greater areas of country. The project was 20 per cent funded by the pastoral industry and the majority of funding by the Agriculture Protection Board, (Figure 27) Caution sign, feral donkeys crossing the Hawaiian highway at Kona, (Figure 28) Two feral donkeys, photographed from a helicopter [Photographies] Accessed from (Figure 25) <http://www.kimballstock.com/>, (Figure 26) <http://www.savanna.org.au>, (Figure 27) www.dreamstime.com & (Figure 28) www.agric.wa.gov.au.

CURIOUS FACT

THE CASE OF THE THURINGIAN FOREST DONKEYS ("THÜRINGER WALDESEL")

Earlier known as the "Miller's Donkey" or "Stone Donkey" (Mülleresel or Steinesel), donkeys with this name were collected in West Thuringia, Saxony and Saxony-Anhalt. The stock of the Thuringian Zoo were placed in the zoo and bred further. Animals with a suitable appearance were imported from the United Kingdom. There was no herdbook and no breed standard. Not even the animals sold were registered. Furthermore, there was no interest group or society for this animal in existence.

These donkeys were displayed at the Thüringer Zoopark I with the aim of teaching people about mule production and about the different traditional uses of donkey breeds (pack donkey, wool transport etc.) at festivals, expositions etc. The Thuringian forest donkey is one of the most recent donkey populations accepted as a donkey breed. Founder animals were dwarf donkeys used by farmers, millers and charcoal burners in the Thuringian forest area.

These typically have a stone-grey coat with white belly and black eelstripe and shoulder cross. They can also have black or dark brown/brown coats with lighter markings around eyes and on muzzle. Zebra stripes are often found on the lower legs.

Height male: 100-110cm; female: 95-110cm;

Weight: male: 133-210 kg; female: 156-185 kg



Figure 21. Thüringer Zoopark Erfurt (2014) Thuringian Zoopark Erfurt [Logo] Accessed <http://www.zoopark-erfurt.de>

Figure 20. Winfried Schäfer/imageBROKER (2014) Thuringian Forest Donkey, Daun Wildlife Park, Rhineland-Palatinate, Germany, Europe. [Photography] Accessed from <http://www.aqefotostock.com>

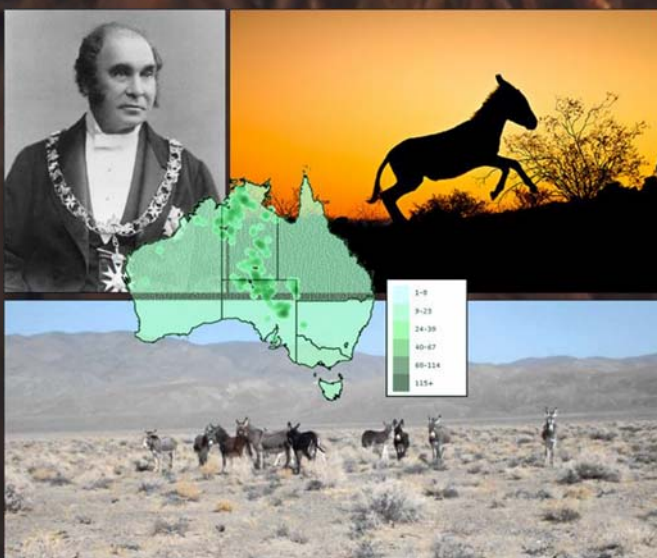
FERAL DONKEYS PEST PROBLEM IN WESTERN AUSTRALIA AND THE USA

Donkeys were first imported in substantial numbers into Australia in 1866 by Sir Thomas Elder. They were used as pack and draught animals in outlying areas of Western Australia (WA) until the 1930s. They were eventually replaced by the motor vehicle and unwanted donkeys were released to the wild where they became feral. The first record of feral donkeys is from the Kimberley in the early 1930s but it is possible that some became feral much earlier.

Feral donkeys occur in pastoral areas of WA, most commonly in the Murchison, Pilbara and Kimberley region, extending into the Goldfields. Control programs have resulted in local eradication of the donkey from some pastoral leases in the Kimberley.

During the dry season in the Kimberley, donkeys concentrate on the flats of major river and creek systems. Fewer are seen on the lower slopes, foothills and along the minor creeks, while a few occur in hilly country. Their distribution is similar to that of cattle in the same areas at the same time of year. In the Pilbara, donkeys inhabit breakaway country, especially the 'pea bush' flats; they are also found in areas of mulga and other acacia species. In the Goldfields, feral donkeys are confined to eucalypt sandplains with granite hills and to some lake systems. Feral donkeys are versatile foragers. They eat a wide variety of grasses, herbs and bushes.

Donkeys can reduce their evaporative water loss when they become dehydrated. They are able to reduce the water content of their feces and can continue eating when deprived of water. They can tolerate extreme loss of body water. These abilities have contributed to their success as a feral animal in Australia. In hot, dry conditions they do not move far from water, preferring to drink every day. Their home ranges vary widely in size, depending on the habitat. In arid areas home ranges average 32km². This may be reduced to 19km² in less arid areas while in the best grassland habitat average range size may be as low as 3km². The home ranges of individuals overlap substantially. Feral donkeys live in social groups which may contain either or both sexes. The composition of such groups is unstable, with some individual animals moving between groups. In the Kimberley feral donkeys produce foals between July and March; most are born when green feed is available. Both female (jenny) and male (jack) become sexually mature at about two years of age.



Figures 29, 30, 31 & 32. (Figure 29) History SA, (Figure 30) Atlas of Living Australia (Figure 31) Klein-Hubert/KimballStock & (Figure 32) Barefoot Solutions (2012-2014) (Figure 29) Sir Thomas Elder, (Figure 30) Australian feral donkeys distribution map (Figure 31) Silhouette of a feral donkey galloping at sunset in Mojave Desert, Arizona (USA) & (Figure 32) Feral donkey in Nevada, USA [Photographies & Map] Accessed from (Figure 29) <http://adelaidia.sa.gov.au>, (Figure 30) <http://bie.ala.org.au>, (Figure 31) <http://www.kimballstock.com/> & (Figure 32) <http://www.youtube.com/>

Feral donkeys utilize the same food as domestic stock, this is a problem particularly where food is scarce. In other parts of the world overgrazing by donkeys has altered the composition of desert vegetation. Their paths or trails contribute to soil erosion, especially where they move regularly to and from water. They sometimes foul water holes and may prevent other animals from drinking.



Figure 33. Worth's World (2011) Wild donkeys on the road in Las Vegas, USA [Photography] Accessed from <http://www.sheaky.com/>

Feral donkeys are declared pests of agriculture in WA under the Biosecurity and Agriculture Management Act, 2007 and programs are in place to control them in the wild. The primary means of control is by shooting from helicopters. In Western Australia, only feral species may be hunted on private land with the landowner's permission, subject to holding a valid firearms license. These species include camels, donkeys, feral cattle, feral dogs, feral horse, hares and starling.



Figure 34. Australian Hunting Net (2007) Feral donkey hunt in Australia [Photography] Accessed from <http://www.australianhunting.net>

This procedure has been improved by the 'Judas' technique where selected donkeys are fitted with radio transmitter collars. These collared Judas animals are left to join up with other donkeys. When a Judas animal is later radio-tracked, any companion feral donkeys can be identified and knocked down, leaving the Judas animal free to roam and locate other herds. In the Kimberley other control methods, such as shooting for pet food, is of limited value because of large distances, rough terrain and the logistics of bringing product to the market. Trapping at watering places has variable results as some areas have too many alternative water sources. Feral donkeys are difficult to muster because of their habit of breaking away when driven. Shooting from the ground is difficult in rough terrain. However these techniques may have some value in other areas.

4. STANDARDIZED BREEDS

Standardized breeds are the least numerous of the various types of donkey breeds. Nearly all of the standardized donkey breeds are either miniatures used as pets outside their area of origin, or are large mule-breeding donkeys that were important historically (see Book 1, Chapter 11). The route to standardization of the two types is important. Large mule-breeding donkey breeds followed a route to standardization that frequently occurred in the breed's home tract as a response to the need for breeders to assure size and quality in their stock. For miniatures the process was more often a second route called gentrification, which is standardization following export from the original site. This second route usually involves uses and selection pressures distinct from those in the original home.



Figure 35. Donkey & Mule Society of NZ (Inc.) (2008) Awapunii Barack (Mammoth Jackstock foal) & unnamed American Miniature Mediterranean/English jack foal. December 19th, 2008 at Waikato [Photography] Accessed from <http://www.donkey-mule.org.nz/>

A third route has recently become increasingly common for donkeys. This is breed definition and selection from local animals with traditional local uses. This has been a response to recent efforts to safeguard livestock diversity, and is especially common in North America and Europe. In these regions, governmental support schemes usually demand that breed populations be well defined. This makes it necessary for breeders to organize and document the animals. The general result of this is to take

local landraces and further define and standardize them. This third route has wonderful opportunities for effective conservation of these resources, but only if breed definition is wide and inclusive of the variation that is present locally. In many cases the temptation will be to eliminate rare variants from the population.



Figure 36. Katie Sowa (2012) *The Ugly Donkling, Part 1*, by Katie Sowa [Illustration] Accessed from <http://www.bighuacreations.com/>

Population structure of standardized breeds has repercussions for effective genetic management. A fully developed standardized breed is usually organized as a pyramid. This is due to breeders tending to communicate well, and tending to mostly use breeding stock from a few elite breeders. Over time this stratifies the breed into an elite tier where a limited number of breeders exchange stock among themselves, as well as providing stock to a multiplier tier. At the multiplier tier many of the breeding animals, and especially the males, come from the elite tier, while few if any of the males that are produced in this tier are destined for breeding at the elite tier. At the commercial level nearly all of the males are bought in from the multiplier tier.

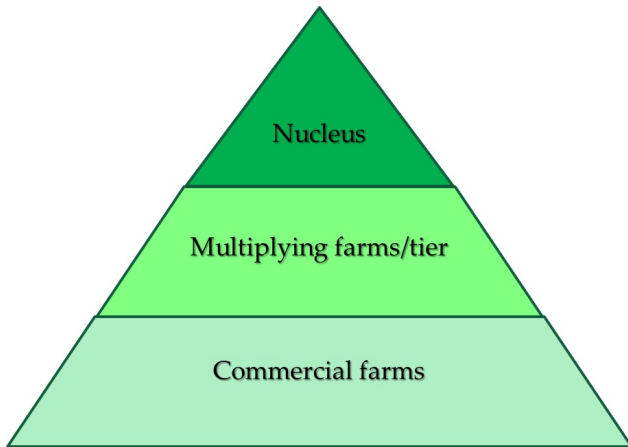


Figure 37. Francisco Javier Navas González (2014) Fully developed standardized breed pyramid [Graphic]

This pattern has the consequence of the genetic material flowing in only one direction, from elite to multiplier, and from here to commercial, with little or no gene flow in the opposite direction. This is especially typical of production livestock, and is less consistently true of donkey breeds. Still, as breeders organize and communicate, the genetic organization of a breed tends to fall into this model. The importance of this population model is that the census figures tend to include all animals, but the real genetic core of the breed is only those elite animals with disproportionate influence on the population. The genetic consequence of this pyramidal organization is that even very numerous breeds can have relatively little genetic variation. This becomes important when developing strategies for long-term conservation.



Figure 38. Francisco Javier Navas González (2014) Current standardized donkey breeds [Photography]

Standardization, in a very strict sense, came later to donkey breeds than to other species such as horses and cattle. A handful of the breeds of large donkeys do have a long

history of standardization, including Zamorano-Leonesa (Spain), Catalanian (Spain), Andalusian (Spain), Poitou (France), and American Mammoth (USA).

In each of these cases, the historic use of the animals was to produce large jacks that could be used for mule production. These mules were generally used for draft, but also in some cases for riding. One aspect of standardization was a desire for uniform teams of mules, so that color was often standardized. Black (with light points) characterizes several of these: Zamorano-Leones, Catalanian, Poitou, and American Mammoth (at least historically). The Andalusian stands out among standardized breeds as grey instead of black.

The standardization of these European examples was always from local landraces. Local traditions, foundation, and isolation provided reasonably uniform populations that were then taken to the next stage of uniformity and definition. This is the most usual pathway for development of standardized breeds.

In contrast, the American Mammoth was a more deliberate process that focused on the final utility of the jacks for mule production. This involved selection for size, with little regard for geographic origin of the stock. The result is a blend of various European influences from widely variable sources. In the case of this breed, the uniformity comes nearly all from selection, and very little from a restricted foundation.

The American Mammoth also provides insight into the way breeds function as genetic resources. The herdbook is still open to inscription of new animals that lack documented ancestry, as long as they meet certain size and height requirements. This level of openness at first thought seems to be too open, with insufficient isolation to result in a true breed. Fortunately, though, the

phenotype that is desired is an extreme phenotype, so that randomly bred animals cannot meet the requirement.

In this case the height requirement assures that the animals have all (or nearly all) Mammoth breeding, and this safeguards the breed from introduction of outside breeding. So, despite a herdbook that is technically open rather than closed, the breed still functions as a closed breeding population.

Other attempts at standardization of donkey breeds are more recent, and are generally European. Most of these are responses to recent movements to define and then conserve local genetic resources. The process usually begins by encountering a local landrace, and then defining it more formally. This process tends to change landraces to a form more consistent with a standardized breed. In these efforts breed definition becomes extremely important because narrow definitions can leave out much of a landrace by focusing on only a few of the original variants in the landrace. This is especially likely with minority color variants, which can be easily lost to the population.

A most central detail of standardized breeds is their function as isolated genetic populations. This is true regardless of where the animals are located. For example, Poitou donkeys are bred in France, the USA, and a handful of other European countries. These all are part of the same genetic population because of breeding practices that limit recruitment of breeding animals to those candidates with parents from the original population. Few donkey breeds can claim such an international distribution, but for those that do it is important to have reciprocal recognition of breeding stock among the various countries that hold these genetic treasures.

5. LANDRACES

In contrast to standardized breeds, landraces are isolated from one another less formally. Factors working to isolate landraces one from the other usually include geography, although culture of the owners can also be important if the owners impose genetic isolation on a population by restricting mating to neighboring animals. Donkey landraces are more likely to have geographic isolation than they are to have isolation from cultural practices. Geographic isolation imposes natural selection pressure from the local environment, in addition to any human pressure for traits of interest or utility.



Figures 39 & 40. (Figure 39) Aquila Villas & (Figure 40) Domenico/Made in South Italy Today (2014) The Asinara donkey, is a rare landrace of feral, and consistently albinistic, donkey indigenous to the island of Asinara, which lies off the north-west coast of Sardinia, Italy, in the province of Sassari [Photographies] Accessed from (Figure 39) <http://www.pinterest.com> y (Figure 40) <http://www.madeinsouthitalytoday.com>

Due to the informally organized breeding structure of landrace populations they usually have less stratified organization than do standardized breeds. Rather than a

pyramid, these more often are organized as moderately overlapping circles where each subgroup is moderately isolated from the others. Each location tends to have animals that are highly related to one another, and more distantly related to populations further away. This population structure presents huge challenges for breed definition and then also for effective conservation management. The process of defining populations involves deciding where the boundaries are, and which animals should be included and which excluded.

If the structure is a series of overlapping subpopulations then exactly where to impose that boundary becomes a difficult but important task.

The usual approach to defining a landrace is to document and define the elements of foundation, isolation, and selection that have produced the population. Then candidate animals can be compared to the criteria set forth, and can be included or excluded on that basis. In most cases, for donkeys, this will simply be local donkeys of any set region or country, with minimal phenotypic distinction between neighboring populations other than international borders.

One extreme of landrace definition would be to focus on very small and very local populations. This is likely to doom such populations to inbreeding depression if mating is tightly constrained. At the opposite extreme, some observers consider that donkeys are “just donkeys” and are all fundamentally the same. That attitude can deny the importance of isolation of populations to the development of genetic distinctiveness that should be conserved.

6. GENETIC SAMPLING OF DONKEY BREEDS

Effective genetic management of donkey breeds requires a good understanding of the underlying character of the targeted breed. Standardized breeds benefit from different approaches than those targeted for landraces. These differences are not trivial if conservation of these resources is to be successful.

Standardized breeds must be sure to capture enough genetic variability to provide for viability into the long-term future. For highly stratified breeds this means sampling the elite level thoroughly. Few donkey breeds are as highly stratified as the breeds of other species such as cattle, and in this case a broad sampling must also involve non-elite layers of the breed that still have animals unrelated to the elite herds.

Due to the pyramidal structure of most standardized breeds it can also be important to sample relatively unrelated animals from the multiplier tier, and perhaps the commercial tier in order to broaden the genetic base of the breed. Production animal breeders have developed ways to assure an “open nucleus” strategy that allows for inclusion of superior, and typical, animals into the elite tier from these other tiers. This can be essential for the long-term genetic management of these breeds as genetic resources.

Landraces are more difficult to sample, because their organization is less of a hierarchy. For most landraces each small herd or group is likely to have genetic distinctions, and assuring that all of these are sampled can be a daunting task. The goal is to make sure that each of these smaller groups contributes to the future of the breed.

CURIOUS FACT

PROCEDURE FOR OBTAINING A HAIR SAMPLE FROM A DONKEY FOR DNA TYPING

Each laboratory uses its own DNA typing kit. Only one DNA kit should be used per donkey. Select mane hair well forward of the withers, or tail hair in foals.



Figures 41 & 42. (Figure 41) *The Telegraph – UK* & (Figure 42) *attack-on-art (2014)* (Figure 41) *The rare French Baudet du Poitou donkey breed is born with curly hair that naturally grows into long dreadlocks as an adult. This one hasn't had a haircut in 17 years! When taking a hair sample you must always take the hair root too, otherwise the hair will be useless & (Figure 42) A donkey's mane [Photographies] Accessed from (Figure 41) <http://govbooktalk.gpo.gov> y (Figure 42) <http://attack-on-art.deviantart.com/>*

Ensure you have at least 30 hairs. Wrap the hairs around your finger or a comb, as close as possible to the skin to ensure you obtain the hair roots. Pull the hair out at the roots and keep dry. Handle the hairs a little as possible to avoid contaminating or damaging the hair roots. Make sure you have around 30 hair roots to send to the University. Hair broken off or cut off will not be acceptable.



Figure 43, 44 & 45. *attack-on-art (2014) Donkey hair sample taking procedure [Photographies] Accessed from <http://attack-on-art.deviantart.com>*

To process the sample we need a simple DNA test. This kit must comprise the following:

1. Purple DNA hair sample card (uniquely numbered)
2. Plastic snap-lock bag
3. Reply paid envelope
4. 2 labels with your donkey's details
5. A pink DNA ID Certificate

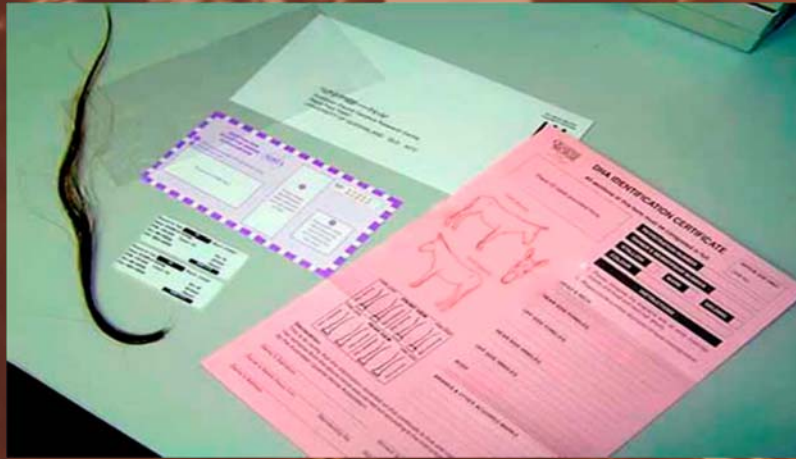
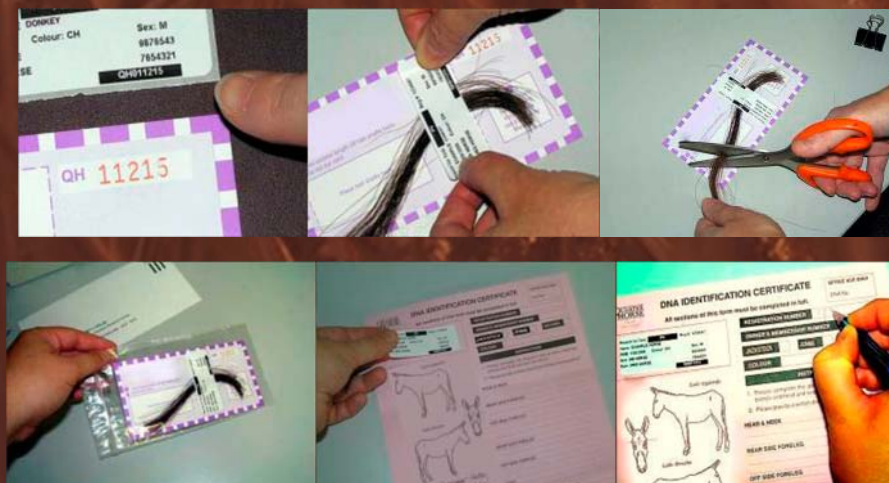


Figure 46. Francisco Javier Navas González (Edited from Australian Quarter Horse Association) (2014) Donkey hair sample taking material and documents [Photography] Accessed from <http://www.aqha.com.au>

The purple card is individually numbered. Please make sure the number in the bottom right corner of the label matches the number in the top right hand corner of the purple card. We will also check that your donkey's details are correct. Place the hair shafts on the front of the purple card included in your DNA kit. We will make sure the hair follicles are on the right hand side and inside the area marked (1). We will place the donkey identification label vertically over the shafts of hair in section (2) to hold them in place. We will trim the excess length off the hair shafts at the point marked (3). We will NOT trim the hair roots off. Insert the card and hairs into the resealable bag that came with the DNA kit. We will make sure the kit is closed firmly by pressing the special seal together. Each hair sample must be in its own plastic bag. We will put the kit into the reply paid envelope supplied for the University, and post immediately after the sample is sealed up. We will place the second label in the top left hand corner of the pink DNA ID Certificate and complete the pink DNA ID Certificate with all the donkeys' markings and details. We will sign the bottom of the page and have another person that witnessed you taking the hair sample sign too. We will return the pink DNA ID Certificate to your donkey breed association. If the sample is for an already registered donkey, send the original Certificate of Registration with the pink DNA ID Certificate, and your association will update it with your donkey's DNA number and return it to you.



Figures 47, 48, 49, 50, 51 & 52. Francisco Javier Navas González (Edited from Australian Quarter Horse Association) (2014) Donkey hair sample preparation [Photographies] Accessed from <http://www.aqha.com.au>

7. LONG-TERM GENETIC MANAGEMENT

Long-term management of donkey breeds as genetic resources has a host of challenges that are fairly unique to donkeys rather than being shared across many species. The species is generally organized as a series of poorly defined landraces, few of which have strong directional selection for specific characteristics. The standardized breeds stand out as few in number and generally recent in formation. These therefore tend to intergrade with landraces without a sharp boundary between the two general classes of breeds.

Some breeders and breed associations will have a very narrow philosophy of what constitutes a breed, with fairly strict closure of the population. This has the attraction and advantage of making the breed very predictable. Few donkey breeds fit this philosophy, with the French Poitou likely the most extreme example. The breed is rare, and registrations are constrained so that anything other than purebred matings is unlikely to be registered. The breed also has an extreme phenotype, and is one of the premier mule-breeding donkey breeds internationally. While the breed type and style are quite distinctive, the overall vigor and vitality of the animals may be slipping. This raises real and important questions about the wisdom of complete isolation of a breed, especially a rare breed. Breed survival could end up being sacrificed for breed purity, which is hardly the goal of effective conservation.

The other breed with an old herdbook is the American Mammoth. This is another large donkey used for mule breeding. As the name suggests, it is an American product and descends from a combination of European breeds. History suggests that this is 80% Spanish, with other contributions from French, Maltese, and Italian donkeys. For some of these the origins were noted, and

while studbooks had not been organized at this early date, the regional European breeds that were the source of the imported animals were certainly well along the path of consolidating their identities and genetics.

The American Mammoth stands out as having an open herdbook, so that individual donkeys of unknown heritage can be admitted if they meet certain (generally height) requirements. At first this seems to be too open to yield a defined breed, but the size limitations are such that donkeys that lack a preponderance of Mammoth breeding will simply not meet the minimal requirements. In this case the extreme phenotype preserves the purebred character of the breed, despite an open herdbook.

The American Mammoth does have lessons for breed maintenance, though, in that the type has changed with fashion. A century ago the demand was for large, long-eared dark jacks to sire draft mules from draft horse mares. Size was important, but also the conformation and attitude that go along with a good draft animal. In the mid 1900s this fashion changed, and red jacks became more popular because most farmers had sorrel Belgian horses and wanted sorrel mules. Red jacks crossed to the Belgian mares were assured of getting the desired red mules. Interestingly, even within groups of full sibling donkeys the red ones and the black ones have a different type. The red ones are nearly always taller, more massive, and somewhat coarser.

In the late 1900s fashions changed yet again, and the demand for tall saddle mules increased. This led to yet another change for the American Mammoth, this time for finer conformation, easy riding gaits, and also for odd colors that would have been discouraged in the past. It is now possible to find spotted, grey, and gaited jacks within the breed, and these are increasingly common. The result of these changes has served to diminish the frequency of black in the American Mammoth Jack, while red, grey, spotted, and other odd colors have become more common. These other colors were always present in the breed, but have increased from a small minority of animals to becoming very common. The change from draft mule production to saddle mule production also brought with it differences in selection of jackstock. Conformation, temperament, and gaits have all changed to some extent, demonstrating that function drives selection, and selection changes gene frequencies.



Figure 54. Right Pet (2014) Two American Mammoth Jackstocks showing quite different phenotypic characteristics [Photography] Accessed from <https://www.rightpet.com>

Several others of the standardized donkey breeds have herdbook structures in between the stringent extreme of the Poitou and the more relaxed “size only” extreme of the American Mammoth. Most of these breeds are local European breeds, long recognized but only recently having organized breeders. The Zamorano-Leonesa is fairly typical of this sort of breed. It has long served as a local genetic resource, but with more uniformity and recognition than is typical of landraces.

It became officially recognized as late as 1940, when breeders began to be more organized into a standardized breed association. Due to agricultural mechanization and declining interest in mule production the association then ceased during the 1960s, only to begin again in 1998 due to increased appreciation for local genetic resources. The breed has received special protection from the government since 1980.



Figure 55. Deb Robson and Tussah (2011) A Poitou donkey outside, and a Mammoth Jackstock inside the stable at Sedgwick County Zoo in Wichita, Kansas (USA) [Photography] Accessed from <http://independentstitch.typepad.com>

Other Spanish breeds followed a path similar to the Zamorano-Leonesa. The breeders of the Catalonian donkey breed reopened their herdbook in 1978. A few other local types also became organized, including the Andalusian which has always been recognized as an elite mule-breeding donkey. Others, such as Balearic, have also benefitted from organization and recognition. Breeds of smaller donkeys such as those from the Basque regions and the Canary Islands have less history of specific recognition, but are now organized so that they do not drift to extinction.

The breeds of smaller donkeys fit better into the landrace classification, deriving their uniformity almost from happenstance. The breeds of larger donkeys (Catalonian, Zamorano-Leonesa, Andalusian), despite no formal organization of breeders for most of their history, still fit the definition of standardized breeds because breeders have always had some degree of communication and agreement on selection goals. Many other European breeds have gone through a process resembling the Spanish experience. Some, such as the Italian Martina Franca and the Portuguese Miranda involve animals with a long history of name recognition. Others tend to be more local breeds that have only recently organized breeders and in the process have gained cultural and legal recognition as breeds, even though they might have long histories of local use and genetic isolation typical of true genetic breeds. These include many French breeds, as well as those from Belgium, the Netherlands, Croatia, and Italy.

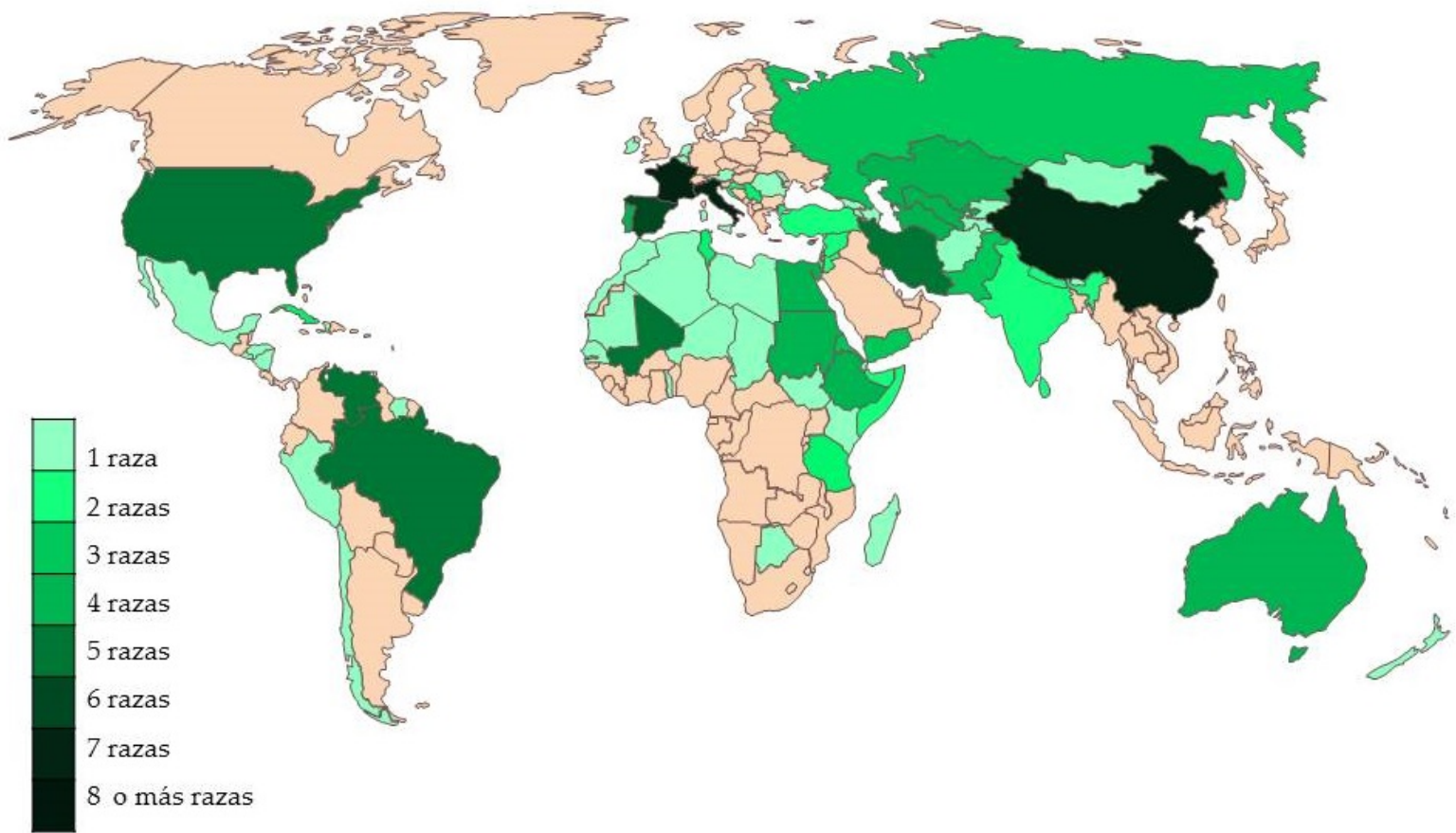


Figure 56. Francisco Javier Navas González (2014) Donkey breeds worldwide distribution map [Map] Accessed from www.freeworldmaps.net

8. BREED DEFINITION

The definition of specific breeds is an important step in maintaining breeds as genetic resources. Essentially, breed definition is deciding what is to be allowed within the breed, and what is to be excluded. This often centers around color, size, or other relatively superficial but easily recognizable traits. This becomes a significant quandary for conservationists. Many landraces and other local breeds have fairly wide variability. This is maintained due to lax selection pressure, and in the case of donkeys, subsistence use that did not emphasize points trivial to survival and usefulness.

As breeds become defined and organized it is common for breeders to decide to eliminate rare variants in an attempt to make the breed more readily recognizable and distinct from other breeds. In the case of breeds of large donkeys this process had long been pursued due to breeder preference and fairly intense directional selection. One of the easiest traits to standardize is color, but it is essential for conservationists to realize that selection (culling) removes entire animals, and not just single alleles. As a result, some animals of rare phenotypes may actually be essential to the breed in maintaining the genetic diversity essential for long-term survival. As a general rule, breed definition that is based on landrace populations should be wide and inclusive. Focusing on the elimination of rare variation that is produced within the population should be avoided, because it eliminates valuable options for future breed viability. In general the history and tradition of these landraces is to have variation, and this

variation should be celebrated rather than shunned.

9. MANAGING BLOODLINES AND GENETIC DIVERSITY

Managing bloodlines and genetic diversity are important aspects of effective breed conservation. It is helpful to accomplish a breed census that includes as much background information as possible. While full pedigrees are always best, these are not always going to be available for landrace animals. In the absence of full pedigrees it is usually possible to depend on specific site of origin (community, town, other geographic determinant). This at least identifies animals by origin, and can help in assessing relative degrees of relatedness of animals.

Whether pedigrees or other background are used, it is then possible to evaluate the animals and to classify them as having a relatively common genetic background or a relatively rare genetic background. This can help to drive selection decisions so that animals with rare backgrounds can have relatively wider use, and animals with more common backgrounds can be carefully evaluated and rated so that only the superior ones see use in breeding. This is especially important on the male side of things, but in many landraces the females often can contribute unique and rare genetic strains that would otherwise be lost to the breed. Rare bloodlines that are only present in females can still be managed to expand their representation in a breed. Females of rare bloodlines can be mated to males of rare bloodlines to produce males that can be used more widely, assuring that the contribution of the rare bloodline of the females is conserved and not diluted out by mating to males of common bloodlines.

Periodic monitoring of the relative status of bloodlines within a breed can help to assure that none drift to extinction through inattention. In the case of rare bloodlines, though, it is always important to investigate the reasons for the rarity. If it is just happenstance or fashion, then conservation is appropriate. If the bloodline has a serious flaw, then perhaps it is rare for a reason and should not be expanded until that weakness is eliminated.



Figure 57. Livestock Managers (2009) The Donkey Manager 007 is a sophisticated program and does what you need a donkey management program to do, but is very easy to use. Instead of hidden drop-down menus, this donkey manager has clearly marked buttons on the screens in plain view. The display screens are presented in a neat, easy to read layout, and the reports are printed in the same order they are displayed on the screen. All Animal Types Breeding Records; Feed Inventory, Work Animals, Multiple Sales, Picture Pedigree, Embryo Transfers, Inoculations and Procedures, Pedigree Chart, Purchase Report, Drop- Down Calendar (All Dates), Password Protection, Cycle Due Dates, Automatic Data Backup, Sales Reports, Purchase Reports, Veterinarian Visits, Medication (Animal), Tractor Info, Equipment, File Cabinet, Pasture Management, Ranch Weather, Animal Comments, Animal Pictures, Business Contacts, Bred Jennets Due Dates, Semen System, Scales and Scanners, and many more. \$289 (232.25 €) Donkey 007 Commercial/\$149 (116.12 €) Donkey 007 Small Herd/\$50 (38.96 €) Add Embryo Transfer/\$99 (77.15 €) Upgrade from Donkey Version 5 [Screen Caption] Accessed <http://www.livestockmanagers.com>

10. DONKEY COLOR GENETICS

When defining a breed, coat color is one of the most relevant issues we have to deal with. The ADMS is conducting research as supervised by Dr. Phillip Sponenberg, DVM PhD and with the new Donkey Color Genome Project with Dr Michal Prochazka of *Pet DNA* of AZ. This work is not complete, but there are some aspects which have already been proven.

10.1. GENERAL GENETICS SUMMARY

Nearly all genetic information is paired, and this is the key to understanding how genetics works. Each animal receives one of each pair of genes from the sire, and the other one comes from the dam. In its own turn, when the animal reproduces, it will provide either one or the other (not both) to its own offspring. This pairing and sorting generation to generation is critical to understanding genetics.



Figure 58. Stephan Plaschke (2012) Donkey family [Photography] Accessed <https://www.flickr.com>

The paired information can interact in different ways. Both members of the pair can be identical, and this is referred to as homozygous. Or, the pair can be made up of two different pieces of information, in which case the animal is called heterozygous.

The variants at each genetic address, or locus, are called alleles. These can interact in different ways. Dominant alleles can

mask a recessive allele if they are paired together. So, for most systems, three types of animals are possible:

1. homozygous dominant. This means that both pieces of information are the same, and are the type that is expressed. The animal expresses the dominant type.

2. heterozygous. This means that the animal has one copy of the dominant allele, and one copy of the recessive allele. The important detail here is that it can only express the dominant, so it hides the recessive. The key is that the animal can pass either one of these along to its offspring - so it could produce either type depending on how it is mated. While it is impossible to tell the difference between homozygous dominant and heterozygous animals by visual inspection alone, it is easily possible to assure an animal is heterozygous if it has a recessive colored parent, or has produced a recessive colored foal.

3. homozygous recessive. This means that the animal has two copies of the recessive allele. Since no dominant allele is present the recessive is expressed, and the animal can only provide the recessive allele to its offspring.

Other types of genetic interaction are possible with alleles at some loci (incomplete dominance and codominance, intermediate dominance, for example), but most of what little is known about donkey color is covered in the dominant/recessive model outlined above.

It is also wise to remember that genetics is a science of possibilities and is not a science of certainties. Genetics is great at predicting the range of possibilities in the next 100 foals – but not the details of the next one. The challenge, and the fun, is to figure out what hidden information is lurking

in breeding animals - what possibilities are there and how to tease them out of the breeding combinations.

10.2. COLOR DETAILS

Final donkey appearance is the result of a single color designation, plus any combination of white patterns superimposed over the color. The real complexity lies in that the final color arises from teamwork at several different genetic locations, each contributing to the final appearance. Unravelling those combinations can be difficult. The important concepts are that color is distinct from white, and that color is the result of several different choices at several different genetic loci. It is the final combination of these that gives the final single color. Patterns of white can then be superimposed over the final single color, and can do this in any combination.



Figure 59. Figure 59. Slice (2011) Donkey different coat color patterns [3D Illustration] Accessed from <http://s4.zetaboards.com/>

Most donkeys have an overall body color, and then can have “points” a different color. In donkeys, the “points” are the muzzle, rings around the eyes, and also the belly and upper legs. The “trim” can also vary from the overall body color, and includes the mane and tail. The combination of body, point, and trim color give several different possibilities to donkey color.

The relationships between several colors have been well documented. Others, at this point, are more of an educated guess.

Sorrel/chestnut is recessive to nonchestnut. The usual donkey nomenclature calls red donkeys “sorrel” rather than chestnut, but this is a similar genetic mechanism to that in horses. Blacks include two types: homozygous and incapable of producing sorrel, and heterozygous and capable of producing black or sorrel. Sorrels are of only one type - homozygous. Sorrels can pop up as surprises out of black to black matings. Nonsorrel animals which have a sorrel parent or have produced a sorrel foal **MUST** carry sorrel, and might be useful in a breeding program geared at producing sorrels.

Nondun (or dark) is recessive to dun. The most common choices here include the usual grey dun as compared to black or nearly black. The important issue is that black animals can pop up from gray dun animals, but mating two blacks never yields a gray dun. A gray dun which has produced a black or has a black parent must carry black, and could therefore be useful in a breeding program geared towards producing black animals. This sort of variation is more common in smaller donkeys, and rare in larger breeds where black is common and grey dun rare or nonexistent.

By combining the information on black/sorrel and nondun/dun the results are:

	chestnut	nonchestnut
dun	light dun	sorrel/rose gray dun
nondun	sorrel	black

Table 1. Combined information results on black/sorrel and nondun/dun [Table]

The exact shade of the combination of dun and chestnut is uncertain, and might be quite variable. The sorrels in the Mammoth breed almost certainly do not have the dun information in them, as dun is nearly absent in the breed. In contrast, the sorrels in the Miniature breed nearly all do have this information in them, and yet most are nearly identical to the Mammoth color. However, some sorrels are very light, and some reddish donkeys are very light with obvious striping like duns. These are likely to be combinations of dun and sorrel.

Ivory is recessive to dark colored. The usual ivory (blue eyed cream) in Miniatures is also genetically gray dun, but could be modified from any original color to the pale ivory color. Most ivories, however, do retain some barring suggestive of dun. Ivory is the recessive surprise, so the only way for a breeder to assure that the gene is in the mix is to use ivory animals, or ones with ivory parents or offspring. Ivory is more common in the smaller size classes of donkeys, and is rare in large ones. In many breeds ivory is called white erroneously.

A second dilution is much rarer, having only been reported in Australia. The result is much like champagne in horses, where the eyes are amber, the skin is light, and the color is changed to a light shade of the base color. It appears to be dominant.

Light points are dominant to dark points. The result is that dark points can occur as a surprise, and if a light pointed animal has a dark pointed parent or foal then you know the light pointed animal carries the dark point gene. The dark points are dramatic on a black animal, for then the animal is completely black. The dark pointed variant does occur on any background color, but is more common on gray duns and blacks.

Other details of color do vary in donkeys, but the genetic basis of these is currently

undocumented. Russet animals are similar to sorrels, but have black trim instead of red or flaxen trim (mane and tail). At least one result of a russet mated to a sorrel producing a black foal in the Mammoth breed suggests that russet and sorrel are at different genetic loci. Some few donkeys are bay, with black legs in addition to black trim. Other color variants include brown and smoky, which can be close to black but with obvious striping. How these behave in breeding programs is uncertain. It remains true that when two similar colors are crossed (smoky to smoky) the usual result is to get the same color back. The results following matings to other colors are much more variable.

10.3. PATTERNS OF WHITE

Patterns of white include both spotting patterns as well as roaning where the white hairs are mixed into colored hairs. Some of these patterns are obvious, others can be easily missed. Each is independent, and each can be superimposed over any background color. Some combinations are more common than others.

Spotting is dominant to nonspotted and homozygotes do not exist. Mating spotted donkeys to spotted donkeys gives some nonspotted foals (about one third of foals) while nonspotted to spotted usually gives about half spotted foals. The practical consideration is that every spotted animal can produce a nonspotted foal on occasion. This also means that a nonspotted animal cannot produce spots if mated to another nonspotted animal. regardless of the presence of spotted animals in the background. An essential point is that donkeys with facial blazes but without body spots do breed as if they were spotted, so these animals might be valuable for breeding programs. Animals with only a star do not seem to be the same in this regard, and generally lack the gene to produce spots.

Roan is very confusing genetically, and is usually called grey in donkeys. This is the color of the Andalusian breed, and is common in other breeds as well. It is probably dominant in black based colors, although it appears to be recessive in red based colors. The relationship between roan, frosted, and frosty¹ is not obvious, and has not been well documented. Some of the difficulty may be in correctly assessing the color of all of these animals. Frosted is probably dominant, and its relationship to roan is confusing. When any of these roan patterns is combined with spotting the result can be white foals. The white donkeys, in turn, can produce spots, roans, solids, and whites. These whites are distinct from ivory in that they have dark eyes, and usually have residual small patches of color that rapidly fade while the animal is still young.

¹ There is a coloration in donkeys which looks something like the aging gray in horses, but to stay away from the confusing, it is termed frosty in donkeys. Frosty may progress a little, frosted is grayed or roaned (we are not sure which it is genetically) out more completely.

11. CONCLUSIONS

Donkey breeds are unusual when compared to breeds of most other species, largely because donkeys have served so well as subsistence animals and therefore had little attention paid to their selection and use. That is now changing, but how to go forward into a future that makes these genetic resources secure and available for future generations is challenging.

Wise management of these resources will assure their contributions to those future situations.

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Chapter 2

Human and Donkey Relationships since Domestication

Jill Bough

1. INTRODUCCION

He can live without man. But man can scarcely do without the labor, the sacrifice, the suffering of the donkey. The animals that render the greatest services to man are the most cast off and deprived, such as the donkey that has accompanied man since the dawn of time, in all weathers, humbly and patiently serving the most brutal of all animals (*Vieira 2006, 134*).



Figure 1. CR Callahan (2014) A donkey on the horizon in Had Dra, Morocco[Photography] Accessed from <http://www.crcallahan.com>

The donkey has been the companion and helpmate of humans since their earliest domestication, possibly as long as 10,000 years ago (*Beja-Pereira et al. 2004*). They are well known for their tolerance of hard work, their sturdy natures, their resistance to disease and the fact that they need little maintenance. These characteristics are accepted by humans, because it suits them; in fact, donkeys do need considerable care if they are to remain healthy and capable of the work expected from them. This book is mainly concerned with the utilisation of donkeys; but we do well to remember that the donkey is a sentient animal, intelligent, sensitive and loyal, deserving of our care and respect. He is an animal embedded in human history, in literature, religion and mythology but he is also an animal in his own right, a patient, gentle and loyal creature.

Because he is stoic, slow and sometimes stubborn, donkeys have been considered lacking in intelligence. This is most certainly not true. As Frank Brookshier puts it:

Just because he refuses to comply with an order or does so in a leisurely fashion is no indication he is short on intelligence or fails to understand what is wanted of him. He does know. But he is not ready (Brookshier 1974, 7).



Figure 2. Falha (2012) According to the legend. The Onocentaur was similar to the standard Centaur except that it was part donkey. However, it had a very violent temper and sometimes conspired with the Sirens to attack sailors in ships. [Illustration] Accessed from <http://historymaniacmeghan.wordpress.com>

Throughout human history, the donkey has been there, sometimes revered, sometimes reviled or ridiculed; all too often misunderstood, mistreated or neglected.

His association with the poorer classes of society has rendered him of low value and status; his small stature and steady gait supposedly indicative of lack of progress. Yet no animal served us better. Indeed, animal traction experts tell us that the donkey is one of the best draught animals with a high learning ability (*Fielding & Starkey, 2004*). Fond of human company, he will continue to serve us well if we consider his needs as well as our own. A well cared for donkey can live for over 40 years so can be the salvation of a struggling family as well as their longtime companion.

HECHOS CURIOSOS

THE AA-HEMET OR EYORE IN ANCIENT EGYPT

There is evidence that the ancient Egyptians domesticated donkeys over 5,000 years ago (see Book 2, Chapter 10). Descended from the African Wild Ass, the donkey in Egypt stood four feet (1.2 meters) high at the shoulder and weighed about 600 pounds (272.16 kilograms), much larger than a modern donkey. Donkeys played an essential role in ancient Egypt, as they still do today in the Nile valley, as the principal load-carriers. (The horse and camel were introduced fairly late in Egyptian history (see Book, Chapter 14).

Donkeys were kept in pens or were allowed to roam in herds, watched over by a herdsman. The donkey was highly valued as a beast of burden, and are often shown in tombs carrying sheaves and grain in saddle packs, or pulling carts. Female donkeys were kept as dairy animals. Like pigs (occasionally used for treading seed into the soil) and cattle, they were employed for threshing, a job for which their sharp hooves made them particularly suitable.

Donkeys were also used to pull the plow, and two New Kingdom texts refer to donkeys pulling a chariot. Three Old Kingdom reliefs portray the owner being transported to the fields in an elaborate palanquin suspended over the backs of two donkeys because it was considered undignified to ride a donkey, unless it was on a litter. Overland trade was completely dependent on donkeys until the introduction of the camel. Possessors are recorded as having taken care of their sick donkeys. The attitude to the animal is expressed in an ancient Egyptian proverb: "*When there is work to do, get a donkey. When there is fodder, fetch an ox.*"

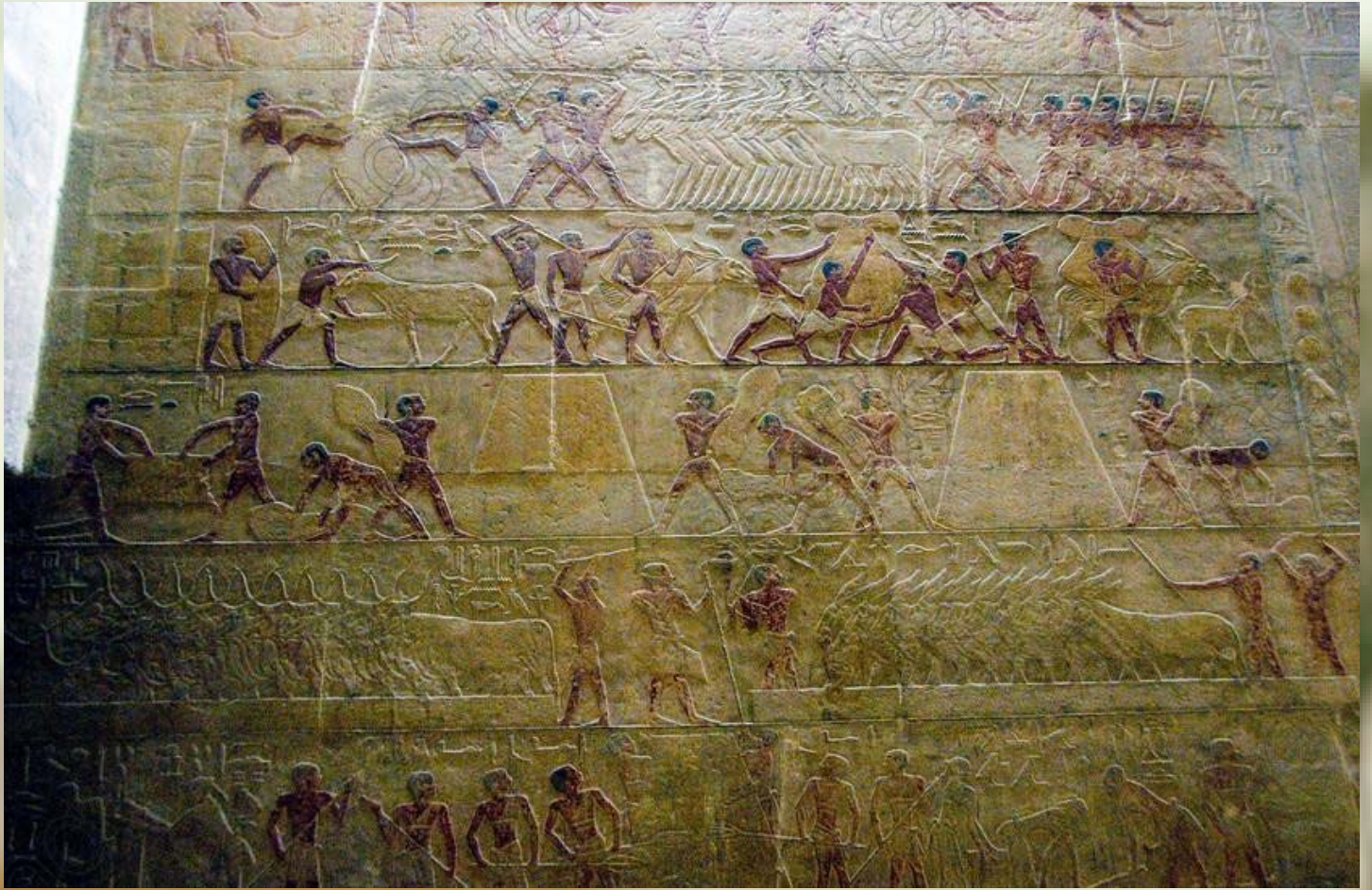


Figure 3. Jim Henderson (2007) Donkey handling relieves. Ancient Memphis (UNESCO World Heritage List, 1979). Saqqara. Necropolis. Private funerary mastaba of Mereruka, 6th Dynasty, 2349 BC. [Painted relief] Accessed from <http://www.crooktree.com/>

The purchase price of a donkey was fairly high, donkeys being worth more than a goat, sheep, or pig, about as much as a cow. No distinction was drawn between male or female donkeys, so variations in value reflect the quality and age of the animal. Only the wealthy could afford a donkey - peasants rented the animal from the more prosperous. Owners bragged about their large herds of donkeys, and the pharaoh Aha was buried with the remains of ten donkeys to accompany him in the afterlife. These donkeys were accorded the same importance as court officials, and occupied their own special tombs. Starting during the Middle Kingdom, the donkey became associated with the evil god Set, who was said to take the form of a red donkey. A myth states that 77 donkeys opposed the sun-god Ra and stood in his way to try and prevent his rising. During the New Kingdom, the "Donkey of Set" was ritually killed with a lance at the festival of Osiris. At Busiris the sacrifice was symbolic: a donkey's picture was impressed upon sacrificial bread. The hieroglyphic of the donkey came to be bound or pierced with a knife, to render it harmless.

There were many Egyptian proverbs concerning the donkey, like; *"Do not tie your donkey's foot to the palm tree lest he shake it."*, *"The hissing of the snake is more effective than the braying of the donkey."*, *"The waste of a donkey is carrying bricks."*, *"One does not load a beam on a donkey."*, *"If a donkey goes with a horse it adopts its pace."*, *"One does not praise a donkey carrying a load because it brays."* Just having a look to these sayings we are able to learn about the misconception that has followed donkeys since the beginning of humanity.

(*Cow of Gold*, an encyclopedia of Egyptian mythology)

Donkeys have been a constant presence since the earliest human societies formed. Their greatest use to humans has been as beasts of burden, from Ancient Egypt to present day Africa, bearing every conceivable commodity on their backs or pulled in small carts. They have been kept in great herds as dairy animals: their rich milk beneficial to humans for nutritional, medicinal and cosmetic purposes. Their flesh has been eaten and their hides used for a variety of purposes. We owe the donkey a great debt of gratitude for his presence throughout human history. This chapter provides a selection of snapshots of the relationships between humans and donkeys over time and distance as donkeys travelled with their humans throughout the world. Sadly, this one-sided relationship has not often proved rewarding for the donkey. One of the most used and abused animals, humans have exploited him not only to relieve their physical burdens, but also their psychological and spiritual ones as he became a part of their belief systems and rituals (Bough, J. 2011a). These differing attitudes and beliefs were to have an effect on the treatment of actual donkeys in the real world. It is worth remembering that the donkey does not change; it is human perceptions of and attitudes to him which change.

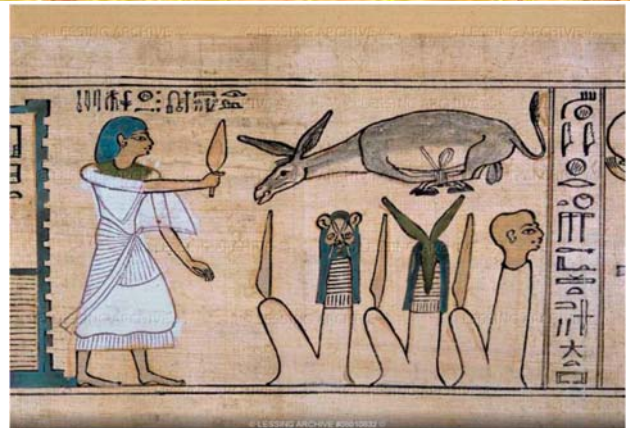


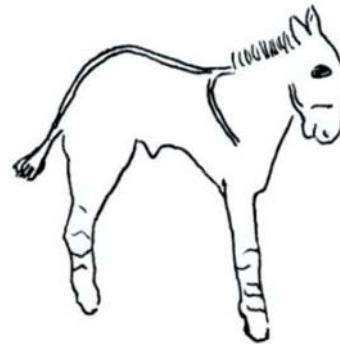
Figure 4. Lesson Archive (2013) A vignette from the Book of the Dead of Chensumose, priest of Amun-Ra. Three demons bear knives, while Chensumose confronts a trussed donkey. Papyrus. 21st Dynasty (1080-960 BCE), Third Intermediate Period, Egypt. During the New Kingdom, the "Donkey of Set" was ritually killed with a lance at the festival of Osiris [Papyrus]. Accessed from <http://warboar.wordpress.com>

2. DOMESTICATION

Wild asses had been part of the lives of Ancient Egyptians from at least 6000 BC as rock art shows them being hunted while rock art from before 3000 BC depicts donkeys carrying goods on their backs and being driven by humans. Research suggests that present day donkeys are descended from two lineages of domesticated asses in northeast Africa¹ (Beja-Pereira *et al.* 2004). Other recent zooarchaeological analysis support the findings that the modern domestic donkey (*Equus asinus*) derived from the wild African ass in northeastern Africa around 6,000 years ago (Kimura, 2013). The two subspecies of the wild African ass (*Equus africanus*) are the Nubian ass (*Equus africanus africanus*) and the Somali ass (*Equus africanus somaliensis*) (see Book 1, Chapter 1 & Book 2, Chapter 14).

Both of these asses are still alive today, but both are critically endangered. Ideally suited to their semi-desert homes, they thrived in any dry stone area where there is scrub vegetation within two or three days of water (Clutton-Brock, 1992) Of the two species of African wild ass, the Somali is taller, greyish in colour and is distinguished by strong dark stripes on their long legs. They still manage to survive in the wild in Somalia, Eritrea and Ethiopia despite a ninety percent reduction in their range in the last 20 years (Moehlman, Kebede & Yohannes, 1998). The sturdier Nubian wild ass, depicted as a hunted animal in Egyptian art and known for its stamina, is believed to be the ancestor of the domestic donkey. They are fawn in colour and have, as well as the eel marking running down the back, the distinct shoulder stripe running from the withers down to the top of the leg, inherited by domestic donkeys. Their ears are typically longer than other wild asses and their bray is identical to

that of the donkey. The Nubian is thought to be virtually extinct in the wild today, with only a few remaining in captivity. Severe drought, devastating wars, loss of habitat and competition with domestic livestock for pasture and water are the main reasons for their drastically reduced numbers, as is their capture for domestication over centuries.



Figures 5 & 6. (Figure 5) La Finestra de Fidel & (Figure 6) Roger Blench (2013-2014) (Figure 5) A mosaic representing an Atlas wild ass (*Equus africanus atlanticus*), in The National Bardo Museum (Tunisia). Also known as Algerian wild ass, is a purported extinct subspecies of the African wild ass that was once found across North Africa and parts of the Sahara. It was last represented in a villa mural ca.300 AD in Bona, Algeria, and went extinct as a result of Roman sport hunting & (Figure 6) Redrawn petroglyph of a putative Atlas Wild ass from the "The she-ass and her foals" set. Note the short ears, the shoulder cross, chevron stripes on the legs and eel stripe. Engraving, Naturalistic Bubaline school, El Richa (Saharan Atlas, Algeria) (L = c. 160 cm for the main animal.) [Photography & Illustration] Accessed from <http://lafinestrade Fidel.blogspot.com.es>

¹ Albano Beja-Pereira, a molecular biologist from CIBIO-University of Porto, Portugal, sampled donkey DNA from 52 countries

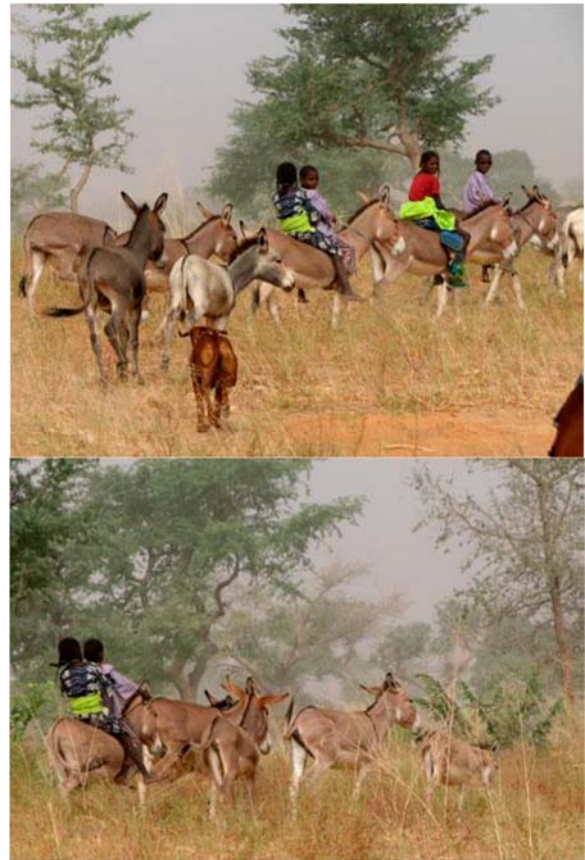


Figure 7. Emma Redfern (2014) *Dead Donkey with a view North Horr (Kenya)*. 12th February, 2014 [Photography] Accessed from <http://rememberthegoat.com/>

Donkeys were first domesticated by ancient cattle herders as a response to the area becoming more arid and rainfall more unpredictable, although knowledge as to the actual timing and processes of domestication remain unclear. They may well have been domesticated several times by different groups of herders, while interbreeding is likely to have continued between wild and domestic asses throughout the long and slow domestication process (Kimura, 2013)

Originally kept in herds as dairy animals and for their meat, their predominant use was as transport animal. Domestication of the donkey marks an important point in human history as it signifies a shift from a sedentary lifestyle to a more mobile society based on trade (Clutton-Brock, 1989). The donkey was the hardest ancient transport animal in Africa and the Near East and as the climate grew drier they enabled pastoralists to move their households with their herds in search of food. In Egypt, however, in the fertile valley of the Nile, a settled civilisation developed that relied solely on the donkey for all domestic and agricultural purposes. They carried materials for construction sites, goods for trade, food, everything that was needed for the running of the society. A constant stream of donkeys walked from the farms and villages down to the Nile and back, transporting water which kept the crops

growing, the mills turning and the economy prospering (see Chapter 29).



Figures 8 & 9 Esther Garvi (2009) *The Tuareg Children and Their Donkeys*. At wintertime in Niger. Some days are temperate and sunny while some are cold and dusty (especially around dawn). It is possible to meet more people at this time that the millet fields have opened up to the nomads, who bring their animals south from the northern pastures. In the photographs there is a group of Tuareg children who were driving a herd of donkeys through the millet fields. The children are professional herders, riding bareback on their well-trained donkeys. This brother and sister ride in perfect unison, handling their donkey with perfect ease. Suddenly, a few riderless donkeys drifts off on their own, and the brother and sister ride after them. With perfect ease, they trot bareback on their bitless donkey, catch up with the runaways, and steer them back to the main flock. [Photographies] Accessed from <http://www.esthergarvi.org>

The earliest domesticated donkey bones identified archaeologically were found near Cairo. Those found at the site of El-Omari, a predynastic Maadi site in Upper Egypt date to 4600-4000 BC, while the discovery of ten complete donkey skeletons buried at Abydos date to around 3000 BC. (Rosset *et al.* 2008). Four hundred and eighty kilometers south of Cairo, the site of

Abydos, situated in the Nile Valley, is famous as the burial place of the earliest Egyptian kings (see Book 2, Chapter 25).



Figure 10. Jim Lopes (2012) Donkey over an archeological site in Egypt [Photography] Accessed from <http://морфильм.рф/>



Figure 12. The Global Egyptian Museum (2014) High-Relief from 6th Dynasty, found at the Necropolis of Giza. In Pelizaeus-Museum [04/030] Hildesheim. This harvest scene is composed of three wall segments. The bottom register shows the transport of large sacks of barley to the threshing floor. To the right are two labourers who pile up the goods. The middle register has scenes of the harvest of flax and barley, carried out with sickles. To the right is an overseer inspecting the work's progress. The uppermost register continued the agricultural theme, but this has now all but disappeared [Photography] Accessed from <http://www.globalegyptianmuseum.org/>



Figure 11. Amazon (2014) Egypt Desert Camel and donkey rider French Print 1880. Page from an Issue 1881 L'Univers Illustre published in France [Photography] Accessed from <http://www.amazon.com>

The donkeys' burials and their location in the high status area of the North Cemetery indicate that the donkeys were highly valued as they took their place alongside the kings of Egypt in their burial chambers. An analysis of the skeletons and comparison with modern and ancient animals led researchers to argue that the domestication process was not complete by the end of the predynastic period, but instead continued as a slow process over several centuries. These 5,000 year old bones revealed extensive wear on the joints from a life time of transporting heavy loads. As archaeologist Fiona Marshall notes: "This is the very dawn of the Egyptian state, the engine of which was the donkey" (Rossel et al., 2008).



Figure 13. William Brassey Hole (2014) *Israelites making bricks in Egypt* [Oil on Canvas] Accessed from <http://www.wikigallery.org/>

CURIOUS FACTS

THE DISCOVERY OF THE CATACOMBS OF KOM EL SHOQAF A

Tradition has it that on Friday, September 28th, 1900, in Alexandria, Egypt, a donkey, hauling a cart full of stone, made a misstep and disappeared into a hole in the ground. If that story is accurate, this beast of burden made one of the most astounding discoveries in archeological history: A set of rock-cut tombs with features unlike that of any other catacomb in the ancient world.

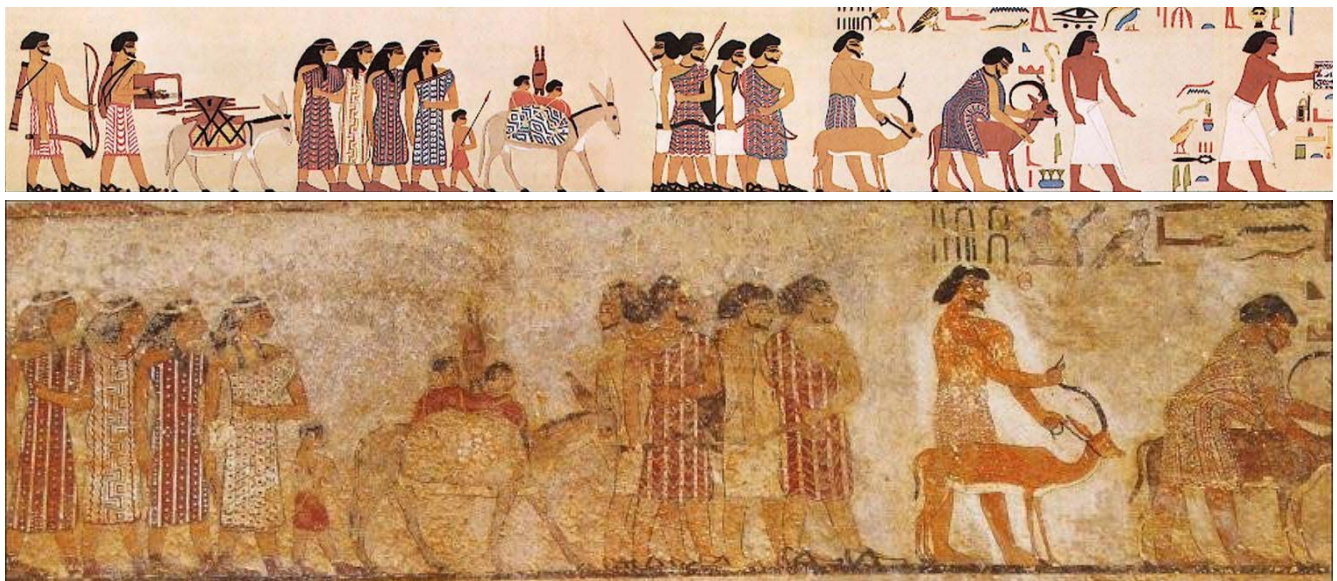
We actually don't know if the donkey story is true or not, but records do show that the shaft was reported to authorities by a man named Monsieur Es-Sayed Aly Gibarah. Following the rules about such finds in those days, he sent a message to the local museum saying, "While quarrying for stone, I broke open the vault of a subterranean tomb. Come see it, take the antiquities if there are any, and authorize me to get on with my work without delay." The curator, tired of being called out to sites and finding nothing of importance, didn't go himself, but sensing the man's impatience to get on with the work, sent two of his assistants home early, telling them to check out the find on the way. What they found brought the curator out the next day and he spent much of the rest of his life documenting this unique discovery. Archeologists believe that the Catacomb of Kom el Shoqafa was started in the 2nd century A.D. and was used to intern the dead for the next 200 years.

PYRAMID CURSE

An unusual curse who prevented thieves from breaking into pyramids was the "Donkey Curse" which threatened the violator of the tomb with being raped by a donkey, the animal of Seth.

Domesticated before the horse and the camel, the donkey enabled the earliest travel and trade between ancient city states and other cultures. Because of their hardiness in semi-desert conditions, donkeys were a vital aspect of early trade and integral to the formation of more complex civilisations; an important link in all areas of business, from the transporting of farm producers to the merchants travelling the trade routes connecting the Nile with the Sudan, Ethiopia and the trading centres of the Middle East. Apart from their importance as transport animals, the hide of the donkey was prized in the Middle East from the earliest days of domestication. Shagreen was made from their untanned hide to make footwear and other articles for human use such as harnesses, seats, tying and fastening materials, drums and a myriad other objects while different parts of

the body were used as medicines. From the Middle East they travelled along the great trading routes to other regions of the world. Traders and herdsmen met along the caravan routes that spread out from Damascus, the 'City of the Asses', where the trading and swapping of donkeys took place. However, the as yet limited understanding of the domestication, spread and use of donkeys means that their journeys from Africa to the Iberian Peninsula and from there to different parts of Europe is still not clear. While the donkey's use in Europe has changed drastically over recent years, the lives of the descendants of those donkeys many thousands of years ago in the Middle East have changed little. They continue to carry burdens of all kinds, especially the ubiquitous firewood and water.



Figures 14 & 15. Ashcraft (2009) Tomb No. 13 of Khnumhotep II at Beni Hasan, Egypt. Khnumhotep II (Egyptian governor) Ibscha Relief illustrating events that occurred during the 6th Year of Sesostri II. The painting evidently registers an actual event which Khnumhotep felt worthy of eternal repetition. It depicts a group of thirty-seven Semites in full size in the act of paying customs duties to the monarch's officials. A bold hieroglyphic text states that these Asiatics are supplying him with such important items as stibium, a mineral required for eye makeup acquired in Mesopotamia. Khnumhotep evidently feared that the place he would occupy in the hereafter might lack the mineral, as was the case in Egypt. The date given is the fourth year of Sinusert II's rule, or about 1892 B.C.E. The leader of the caravan of tradesmen and artisans is named Abushei, a distinctly Hebrew name. It was, for example, the name of a top general under King David. What is most remarkable about the rendering was the depiction of advanced tools and instruments as yet foreign to Egypt. Middle Bronze Age metal-smithing is one of the crafts practiced by the Abushei group, readily deduced from an anvil and a bellows loaded on the backs of the donkeys. An Egyptian artist thus presents evidence of metalworking technology that had not yet been employed by Egyptians.

Curvilinear, laminated bows are being carried by members of the troupe. At the time, the bows of Egyptian soldiers were made of simple arched twigs. A 12-string harp or lyre borne by another member would likewise be unknown to Egypt until new forms of music, games and dance were introduced in the Second Intermediate Period. Most striking in the great expanse of the mural were intricately woven fabrics of the clothes worn by both the men and the women. They were produced on an upright loom, another mechanism as yet unknown in Egypt, as were the vivid colors of the dyes employed, colors faithfully reproduced by the anonymous painter of the mural. [Illustration] Accessed from (Figure 14) <http://commons.wikimedia.org> & (Figure 15) <http://classconnection.s3.amazonaws.com>



Figure 16. The British Museum (2014) "Peace Panel" from the Standard of Ur, Excavated by C.L. Woolley. From Ur, southern Iraq, about 2600-2400 BC. British Museum, Room 56: Mesopotamia. The 'Peace' panel depicts animals, fish and other goods brought in procession to a banquet. Seated figures, wearing woollen fleeces or fringed skirts, drink to the accompaniment of a musician playing a lyre. Banquet scenes such as this are common on cylinder seals of the period, such as on the seal of the 'Queen' Pu-abi, also in the British Museum [Photography] Accessed from <http://www.britishmuseum.org/>

3. WAR

The donkeys' role as hardy transport animals saw their exploitation in many human conflicts. It began in Sumeria with the domestication of the donkey and the

invention of the wheel (Hamblin 2006). The Sumerian artefact known as the *Standard of Ur*, dating from around 2600 - 2400 BCE, illustrates this early military use.



Figure 17. The British Museum (2014) "War Panel" from the Standard of Ur, Excavated by C.L. Woolley. From Ur, southern Iraq, about 2600-2400 BC. British Museum, Room 56: Mesopotamia. 'War' shows one of the earliest representations of a Sumerian army. Chariots, each pulled by four donkeys, trample enemies; infantry with cloaks carry spears; enemy soldiers are killed with axes, others are paraded naked and presented to the king who holds a spear. [Photography] Recovered from <http://www.britishmuseum.org/>



Figure 18. The British Museum (2014) Standard of Ur, Excavated by C.L. Woolley. From Ur, southern Iraq, about 2600-2400 BC. British Museum, Room 56: Mesopotamia. This object was found in one of the largest graves in the Royal Cemetery at Ur, lying in the corner of a chamber above the right shoulder of a man. Its original function is not yet understood [Photography] Accessed from <http://www.britishmuseum.org/>

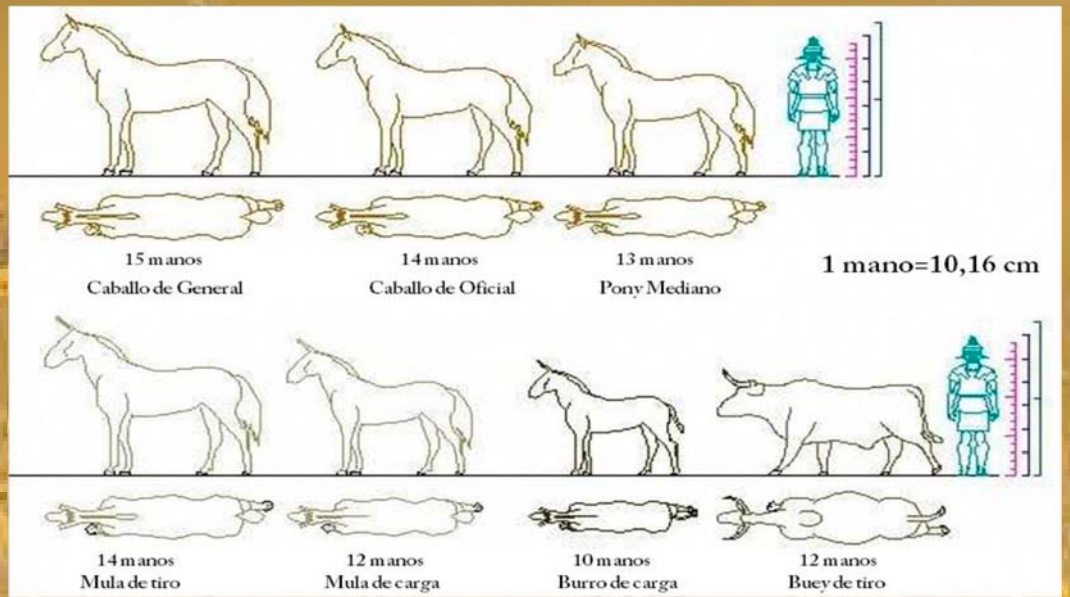
Donkeys and donkey/onager hybrids are depicted drawing war-carts. This early representation of a Sumerian army, possibly engaged in a border skirmish due to the constant occurrence of war amongst the developing city states, illustrates the importance of donkeys to their conflicts. The Syrians used donkeys to pull war-carts to carry supplies in the Early Bronze Age

while Roman and Greek armies exploited both donkeys and mules for pack work and riding and for pulling chariots.

One of the greatest challenges to the Roman army was transporting water to the men and animals, especially if the campaign was being fought in desert conditions. There are several records of

numerous pack-animals carrying water in specially made water-skins.

Pompey, for example, ordered water for his troops to be carried in ten thousand skins when crossing a desert region while Herod is reported to have supplied water for Roman troops in their march across the Sinai carried on the backs of donkeys (*Roth, 1998*)..



Figures 20, 21, 22, 23 & 24. (Figure 20) Juan Francisco Adame Lorite, (Figure 21) Gun Powder Ma, (Figure 22) carvel2, (Figure 23) The VRoma Project & (Figure 24) Gary Brueggeman (1896-2003-2011-2012) (Figure 20) Trajan's Column (Italian: Colonna Traiana) is a Roman triumphal column in Rome (Italy) that commemorates Roman emperor Trajan's victory in the Dacian Wars. Completed in AD 113, the freestanding column is most famous for its spiral bas relief, which artistically describes the epic wars between the Romans and Dacians (101–102 and 105–106) (Figure 21) Roman carroballista, a cart-mounted field artillery weapon. Relief Detail of plate XLVI (Figure 22) Roman war donkey and roman soldier lead figurine, (Figure 23) Obverse of a brass sestertius of Tiberius, minted in Rome (22-23 AD), with the covered mule cart, called a carpentum. The coin may commemorate the Senate and People of Rome (SPQR) granting Livia (Lulia Augusta) the right to sit with the Vestals at public games; she may also have been granted the right to ride in a carpentum & (Figure 24) The illustration below shows some representative sizes of horses, donkeys, mules and oxen. The scales at the right show hands (magenta), feet (blue) and meters (green) according to Roman soldier's medium height. Donkeys were also used, though it seems that mules were preferred. They are smaller than mules, between 36 and 60 inches at the withers, carrying proportionately smaller loads. A small donkey could carry about 120 pounds, a large one the same as a mule [Photographies & Graphics] Accessed from (Figures 20 & 21) <http://en.wikipedia.org>, (Figure 22) <http://warlordgames.com/>, (Figure 23) www.vroma.org & (Figure 24) <http://garyb.0catch.com>

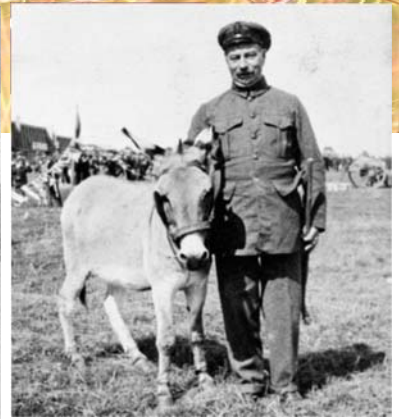


Figure 25. CaveLupa (2012) Frasse, the War Donkey [Illustration] Accessed from <http://cavelupa.deviantart.com>

Donkeys have remained an important means of transport in most theatres of war ever since, especially in inaccessible, difficult and rocky terrain and harsh climates. In the modern era, they played an important role in both the Boer War and the First World War and even the Second World War in certain inaccessible areas (Bough, 2011a) (see Book 2, Chapter 10).



Figure 26. Australian War Memorial (1914-1918) World War I (WWI or WW1 or World War One), also known as the First World War or the Great War, was a global war centred in Europe that began on 28 July 1914 and lasted until 11 November 1918. Donkeys and mules were fairly widely used during the First World War. Here an Australian soldier is pictured riding his donkey [Photography] Accessed from <http://www.getbucks.co.uk/>



Figures 27, 28, 29 & 30. (Figure 27) Gsl, (Figure 28) Carl, (Figure 29) T. P. Bennett photographer & (Figure 30) Australian War Memorial (1915-1918-2006-2011) (Figure 27) Lt. Richard Alexander "Dick" Henderson using a donkey to carry a wounded soldier at the Battle of Gallipoli, (Figure 28) Two Australian officers mounted on donkeys in desert, in Egypt during World War I, 1915. Shows two unidentified Australian officers mounted on donkeys. Egyptian man beside them. Card in sand between the two donkeys bearing the numeral 8. Sphinx and pyramid in the background. T.P. Bennett collection, (Figure 29) 19 Squadron, Buildings and structures, Duxford after closure, First World War, Second World War. The unnamed First World War donkey & (Figure 30) Simpson working in Shrapnel Gully at Anzac Cove, assisting a wounded soldier, 1915 [Photographies] Accessed from (Figure 27) <http://en.wikipedia.org>, (Figure 28) <http://search.slv.vic.gov.au>, (Figure 29) <http://blogs.iwm.org.uk> & (Figure 30) <https://www.awm.gov.au>

In the East Africa Campaign of 1916-17 thousands of donkeys died a terrible death from tsetse fly, others from the supposed antidote, arsenic. Out of the 34,000 employed in the campaign, there were 1,042 alive at the end. In the Near East, 8,000 were employed to carry baskets of stone, helping General Allenby build a road from Jaffa to Jericho. In Sinai and Palestine donkeys proved invaluable to the Allied Forces in the harsh desert conditions (Cooper 2000). Donkeys are also used by both the Allied Forces and the Taliban in the ongoing conflict in Afghanistan today. Despite sophisticated weaponry, donkeys are still often the chosen method of transportation for elite Special Operations Forces where battles are fought in mountainous and treacherous terrain, inaccessible to tanks and other vehicles. Donkeys, handlers are told, have a strong sense of survival. If they decide something is dangerous they will not do it, they are smart enough to know when they cannot manage something. Their propensity to freeze when frightened rather than running from danger is seen as a great asset. Yet with trust and confidence in their handlers, donkeys will accomplish whatever task is required of them. (Special Forces use of pack animals 2004)² A close bond can develop between a handler and his donkey as the soldier learns to trust the instincts of his companion in a dangerous environment.



Figures 31 & 32. (Figure 31) EPA & (Figure 32) Гласът на българите (2011-2013) (Figure 31) A Libyan rebel near Bani Walid & (Figure 32) War Donkey [Photographies] Accessed from (Figure 31) <http://justiceinconflict.org/> & (Figure 32) www.pars.com



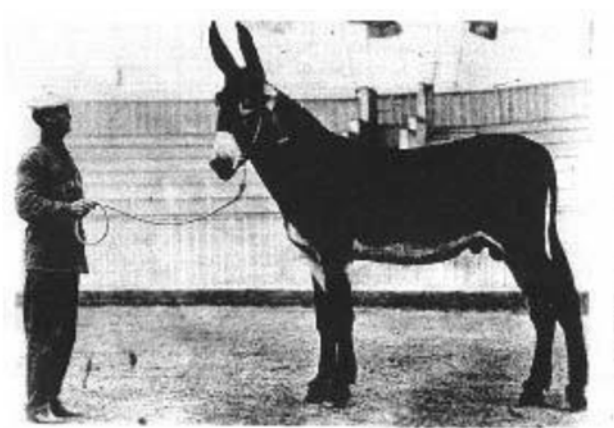
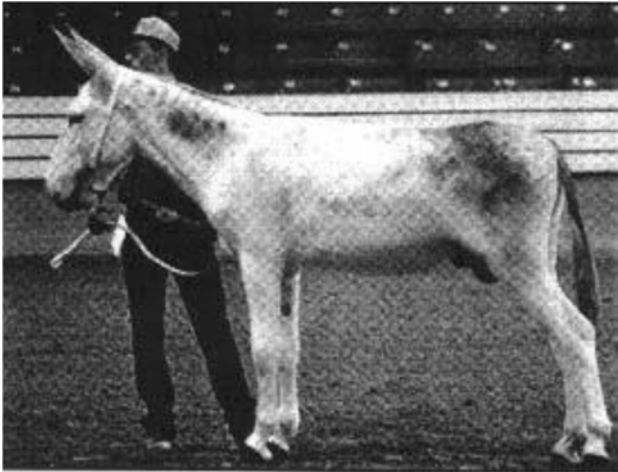
Figure 33. Gary Chancey (2014) First Sgt. John Mangels, C Company, 1st Battalion, 32nd Infantry Regiment, establishes a relationship with a donkey using his natural instincts Jan. 30. This technique is important since the donkey is bred to please and work hard [Photography] Accessed from <http://www.drum.army.mil>

² The important role played by animals in human warfare is now finally being recognised and it is appropriate that bronze statues of a donkey and mule feature as the centrepiece of the 'Animals in War' memorial in Hyde Park in London (2004). These are individual animals struggling under their loads of First World War military equipment, yet they also symbolise all the hundreds of thousands of animals who suffered and died, not only in the Great War but in all human conflicts.

4. THEN AND NOW: EXAMPLES FROM EUROPE

Domestic donkeys evolved into many different and diverse breeds as they spread across the world, the result of years of selective breeding by humans depending on the specific characteristics required and the different environments in which they were used. Specific breeding goals, available fodder, climatic conditions and geographical isolation led to a great diversity of breeds (Bough 2011a)³. However, interbreeding and genetic attenuation has left many donkey breeds vulnerable while the advent of mechanisation saw many others disappear or drop into serious decline.

Figures 34 & 35. Leah Patton (1998) (Figure 34) Modern Mammoth shows strong Andalusian characteristics, 1998 & (Figure 35) National recognition first came to the Hineman Jack Farm in 1915, when H.T. and George took some stock to the San Francisco World's Fair, during the Panama Pacific International Exposition. One jack, Kansas Chief, won the title of World Champion Jack. In addition, their herd won a total of 28 ribbons. After the World's Fair, the Hinemans began attending shows and fairs in earnest. The longer they exhibited, the more they consistently won the top prizes. By the 1930s they totally dominated the show and fair circuits. This jack shows Catalonian characteristics [Photographies] Accessed from (Figure 34) www.saddlemuleneews.com & (Figure 35) www.nasma.us



³ see Book 1, Chapter 1.

During the late eighteenth and nineteenth centuries, donkey breeding was an important industry in certain countries. Spain was a leader in the industry: Catalonia and Andalusia each bred a large type of donkey, their jacks greatly valued for breeding in other parts of the world. These larger breeds became the foundation of the Mammoth jacks developed in the United States when mule breeding became important in agriculture and to the economy.⁴



Figure 36. duane/No Casts (2014) Recognizing that Jesus intentionally chose a donkey for his procession, “an animal associated with royal coronations and kings on parade in the city” [Ben Witherington III, Matthew, 391] many if not most scholars opt for the obvious explanation: that Jesus did this to fulfill the prophecy in Zechariah 9:9: “Tell the daughter of Zion, Look, your king is coming to you, humble, and mounted on a donkey, and on a colt, the foal of a donkey.” This may be true, but at the same time Jesus recreated a scene that was repeated several times in Israel’s history before the prophecy was written. Ben Witherington, claims that the reference to Zechariah 9 in Matthew is drawing on 1 Kings 1:32-40, when King David on his death bed learns that his throne has been usurped by his eldest surviving son Adonijah. David insists that his youngest son Solomon be mounted upon David’s donkey and escorted to

Gihon for his anointing. And this in turn was a repetition of 2 Samuel 16:1-14, when David himself mounted the same donkey. In the Ancient Near East to mount a donkey this way was symbolically equated with mounting the throne. After anointing Solomon, the people sounded a trumpet and the crowd roared, “Long live King Solomon!” All the people followed him, “playing flutes and greatly rejoicing, so that the ground shook with the sound.” [Etching] Accessed from <http://nooutcasts.org>

In the last half of the twentieth century, however, the donkey population in Spain collapsed by more than a million, to the estimated 73,000 that exist today due to the intense mechanisation of agriculture that took place in the 1960s and 1970s.⁵

Donkeys, which were once an important part of the daily lives of the people and of significance to the economy were no longer needed and therefore perceived as of little value. Thankfully, in Spain, as in other countries there are sanctuaries which care for neglected donkeys and the harmonious relationship between humans and donkeys is once again evident while the donkeys can live out their lives in safety and comfort.

Donkeys came to Greece during the rule of King Solomon (971-931BC) where they were used in all areas of economic production. Their labour was necessary for all heavy tasks such as ploughing, turning grindstones, pumping water, hauling rocks and logs; they also carried oil, wine and grain to be loaded onto the ships and goods from town to town (Bough 2011a). They proved useful on the narrow tracks between vines on the steeply terraced hillsides in viticulture. They also carried people on their backs or in small carts. As Ancient Greek historian Mark Griffiths point out:

“Without them there would have been no food for the table or fuel for the fire; nor would the workshops, markets, and retail stores have been able to conduct their business (Griffith 2006)”

4 The first two were imported by George Washington in 1784 (see Book 1, Chapter 11).

5 The Andalusian, for example, is an especially large and hardy breed and is thought to be descended from the giant Egyptian Pharaoh donkey, now extinct.

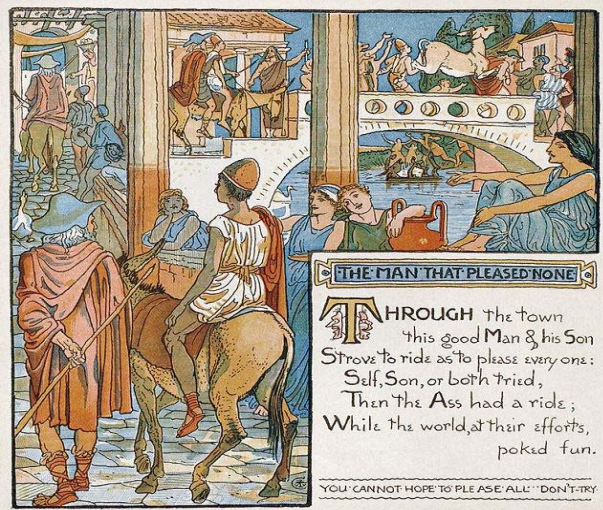


Figure 37. Walter Crane (1887) Walter Crane's composite illustration of all the events in the tale for the limerick retelling of the fables. Illustration for "The Man That Pleased None" from *Baby's Own Aesop*, a children's edition of Aesop's fables. Library of Congress [Illustration] Accessed from <http://en.wikipedia.org/>



Figures 38, 39 & 40. (Figure 38) American University of Washington, D.C., (Figure 39) Paul Randall Williams, (Figure 40) Klein-Hubert/KimballStock (2003-2010) (Figure 38) Donkey carrying baskets in Greece, (Figure 39) Donkey loaded with hay sleeping in the midday sun. Naxos, Greek Cyclades Islands & (Figure 40) Donkey tethered to tree in olive grove in spring, Greece [Photographies] Accessed from (Figure 38) <http://www1.american.edu>, (Figure 39) <http://funkystock.photoshelter.com/> & (Figure 40) <https://www.kimballstock.com/>

Donkeys have remained integral to Greek culture and the ubiquitous image of the

donkey carrying an elderly villager along narrow village streets or a tourist up a steep mountain path is well known. However, their fate is now under threat due to mechanisation. Almost everywhere in Greece, cars, trucks, and motorcycles have taken over, apart from the island of Hydra where donkeys and mules are used for all land transport. Georgos Arsenos of the Aristotle University's School of Veterinary Medicine explained that the population of donkeys in Greece has been falling dramatically over the past 50 years. The number has dropped by 96% falling from half a million in the 1950s to just over 18,000 in 1996. Many more died during the 2007 devastating fires that swept the country's southern Peloponnese where about 40 % of Greece's donkeys live. "If this reduction continues, then within just 10 to 15 years the donkey population will fall below 1,000 animals," he said (*Greece's Donkeys Moving into History at a Rapid Pace*, 2007). It is a pity that donkeys once integral to Greek culture are now left to starve by the roadside while a remaining few are used to carry tourists.⁶ Many humans forget the debt they owe to donkeys and the close relationship they have had over so many centuries (see Book 3, Chapter 6).

However, there are examples of attitudes changing once again towards our donkey companions as sanctuaries are established to care for them while other uses for donkeys are found in some countries. England had been regarded as one of the cruellest and least sentimental nations in Europe towards animals until the early part of nineteenth century: by the end, it was a leader in animal welfare. This is reflected in their relationship with donkeys.

By the eighteenth century, donkeys could be found more commonly working in the expanding industrial towns rather than in

rural villages and their abuse and neglect was everywhere evident on bustling streets. Similarities can be drawn between attitudes towards donkeys and their status and treatment in Britain and in Ancient Greece, especially their association with the lower classes which reflected the deep class divisions within the society (Ritvo 1994). Before the days of mechanisation, the donkey was the beast of burden for the poor doing the most menial of jobs. Most were overburdened, overworked and underfed. Costermongers and their carts pulled by donkeys were a common sight and around Covent Garden on a Saturday morning there could be as many as two thousands of them at work, with 200 lined up for sale (Mayhew 1851).

In the twenty-first century, life for donkeys in England has changed dramatically. Although there are relatively few working donkeys, they are viewed fondly their close relationship with humans recognised. Most are valued and well cared for although here, as everywhere, there are always individual stories of terrible neglect. The beach donkey is still a common sight in the UK and a law which requires donkeys taking rides on Blackpool beach to work a maximum seven hour day and to have an hour's lunch break each day has been enacted (see Book 3, Chapter 6).

The Donkey Sanctuary in Devon, which cares for 75% of all donkeys in the UK and runs sanctuaries in many third world countries, is now the largest organisation of its kind in the world and is one of the highest earning charities in Britain. The life for donkeys at the sanctuary is indeed donkey heaven. Many hundreds of people visit the sanctuary and everywhere there are reminders of the close bond between humans and donkeys: in the commemorative plaques and benches and the children fondling and grooming the donkeys (Bough, J., 2013).



Figure 41. Jack Stasiak (1910) London Life. Coster in His Donkey Cart at Covent Garden [Postcard] Accessed from <http://www.ebay.com/>



Figures 42 & 43. (Figure 42) Plaques of London & (Figure 43) Bridgeman Art Library/Private Collection/The Stapleton Collection (2014) (Figure 42) Tribute plaque to Working Donkeys of Covent Garden. From 1661 to 1974. Corner of Henrietta and Southampton Streets, London WC2 (Western Central 2) & (Figure 43) 'Whip Woman' at Covent Garden [Photographies] Accessed from (Figure 42) <http://www.plaquesoflondon.co.uk> & (Figure 43) <http://www.magnoliabox.com/>

5. RELIGION

Donkeys have not only played an important physical role in peoples' lives they were also endowed with symbolic and spiritual meanings from the earliest days of their domestication. The first narratives about our lives together were drawings on cave walls: donkeys have been portrayed being hunted for food, as beasts of burden, as companions, even as gods to be worshipped. The practice of including donkeys in funerary rituals and sacred places dates back at least 6,000 years. In his historical survey of near eastern texts, Kenneth Way concludes that 'it is evident that donkeys held a very special status in the ceremonies of both life and death'(Way 2011, 150) (see Book 2, Chapter 10). He found that donkeys functioned, amongst other things, as 'funerary furnishings', included amongst the goods needed by the deceased in afterlife.

Donkey burials span approximately 2,000 years of history in the Near East. In the third millennium BC, the earliest donkey burials occur in Archaic- period Egypt, where they are always associated with elite human tombs, interred adjacent to monumental human graves (Way 2011). As we have seen they were vital to the everyday lives of the ancient Egyptians so it is not surprising that they were also linked to their beliefs concerning the afterlife and used in religious ceremonies. This is clearly shown in the discovery of the ten complete donkey skeletons at Abydos which indicate the importance of donkeys to high- ranking humans, both in this life and the next. Perhaps they were intended for continued use in the afterlife, or maybe as offerings to the gods. The regard in which donkeys had been held in the Old Kingdom in Egypt, however, was not to continue. Originally, the donkey had been associated with the mighty desert god, Seth. He was

often depicted with a donkey's head, his sexual potency symbolised by the donkey, especially the erect tail and ears (Bulliet 2005, 151).



Figure 44. 3Drivers (2014) Seth [3D Graphics Image]
Accessed from <http://www.turbosquid.com>

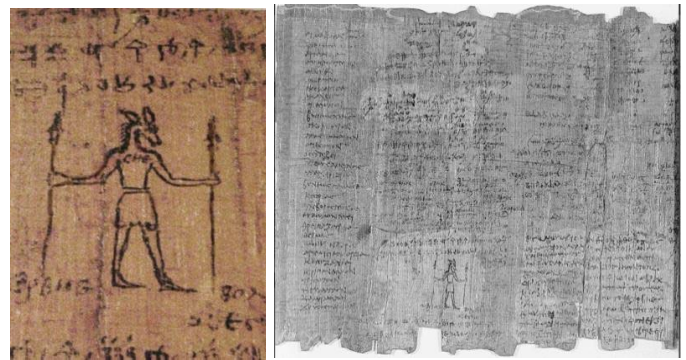


Figure 45 & 46. Monique van der Veen (2014) Leyden Papyrus "Figure with human body and Seth-animal head. His arms are stretched to the left and right and keeping big man standards. On his chest is "Seth" in Coptic letters, he wears a short skirt." Greco-Roman Period, Roman, 4th century (CE 300 / 350) The Dutch National Museum of Antiquities (Rijksmuseum van Oudheden). In Hans Dieter Betz, you can find a translation to the spell PGM XII. 449-52, which is a "spell of separation", in which the goal is to "Separate NN, born of NN, from NN, born of NN!" (page 170) [Photographies] Accessed from <http://www.joanlansberry.com>

Over time Seth fell from grace and with him, the status of the donkey. He was transformed into a dark power, the god of storms, chaos and evil. Seth was later linked to the evil Typhon by the Greeks and both came to be associated with demonic forces. By the end of the Middle Kingdom, the donkey had become 'unclean', symbolic of all that was negative. Villagers would load all their bad luck and wrongdoings onto the back of a donkey and push him to his

death over a steep cliff. This practice continued with the early Egyptian Christian Copts: the donkey symbolised all that was negative and one was chosen to bear all the sins of a community and was destroyed, usually by pushing it over a steep cliff. The physical donkey, so useful in everyday life, became an evil omen to some humans and there is no doubt that such beliefs lead to the neglect and abuse of donkeys in the real world.



Figure 47. log07 (2010) Brown donkey jumping from a cliff to another with a girl on his back [Illustration] Accessed from <http://fffffound.com/>



Figure 48. Francisco Javier Navas González (Adaptation from Sidney Nolan) (2007) Adaptation from Sidney Nolan's "The Slip" [Painting] Accessed from <http://www.worldart.com.au>



Figure 49. James Cope (2011) A draft of Zeus battling Typhon [Draft] Accessed from <http://islanderart.blogspot.com.es/>

However, for some desert tribes the donkey was their totem. Ancestors of the Israelites took the donkey as their emblem, in admiration for an animal that was so well adapted to survive desert conditions. Tacitus, the Roman historian, believed that Semitic tribes worshipped the donkey because without them they would not have been able to survive in the desert: their most important use was to carry water, just as their descendants do today. The Hebrews also kept large herds of many thousands of donkeys which suggest their use as dairy animals and their economic value. Early Christianity, however, was influenced by Egyptian religious traditions, which had impacted for centuries on Greek and Roman religious traditions, as well as the those of the people of Israel.

Non tibi, sed Religioni.



Figure 50. Geffrey Whitney, Andrea Alciati, János Zsámboki, Claude Paradin (1866) The emblem for the story of the donkey carrying the icon [Etching] Accessed from <http://ilovegooglebooks.blogspot.com.es>

Ways of perceiving donkeys, deeply rooted in such a diversity of religious traditions and practices, resulted in both positive and negative outcomes in the value placed upon them, our relationships with them and the treatment they received.

It was largely the denigration of donkeys by the Ancient Greeks and Romans that most determined their low status and subsequent treatment in the West. Both the Greeks and the Romans depended on slave labour and donkeys came to be associated with slaves. From their early association with Egyptian kings and gods, donkeys were now considered as the lowest of the low and were treated accordingly.



Figure 51. Storck, J., Teague, W.D. (1952) Head oval. Rotating hourglass mills from the tomb of M. Vergilius Eurysaces, the Roman slave who become an important miller. Above, a shop sign from Pompeii. [Illustration] Accessed from <http://biqai.world.coocan.jp>

Their symbolic link with various Greek gods influenced their reputation as stupid, lazy and lustful animals. They were associated with the Greek wine god, Dionysus, and the cult of Priapus, the Greek god of fertility. Priapus was often depicted as a donkey while Dionysus himself is often shown riding on a donkey. Despite these darker symbolic connotations from ancient Egyptian, Greek and Roman mythologies the donkey continued to have positive symbolism for the Hebrews and, later, Christians. Some scholars argue that there is a link between Dionysus and Jesus because of the significance of wine - and that both rode on a donkey.

A melding of these Egyptian, Canaanite, Jewish, Christian and Islamic traditions meant that the “sacred aura of the donkey far exceeded that of any other domestic animal in the region” (Bulliet 2005, 159) Indeed, Jews, and later Christians were accused of onolatry, or ass-worship. Many early writings strongly suggest that the worship of the God of the early Christians was associated with the head and/or penis of the donkey. Scholars who have studied these stories found that they provide “extensive evidence of donkey veneration in the ancient world and numerous clues to the peculiar association of the ass with Judaism and Christianity” (Bulliet 2005, 159) (see Book 3, Chapter 11).

The three great monotheistic religions born in the Middle East, Judaism, Christianity and Islam, developed over many centuries and from a wide variety of cultures and traditions, contain many conflicting and contradictory voices with regard to the value of animals. The donkey was certainly an

important element in all three religions and there were rules in the scriptures concerning their use. The best known in the Bible is that they, along with their owners, worked for six days and rested on the seventh. Most Jews rode on donkeys and they are often mentioned being ridden by persons of wealth. However, their roles in the scriptures are symbolic as well as physical. They were believed to have special qualities that connected them to the spiritual world; they were even believed to have prophetic abilities. Perhaps the most famous is the story of Balaam's ass in the Hebrew Bible (Numbers 22:21-35), the only animal to actually speak in the Bible (apart from the serpent).

their masters in human language. Mohammed is said to have talked with his personal donkey, Yofir, a descendant of Noah's donkey. According to Moslem legend, only a favoured few animals are allowed in the Garden of Allah, two of which are Balaam's Ass and Mohammed's donkey. (Bough 2011a) (see Book 2, Chapter 10 & Book 3, Chapter 5).



Figure 52. Depictions of Mohammed Throughout History (1595) Mohammed, on a blue donkey, touching hands with the Archangel Gabriel, from the 1595 illustrated edition of the *Siyer-i Nebi*. Topkapi Palace Museum, Istanbul, Turkey. [Illustration] Accessed from <http://www.zombietime.com>

According to Jewish tradition, Balaam's ass was special and she was hidden away and cared for until such time as she was called on to carry the long awaited Messiah. Islamic traditions contain numerous examples of talking donkeys who speak to

CURIOUS FACTS

YA`FŪR, MUHAMMAD'S BLUE DONKEY

Also variously rendered as Ya'foor, Ya'four, `Ufayr, `Ofayr and so on, meaning "Deer" in Arabic, was a donkey used as a mount by the Islamic Prophet Muhammad, who was said to have often ridden it bareback. There are many tales of this donkey but the most common would be that the donkey is recorded to have been a gift from the Byzantine governor of Egypt sometime between 628 and 632 AD (8–11 AH-*After Hijra*). According to an Islamic tradition, it had the power of speech and told Muhammad that it was the last of a line of donkeys ridden by prophets and was a descendant of the donkey ridden by Jesus in his triumphal entry into Jerusalem, which was also called Ya`fūr. The tradition holds that Ya`fūr committed suicide in despair after Muhammad died by throwing itself into a well, though these accounts are held to be unreliable in hadith studies. In the centuries after Muhammad's death, the donkey's name and symbolism was repeatedly adopted by Islamic religious figures and rulers.

Ya`fūr was one of several animals that Muhammad rode; the others included a roan horse called Murtajaz ("Spontaneous"), a black horse called Sakb ("Swift"), a mule called Duldul ("Vacillating") and a camel called Kaswa ("Split-Ears"), who accidentally killed herself when she hit her head on the stone wall of a mosque sometime after his death.

According to the *Book of Gifts and Rarities* (Kitab al-Hadaya wa'l-Tuhaf), an anonymous 11th century work, Ya`fūr was presented to Muhammad by al-Muqawqis, the Byzantine governor of Egypt (possibly Cyrus of Alexandria, the Patriarch of Alexandria at the time).

Muhammad had sent Muqawqis a letter inviting him to convert to Islam. In return, Muqawqis sent the donkey, the mule Duldul, four slave girls, an eunuch, a horse, 1000 mithqals of gold and quantities of Egyptian goods and articles. One of the slave girls, Maria al-Qibtiyya, a Coptic Christian, was kept by Muhammad for himself and bore him a short-lived son, Ibrahim. The donkey was every bit as good as the rest of presents, as Egyptian donkeys were known for their beauty and were used by wealthy merchants as a means of transportation.

The donkey is the subject of a hadith (an account of the sayings and deeds of Muhammad) that holds that it had the power of speech. According to one version, Muhammad asked the donkey what its name was, to which it replied "Yazīd bin Shihāb". He declined to call it this, giving it the name of Ya`fūr instead (a name which, according to another Islamic tradition, was shared by the donkey ridden by Jesus during his triumphal entry into Jerusalem). The donkey is said to have declined the gift of a female companion.

Another account holds that it was the donkey that spoke first to Muhammad, telling him that it had formerly been owned by a Jew. It had been uncooperative with its previous owner, deliberately stumbling so as to make him fall off, and was often punished by having its food withheld and being beaten. According to the donkey's own account, it was the last of sixty generations of donkeys which had been used by prophets (including Jesus, Ezra and Balaam) as riding animals. The donkey was said to have told Muhammad that he was "the last of his lineage, for Muhammad was the last of the prophets, and that he had been waiting for him and had allowed no one else to mount him."

Muhammad was also said to have used Ya`fūr as a messenger, sending it to fetch supplies from merchants at whose doors it knocked using its head. The donkey would give the merchant a token telling him to love or to respond to the Prophet of God. When Muhammad died, the grief-stricken donkey was said to have committed suicide by throwing itself down the well of Abū 'I-Haytham bin at-Tayyihān.

An alternative hadith transmitted in Syria holds that Ya`fūr's colour was black rather than sandy, that its previous name was 'Amr rather than Yazīd or Ziyād, and that it was the last of seven siblings ridden by prophets, rather than being the last of a line of sixty donkeys.

These accounts, however, are regarded in hadith studies as being untruthful and their chain of attribution or isnād is seen as dubious. The 12th century historian Abu'l-Faraj ibn al-Jawzi is quoted as saying, "May God curse the fabricator of this tradition!". Ibn Hibban considered the origins of the source were weak, Muhammad bin Mazyad, due to him being unreliable.

Followers of Shia Islam believed that the Mahdi, the prophesied redeemer of Islam, would make his appearance in the company of Ya`fūr the donkey and Duldul the mule. In one uprising, a grey mule representing Duldul was paraded with a chair on its back for the Mahdi. In the lands where Sunni Islam was practised, Ya`fūr was repeatedly invoked in political and religious events for centuries after Muhammad's death. A "false prophet" active in Yemen in the 7th century usurped one of Muhammad's own epithets, calling himself (or being called) the Sahib al-Himar, the "Master of the Ass". Likewise the 8th century Umayyad caliph Marwan II was nicknamed al-Himar, "the Ass". The early Fatimid Caliphate was nearly overthrown in the 10th century by the rebel Abu Yazid, known as the "Man on the Donkey", while in Morocco the 12th century founder of the Almohad movement, Ibn Tumart, insisted on riding a donkey.

In the wider context, the story of Muhammad's donkey can be seen in the light of such animals being seen as religiously significant in the Near and Middle East for thousands of years. Donkeys and asses were held by the ancient Israelites to have a special connection with the spirit world. This is illustrated in the story of Balaam and the angel in the Book of Numbers, in which the prophet's donkey sees an otherwise invisible angel and miraculously gains the power of speech. Samson, too, draws on the mystical power of the donkey by using an ass' jawbone – symbolic of the power of the donkey's voice – to slay a thousand Philistines, while asses and donkeys were integral to the stories of Jesus and David.

A traditional connection between prophets and donkeys also existed in pre-Islamic Arabia, where seers (known as kahins) were often associated with asses. Muhammad's arrival was said to have been prophesied by a Jew who spoke of "a man neither short nor tall, wrapped in a cloak, and riding an ass." The evil anti-Messiah al-Dajjal is also expected to appear on a giant white donkey, while Muhammad himself is widely reported to have warned of the infernal nature of a donkey's voice: "When you hear the bray of an ass, seek refuge with God from the devil."



Figure 53. Depictions of Mohammed Throughout History (1595) Mohammed and his followers travel to Mecca, from the 1595 illustrated edition of the Siyer-i Nebi. Topkapi Palace Museum, Istanbul, Turkey. [Illustration] Accessed from <http://www.zombietime.com>

The links between donkeys and prophets are also strong in Islamic literature. When Mohammed died, the last of God's messengers according to Islamic beliefs, Yofir was said to have run head first into a well to commit suicide to end the hereditary line of prophets' donkeys stretching back to Noah. She did not want to be ridden by any other than the Prophet. Shi'ite tradition drew on the stories of Mohammed and his donkey to incorporate into their ideology. Shi'ite Imams chose to ride donkeys to emulate the prophets as evidence of their humility (*Sindawi 2006*). Donkeys were used for the Moslem conquest of land as well as the spread of religion. From the holy cities of Mecca and Medina, Islam spread throughout the Middle East, the donkeys carrying provisions for the advancing armies; they also carried pilgrims in the opposite direction, from the desert to the holy shrines of Islam, especially to Mecca.

Human and donkey relationship changed once again with the spread of Christianity: through their association with Jesus they became exemplars of piety and humility. The stories surrounding Jesus' birth in a stable gave rise to many legends. Two donkeys are mentioned symbolically in the Gospel story, one coming from the north and bearing Mary to Bethlehem, where, according to legend, an ass and ox stood over the crib; the other taking her to Egypt to escape the slaughter of the innocents. Jesus' triumphant entry into Jerusalem on the back of a donkey is one of the most enduring symbols in Western culture and it is usually described as a symbol of his humility (*Bough, J., 2013*). There was a tradition of the messiah riding upon the lowly ass. Kings and messiahs did ride on donkeys, at least those coming in peace: conquering emperors rode on fine chargers. The ties with Christianity are so strong that legend has it that the cross on the donkey's back came from the shadow of the crucifixion, a living symbol that the

donkey has carried through the centuries. The importance of the donkey in religious festivals and traditions is still seen round the Christian world today, especially those surrounding Easter and Christmas, such as the legends of St Nicholas (*Dent, 1972*). Ever since the examples of Christ and Mohammed, donkeys have continued to carry holy men bearing religion throughout the world. These religious associations of donkeys accorded them a more respected place in their relationships with humans but these were certainly not the only influence on our perceptions of them (see Book 3, Chapters 6 & 11).

The more noble and pious image of the donkey which derives from some religious texts is evident in other genres of literature; however, the greatest influence on our impressions of the donkey derive from ancient Greek and Roman texts. Western cultural representations reflect the complex and contradictory attitudes towards donkeys and our conflicting relationships with them. The many fables by Aesop and others represent the donkey as stubborn, stupid and servile. In fact, the donkey is used in these moral tales as human exemplars but we continue to view them as donkey characteristics rather than human failings. Probably the most influential story in determining attitudes to the donkey was *The Golden Ass* (160AD) (*Apuleius, 1994*). When a young Greek called Lucius is accidentally transformed into a donkey, he is condemned to serve humans, to carry their burdens and to be abused by them. The received wisdom regarding donkey's stubbornness, foolishness, lustfulness and curiosity are used in the narrative to propel the story from episode to episode as Lucius passes from one unpleasant character to another.



Figure 54. Mr. Munn (2012) Lucius Apuleius changes into an ass [Etching] Accessed from <http://zoomar.tumblr.com>

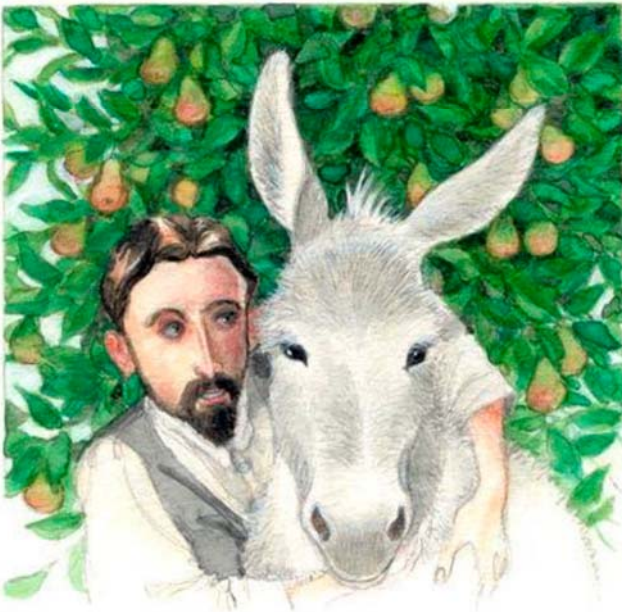
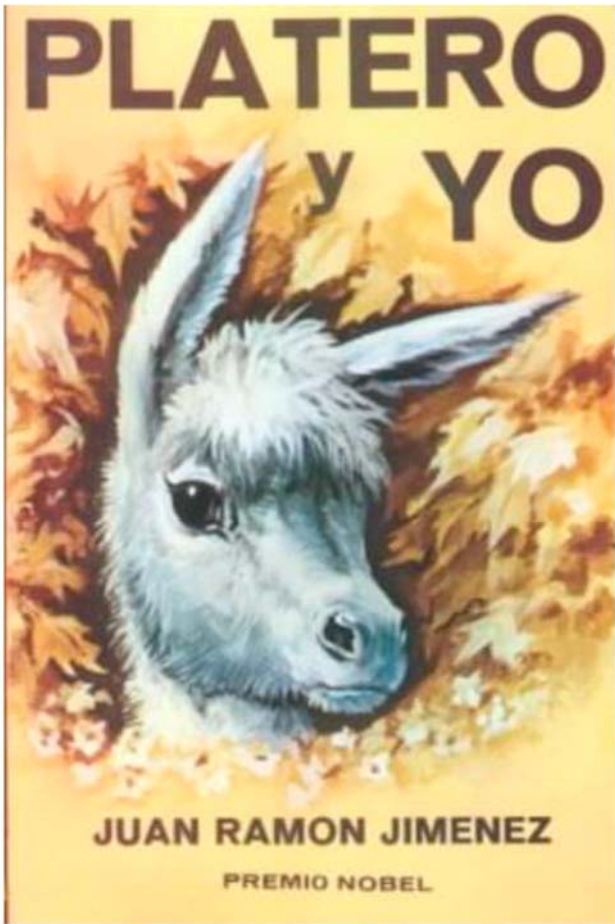


Figures 55 & 56. (Figure 55) Escarlati & (Figure 56) Jules David (1605-1808-1892) (Figure 55) Miguel de Cervantes' first edition cover from, *The Ingenious Gentleman Don Quixote of La Mancha*, Madrid, Juan de la Cuesta, 1605 & (Figure 56) *Don Quixote*, by Jules David [Illustrations] Accessed from (Figure 55) <http://es.wikipedia.org> & (Figure 56) <http://leereluniverso.blogspot.com.es>



Cervantes' novel features a donkey as both animal companion and as allegory for human nature. Dapple, Sancho Panza's beloved donkey, is both a true friend to his master, as well as a reflection of his character. Both are simple and honest souls, to be admired for their loyalty and steadfastness. In Jimenez's novel *Platero* is his companion and confidant with whom he has long, philosophical conversations. This is the human and nonhuman animal bond at its most serene.⁷ The way that a society represents donkeys in its literature both reflects and affects their treatment in the real world

⁷ For a full account of donkeys in art and literature see: (Bough 2011b) & (see Book 3, Chapter 8, 9, 10 & 11).



Figures 57 & 58. (Figure 57) La Lectura & (Figure 58) Jesús Gabán (1941-2009) (Figure 57) During the Christmas of 1914, La Lectura publishers, in Madrid, published "Platero and I" by Juan Ramón Jiménez within its youth Collection, & (Figure 58) Juan Ramón Jiménez and "Platero and I" picture cards [Illustrations] Accessed from (Figure 57) <http://www.culturamas.es/> & (Figure 58) <http://www.jesusgaben.com>

6. CONCLUSION

In some developed countries of the world today, the donkey has become popular as a companion animal. Their gentle and dependable natures, smaller size and low maintenance make them an ideal mount for children. The bond between donkeys and children has always been special and they are now widely used with disabled children to foster confidence. The use of donkeys as therapy for children that are mentally and/or physically disabled is growing in popularity. The physical and emotional benefits that the animals offer to the elderly have also been recognised in psychiatric hospitals and residential homes for the aged.

The still calmness of donkeys can have a soothing effect on the elderly, on patients and children, improving their emotional well-being, self-esteem and confidence. The relationship between therapy donkey and patient is especially powerful and there are examples of children who cannot relate to other humans learning to connect with their special donkey which in turn helps them to develop skills with people (see Book 1, Chapters 9 & 10).

Because of their social and vigilant natures, donkeys are kept as companions to other animals, as sentinels and as shepherds to guard flocks of sheep. Donkeys have gained popularity as guard animals, especially in the United States, Canada and Australia.

Their natural dislike of canines means they will chase, bite and kick dogs, coyotes, dingoes and wolves if they invade their territory.⁸ Because they are a sensible and calming influence, they are also used by farmers as companion animals to young horses and cattle, to train and steady them (see Book 1, Chapter 9 & Book 3, Chapter 2).

Many companion donkeys are ridden by their owners on treks, used to help around smallholdings while others are proudly paraded round the show ring and are generally considered a valued part of family life. The relationship that these humans have with their donkeys is important to them, not for their utility, not as beasts of burden but because they bring friendship, an enchantment, a special connection with the animal world. Donkeys are innocent, loving and mysterious. We have shared a path throughout history, a special relationship that continues in its many forms today.

⁸ Donkeys are the cheapest means of guarding sheep, goats and cattle; they cost little to buy or maintain and can live with a flock for many years (see Book 3, Chapter 2).

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Chapter 3

Temperament, Behaviour, Movements and Body Language

Francisco Javier Navas González & María Miró Arias

1. INTRODUCTION. SOCIAL STRUCTURE

The assessment of behaviour, temperament patterns or ethology and temper are aspects which are recently becoming greatly relevant. Not only our current Media allows us to take into account such a trend, but this reevaluation is also denoted because of the appearance of several studies which intend to report different protocols, and assessment of the patterns that belong to evolutionarily very distant species between themselves. When we refer to behaviour we talk about a term that it is normally going to be bounded to a noticeable controversy, and which, even from its etymology, it is going to lend to a discussion. Some authors allude to animal general behaviour by using the term behavioural 'style' or emotional 'tone' (Lyons, 1989), or simply 'individuality' (Mendl y Harcourt, 1988), more than restricting to the mere use of the word temperament, due to the difficulties that appear when it comes to interpret such term.

With a wide base which resides in the study and discussion about psychology that concerns human personality (Block, 1977), this controversy that we have mentioned above is going to spread over not only the definition of the term and its elements, but it is also made patent when it refers to the way it develops. That is to say, the fact of whether it is going to constitute an inherent factor to individuals, or on the contrary, it can be externally modelled and influenced.

CURIOUS FACTS

MUTUAL UNDERSTANDING THEOREMA

<<Honestly, I do not know who is more obstinate and stubborn. A donkey who does not listen to its owner or an owner who does not listen to his donkey>>

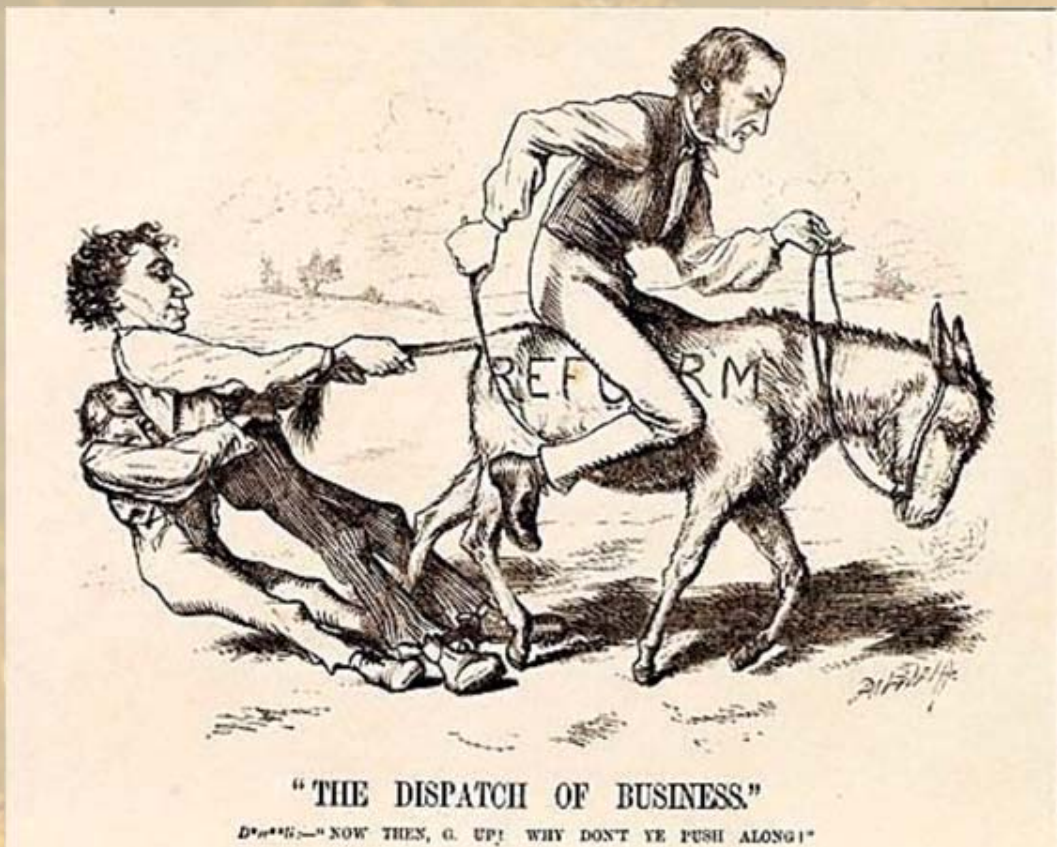


Figure 1. Tim Riley (2013) Gladstone on donkey representing reform is held back by Disraeli aided by the English Working Man, 1866 [Etching] Accessed from <http://en.wikipedia.org>

2. BEHAVIOUR AFFECTING FACTORS

When we prepare to assess a certain donkey's behaviour, or the way it interacts with the environment surrounding it and all the items found in it, we quickly realize of the marked influence that particular factors have over it. Among these factors, the following have proved to be the more relevant ones:

2.1. SOCIAL STRUCTURE AND INHERITANCE

Donkeys are a species included in what in zoology is known as precocial species



Figures 2, 3, 4, 5, 6 & 7. Klein-Hubert/KimballStock (2014)
First care from a Contentin Jenny to its new born foal. We can observe the speed with which the foal is able to stand, only a few hours after birth [Photographs] Accessed from <http://www.kimballstock.com>

Species considered precocial are those whose offspring is able to see, hear, stand and develop all the other functions typical of an adult individual, almost since birth. So that, this species require less parent care (both maternal and paternal) and are able to join their adult individual's activities a few days or even hours, after birth. Donkey offspring is able to walk a few hours after birth and is able to follow its herd rhythm in less than a week.

Species	Time after birth needed to stand	Time after birth needed to walk
Donkey	20 to 30 minutes (2h maximum)	If weather allows it, 2 hours
Horse	Between 1 and 2 hours (55 minutes)	90 minutes
Mule	1 hour	2 hours
Cow	30 minutes (some even two hours)	From 10 minutes to a few hours
Goat	(15 minutes with good weather conditions) 30 minutes	If good weather conditions, a few minutes
Sheep	10-11 minutes, until 30 minutes	Minutes after standing up
Zebra	Minutes later	15 minutes (it runs in approximately an hour)

Table 1. Francisco Javier Navas González (2014) Interspecific comparison between stance times and the ones in which the animals starts walking/running after birth.

Over 60 million years, donkeys have survived developing qualities that allowed them to escape from their predators. Even today, 6000 years after their first domestication, as it has been shown by the latest dating (see Book 2, Chapter 10), donkeys still avoid danger or the likelihood to suffer from it.

Socially, donkeys evolved until they became gregarious animals that describe herds in which a single male and several females coexist with their offspring. Until males reach sexual maturity and they are expelled from the herd to young male groups that compete for the reproductively active females' favour. It always exist a strong bond between mothers and their offspring, which is set soon after birth.

The most of young donkeys in nature stay in herds until they are 2 years old when they reach their full sexual maturity. Among the herd female members, there is a female that predominates over the rest, which we will know as matriarch or "bell jenny", which function is to play the part of the male when it is not present. Once the offspring have reached their sexual maturity they can only stay in the herd in exchange for another member of their same sex, given the proportion of females respecting to males, those have more opportunities than

males to remain with the herd that they were foaled in.

In the case of the young members that have been expelled from the herd, when they are males they will travel together for some time until they find another herd or they will adopt wandering females to found a new herd themselves. Another situation that takes place is when young males wander in solitary until they find a herd which lacks of a male. It is less likely to happen for an unrelated male to expel the dominant male of the group. In a herd, there can appear problems respecting paternity, like consanguinity.

The male of the herd will always keep the prevalence of its paternity but he will not always achieve its purpose. A 20 per cent of the individuals born into a herd do not belong to the dominant male of the herd. Wild horse herd studies have shown that the stallion of the herd frequently expels young members regardless of their sex. Expert theorize about this situation stating that it could be due to an instinct put into practice in order to avoid endogamy, so that the stallion of a certain herd does not mate with its own female offspring.

Young females normally join another herd in a really short period of time, so that foals expelled from several different herds generally conjoin searching for the safety of small "single" groups, until they are able to succeed stablishing their dominance over a horse at an advanced age from another herd. Contrary to the popular belief, the social structures described by wild horses are mainly matriarchal and they focus around an alfa or dominant female, commonly known as godmother mare.

This mare will be the most mature and familiarised with the terrain and available resources of the whole herd, being responsible for the global safety of the herd.

This mare will take the initiative when the herd moves, determining which will be the best route to take, and demanding certain rights such as drinking or feeding in the first place. The external area of the herd is the stallion territory, who should fight from predators and other males. When the herd moves, the stallion brings up the rear, being aware from predators and driving laggard members of the herd.

External males to a herd arouse their behaviour tending to act more aggressively during the mating season, with the aim to mate with laggard females. Because of living in the outside area of the herd domain, being exposed to the open, predators, and to his male challenges, the herd stallion will have a quite more vulnerable existence than other members, because of being more exposed to different risks than any other member of the herd and possibly being replaced by a stronger successor at any time (something that could be another strategy against endogamy).

Curiously, some stallions let a young male live in the border of the herd's domain, possibly regarding it as a kind of successor, which will demand the herd in time. Biologically, and depending on the physical environment available to a certain herd in the nature, there is only a need of a stallion for each 10 to 20 mares, although the most of the bands or herds are normally smaller in size.

Each social group settles at territories which will frequently superimpose with the ones belonging to other herds. However, the rest of the time males will not be devoted to protect their herd against other groups, but a great part of its time will be used to mark its territories by means of using dung piles and urine traces. In those areas in which vegetation and water resources are enough, wild asses describe really similar structures to the ones mentioned above in horses, although such

unions are more labile, breaking once mating season comes to its end.



Figure 8. reurinkjan (2011) "Kiang" or Tibetan wild donkeys live in very united herds that will never disperse. Lead by a mature female, herds travel drawing a single queue, and their members seem to perform every single activity at the very same time, including eating, drinking, turning back and running. Unlike horses, however, there is slightly physical contact (grooming at the most) between animals. Males start following these female herds in July, fighting between them for mating rights in August. In the middle of August, successful males start driving females in their herds, defending them from rival males. The Kiangs are good swimmers, and during summer months they enjoy bathing in rivers. During August and September, the only season in which vegetation is abundant, kiangs will likely put 40 to 45 kg weight [Photograph] Accessed from <http://www.flickr.com>

In contrast, establishing ourselves in the cradle of domestication. Our today's domestic donkeys North African ancestors, evolved under a context in which vegetation was scarce and available water resources were limited. Something that pushed them to live much more solitary lives. Reproductive females only coexist with their foal foaled during the last year and stallions defend their herds in order to increase their mating possibilities. This way, a matriarchal society is established, which is curiously inherited generation to generation, from alfa females to their female offspring, from mothers to daughters.

Maybe these social evolving differences are the base which results in the noticeable territorial behaviour developed by current domestic donkeys. Such an instinct is also the base for the use of guard donkeys in which donkeys are given in several countries (see Book 3 Chapter 2) to protect sheep flocks and cattle herds against

wolves, foxes, dogs, coyotes and big felines' attacks in the north of Africa and in the South of America.

Unfortunately and although it is not the most frequent, this territorial nature could lead, in some cases, in small animal attacks, such as sheep, goats, birds, cats, and above all dogs (given the existing inner animadversion respecting predators that donkeys naturally present).

This existing dualism and which concerns donkeys' fight/defence mechanisms will be more frequently shown by them rather than by horses. This is due to the fact that current domestic donkeys' ancestors used to live in one or two individual groups in which evasion flight survival method was not always as effective as wild horses' trend to gather together into bigger herds could be. Any fear-producing situation over a certain donkey will trigger its flight response. This response will turn into a defensive response if the area that the donkey can make use to escape from such fear generating stimulus is reduced, until the donkey is located at a safe place at a reasonable distance from it.

We should not forget that herds in which, given the environment conditions in which donkeys evolved, by necessarily migrating along great distances in search for feed and water resources, they also developed a physiological mechanism that kept the animals mentally and physically stimulated almost constantly. Because of this, in domestic environments in which animals are kept, with daily available food and water, and in which predators are no longer a problem for the one they should be ready to react, problems varying from obesity, boredom, stereotypies to a poor social

interaction could overcome. Environment plays a very important role on the behaviour that our donkeys show and, it is over our husbandry techniques over which the obligation to correct a lot of the deficits originated by this domestic environment falls. A suitable diet, companion, availability of an area that allows movement and exercise, as well as, mental stimulation are vital in order not to see our donkey's behaviour altered.

2.2. LOGIC

Here we must introduce the donkey logic concept. There is always a justification that explains the certain way of proceeding that a donkey has at a particular moment and it is not until we understand this donkey psychology tenet that we start looking further beyond and more than just a complicated or improper behaviour.

Anytime that we intend to assess and to solve a behavioural problem, the first thing that we should think about, is which is the benefit that a donkey obtains from the activity that we are asking it to perform. Essentially, establishing a motivation (which will vary from one donkey to another) in order that the donkeys be motivated to develop a certain task, we will be able to demarcate the cause that originated our problem, and once this has been recognized we will be able to act against it to correct or counteract it.

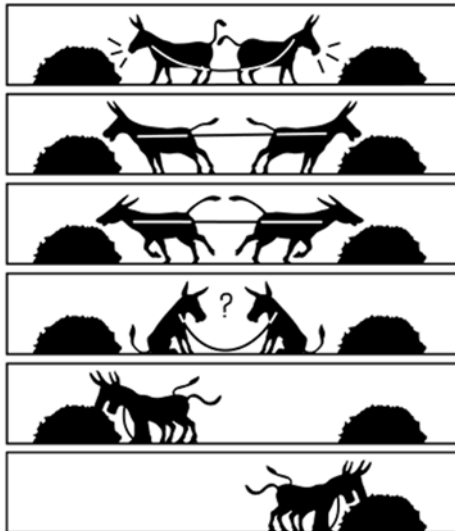


Figure 9. Movimiento americano contra la guerra - "No Foreign War Crusade (1937) The two donkeys and the straw bundles' story [Drawing] Accessed from <http://www.educarueca.org>.

2.3. GENETICS

Donkey present specific behavioural characters which are normal for donkeys and understanding the existing differences between donkeys' behaviour, horses' and their hybrids' is fundamental. Mainly when we start a training or handling process, in which case, understanding these differences is vital. The same as donkeys inherit, from their parents' genetic provision other characters such as coat colour or size, their temperamental characteristics also seem to be associated, in a way which is currently under study.

If we move to the human species, we can easily see that parents and their offspring frequently share certain behavioural patterns, although the most important thing would be to distinguish whether those patterns are genetically inherited or on the contrary, they are learnt from parents at juvenile development stages.

Lacking of results we could conclude that, behavioural characters from certain parents, when they are simplified to their essence and they are cleaned from any environmental pollution that could have occurred, like, traumatic experiences, or

those from animals keeping bad memories that make them alter the way they act in front of certain situations, are passed to their offspring consequently appearing in future generations, also expanding to later generations than first filial generation (i.e., from grandparents to grandchildren)



Figure 10. TripAdvisor (2013) Jenny and its foal showing exactly the same eating pattern during an exhibition in Barnsley, South Yorkshire (United Kingdom) [Photograph] Accessed from TripAdvisor (2013) Asna y su cría demostrando exactamente las mismas pautas de comportamiento durante una exhibición en Barnsley, Yorkshire del Sur (Inglaterra) [Fotografía] Recuperado de <http://www.tripadvisor.es/>

Omitting this genetic basis, it will always be essential that all the jennies rearing foals present a better attitude towards handling that allow their offspring react in a more suitable way towards the people who work with them and in an easier way. Of course, this will not avoid that we have to work in donkey foals' education later, to get the result from our instruction work for handling to be consistent, as we cannot avoid the environmental component that will inevitably mould behaviour.

2.4. ENVIRONMENT. BOREDOM, ITS WORST ENEMY AND COMPANION, THE BEST WAY TO FIGHT IT.

The mental stimulation that represents the interaction of our donkeys accounting with a diverse environment, during their daily lives, will be the best preventive medicine against behavioural disorders. Such disorders will precisely appear as a natural method to fight against the boredom resulting from the domestic conditions that originated them. An insufficient space, even more in species such as this one which shows marked territorial behaviour, will increase fights subjected to the establishment of dominance relationships that will arise because of the competition for food or vital space. These social pressures will translate into an increase of stressing situations affecting the animal and which will surely result in the appearance of a behavioural disorder. Donkeys are very social animals and require high balanced and active mental stimulation. A donkey kept in loneliness will need a playmate, whatever it is another donkey, a horse or another animal.

Fights between herd males for its control can be very bloody. In the course of them, animals kick and bite each other elsewhere. Ears are usually a very vulnerable part, and that, if it takes a lot of time to establish the different dominance relationships, between the animals fighting, can result in life threatening injuries in one or both opponents. This is one of the existing differences between horses and donkeys. While horses tend to adopt elusive strategies when facing danger, is quite frequent that donkeys face a predator or a threat directly. They will kick and bite both with their front and back limbs, leaving their heads at a high position (to pretend a bigger height), with enlarged nostrils and showing their teeth. Braying and huffing strongly.

The social hierarchy that is likely to be established is responsible for, when a group grazes at a paddock, and the dominant male is required, the formation of a queue of jennies behind him rather than approach at different levels. When the owner is regarded as the herd's dominant personality (something that will frequently happen because feed supply helps a lot), donkeys will come when the owner calls them without much trouble.



Figures 11, 12 & 13. (Figure 11) Cindy Benson, (Figure 12) iPhone Poker Apps & (Figure 13) Janet/Baby Goats & Friends (2010-2013) (Figure 11) One of the best entertainment that a donkey can have is the companion of other fellows together with the ones it could eat, play and sleep, as it happens with this two miniature geldings, (Figure 12) Poker Donkey & (Figure 13) Small donkey next to a tool box [Photographs & Drawing] Accessed from (Figure 11) <http://bensonranch.com/>, (Figure 12) <http://www.iphonepokerapps.com/>& (Figure 13) <http://www.babygoatsandfriends.com>

Any stressing resource present in the environment that surrounds donkeys will reflect over their behaviour. When owners, or personnel in charge of donkeys, interact with them they start to play a role inside the donkey's usual surrounding environment, so that people's behavioural changes will also be translated into changes in the

temperament that donkeys show. When a donkey is accustomed to describe a daily routine and it understands that this routine does not mean any danger that could affect it, it will develop it without any problem. Donkeys are very routine animals; so that any alteration occurred over their daily routines will make our donkey's behaviour be modified.

This is the reason why any environmental change should be performed as progressively as possible and if and when it is carried out following a previous carefully studied plan, in order to allow the donkeys adapt to these changes without stressing. Providing the housing in which our donkeys comfortably live with a suitable quantity of material destined to their entertainment (i.e., a ball), is essential to prevent those problems and to mentally stimulate them.

We should not overcharge their environment with multiple distraction elements, because an excess could turn out to be counter-productive. Stereotypical conducts are contagious. It will be enough with only an animal showing an anomalous behaviour pattern to quickly have it transmitted all over the rest of the herd.



Figure 14. Catch the Moments (2012) Donkey biting a wooden fence at a pet zoo. This stereotypic feature is known as wood-chewing and it is present in a lot of donkeys as an stress sign or because of boredom [Photograph] Accessed <http://catchthemoments.wordpress.com>

2.5. PAIN AND HEALTH PROBLEMS. SUFFERING IN SILENCE

Another aspect to take into account is the ability that has commonly been described that donkeys present to cover up pain, hiding illness symptoms or at least without showing an obvious expression of the pain they are suffering or weakly showing evidence from it, in colic cases or even lameness ones, among other pathologies, reaching situations in which it may be too late to be able to solve the problem (Ashley, 2005).

Pain is one of the most common causes for behavioural alterations, over all, because, as we have mentioned in the paragraph above, when a donkey shows suffering signs, we found ourselves dealing with an advanced stage of the original problem. If a donkey is in pain, it will make whatever it can do to relieve itself from pain. This will derive in a noticeable willingness to be treated, when they understand that our actions try to make them get better. Arthritis, shoulder or spine problems and other lesions could derive into kicking or unwillingness to lift their limbs.

If lifting their limbs results painful, by kicking donkeys will try to put their limb back to the floor and make pain diminish. In the case of young donkeys that suffer from growth-derived toothache, the trend to bite and nibble surrounding environmental elements or their carers could arise. During anamnesis, pain must be considered at any time we find difficult or abnormal behavioural patterns. One of the best assessors of such alterations will be those people that spend more time observing and living together with the animals. We must understand every donkey as an individual being with its own behaviour and involved in an environment from the one this behavior patterns results. Especially when sudden temper changes or whether different behavioural patterns from the ones that our donkey usually shows appear (such as tame donkeys which turn into aggressive ones or start trying to kick or directly kick their owners or carers), a specialist veterinarian should be contacted. In many of this situations once the original problem is solved and pain diminish; donkey's behaviour is quickly recovered.



Figures 15 & 16. (Figure 15) Ron Leishman & (Figure 16) The Donkey Sanctuary (2014) (Figure 15) Donkey playing the “stick the tail to the donkey” playground game & (Figure 16) Donkey kicking at a vet who has touched the wounds of its rear limb [Drawing & Photograph] Accessed from (Figure 15) <http://vecto.rs> & (Figure 16) The Donkey Sanctuary, Understanding Donkey Behaviour.

There are a lot of health alterations that can result in behavioural changes that could turn into problems as time goes by, if we do not treat them. Among these disorders we can find ovarian cysts, endocrinal

alterations, mineral and vitamin deficiencies, brain tumors, blindness, hearing loss, skin problems, photosensitivity and food intolerances or allergies, among others. These conditions are complicatedly detected and a veterinary specialist assessment is always necessary, to be able to obtain an accurate diagnose as well as settling the consequent suitable treatment.

The fact that those animals are less expressive than horses or ponies, leads people to think that they are less sensitive. In fact, donkeys are very sensitive both to physical stress and to psychological one, as we have been able to learn from this chapter, but resulting symptoms from these stress can easily be overlooked until the problem is overwhelming and then it is not possible to modulate it, frequently when it is a bit late and plenty of complications have appeared. For example, an appetite loss will frequently be the only symptom that a colic affected donkey will show.

Apathy and depression are the most commonly reported behaviour signs and which we could set as the most relevant for donkeys under abdominal pain situations. Lethargy and a decrease awareness state will be accompanied by isolation and reluctance against contact with carers. A lowered head is also a frequent sign. In a limb pain case, a greater frequency concerning the number of times that a donkey lies down has been reported, with this symptom maybe being more relevant than the weak existing relationship between reluctance to move in such pain situations. In older donkeys, throwing out variable amounts of partially chewed feeding will show obvious chewing discomfort, something that could lead to choke, increasing the suffocation risk. The rest of commonly reported signs for horses seem not be significantly shown by donkey species.

2.6. LEARNING OR EDUCATIVE PREVIOUS EXPERIENCE

Learning starts from the first very moment in which a foal steps into the world and continues for its whole life. Learning can be described as acquisition of knowledge, in a way in which it leads to changes in the animal's behaviour that relatively persist in time. The fact that a donkey foal has been socialised with other donkeys and that it has been allowed to sequentially develop in a proper way along the juvenile development stages, will determine the presence of behaviour problems as the animal grows up.

Pain or fears inducing traumatic situations, will quickly teach donkeys to fear, and so that to avoid the people involved in these situations. The more time we spend with our donkey from birth, the greater the learning process acquirement will be. Every time that we interact with our donkey, it will learn according to how the situations we expose it to are solved. That is to say, that during the learning process, a donkey will not assess whether its behaviour is beneficial or detrimental towards the human being involved, but which is the effect that showing a certain behaviour has directly over itself (does it mean a reward or a punishment, does it mean pain or a risky situation, among others). Plenty of the behaviours which are usually considered problematic by carers, do not mean in fact, a problem for the donkey itself, but a way to adapt it to the environment and the situations that surround it, in the most comfortable or beneficial way towards its life.

When a donkey is in fear or scared because a certain stimulus (its shade or the door of the stable, for instance) will answer really well to a systematic desensitisation and to autogenous training, which is a psychotherapeutical technique based upon

passive concentration over physical sensations. It is closer to meditation techniques rather than suggestion or hypnotic ones.



Figure 17. Clipartpal (2014) Donkey at school [Illustration]
Accessed from <http://www.clipartpal.com/>

2.7. INTERACTION WITH HUMANS BEINGS. TRAINER CHARACTERISTICS

The way in which a donkey behaves is influenced by the ability, experience, and self-confidence of the person in charge of its husbandry. A nervous person will transmit his/her nervousness to the donkey he/she is training, as well as, a calm person will transmit calmness to the animal in his/her care, making it way more easy to train. We should never prejudge an animal prematurely, according to previously given tags by other educators.

When an educator or the person who normally takes care of the animals tell us that a certain donkey has a complicated behaviour or temper, this could make our attitude towards this donkey change, translating into a reflect effect which would alter the real conception that we could have of the animal under study. Donkeys are usually big in size, and account with a great strength, and it is normal that unexperienced people lack of the necessary self-confidence to face a donkey's husbandry process satisfactorily.

A nervousness or scary sensation will be transmitted to the donkey that we have to educate, something it will take advantage of for its own benefit. Wide and deep bibliographical and the review of other informative resources' review should be carried out in order to set a basis that, together with the direct observation of the animals, let us face a training session satisfactorily.

who understands the different behaviours that they adopt, will help to work against behavioural problems and that the donkeys learn faster than in the case of a person showing impatience or to be unexperienced.



Figure 18. Nina Allender (1920) "Learning new tricks", A woman tries to train the republican elephant and the democrat donkey, using her vote as a treat [Drawing] Accessed from <http://www.sewallbelmont.org>

Donkeys will learn the behaviours which are closer to their natural behaviours easier. Those totally foreign and different activities to those naturally assimilated such as driving, riding, lifting limbs up during shoeing or getting adapted to travel inside a mobile unit, can take us more time until they are fully learnt, due to the existing distance between such activities and those described by donkeys in their natural environment.

How a certain donkey is educated or managed will condition its behaviour. An experienced educator, who is able to communicate properly with donkeys and

3. WHAT METHOD SHOULD WE USE TO ASSESS DONKEY BEHAVIOUR?

When we intend to deal with donkey training we should make two key aspects certain. First, we are going to need much more patience than with any horse under normal circumstances, and secondly, about the statement according to which a donkey must be educated rather than trained, as it would happen in their equine fellows.

Psychologically understanding donkeys' behaviour will not also allow us to carry an appropriate husbandry, but it also will make it enormously easier to do it. It is possible to find references saying that anytime we want an ass to perform a certain task we will have just to push it to perform right the opposite task. Although this is not totally true, it allows us to understand a key donkey psychology fact. Negative reinforcement is normally much less effective than positive reinforcement (whatever kind it is; treats, strokes, to talk in a low and friendly voice, among others).

Motivating a donkey by means of using strength is counterproductive, because a scared or confused donkey will stay still and it will not give any step forward. Instead of doing this, we will leave the donkey calm down for a little period of time, to try it again, rewarding and congratulating effusively for having asked to our patience.

Donkeys love to eat, so that we must consider that motivating a scared donkey which is refusing to follow our requests, is not a treat (on the other hand, we should not reward a bad reaction), but a way to help the donkey focus on other stimulus apart from its fear of confusion. Once we have achieved it, the donkey will be more relaxed.

A foreign situation can potentially mean danger and, trying to avoid such dangerous situation, can only be considered as preferable in whatever animal showing it.

However, this response must be corrected if and when the owner or carer shows that at a certain occasion there is not any danger to worry about.

In those cases, a donkey should show what we know as the *confidence* factor. One of the greatest achievements that an owner should try to achieve is to get the confidence of the animals that he owns in his farm. Although a unique method to achieve such fulfillment does not exist, these tests suggest the effectiveness of some educative methods over other ones.

The choice of the behaviour assessment method, that is, the application of one or other technique in order to describe or quantify it has always arouse a certain controversy. Animal behaviour, by applying behavioural tests as well as, by surveys based upon specific questionnaires, has enormously been increased during the last decade and more precisely during the last years, in which, animal behaviour has become one of the latest trends, trying to include animals within our society.

The existing differences in behaviour assessment by means of using behavioral test, among others, are going to be that we take into account donkey's behaviour (*McCann et al., 1988; LeScolan et al., 1997; Mackenzie y Thiboutot, 1997; Visser et al., 2001, 2003b; Hausberger and Muller, 2002; Seaman et al., 2002*), changes in autonomous functions changes (*McCann et al., 1988; Jezierski et al., 1999; Hada et al., 2001; Visser et al., 2002, 2003a; Momozawa et al., 2003*) and endocrine function changes (*Anderson et al., 1999; Hada et al., 2001*) in response to certain stimuli.

While in the case of the assessment by using specific questionnaires derived

surveys, people filling them are going to be familiarized with the animals under study, and so that they are going to be able to perceive the information that body language provides in a better way, basing on their assessment by observing the animals (*LeScolan et al., 1997; Anderson et al., 1999; Morris et al., 2002a, 2002b; Momozawa et al., 2003*).

Among the advantages that questionnaires have, when comparing them to behavioural tests, we find that the first ones are based on long term observations by the people who fill them, the answers to surveys do not take the risk of being affected by a temporary change on the animal's physical condition, as it could happen in a behavioural test. A questionnaire can also assess several donkey's behaviour features simultaneously, something which would be difficult to achieve by only applying a single behavioural test.

Anyway, as a subjective component exists and resides in the fact that surveys are going to be filled with the opinion of different observers, it could be expected that the results tended to be less objective from those reported by a behavioural test.

In some cases, with the aim to distinguish between reliability and validity of the data reported by both of them, behavioural tests and questionnaires and associated surveys, some authors have carried out studies in which both were applied to the same sample of animals, in order to compare both assessments (*LeScolan et al., 1997; Momozawa et al., 2003; Visser et al., 2003a*). Other analysed the existing variation due to observers, that is, respecting to the people in charge of filling the surveys (*Morris et al., 2002a; Visser et al., 2003a*).



Figure 19. Centro Rural Malpica (2014) Veterinarians studying donkey behaviour [Photograph] Accessed from <https://www.facebook.com>

CURIOR FACTS

WISH GRANTING AND WEATHER PREDICTING BEHAVIOURS

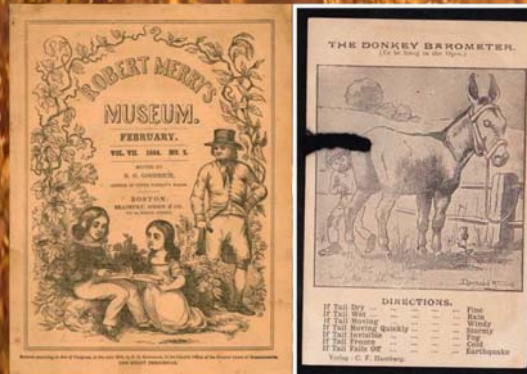
In Boston's children magazine *Robert Merry's Museum*, in November 1844, the next fragment appeared:

<<When asses bray more than ordinary, particularly if they shake their ears if uneasy, it is said they predict rain, and particularly showers. It has been noticed, that, in showery weather, a donkey, confined in a yard near the house, brays before every shower, and generally some minutes before the rain has fallen, as if some electrical influence, produced by the concentrating power of the approaching rain-cloud, caused a tickling in the windpipe of the animal, just before the shower came up. Whatever this electric state of the air preceding a shower may be, it seems to be the same that causes in other animals some peculiar sensations, and which creates a variety of prognosticative motions in different species such as the peacock >>



Figures 20 & 21. Karin Struwig Photograph (2010) Braying donkey every time someone approaches its pen [Photographs] Accessed from 22) <http://www.merrycoz.org/> & (Figure 23) www.delcampe.net.

Two old english proverbs read the following; *When the ass begins to bray, be sure we shall have rain that day.* And y *"It is time to cock your hay and corn, when the old donkey blows his horn."*



Figures 22 & 23. (Figure 22) Pat Pflieger & (Figure 23) Delcampe.net (2013) (Figure 22) Portrait of the magazine Robert Merry's Museum, 1844 & (Figure 23) The Donkey Barometre [Photographs] Accessed from (Figure 22) <http://www.merrycoz.org/> & (Figure 23) www.delcampe.net

<<The time of day at which the animal folk express themselves has a great deal to do with what their expressions mean. As we shall see presently, the owl's hoot in the daytime is, like the coyote's yell in the daytime, the only hoot that's worth a hoot. So, contrarywise, the burro's bray is to be regarded as expressive of weather opinion only after dusk. If right after dusk, not late in the evening though, more than two burros set out a braying and if they are answered by one or more burros off some distance, then, according to Mexican interpretation, it will rain before morning. Burros, it may be explained, are, excepting coyotes and happy hens, probably the most choral animals on earth; but, then, they have near precedent for being all liars.>>

J. Frank Dobie, *Coffee in the Gourd*, 1923

<< If the first thing you hear in the morning is a donkey's bray, make a wish and it will come true. >>

English proverb

Facing direct assessment techniques, methodical assessment through surveys implies the advantage of recognizing behaviour qualities that are not covered in the first case. However, among the arguments that his detractors expose, there is the critical that relies on subjectivity under which observations may be conditioned by the evaluator judge, a fact that could be reversed by exposing that, in the most of the behavioural assessment methods, an element related to observer judgment is included, in order to reduce biases caused by subjectivity (*Feaver et al., 1986*).

Animal behaviour, as it emerged from the application of these methods, seems to be an inherent characteristic of each individual (*Lyons et al., 1988; Lyons, 1989*), and extends in time. Its importance lies in the possibility of establishing correlations with the data reported by direct behavioural observations, just as indirectly also provides reflect information about the existing change from a general pattern of behaviour to another totally different, caused by a change in the conditions which the animal is accustomed to (*Stevenson-Hinde, 1983*).

The study or assessment of all factors, as well as the complementarity between one and other tests, is necessary since otherwise it would be difficult to assess the ability of an animal to be trained or learn, regardless other behavioural components, i.e., that the best results are obtained because of this with, the association of both questionnaires and behavioral tests, as we do in this study.

However, we must highlight that completion of the questionnaire, as well as the assessment of the derived surveys, is able to assess learning or trainability in a more accurate and understandable way, as observers have found it possible to

appreciate and evaluate, through daily observation of animals under different circumstances and in different situations.

The results of other studies applied to other equid suggest that, the application or the carrying out of this evaluation, by means of the combination of behavioural tests simultaneously to questionnaires and surveys, provide better quality and reliability results, making them very useful for its implementation. Being able to make use of them for future studies aimed at assessing their possible genetic backup, current trend regarding to the assessment of animal behaviour, as has been done in humans and dogs (*Reif and Lesch, 2003 ; Takeuchi and Houpt, 2003*).

4. PEER TO PEER. A COMPLEX PSYCHOLOGY

The education of donkeys is a complex subject that has always been characterised by the great prejudices that have surrounded it and that have done nothing but further complicating a situation which itself is already complicated. Donkeys are not stubborn, this is the first prejudice that we should get rid of if we want to succeed in our understanding of their psychology. If we do not assume some provisions like this, we will have lost any chance to educate them even before starting.

One of the situations that we find and in which the most of the problems that appear when trying to establish the relationship between a donkey and its educator seem to lay, is the lack of expertise on this species that exists today. Whatever the veterinary discipline applied is, we should not be surprised by the currently existing major lack of knowledge. Until relatively not long time ago, it was difficult to find standard hematological and biochemical parameters for this species and its hybrids.

Many horse trainers intend to apply the same methods used in horses with donkeys (see Book 2, Chapter 14). Horses are agile and impulsive animals, so a nervous horse will rear up, flee, buck or show this stress that it is suffering openly. Compared to a donkey, they are not as agile as horses and therefore they can neither escape that far nor run as fast as a horse, adjusting the defensive position to remain totally still expecting not to be discovered, even under the same stressful conditions in which a horse would run away. The approach to training horses that is currently being applied, down to the essence, is to reassure and train the horse so that it gets over its fears, while now, the acquired position when facing donkey's education, is to educate by opposition to his

stubbornness, something which only increases their anxiety.

We are facing a surprisingly complex species. The psychology of donkeys is far more interesting and curious than the one occurring in many other species. It might seem difficult to understand but to start training a donkey we should see these animals as if we were talking to our spouse, partner or boss.

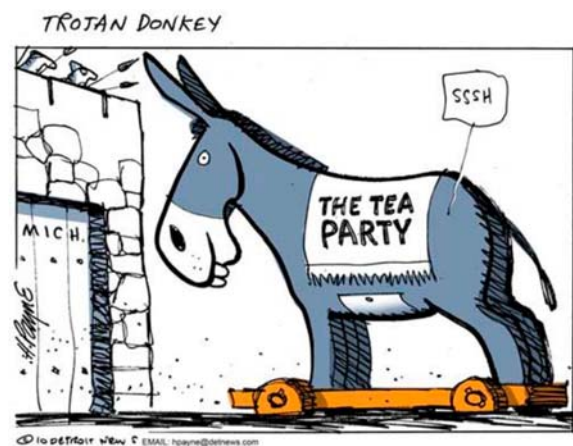


Figure 24. Henry Payne (2010) Trojan donkey. Caricaturing the American political party, The Tea party. We never know what really lurks inside an ass [Caricature] Accessed from <http://amconwr.blogspot.com.es/>

Many other animals are much like small children, when referring to behaviour. We will understand this after the following example; you can tell a child that we have explained him/her we want him/her to tidy up his/her room, that he/she knows how to do it and the he/she will stay in the room until it is tidy, since we are the person in charge. Now try to explain the same thing to your spouse, partner or boss; that they should do what they are asked to do when they are told to tidy up the office, workshop or kitchen, and soon we will see that we are not able to get anywhere. Creativity plays an important role; we approach through treats, bribery, gestures and subtle clues, a lot of actions that allow us to get what we want but without falling into a dispute.



SPUDCOMICS.COM © 2012 LONNIE EASTERLING
EEYORE FINALLY GETS SOME THERAPY

Figures 25 & 26. (Figure 25) Copitch & (Figure 26) Lonnie Easterling (2012) (Figure 25) Drawing number: 0321. In this cartoon a pun is made between what the donkey claims "People do not appreciate a donkey with the IQ of a genius. I don't make friends easily" and what the psychologist answers "It makes sense. Nobody likes a smartass"& (Figure 26) Eeyore, Winnie The Pooh Walt Disney Pictures' donkey character, visits a psychologist and he tells him that he thinks all his problems began when his mother named him "eeyore" (Igor in Spanish), the sound emitted by donkeys to bray, to what he would replicate "Who does that to their kid?" [Illustrations] Accessed from (Figure 25) <http://copitch.com/> & (Figure 26) <http://spudcomics.com/>

A good starting point is to understand the history of our ass and where it comes from. Thus we realize that the same method does not always fit any occasion. Something that can help us a lot, and of course, that will take our time is to think that what we actually do is to agree on decisions regarding the achievement of a certain task,

as if our ass really had anything to say about it, even when you know it is completely being manipulated.

Another way to understand donkey's psychology is to think of a crossword puzzle. A horse is like a regular crossword; Most are fairly easy if you have a large enough vocabulary, but sometimes there are two possible answers that fit perfectly alike, thus forcing us to work to find out which one is correct. With regard to asses, there are more like a cryptic crossword; the answer is easy and extremely logical, so you know you are right once you have found the solution.

Difficulty starting a certain donkey's education process is to work on what the questions mentioned in the previous paragraph are, which we will have to answer to educate our donkey. That is, rather than the answer we should give them, what we must give answer to. Another small detail that should not be overlooked is that the donkeys are small animal psychologists that will forget or rather do as if they forgot everything they knew when they move from their habitat, so as to assess who and how is their new owner.



Figure 27. Dishmon Wood Products (2014) Wooden donkey puzzle [Photograph] Accessed from <http://dishmonusa.com>

Our donkey will assume its new owner is a beginner, so it will try to implement all kinds of white lies or tricks given the arisen mistrust that will emerge when facing a new environment, which is unknown to them.

A new ass will make us think that its previous owner mistreated him, so that it will scare much if we raise a stick, it will try to act as if it was unsure how to rope guide or as having been conducted for the first time, that its previous owner always fed him on oat hay and so that it cannot possibly eat hay forage, i.e., our ass will do all in its power to keep in control, especially if it observes and understands that its owner does not have experience enough, something which will ensure it gets away with it.

We must be patient and stand firm when we give an order, no matter how long it takes to get it, but we must not yield. Soon we will see that our ass surrenders and looks at us with a typical face that says, "Well ... it was worth a try." For example, when a donkey being led by a rope, learns that, when he pulls from this rope we drop it, he will also learn that it will be enough with pulling to achieve its purpose, so that it will not fail to try again and again.



Figure 28. DreamWorks Pictures (2014) Donkey, pouting in Shrek [Captura de Pantalla] Accessed from <http://www.belovedspear.org/>

5. A BAD REPUTATION DUE TO A MISUNDERSTANDING

As we prepare to conduct a temperament assessment, that is, to examine the patterns of behaviour that ass specimens exhibit, it is very easy to fall into an error, perhaps because of their morphological similarity to other species such as the horse and their hybrids; mule and hinny, if we suppose they share counterpart behaviour patterns. However, we found ourselves, facing a unique species, which has an own identity and therefore will present behavioural traits and attitudes characteristic of it.



Figure 29. NorthEscambia.com (2010) Burrrito (Little donkey) and Charlie Brown. Although sometimes they may take after other animals, they are a different species, so that their behavior patterns are also different [Photograph] Accessed from <http://www.northescambia.com/>

Traditionally known for its stubbornness, the temper of this species in general, is often misunderstood, and deriving from this fact, consequently more harshly treated than it would be required in most cases (McLean, A. and Heleski, C., 2008).

A donkey is not a horse of small size and therefore should not be treated as if it were one. His noble sight and long ears give it the appearance of a Teddy bear, something that does nothing but blur an extremely complex and often misunderstood character. These animals require constant mental stimulation and daily contact with other conspecifics and people. Otherwise they become

cantankerous and may become ill if left alone for too long.

CURIOUS FACTS



Figure 30. Wendy Blanks (2013) In 2013, Thailand was declared a cold disaster area. In Turkey literally the animals were frozen when they stayed still. These donkeys were stranded in the mountains and when they were found they were stacked against each other in order to keep warm [Photograph] Accessed from <http://www.thesleuthjournal.com/>

6. A PHYSIOANATOMICAL BASE THAT CONDITIONS ITS BEHAVIOUR

Donkeys from their natural origin are adapted to the hot, dry climate of northeastern Africa. In those locations where temperature oscillation between day and night is so wide, their thick hair protects them from cold nights (especially when they are stacked to conserve heat). However, this thick coat is not waterproof against water and humidity, as donkeys do not have the same fat (or a lesser extent of it), present in horses and ponies.



Figures 31, 32, 33 & 34. (Figure 31) Sixbucks' TypePad Experiment, (Figure 32) Pete Markham, (Figure 33) The Marketing People Blog & (Figure 34) Gardening for Wildlife/Debbie (2009-2011-2014) (Figure 31) A donkey sheltering from the rain at a bus stop, (Figure 32) donkeys really enjoy playing. In this case though Jackie, which is not likely to kick or buck, if it gets much excited when playing in the snow as seen in the picture, can get to kick the air (Figure 33) Shelter to protect Molly and Taylor from snow, (Figure 34) Donkey playing with a ball to fight the boredom of winter [Photographs] Accessed from (Figure 31) <http://sixbucksamonkey.typepad.com/>, (Figure 32) <http://www.flickr.com/>, (Figure 33) <http://www.themarketingpeople.com/> & (Figure 34) <http://gardeningforwildlife-debbie.blogspot.com.es>

This means that they will be more reluctant to collaborate with their handling in rain or snow, as moisture is able to penetrate their hair layer and reach their skin, thus reducing body heat quickly. A well-ventilated shelter therefore becomes a necessity that we should not leave unnoticed.

A barn should be located in an area sheltered from cooler air streams and a generously inclined sole will prevent dirt from accumulating and allow the bed to remain continuously drained. Donkeys should have access to an adequate and well maintained throughout the year shelter.

In addition, a donkey will also benefit from any additional waterproof protections meaning an extra protection especially in winter, like a waterproof protective mat.

Also donkey's average temperature is usually one degree lower than that of the horses and they are energetically more efficient because they have a considerably more efficient digestive system than a pony of the same size would. Under hot conditions they tend to stay still giving the impression of being immersed in a strong drowsiness. If possible they will seek a shelter in the shade; but if it is not, they will face the sun to minimize the exposure of their body to sunlight.

7. THE CLOSE LINK BETWEEN MEN AND DONKEYS

Donkeys were one of the first species to be domesticated by mankind, serving its owners since the first donkeys were raised over time. This role, now reevaluating, has achieved that they are currently regarded as the main draught animal for many of the cultures living in the world today.

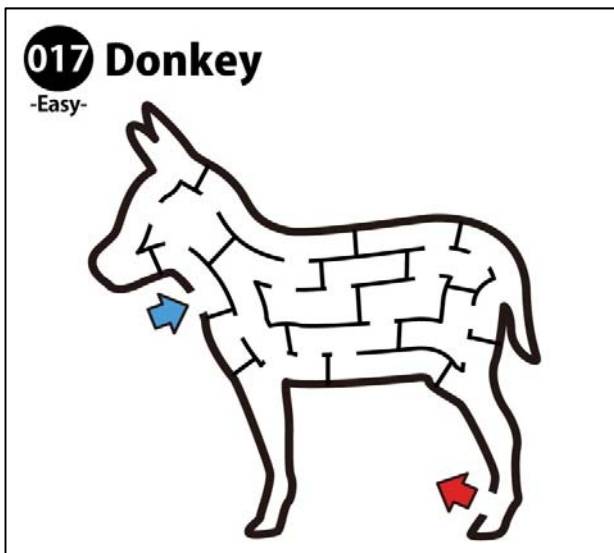


Figure 35. mazebox.net (2014) Donkey-shaped maze [Drawing]
Accessed from <http://mazebox.net/>

Donkeys seem to possess an innate trust in man (accompanying the accumulated long tradition since the first donkey was domesticated), and given the high sociability of these animals, they tend to create strong bonds with their owners.

As we have seen in several chapters (see Book 1, Chapters 2 & 9 and Book 3, Chapter 12) donkeys have served man as a military and food transport in many of the wars that have ravaged the land. It is precisely, the relationship of mutual trust that becomes established, which makes the bond established between a donkey and his/her caretaker so special as to acquire them as companions in such complicated situations.

This relationship is not only especial but it is totally different to the one that may exist between other species and humans, such

as horses. We must understand donkey behaviour like a large dog or even a toddler.

Thus we will be able to get rid of many prejudices, something which will allow us quickly and successfully progress on the long road which is the education of our ass. The sense of caution and direction of a donkey has proven to be greater than horses with donkeys being able to solve mazes in less time than horses do.

Although donkeys have always been faithful companions which gradually helped us understand the process of civilization (note its important role in current developing countries) and build the world the way we know it today, they are still having to face the major obstacles represented by the prejudices that have traditionally befallen over this species.

There is a general trend towards the acceptance that donkeys are characterized by an inner stupidity, laziness and malicious cunning that has accompanied donkeys from virtually the last 2000 years until today.

These prejudices are merely a reflection of the profound lack of respect humans have professed these animals that have often been caricatured and overloaded with countless grueling tasks. Donkeys enjoy a superior intelligence to most pets and their owners must recognise it.

A donkey will not move in a situation perceived as dangerous, something that will prevent it from suffering many accidents arising from, for example, the use a bad harness.

It is difficult to force or frighten a donkey so as for it to carry out a certain task, especially if they have not previously been taught which benefits it will bring her/him, contrary to what happens in horses.

Donkeys are infinitely more cautious than horses, playing the part of complete analysts of the risk present in each situation.

The emerging rediscovery of this species is causing a rapidly growing popularity, with some American breeds like miniature Mediterranean donkeys which are currently one of the most popular pets, being considered almost to be like dogs and cats (see Book 1, Chapter 9).

8. DONKEY SENSES

When relating to asses, our ignorance makes misunderstand appearing reactions as if there were some reason for them to occur. This is due to the prejudices we have already mentioned above, and to what we interpret with our senses, less developed, or at least designed differently.

When a donkey's keen senses tell it that it could be in danger, its immediate reaction is to run away or move away at least. If, in response to this behaviour, we punish the donkey and we infringe it any pain, we will confirm that it was right when it wanted to escape, something which will lead it, the next time such dangerous stimulus is perceived, to react even more violently.

The key to the correct interpretation of the behavior of donkeys is to understand the world from their perspective and consider it. His appreciation of the world is based on its senses and on a study of the situations according to their complex psychology. The aim of any ass will be to seek the safety and comfort of a quiet and sheltered location. Voluntarily they will not endure the discomfort for long. If we continually respond with a behavior that causes more discomfort or threatens their sense of safety, we will be generating a continuous desire to escape.

Donkey's perception will surely be different from ours, so to understand their behaviour, we must understand their worldview. Do not forget that they have a much more specialised than us sensory technology. The senses of asses collaborate together getting to achieve great effects.

8.1. HEARING

The donkey has a worse hearing range than dogs but much better than humans or even similar to that of the horse, but also has the advantage of larger ears that allow it to act as a sound collector,

improving its hearing. Each sound is carefully captured by both pinna and will be interpreted at the same time. From this, it can be deduced that, the hearing of an ass is often stated to be more acute than that of a horse and probably that of a human.

The speakers of a stereo produce musical tones ranging from 20 to the 20,000 decibels. The rest is inaudible to humans. Donkeys' abilities are much higher due to their large auditory spectrum. They detect footprints, wheels, whistles, vocals and storms long before us.

A donkey may perceive a wolf at such a distance that their companion neither has seen it nor has probably been able to hear it. Whether the donkey has had the ability to see it or not, can be doubted, but the fact is that it has perceived the wolf.

His whole body acts as sound receptor, so that the sound transmitted through the air is received by the ears, and the one transmitted through the land is received by an amplification system formed by their feet, the inside side of the ears and the brain. The sense of hearing and their interpretations are so indispensable to their security that any damage or prejudice could cause it great distress. They could even stop sleeping or eating when they do not know how to identify a certain sound.

Another advantage is the ability to move their ears to locate the source from which the sound comes.

Ears have a rotational spin on its axis, which becomes even higher than 180° allowing it a greater sound reception. The hearing organs are essential organs, both for donkeys and us, as they provide us a wealth of information about the mood or behavioural situation under which a particular animal is.



Figures 36, 37 & 38. (Figure 36) Álvaro López Pinto & (Figures 37 & 38) Francisco Javier Navas González (2011-2014) ((Figure 36) Two curious donkeys being alert as evidenced by its ears and upright position (Figures 37 & 38) Reaction of an ass at the sound of a horn and a speaker [Photographs] Accessed from (Figure 36) <http://haciendofotos.com>

While an ass will get being scratched on the inside of its ears really well, we should do neither sudden movements like damaging pulls (as they are very delicate) nor so subtle that we tickle them, situations in which they will quickly shake their head. Before a donkey allows you to freely manage its ears, it must have been already proven that this is not a problem for him, or what is the same, it should trust in us. The sense of smell, hearing and touch allow the ass discerns, in such long distances, that they usually start paying attention to different stimuli with these senses prior to using their sight.

8.2. SMELL

It is considered that donkeys' sense of smell is very acute, very similar to the way horses do. The sense of smell of the ass, like the one of the dog, is so superior to ours that we cannot even imagine. Being a predated animal, the donkey is especially sensitive to the scent of predators (including humans),

which given our feeding, sets free a characteristic odor derived from the proteins and fats that we eat in our diet. It is even said that donkeys can perceive water a mile away. The odor is characteristic of each ass. When two people do not know each other, they will likely ask about what their names are. Donkeys, unable to speak greet each other sniffing. They also smell objects that call their attention for the first time, as well as their fellows' urine and feces.

Jennies recognize their young offspring by its characteristic odor. It is common to see males sniffing the air. When two donkeys meet each other, they will sniff and snort bringing their nostrils together, so that at each inspiration and expiration odor particles are absorbed by breathing, providing relevant information that the donkey can employ to recognize their fellows and the people who are in contact with them (a good way for a donkey to recognize us, will be to bring our hand, palm down, at a safe distance so that it is able to sniff it) and also, detect certain temperamental states such as fear, anxiety, nervousness, among others.



Figure 39. Adanakar (2014) Donkey foal smelling flowers [Photograph] Accessed from <http://adanakar.blogspot.com.es/>

That is, this olfactory greeting is one of the ways that donkeys have to make sure that a person or ass approaching them has a friendly attitude. Smell and its physiological involvement with taste makes donkeys be less likely to accept a meal which they are

unfamiliar to, thus making it difficult for us to provide them with drugs or a worming treatment.

8.3. VISION

The sight of the ass is not as developed as that of the horses, although they present a blind spot as those, immediately in front of the nose and behind the head. They have good peripheral vision while keeping his head down to graze, but a very poor ability to see objects in high places.

They have good binocular vision allowing them to spot any possible threat. It is thought that they are able to distinguish the same spectrum of colors as horses do, being able to clearly differentiate between primary colors.

Another aspect is that, they are not likely to show themselves as sensitive to direct eye contact as horses are. All these features of the sight of donkeys appear to have derived from the habitat in which they originated. A desert climate in habitats surrounded by sand and dust. The vision of the donkeys will be their primary danger detector, so that this is one of their most important senses. Both eyes can be used together to focus on an object making use of binocular vision or independently, using monocular vision. They can see pretty well laterally and reasonably well to their back (especially with lowered head). Raising or lowering his head, or turning it to one side or another, the ass will be able to receive more complete and clearer information about their environment, as well as focusing on specific objects, however far or near they are. Donkeys can instantly focus from distant objects to those who are closer to them, detecting the slightest movement however slight it may be, even from a great distance. One quality that serves donkeys very well, especially for wild and feral donkeys. They also have a better night

vision than other species, although they do not reach the level of cats. However, their eyes need time to adjust when they move from light to dark, something which could explain the doubt you always generate in an ass when loaded to a mobile unit. Donkeys possess dichromatic vision unlike humans in which the vision is trichromatic. In other words, donkeys can naturally see the blue and green spectrum and variations based on these two colors, but cannot distinguish red. However, it is always controversial. Recent research indicates that they present a similar vision to blindness situations against red-green, during which certain colors like red and related colors to this, appear to be generally green.



Figure 40. Valley Central Veterinary Referral and Emergency Center (2011) A donkey visiting the ophthalmologists [Photographs] Accessed from <http://www.vcvrc.com>

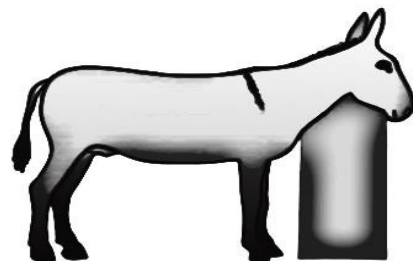


Figure 41. Sue Weaver (2008) Donkey blind spots [Illustration]

8.4. TOUCH

Donkeys have whiskers around their eyes and on their nose, which are basically extensions of nerve endings that act as touch receptors. Adult asses slightly test electric fences touching them with their mustaches, while donkey foals with their still wrinkled mustaches tend to bump into all surfaces they approach to, with their nose. There is a large nerve supply to the whiskers. Those who shave those organs for exhibitions deprive them of an important secondary sensory organ.

Donkeys are very attracted to sweet and particularly have a special interest in fruit. They love nuts. They tend to swallow them in the whole and then spit out the shell. Just as the horse does, they show no interest in eating stale or moldy food, as they will not also feed from a dirty container, something which comes from their keen olfactory sense.



Figure 42. 4ever.eu/R® (2014) Whiskers on a donkey's face [Photograph] Accessed from <http://imagenes.4ever.eu>

8.5. TASTE



Figure 43. Brother Lapin's Pilgrimage (2011) A donkey eating an orange during Saint James' Way [Photograph] Accessed from <http://brotherlapin.com/>

CURIOR FACTS

NO ONE IS PERFECT

“One who wants a flawless ass must walk”

“He that is a donkey and believes himself a deer finds out his mistake at the leaping of the ditch”

Italian Proverbs

9. MOVEMENTS AND GAITS

The study of donkey movements has its first record in 1878, when a photographer surnamed Muybridge decided to investigate whether "horses were able to fly". For this reason he placed a set of aligned cameras, shooting each of them when a cable was hit by the brisket of a galloping horse.

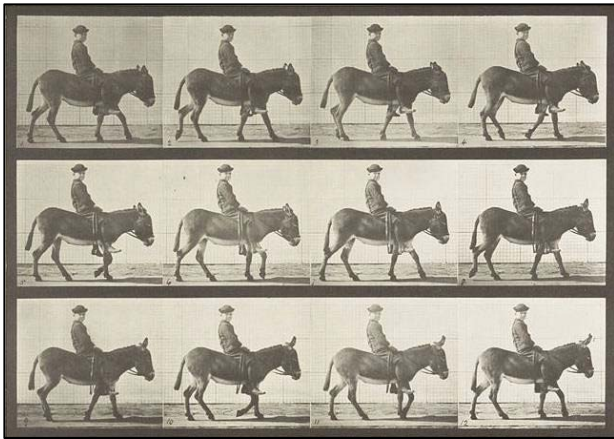


Figure 44. Eadward Muybridge (1830-1904) *Animal Locomotion: Plate 665: "Walking jenny mounted bareback by a child. The first shots by Muybridge were followed by multiple sequential shots of different animals in order to study their kinetics* [Photograph] Accessed from <http://jenbekmanprojects.tumblr.com>

The current development of film and video has enabled a breakthrough in motion analysis.

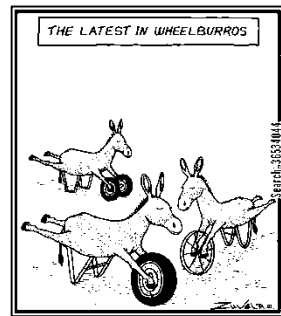
From the first Muybridge's experience, research in the field has developed to the point where not only has deepened in the analysis of movement individually, but in the interracial and interspecific differences, problem and musculoskeletal disorders diagnosis or even to see the effects and slight signs of laminitis.

Anyway, this vast source of knowledge was only available to private research centers and large equine medicine hospitals. Analysis techniques have increased their popularity and modernization over the years, not only improving and adding more perspectives to a long list of patent applications, but getting

cheaper costs, since the technology is becoming more affordable.

Analysis of movements and gaits using video recordings has become an available tool to veterinarians, technical specialists and even practice owners.

Movement analysis is simply a method of movement assessment in our donkey case, through close examination of items of interest such as stride length, joint angle, sequences of steps, etc., factors that have traditionally been evaluated using the mere observation of animals in motion.



Figures 45 & 46. (Figure 45) Tony Zuvela & (Figure 46) Artizans (2014) (Figure 45) *Ultimate trolleys* & (Figure 46) *Donkey on treadmill* [Illustrations] Accessed from (Figure 45) <http://www.iantoo.com/> & (Figure 46) <http://www.artizans.com>

Movement analysis has dramatically evolved together with the possibilities that videotaping of individuals offer (Clayton H.M. & Schamhardt, H.C. 2001).

This allows us not only to keep records that show the evolution of the way donkeys, in this case, move and their training, as well as the detection of potential problems that are evident to a greater extent during exercise. We can therefore study the evolution of rehabilitation programs prolonged in time and observe the immediate effects of horseshoe changes, physiotherapy or even the advance of the learning programs applied.

The donkey species still remains unknown to many and misunderstood by many others. For instance, their unusual ability to mask pain and to implement compensatory mechanisms that hinder the diagnosis of diseases until they are chronic or are much patent.

Movement or gait analysis can summarize an unquestionably useful tool for many specialists:

1. Equine therapists, a group which includes masseurs, physiotherapists, chiropractors and osteopaths who treat musculoskeletal problems and are responsible for equine sports performance in first instance, tend to observe patients. This method is valid to assertively diagnose laminitis with clear signs and other obvious issues. However, our eye is not able to perceive, capture and comprehend everything we see, especially when we refer to faster gaits such as trot, canter and gallop. Video gait analysis allows the therapist to make the recorded animal movement slow to thereby be able to examine any changes apart from normality in that particular gait. Improving the accuracy in the visualization and diagnosis of the problem and ensuring the effectiveness of the treatment. With these techniques we manage to advance the diagnosis, something which can be very beneficial when treating diseases whose prognosis worsens, if they lengthen out in time.
2. Blacksmiths primarily involved in the maintenance and improvement of movement as well as welfare and health of donkeys when performing hoof care and horseshoeing labors. Although, in this breed, it is rare to

conduct a systematic shoeing (Hinnefeld, L. 2008), to observe the motion that the hoof describes in slow motion allows a complete evaluation of not only the balance and good execution of horseshoeing, but to ensure that the changes we have made in it are actually beneficial. Farriers can easily diagnose what the problem donkeys are suffering is in particular, and therefore provide a personalized attention and follow-up for each case.

3. In the case of veterinary specialists, gait analysis complements and facilitates the diagnostic process and complete the investigation of gait problems. In conjunction with other techniques used as x-rays, scans and nerve blocks, this tool helps you to locate the problem, not only reducing the time required to diagnose a disease but doing it in a safer and more effective, way avoiding the worsening of the problem and needless increase in the cost of treatment. It will also be useful to achieve pre-purchase examinations, allowing the veterinarian to clearly assess the quality and characteristics of gaits, and evaluating if the movement of the donkey is properly adjusted to a certain desired purpose.
4. Coaches can make use of this tool in those cases in which the desired progress in relation to the training time is not achieved by allowing the early identification and prompt planning to face the problems that may be arising, improving the efficiency and reducing the risk of injury. They can thus evaluate changes in the quality of movement.
5. Riders and trainers will easily identify riding stance problems in

relation to the ass showing that it could be improved to make this task easier and more ergonomic for both.

6. When selecting individuals that are chosen for breeding, this tool is the ideal complement by which we will be able to disqualify individuals with serious damage to a greater or lesser extent, and whose likelihood of transmission to offspring is known.

To carry it out we just need to configure our own system to analyze any donkey, assessing which signs will be considered as positive and which as negative and their degree (from 1-5). Normally a video camera, a laptop and a computer program as it could be VLC Video Player ® (VideoLAN, VLC, 2013) that let you slow down the video to see the ass in slow motion will be enough.

Provided that, of course, the advice of a specialist veterinary expert will be the key to the interpretation of the signals recorded by the media, providing the necessary knowledge and expertise of a medical professional.

In 2007, the *American Donkey & Mule Society* in collaboration with a historian undertook a study about the way in which the centuries of the Roman army would have managed not only to move, feed and shelter thousands of troops, donkeys and mules in an investigation that lasted for months.

This study envisioned that considering the fact that donkeys and mules move when walking with a speed ranging between 6 and 8 km/h (4 to 5 miles/h). When employing a fast trot they reach 14 km/h (9 miles/h) and gallop 32 km/h (20 miles/h) or more. However, gallop cannot be prolonged for a long time, so that the animals would have to switch between the different gaits speeding up in some

stretches and moving more cautiously, trotting or walking on others.



Figure 47. The Donkey Sanctuary (2014) Veterinarian team attending an ass at a hospital operating theatre of The Donkey Sanctuary [Photograph] Accessed from <http://www.thedonkeysanctuary.org.uk>

The terrain and climate conditions, as well as the charge that the animal was carrying with it (whether it was a person mounting on the chair or a good being carried) would have been an influential factor in the daily passage. An animal that is more lightly loaded move quickly and nimbly and have a lower energy requirement (and therefore food) than a heavily loaded one.

Since under normal circumstances it would have only displaced during daylight hours, they would have gotten an average of about 12 and 16 km/h (8-10 miles/h) for about 8 travelling hours, if in addition we include the relevant factor of the bone structure of human beings not being ergonomically designed to fit comfortably to the bone structure of equids, even using a saddle and, that wounds caused by the rubbing between them are really painful for animals.

If, on the contrary, these trips had not been done on the backs of animals but being shepherded by the shepherds, we should expect a lower average speed since the

element or limiting factor in this equation is the speed that the human shepherd would be able to perform.

In a wrong way, donkeys have a reputation as stubborn, clumsy, slow-moving animals. However, many standard size donkeys can move nimbly like a horse if they are convinced that the scope of a given speed is necessary.

Like horses, donkeys have three basic gaits, or ways to get around, each at a different speed. Its fastest donkey fellow is the Asiatic wild ass, also known as onager. The onager can reach speeds of 69 km/h (43 miles/h) at full speed. This is equivalent to the speed that a racing thoroughbred can achieve.

Other domestic breeds of donkeys are able to achieve equivalent speeds and some horses are able to compete against them in some time trials as *pole bending* (western dressage speed test with obstacles in slalom). Unlike most horses, donkeys are generally not inclined to run at full speed but prefer to move at a slower pace.

We will appreciate different moves depending on the age of the animals, so that donkey foals will also present a series of characteristic gaits that although could be categorized as those seen in adults, they will easily be distinguishable from the latter.

The presence of anecdotal cases of donkeys undergoing dressage and training plans get to develop strides and gaits that would be far more historically typical or unique of the horse, suggests the possibility of developing specific training patterns and specific assessment that open and make the perspectives of this species greater (see Book 2, Chapter 14).

Donkeys do not have a range of gaits as varied as horses do (*Dalton, C., 2008*).

Basically, the gaits presented by the donkey species are:

1. Gallop, Canter and Pole:

1.1. *Characteristics:*

Gallop is the fastest gait that asses may present. Being equivalent to the way donkeys have to run when free in their natural environment, in this case, and in a controlled way, in their derivations known as canter or pole and lope, gaits that would be similar to a runner capable of both moderating and adjusting their own pace, as well as to perform gaits at its maximum speed. We must be careful to distinguish between the gallop (the fastest gait) and canter or pole, in which diagonally paired limbs do not land together. It is very complex and we will rarely be able to distinguish between the two by paying attention to the sound of hoof steps on the floor. There are even better tactics to differentiate rather than the mere observation of the motion sequence, which is very similar in both gaits. Gallop is a four-beat gait, in which limbs land at the same time, unlike canter in which we have already mentioned, they hit the ground separately.

During the gallop, the donkey will spend most of the time high above the ground (or what is the same without any resting limb). In a photo, you can even seem that the animal appear to be planning. The amplitude of this gait stride is longer, and it could appear that its back is flattened and lengthened. While some donkeys are perfectly capable of developing even higher speeds that would exceed its limit, most donkeys gallop between 32 km/h and 48 km/h (20 and 30 mph) when running at full speed, and not just walking. This gait could see its beats reduced to become

a two-beat gait in which the rear limb hits the ground before the diagonal formed by the opposite hind limb and its opposite of the thoracic region do it. The period of suspension will start right after the last front limb leave the floor. The fastest donkeys will possess a resting phase within this gait much shorter, i.e., the limbs will remain less time resting on the floor.



Figure 48. Blackpool Zoo (2014) Miniature donkey running in one of the paddocks at Blackpool Zoo [Photograph] Accessed from <http://www.blackpoolzoo.org.uk>

Canter or sustained gallop could be defined as a held in content or broken gallop. It is characterized by three beats, so that the supporting base that supports the weight will vary from one to two diagonals to a single rear limb. The period of suspension will be the best beat to change the donkey's direction.

The average speed of this step ranges between 9.6 and 16 km/h (6-10 miles/h). The sequence of steps change depending on the pace and direction of the animals.

Depending on whether the step is left or right (which varies depending on the limb heading the action) on a circular track the limbs that are on the inside, rear and front will present a more advanced position. When the direction is to the right, the sequence will be:

1st beat: left rear limb, right rear limb.

2nd beat: right rear limb / left front limb.

3rd beat: right front limb.

Period of suspension: After the right forelimb is lifted from the ground.

Whereas when the direction is to the left, the sequence is:

1st beat: right rear limb.

2nd beat: left rear limb/right front limb.

3rd beat: left front limb.

Period of suspension: After the left forelimb is lifted from the ground.

A variant would be Cross-firing that occurs when a donkey changes its direction from right to left, but without changing the sequence of its hind limbs, or vice versa. The sequence in this example would be: right hind limb, left hind limb, left forelimb and right forelimb.

1.2. *In the wild:*

When donkeys reach high speeds or those that exceed the limits that they are usually able to achieve will apparently present a typical balancing gait also observed in sheep or zebras, during which they seem to have all their limbs airborne simultaneously.

As mentioned above, this gait is the closest to the way in which wild asses run in their wild habitat. We will appreciate gallop in donkeys when they are left to walk on their own and, especially when fleeing or playing among their fellows. In socialized asses but that have been kept under feral conditions (mountainous conditions, i.e., have had contact

with men so they do not react with fear towards them, but because of the fact that they had not received training, they do not often collaborate when forced to perform certain tasks or exercises).

1.3. *Donkey foal adaptation:*

In donkey foals we will appreciate this gait often in a rather ramshackle way in young individuals of a very short age, which will correct and make this gait smoother as they grow. This will be the gait that donkey foals use to play with each other or to scamper around their mother in order to be able to reach its pace. Donkey foals or young asses show a marked tendency to develop faster movements when are tested together with their mothers.

1.4. *Training and assessment:*

The biggest challenge that a donkey will have to face is speed. Their normal gait allows them a sustained speed of about 4-5 km per hour (2.5 to 3.1 miles/h).

In some parts of the world local donkeys and their drivers achieve a good gallop over short distances, but generally when a certain donkey is urged to accelerate it will only start trotting (*Chirgwin, JC et al., 2000*), so that it has even been stated by many authors that donkeys are not able to gallop.

This would be uncertain, although it is not useful to consider this gait when assessing the functional purpose of animals in a quantitative manner, but rather determine whether a donkey is qualitatively able to reach to present it when performing a certain task or not.

To start a workout plan to train this gait to donkeys, the first thing that we should teach our animal is when it must begin to move, when to accelerate and how to maintain a certain speed in a sustained and consistent manner, and when to stop, all under signals from the coach. Starting, acceleration, preservation and stopping motion actions, should each be linked to its own word, so that the donkey can learn them.

First thing to do is making the donkey associate the pronunciation of a word with the order that tells it that it must develop a specific action. When you start moving, the word "START" (START) may be accompanied by the shaking of elements that are foreign to the ass and produce it fears.

According to some farmers by introducing small pebbles into a plastic bottle and shake or tie a plastic bag or sheet of paper to a stick and move it are good choices (*McLean, AK et al., 2012*), with the noise we will surely get the ass to move. By using this tool which others authors have also named "motivator", and moving it behind the donkey in an appropriate position, we can redirect or even early grossly control the direction of ass, however, we must make use of these elements decreases over time as the frequency with which the donkeys follow our orders successfully increases.

During training sessions we should be effective as donkeys are very intelligent and will usually get accustomed to the stimulis, so that as

time goes by their response will be lower. Thus, an adult donkey will not be able to maintain the gallop for a long time and if it is not controlled by the coach it will make use of it until it reaches a distance where it feels safe.

In any case, gallop is difficult to achieve. For a donkey trotting during a work session will be fast enough and individuals will not be able to keep much faster gaits during a very long time. Obviously, the coach should also possess a proper physical condition for this type of activity.

Since the election of a word or proper command, the sound intensity when performing the action, to the need for the coach to accelerate its pace or run beside the ass, either to drive it or to evaluate it. The asses must be hold by a rope halter with sufficient length to allow us handle the animals without having that length hinder the movements of the ass or coach.

An assistant in charge of producing the stimulus with the elements mentioned above from the back of the ass will help to speed up the process. We should never stop paying attention to the signs of body language that the individuals present (Navas, FJ, 2012). In the head area, the ears and the tail, in the back areas, will provide us with information about the animal's attention being paid to the stimuli around it and its mood and therefore responsiveness.

It will take some time for both the coach and for the donkey to find a speed where both are comfortable, but when this happens, he may proceed to teach the command or

the stopping order "STOP", rewarding the donkey right after following this order (positive reinforcement), considering of course that speaking in a slow, quiet tone that quiets animals greatly facilitates the achievement of this task. We will need to consider a somewhat greater distance in order to train this gait or even to study it than the one needed for other gaits.

We can be sure that the strength of any donkey will exceed that of any coach, so it to accustom the donkey to gallop it will not be a bad idea, to use a bicycle (donkeys tend not to like bicycles a lot at first, so we should get them used to their presence). We can benefit from the advantages of using a bicycle so as for animals to gallop, in cases in which the starting and stopping are performed under a perfect verbal control, and require no opposition force by the coach.

2. Trot

2.1. Characteristics

This gait is developed with three basic elements to consider. The first two beats that form the gait and a diagonal support stage. In this step, one pair of diagonal limbs rises while the opposite touches the ground. Starting the suspension of all limbs. The period of suspension will increase as the trot does it too.

The sequence described by the limbs will not change in any of the modes of walking so it is not worth to distinguish them in donkeys (average or ordinary, working, collected, or extended trot) The average speed of trot ranges between 11 and 16 km/h (7 to 10

miles / h) to the extended trot, 16 and 48 km/h (10 to 30 miles/h). Today is thought to be a genetic trait dominant over the walk (A.C. Becker, et al., 2011).



Figure 49. Elms Farm Miniature Donkeys (2006)
Trotting donkey [Photograph] Accessed from <http://www.donkeys.net>

The sequences described by the limbs are: left forelimb/ right hind limb (left diagonal) - 1st beat. Right forelimb/ left hind limb (right diagonal) - 2nd beat.

Except in certain cases (Spanish donkeys that have successfully been trained to perform and develop the gaits that a horse perform, see Book 2, Chapter 14) we will not appreciate the difference between types of trotting. The different modes of trotting are:

a) Collected trot: A donkey when leaded decidedly advances, with the neck raised and arched. The hocks tucked, keep the drive thus allowing the shoulders are easily handled in all directions. The donkey has shorter strides than in other trot modes, but keeps lighter and more mobile. This type of trotting would be more typical of horses and will rarely be seen in donkeys given their more controlled movements.

b) Working trot: It is an intermediate gait between the collected trot and medium trot. It will be shown by a still untrained donkey and therefore unable to perform or complete assembled complex movements.

It is well balanced. A trot forward with even, elastic strides, with the much active collaboration of hips. The power that comes from the activity of the hindquarters is very important. It will be the kind of trot that we will more frequently appreciate in animals when they are at their pen or stable, and can develop free willing movements.

c) Medium trot: is an intermediate gait between the working trot and extended trot, but higher and rounder than the previous one. The Ass advances strongly, moderately lengthening its stride with the push coming from the hindquarters.

We will only be able to distinguish it in those animals that have been subjected to dressage plans that allow us distinguishing between the existing subtle differences between the different types of trot.

In general, strides should be as regular as possible and the movement is well balanced and unconstrained on the whole.

d) Extended Trot: Ass will cover the maximum area available while maintaining the same pace, lengthening its stride thanks to a major boost from the hindquarters. Forelimb hooves should not step back from its projection on the floor.

The function of the forelimbs and hindlimbs must show to be similar when referring to their extension. All

movement should be well balanced and the transition to collected trot should be performed gently, carrying the weight on the hindquarters. We could mistake this trot with the beginning of a canter.

2.2. In the wild:

In the wild donkeys develop two types of trot and when it comes the time to train it, it should be able to trot at two speeds (slow trot, also called *park trot*) and a fast working trot work (also called *road trot*).

2.3. Donkey foal adaptation:

In donkey foals we observe this gait too, especially when donkey foals are near their target and thus approach more cautiously than for their usual games. All this changes when donkey foals are with their mothers, since in these cases will be the females with offspring which will define the moving gait of younger animals.

It may be possible to appreciate the gait sequences, but to present highly structured patterns or maintained over time will be more complicated (since those animals will not have received training lessons).

2.4. Training and assessment:

Animals should be encouraged to trot and then move at a walking gait to later go back to trotting (usually when the tests are carried out on linear paths considering distances that enable a satisfying enough assessment). As it happens in all gaits; smoothness of gait and a clear transition from one to another, are important factors that should be considered.

Trotting is a slow running gait that should not be confused with the slower modes of galloping (very complex assessment study, given the species we study). A donkey can cover a considerable territory and travel long distances at a trot, with an average speed of 12-14 km/h (8-9 miles/h). This pace results much more comfortable for a donkey than a gallop, and it can keep it for a much longer period of time without tiring.



Figure 50. Gérard Lacz (2014) Jenny and its foal trotting at a paddock in France [Photograph] Accessed from <http://www.agefotostock.com>

3. Walk

3.1. Characteristics:

The walking pace is slow and steady, which is about the speed that a human could reach (around 6 km/h and 8 km/h, 3.5 miles/h and 5 miles/h). When we combine this pace, with the ability to transport heavy loads, the donkey becomes an ideal travelling companion. The sequence of steps is not modified when we change to the ordinary walk, to collected or extended.

Walk is a gait in which four beats are developed, thus indicating that each limb rises and hits the ground at different times. The sequence of steps is as follows: left hindlimb, left forelimb, right hindlimb, and right forelimb. Two or three limbs are

always on the ground at the same time, creating a triangular support base. There is not a suspension period during which all legs are suspended in the air.

3.2. *In the wild:*

This gait is the preferred gait of the donkey. This is largely due to the fact that, unlike the horse, whose first instinct is to run away from danger donkey prefers to move slowly and safely, distrusting before proceeding in a certain way and thinking about the situations that are it may face before reacting.

3.3. *Donkey foal adaptation:*

Donkey foals will present a much more defined walking gait as they age. Donkey foal typical games at early ages make this gait be camouflaged among air leaps and strides. No major technical differences exist; although it is evident the lack of supportive musculature of the neck causes movement not to be as stylized as it might occur in adult asses.

3.4. *raining and assessment:*

This gait does not almost require training apart from that aimed at correcting aesthetic faults due to a lack of it (not those that come from anatomical defects), or to designate the signals that a donkey can take as an order to perform a certain action. To assess that the anatomical structures involved act synergistically and coordinately. Keeping atlanto occipital and atlanto axial joints stable as well as, the right supportive role of the musculature of the neck at its junction with the back, in order to be able to correct it by

implementing plans and training guidelines that may reinforce it. We will also evaluate possible aplomb defects, since in general; it will be the development of a harmonious walk, what we will be really looking for training the animals (Woodford, C. 2010).



Figure 51. Thomas Mathie (2010) Walking donkey at the beach [Photograph] Accessed from <https://www.flickr.com>

4. Backwards walk:

4.1. *Characteristics:*

We are facing a gait that would consist of two diagonal beats. The limbs described an equal sequence to the trot but at a considerably slower speed as that of the walk. Right forelimb/left hindlimb (1st beat). left forelimb / right hindlimb (2nd beat), all backwards.

4.2. *Training and assessment:*

This gait will be one of the most difficult to achieve with our donkeys. We must first earn the trust and make the donkey be calm. Body contact between the trainer and the animal is so vital that he should transmit a self confidence to the animal that allow it to give steps backwards. With patience early rewards are obtained.

5. *Special gait:*

See Book 2, Chapter 14. Inherited ambling and Classical dressage routines in exceptional cases.

10. How to distinguish between gaits?

A very important fact when performing a gait analysis or the study of the pace will be the determination of the difference between a gait and another.

Most donkeys move forward using three basic gaits: walk, trot and canter (see Book 1, Chapter 8).

1. At a walk, a donkey will have a limb in the air at all times. Listening to the sound of hooves when walking on hard ground will allow differentiating it very easily because this is the slowest gait that donkeys perform. We must hear a four beats gait in a distinctive way and that can easily be counted like "1, 2, 3, and 4 ". If the animal is not tied with a rope or bridle, the head must move at a slight angle while walking.

2. At a trot, limbs move together in diagonal pairs, that is, a forelimb will move while the opposite hindlimb moves too, at either of the two possible speeds of this gait. Movement will be faster than at a walk showing a rhythmic swing.

Hoofsteps will leave a characteristic two beat mark on the floor, because their legs move in diagonal pairs together, producing the typical 'clip clop' sound. When a forelimb contacts the surface, the hindlimb of the opposite side will advance. Hooves can float slightly before contacting with the ground, causing the other two limbs to pivot forward. At the trot, limbs describe the same pattern, but at a slower pace than the gallop, and often just a little faster than the walk.

3. At a canter, a forelimb gets apparently a little bit anticipated with respect to each other. We must focus on the sound of hooves and the visual gait pattern, simultaneously, as the donkey will move faster this time. If you are performing canter, the donkey will seem to bounce forward. Usually, it is faster than a trot gait; canter is a three beats gait with a short pause that

occurs when all four hooves do not contact the ground momentarily.

When a donkey performs a canter, the forelimb is going to lead the gait, something that means that it will land alone and slightly ahead of the other forelimb. For example, if a donkey heads with its right forelimb, their hooves touch the ground in the following order: left hindlimb, right hindlimb and left forelimb at the same time in order to proceed with a stage in which all four limbs are suspended above the ground. The short canter describes the same sequence on the hooves, but at a less lively and jovial pace.

4. At a race gait, we must be careful to be able to distinguish the difference between a trot and a gallop. It is unlikely to be able to distinguish between them just by hearing their hoofsteps. There are also better clues than the mere observation of the sequence of limb movements, which will be similar to those present in the gallop. Gallop is a four-beat gait, in which the limbs that landed together at a canter, make contact to the floor separately.



Figure 52. Hill Farm (2011) Galloping donkey at the highest speed [Photograph] Accessed from <http://camera-obscura-billie.blogspot.com.es>

The gait that asses commonly describe in nature is very effective and being honest, it will often be easier to walk at the pace that donkeys follow than to get them to acquire ours. The change of direction, i.e., pulling

the rope diagonally so that the donkeys are forced to change their station crossing their front legs, will help us to make them walk in multiple times when they do not want to walk. For example, given their small height (in some breeds) keeping their limbs below the animal and only about 10 cm high from floor when manipulating their hooves, will prevent us from being kicked.

Asses anatomically possess physical barriers that naturally make them less agile than horses. If they are not facing a stressful situation that requires putting on a flight, they will always describe slow movements, something that impatient educators may find frustrating. Perhaps most difficult thing is to make an ass acquire either a certain pace or another and consequently describe a particular gait, especially when they do not understand the reason why that decision was made.

The movements used by a donkey to move also give us plenty of information about the state of mind of an ass, for example, donkeys are frequently seen galloping under different excitement situations, both positive (such as playing) and negative (aggression).

11. COMMUNICATION AND BODY LANGUAGE

To deal with the study of the way in which donkeys communicate we must establish two basic communicative channels. Acoustic communication, consisting of a series of noises and sounds that will be which asses mainly use to communicate among themselves with individuals of the same species, and to save large distances.

Think of the way that a mother has to communicate with their children and explain them that they have done something they were not supposed to do. First, their mother will employ verbal commands that correct the attitude of her children, but will also make use of a non-verbal language that children will perfectly understand. The smell is the identity card which the donkeys use to recognize that an external stimulus involves a threat or not, at first instance. In addition to the unquestionable information that we receive when we know the animals' experiences previous to the study, we see however, that this will not always be possible, due to a mere matter of time.

This relegates us to try to answer the question to which we could arise about the way that asses are going to communicate with their environment, with animals of another and their same species, drawing the conclusion that, as many breeders and owners relate, body language constitutes an important source of information for assessing and rating the character of a donkey at a particular time, at the same time that it will provide us with an invaluable tool that will make it possible for us to be able to anticipate possible reactions of the animal.

Commonly found behaviour problems will be for example, situations in which an ass does not respect the space of the owner, leaps on or pushes the person who is going to feed it at lunchtime or when it simply distinguishes food between its owner hands, etc.

We can learn from practical experience that body language can become an extremely useful tool when it comes to training animals, especially when we have to counteract and correct undesirable behavioral traits, as well as making it one of the most effective ways to communicate with our animals.

When a donkey either harasses or importunate the dominant ass of the herd, this will tilt its ears back, launch challenging looks, trample its feet, huffing and puffing very strongly to warn an offending adversary that should retire and leave it alone.

If the offender does not respond to these signals, the dominant donkey will launch kicks into the air as another warning sign and even charge a few steps against the offender. This pattern mentioned in the paragraph above constitutes the basic pattern of signals through which the donkeys express their dominance and establish relations between individuals of the same herd.

The use of these signs in terms of training of donkeys can be very curious and surprising at the same time. The use of the body language that animals use to communicate then becomes a good tool to solve temperamental problems such as those mentioned above, as well as it provides valuable information, studying the response that they have.

The implementation of these signals must be carried out over a period of time in which, donkeys at first, perhaps will appear to be worried or surprised; however, eventually we will appreciate improvement in the respect that is set within the existing bond between a trainer and an animal.

At first, it will be necessary to make the signals from a wide distance so that the ass does not feel intimidated, but at the same time enough for it to make this pay attention, a fact that the animal will mark as the coach approaches (*Jorgensen, k. 2004*).

To begin the study of signals of the body language, there are two basic regions which we will pay particular attention to; such as the head and the hind-quarters. In the head, the ears will particularly have a high importance while the hind limbs and tail will provide us with more information when we look at the animal from behind. The ears are the most mobile and expressive part of the animal.

A donkey will much appreciate these sensitive organs to be scratched. If we generously cherish the ears of an ass on its inside (if we simply brush them, we will tickle them and they will shake their head instinctively), we will observe that they slowly lower their head and their lower lip will lift as if they were in ecstasy.

All the donkeys are not the same; there will always be an exception which confirms the rule, i.e., a donkey that does not like to be caress on the ears. Partly it also happens since people tend to approach donkeys at the first time, by touching this body organ and without doing it properly and repeatedly; it could result in a bad experience that will make the ass avoid such contact in the future.

Most people think that having the ears back is a sign of disagreement, anger or imminent aggression or threat, but this is going to be like this just part of the times. In the rest it will be an indicator that the donkey is listening behind it, showing fear, or perhaps being a little sleepy.

It will be when a donkey puts its ears back extended, laying close to the surface of the neck and at the same time shows the white of the eye, when we will really be facing a threatening situation. This expression could be seen when equids are generally found in herds among individuals and it is usually accompanied by a bite and even a kick. This expression will mean imminent aggression and is only normal among animals of the same species.

When a donkey shows us this expression we will have to quickly correct this attitude or stay away from the area in which the animal is continuing to show it, first and foremost, we must act cautiously. Most donkeys do not employ this attitude against humans and the acquisition of animals displaying this pattern of behavior would not be recommended.

This expression may frequently appear in situations of a very varied nature. We will see it briefly when two donkeys cross in the road towards a food source, or towards us in a very moderate version of it when we fasten the girth very quickly. In this way we will differentiate a helpless gesture of a threatening one.

The braying of an ass is unique and is able to travel over really long distances. Asses are very social animals and need companion. If it were ever possible they should be kept in pairs, since these will tend to be very strongly bonded to their companions, and when we cannot meet them the time needed, this will be the best option. An anecdote at an English refuge tells us that, when two donkeys were moved from a refuge to another, in arriving at the new home, both stood on the ramp before descending from the mobile box and strongly brayed.

Suddenly a considerable group of donkeys, all those who had been staying at the shelter for many years, galloped towards the gate of entrance answering back to their call. After research on the history of these donkeys, it was discovered that all of them had worked together on the beach in Blackpool in England. Despite the passing of the years, long ago lost classmates recognized each other and both recognized their call.

Separation anxiety may occur given that asses form close bonds with congeners and with other animals that inhabit with them, causing them to suffer from anxiety or depression if separated from a nearby companion. The donkey is a species of habit, separation or loss of a companion, a change of home or routine and long journeys, given the uncertainty that they produce, can all be potential causes of stress.

This should be considered carefully when practicing changes in daily routines of these animals and these changes, do, need to be as gradually as possible, and always keeping the ass under thorough monitoring. If the companion of a donkey dies, the body should remain next to the surviving one for at least one hour. Not all asses will approach to the corpse of a dead colleague but some do, so and as it has been shown, to have the chance to do it, is important.

When facing this situation, or others, such as the sale of some animals, asses can manifest loss of appetite, because of a great emotional pain that may lead to a depressive process. Asses prefer to establish close bonds with other asses, but if there are no other donkeys to strengthen links with, they will be content with horses, sheep, goats, llamas and alpacas, dogs and cats, and even human beings, for which they have a great affinity.

Among other communicative elements, the snorting (given the communicative involvement of smell), grunts, snorts and other sounds as bellows and purrs that apparently vary among individuals.

These variations that humans are able to discern, can be assumed to represent the transmission of information of different characteristics. The vocalizations that asses produce, according to what researchers David G. Browning and Peter M. Scheifele state, are unique among equines, since they are result from both their inspiration (the *iii*) and their exhalation (*aah*). These vocalizations consist of a series of emanations that only stop when asses are left without wheezing. The acoustic nature, duration, and sequence (*iii-haa* may alternate with the *haa-iii*) are unique and characteristic of each animal, constituting, together with the smell, their identity hallmarks.

Donkeys bray very frequently and because of very different reasons. Regardless of their sex and reproductive status. Entire and gelded, they are going to bray for reasons ranging from alerting its congeners before the arrival of the owner or calling the attention of this, in order to have their feeding served.

CURIOUS FACTS

THE COMEBACK FROM EGYPT, THE 'BRAY' PRESENT



Figure 53. Figure 53. Cornelis Cort (ca. 1533-1578) Rest on the comeback from Egypt, Anonymous, at Spanish National Library (Madrid) [Etching] Accessed from <http://www.iberoamericadigital.net>

“¹⁹ Now when Herod was dead, behold, an angel of the Lord appeared in a dream to Joseph in Egypt, ²⁰ saying,

–“Arise, take the young Child and His mother, and go to the land of Israel, for those who sought the young Child’s life are dead.” ²¹ Then he arose, took the young Child and His mother, and came into the land of Israel.²² But when he heard that Archelaus was reigning over Judea instead of his father Herod, he was afraid to go there. And being warned by God in a dream, he turned aside into the region of Galilee. ²³ And he came and dwelt in a city called Nazareth, that it might be fulfilled which was spoken by the prophets, “He shall be called a Nazarene.”

Mathew 2:19-23

After hiding in Egypt for several years, Joseph and Mary returned to Nazareth. One night, while they were sleeping, their donkey heard the horses of the soldiers approaching in the distance. Fearing that the soldiers would kill the child, the donkey screamed to alert the Holy family. He screamed and screamed, again and again, but his voice was too soft to wake Joseph and Mary. The family was still asleep and their ass could not wake them up, anyway it did not give up trying.

When he returned to neigh, God rewarded the donkey with the strong voice that has characterized it until this date. Coptic traditions consider the Holy Family made the return journey by sea and not by land. The hypothesis is likely to have happened. Once all danger ceased, this road was cheaper and offered less deprivations than the path used by ground convoys.

If we want them to stop braying we will simply need to just provide them with whatever they are demanding. However, it is very risky to do it so, since for example, imagine that a donkey is braying because the animal is hungry and lunchtime has not arrived yet, if we feed them, this will strongly reinforce this behaviour and braying will increase in frequency and volume, repeating increasingly early on successive mornings.

The braying of an ass, in terms of its volume and tone not only varies between sexes, but also according to their size. We can distinguish from the more squeaky Miniature Donkey’s brays, until the serious American mammoth jackstock’s ones.

But donkeys not only bray, they also employ a wide variety of snorts, grunts, wheezes, gasps, purrs, which vary from each donkey to another, but that we can quickly come to understand by observing

them. Entire male donkeys tend to bray more frequently and at a louder volume. All tend to bray at dawn, and some in the evening; if there are other male donkeys present in the area, they will respond with loud braying.

Asses will bray if they are hovering around jennies in heat, prior to performing any movement or to woo them. We must avoid keeping asses in situations in which their brays create discord. Jennies and geldings will bray when they claim for their food or they are separated from the herd, or as a response to another donkey's brays.

Donkey foals rarely bray. The frequency and strength of the brays is much greater in the case of males during breeding season and if there are close females (but again, jennies also bray). Grunts are antagonistic¹ behaviors and are normally accompanied by other assertive body signals as tail lashing and shaking, chin shaking or trampling.

The snorts and puffs show excitement and the bellows will be the way in which a female will call the attention of its donkey foal or when a donkey invites other to mutual grooming. In addition, females employ a sort of low tone and gentle purring to communicate with the newborn foals.

Asses make use of a wide range of signals that we could include in body language. With regions such as the head, the angle they describe with their neck, body and tail that provide us with a wealth of information about the state of mind of our ass.



Figure 54 Figure 54. *Life us Galician rivers (2014) Fariñeiro donkey (Flour carrier donkey) braying in the ear of a congener. Galician Fariñeiro donkeys, use to transport the grain to mills and the flour from there, back home [Photograph] Accessed from <http://www.rios-galegos.com/>*

By paying attention to these signals we will be able to distinguish the message that they want to transmit, from the quiet ride of a female and her foal to the aggressive persecution of a stallion after a predator or a female in heat.

The area around the eyes and the ears are very personal areas, therefore we must avoid petting around them the first time that we find an unknown ass.

Little by little and once we have introduced ourselves to this donkey, by showing it the way we smell, bringing our hand close at a safe distance, from which it can smell us without meaning a potential threat for them and we talk to them at a leisurely friendly voice tone, we will observe that ass will show more confidence each time until it let us move up to the ears.

Scratching his chin is a very effective way to establish a first contact with an ass the first time.

Asses associate our caresses with the mechanisms of grooming that they possess. Mutual grooming occurs when asses staying close to others, use their teeth to chew and scratch their neck, shoulder and cross hair.

In ethology, we call agonistic behavior to the social behavior related to fight. It helps animals to ensure basic needs such as housing, land, food and sexual partners. It includes two opposing components: aggressive and defensive behaviours. The first one can involve threatening or attacking. Typical patterns of defensive behaviour include appeasement, submission and escaping behaviour. Aggression is divided into inter and intraspecific aggression. Intraspecific aggression is directed to individuals of the same species while interspecific aims at other species. It includes predation and antipredatory tactics and ensures survival. Thus we often call antagonists behaviours to those who appear between members of the same species, and presented in the form of aggression in order to compete for the available resources.

Donkey foals are very sensitive to stressful situations. It has been reported, in donkey foals suffering from states of fear that have brought them into a considerable stress state to fall into a catatonic or abstraction state.

The best thing we can do is to retire until the animal is reassured and out of this state. If we see that an animal is quickly worsening or the stress is very sharp, quickly wetting the animals with a bucket with cool water will remedy the advance of the consequences of stress. If our activity were going to be resumed we would do it once the donkey foal is recovered and proceeding very carefully.



Figure 55. Zacateks (2012) Donkey ears [Photograph]
Accessed from <http://www.zacateks.com/>

Inherently, the donkey species will enjoy certain characteristics that will therefore condition a proper evaluation of its behaviour, among them we should remark, a strength that is higher than that expected of any of the rest of equine species, and a greater capacity to use such force in their own benefit as an advantage, something which is even made more evident when we establish a direct comparison of the carrying and pulling capacity of both species and their hybrids.

A notable example of this comparison would be that of the widespread tests which are carried out in the North of Spain, in the autonomous communities of Cantabria, Basque Country and Navarra, and France where with regard to equids, there are even three different modalities of the same sport, stone pulling set; namely by donkeys (*asto probak*), mules (*mando probak*) and horses (*zaldi probak*), which although applies the same standards to both species, the fact that these categories are established is indicative of the differences between them (*Association of sports federations of Gipuzkoa, 2008*), (see Book 2, Chapter 12).

Proper training and the degree of physical condition of the animals will be determining factors for adaptability and for their work production capacity, the availability of oxygen and food that the animals have will condition the obtained results.

The factor of variation involving the appropriate design of harnesses and tools for traction will be important as well. Comparing key species used in animal traction with the efficiency in the use of energy to work, the value corresponding to humans ranges from 10 to 20%, from 9 to 10% for cattle, mainly referring to oxen and buffaloes, from 10 to 15% for horses, and from 25-30% for donkeys.

In these tables, we can observe that, in the case of the asses, as reflected in table 2, the power that is necessary to successfully conclude a day of work is significantly less than the needed by other species, as well as table 3, gathers that while accounting for a lower weight, the power they develop is proportionally greater.

Species	Power (W)	Working time (hours/day)
Donkeys	200	3
Cows	300	2
Oxen	450	6
Horses	500	5
Mules	550	6
Buffaloes	600	6
Camels	650	7

Table 2. Interspecific comparison of the power used by well-trained animals and in a good physical condition respecting to the working period. (CTA, 1992).

ESPECIE	Weight (Kg)	Developed Force (Nw)
Donkey	80-120	20-30
Horse	300-350	75-90
Pair of oxen	400-800	80-200

Table 3. Tractive force developed by animals. (Medina, L. 1987)

Continuing with the temperamental characterization of this species in its domestic variety, we can say that the trend they have to easily adopt routines is well known, as well as their skills in detecting alterations in such routines, so that possible changes in feeding or cleaning patterns, when facing events such as the arrival of the veterinarian or blacksmith, will make that animals be suspicious of the reason why they are being treated in any unusual way and so that reacting in a less cooperative way or directly refuse to perform tasks such as entering to an inspection stand.

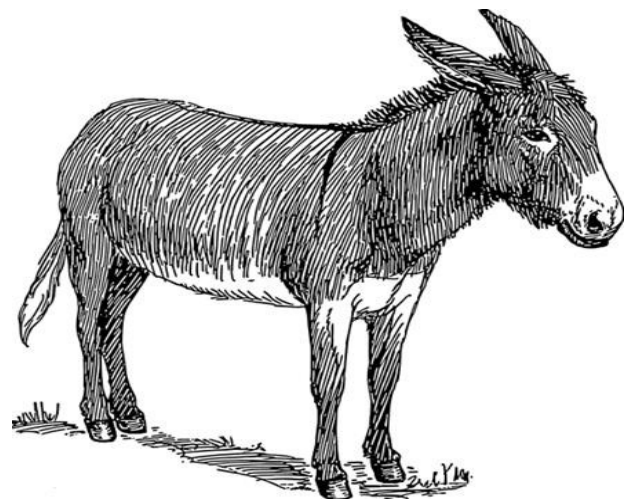
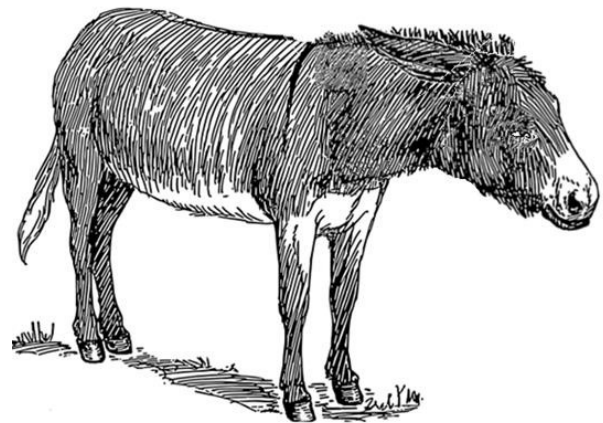
These aspects require the observer to know and anticipate possible reactions that animals could have as well as being more astute, by means of using the recognition of these signs.

Normally, donkeys will be more confident with people that they are familiar to, being distant and extremely observing in the presence of strangers, the reason why it is important that any test is carried out in the presence of as less amount of people present as possible, accounting for the presence of the owner or carer of the

animals, or after a previous period of socialization.

It is also recommended that during the development of the tests the voices used are faint and that movements are not abrupt, because this will make the assessment much easier (McLean, A.y Heleski, C., 2008).

Similarly, when riding the donkey or when we found ourselves working around it, the animal will raise and point back one or both ears. This shows that it is paying attention to whom is around and to what is happening in the environment that surrounds it.



Figures 56 & 57. Francisco Javier Navas González (2012) on the left, a donkey will often put their ears back, attached to the surface of its neck and will show the sclera, as a sign of threat, while in the case reflected on the right, a donkey shows attentive ears directed backwards but diverted slightly to the side to listen to the orders of his coach [Illustrations]

During training is essential to recognize these signals since we must know to differentiate between behaviour patterns that deserve a corrective action or punishment, against those that denote boredom, fatigue or illness.

Similarly, these signals will warn us about reactions towards ourselves or towards other animals, helping us to anticipate and take action, something that we will get through direct observation of the animals.

The presence of ears laid forward is often interpreted as an expression of friendliness and gentleness, as well as an expression of security. In the majority of cases we will be right, but, however there are situations in which we will recognize this sign on an ass, i.e., forward upright ears, they can mean a clear danger signal.

We must bear in mind that the ears of our animals will be focused or be directed towards those areas where something interesting to our animal is happening, either a strange noise, the movement of an object or a person in their environment, among others.

Asses strive to collect all the possible information, both visual and sound, paying more attention to what is happening than we might expect at first.

This is a very important fact to consider when we take the animal for a walk mounting on donkeyback, since it must be us leading the donkey and not on the contrary, and therefore we must avoid distractions, something for what the best option will be unexpectedly beginning to walk one or twice and the stopping in order to call its attention and making it be alert.

If a donkey points its ears towards another animal, he will probably want to approach it to interact. This sign will be followed by resounding squeaks, kicks and bites that

could turn out to be dangerous for riders and animals.

For this reason, this is an aspect that we must take into account even more if we are talking about a group of animals in order to prevent possible riots.

Ears intensely erect can also mean a shy donkey. These will be shown, for example, in situations in which a new object is placed in front of the individual, which will present its neck in elevated position with pricked ears swing from one side to another (changing the hoof that contacts with the ground, giving little steps).

These early signs develop in a matter of seconds even synchronizing in time. Ears that remain upright long in time will be an indicator of where to address the place of origin of the object or situation that calls the curiosity of our animal, this is a fact that needs to be corrected, but not with much severity, because it is the way the animal expresses its character.

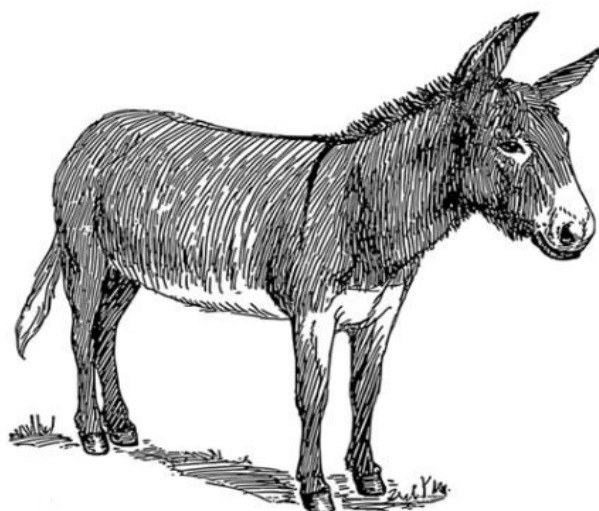
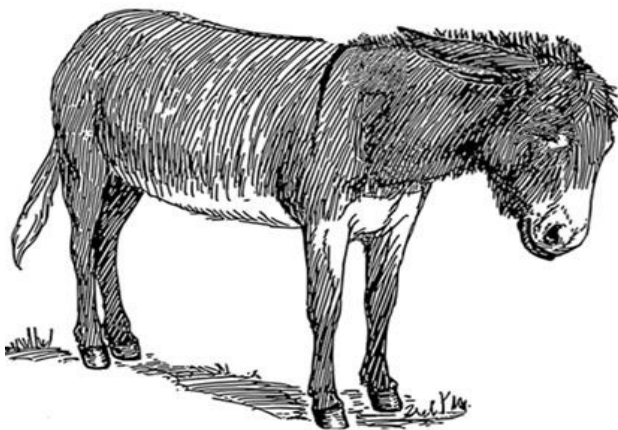
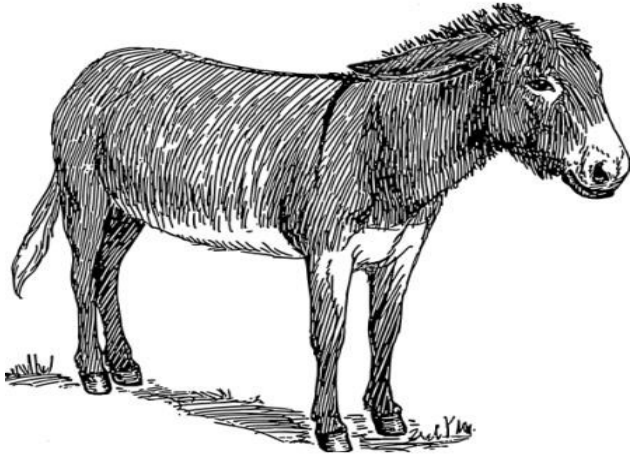
Other situations in which forward erect ears can make act of presence will be game situations and mischief, more typical from young animals or on the contrary for fear expression, being both followed by subsequent tinkering, bites and fled back.

Asses also show some facial expressions that are very subtle and difficult to describe. Eyes half-open and a strap or shirred lip will usually indicate a bad temper.

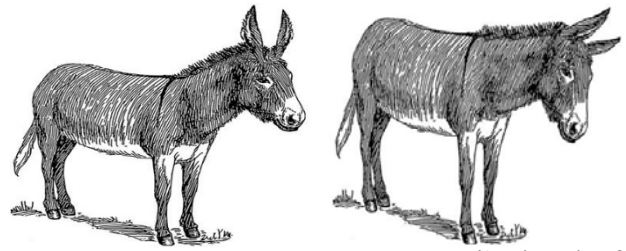
They are also indicative of pain, although both are two aspects that are often linked, as a sign of a dangerous and in pain animal that obviously does not enjoy of a very good attitude. A puckered lip and closed nostrils are also signs of that the animal is holding its breath, another sign of pain, or better to counteract it.

This behaviour has been observed when we are preparing us to wrap the girth when

we want to ride an animal which will struggle to breathe air into its body that will later be released in order to be more comfortable once it has breathed it out, something which may result dangerous for the rider.



Figures 58, 59 & 60. Francisco Javier Navas González (2014) In the first picture, the animal presents a calm, fatigue or boredom state. The central figure shows a depressed animal because of an illness, as you it can be noticed by the position of the ears and the slight tilt of the neck. Instead, in the figure at the bottom of the page, donkey's ears are shown pointing backwards diverted towards the side as a sign of warning and attention to what happens around it [Illustrations]



Figures 61 & 62. Francisco Javier Navas González (2014) Left, this is the typical expression that an ass would present when being curious or interested in some element of its surroundings, while the one on the right displays an image that appears when the typical alert or fear expression arises [Illustrations]

When we appreciate these signs what we have to do is to wait a little longer to wrap the girth, giving time for the animal to breathe out and slowly fastening it subsequently before riding.

Below in table 4, we show a description of the body language signals found during the implementation of disciplinary training plans, which have proved to be the most relevant, either because of their frequency, or because of the information provided to us, as well as, ways to imitate such signals are described so that we can make our communication with donkeys easier.

SING	GRADE	RECOMMENDATION	IMITATION
Tail Swish	Light or grade 1	This is a light and very appropriate sign as a first attempt to communicate. It is recommended and it has been applied in situations in which a donkey stays very close to its carer when this is rationing the food.	The way to imitate it, although it could be assumed complicated given the anatomical differences, is carried out by swinging our arm behind our back, something which has proved to be a great alternative to a real tail.
Evil Eye/Glaze	Light or grade 1	We will use this subtle signal in situations where for example, we want asses to wait patiently until the food has been dispensed and they can get ready to eat.	We will proceed as follows. We will have food in feeders and we will have to face asses that will have to stay away until they receive the signal allowing them to approach and have the food (it is possible for some of them to give one step forward and back as a sign of impatience or challenge). We will carry out this signal staring at animals without taking away the look. Normally it will not take much time until the animals show signs of submission like looking away. We will usually stop suddenly and quickly turn back to surprise the provocative donkey. Then we will stretch our neck. If we want to make more emphasis we will stomp our feet on the ground.
Snort/Hiss	Moderate or grade 2	This signal is one of the more clearly representative ones and through which a donkey will show the discomfort that the presence of an opponent makes it feel. Asses can puff in a very noticeable way and this signal will grow in intensity and volume as the measure of the offense will also do.	Give deep and repeated breaths but pausing between them.
Stomp	Moderate or grade 2	Stomping is a more moderate sign and often comes accompanied by hostile glances and snorts resulting quite convincing for those animals that are not very willing to measure its limits.	Stomping the ground accompanying it with breaths and stares aimed at animals.
Kicking in the air	Moderate or grade 2	If ass ignores the stomping and does not move away the next thing that a donkey would do, would be to launch a kick back into the air	Launching kicks into the air backwards, trying to imitate what the donkeys will carry out to tell other animals that they should not come closer.
Contact with the brisket	Intense or grade 3	Donkeys, in situations in which they want a fellow to move away or to slow down their advance, they will make contact with their muzzle towards the flank or brisket of their opponent, so as for them to receive a warning sign.	On occasions when a donkey becomes more persistent and insists on approaching, we will use our leg to make contact with their brisket, with no intention to hurt him, but with the intention of containing their advance and warn them seriously that it should move away.
Shuffle or Charge against	Very intense or grade 4	This is a strong signal that indicates an ass to keep out. Donkeys will face an opponent and move a few steps against it, as an aggressive attempt, in order to produce their moving away reaction.	We will look the donkey face to face, and walk a few nimble steps towards the donkey which we want to make to move away.
Jump or Bounce	Very intense or grade 4	This behaviour is often recognized in asses when it seems that they want to give a kick with both hindquarters, but are too tired to do it or do not have enough space, so they simply react jumping repeatedly. It is usually accompanied by a snort, after presenting more moderate signs in order to indicate the donkey should move away.	It is recommended for us to use this signal when we do not have much space and want our asses to move away or keep out. We will give small jumps or hops, trying to imitate those movements, snorting while imitating movements such as moving our back away to launch it against the animals that we want to follow our orders. Practical experience has shown that the faster and more marked the jumps are, the greater is the fulfillment of the order by the donkeys is.

Table 4. Body language signs, their intensity degree, recommendations and implementation during animal training (Jorgensen, K., 2004).

Of course whenever it is necessary to reprehend our ass, it is important for the punishment to be adequate and to be in consequence with respect to the undesirable action that it has perpetrated, immediately putting it in practice. Otherwise the donkey will have forgotten about it and will have no

consciousness of the reason why it is being reprimanded. We will always apply the 3 second rule, according to which you have three seconds to show our animal that a certain action carried out was wrong, after these 3 seconds we will have to forget about it.

CURIOUS FACTS

SAINT ANTHONY OF PADUA AND THE MIRACLE OF THE DONKEY OF TOLOSA IN 1225

According to the most imaginative versions of the story, the donkey (or mule by some versions) that stars in this scene was a supposed sister of the donkey in the passage related in Numbers 22, 21-36, tells the time when an angel brandishing a flaming sword, intercepts on the way of Balaam, commissioned by the king to curse the Israelites who had just enter the territory of Moab. Inexplicably, the only one who notices the angelic presence is the donkey on which the soothsayer is riding, so the animal abruptly stops its march. The rider, interpreting the gesture as his jenny's whim, decided to punish it by hitting it with his whip for it to resume its walk. At this point, miraculously, the donkey starts talking rebuking his own lack of vision. Thus, informed by the animal of the vision of the angel, it will tell Balaam the will of Yahweh: to bless its people instead of cursing them.



Figures 63 & 64. (Figure 63) fondobaskets & (Figure 64) Call To Holiness (1889- 2012) (Figure 63) Mexican article dating from 1889, telling about the miracle of the donkey & (Figure 64) Statue depicting Saint Antony of Padua and the Eucharistic Miracle of the donkey at St. Anthony's Shrine in Ellicott City, Maryland (USA) [Photographs] Accessed from (Figure 63) <http://calltoholiness.us/> & (Figure 64) <http://calltoholiness.us/>

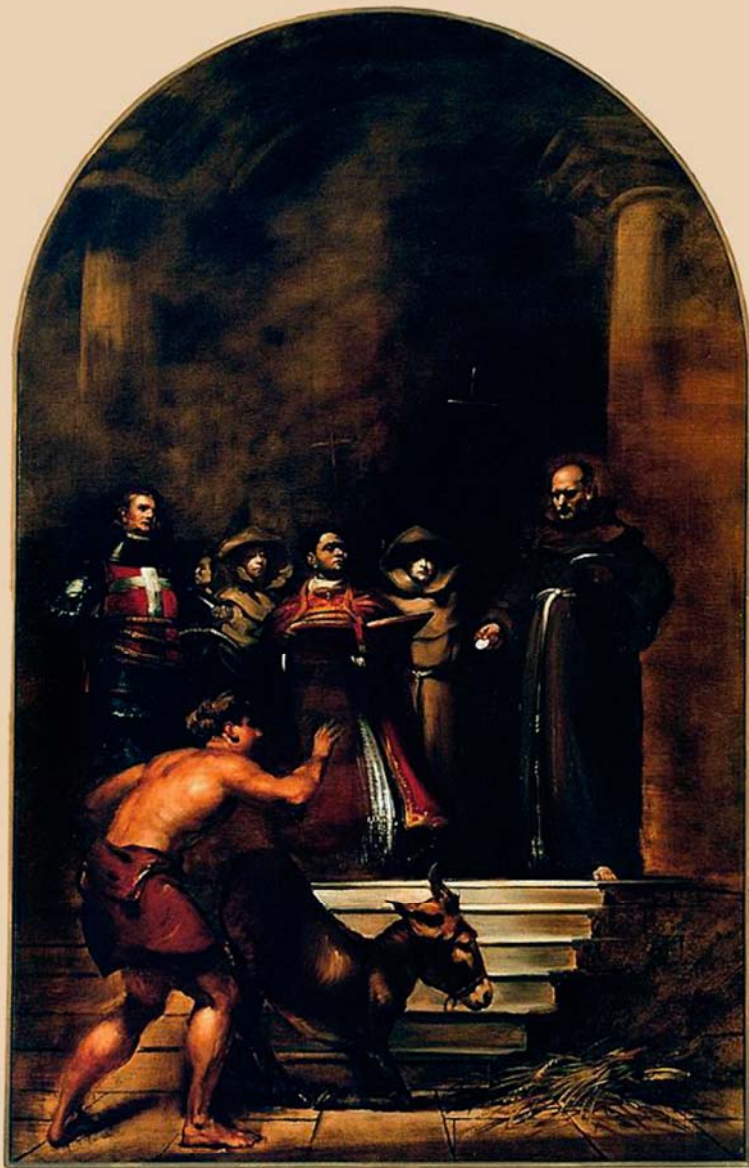


Figure 65. Frank Mason (1964) 'The miracle of the ass' scenes from the life of Saint Antony of Padua, 1195-1231. Painted by the sovereign military order of Malta. Is located in the Church of San Giovanni Di Malta, Venice (Italy) [oil on canvas] Accessed from <http://www.frankmason.org>

The event, set by some authors in Bourges, by others in Toulouse and finally in Rimini (Italy) in 1225, begins as follows: *Was Saint Anthony preaching in Rimini (Italy). There, the heretic patarinos (popular Congregation of Milan which questioned the appointment as Archbishop of the city of Guido de Velatte (1045), Milanese nobleman loyal to the German Emperor Henry III) had defaced the dogma of the real presence, reducing the Eucharist to a simple commemorative dinner. Antony, in his preaching, fully illustrated the reality of the presence of Jesus in the Holy host. But the heads of heresy did not accept the reasons for the Holy and tried to refute its arguments. Among them, Bonvillo, which was the main one and a know-it- all, told him:-fewer words; If you want me to believe in the mystery, you have to make the next miracle: I have a donkey; I will deprive it from eating for three continuous days, once they have past we will come together in front of it: I will carry its feeding, and you with your host. If the ass, without taking care of the feed, kneels and adores your bread, then I will also adore it. The Saint accepted the trial and retired to implore the aid of God with prayer, fasting and penance.*

The heretic deprived his ass from any feeding for three days and then released it to the public square. At the same time, on the opposite side of the square, Saint Anthony entered, carrying a monstrance with the body of Christ in his hands; all this in front of a crowd of people anxious to know the result of that extraordinary commitment made by the Franciscan Saint. Then, the Saint faced the hungry animal, and talking to him, said:- in the name of the Lord to whom I, though unworthy, have in my hands, I command you to come and do reverence to your Creator, so that the malice of the heretics gets confused and everyone understands the truth of this highest sacrament, that the priests treat at the altar, and that all creatures are subject to their Creator. While he was saying the Holy words, the heretic offered barley to eat to the donkey; but the jenny, ignoring the food slowly advanced, and respectfully bowed the knees before the Saint that had raised the sacred host, and stayed in this position until Saint Anthony granted license that it should rise. Bonvillo fulfilled his promise and converted wholeheartedly to the Catholic faith; the heretics recanted their errors, and Saint Anthony, in the midst of a storm of applause, gave his blessing with the Blessed Sacrament present and led it in procession to the Church, followed by all the people.

Some of the signs referred to in table 3 are not always going to transmit or to refer to establishing of a dominance bond, that an ass comes jumping, running to the sides without direction, with its head tilting or shaking can mean the mere interest of playing with its trainer just as it would with the other members of its herd, as the case may be, we must give firm orders, if the animal presents this behaviour at an inappropriate time.

We must not forget that the best source of donkey's body language learning will be found in the way they interact with other fellows of the same species, by pushing the observation of such behaviour patterns to the first places making it become the best teacher that we could possibly have.

As we have outlined the temperament or behaviour that a donkey will present will be influenced not only by the environment that surrounds the animal but by the circumstances accompanying the moment of evaluation, so that factors as the owner, their relationship with other animals (other species enjoy the companion of donkeys, being this special relationship described towards ovine) of the same or other species, received training, the well-being to which it is subjected, body condition, the evaluator, evaluation time and people present, etc., would mark the reactions of an individual.

Therefore, the temperament monitoring of a representative sample of donkeys requires a method whose implementation is at the fingertips of the people who work and will keep direct contact with the animals, providing a set of situations and data enabling the animal to be assessed when it shows unaltered patterns of its way of acting and interact with the environment in the way in which it would usually do it.

In human psychology, methods of valuation by outside observers and, more recently, the self-assessment questionnaires have shown to provide much valuable information to assess or examine individual behaviour (*Kellner and Sheffield, 1973*), being these methods subsequently applied to different species of domestic and companion animals (dogs, *Serpell, 1983*; cats, *Feaver et al., 1986*; dairy goats, *Lyons, 1989*, cattle, *Grandin T., 1998*, and horses, *Momozawa, Y., R. Kusunose, et al. 2005*).

Obviously unable to perform self-assessment questionnaires, the combination of different tests, namely as, carried out both by the personnel directly related to animals (owners, caregivers, family members, etc.) as others carried out by qualified personnel is set as optimal choice, but outside the usual environment of the animal having taken the above considerations and after a period of socialization prior to data collection.

Although asses have a generally distrustful character, they often show a quiet, peaceful and docile appearance, and if they are treated well they can quickly forge friendship, especially with the children. This species is characterized by a great curiosity to external stimuli, something that always goes hand in hand with a manifest distrust.

Between fellows, they will adopt a playful and close relationship. In open places donkeys, like horses, they love to roll in the sand; something that allows them to get rid of parasites that hide in their fur, scratching so those parts of the body where they feel some welt caused by insect bites.



Figure 66. Klein-Hubert/KimballStock (2014) Provence jenny watching while its foal is taking a sand bath [Photography] Accessed from <http://www.kimballstock.com>

Donkeys are very sociable, thus, when staying isolated for longer than normal, for example leaving them tied up, they will begin to bray when they feel the presence of another donkey around. Frequent episodes have been reported in which mothers have developed a great stress as a result of the loss of an offspring, a companion or a change of owner. Especially on those occasions on which they are not in contact with any donkey in their normal habitat, asses will establish strong links with horses, goats, sheep, camels, dogs and cats and even birds.

When choosing a donkey as owners we should opt for quiet and docile animals that show lively and respond immediately but sparingly, for voices, whistles and gestures. We must avoid acquiring excessively nervous animals that scare easily, as well as also aggressive or lethargic animals. Females are generally more docile and can also give offspring.

The key is the way in which we approach an ass. During an inspection, we must proceed with great calm and softness, with care and without sudden gestures. Presenting them our smell (hallmark) and making a statement of intentions. The animal must accept the person touching, taping and petting on it. Once he accepts the initial contact the animal must stay

relatively still and quiet while the different parts of its body are being reviewed.

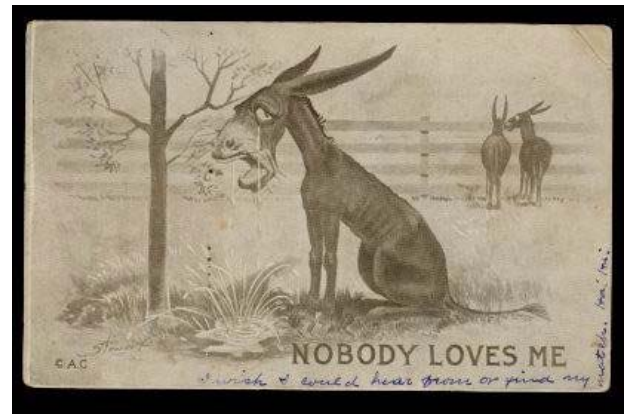


Figure 67. Kimberly Hecker (1908-1911) Stewart's donkey postal series. Represents an ass weeping and exclaiming 'No one loves me' [Photograph] Accessed <http://www.oanda.com/>

Two similar species are still different species. Although the social structure, as we have previously reported it in preceding paragraphs is very similar. We should make an aside at this point.

Regardless of their environment, horses have socially evolved to form harems. The horses use areas of dispersal that they do not defend against other horse harems. However, asses have two fundamental social structures precisely depending on this environment. A nutritionally-rich environment sets asses in harems as we stated at the beginning of this chapter. Although it is true that this harems tend to be more transient than those of horses and male asses tend to be much more territorial. However, if the environment of the asses have limited vegetation and reduced water availability, then the asses pass long time alone or with last year's offspring, only forming larger herds during the seasons in which no breeding takes place. During the breeding season jackstocks will defend their territory from other jackstock intruders to ensure their reproductive success. Quite possibly the differences between both species, horses and donkeys, arise from the differences between their social structures.

For horses, excluding the slowest members ensures survival. Solitary asses do not possess any benefit in regards to the security offered when they are within a group, hence they adopt a defense attitude, facing potential threats more than a flight attitude, making them suitable for application in pastoralism and protection of cattle especially against canids' and big felines' attacks.

The marked territorial character of asses also leads to behavioral differences that we must contemplate when it comes to educating our asses, especially if they are uncastrated males.

Asses can be very territorial about their areas of pasture by attacking small units of livestock as well as pets. This aggressive behaviour most frequently occurs in young male asses especially in spring or in an environment that does not provide them with enough mental stimuli, because they get bored.

This behaviour, however, may also occur in elder jennies and jackstocks as well as we will find animals that do not exhibit this behaviour at all and live together with other small sized domestic species without any problem.

Asses are extremely stoic animals, and show their pain or fear, much less than horses do. In fact, the trend of a scared donkey will be rather stay still than run terrified (something that is very useful for the caregiver in charge of such donkey). This is so important that even in cases of severe disease, the only symptom that will alert their carer of a possible illness or injury will be very subtle changes in their behavioural patterns.

A donkey can be terrified and do not show any apparent symptoms of it apart from being very alert. They possess a lower flight instinct (also conditioned by its anatomical

conformation), so they do not tend to lose control and run terrified as easily as horses do. We can add this fact to the list of situations that can lead to the misunderstanding of their emotional state, and that can, as a result, make them less cooperative animals and with the ones therefore it is harder to work.

A clearly frightened horse will demonstrate that it is afraid, while a frightened ass will simply rise in height a few inches (centimeters), will open its eyes slightly and will display an increased alertness respecting to normal situations.

Also it is easy to make a mistake when diagnosing an aggressive ass, since precisely a donkey can display an aggressive or disrespectful behaviour when in fact, they are simply afraid.

Whenever we approach an animal whatever species it is, we must take some care, no matter how friendly and harmless their appearance might be. For example, in the case of the donkey, we should not forget about their wild ancestors, which just like their equine counterparts have similar attacking and flight instincts.



Figure 68. *Life* (2009) wild ass running [Photograph] Accessed from <http://www.egyptsearch.com>

When a person adopts a donkey as a pet, he/she will quickly notice that each of them has a very particular character and

that their education may be almost as much challenging as the one of a horse.

It is true that given the lower tendency to terrify, they are less prone to lose control and self-harm or injure their carers.

Male asses can be aggressive between them, causing each other a severe damage. Their stoic nature and this increased belligerent mechanism perhaps are the two main reasons why any method applicable to horse dressage seems not to be suitable to educate mules or donkeys.

It is not easy to force an ass to do something that it does not understand it will be a benefit for itself; this is the reason why it is very difficult to make them take the typical disciplines of dressage, for example.



Figure 69. Eduardo Zamacois y Zabala (1868) *Back to the convent*. As a comic scene, it describes a group of Franciscans returning to the convent after visiting the village market, whose buildings can be seen from the height on the right side of the picture. In the foreground, the composition is focused on the anecdotal event facing a bald monk who fails to master the donkey, pulling from two ropes clasped to the mouth, while the animal gets rid of the burden he carried on his back, spreading it along the ground. Meanwhile, other Franciscan situated at the threshold of the door of the convent and beside two pairs of tied donkeys, laugh at his companion. Is located in the Carmen Thyssen Museum (Málaga), Spain [Oil on canvas] Accessed from <http://www.carmen Thyssenmalaga.org/>

Asses are not hard to educate, but to do this we must know about the science of behaviour and thus approach them in a psychological way. Positive reinforcement and a skilled educator may be two of the best tools that we can make use of to

establish and successfully lead the educational process of a donkey.

Patience is a fundamental virtue. A donkey educator must be able to move forward with small steps to modify the behaviour of a donkey.

However, in some way this is how any equid should be tamed, trained, or in the case of asses educated. Asses need some time to think on the problems that they face, so that, they need this ability to solve problems, to be educated and gradually developed.

As it happens in positive reinforcement (bribes in the form of fruit, sugar, and stale bread) plays a beneficial role that will help us a lot. The use of negative reinforcement is very common with these animals. Unfortunately, the common misunderstandings and refusal to comply with wrongly expressed orders by carers, makes also common the use of an exorbitant physical force in order to make them comply with what they have been commanded to, on a routine basis.



Figure 70. *Everyday reading* (2012) Ass eating a carrot. Interestingly all animals do not appreciate the same food as a reward. This will depend on the methods that owners used when educating the animals while growing up from birth [Photography] Accessed from <http://everyday-reading.com/>

These methods should be avoided at all costs in favour of sound and psychologically inclusive educational

practices, to understand the possible fear and pain that may be underlying. Perhaps this the first step to strip this species of its bad reputation of stubbornness, derived from the misunderstanding of caregivers, who misinterpret this highly developed sense of self-protection.



Figure 71. Chris Tully (2011) Race between a donkey and a North American Standardbred race horse [Photograph] Accessed from <http://www.standardbredcanada.ca>

Until today, the studies of behaviour and cognition of the donkeys have been limited and perhaps they have not deepened as far as they should have done it. However, new approaches foresee that asses are quite intelligent, cautious, friendly, playful and always ready to learn, always if and when this learning provide them with some benefit. Their gentle nature allows them to calm down the animals that they live with, causing what could be called a soothing effect on them, on the contrary as it is established by the popular belief according to the one donkeys, ponies, and horses cannot live together (perhaps this thought is associated with the possibility that donkeys transmitted respiratory strongyles parasites as *Dictyocaulus arnfeldi* to horses, without being perceived as they do not produce symptoms asses, a risk that could be made negligible by applying an appropriate deworming routine consisting of ivermectin in the right moment).

12. SOLVING PROBLEMS

The sciences of behaviour and learning are very complex subjects and have a dimension with limits that are currently unknown. We must always perform a behavioural examination before any educational discipline. When hazardous or difficult behaviours are present, the professional assistance of a veterinary specialist will be necessary for the treatment of this species, before the implementation of any educational process, as well as caregivers must keep caution when their working asses show behavioural alterations in order to be able to prevent accidents.



Figure 72. Family Fun Cartoons (2014) Donkey doctor
[Illustration] Accessed from
<http://www.familyfuncartoons.com>

The basic work procedure for conduct or behavior problems is the following.

The main thing will be to establish the possible cause of the problem:

1. We will have a veterinary expert check the animal looking for pain or medical conditions that might be the cause of these changes.
2. We will look for professional experience when we are not sure about the cause, do not have experience or if a certain behaviour could be dangerous.
3. Consider that our behaviour may be affecting the behaviour of our ass.
4. Study and investigate behavioural problems always from reliable sources of information; courses, and experience of professionals in the field.
5. Create an adaptive plan of education which will split the educational process into easily achievable small units.
6. Create a safe environment in which to work.
7. Accept that educational correction can take many months depending on the problem that educators have to overcome and their ability to do it.
8. Be patient.
9. Observe body language, taking into account that the signals that they send may be our best allies.
10. Do not have prejudices like those mentioned in this chapter.
11. Positive reinforcement against negative reinforcement. Always reward good behaviours on a priority basis.
12. We should expect an increased tendency in a behaviour problem to get worse rather than to get better, if we do not do anything to solve it.

The nature of asses is not being aggressive, stubborn or difficult to handle but defending themselves, learning and

surviving. Donkeys given the context, in which they evolved, have become real experts in survival.



Figure 73. Dongguan City Zhiyu Electronic Co., Ltd. (2014) Donkey-shaped LED lamp [Photograph] Accessed from <http://zhiyulighting.en.alibaba.com>

Historically, a characteristic clumsiness has been attributed to them, result of a traditional misunderstanding towards his conduct. Donkeys have evolved into what we could perfectly call energy conservators. These animals only use as much energy as it is strictly necessary to carry out the development of a certain task or action.

Among the factors influencing the power that a donkey can develop, their live weight is crucial.

The behaviour of these animals and over all, the conditions under which they are kept on farms, hinder taking zoometric measures and the assessment of their live weight in the field. The force that these animals are capable of generating is turned into energy and this energy is quantifiable.

So that we can estimate if an animal in particular is more adapted to carry out a certain task or another according to the

amount of force that it is able to develop and how long it is able to develop it for.

A donkey is an energy saver that is adapted to the maximum of the cycles of work that humans have traditionally compelled it to perform, thus resulting in a more profitable use, with respect to other animals such as horses, mules or oxen, as we have seen in tables 2 and 3 (CTA, 1992), i.e., asses make use of their qualities to promote their learning to survive, a fact for which they have proven to be excellent students.

Similarly they have learned how to easily find the way to avoid activities that they find complex, frightening, or painful. They also enjoy a good memory that allows them to remember the good and the bad experiences they have been through, something that will be very useful for them in the future.

Of course, learning rate, i.e. the speed with which a donkey is able to learn a practical concept depends on the nature of the concept and the proximity of this to their natural behavioural patterns.

Those activities that are totally strange to their nature as being led, being mounted, allowing to be hold their feet for the farrier to treat their hooves, travelling in a mobile unit, will take them longer to assimilate them, given their distance with respect to the natural behaviour of asses.

Their learning rate can be as fast as that of a dog or a dolphin, species whose assimilative capacity has been scientifically proven. Their intelligence is such that, in many cases we ask ourselves who is really educating whom, in aspects such as, about what are the key points of the body of our ass that we should scratch when providing them with a reward.

We will frequently observe donkeys turning their back on their owners so as for them to be scratched all over that specific part.

During this learning process, we see how an ass educates its owner to do what he wants with a visual order. When a donkey has been trained using techniques framed within the positive reinforcement in the past, it will more likely be safe and comfortable, and have a greater motivation towards learning new tasks through its interaction with people and their environment.

To increase their effectiveness we will divide the lessons in small instructional units, facilitating their gradual understanding, so that we will be able to shape our donkey's behaviour gradually.



Figure 74. Fabián Laveaga/Borderzine.com (2010) A donkey at the Zoo in El Paso, Texas, showing stress signs [Photograph] Accessed from <http://borderzine.com>

All asses have a marked individual factor in terms of the conduct they adopt and therefore their ability to learn will be varied.

As well as a donkey must be willing to face learning, the teaching skills of the educators and their ability to easily and consistently communicate with the donkey will make the educational process easier to acquire solid results and so that longer lasting.

Donkeys tend to find motivation in situations that would be welcomed in their natural

habitat, as food and scratches, social interaction with other animals or perhaps for being set 'free' on an open field where to gallop along with their companions.

Not all asses will be motivated by the same rewards, nor will do so at the same level everytime and this depends much on the usual procedure followed in every farm or even by every owner.

The use of the scratch to motivate an animal is reminiscent of their naturally described mutual grooming. It has even been proven that scratching on the area around the cross may decrease the cardiac rhythm in horses.

However, the pats will not be considered very nice and much less will be referred to as a positive experience.

Donkeys do not mutually pat each other in the nature and therefore it will be very difficult for them to understand such action.



Figure 75. Dragonxero's Blog (2011) Donkey with a bouquet of flowers in its mouth [Photograph] Accessed from <http://dragonxero.wordpress.com/>

A few slaps are very similar to the beat of a fly on the body of the ass or a direct hit on the animal, therefore it is always best to pet an animal as a reward to a good behaviour and they will appreciate it and interpret it in a much better way. A donkey may also be motivated by the evasion of a negative stimulus as pulling from the leading rope or any negative body sign.

That is to say that the donkey will be motivated to perform the behaviour that will help it to avoid those negative stimuli. This type of reinforcement should be used carefully with a complete understanding of what are the consequences of its misuse. We must never use this type of negative reinforcement in an increased or excessive way in contrast with normality and according to the response that we want to correct.



Figure 76. GFC Collection (2014) Arabic man running after his donkey [Photograph] Accessed from <http://www.worldofstock.com/>

Even having used a negative reinforcement to correct a certain bad habit, we will still have to make use of rewards to encourage this behaviour correction when it is corrected.

When asses are old or have been used to proceed in a certain way for many years, we could easily think that their behaviour will not change. However, it is certainly possible to teach new behaviours to these animals. Once older asses are mentally stimulated, and we face them to problems that must be solved and give them challenges to accept, they will begin to learn new ways of behaving quickly. Unquestionably an older animal will present a less plastic temperament, which will be more difficult to change and whose education or re-education will take more time.



Figure 78. Ruben Bellinkx (2012) the Animal pyramid: Donkey Version [Watercolor and pencil on paper] Accessed from <http://www.rubellinkx.com/>



Figure 77. Gavaweb/Miguel Corchero (2008) Manifesto of the donkey man [Illustration] Accessed from <http://cylcultural.org/>

13. SO, WHAT DO I DO IF MY DONKEY KICKS?

When the conduct of our asses needs to be corrected; it will require a much greater patience that it is necessary to educate other species. Among other vices, kicking may be a dangerous vice that if allowed can become a habit, so that we will have to face two problems; the problem itself and to consider possible ways to solve it.



Figures 79, 80 & 81. Raphael Tuck & Sons (1908 / 1909 until 1915 or 1916) series of postcards with messages; "Can't get away", "Unavoidably detained" or "Having a ripping time" [Postcards] Accessed from <http://www.searlecanada.org/>



Figure 82. Matson, St. Louis Post Dispatch/Daniel Kurtzman (2008) Political cartoon depicting the diversity of ideas within the US Democratic Party [Etching] Accessed de <http://www.italy.org/>

CURIOUS FACTS

THE REPUTATION OF THE BEHAVIOUR OF ASSES THROUGH CHILDREN FABLES

1st Fable, "The man with the donkey" (Miguel Agustín Príncipe's Little Fables) Oddly joke, a man and a donkey agreed to teach each other their language; and the Donkey ... unholy luck! He did not learn a word in two years of study and strife. Meanwhile the man, in just one day, learned how to bray perfectly.

MORAL: Do not deal with the brute not a minute, you will not get the high reward to make a person out of it, and it may make a brute out of you.

2nd Fable, "The Donkey and the Well"

One day a farmer's donkey fell into a well. The animal cried woefully for hours as the farmer thought about what he could do. Finally, he decided that the donkey was old and the well needed to be covered anyway; so it was not worth retrieving the donkey out of the well. The owner invited all his neighbours to help. Everyone brought shovels and began to throw dirt into the well. At first, the donkey realized what was happening and horribly cried. Then, to everyone's surprise he suddenly stopped. A few shovel downloads later, the farmer looked down into the well and was shocked by the sight that he beheld. With each shovel of dirt that fell over it, the donkey was doing something amazing, shook and stood while the earth was filling the well. Soon the donkey was able to reach the edge of the well and it happily trotted off.

MORAL: Life is going to throw you many types of dust over. The trick to get out of the well is to shake it off and step up. Each of our troubles is a stepping stone. We can get out of the deepest wells just by not standing still.

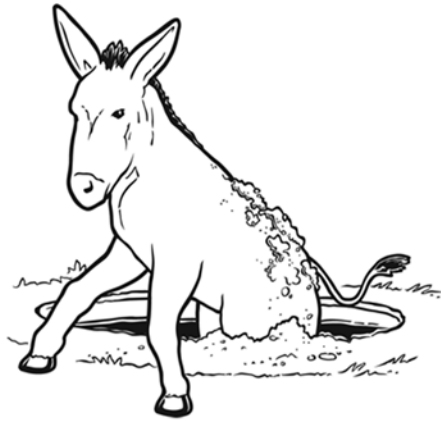


Figure 83. Manhardeep Singh (2014) Donkey getting out of the well [Illustration] Accessed from <http://manhardeep.com/>

A good starting point is to consider any cause that might be causing or encouraging this behaviour, before you decide to implement a procedure or other. Angry, scared, in pain, excited, disappointed, or even simply happy (as when they run kicking into the air with the heels upward) donkeys may show this behaviour.

Once we have found why our ass is kicking, and what caused that it decided to kick, we will be able to take appropriate action. If we have a young donkey which is excited and energetic because, for example, a summer storm or the breeze, we will leave him frolic in the grass kicking with its heels, rather than attempting to approach him to put it a halter or to start a training session for which it will be very absent-minded.

If it is time to distribute the food and our ass is kicking, it may be trying to dominate the behaviour of its owner to streamline it (it is a sign of impatience). In this case, an ass showing this behaviour is unacceptable, therefore we must correct this behaviour using body language, to make it understand that it should wait respectfully. We must not forget that we always have to try to be the owners of the herd, so it is in our hands to decide when an animal can approach the food and feed and when not.

If we have a female with a wounded udder and it kicks her foal when it comes to breastfeed, this will almost completely be due to the pain that breastfeeding produces. In this way and seeing which was the cause which produced those mammary lesions we will be able to correct this situation.

If I try to carry out hoof care labours in my donkey and this is trying to kick, it may be that this has previously suffered from a bad experience related to such work and is therefore afraid of it. It may also be due to the fact that no one has done it before and therefore it is confused about such procedure. We will need patience to cope with those fears and thus make it learn that we will not damage it while we take care of their hooves.



Figures 84 & 85. (Figure 84) Ty Randall & (Figure 85) FitStrong Personal Training (2010) (Figure 84) donkey foal launching a kick towards its companion & (Figure 85) Playing ass kicking to the air [Photographs] Accessed from (Figure 84) <https://www.flickr.com/> & (Figure 85) <http://fitstrongblog.wordpress.com>

Normally once we have discovered what the cause that triggered this behaviour was, we will be able to find a way to solve the problem, without the need to intimidate our ass or force it to submit to our orders. The key is to be careful and patient while carrying our donkeys' and our own safety in mind.



Figure 86. *Banana Daiquiris and Life Lessons (2014) Ass kicking a man during a donkey race in Bagley, Minnesota Clearwater County Fair. A kick beaten by a donkey can be very dangerous and painful [Photograph]*
<http://bananadaiquirisandlifelessons.blogspot.com.es>

14. DIFFERENCES BETWEEN SEXES AND REPRODUCTIVE STATES

All equine behaviour is influenced by the environment in which their ancestors evolved, and the difference between the behaviour of horses' and asses' is actually derived from these evolutionary differences between the environmental niches they occupied.

Entire young donkey males can be more difficult to handle as they mature sexually, similarly to what would happen in the wild, causing problems to their caregivers even more when they approach the age of two years old. This fact becomes exponential and becomes truly a problem if asses have not been educated properly during these critical first two years of life.

Jackstocks can be very friendly and placid animals until hormones make act of presence, something that can have a sudden change of behaviour as a consequence. Jackstocks and even some geldings, fight aggressively with other asses to cause serious injury in the neck, ears and the fore limbs of their opponents. Among brays, fighters get their teeth on the cross of their opponent and try to bite their limbs. In the wild, where these battles are likely to occur, wounds of war include scars, broken ears and lost tails. Any idea arising to intercede between two male donkeys that are fighting is suicidal, because in the thick of the fight, such aggressive behavior could be directed towards those humans that tried to stop them.

These lesions can also occur against caregivers while the jackstocks are fighting or trying to accidentally access a donkey, as well as a direct result of an act of aggression. However, isolating completely the jackstocks of other animals is unethical and can lead to major problems of

behaviour caused by boredom stress and frustration.



Figure 87. jb123456 (2014) Game cards part of a Victorian game of animal families. The donkey family; Mrs Ass, Mr Donkey and baby Donkey [Photograph] Accessed from <http://www.ebay.ca/>

Potentially a young jackstock may cover its mother or sisters when they are close to about a year of age and on, something that can lead to unwanted donkey foals given the increase in the consanguinity and birth defects associated to it. Under domestic conditions an older jackstock will attempt to cover its female relatives, if they are not kept separate, something that again, will have an inbred impact over the resulting offspring.

Jackstocks can sometimes be also aggressive towards offspring, especially if they are not their own offspring or jackstocks have been separated from the jennies and their offspring for a long period of time. Geldings tend to have a more predictable character, but this depends on the age in which castration occurred.

If an ass about two-year-old has had the possibility of knowing the force that it is capable of developing, then even after neutering them their difficult behaviour will remain. Over time they will be less susceptible to the effects of hormones but this learned behaviour could continue making them difficult to manage.

It is recommended that the donkey foals be neutered between 6 and 18 months of age

and preferably as younger as possible within this age group. However, it is more advisable to practice castration oriented surgery to the animals in the colder months of the year to thus minimize the risk of flies that could result in the infection of surgical wounds. The younger the donkeys are when the surgery is practiced, the less traumatic it should result and the greater its influence on behaviour will be.



Figures 88, 89 & 90. Reuters (2009) Entire male donkey fight in Kunduz, Afghanistan. Since the Taliban have banned dogfighting that used to take place, currently among the young, it is common to organize fights among donkeys, something that reveal the violent nature that they can present [Photographs] Accessed from <http://www.dailymail.co.uk/>

behaviour are seated. This period of adaptation can vary widely between 3 months and a year. To avoid unwanted crosses it is advisable to keep older castrated males separated from the jennies for at least two months. Although their behaviour towards people will usually be more predictable and calm than in the case of entire jackstocks, we should still have in mind that even after castration, the geldings may be more sexually active than the castrated horses and sometimes they will try to mount females as any jackstock would.

The older they are when they are castrated, the greater the probability that castrated asses continue presenting such characteristic territorial behaviour of jackstocks will be, proceeding to pursue the cattle that they live together with. This typical behaviour of the jackstock can be present in geldings, making some people lean for thinking that castrations were not practiced properly (calling them *rig*). The term *rig* describes a donkey or male horse that has been castrated, but in which some reproductive tissues remain, causing males to express typical behaviour patterns of stallions or entire jackstocks, something that can be ruled out by a blood analysis. There are exceptions, but usually jackstocks are not good pets, and no one should buy a jackstock unless you have the knowledge and infrastructure to handle them. It can be dangerous to keep gelded males with entire one, as they may have lost their male scent and entire males may try to cover them.



Figure 91. Friends of HA Haiti (2007) Students observe two male asses fighting [Acrylic on canvas] Accessed from www.flickr.com

If we want a donkey as a pet or to ride it, drive it or just to have a walk, then a young gelded donkey will be a more suitable option. Despite its size, the miniature Mediterranean breed male donkeys can be as difficult to manage and potentially as dangerous as asses of greater size.

Therefore miniature male donkeys should be treated and handled while maintaining the same precautions and respect that is applied to the jackstocks or male donkeys of other larger breeds, with castration becoming the best option if they are not staying on the farm for breeding. It is preferable for male asses to undergo the minor surgical discomfort involved in castration to spend its life in an inappropriate environment with inappropriate and frustrating handling derived from the stress produced because of having a limited social contact with other asses.

It also reduces the potential dangers for caregivers and children arising from the unpredictable nature of jackstocks.

Often donkey foals tend to be purchased at 6 months of age by committed owners, since at this age they are apparently calm and easy to handle animals, at the same time that the merchant usually advises that neutering them is not necessary. At the same time that the animal grows up its behaviour will change and then the owner will have to pay the cost of neutering, although it will not get the same results that it would have gotten if having made it previously.

Entire male mules are notoriously difficult and dangerous to handle (they are sterile but they still produce testosterone), they can be very determined to get the access to females, and they may attack other equines during moments of frustration or when they are next to reproductive females. However, when they are

castrated, male mules are much easier to handle and seem to be less stressed.

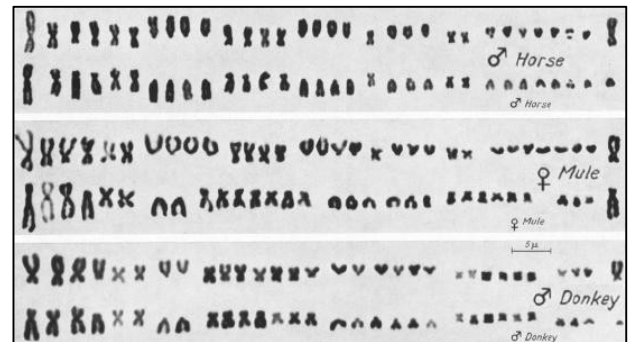


Figure 92. *Journal of animal science* (1933) Karyotypes from top to bottom; Male horse, female mule and male donkey [Photograph] Accessed from <http://jas.fass.org/>

Mules have 63 chromosomes, while donkeys have 62 and horses 64 chromosomes in their nucleus. In the case of male mules all are sterile and have always a problem in the seminal gland that is attributed to the different number of chromosomes existing between parents, and therefore have no reproductive potential. For these reasons it is always advisable to neuter the male mules and something which always have a better prognosis, when they are much younger. However female mules are only almost always sterile, but not always. Not in vain they have all functional bodies: they ovulate, get in heat and breastfeed. They only do not get birth because of a genetic issue. They do not beget fertile ovules in general, as a result of the existing recombination of chromosomes. Although they can generate fertile ovules very rarely. It occurs when those little ovules are formed, only with the inherited DNA from the mother (mare), or inherited from the father's (donkey) DNA. An extremely low percentage of fertile eggs, but that if during that ovulation, the mule were covered by a horse, a horse foal could be born, and if it were covered by a donkey, a donkey foal could be born. Although we must expect, in these rare cases of fertility, that the

offspring tend to be underweight and account with a weak health. It is estimated that male mules ratio is of the order of 45%, so it is somewhat more likely that a mule is female, 55%, but only a little more likely (see Book 2, Chapter 7).

Jennies are usually less territorial than males, but there are always exceptions to a rule. Male asses tend to use their forelimbs for self-defense, while the jennies prefer to come back and kick with their hind legs. Jennies have their own set of behavioral problems usually associated to the changing levels of hormones during the estrous cycle. Jennies usually come in heat every 18-24 days and this usually lasts between 4 and 6 days depending on the donkey.

It is important to remember that these hormonal cycles do not take place throughout the year (depending on the weather), and that in winter they often do not occur.

During the estrous cycle the jennies can have days in which their behaviour is particularly difficult and those when they are normal or even extremely friendly and social. Each donkey is different when it comes to behaviour terms so many jennies will show no sign of being in heat, keeping their constant behaviour throughout the cycle.

Females require a patient and sympathetic treatment during these hormonal fluctuations, and to help us predict such changes, it is recommended that homeowners with asses showing behavioral fluctuations record a behaviour diary of them during at least between three and four months to thus detect irregularities earlier, or on the contrary, to see whether their cycle is regular.

This will allow the owner to be able to plan activities such as hoof care labours or the visits of the veterinarian in order to avoid the

probability of choosing that 'difficult days' to carry them out. Those medical conditions affecting the reproductive organs can also lead to a difficult behaviour in jennies and a veterinarian should always be consulted if such complications are suspected.

As a general rule, if we are going to acquire asses for leisure, it is advisable to choose geldings or females and if we were intending to buy donkey foals, they must be neutered as soon as possible. If we think to breed our own donkeys it will be a better option to request the services of a good reputation breeder than to grow up our own entire male and keep it at our farm for that purpose.

If we define a jackstock, maybe the two nouns more justice define his character, would be, strength and sensitivity. These qualities are enhanced or intensified, by the remarkable intelligence of these males and their strong hormonal control.

Like the rest of the asses, regardless of their reproductive status, jackstocks do not possess a wild nature and show willingness to be handled by humans. They are quite different from a jenny or a gelding with respect to various behaviours.

However, some of these behavioural differences are not necessarily desirable. The primary reason why we should keep a jackstock on our farm is the breeding for donkeys. If we wanted to keep an ass in our farm for entertainment or as a companion, a jackstock would not simply be the best choice.

Given the volatility of the hormonal activity of the jackstocks, they are not suitable as pets, and in fact, they can be potentially dangerous in a domestic environment. If we look at the nature of the entire male asses, we can also understand that trying to keep an entire male donkey as a pet is not morally ethical.

They have no control over the hormonal activity of their body, which compels them to show undesirable or dangerous behaviour patterns resulting from the frustration or the impossibility of covering a female.

Other concerns about maintaining a donkey as a pet that we should consider is its longevity. Most people are not ready to have a pet for life. Finding a good home for a jackstock can be tricky (especially when it does not have features that make it a quality breeding stud), but finding a home for an elderly jackstock can turn out to be an impossible task.

Very few people maintain an entire male donkey as a pet and the majority of those do believe that their ass is an exceptional individual, until they witness a disastrous episode deriving from its hormonal volatility in which the jackstock attacks a person or another pet, such attacks can result in fatal injury. Asses should be kept under conditions which foster its use for breeding and to be alone and exclusively handled by people with experience and appropriate skills to control them.

Interestingly, asses responsible for seriously attacking other asses tend all to be asses which were considered to have a good behaviour and a good attitude towards handling.

The most of the incidents of assault involve donkeys whose age ranges from 2 years to 26 years of age, regardless of their breed, and can affect from American mammoth to miniature Mediterranean donkeys.

The attacks usually occur against caregivers, and although this is not always the case, some events such as the visit to a competition or to a fair where large concentrations of animals are given, or simply trying to correct a behavior, can change the behaviour of a donkey, peaceful

until now, and turn it into an unknown aggressor.

Attacks can vary from bites to slaps and kicks, sudden hits in order to knock someone over, shocks and even amputations or death. That an entire male ass seems to be well educated, is usually driven or ridden by people and even obeys the orders of its owner which has spent years living together with it, does not exclude them from showing an aggressive behaviour that may compromise the integrity of the people in its way.

When a donkey causes an aggression and one person has the bad luck of being involved or at least be present, it will not usually desist in its attempt to do it and any attempt to separate the animals engaged in the battle will be useless (even scare them with a car).



Figures 93 & 94. (Figure 93) Karin J. Burton & (Figure 94) les day (2008-2014) Two asses fighting [Photograph] Accessed from (Figure 93) <http://jpgmag.com/> & (Figure 94) <https://www.flickr.com/>

In these cases, something which has shown to be somehow useful is, recalling a typical behaviour of the games between the asses that stimulate the movements that the donkeys employ, given the fighting situation. Donkeys are very careful with their limbs. Holding their forelimbs at the level of their cannon bones will make asses cease their aggression, although this is not always possible.

Something that we would like to emphasize is the fact that all the asses who are involved in aggression usually have one aspect in common. The ones causing the aggression were apparently gentle, were well educated and had a history containing no record of aggression episodes towards individuals of their environment. Normally these events had as a trigger a change in their daily routines, changes in habitat or area or as a response to the presence of other donkeys and horses that want to interact with them, changes in the person who was in charge, increased arousal because of the use of the jackstocks to cover in days in which the aggression takes place against new partners in their environment, even when they are gelded.

These violent attacks are exclusive of jackstocks. A disrespectful, spoiled or frightened jenny or gelded, could infringe a bite or casual kick, however, their propensity for this type of action can be observed during their daily interactions with his fellow herd and caregivers or when triggered in situations in which they are kept under rustic handling conditions and because of having short age donkey foals near. The fact to be able to anticipate undesirable behavioural actions allows us to discourage asses to show them. In contrast to the attacks of the jackstocks, this type of behavioural problem can easily be corrected with the appropriate education during a period of time.

Perhaps the attacks of the jackstocks may be attributed to their instinctive need for maintaining the order in their herd and to the overwhelming force of the male hormone, testosterone, main cause of its strong desire to cover.

Testosterone has been frequently reported as the cause of the attacks of asses. This fact seems to be evident in cases in which a jackstock attack takes place when it is concentrated on covering a female, or attacks by males which have never covered and have become extremely sexually frustrated.

On the other hand, many of the attacks are caused by donkeys that have been educated and as part of carefully organized breeding programs. These attacks occur spontaneously, apparently without cause, when a donkey is at rest and has not been stimulated or sexually deprived.

Perhaps the attacks of the jackstocks may be attributed to their instinctive need for maintaining the order in their herd and to the overwhelming force of the male hormone, testosterone, main cause of its strong desire to cover.



Figure 95. Big Al Innellan (2008) Donkey attacking a Rottweiler [Photograph] Accessed from <http://www.flickr.com/>

In this type of incidents there is a common factor, the presence of a recent change in the daily routine of the jackstock or its

environment. Due to the highly sensitive nature of the jackstocks and the strong instincts to keep their herd intact and under control, these changes, no matter how subtle they may seem to us, detonate some sort of response to varying degrees in all the breeding jackstocks, which sometimes can manifest itself as an attack.

In the wild, male asses are the only key figure of the herd. Changes in the structure of this, or in the daily routine of its members take place only after the approval or victory of a donkey from the herd. It will be extremely possessive and protective with their jennies and offspring.



Figures 96 & 97. (Figure 96) Jhhwild & (Figure 97) Bookworm (2008-2013) (figure 96) Donkey foal in the foreground, while we can observe two feral horses fighting in the background & (Figure 97) Two male asses during a violent attack [Photographs] Accessed from (Figure 96) <http://www.flickrriver.com> & (Figure 97) <http://www.bookwormroom.com>

with attacks of some entire male asses to educate, discipline, or establish control over a donkey of their herd. Some of the most violent attacks of these animals however, are more alike the tactics that a donkey would use to expel an intruder, as any other jackstock, that attempt to compete with the current dominant male, challenging him in order to become in charge of the herd. If we looked at the **behaviour** of asses during a period of time, we will repeatedly see reactions that obviously derive from the instinct that jackstocks have to dominate and maintain the control of the herd that they preside **over**.

Even when they normally live in separated stables within the farm since we must control the jackstock reproductive instinct, we will observe, when the gate features make it possible that they can make eye contact, so that it allows the interaction between the jackstock and the flock of females is very particular. The jennies will often show a "vain" attitude in the presence of a jackstock, especially if they are gathered in separate living pens. However, when something scares them they will likely run to the gate where the jackstock, looking for their protection, is housed.

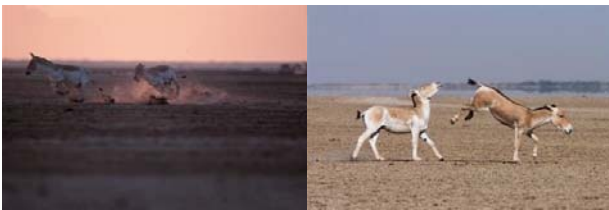
An entire male ass will employ many of the same behavioural actions associated

HECHOS CURIOSOS

BETTER SAFE THAN SORRY

Here we present a list of cautions and procedures that are very helpful when keeping jackstocks in stables:

1. If we have two jackstocks on a farm stables they must be sufficiently separated or isolated so that the eye contact between them is not allowed. Each pen must be broad enough to allow them make the necessary exercise and an attached barn that is accessible and from which they can leave at will. They are in a visible place where we will regularly visit and that can be controlled even without being close.
2. Jackstocks may each be in visual contact with his female herd but cannot get close to another male's harem.
3. Each jackstock has a number of toys in its area that will provide enough entertainment
4. All covers are carried out naturally or at least we should trick the donkey with a jenny in the case of a donkey semen extraction for semen doses.
5. Never allow a jackstock to cover anywhere other than his own fold.
6. The same type of equipment and materials for every mating are used.
7. A tether is always used when the males are taken out of the fold or when mating occurs.
8. Never allow them to have contact with other animals when they are outside the fold.
9. Never allow them to touch us with their mouths.
10. Do not go into the pen or stall with food until they are moved to an area about 5 meters from the entrance and to the one that they will not be allowed to come closer, or its trough until all the food has been prepared and we have got out of the place.
11. Try to feed them at the same time every day or at least as close to the same time as possible.
12. They will need to receive as much attention and affection as our time let it, more than jennies or geldings that will have each other for company.



Figures, 98, 99, 100 & 101. Arkive.org / (Figure 98) Richard Coomber/naturalvisions.co.uk, (Figure 99) Eliot Della Ferrera/naturepl.com, (Figure 100) Manjeet & Yograj Jadeja (Figure 101) Anup Shah/naturepl.com (2013) (Figure 98) Indian Wild female Asses and their current year's offspring, (Figure 99) Group of Indian wild asses and a male showing flehmen response, (Figure 100) An Indian wild ass chasing another & (Figure 101) Indian wild male ass kicking to another [Photograph] Accessed from <http://www.arkive.org>

The scene will drastically change when a new jenny is introduced into the harem. This fact will trigger aggressive behaviour towards the new jenny, particularly if this is attracting much attention from the rest of jennies or even the owner. This behaviour will remain until the jackstock is allowed to cover the female in heat, so that it is admitted and that a kind of initiation to the harem ceremony is set. Often the jackstock will attempt to bite and be very rough when covering a new jenny.

It **will** also be very hectic, especially if another jackstock or male donkey is approaching the female group, that a jackstock is able to see that its owner is driving others apart from the asses of his harem will also trigger the same extremely agitated response. We must avoid these situations so that the entire male ass of our farm does not alter its behaviour, something that could bring trouble to our farm.

We will often observe, and especially if the owner is a woman, the jackstock will see her as an important part of its herd. But it is certain that this possessive attitude will be enhanced if the owner handles other asses out of its herd, something that although it will not usually be reflected in direct attacks can result in the fact that ass avoids its treatment in the following sessions, something that would contrast with the physical assaults which would receive a jenny paying such attention to other non-herd asses.

Although apparently there is no way to predict when a violent attack by a donkey will be trigger, there is a number of actions that we can put into practice to limit the probability that the attack takes place. The consistency and soundness of our care and our management techniques, carefully observing the daily behaviour patterns of our ass (something for which the daily behavioural diaries can be very interesting), and the limitation of the changes in the environment of our jackstock as far as possible, are facts that we can put into practice in a relatively easy way.

To handle jackstocks, we will have to be firm and always maintain everything under control; at the same time that we recognize that they are very sensitive animals whose cooperation may be lost completely if we applied a rough treat. A jackstock scared of its caregiver will focus more towards the evasion of the individual rather than obey

his orders. Under normal conditions, there should be no reason to resort to abuse or to a more rigid treatment, as a method of training.

Male asses are highly intelligent and generally have a great disposition to obey when handled in the right way. In my opinion, if an individual is necessary to resort to a sudden technique when handling a stallion, what is most likely is that the person lacks good skills to educate a jackstock which are necessary or has refused to be thorough when it comes to implementing an educational programme. Due to the effects of the hormone testosterone, entire males possess a more precocious nature than females or geldings. This added element requires that anyone who wants to handle an entire male ass must be alert about the effects that it may have against any situation, never leaving his attention to be distracted from the control of the jackstock, however short this distraction is. We must be able to recognise the moments in which the behavior of a jackstock is being affected by the action of testosterone. The jackstock will be rigid, built their ears and will not pay attention to us, also presenting an intense look. All of these signs may or may not be accompanied by a braying, or in later stages, even a drip from the nostrils.

The ears as we have seen throughout this chapter, are the first part of the body that we will have to pay attention to able to appreciate that an ass is diverting its attention from us. With this first sign, we must use verbal orders that are common to them or even signs of physical contact to get it back to focus their attention on us.

This will be an early way of reaching the end of many of the occasions in which this behaviour occurs. If we wait until this ass shows all the signs above, it may be too late and the effectiveness with regard to the possibility of correcting such conduct is very difficult if not impossible to achieve. Asses are able to show both, the most docile attitudes and the most aggressive and dangerous behaviour patterns.



Figure 102. Lewis Farm Market (2012) Little donkey braying
[Photograph] Accessed from <https://www.flickr.com/>

15. EVOLUTION OF THE PATTERNS OF BEHAVIOUR AMONG THE JENNIES AND THEIR OFFSPRING

The jennies tend to leave the herd before calving. Sometimes in companion of another female or an ass related to them. Delivery usually takes place at night and near water resources such as lakes, streams, or in swamps. In a pasture, the jennies sometimes isolate from the herd for weeks or even longer.

A jenny will lick its newborn baby to clean it. This will be the way in which the mother will be linked in a very strong way toward its new offspring. During the first few days after the birth, the jennies will be especially protective with their foals, something that the owners will be able to discover when a jenny that had been affable until now, becomes aggressive when its owner tries to interfere between it and its offspring.

She will keep closer physical contact with its donkey foal while it whispers, caresses with the snout, and groom it. Within one or two weeks, the female will allow the friendliest members of the herd to come near to the donkey foal, although it will always keep it in its proximity for a few weeks further, protecting it while it rests.

Frequently several females with their foals will meet, so they will create nursery herds, in order that some females remain in take care of the foals, while other mothers rest.

As time goes by, the donkey foals will be able to leave such protection to go out and play with other donkey foals, though in moments in which the jenny feels some kind of danger it will claim and find its donkey foal until both are brought together and safe.

The social relationship between a female and her offspring is typically studied basing upon the study of the spatial relationship

between them. Since they are born until they reach maturity, there is a gradual change in the spatial relationship between the jennies and their offspring during the first year, reflecting a growing development of the independence of their young offspring with respect to their mothers, regardless of the sex of these offspring.

The asses show a marked maternal character towards their newborns, but thereafter will tend to move increasingly less closer to them showing a general trend towards separation. One of the concepts that we have to introduce is the safety/confidence factor. Asses are animals in which physical contact is the main source of comfort.



Figure 103. Arcadian Exotics (2013) A jackstock and a donkey foal showing flehmen response [Photograph] Accessed from <http://www.arcadianexotics.com>

The asses show a marked maternal character towards their newborns, but thereafter will tend to move increasingly less closer to them showing a general trend towards separation. One of the concepts that we have to introduce is the safety/confidence factor. Asses are animals in which physical contact is the main source of comfort.

The offspring will respond by moving towards their mothers to thus keep in touch,

even though this is something that will be increasingly less persistent as the donkey foals advance in age, especially after they have reached their ten months of age.

Under wild conditions, this time sets the beginning of the period of weaning. Since the donkeys slowly begin to be more distanced from their mothers, the possibility that some foreign elements drive to such separation increases.

A jenny will usually comfort her foal by holding it between its chin and its brisket. Adults and adolescents have their heads each other on the back or the rump of other animal or even on the back of his caretaker to show affection.

In a domestic environment, in which resources are limited, there is a spatial confinement and sexual activity is limited, the jenny and its offspring will not be separated after weaning and their relationship will evolve towards showing the type of existing behaviour among jennies and young foals.

This is mainly because of the behavioural change of the jennies that will approach their offspring rather than moving away from them (weaning), as we will also go from a lower frequency (playing behaviours towards other donkey foals) to a higher frequency of approach to them by their offspring.

The result will be two adult donkeys which have a close relationship and are equally active when maintaining contact.

This close relationship may provide some benefits. A potential benefit is an immediately available grooming partner. Another is the potential for the pair of asses to develop a coalition that helps each other in the future, for example when accessing to resources or to obtain mutual protection.

Among the groups that usually generate in a refuge, the grooming normally occurs between related asses, usually females and their adult offspring. These grooming sessions can last from half an hour to longer.

Certainly, all grooming has a hygienic and protective function so they are able to clean those areas to which the individuals are not able to reach by themselves, and also apparently consists of a seemingly pleasant experience since both participating asses of it seem to be relaxed.

It also encourages the close relationship between grooming fellows, allowing them to develop a coalition that could be useful in the future.

In large groups of donkeys, couples act as units when they try to access resources, since it seems more complicated to move a couple of a feeder than a single donkey working individually to obtain their food, so that they respond more effectively to unwanted approaches.



Figure 104. Yeguada el Molinillo (2013) Andalusian twin donkeys with her mother [Photograph] Accessed from <http://www.yeguadaelmolinillo.com>



Figure 105. Buydogbeds (2009) Small donkey foal running through a meadow while its mother grazes [Photograph] Accessed from www.flickr.com

It would be interesting to determine whether postulated benefits for these associations by couples have some kind of tangible effect in terms of increased longevity and better health, but this information still has not been proven scientifically. A close spatial relationship in a similar way to the exposed above is that between donkeys that have been bred together in a private home. Therefore, this case cannot respond to the occurrence of these behaviours in a large group but also explain the occurrence of these behaviours in asses which have been bred as pets or companion animals.

Jennies remain close to their newborns and keep touch contact almost continuously. When their young foals rest, they also do it with them, or simply graze nearby. The most of jennies with very young donkey foals actively reject the approach of any other ass, adopting threatening stances towards any ass that could be too close.

The new donkey foal feeds frequently, every 15-20 minutes (wild asses will do it every 3 to 10 minutes during the first 5 days, to nurse only every 20 to 30 minutes, when they reach around 10 days of age, (Rashek, 1976). The way in which the jennies invite their young donkey foals to nurse is shown when they stay still keeping one of their limbs bent backwards to show their udders.

After the first days, the jennies approach their foals less frequently and present a general trend to move away. This tendency is increased as the donkey foals grow up.



Figures 106, 107 & 108. (Figure 106) Gian Paolo Torres, (Figure 107) Klein- Hubert/KimballStock & (Figure 108) Sarah Schweitzer/Maisie Crow (2009-2011) (Figure 106) Ass on his mother, (Figure 107) Sardinian ass on his mother in France & (Figure 108) Rosa, 12-year-old embraces the donkey foal that her family keeps at home [Photographs] Accessed (Figure 106) <http://lusignolo.wordpress.com/>, (Figure 107) <http://www.kimballstock.com/> & (Figure 108) <http://www.boston.com/>



Figure 109. The Kubrick Theme (2008) Cocoa, Mia Tiffy, 9, 11 and 9 years respectively, were born on the same farm and were moved to a new home since their owners could not take care of them due to their age. On the picture we can see them comforting each other [Photograph] Accessed from <http://bridgefarm.files.wordpress.com>

Although the jennies will regularly invite their donkey foals to breastfeed during the first days, thereafter the foals will have to start the most of the attempts to breastfeed. It is also observed that the donkey foals acquire a special behaviour when they want to nurse: vocalizing softly, lying their ears back and sometimes shaking their heads.

If the jenny intends to let its donkey foal to breastfeed it will remain steady, if not, it will continue exploring their environment or will escape. Another evident fact is that the foals will almost always try to nurse after periods of voluntary separation from their mothers in the 95% of the cases, for example during the visits of the veterinarian to place their microchip or during a medical examination.

This percentage increases to 97% when there has been a problem or disturbance in the group, or due to the demand effect when other foals have started nursing, in 76% of the cases. Females will also cease to graze near the place where their foals are resting, allowing them to contact other animals.

This pattern will continue as the donkey foal grows, but any threatening event, such as the introduction of a strange ass or person in the meadow, will cause the jennies to come near their offspring more often.

All the donkey foals will follow their mothers, but the frequency at which the foals continue doing it as their age increases, decreases with time. As they grow up, donkey foals will prefer to spend time playing or resting with other donkey foals, returning to the protection of their mothers whenever they are threatened.

It has been observed that they will both rest and spend the same time away from their mothers as close to them. The cause of a greater range in the spatial relationship between the jennies and their offspring seems to be associated with episodes of

time in which the jennies stay apart from their foals for grazing as the foals grow.

The mother will make the decision to start weaning as soon as her offspring is able to survive basing on adult diet, particularly when this might be pregnant again. The studies of McCort, (1980) noticed that the jennies will restrict breastfeeding when there is a shortage of food resources. The foal on the other hand, will tend to prolong breastfeeding times. For the communities of feral donkeys living in desert areas, lactation has additional risks. Lactating females must remain within an area in which there are puddles since they needed to drink 2-3 times a day and thus increases the possibility of finding a greater number of predators (Moehlman, 1974). The mother will make the decision to start weaning as soon as her offspring is able to survive basing on adult diet, particularly when this might be pregnant again.

Since breastfeeding usually begins with the attempt of the donkey foal and is completed by the jenny, weaning will require that the foal attempts to nurse are aggressively discouraged by its mother. The jennies tend to separate more persistently from their 10 months old foals, something that, under wild conditions, will represent the beginning of the weaning process. This process is also promoted by the fact that the older foals tend to spend more time and further away from their mothers, something that can lead to a wider separation from mothers because of an external stimulus.

HECHOS CURIOSOS

DOMESTIC ASSES IN EXTENSIVE SYSTEMS

A curious fact that we can observe is the tendency that domestic donkeys have to adopt behaviors that would be more typical of wild asses, when despite being domestic, they are held under operating conditions where human contact is almost nonexistent, rather than mere provisioning, commissioning and microchip identification, shoeing, and other routine tasks.

In this type of farming systems and especially in females (since males, in most cases will be exposed to an educational or socializing process after a forced weaning to make handling during breeding easier), characteristics such as hardiness and motherhood will arise and become more evident. They are highly adapted animals whose weaning is done naturally. In addition an exacerbated protection character from possible threats such as dogs (whatever size they are) or even the veterinarian, who comes to examine animals himself, will arise to face them, especially in those females with recently newborn donkey foals which will attack them or attempt to do it creating situations of extreme danger and to which we must be prepared.

PLAYING BEHAVIOURS ETHOGRAM IN DONKEYS

Nibble	A donkey manipulates an object (a glove or a cube; the mane, tail or another part of the body of a fellow or an animal of another species) without using its teeth.
Grab with teeth	An ass holds the object between its teeth. The main objective in this case is usually another donkey's tail. This step usually precedes the next.
Raise	An ass raises its head and raises the object that holds with its teeth a few inches to several feet. This step usually precedes the next.
Shake	The object which is held with teeth, is cavorted on the ground, shaken or wobbled describing a circular movement. This step usually precedes the next.
Pull	Release the object
Hand wringing	Donkeys tend to tap on an object, usually several times
Small jumping	Keeping the appropriate angle to its herd-mate (usually its donkey foal) and with having its rump normally contacting the belly of its objective, the ass weight is transferred to the forelimbs while the rear jump a few inches on the ground (without a kick happening).
From and to an object	An ass will trot and gallop towards an object and from the object several times.
Walking in circles	Move describing any air around the object.
Resting rear on a companion	Placed in the right angle an ass jumps over the back of another so that both forelimbs hang on the other side.
Cover	The donkeys jump over the posterior third of a couple of their herd of either sex (or their escendants) acting as if they were mating. A simpler form of this behaviour consists of leaving the chin resting against the hindquarters of its companion as if it were about to cover it.
Frolicking/playing	An ass jumps repeatedly.
Run	A donkey will run from one side to another just for the mere pleasure of running.
Kick	An ass lowers its head and its his weight toward their forelimbs, then kicks with its hindlimbs.
Jump	A donkey will use their hind legs to jump into the air.
Leap	Combined jumping and playing, to or from an object.
Game/battle	Male asses (both entire and castrated) of any age take part in these maneuvers between the game and the fight. Although male donkey foals can invite female donkey foals to play, the jennies normally will not be prone to such games with another jenny, geldings or young males of the herd.
Head/neck/chest Nip and Bite	Asses with erect ears and retracted lips play licking and nibbling a fellow.
Neck Grasp	Asses strengthen the crest of the neck of their partners.
Neck Wrestle	A donkey and its companion fight using their heads and necks. One or both may drop to its knees; shoulder hits are also frequent in this behavioural pattern.
Rise above itself or a fellow	Sometimes almost vertically
Threatens the hindquarters	With the ears back and rump against its playmate, an ass lifts its leg as if it were going to kick
Kick	A donkey almost always kicks, inefficiently with one of its hindlimbs.
Evasive Balk	While playmates come closer to each other. One of the donkeys abruptly stops and turns back describing a circular motion while the hindlimbs pivot in place.
Transporting an object to a different position	Grab an object and take it to another point
Pull	Especially to pull the tail of its companion
Chase	Persecutory Racing
Teasing	An ass teases its fellow in order that it follows it in its games.

Table 4. Described playing behaviour ethogram in asses (McDonnell, S.M. & Poulin, A., 2002)



Figures 110 & 111. (Figure 110) levers2007/Getty Images & (figure 111) Dr. V (2007- 2012) (Figure 110) A donkey approaching the camera lens showing the characteristic curiosity of some asses & (Figure 111) Ass rolling around in the sand [Photographs] Accessed from (Figure 110) <http://www.huffingtonpost.co.uk> & (Figure 111) <http://pawcurious.com>

CURIOUS FACTS

LEARNING TO PLAY DEAD

In the nature there are many species that have adopted the strategy of pretending to be dead as a way of survival when they are threatened. For example, the opossum, some species of snakes and other reptiles and sharks. While wild or feral donkeys do not perform this technique, it is possible to teach educated donkeys to perform it.



Figures 112 & 113. Low Lai Chow (2012) Donkeys playing dead [Photographs] Accessed from <http://www.lostateminor.com/>

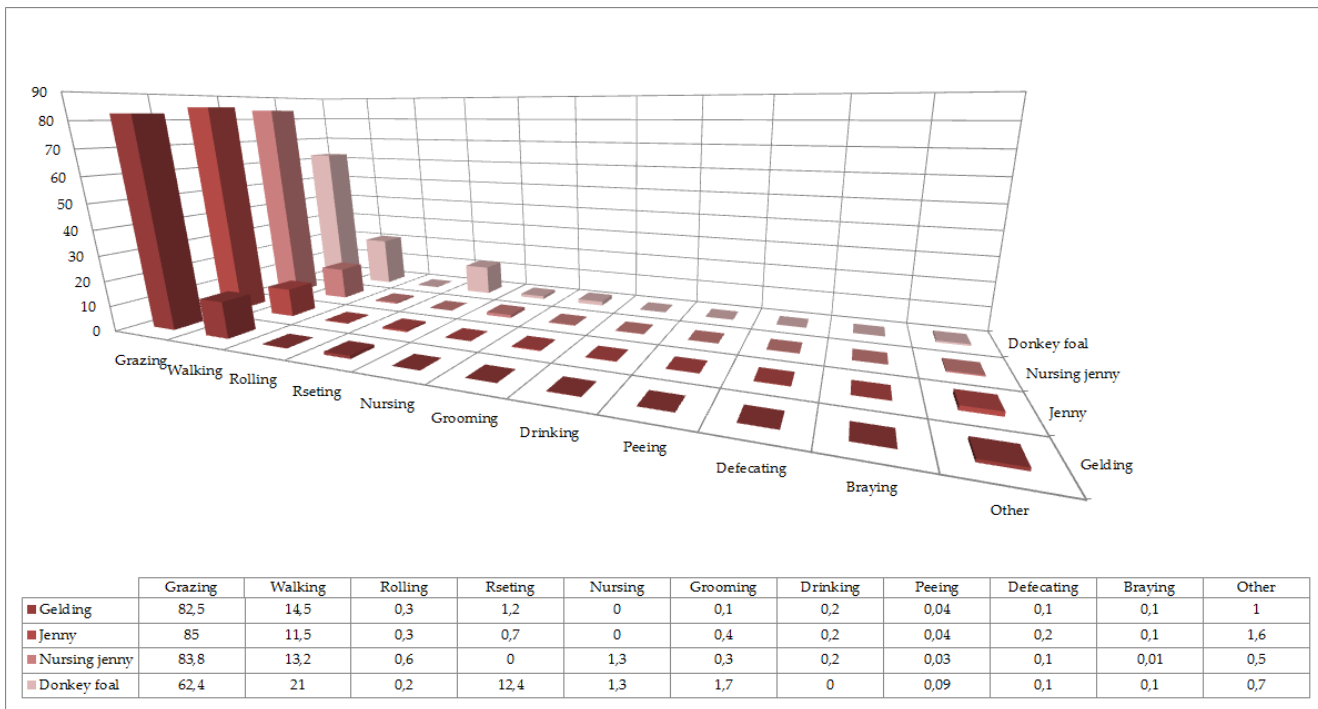


Figure 114. Francisco Javier Navas González (2014) Percentage of average time spent on daily activities [Graphic] Accessed from (E.A. Canacoo, et al., 1998).

Under special conditions as those that occur in a refuge, the offsprings remain with their mothers continuously. The nature of the relationship between mothers and their offspring under these circumstances is curious: mothers behave as they would with a newborn foal; showing a high frequency of approaches and movements in order to keep in touch with the adult offspring. The offspring has also adopted a similar pattern of conduct to the foals of a younger age, approaching and making contact with their mothers. The jennies change their spatial relationship away from their offspring to graze and rest among other activities. The response of the foals was to scroll down to their mothers in order to keep contact with them. The older foals will be less persistent in this chase, something that in the wild concludes with the separation of the female and their adult offspring.

Under conditions of domestic handling, where resources are not limited and animals are confined together and are reproductively inactive, this separation does not occur and the relationship between the donkeys and their adult offspring reverts to present the one kept between jennies and their young foals.



Figures 115 & 116. (Figures 115) A1Z2E3R & (Figures 116) IndiaTimes (2013-2014) (Figure 115) Caresses between a jenny and her adult daughter & (Figure 116) a pair of donkeys protects each other during the annual fair of Vautha village, 50 Km from Ahmedabad. Vautha is a center of donkey and camel trade to which thousands of asses arrive each year to be sold and bought. When a donkey foal is tired or scared, its mother will rest its head on its back and gently nibble its cross. A way to comfort a donkey of any age consists of dropping our arm on and slightly leaning over it, in the same way that its mother will do it with its head and caress its shoulders and back [Photographs] Accessed from (Figure 115) <http://a1z2e3r.deviantart.com/> & (Figure 116) <http://www.indiatimes.com/>

CURIOUS FACTS

ALONGSIDE BUT SEPARATE

While the relationship between donkeys and horses may not have to mean a problem, we see that when donkeys and horses are together (in a considerable number) in the same field (especially when kept under extensive farming conditions as in the pasture, tend to be segregated into two totally distinct subgroups, which with exceptions (occasionally mixed and scattered single animals) shall consist of on one hand, a group of horses and on the other hand a group of donkeys, without mixing.

Naturally, a mare will not accept to be covered by an ass like a jenny will not allow a horse to cover it if it has not been previously instructed in this regard. Not even having been raised in the same environment. This makes it common to use animals of the same species to trick them, prior to mating for mules and hinnies, and the assistance of specialized personnel to conduct the mating.

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Chapter 4

Similarities and Differences between Donkeys and Horses: We Are Different, Aren't We?

Mihajlo Erdeljan & Montserrat Pablo Gómez

1. INTRODUCTION

The donkey is just a smaller version of horse with long ears, true or false? Of course they are evolutionary related but both species have their own specific features. Some facts are obvious: of course size, long ears, short upright mane, different colouration on the head which is highlighted with lighter, finer hair on muzzle and around eyes and a tufted tail more like one in cows. Donkey head is larger in proportion to their bodies, than in horse. Other easy thing that can be observed is that horses neigh and the donkeys bray and they are doing that much louder than the horses. We usually take donkeys for granted like smaller, inferior, younger brother of horses, but in fact, in many areas donkeys are unique and even superior to horses.

Donkeys has a completely different outlook on life, drinks water differently, reacts to frightening situations differently, has very different nutrient requirements, and has unique physiological responses. Many common rules of horse management are detrimental to the donkey. For instance, the normal ration for a horse will make a donkey obese, possibly cause him to founder, and may result in decreased fertility. The horse dosage interval of penicillin does not produce therapeutic blood levels in the donkey. Castrating the donkey or mule by the routine method used in horses, without ligation, may result in such excessive bleeding, and some have died as a result (Burnham, S.L., 2002).



Figure 1. Bharathi Vasanthakrishna (2010) A donkey and a horse standing one behind the other at a paddock [Photograph] Accessed from <http://kornestone.files.wordpress.com>

CURIOUS FACTS

A THREE-WAY CRIME

A horse, a donkey and a camel were stolen.

Three suspects: Robert, Scott and Tommy. All we know that each person stole one animal, but we do not know who stole which. Here are the investigation statements.

Robert: Tommy stole the horse.

Scott: Tommy stole the donkey.

Tommy: They both were lying. I did not steal the horse or the donkey. Later on, police found out;

The man who stole the camel told a lie.

The man who stole the horse told the truth.

Can you find out who stole which?



Figura 2. Lez Sanders (2010) A camel, horse and donkey share a paddock near Colo River in the Blue Mountains, New South Wales in July 2010 [Photograph] Accessed from <http://www.abc.net.au/>

How did you find it out?

Here, first and second statement are contradictory, both can be true together. Also both cannot be false as well as, it will mean Tommy stole the camel and his statement will be true. But as we know, the one who stole the camel told a lie so it can't be. From above we can say Tommy either stole a horse or a donkey. Let's assume Tommy stole the horse, in this case Tommy's statement would be false. But we know the one who stole the horse told the truth so this is contradicting and it can't be correct as well. So, We can say that Tommy stole the Donkey for sure. As Tommy stole the donkey, Robert's statement is false and Scott's statement is true and the camel and the horse is stolen by one of these two. We also know that the one who stole the horse is true and the one who stole the camel is lying, so that, we can deduce that Robert stole the Camel and Scott stole the Horse.

2. TAXONOMY AND ETYMOLOGY

Donkey, also known as ass, is a domestic animal from the equid taxonomic family. We classify it in the following way:

Kingdom: Animalia;

Phylum: Chordata;

Class: Mammalia;

Order: Perissodactyla;

Family: Equidae;

Genus: Equus;

Species: *Equus asinus africanus*.

The word ass has its etymological origin in the term which describes this animal in Latin: *asinus*, a term which is also used to form its scientific name to describe the domestic subspecies. *Equus africanus*, literally means, african horse. In Spanish, The word donkey –*borrico*- is a derivative from the Latin term *burricus*, which means small horse. Two more terms also exist in Spanish speaking countries –*asno* and *burro* - .

Traditionally, the scientific name for the donkey is *Equus asinus asinus* based on the principle of priority used for scientific names of animals. However, the International Commission on Zoological Nomenclature ruled in 2003 that if the domestic species and the wild species are considered subspecies of each other, the scientific name of the wild species has priority, even when that subspecies was described after the domestic subspecies. This means that the proper scientific name for the donkey is *Equus africanus asinus* when it is considered a subspecies, and *Equus asinus* when it is considered a species.

At one time, the synonym ass was the more common term for the donkey. The first recorded use of donkey was in either 1784 or 1785. While the word ass has cognates in most other Indo-European languages, donkey is an etymologically obscure word for which no credible cognate has been identified. Hypotheses on its derivation include the following:

- Perhaps from Spanish, for its don't-like gravity; the donkey was also known as "the King of Spain's trumpeters"
- Perhaps a diminutive of dun (dull grayish-brown), a typical donkey colour.
- Perhaps from the name Duncan.
- Perhaps of imitative origin.

From the 18th century, *donkey* gradually replaced ass. The change may have come about through a tendency to avoid pejorative terms in speech, and be comparable to the substitution in North American English of *rooster* for *cock*, or that of *rabbit* for *coney*, which was formerly homophonic with *cunny*. By the end of the 17th century, changes in pronunciation of both ass and arse had caused them to become homophones. Other words used for the ass in English from this time include *cuddy* in Scotland, *neddy* in southwest England and *dicky* in the southeast; *moke* is documented in the 19th century, and may be of Welsh or Gypsy origin. In the United States, the Spanish *burro* is used both specifically for the feral donkeys of Arizona, California and Nevada, and, west of the Mississippi, generically for any small or standard donkey.

CURIOUS FACTS

HOW TO SAY "DONKEY", "HORSE AND "STUBBORN" IN SIGN LANGUAGE?

The sign for "donkey" shows the bending ear of a donkey. Do the movement twice. If you use a fast, firm, single movement to bend the ear down and hold it there for a moment it means "stubborn." (Make sure to use a stubborn facial expression).



Figure 3. Dr. William Vicars (2010) "Donkey" in sign language [Photography] Accessed from <http://www.lifeprint.com/>

Figure 4. Dr. William Vicars (2010) "Stubborn" in sign language. Notice the "stubborn" facial expression. The sign for "stubborn" is based on the sign for "donkey." If you do the sign "stubborn" using a double movement and a neutral or friendly facial expression it means "donkey." [Photography] Accessed from <http://www.lifeprint.com/>



Figure 5. Dr. William Vicars (2010) "Horse" in sign language [Photography] <http://www.lifeprint.com/>

The sign for "horse" is made by forming the letter "u" (or "h") with your right hand. Place your thumb on your right temple, or a little higher. Bend and unbend your first two fingers a couple times. If you use all the fingers instead of just the index and middle finger this sign means "donkey." If you sign "donkey" but only move fingers from the upright position to the bent position (one single, quick motion) and do not move them back--then you have signed "stubborn." - Think of how some animals bend their ears down when they are behaving stubbornly.

The horse, *Equus ferus caballus*, is classified in the following way;

Kingdom: Animalia;

Phylum: Chordata;

Class: Mammalia;

Order: Perissodactyla;

Family: Equidae;

Genus: Equus;

Species: *Equus ferus africanus*.

spanish word for mare) comes from the feminine for the word *equus*, *equa*.

It is one of two extant subspecies of *Equus ferus*. It is an odd-toed or odd- hoofed ungulate mammal belonging to the taxonomic family *Equidae*. The horse has evolved over the past 45 to 55 million years from a small multi- toed creature into the current large, fine-bearing, single-toed animal. Humans began to domesticate horses around 4000 BC, and their domestication is believed to have been widespread by 3000 BC. Horses in the subspecies *caballus* are domesticated, although some domesticated populations live in the wild as feral horses. These feral populations are not true wild horses, as this term is used to describe horses that have never been domesticated, such as the endangered Przewalski's horse, a separate subspecies, and the only remaining true wild horse. There is an extensive, specialized vocabulary used to describe equine-related concepts, covering everything from anatomy to life stages, size, colours, markings, breeds, locomotion, and behaviour.

The Latin term to describe a horse was *equus*, while *caballus*, from which *caballo* (the word for horse in Spanish) derived, is a term which comes from late Latin, which is likely to have a Celt origin, an which means "Gelded horse". *Yegua*, (the



Figure 6. Kersti Nebelsiek (2007) A classical Iberian Jennet, from a contemporaneous altarpiece depicting the surrender of Granada in (1482-1492) [Photography] Accessed from <http://es.wikipedia.org/>

A jenny is a female ass or donkey. Occasionally, a female mule is referred to as a jenny, but more often, the term "molly," "mare" or "mule mare" is used. In Ireland, the word jennet is used for a hinny. This usage was carried with immigrants to North America. In western Canada, the term "jennet" is sometimes used instead of "jenny."

The term *Jennet* usually refers to a type of horse popular in the Middle Ages, the historical Jennet or "Spanish Jennet or Iberian Jaca" was a small Spanish horse, noted for a smooth naturally ambling gait, compact and well-muscle build, and a good disposition. The *jennet* was an ideal light riding horse, and as such spread across Europe and provided some of the foundation bloodstock for several horse breeds in the Americas. One archaic term for a jenny was "she-ass." An intact male donkey is called a "Jack" or "Jackstock" (*garañón* in Spanish, especially when they account with a great height).

A gelding is a castrated equine such as a donkey, a horse, a hinny or a mule. Castration, and the elimination of hormonally driven behaviour associated with a stallion, allows a male horse to be calmer and better-behaved, making the animal quieter, gentler and potentially more suitable as an everyday working animal. As a verb, "gelding" or "to geld" refers to the castration procedure itself.

CURIOUS FACTS

THE BOLTON ASS

The Bolton Ass was a creature who believed he could become as swift as a race horse by chewing tobacco and taking snuff.



Figure 7. Bolton (2011) *The Bolton Ass racing a Thoroughbred*. He didn't win, but he sure gave that high-brow a run for his money! [Illustration] Accessed from <http://www.theboltonass.com/>

THE EVOLUTION OF THE HORSE FAMILY

Humans have long held affection for the beloved equine, and they are an endless source for love, companionship, work and research. Thousands of ancient fossil specimens have been uncovered and hold a wealth of information on where they came from. Horses evolved over the last 55 million years (MY) from tiny distant relatives, *Hyracotherium*, that were the size of small dogs. They did not have hooves yet, instead having 3 padded toes on their rear legs, and 4 on their front. These tiny horses lived in the tropical forests of the early Eocene epoch, they thrived in this environment, feeding on fruit and tender greens. *Hyracotherium*, originally from the European continent, migrated across land bridges that connected to Greenland, and North America.

In North America these early "dawn" horses evolved and diversified into many descendants. North America hosted an explosion of horse species and evolution over the next 55 MY. The Bering Strait land bridge ("Beringia") opened up migration out of N. America, into Asia and Europe again about 40 MYA. Ancient horses traversed the northern hemisphere, and eventually reaching Africa and South America. Interestingly, indigenous horses became extinct at the end of the last ice age in the Americas, about 10,000 years ago. The reasons for the extinction are unknown, but climate change, and perhaps over-hunting played a role.



Equidae (horse family) has only one living genus, *Equus*; with 7 species, and numerous subspecies. The 7 species groups are African Wild Asses (Donkeys), Horses (domestic and wild), Grey's Zebras, Onagers, Kiangs, Plains Zebras, and Mountain Zebras. There are about 35 other genera, all extinct, within Equidae.

This globe spotlights the movements of various horse groups over the last 55 million years. The modern horse finally returned to its native continent during the Spanish Invasion, at the end of the 15th century²⁴. The Horse family is a complex tree, or "bush", with many branches leading to extinct species and other "cousins". *Equus* is the lone survivor of this vast family, and what we now know is that horses did not evolve in a straight line, with the modern horse as the end goal. But evolved as a result of random genetic variations, natural selection, and changes occurring over millions and millions of years².

Horses went through massive amounts of changes including body size, teeth, foot and leg structure, brain size and intelligence. It's believed that horses were domesticated in many different areas of Eurasia nearly 6,000 years ago³. These animals thrived in tropical climates, arid deserts, high altitudes, hard and rocky terrain. Their diet underwent transformation as well as their teeth.

Movement Through Time

-  *Hyracotherium*
-  *Anchitherium*
-  *Hipparions*
-  *Equus, Hippidions*

-  55 million years ago
-  Present

The study of how biological organisms are related to each other is called phylogeny. The tree below represents the phylogeny of the horse family as we know it, and how they evolved through time. This "family tree" model is an ongoing science, and as scientists continue studying the relationships of horses and their ancestors this picture will also evolve.



This fossil skull is approximately 35 million years old. *Mesohippus* was found all over North America during the Oligocene.

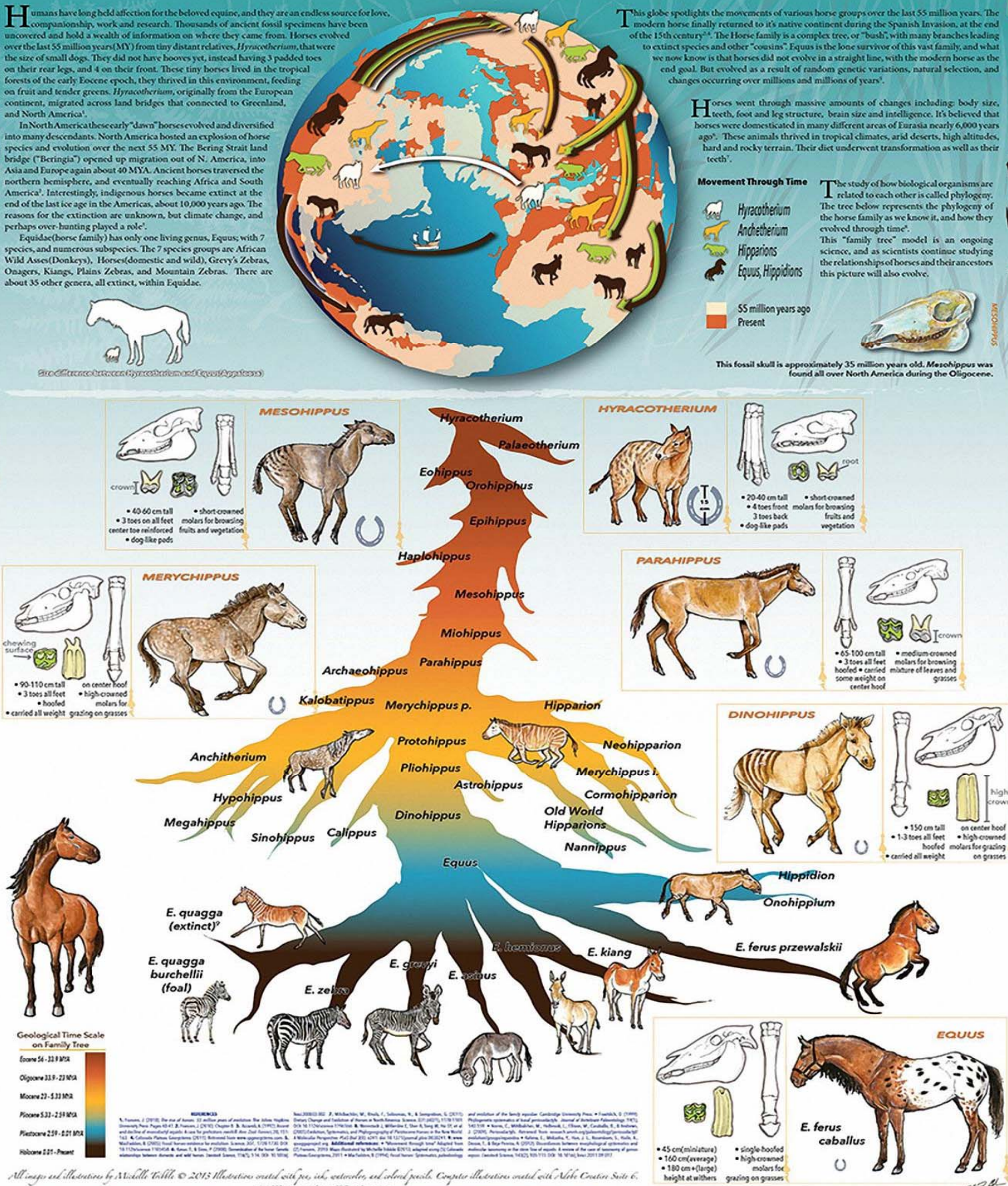


Figure 8. Michelle Tribble (2013) The evolution of the horse family [Poster/Ink, Coloured pencil, Watercolour, and Adobe CS6] Accessed from <http://tribbill.files.Wordpress.com/>

3. ORIGIN AND EVOLUTION

The origin of equids (horse family) dates back from about 60 million years ago, with the appearance of the *Eohippus* genus, which was a browsing animal, with a height that fell between 20 and 40 cm (7.87 to 15.74 inches) and which had 4 fingers. Later, the *Mesohippus* genus appeared (about 30 million years ago), which had a bigger size (about 60 cm - 23.62 inches) and which had improved its speed and reflexes; its vision was monocular and lateral. 20 million years ago, the *Merychippus* genus came into scene; it measured 80 cm (31.49 inches), had three fingers, and fed on pasture, something which also brought the consequent stomach and teeth modification; it slept standing still.

The immediately previous ancestor to the *Equus* genus, was the *Pliohippus* genus, which dates from 10 million years ago, measures 120 cm (47.24 inches), and described great migration movements. This may be the origin of species such as, the Tarpan (*Equus ferus ferus*), also known as Eurasian wild horse, which was an extinct subspecies of wild horse; The Przewalski's horse or Dzungarian horse, which is a rare and endangered subspecies of wild horse (*Equus ferus*) native to the steppes of central Asia, specifically Mongolia; all three species of zebras: the plains zebra, the Grévy's zebra and the mountain zebra and donkeys (*Equus africanus asinus*).

The *Equus* genus comes from *Pliohippus* and *Plesiohippus* and it contains 6 subgenus: *Asinus*, *Hemionus*, *Equus*, *Dolichohippus*, *Hippotigris* and *Quagga*, although Corbet and Bennet, basing on archaeological studies, only recognise two of them: *Equus asinus*, which descends from *Astrohippus*, with three species: *E.a. asinus*, *E.a. hemionus* and *E.a. kiang*, and the subgenus *Equus equus* which directly descends from *Dinohippus*, with 5 species:

E.e. caballus, *E.e. quagga*, *E.e. burchelli*,
E.e. zebra and *E.e. grevyi*.

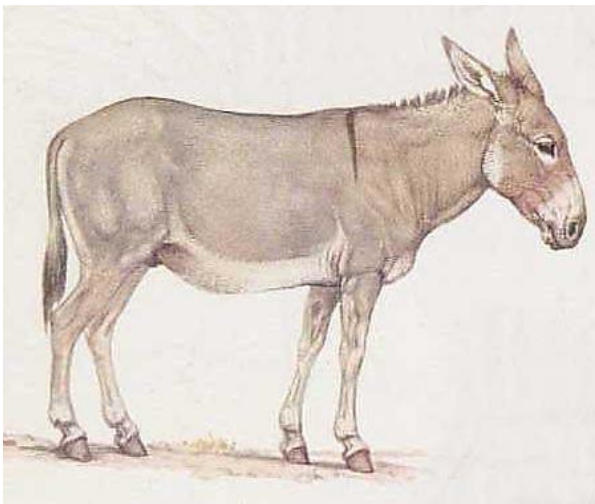
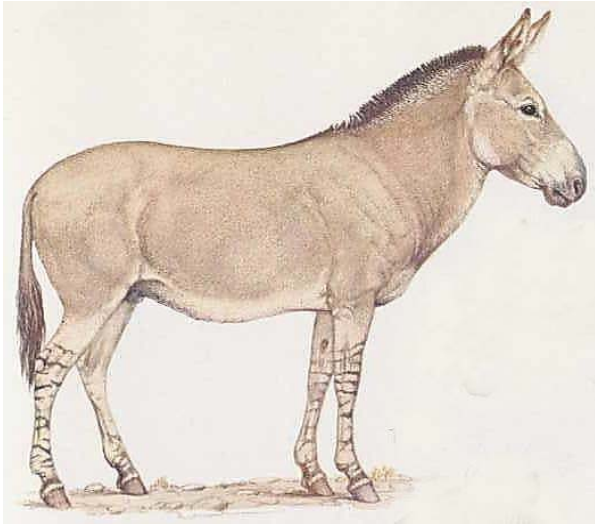


Figure 9. Heinrich Harder (1914) Prehistoric animal Illustrations used in the 1914 book *Tierwanderungen in der Urwelt*. Left to right: *Meshippus*, *Neohipparion*, *Eohippus*, *Equus scotti* and *Hypohippus* [Illustration] Accessed from <http://archive.org/>

According to a great number of authors, current donkey breeds, derived from two ancestor branches: *Equus asinus africanus*, or Nubian ass, native from the Nile Valley, and *Equus asinus somaliensis*, or Somalian Ass, which gave origin to Asian Southwest asses and probably, to the most of the European donkey breeds too.

However, other authors like Dechambre and Sanson also maintained the theory of the existence of two ancestral lines, one of them having its origin in the northeast of Africa, which would correspond to *Equus asinus africanus* and the other one, *Equus asinus europeus*, whose origin area is set in the Mediterranean basin, more precisely, The Balearic Islands, something which would have given origin to the most of the European donkey breeds.

Though it could appear to be incredible, tapirs, or even rhinoceros, are animals which are somehow related to donkeys, as they are all ungulates, like the giraffe, the deer or the camel, much more distant from the donkey species.



Figures 10 & 11. Helmut Diller (2009) (Figure 10) Somali Wild Ass (*Equus africanus somaliensis*) & (Figure 11) African Wild Ass, Nubian Ass (*Equus africanus*) [Illustrations] Accessed from www.delachauxetniestle.com/

All of them belong to the Artiodactyls group (even-toed ungulates), while the donkey, as well as the horse, are perissodactyls (odd-toed ungulates).

Horses' recent History is not known overall. In particular, it still remains unknown when did the separation between asses, wild horses, zebras, and domestic horses took place. It is also unknown yet, whether domestic species (the donkey and the horse) are the result of a human carried out selection or if natural selection existed.

The *Equus* genus is likely to have developed in North America, from where it would arrive in Europe, Asia, and later, came to Africa. Despite this fact, at the final of Pleistocene or beginning of the Holocene, between 9,000 and 10,000 years ago, the *equus* genus had totally disappeared from the North American continent, in order to develop in the Old World.



Figure 12. Montserrat Pablo Gómez (2014) Ancient horse Migrations [Map]

The donkey's domestication process started during the Holocene epoch (8,000 to 10,000 years ago), in the north of Africa. Afterwards, it spreaded towards the southeast of Asia and the south of Europe. The oldest discoveries of domestic donkeys date from the 4th millennium before Christ, and were found in Egypt, buried together with other domestic animals.

As their ability to adapt to humid and cold climatology was really poor, they never came to reach a great number in the European northern area. It appears that, Asia Minor (Anatolia) was the starting point from where donkeys were taken into Europe, through Ukraine, Russia and The Balkan Peninsula.

There exist evidences of the presence of these animals from 800 - 900 a.C. in Ukraine. The Donkey reached Italy from The Balkans, spreading throughout Europe, concurrently with the roman conquers. Despite this fact, some donkey populations straightly arrived from Africa across Gibraltar strait (*Jordana y Folch, 1996*).

4. GENETICS AND CROSSBREEDING: FERTILITY, STERILITY AND RARITY

As we may be able to realize, horse and donkey belong to two geographical origins very distant from each other, something which is reflected on their physical and genetic characteristics. Concerning genome, they are noticeably different. The chromosome number that each species has varies, as we can read in the following table;

SPECIES	CHROMOSOME NUMBER
<i>Equus przewalski</i> (Przewalski's horse)	2n=66
<i>Equus caballus</i> (Domestic horse)	2n=64
<i>Equus asinus</i> (Domestic donkey)	2n=62
<i>Equus hemionus</i> (Asiatic wild ass)	2n=56
<i>Equus burchelli</i> (Plains zebra)	2n=44
<i>Equus grevyi</i> (Grévy's zebra or imperial zebra)	2n=46
<i>Equus zebra</i> (Mountain zebra)	2n=32

Table 1. *Equus* genus chromosome number.

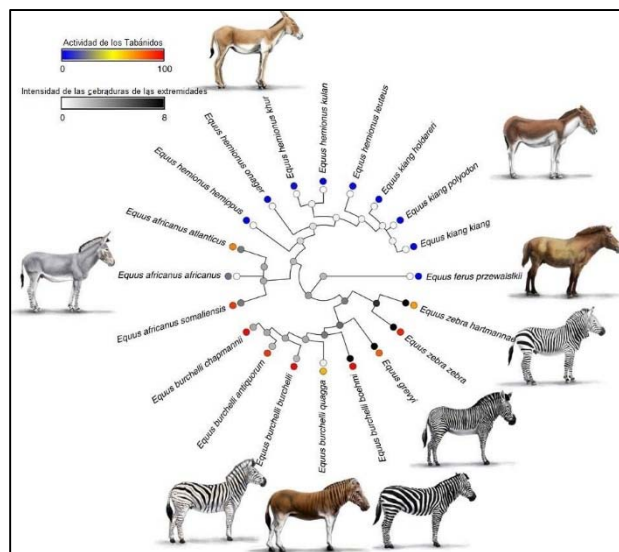


Figure 13. Rickesh Patel (2014) Phylogenetic tree of equid subspecies showing leg stripe intensity (inside circles) and proportion of geographic range overlap with 7 consecutive months of temperature lying between 15 and 30 °C and humidity between 30 and 85% (outside circles). Some have full body stripes, some leg stripes, some neck stripes and some are not striped at all. The blue dots show species not plagued by tabanid flies. Notice that those are the animals with no stripes. There was no such correlation with other factors like the presence of certain predators or temperature. Although there exist plenty of other animals living in the same areas that are not striped, zebras are covered with short hairs that biting insects can penetrate with their mouth parts. Non-striped

mammals living in the same areas typically have longer, thicker fur that the flies can't get through. Apparently, many insects, including tabanids and tsetse, don't like to land on striped surfaces. And indeed, solid coloured feral horses suffer much more harassment from flies than do their striped cousins. The idea that insect parasites drove the evolution of stripes isn't settled science yet, but it is a fascinating hypothesis. [Photography] Accessed from <http://www.nature.com>

In some cases, hybridization is possible, though in the most of them, hybrids result sterile like hinnies (Horse ♂ x jennie ♀), mules (jackstock ♂ x mare ♀) and zebroids (also zedonk, zorse, zebra mule, zonkey, and zebrule, the offspring of any cross between a zebra and any other equine: essentially, a zebra hybrid. In most cases, the sire is a zebra stallion.

Offspring of a donkey sire and zebra dam, called a zebra hinny, or donkra, do exist but are rare. Zebroids have been bred since the 19th century. Charles Darwin noted several zebra hybrids in his works.

The usual naming convention for hybrids is a "portmanteau word" comprising first part of male parent's name + second part of female parent's name.

FATHER	MOTHER	OFFSPRING
Donkey (Jack stock)	Horse (mare)	Mule (male), John (male), Molly (female)
Horse	Donkey (jenny/jennet)	Hinny
Zebra	Donkey (jenny/jennet)	Zebross, Zedonk, Zebronkey, Zonkey, Zebadonk, Zebryde, Zenkey (Japan), Hamzab (Israel)
Zebra	Horse	Zorse, Golden zebra, Zebra mule, Zebrule
Zebra	Pony	Zony
Zebra	Shetland Pony	Zetland
Donkey (Jack stock)	Zebra	Zebret, Donkra
Horse	Zebra	Hebra

Table 2. *Equus* genus possible hybrid combinations (see Book 2, Chapter 7)

Mules and hinnies have 63 chromosomes, a mixture of the horse's 64 and the donkey's

62. The different structure and number usually prevents the chromosomes from pairing up properly and creating successful embryos, rendering most mules infertile. There are no recorded cases of fertile mule stallions. A few mare mules have produced offspring when mated with a purebred horse or donkey. Herodotus gives an account of such an event as an ill omen of Xerxes' conquest of Greece in 480 BC: "*There happened also a portent of another kind while he was still at Sardis,—a mule brought forth young and gave birth to a mule*" (Herodotus, *The Histories* 7:57).

In his *Histories*, Herodotus uses the mule as a symbol of both potential advantages and risks of intermarriage and reproduction between different ethnic groups. Both literal mules and the children of mixed marriages are symbols of revolutions and new dynasties. These revolutions are often marked by an attempt to blend or conglomerate distinct cultural *nomoi*, or customs. Herodotus' stories about ethnically mixed leaders and their effects upon their societies serve as both encouragement and warning to governments like Athens and the Persian Empire.

As of October 2002, there had only been 60 documented cases of mules birthing foals since 1527. In China in 2001, a mare mule produced a filly. In Morocco in early 2002 and Colorado in 2007, mare mules produced colts. Blood and hair samples from the Colorado birth verified that the mother was indeed a mule and the foal was indeed her offspring.

A 1939 article in the *Journal of Heredity* describes two offspring of a fertile mare mule named "Old Bec", which was owned at the time by the A&M College of Texas (now Texas A&M University) in the late 1920s. One of the foals was a female, sired by a jack. Unlike its mother, it was sterile.

The other, sired by a five-gaited saddlebred stallion, exhibited no characteristics of any donkey. That horse, a stallion, was bred to several mares, which gave birth to live foals that showed no characteristics of the donkey.

Hinnies are difficult to obtain because of the differences in the number of chromosomes of the horse and the donkey. A donkey has 62 chromosomes, whereas a horse has 64. Hinnies, being hybrids of those two species, have 63 chromosomes and are sterile. The uneven number of chromosomes results in an incomplete reproductive system. According to the American Donkey and Mule Society, "*The equine hybrid is easier to obtain when the lower chromosome count, the donkey, is in the male. Therefore breeding for hinnies is more hit-and-miss [sic] than breeding for mules.*" Male hinnies and mules are usually castrated to help control their behaviour by eliminating their interest in females. The male hinny or mule can and will mate, but the emission is not fertile.

Female hinnies and mules are not customarily spayed, and may or may not go through estrus. Female mules have been known, on rare occasions, to produce offspring when mated to a horse or donkey, though this is extremely uncommon. Since 1527 there have been more than sixty documented cases of foals born to female mules around the world. In contrast, according to the American Donkey and Mule Society, there is only one known case of a female hinny doing so.

In China in 1981, a hinny mare proved fertile with a donkey sire. When the Chinese hinny was bred to a jack, she produced "Dragon Foal," which resembled a donkey with mule-like features. In Morocco in 2002, a mule mare bred to a donkey sire produced a male foal. DNA testing revealed the foal has a

mixed karyotype hybrid like the Chinese hinny offspring, Dragon Foal.

There are other reasons for the rarity of hinnies. Jennies and stallions may be choosier about their mates than horse mares and donkey jacks. Thus, the two parties involved may not care to mate. Even if they do cooperate, female donkeys are less likely to conceive when bred to a horse than horse mares are when bred to a donkey. Breeding large hinnies is an even bigger challenge, as it requires stock from a jenny of large size, such as the Baudet de Poitou or American Mammoth Donkey. Mammoth donkey stock is becoming increasingly rare and has been declared an endangered domestic breed. Fanciers are unlikely to devote a Mammoth jenny's valuable breeding time to produce sterile hinny hybrids when Mammoth females are in high demand to produce fertile pure-bred Mammoth foals.

Donkeys and wild equids have different numbers of chromosomes. A donkey has 62 chromosomes; the zebra has between 32 and 46 (depending on species). In spite of this difference, viable hybrids are possible, provided the gene combination in the hybrid allows for embryonic development to birth. A hybrid has a number of chromosomes somewhere in between. The chromosome difference makes female hybrids poorly fertile and male hybrids generally sterile due to a phenomenon called Haldane's Rule¹. The difference in chromosome number is most likely due to horses having two longer chromosomes that contain similar gene content to four zebra chromosomes. Horses have 64 chromosomes, while most zebroids end up with 54 chromosomes.

Common wisdom states that hybrids only occur when the zebra is the sire, but the

Barbados hybrid demonstrates the opposite case. Two other known zebra hinnies have been foaled, but did not survive to adulthood. The rarity of zebra hinnies indicates the smaller number of chromosomes must generally be on the male side if a viable hybrid is to be produced. Before this comes into account, a successful mating needs to be accomplished in the first place.

Zonkeys are interspecific hybrids bred by mating two species from the same genus. The offspring have traits and characteristics of both parents. Zonkeys vary considerably depending on how the genes from each parent are expressed and how they interact.

All species of domestic and wild horses can interbreed despite having different numbers of chromosomes. In addition, mares can carry extraspecific implanted embryos to term.

Zebras and zebra hybrids often do not exhibit recognizable signs of disease or pain, even with serious medical conditions such as laminitis or surgical diseases of the abdomen.

¹ It was formulated in 1922 by the British evolutionary biologist J.B.S. Haldane:

"When in the F1 offspring of two different animal races one sex is absent, rare, or sterile, that sex is the heterozygous sex [heterogametic sex]."

5. ETHOLOGY, PHYSIOLOGY AND PHYSICAL CHARACTERISTICS

In general, donkeys are slower and less powerful than horses, however they are more durable than horses. Of course there are many breeds of horses and not so many breeds of donkeys but still they are different in height, mass and body composition.

Donkeys are extremely intelligent animals, some say more intelligent than horses. They have a strong sense of survival. If they think that something may be dangerous for them they just will not do it. They like to think things through before doing things, and can be trickier to train. They are particularly patient and persistent animals, we may even mistakenly say stubborn.

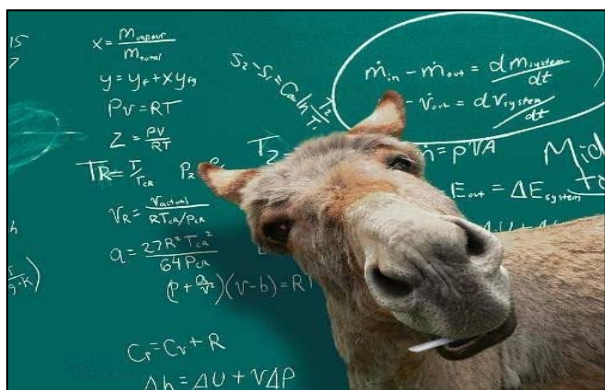


Figure 14. Worth1000.com (2013) Smart ass [Photography]
Accessed from <http://jimchriscole.com/>

Donkeys are animals of areas with a poor food and water supply. Their origin is in border areas of deserts. They are wholly adapted to these conditions so their food needs are much lower than that of a horse. Because of that domestic donkeys can be easily overfed and become obese.

Horses are fast and explosive and in case of any sign of danger they will run away. Donkeys, however, will simply freeze when frightened. Donkeys evolved in rugged desert terrain and fleeing in times of danger simply was not possible. Also donkeys have

a general fear of dogs, that fear is probably originated from jackals from their homeland in Africa. Nowadays, they are often used to guard livestock, especially goats and sheep's, against coyotes and feral dogs.

Growing numbers of donkeys are also used for leisure in developed countries and are popular as pets. Keeping donkeys in temperate environments can, however, put them at risk of disease particularly those associated with obesity or inappropriate management (Trawford, A., 2011). Extensive further research is required to improve our current understanding of the donkey and the best way to treat, manage and work with this important species.

Research into donkey health and welfare has been limited and has generally been carried out by a small number of enthusiasts (Trawford, A., 2011).



Figure 15. The Only Way Is Bullen (2013) Donkey taking care of a goat kid [Photography] Accessed from <http://theonlywayisbullen.blogspot.com.es>

Recent findings have led to changes in the way donkeys are treated and managed; examples include removing cardboard bedding for donkeys which can increase the risk of impaction colic (Cox, R., et al., 2009) or hyperlipidemia (Burden, F.A., et al., 2010).

Perhaps one of the donkey's most famed traits is its stoicism; pain detection is notoriously difficult. The donkeys do show

signs of pain just in different and more subtle ways than their horse cousins (Olmos, G. et al., 2011).

Donkeys like to walk or amble everywhere at slow gaits, and need more motivation to go to trot or canter. Horses are faster and if they are free they choose faster walks.

Donkeys also live longer, on average, than horses. Donkeys often live more than 30 years or even close to 50, in the same time a very few horses live more than 30 years. One difficulty in proving this with donkeys is that the eruption schedule of their teeth does not match that of the horse (Burnham, S.L., 2002). The schedule is delayed so that a 10-years old donkey does not yet have a smooth mouth. The other factors used to determine age ranges for horses do not apply to the donkey because they do not have the same shape corner tooth.

Normal, physiological values of complete blood screen and biochemical parameters are close to the ones in horses but not quite. There are some concerns in these values, one is that many different authors interpreted physiological values for local population of donkeys which may not be a 100% adequate for suspected population and another is that complete blood screen is usually analyzed on machines with programs for horses which have physiological values for horses that could be inadequate for suspected local population of donkeys. For example if an adult donkey have a red blood cell count of $5,0 \times 10^{12}/l$ and a practitioner look a physiological value for horses that particular donkey can be false diagnosed as anemic. Some of these values are presented in table 3.

ANALYTE/PARAMETRE	ADULT DONKEY	YOUNG DONKEY	ADULT HORSE
Body temperature (°C)	36,2-37,8	36,6-37,8	37,5-38
Pulse/Heart rate (bpm)	36-68	44-88	28-44
Respiratory rate (rpm)	12-44	16-48	16-24
Hematocrit (l/l)	0,25-0,38	0,27-0,43	0,32-0,48
Hemoglobin (g/l)	90-153	93-150	100-160
RBC ($\times 10^{12}/l$)	4,0-7,3	5,0-8,1	6,0-12,0
Leucocytes ($\times 10^9/l$)	6,1-16,1	7,8-21,9	6,0-12,0
Neutrophils (%)	28-78	25-71	30-75
Lymphocytes (%)	17-65	16-67	25-60
Eosinophils (%)	1-10	0-10	1-10
Basophils (%)	0-0,08	0-0	0-3
Monocytes (%)	0-5,0	0-6,0	1,0-8,0
Platelets ($\times 10^9/l$)	245-1195	250-1200	100-400
VCM (fl)	57-79	49-70	34-58
HCM (pg)	18,9-28,6	16,4-25,0	13-19
CHCM (g/l)	314-391	253-440	310-370
Creatinine ($\mu\text{mol}/l$)	53-141	61-107	8-168
Urea (mmol/l)	1,9-7,6	1,5-6,1	4,3-9,3
Total bilirubin ($\mu\text{mol}/l$)	1,4-7,7	1,4-6,1	10-42
Triglycerides (mmol/l)	0,2-4,3	0,2-2,0	0,1-0,5
Total protein (g/l)	58-82	53-78	55-73
Albumin (g/l)	20-34	21-32	26-37
Globulin (g/l)	29-53	23-50	26-40
CK (IU/l)	15-149	21-180	2,4-23,4
GGT (IU/l)	8-49	8-39	9-25
GLDH (IU/l)	0,4-8,0	0,4-3,9	0-12
AST (IU/l)	59-199	63-172	230-330
ALP (IU/l)	150-163	212-576	130-350
SDH (IU/l)	0-1,5	0,1-1	2-6
GPx (IU/l)	4,5-51	8-39	20,6-26,4

Table 3. Trailović, D.R. (2011) Normal values for some physiological parameters in adult, young donkeys and horses [Table]

CURIOUS FACTS

GUINNESS WORLD RECORDS

(<http://www.guinnessworldrecords.com>):

THE TALLEST AND THE SHORTEST DONKEY

The shortest donkey in terms of height is KneeHi (born 2 October 2007), a brown jack who measured 64.2 cm (25.29 in) to the top of the withers at Best Friends Farm in Gainesville, Florida, USA, on 26 July 2011. The registered miniature Mediterranean donkey, KneeHi is owned by James, Frankie and Ryan Lee (USA). KneeHi was measured in the standard manner for equine animals: unshod, on even ground, to the top of the withers (to the highest dorsal process of the vertebral body), following a straight line up to the fetlock (equivalent to the ankle joint) using a measuring stick with a spirit level (bubble) crossbar to ensure evenness. He was born (at a height of 16.5 in; 41.9 cm) to the dam Itsy Bitsy Annie (27.5 in; 70 cm) and the sire Golden Point's GP Billy Bob (29 in; 73.6 cm). Mediterranean miniatures were bred in Sardinia, originally to be housed indoors, typically turning grain grinding stones. Robert Green (USA), who first introduced the breed into the USA in 1929, is quoted as saying: "Miniature Donkeys possess the affectionate nature of a Newfoundland, the resignation of a cow, the durability of a mule, the courage of a tiger, and an intellectual capability only slightly inferior to man's." Guinness World Records Editor-in-Chief Craig Glenday was present at the measuring, which was carried out by a local.



Figuras 16 & 17. Figures 16 & 17. James Ellerker/Guinness World Records (2011) The shortest donkey [Photography] Accessed from <http://www.guinnessworldrecords.com>

A donkey named 'Oklahoma Sam' celebrated being crowned the 'Tallest Living Donkey' on the planet on 13th September, 2012. Measuring 15.3 hands (155.45 cm; 5ft 1in) tall, she dwarfs the common donkey (8 hands high) and her own larger 'Mammoth jackstock' breed (12 hands high). The four-year-old record-breaker lives in Watsonville, California, USA, where she shares her one acre of land with a macaw, duck, goose and four cats. The other animals, unfazed by Sam's size, enjoy playing with the giant donkey, and when Sam isn't chasing them around the farmland she can usually be found sleeping in an area of shade or nibbling on her bale. Sam's overall care is handled by 54-year-old Linda Davis, a keen gardener and animal lover. Linda, who calls Sam her "soul mate", says: "It actually doesn't cost anymore to have a donkey of this size. "He doesn't eat more. In fact, if I give him more bale he'll just use it to make his bedding more comfortable. He loves his sleep" On Sam's tile, Linda says: "It's fantastic to get the record. People are always shocked by his size and say it must be a record. Now I can show them the book!"



Figures 18 & 19. (Figure 18) Guinness World Records News & (Figure 19) PYellott (2012- 2013) (Figure 18) Oklahoma Sam, the World's Tallest Living Donkey as of 2012 & (Figure 19) Romulus, the World's Tallest Living Donkey as of 2013, eating carrots with Cara Barker Yellott. [Photographies] Accessed from (Figure 18) <http://www.guinnessworldrecords.com/> & (Figure 19) <http://en.wikipedia.org>

On February 8, 2013, Romulus was measured for the Guinness Book of World Records. His paperwork was received in London and certified by Guinness World Records on May 13, 2013. Romulus is 9 years old and has been measured at 17 hands or 68 inches (1,700 mm) from hoof to withers, five inches taller than the former tallest donkey, Oklahoma Sam. Romulus is the world's tallest living donkey, as certified by the Guinness World Records. He is owned by Phil and Cara Barker Yellott of Red Oak, Texas. Romulus is an American Mammoth Jackstock gelding. Romulus has a brother Remus, who is just 2 inches (51 mm) shorter. Romulus weighs about 1,300 pounds (590 kg). Romulus and Remus are American Mammoth Jackstock donkeys, the world's largest donkey breed. American mammoths were developed and utilized for their potential to produce large mules when cross-bred with horses. Currently the donkeys are used as guard animals that protect the Yellott's other livestock from predators.

At 210.2 cm (82.75"), 11-year-old Belgian gelding Big Jake stands as the world's tallest horse. Jerry Gilbert of Smokey Hollow Farm (Ostego, Michigan, USA) has raised Big Jake from a weanling to today. "He was extremely hard to hold on to when he was young and when I would turn him outside sometimes he would take me with him!" Fortunately, the 2600-pound horse has calmed down a bit in his age. "He is friendly with all the other animals," says Jerry. "He has a great temperament and works hard when he is harnessed to a wagon." There's a lot of accommodation to be made for such a large animal, too. "Everything has to be big! His stall is 20X20 feet when an average stall is about 12X12 feet." "...when we transport him we have to use a semi trailer." While there's a lot of food that could fit in that stall, Big Jake is on a strictly healthy diet, consuming 1 1/2 bales of hay and 40 quarts of oats per day. "We are proud to hold the record and enjoy the people who visit the farm," said Jerry. "We enjoy the reactions and when people leave our farm happy from the experience of seeing Jake."



Figures 20, 21 & 22. (Figures 20 & 21) Guinness World Records News & (Figure 22) AP (2006- 2010) (Figure 20) 11-year-old Belgian gelding Big Jake stands as the world's tallest horse. Jerry Gilbert of Smokey Hollow Farm, (Figure 21) Thumbelina, world's shortest horse & (Figure 22) Einstein, the world's smallest horse who weighs less than a newborn baby [Photographies] Accessed from (Figures 20 & 21) <http://www.guinnessworldrecords.com/> & (Figure 22) <http://oddstuffmagazine.com>

As of 7 July 2006, the record for the smallest living horse is Thumbelina, a miniature sorrel brown mare who measures 44.5 cm (17.5 in) to the withers and is owned by Kay and Paul Goessling (Both USA) who live on the Goose Creek Farm Inc, St Louis, Missouri, USA. Anyway Einstein, a pint-sized stallion could be a record breaker as the world's smallest foal. Einstein, is just 14 inches high and weighs only an incredible 6lbs (The height of the Einstein-small breed of pinto stallion is only 35 cm and weighs 2.7 kg and the height of the current record holder Thumbelina – 44.5 cm). Einstein was born in April 2010, so he needs to wait another couple of years in order to be brought in the Guinness Book of Records. The diminutive horse was born in Barnstead, New Hampshire, on Friday 17th August, 2012, at Tiz Miniature Horse Farm. His tiny proportions may be more suitable for a human baby, but they are tiny for a horse, even a miniature breed like Einstein. Dr Rachel Wagner, Einstein's co-owner, claims the Guinness Book of Records lists the smallest newborn horse as weighing just 9lbs. Breeders say that unlike the current record holder, Thumbelina, Einstein shows no signs of dwarfism - he is just a tiny horse.

We must clearly distinguish domestic equids from wild or feral ones. Donkeys have adapted to live in the desert margins, and because of that it has developed some unique special features among equids. Donkeys are able to emit brays, at such a loud level, which allows them to keep in touch from 3 km away (1.86 miles). Their long ears are really useful when it comes to sound reception and also to body heat dissipation.

They have got a resilient digestive tract, less prone to colic than the one of horses', something which allows them to eat a wider variety of plants, and to perform more efficient water extraction from food than horses do, when comparing two individuals from both species similar in size and body weight. A donkey requires a smaller food quantity than a horse of an equivalent size and body weight does, something which allows them to live in areas which remain inaccessible for their relatives' more demanding nourishing characteristics.

Since far-off times, donkeys have been used as beasts of burden, draught animals and for people transportation. Their own maintenance service is not quite expensive, so that they turn out to be a really useful resource in developing countries, given their resistance and versatility.

Donkey height at withers ranges between 64.2 cm (25.29 inches) of the smallest donkey (Mediterranean Miniature Donkey) and 1,70 (68 inches) of the tallest donkey (American Mammoth Jackstock). Horse height is really variable, it depends on which is the purpose the horse is going to be used for. From the tallest horse's height which reaches 210.2 cm (82.75 inches), to the smallest set at 44.5 cm (17.5 inches).

Though these measures belong to the entries recorded by the Guinness World Records in 2013-2014, there exist records

that establish that a Shire horse holds the greatest record for the world's biggest horse mention ever.

Sampson, foaled in 1846 in Toddington Mills, Bedfordshire, England, stood 21.2½ hands high (i.e. 7 ft. 2½ in or 2.20 m at his withers) by the time he was a four year old, when he was renamed Mammoth. His peak weight was estimated at over 3,300 lb. (approximately 1.5 long tons).

The most recent Shire to hold the record was Goliath, a dray horse for the Young & Co. brewery who held the Guinness World Record for the tallest living horse at 19.2 hh (1.98 m) until he died in July 2001.

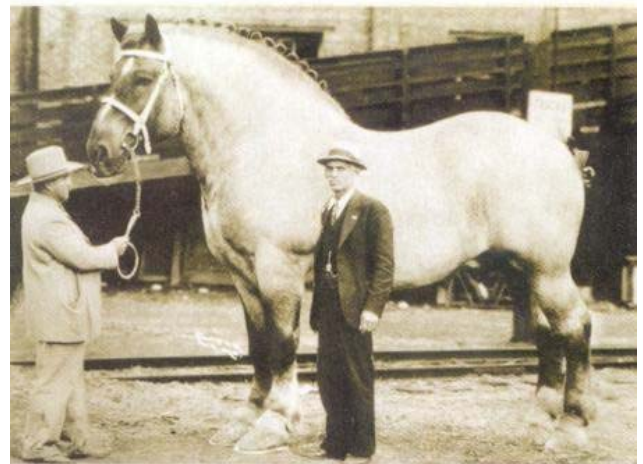


Figure 23. Amber Rank (2013) Sampson, the tallest horse ever recorded [Photography] Accessed from <http://www.pinterest.com>

6. EQUINE COLOUR GENETICS

Although many donkeys are the familiar gray-dun color, there are many other coat shades. Most donkeys, regardless of coat color, will have primitive markings such as dorsal stripes and shoulder crosses, dark ear marks, as well as the "light points" - white muzzle and eye rings, and white belly and inner leg. Leg barring ("garters" or "zebra stripes") may be present as well. Small dark spots right at the throat latch, called "collar buttons" are a good identifying marking and occur occasionally. These typical donkey markings may be passed on in part or whole to Mule or Hinny offspring.

Colours in the donkey range from the gray shades of gray/dun to brown, a rare bay (though not as red-toned as in horses), black, light-faced roan (both red and gray), variants of sorrel (Registry term - Red), the blue-eyed Ivory (also called cream or white-phase), Frosted/spotted White, and a unique Spotted pattern. True horse pinto, horse aging gray, horse appaloosa, palomino and buckskin also occur in the donkey.

The more unusual colors are the Dappled Roan, where the face and legs are light and the body is marked with "reverse" dapples (dark spots on a light background, as opposed to the horse dapple where the dapples themselves are light on dark), frosted gray (with light faces and legs and some white hairs in the coat); the pink-skinned, blue-eyed Ivory white, and the frosted spotted white.

The frosted spotted is an apparent combination of a graying or roan with the spotted pattern, and can throw either more FSW, spotted, or frosty roan colts. The animals are best defined as a spotted animal where the skin is spotted but the color does not necessarily show through on

the coat (it has roaned or "grayed"; out). Frosted spotted white (FSW) can be identified from Ivory white by checking the skin around the eyes and muzzle. Ivory (creams) will have blue eyes and true pink skin, while FSW will have dark eyes, dark "eyeliner" and dark spotting on the skin.

Another unusual variant of the spotting line is the "tyger spot" pattern. These donkeys vary from the typical large spots over the ears, eyes, and topline. The body will be covered with small round spots resembling the appaloosa type.

Though the main relationships between genes involved in equine coat colour encoding are even commonly known among breeders and farmers, colour research is ongoing in different fronts. The American Donkey and Mule Society is conducting research as supervised by Dr. Phillip Sponenberg DVM PhD (see Book 1, Chapter 1), and with the new Donkey Colour Genome Project with Dr Michal Prochazka of Pet DNA Services of Arizona. The work is still incomplete, but there are some aspects which have already been proven.

While assessing the colour of the coat of an individual, there are some areas that should be looked, first of all. At first, we should distinguish the colours present in the body, for the base colour. Then we should pay attention to the colour of the mane, tail and cross (even having to take some hair samples), considering any trim process which could have been carried out. This should be noted as modifications of the body colour. Finally, the colour of the lower legs is also important.

The lower legs might be covered up by the frosty pattern, in which we have to do a closer examination of different areas of the legs and also the trim to determine colour.

To fulfill a greater coat colour study we should use as much information as possible; use the different descriptions on the registration certificates, the trim colour and the lower leg colour in order to obtain a more complete colour overview.

For instance, a red body with black trim and roan legs is listed as russet, because the roan on the legs covers up where you might normally see black.

A red body with red trim and roan legs is sorrel (and probably frosty roan). A red body with red trim and dark red or brown lower legs is sorrel or the red dun pattern. All three have a red body. Two have dark red trim.

The combination of all of the parts has to be used, not just one main area. Sometimes is difficult to identify a certain colour, even more when we are not present at the moment of observing the animal. An important fact is that we have to pay attention and rely on both the breeder's and any present technician observations, and also the colour photographs that are usually attached to those registries. Unfortunately, sometimes it is hard to get photos with good colour quality.

On the other hand, foal coat colour is the absolute worst indicator of adult colour. There are records of donkeys that were pink in winter coats, but just as dark a gray-dun in their shed summer coat as you have ever seen.

Genetically, the animal was gray-dun. It may be that all Gray- duns have some degree of red in the coat. Black certainly bleaches out to red in the sun, and many brown foals have a gorgeous "redhead" foal coat that they lose as they mature. Actually, the notion of having one colour in a baby coat that is lost at maturity is not at all farfetched.

Zebra foals have red stripes at birth that darken to black. Lion cubs are born with immature rosette markings that fade out in the adult animal. The red colour in donkey coats may be of a similar nature. Donkeys are probably less removed from their primitive roots as wild asses than are horses, so the red colour may be a "wild" protective colouration leftover. When performing breed selection colour is an important matter to take into account, but (even more when we pay attention to the American donkey breed management system) conformation and temperament should always be the first concern of a breeder.

Size is of concern only when you are trying to make sure your animals fall within a limit (use donkeys under 34 inches (86.36 cm) if you want 30-33" (76.2-83.82 cm) donkeys, or make sure that the difference in height is not too great between the two parents (such as using a 34" (86.36 cm) jack on a 28" (71.12 cm) jennet).

Anyway, colour should always be considered a bonus. Use the best jennets and especially the best jacks you can find of the particular colours you are striving for. For the betterment of the breed as a whole, it is better to use a 36" (91.44 cm) gray-dun jack with perfect conformation than the brightest of sorrels that is 30" (76.2 cm) tall but has dwarf characteristics or is roach backed and bow-legged.

To determine whether a cross would produce a certain colour pattern, at first, you must look at the phenotypic colour or external colour. Although some coat colours can lead you to a mistake, most are a pretty good indicator of what genotype you are dealing with and which the dominant genes which are playing their part are. To be able to project what combinations you would get from the cross of a certain pair, you would need to know their genetic backup.

Pedigrees or family backgrounds are really useful, but the best way is to assess what other colours those special animals have produced. There is no absolute way to be able to look at an animal with no background, or one that is untried, and be certain what colours it will throw, even if is one of the darker colours, which are usually recessive.

Too many factors may be masked or covered up. We have dark brown animals with recessive sorrel, and difficultly considered black/browns that seem probably to be genetically black-based with the brown agouti modifier. This way we can narrow our chances to successfully guess about the colour, but 100% certainty is difficult, because random always comes into scene, almost at any occasion.

Diploid organisms have two homologous copies of each chromosome, usually one from the mother and one from the father. Those chromosomes are the physical backup which keeps all the hereditary information (genes). There are basically two types of genes - dominant and recessive. Dominant are the strongest ones. If they were to battle they would win or what is to say, they get expressed. Recessive are the "weaker" ones. They lose, keep their head down and hide.

They can hide for many generations. In order for a recessive gene to be expressed, it has to team up with a partner from the other side (the other parent).

Once the recessive finds his "twin" on the other side, Recessive is now stronger than dominant and wins out. Then, the colour expressed is the recessive, and the dominant colour gene gets left out entirely, gone from the picture, just a memory.

LOCUS	ALLELES	EFFECT OF COMBINED PAIRS OF ALLELES
Extension (E)	E e	EE or Ee: The animal forms black pigment in skin and hair. ee: The animal is chestnut, it has black pigment in skin, but red pigment in hair.
Agouti (A)	A a	Agouti: Restricts eumelanin, or black pigment, to "points," allowing red coat colour to show on body. No visible effect on red animals, as there is no black pigment to restrict. AA or Aa the animal is a Bay, black hair shows only in points pattern (usually mane, tail, legs, sometimes tips of ears). aa: No agouti gene. If the animal has E allele, then the animal will be uniformly black.
Cr	Cr C	Cream gene The cream gene is an incomplete dominant. CC: No dilution factor, the animal is fully pigmented. (UC Davis abbreviates as N.) CCr: Single dilution factor (heterozygous dilute) results in Palomino, Buckskin or Smoky Black. Red pigment is diluted to gold with cream to white mane and tail; black pigment is not visibly altered on black points or black horses, though genetic testing can reveal "smoky black" colouration. (UC Davis abbreviates as N/Cr.) CrCr Cremello or Perlino: Double dilution factor (homozygous dilute). Red pigment is diluted to a pale cream. Black pigment is diluted to a reddish shade. Skin and eye colour are also diluted, skin is pink and blue eyes are common with double diluted creams. (UC Davis abbreviates as Cr.)
D	D d	DD or Dd: The Dun gene is another dilution gene. The animal shows a diluted body colour to pinkish-red, yellow-red, yellow or mouse gray and has dark points including dorsal stripe, shoulder stripe and leg barring. dd: The animal has undiluted coat colour.
Ch	Ch ch	Champagne: A rare but dominant dilution gene that creates pumpkin-coloured freckled skin, amber, greenish, or blue eyes, and gives a bronze cast to hair. The skin surrounding the eye must be pink with freckles in adulthood. ChCh o Chch: Dilución ChCh or Chch: Champagne dilution evident (See Genetic Formulas Chart below.) chch: No champagne dilution
Z	Z z	ZZ or Zz: Silver dapple - Dilutes eumelanin or black pigment. Converts black to brown with white mane and tail or results in silver colouring. zz: No silver dapple.
Prl	Prl prl	P earl: A new rare recessive dilution gene that looks very much like Champagne. The Pearl gene is sometimes referred to as the "barlink factor." One dose of the mutation does not change the coat colour of black, bay or chestnut animals. Two doses on a chestnut background produce a pale, uniform apricot colour of body hair, mane and tail. Skin colouration is also pale. Pearl is known to interact with Cream dilution to produce pseudo-double Cream dilute phenotypes including pale skin and blue/green eyes. PrlPrl or Prlprl: No pearl dilution. prlprl: Pearl dilution evident.
TO	TO to	OTO or TOto: Tobiano, a form of pinto patterning. Produces regular and distinct ovals or rounded patterns of white and colour with a somewhat vertical orientation. White extends across the back, down the legs, but face and tail are usually dark. toto: No tobiano pattern present.
O Also noted as Fr or FrO	O o	Oo: Frame Overo pattern - Pinto animal pattern that forms a solid frame around white spotting. White is usually horizontal in orientation with jagged edges, colour crosses the back and legs, face is often white. The Overo "O" allele is different from overo as a colour. pattern classification in those registries which also include the splashed white and sabino genes under the overo or piebald family. oo: No overo pattern. OO: Homozygous overo is lethal white syndrome, characterized by an incomplete colon and the inability to defecate, which leads to death or humane euthanization within days of birth.
W	W w	WW: Lethal. Embryo reabsorbed or fetus dies in utero. Ww: The animal has pink skin and white hair, brown or dark eyes. Hair coat is white from birth. ww: The animal is fully pigmented.
G	G g	GG or Gg: gray gene. The animal shows progressive silvering with age to white or flea-bitten, but is born a non-gray colour. Pigment is always present in skin and eyes at all stages of silvering. Grey animals range from white to dark gray depending on age and the proportion of white hairs in the coat. Animals' coats gray in a manner similar to graying in human hair. gg: Animal does not gray with aging.
Rn	Rn rn	RnRn or Rnm: roan pattern of white hair mixed in with base colour. There quite likely is no lethal roan question. rnm: No roan pattern.
Sb	Sb sb	Sabino - Assorted pinto or roan-like markings. Sabino may be polygenic (a gene-complex rather than a single gene pair), caused by several different genes. Recognized by abundant white on the legs, belly spots or body spots that can be flecked or roaned, chin spots, or white on the face extending past the eyes. Sabino is registered as overo by some registries, but is not the overo or frame overo allele. No risk of lethal white, though some "Fully expressed" sabinos may be completely white in coat colour. SbSb or Sbsb: Sabino markings. sbsb: No sabino markings. SB1: The only Sabino gene currently detected by DNA testing, however does not appear to be the gene that creates sabino colouring in Arabians or Clydesdales.
Lp	Lp lp	Appaloosa or Leopard spotting gene. Produces coat spotting patterns, mottling over otherwise dark skin, striped hooves and white sclera around the eye.

Table 4. Alleles involved in equine coat colour and their effects

PHENOTYPE	POTENTIAL GENOTYPE						
	Extension	Agouti	Dun	Champagne	Silver	Cream	Pearl
Bay	E/-	A/-	d/d	ch/ch	z/z	cr/cr	Pr1/Pr1
Chestnut	e/e	-/-	d/d	ch/ch	-/-	cr/cr	Pr1/Pr1
Black	E/-	a/a	d/d	ch/ch	z/z	cr/cr	Pr1/Pr1
Bay dun	E/-	A/-	D/-	ch/ch	z/z	cr/cr	Pr1/Pr1
Red dun	e/e	-/-	D/-	ch/ch	-/-	cr/cr	Pr1/Pr1
Grullo	E/-	a/a	D/-	ch/ch	z/z	cr/cr	Pr1/Pr1
Amber champagne	E/-	A/-	d/d	CH/-	z/z	cr/cr	Pr1/Pr1
Gold champagne	e/e	-/-	d/d	CH/-	-/-	cr/cr	Pr1/Pr1
Classic champagne	E/-	a/a	d/d	CH/-	z/z	cr/cr	Pr1/Pr1
Silver bay	E/-	A/-	d/d	ch/ch	Z/-	cr/cr	Pr1/Pr1
Silver black	E/-	a/a	d/d	ch/ch	Z/-	cr/cr	Pr1/Pr1
Buckskin	E/-	A/-	d/d	ch/ch	z/z	CR/cr	Pr1/Pr1
Perlino	E/-	A/-	d/d	ch/ch	z/z	CR/CR	Pr1/Pr1
Palomino	e/e	-/-	d/d	ch/ch	z/z	CR/cr	Pr1/Pr1
Cremello	e/e	-/-	d/d	ch/ch	z/z	CR/CR	Pr1/Pr1
Bay pearl	E/-	A/-	d/d	ch/ch	z/z	cr/cr	Pr1/pr1
Bay double pearl	E/-	A/-	d/d	ch/ch	z/z	cr/cr	pr1/pr1
Chestnut pearl	e/e	-/-	d/d	ch/ch	z/z	cr/cr	Pr1/pr1
Apricot	e/e	-/-	d/d	ch/ch	z/z	cr/cr	pr1/pr1
Black pearl	E/-	a/a	d/d	ch/ch	z/z	cr/cr	Pr1/pr1
Black double pearl	E/-	a/a	d/d	ch/ch	z/z	cr/cr	pr1/pr1

Table 5. Genotypic formulas and colour definitions

For example, we will have a look to what happens when we have three genes controlling coat colour, gray-dun and red (sorrel). Our problem jack is gray/dun but he has a recessive sorrel gene (or what is to say that his mother was sorrel). He has one dominant gene for black and one recessive for red, which would be EeaaDd.

If you breed him to only gray/dun jennies, and these jennies have no sorrel gene (in that certain case, they are EEDd and there is not any other possible combination), you will only get gray-dun offspring (dominant colour from the jennies, or even from the jack). But, if some of these jennies also have the recessive sorrel, you have a chance of it pairing up with the jack's sorrel gene. If this happens, and you get a sorrel colt, that colt will only have the recessive sorrel gene to pass along (Sorrel/sorrel). The gray pattern in his case is out of the

picture.

Something similar happens with spotted donkeys. Once the recessive Non-spotted animal jumps out, it won't matter how many spotted parents there were in the background. The dominant allele is lost and is not recoverable.

Dominant colours can be homozygous (meaning the same, or one identical gene from each parent). This means that every foal from that parent will have at least one Dominant gene. If that foal has a recessive gene, it is not from the homozygous dominant parent. Gray/dun can be dominant. If a jennet is homozygous for gray/dun (slate/slate), all of her foals will be gray/dun no matter what she is bred to.

Dominants may also be heterozygous, meaning different or mismatched pairing of the genes (like that slate/sorrel jack above).

Each of these foals has, theoretically, a 50/50 chance of getting either the dominant or the recessive gene. Recessives that are paired with a heterozygous dominant are passive. They are not expressed, but can be passed along.

True paired recessives are the "surprise" colours that pop out of nowhere (like two gray/duns having a bright red sorrel foal). The animal is then homozygous for sorrel, it can only give a copy of the sorrel gene to its offspring.

Sometimes we can be interested in breeding for a certain colour pattern, and in some of those cases random has a lot to say. While selecting for a dominant colour pattern, when this dominant colour has an underlying recessive, you have that chance of it pairing with a matching recessive from the other parent, and then you get a surprise. If you are trying to get recessive colours, the only sure-fire way is to breed only like colour to like colour. Sorrel is recessive and can only contribute sorrel. So breed only sorrel to sorrel and you will come up with sorrels. Once we get past the point where many animals of confusing tones were inadvertently labeled as sorrel, (where their records have proved them to be brown or rose dun, among others) and these are not used in red breeding programs any longer, then you will eventually have true sorrel bred to true sorrel.

Just remember, if you continue to breed for a recessive, you will block off all outside colour, and you will end up with a gene pool that has only that one colour (they cannot contribute any other colour factors). Anyway, it is possible to build a whole population of sorrel donkeys (recessive) out of a gray/dun. If we bred this donkey to a sorrel we will get a gray/dun foal that carries a recessive sorrel gene (it has to, the sorrel parent can only give sorrel, because it has a double dose of the

recessive allele, otherwise it would not show a sorrel phenotype). You take this number- one foal (F1) and breed it to another sorrel (again, remember you only have sorrel genes coming from that sorrel).

The foal of F1 (black + dun/sorrel x sorrel/sorrel) has the chance of being the dominant colour, the gray/dun, possible black if the dun was Dd, or the recessives, sorrel. It's a dice game. At random, you can get the sorrel (F2) you wanted. Again, if you take this sorrel (F2) to a sorrel you will get another sorrel offspring (F3), and so on, *ad infinim*. If we never bred any of the gray/duns into the herd again, you would only ever get sorrel forever (if we avoided taking into consideration the fact that you could have a mutated gene, but that would require further study).

Apart from those simple relationships between genes, we have also to consider the existence of another relationship. For example, The Spotted gene so far has proven to be a Partial or Incomplete Dominant, more properly termed heterozygous. This means it takes only one dose of Spot to get the spots. It also means one parent must be spotted to have spotted offspring. It can range from mostly-white with dark spots, to masked spotting.

We have not yet found any animal that is for certain Homozygous (two doses) for spotting. Although donkey colour does not act the same as horse colour, we need to look at one horse example to clarify. In the Paint horse industry, owners with tobiano horses have found that their horses can be homozygous for tobiano. Tobiano is dominant. If their stallion is homozygous for tobiano, all of his foals will be tobiano marked, no matter what the colour of the dam is. (And yes, even if the mare was solid or appaloosa. There are such horses as pintaloosas, which will show an half-way point phenotype). The paint horse

breeders are now marking in their stud advertisements if their horses are Tt or TT marked. This way, if a breeder wants to make sure his sorrel Quarter Horse mare has a paint foal, he goes to a TT stallion. Now look at it this way. That foal will be tobiano, but since the mother had no matching tobiano gene, the foal will be heterozygous (Tt). All of its foals will have one chance to be spotted, and one not. That is the way it works in our spotted donkeys. Even using a spotted jack on spotted jennies sometimes results in the foal getting the short end of the "t" from both parents and coming out solid. You cannot choose which gene they will get, unfortunately, although we all wish we could. Take your best spotted jacks and put them to good jennies and you get a 50/50 chance of a spotted foal.

A jack or jennet could become a consistent colour producer. For instance, you have a spotted jack that manages to throw 75% spotted foals instead of the projected 50/50. That is what we could call a colour producer. Maybe, we do not know whether you are getting a dark jack throwing dark foals, because the gray/dun jennies he might have been bred to were heterozygous (or better said, carried only one copy of) the dun gene or not. Sorrel jacks cannot give anything else, it's up to the genetic background of the jenny (depending on whether her genotype encodes for gray/dun with a recessive sorrel, recessive brown, or straight gray/dun). She has the key when you are dealing with a recessive gene, and is of course an important half if the jack has dominant genes to work with.

It is really difficult to distinguish which were the originally imported colours, and which appeared as a result of breeding. It totally depends on the breed we are dealing with. Tracing back to the origins to every breed we can start guessing where all started. It is

easier to state that a dominant character belongs to the first ancestors of a certain breed. But when it comes to recessive genes, and even more to those which establish a different relationship between genes, such as Codominant inheritance. Then there are two answers, but neither can really be proven so far, that is what happens with spotted donkeys. The fact that no spotted animals are recorded in original registry records, does not mean that white blazes are often overlooked in donkeys. On the other hand, other characters such as blue-eyed white is also a recessive, and can lie hidden, as can any recessive, for many generations. So, there is no reason to believe it was not carried in by one of the original donkeys that set the origins of a breed. They were closely inbred for several generations, and inbreeding is one way to see the recessives start cropping up. Also, there is some scientific proof that if you close-breed animals for enough generations, a mutation will crop up. Spotted hedgehogs, and spotted pot-bellied pigs are just two examples of inbreeding causing the partial-white mutation. The Przewalski horse, the last true "wild" horse now has such a small gene pool they are being very closely inbred. There are reports of animals with white stars, white faces, and even white body spots beginning to show up. So the question is, are spots bred in from standard donkeys, or did we really have some donkey with an undetected spot pattern? It is difficult to know.

To try to predict which would be the coat colour of the offspring of a certain crossing, we should try to collect as much information as we are able to. The more information we have, the more certainty that we will have concerning the genotype of a single individual, therefore, being able to predict which would be its offspring genotype.

Some of the colours present in donkeys do not strictly resemble those appearing in horses. It even may change from one donkey breed to another. Donkey red is different from that of horses, and always seems to hedge toward the brown or mousey tones. The red tone is also much clearer in the larger donkeys than in the miniatures.

Dr Phil Sponenberg states that foal coat colours are the worst indicator of colour. Foal coats can fool you.

All equine colours may undergo some degree of change in hue or shade throughout the lifetime of the animal. Bay foals are born with only a sooty hint of the distinctive black stockings that contrast the red coat. Black foals, on the other hand, are the same sooty shade all over at birth, only darkening to black with the first shed. Grulla foals have a yellowy foal coat, hiding the gun-metal gray tones of the adult horse under the thick fuzz.

Then there are the greys and roans. Gray horses are born any dark colour (in this case Buckskin and Palomino are considered "Dark") and gradually lighten over time as the dark hairs lose their pigmentation. Many gray horses go through a "dapple" phase, with pale silver dapples against a blue-gray coat (if black based). Chestnut and bay horses may go through a "rose" or "pink" phase, and some will be "flea-bitten" - a white base with red hairs scattered throughout.

Roans will often appear solid as foals, with a few white hairs as the only indicator of a colour change. Roans will show their future change on the hip or flank, grays will start to turn on the tail and around the eyes even as youngsters. Roan should be apparent by the first shed from baby fuzz. Horse roans will keep the dark head and legs, and the roaning will occur on the body. A donkey

roan will have a light face and legs, and contrasting dark dapples on a light coat. This form of "roan" in donkeys may in actuality be more of a "grey" type pattern than a true roan.

But no colour change is quite as striking as the appaloosa. Appaloosa foals may be born quite solid in colour, but look at those sclera and hooves. If the eyes are white-ringed, the hooves and skin striped and mottled, keep your fingers crossed. It is true that some of these "ugly duckling" foals have turned into spotted "butterfly beauties" as they mature.

That's foal coat and that "protective coloration syndrome" we discussed above. Foal coats and winter coats are fine as descriptions for what the animal looks like at that stage. The freshly shed adult summer coat should be used as the true coat color. Freshly shed, because the sun can bleach colours. Even with the summer coat, we have some donkey colours that just will not be defined one way or the other. We have smoky blacks (because you can see a cross) and brown or gray/duns, because they show both mixed together. We can do breeding trials to see what colors they throw when they are adult.

To answer the question gray/dun foals may have dark charcoal coats, slate coats, brown coats, brown/tan, rose, or pink hair. Black foals usually have dark hair, black, although black Mammoth foals usually have red winter coats their first year. Spotted foals will keep the same spotted pattern as when they were born - the spotting does not change, but the base color (the dark hair) will act the same as if the spotting was not there - the gray/dun- and white spotted foal could show any of the color we just mentioned (such as dark gray/dun, brown, rose, etc.). If the animal is a frosted spotted white, the colors may be dark and will lighten up. It can sometimes be

told when the frosted spotted white foals are born because even though they have spots, they already have lost the colour around the eye patches, with only dark "mascara" showing. Other frosted foals are born with the dark patches already gone. Research is being carried out to find whether there is some other factor that makes them fade faster or not.

Some of the characters are quite rare to obtain. That is what happens in the black and white spots case. Black is dominant, but is diluted by "dun", and modified by Agouti. This means both parents have to carry black or be black. Then you have to get the spots, which, as discussed earlier, you are getting 50/50 chances. If black spotted animals are only bred to gray/dun, then you have taken away the necessary factor to match up the black.

If you want to try for black and white spotted (or dark brown) you have to take your black and white spotted (say a jack) and breed him to a select group of jennies.

This is your grouping:

Group 1:

All black jennies (in which you have a 50/50 chance of getting black solid or black spotted).

Group 2:

Black and white spotted (you have a 50/50 chance for each of the parents to give a spotted gene) and all of your foals should be dark.

Group 3:

The jennies should be gray/dun with one black parent. They should be carrying a recessive for dark (we would rather say dark than black, or black/brown, or smoky, because of all the other factors on top that might cause black to come out looking brown, etc.). If you take these black-

carrier jennets and breed to your black spotted jack, you have the chance of gray/dun (since it is dominant) in both solid or spotted, and black if the genes pair up properly (in both solid and spotted, that 50/50 chance). The same thing applies to your gray-dun spotted jennets - if they have a black parent, you have got those chances for gray-dun or black, spotted or solid.

You just have to hope that the genes pair up right and you manage to get the dark spots.

Unfortunately, when facing coat color genetics we have to face another important issue. As we may know there exist some health problems that may be inherent in various colours. We need to break this question down into parts.

The most important question is that of the lethal white gene. This is a complicated subject. For example, in Paint horses with Overo patterns (see the coat patterns section of this chapter) there is a gene defect, now discovered to be recessive that causes foal death. The foals are born white with blue eyes or nearly white (with spotted parents) and are either stillborn, or die shortly after birth because a vital part of the colon is incomplete. Researchers have now located the gene in the overo horses.

The question is whether we have this gene in donkeys or not. We will say this simple, but the statement is very important. We do not know if we have the lethal white gene because no one has reported any such incidents in donkeys. The only way we will ever know if this fault exists is for people who lose foals at birth to keep records of the foals' colour, to have a post-mortem done on the foal, and to record the parent color. A dead foal from two spotted parents - but you have no idea what it died from and therefore there is no way for it to help any research team find out if the flaw exists.

Unless figures on foal deaths are given, no one will ever be able to determine if these deaths are accidental, or due to some genetic factor.

Apart from this, there are genetic health problems, but more are conformation-related than colour related. Since we cannot say anything about lethal white, the only other real colour-related problem is sunburn on unpigmented or pink skin. Blue eyed whites and spotted donkeys with lots of white may get badly sunburned on the pink or unpigmented areas, especially the nose, so it is better to prevent by means of using sunscreen.

Also, there has always been a discussion about whether light hooves (like those on some spotted animals) are softer than darker ones. Since most donkeys do not wear shoes and work on hard surfaces, probably not as much of an issue as they would be in a work horse or mule. Other illnesses such as white line disease are problems more probably related to outside conditions than to the color of the hoof.

It is possible that many other diseases such as the aging gray equivalent in donkeys (Frosted) have the same gray-linked disease as in horses, CIDS, or a Combined Immune Deficiency but, as it happens with donkeys in many other disciplines, no records are present. It is possible, but not enough research has been done. If you are breeding for colour, or breeding certain bloodlines and problems start occurring (not just bad bites or popped stifles, which should be eliminated from breeding herds, but dead foals or a lot of lost pregnancies from certain colour combinations) then what would be the most useful thing to do is to take the time to have DNA samples done, and have a postmortem assessment done on dead foals. Those registries could be extremely useful not only for the future of our breeding programs but for the

international community of equine breeders. The point colour (the muzzle, eye rings, belly) is totally separate from the body colour. Black body colour is recessive whether or not the points are light or dark. Dark points are recessive to the white points which are why you see them more often. The donkeys with the dark points (termed no light point) have two recessive genes for the dark points. The donkeys with light points can carry one recessive gene for dark points. If you get two recessives together the surprise black-muzzle foal pops out.

Fashion is the global trend and fashion also affects donkey coats. There even exist some regional tendencies; which often affect European breeds that should adapt to a certain coat colour standard. Worldwide, there have been a cyclical tendency, and like the 60s fashion everything comes back. Brown was first, then spots, then black, and now sorrel. We know that some breeders would eventually like to come up with a true sorrel spotted donkey, but so far, that elusive red-and-white has not shown up. Hopefully in the very near future that genetic tests for the basic colour genes in donkeys will be commercially available. This will help you to tell if your gray-dun jennet can have black or sorrel foals, or if your animal is truly brown instead of black.

see Figure 26.

CURIOUS FACTS

KEY FACTS WHEN TRYING TO WORK WITH COAT COLOUR GENETICS:

The genes for all colours are present in all animals. They may just be the "no" version of the gene, instead of the "yes" version of the gene. This goes for dogs, cats, horses, donkeys and mules. It is best to think of the genes as a series of switches, according to Dr. Phil Sponenberg, one of the leading color genetic researchers, or as the cars on a long train. All of the switches are there, even if in the "off" position, or all of the cars are connected to the train, even if they are empty. In describing colors, at the moment we will do in the known terms, which are the equine basics. This means using horse color genetic layouts, with variations where we already know that donkey colors differ. While it is easy to say that a horse is a chestnut (ee), what we are really saying is that all of the other colors are "off", so instead of writing out the entire chain each time, we only refer to the ones that are important to the color we are looking at. A chestnut horse is really: ee dd gg rr tt oo splspl crcr chch nprl nprl zz... and so on. If researchers looked at this, they would see an animal that carries non-black, agouti status unknown, non-dun, non-grey, non-roan, non-tobiano, non-frame, non-cream, non-champagne, non-pearl, non-silver, etc. If you are building a color equation, you have to stack all of the blocks or factors in all of the switches or train cars. A black and white spotted donkey is not just black spotted. It is E_aa dd gg rr ss... (or black, non-brown, no gray, no roan, no dun, non-spotted...). Changing any one of these sets of genes will change not only the outward appearance of the animal in most cases, but also how the animal will reproduce.



Figures 24 & 25. (Figure 24) vicked.vicky & (Figure 25) Getty images (2007-2008) (Figure 24) the Painted Donkeys of Gaza. Gaza City zookeepers have found a creative way of drawing crowds to their dilapidated zoo - by painting their donkeys. The Marah Land Zoo's only two zebras died of hunger earlier this year when they were neglected during the Israel-Hamas war & (Figure 25) In 2007, the "Pink Taco" restaurant pulled a donkey dyed in pink which was called "Pinky" and even paraded it around the streets of Los Angeles. This cruel promotion is not even the first time Pink Taco has painted a donkey pink in the interests of gaining customers [Photographies] Accessed from (Figure 24) <http://forum.xcitefun.net> & (Figure 25) <http://www.dailymail.co.uk/>

7. LIFESPAN AND THE IMPORTANCE OF DENTISTRY

In horses kept in captivity, the average life span ranges between 25 and 40 years old. In the wild their lifespan is around 25 years old. They are considered adult horses at the age of 4, and this is when they start to be trained and mount. If they are in good health, a horse can be mounted until well into their 20s. Donkeys live much longer than horses; its lifespan can reach up to more than 40 years (even more than 70 years old). Their sexual maturity is approximately reached 2 years after birth, and they mate whatever time of the years it is.

As well as it happens in horses, we pay attention to donkey's teeth to guess about their age. The deciduous teeth of a young donkey are replaced by the permanent teeth between the ages of 2½ and 4 years. The dental formula for the donkey permanent teeth is:

This grouping occurs on both sides of the mouth top and bottom for a total number of approximately 40 teeth in the adult donkey.

The donkey's dental formulae and tooth number was found to be the same as in horses with a higher prevalence (17 %) of canine teeth in female donkeys.

SPECIES	DECIDUOUS/ PERMANENT	INCISORS	CANINES	PREMOLARS	MOLARS
Donkey	Deciduous	3/3	0/0	3/3	-
	Permanent	3/3	1/1(♂)	3 (4 if wolf teeth are present) /3	3/3
Horse	Deciduous	3/3	0/0	3/3	-
	Permanent	3/3	1/1(♂)	3 (4 if wolf teeth are present)/3	3/3

Table 6. Donkey's & Horse's dental formulae. This grouping occurs on both sides of the mouth, top and bottom, for a total number of approximately 40 teeth in the adult donkey.



Figure 27. Rocky Mountain Rider (2013) Born in 1941, Flower is both the World's Oldest Donkey and Longest Lived Equine [Photography] Accessed from <http://www.rockymountainrider.com>

Horses have rudimentary canines and in diastema. The size of the root is proportionally larger than the crown. The molars have enlarged surfaces and higher crowns. They have delayed root development and complicated folding of enamel. Incisors have high crowns and folded enamel surfaces. Their roots converge. A horse's wolf tooth (PM1) is often lacking. Molars and Premolars form a continuous surface. Premolars have a high rate of wear and continually erupt. The upper teeth are wider than the lower. There is no infundibulum in the lower teeth.

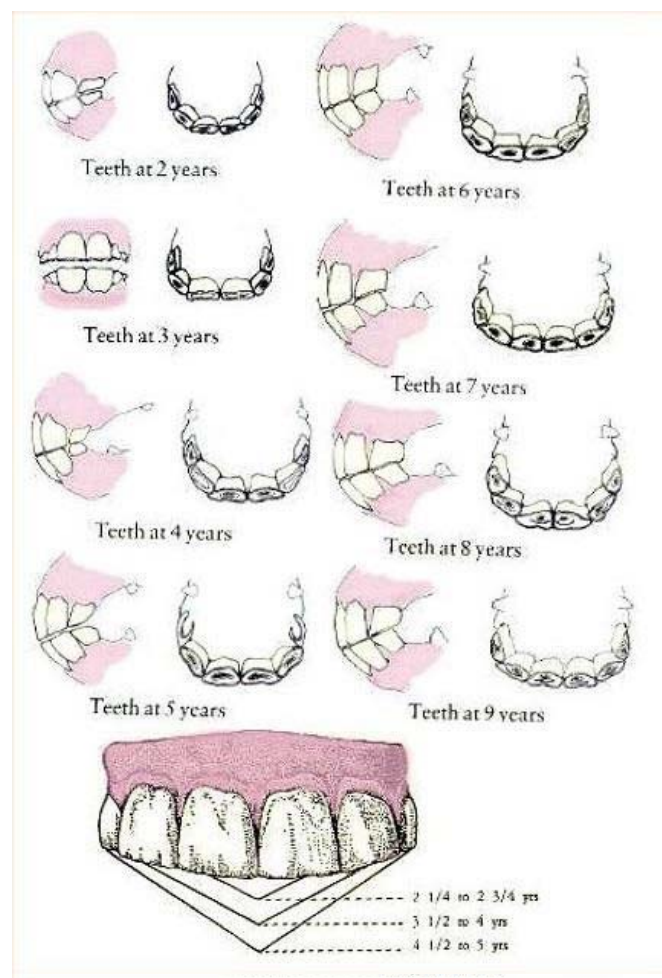
Horses can be aged by their teeth. At 2 and a half years the first permanent incisor will erupt; At 3 and a half the second permanent incisor will erupt and at 4 and a half the third permanent incisor will erupt. Over 5 years of age the folding of the enamel ring (infundibulum) can indicate age. There is a 7 year hook and over 13 years of age a dental star will be present.

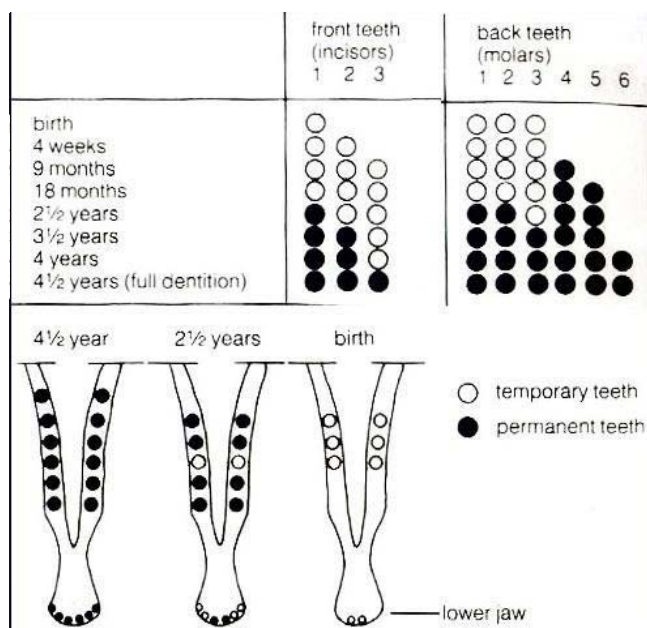
The Galvayne's groove is a brown groove on the upper corner incisor teeth and indicates that the horse is over 10 years old. At 15 the groove will be approximately half way down the tooth; At 20 the groove will run down the whole tooth; Over 20 the groove begins to disappear; At 25 the groove will only be visible on the bottom half of the tooth. At 30 the groove will usually be gone.

As well as in horses, in donkeys, the wolf teeth are the first premolars and have no practical function. They are present in approximately 30% of females and 65% of males. The incisors are used to cut off the plants or food so that it may be taken into the mouth for chewing. The molars and premolars (cheek teeth) chew and grind food between the upper and lower arcades. The incisors and cheek teeth continue to grow throughout the animal's life and are kept in level wear by the opposing tooth above or below. Sharp "points" may develop

on the outside edges of the upper cheek teeth and/or inside of the lower cheek teeth. These points can irritate or cut the cheeks or tongue and cause the animal to be reluctant to chew food properly.

If a tooth is lost, then the remaining opposite tooth may elongate and interfere with normal chewing motion. Signs of poor tooth conformation include: difficult, prolonged, or slow chewing; dropping food; behavioral issues undertake drooling; quidding (when an animal stores a bolus of food in the side of its mouth, or it drops food after a few bites); tongue, cheek, or lip injuries; lack of appetite; abnormal mouth odor; weight loss or poor body condition; and colic. Common tooth problems (in decreasing frequency of occurrence) include: sharp edges on cheek teeth; short, irregular, missing, uneven cheek teeth in old donkeys; loose teeth; and broken incisors.





Figures 28 & 29. Vicki Abbott (2001) (Figure 28) Donkey teeth age determination & (Figure 29) Donkey Temporary and Permanent Teeth [Illustration] Accessed from <http://www.calkinsart.net>

If the wolf teeth are found in an abnormal position they may angle towards the tongue or become inflamed around the gum, resulting in oral discomfort. Treatment for this is to remove the problem tooth. Overshot jaw conformation may result in uneven wear of the first and last cheek aiming at ruling out with attendant chewing problems.

An oral exam is best performed by using a speculum to open the mouth. Sedation may be used to facilitate dental procedures and relieve fear and anxiety caused by the equipment or the sensations transmitted to the teeth. As with all procedures on donkeys, patience and a calm attitude are a necessity. Pain medications may be indicated following a prolonged procedure or if mouth sores are discovered. When using a speculum for dental work, it is important not to use it for a prolonged time, particularly in older donkeys as they may have temporomandibular joint problems or cervical spine arthritis that could be aggravated by forced opening of the mouth. All dental abnormalities may not be

correctable at one time; it may be better to do a partial repair and then complete the rest at a later time.

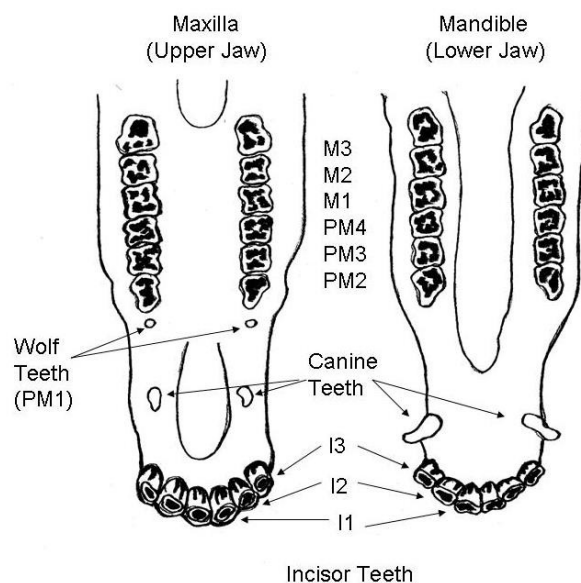


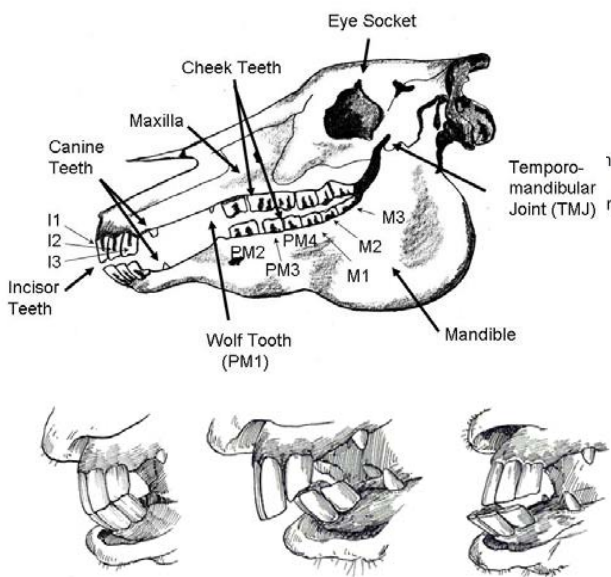
Figure 30. Bradley G. Klein (2012) Occlusal surfaces of the donkey teeth [Illustration] Accessed from Cunningham's Textbook of Veterinary Physiology.

In older donkeys, loose cheek teeth may be left in place if not causing any problem as removal may result in loosening of surrounding teeth. An infected cheek tooth may be pulled with extraction forceps or may require further surgical treatment. Removal of a loose incisor tooth may alleviate discomfort. Dietary management, such as feeding on chopped forage products or mashes, can compensate for the inefficiency of loose cheek teeth.

Routine dental care for donkeys is similar to that for horses. Small-sized dental floats are available for use in miniature donkeys. Bite abnormalities are relatively common in both miniature donkeys and miniature horses. This results from a lack of genetic diversity and reluctance of breeders to remove animals with improper bites from their breeding programs. When size and sales become over-riding considerations, conformation often suffers. Both over and under-bites are common.

These result in problems primarily with the incisor teeth, but severe abnormalities may also affect the cheek teeth. Dwarfism is also relatively common in miniature equines, often accompanied by bite abnormalities and a need for corrective dentistry is especially important in affected animals. Breeding decisions should be made with the long-term health of the animals as the major deciding factor.

A decrease in tooth length, pulp horn length and pulp horn width can be noticed as the animal ages, as well as an increase in occlusal secondary dentine depth, although not all these age changes are statistically significant. Normal histological and ultrastructural features of donkey teeth are identified and found to be similar to equine findings. Enamel is found to be thicker buccally in both maxillary and mandibular cheek teeth. There is no significant difference between donkey and horse incisor microhardness. Examination of donkey skulls at post mortem examination showed donkeys to have a higher degree of anisognathia (27%) compared to horses (23%).



Figuras 31 & 32. Figures 31 & 32. (Figure 31) Bradley G. Klein & (Figure 32) Sue Weaver (2012-2014) (Figure 31) Normal dentition of the donkey & (Figure 32) Donkey Jaw Conformation. From left to right; even (correct), overshot (parrot-mouthed), undershot (monkey-mouthed) [Illustrations] Accessed from (Figure 31) Cunningham's Textbook of Veterinary Physiology

Post mortem dental examination demonstrates a high prevalence of dental disease (93%) and in particular cheek teeth diastemata (85%). Furthermore, age is associated with increasing prevalence of dental disease and diastemata.

Diastemata is also associated with the presence of other dental disorders and with colic-related death in affected donkeys. There is no difference in the medial and lateral width of diastemata but periodontal pockets are deeper laterally. The definition of valve and open diastemata is confirmed by assessment. An increased prevalence of most dental disorders with age is demonstrated as there is an association between dental disease and weight loss, poor body condition score, supplemental feeding and previous episodes of colic. There is a significant association between age groups and dental disease, and age groups and body condition score, but there was no association between dental disease and body condition score. However, body condition score is not associated with supplemental feeding or faecal parasite egg counts either.

Polyodontia is defined as the presence of teeth in excess of the normal dental formula. In equids, supernumerary teeth are uncommon but, when present, are usually located mainly in the caudal aspects of the cheek teeth rows (distomolars), also being found adjacent to normal cheek teeth or even in an ectopic location.

It is believed that this disorder is a result of an inappropriate differentiation of dental germinal tissue during gestational development, with external trauma also acting as an initiating factor, when teeth germs are affected. The presence of these abnormal teeth can lead to axial displacement, dental overgrowths, dental-related soft tissue damage, diastemata

formation, periodontal disease and development of secondary sinusitis.

Polyodontia is recorded in 2.25% of the donkeys, presenting 36 supernumerary teeth, with 2.80% being incisors and 97.20% cheek teeth, with an increasing prevalence as the animal ages. The caudal aspects of the maxillary cheek teeth rows are the most common locations for supernumerary teeth development (distomolars). The mandible was far less commonly affected than the maxilla.

Although polyodontia is uncommon in donkeys, it should be considered in the differential diagnosis of dental disease. A methodical oral examination and a complete radiographic survey of the entire dental arcades are crucial for a correct early diagnosis and treatment plan implementation. The increasing prevalence of fully erupted supernumerary teeth recorded in older groups suggests a late onset eruption process, and therefore, in donkeys undergoing regular dental prophylaxis, the presence of previously unnoticed supernumerary teeth should always be sought.

8. ANATOMY

A donkey is distinguished from a horse by his longer ears, his short upright mane, and by the coloration on his head: the lighter, finer hair on his muzzle and around his eyes. Donkeys have no forelock and have a switch for a tail. The hair in the flank of the donkey has no upward whorl and the donkey has chestnuts only of the forelimbs. The ergots of the donkey tend to be more prominent and suggestive of a vestigial footpad. Some male donkeys have teats on their sheath and have proportionately longer reproductive organs than horses. Donkeys have small boxy hooves with thicker hoof walls and a more upright hoof angle. Donkeys have lower withers and more prominent anterior manubria (the sternum protrudes further cranially), and the donkey pelvis is a different shape. The donkey mandible is formed of thicker, denser, bone, and the space is narrower than that of the horse (Burnham, S.L., 2002). Except the size, tail, ears and other visible characteristics there are some hidden ones. There are several subtle anatomical differences between donkeys and horses, most of which are located in the head and neck region (Den Boon, P., 2012). Donkeys have five instead six lumbar vertebrae as described in table 2, also horses have 64 chromosomes and the donkeys have 62 chromosomes.

Donkey	C7	T18	L5	S5	Ca 15- 17
Horse	C7	T18	L6	S5	Ca 15- 21

Table 7. The vertebral formulae for the donkeys and for the horses (Jamdar, M.N. and Ema, A.N., 1982).

Most donkeys and many mules lack the obvious saddle holding withers of the horse. Most saddles are constructed on saddle trees designed to accommodate a horse's comparatively prominent withers (a feature

that asses and most mules are sorely lacking). Furthermore, there is a current tendency in horses towards seeking the roundness of the back and the widening of ribs, then the most of the saddles are crafted to fit those characteristics. The same can be said for fitting donkeys with bridles designed to fit their short-eared kin (see Book 2, Chapter 14). While a horse and an ass may have heads of the same length, the horse's browband will be way too narrow to fit donkeys and mules. Nor are "ear bridles;" made for horses' short, slender ears, correct for donkey wear. Few donkeys tolerate having their delicate ears crammed through ear loops, and once in there, the base of the donkey's ear is likely to be painfully chafed.

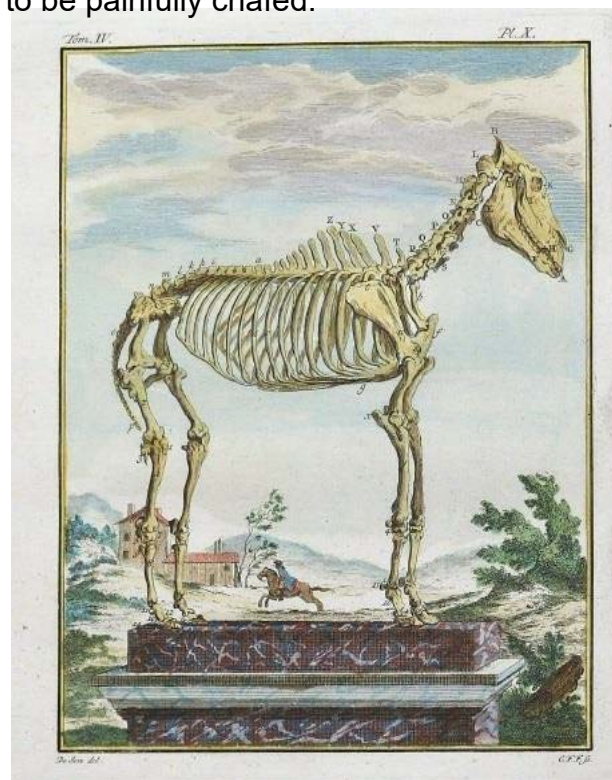


Figure 33. George Louis Leclerc, Comte de Buffon (1801-1807) Horse skeleton from *Histoire Naturelle*, published in Amsterdam from 1801-1807 [Hand-coloured Engraving] Accessed from <http://www.ebay.com/>

Donkeys are more adapted to the outskirts of deserts and similar environments. Some of their anatomical features are the adaptation to these conditions. On the other hand horses

and ponies are native to lush grassland regions.

Some of these adaptations are long, large ears which may help the animal to cool down in hot desert sun, contrary to horses have much smaller ears. Another fact is the lack of undercoat that makes donkeys more resistant to heat although it entails a greater risk of wet weather. Donkey's hair is also longer and coarser than that of a horse. The donkey's mane and tail hair is stiff. It has no true forelock and the tail has short hair to switch more like a cow than a horse. Also hair colour is different. Donkeys have mostly the same genes involved in coat color than horses do but, some of the patterns vary, are not present or are not likely to be seen (see Equine colour genetics in this Chapter).

Other features are connected with vocalization in donkeys, some anatomical forms of upper respiratory tract, which include different vocal folds and laryngeal sacculles from those in horses. Where cross-sectioned donkey heads were compared two conclusions about larynx were made: the presence of an extended recess between the openings of the guttural pouches and the angle of the airway and aditus laryngis that differs from horses' (Lindsay, E.F. and Clayton, H.M., 1986). Further transverse and median sections of the heads revealed that the guttural pouches of donkey were much smaller than those of the horse, and all the anatomical structures related to the guttural pouches of donkey resemble those in the horse with differences in the pharyngeal recess which was deeper and larger in donkey (Mobini B., 2012).

Overall anatomy of upper respiratory tract has its own specificity, which conditions much more aspects than just vocalization, for instance a greater sensitivity to viral and other diseases of respiratory tract. The nasal

opening of the nasolacrimal duct is located in the lateral to dorsolateral aspect of the nostril (Herman C.L., 2009) and can be very challenging to find. The nasal passages and trachea are narrower, the nasopharyngeal recess is deeper and the epiglottis is sharper and more angled. The practitioner treating donkeys will have to take care when intubating or passing a stomach tube to avoid bruising and hemorrhage (Thiemann A.K, 2008).

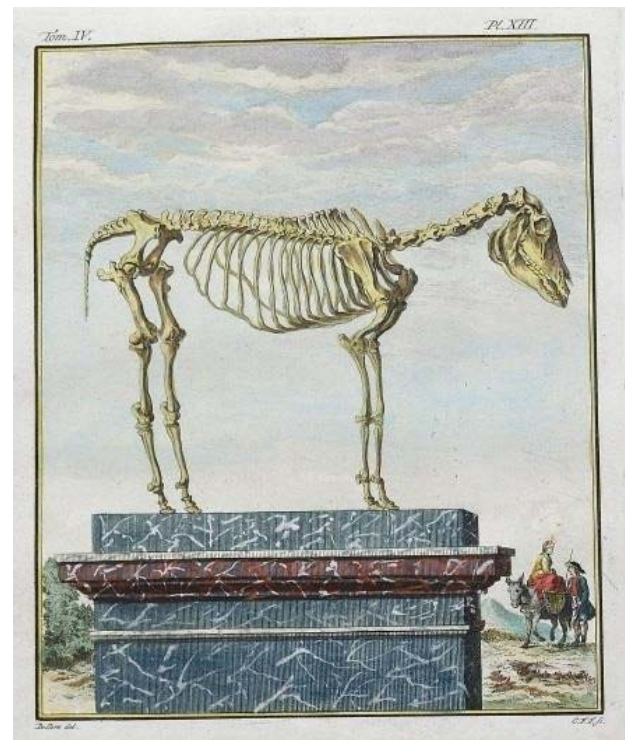


Figure 34. Figure 34. George Louis Leclerc, Comte de Buffon (1801-1807) Donkey skeleton from *Histoire Naturelle*, published in Amsterdam from 1801-1807 [Hand-coloured Engraving] Accessed from <http://www.ebay.com/>

Practical concern with the anatomy of the larynx is the placement of a nasogastric tube (Burnham, S.L., 2002). The particular structure is unique to the donkey, the pharyngeal recess or diverticulum, is caudomedially located to the guttural pouches. This pharyngeal recess in the donkey has a slightly constricted opening, is about 2–3 cm in diameter and stretches to 6–7 cm in length (Lindsay, E.F. and Clayton, H.M., 1986; Hutchins, B., 1984).

Its central location in the pharynx puts it in a direct line to entrap the nasogastric tube, preventing it from entering to the esophagus. Another unique feature of the donkey is the angle of the opening of the airway from the pharynx to the larynx, which tilts on average 5.5° caudally. This differs from the horse, where the aditus rostrally angles 2.5° from the perpendicular (Lindsay, E.F. and Clayton, H.M., 1986). In a recent study, this angle has shown to cause difficulty in visualizing the trachea with an endoscope, but the scope could pass easily directly into the diverticulum (Fores, P. et al., 2001).

One additional difference is that the donkey typically has a narrower ventral meatus than a horse of equivalent size and age (Fores, P. et al., 2001). The donkey has the reputation of excessive bleeding during the procedure of passing the tube. This may be because the nasal passage is so narrow or because the recess traps the tube. The practitioner will have better success entering this very narrow nasal passage by using a small diameter tube. The rostral aperture of the naso-lacrimal duct of the donkey is located in a different area of the nostril flare than that of the horse. In the horse, the opening can be found at the muco-cutaneous junction on the floor of the nostril, slightly medially. In the donkey, the opening of the naso-lacrimal duct is located laterally on the flare of the nostril, and is slightly dorsal (Schoener, S., 1981).

The donkey is susceptible to fly-strike at the medial canthus of the eye. If the lacrimal duct and surrounding tissue becomes inflamed or infected, tears spill over and attract more flies. After addressing the removal of fly larva, infection or other sources of inflammation, the duct may still not be patent, deeming it necessary to irrigate the lacrimal duct from the nasal aperture (Pohlmeyer, K. and Wissdorf, H., 1975), this almost never happens in the horse.

It is usually necessary to use a penlight and light sedation to locate this opening because of the very small size of the nostril of the donkey and his resentment of its handling under such situations (Burnham, S.L., 2002).

Horses have a thin myofascial layer, called the cutaneous colli muscle, which covers the jugular furrow. This is a relatively small V-shaped muscle developed in the superficial fascia on the caudoventral region of the neck. It arises from the manubrium sterni and a median fibrous raphe. The fibers dorsocranially diverge from this raphe to the sides of the neck, thinning out and blending into the superficial cervical fascia (Sack, W.O., and Habel, R.E., 1977). When assessing donkeys in the anatomy section it is showed that this muscle is more than a rudimentary layer, and the muscle tissue on the specimens is remarkably thicker, covering the middle one-third of the jugular furrow, in effect, obliterating the furrow in this region (Schoener S., 1981).

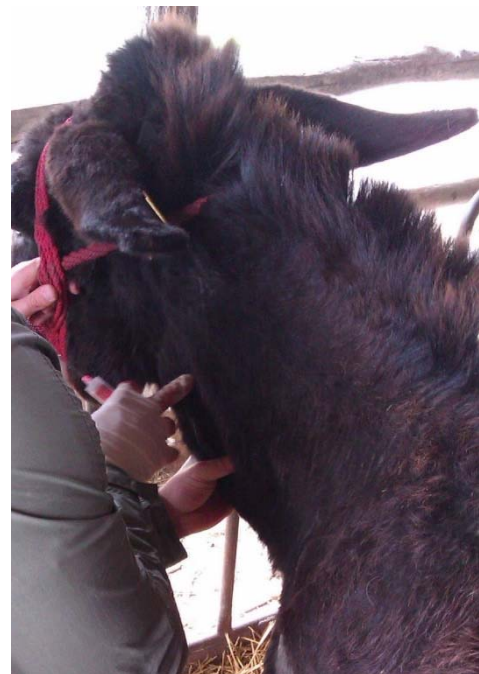


Figure 35. Mihajlo Erdeljan (2013) Right hand is pointing to a place on the neck which is the most suitable for blood extraction, respectively the upper one third of the jugular furrow [Photography]

The origin of the cutaneous colli is further up along the median raphe arising from the manubrium. Also that muscle can be palpated on the live donkey. Curiously, the manubrium of the donkey is also larger and protruded further forward. The jugular vein is more easily palpable above and below the muscle. Advice for the practitioner who performs the venipuncture is to use the upper one third or lower one third of the jugular furrow to palpate the jugular vein before attempting the “stick.” Exact spot on the upper one third of the jugular furrow is showed in Figure 35.

The shape of the donkey sacrum and the spacing and direction of the spines of the sacrum and coccygeal vertebrae differ in the donkey (Shoukry, M. et al., 1975). Also, the location of the end of the spinal cord and the end of the dura differs from those of the horse. Injection of a local anesthetic into the epidural region requires knowledge of these differences. Indications for caudal epidural anesthesia in the horse include surgical procedures involving the tail, perineum, anus, rectum, vulva, and vagina (as for Caslick’s suture, rectovaginal tear repair, prolapsed rectum, or tail amputation), and symptomatic relief of pain during obstetric manipulations (Mansmann, R.A. and McAllister E.S., 1982). Most common indications for epidural anesthesia in the donkey include rectal or vaginal prolapse or to treat melanomas in the tail and perineal region (Shoukry M. et al., 1975). The sacrum of the horse is a relatively flat bone with five segments (Heath E.H. and Myers V.S., 1972). The donkey’s sacrum also has five segments, but often the first coccygeal vertebra is fused to the sacrum with occlusion of the sacro-coccygeal space. The croup muscles of the donkey are usually less developed than the horse.

In the horse, anesthesia is injected in the first inter-coccygeal space at an angle of about 45° from the horizontal (Heath E.H.

and Myers V.S., 1972). In the donkey, the injection site is in the second inter-coccygeal space, directing the needle at an angle of 30° from the horizontal. This site is more suitable because there is a wide interval between the second and third coccygeal vertebral spines, and the anesthetic can be injected forward under the second coccygeal vertebrae spine. The needle can be introduced into the vertebral canal here because there are no large tail muscles, and the spines of the sacral segments and the coccygeal spines are more easily palpated in the donkey.

Donkeys and horses have slightly different hooves which are more round in horses, while in donkeys the hoof is more elongated from front to back, and more upright when viewed from the side. There is also a large number of more subtle differences in distal limb, some of them are listed in Table 8 (Collins, S.N. and Thielen Van, B., 2012):



Figure 36. Nina Leen (2012) Dr. S.H. Chubb, Osteologist at the American Museum of Natural History, adjusting a wire brace on the skeleton of a small donkey, November 1944 [Photography] Accessed from <http://wnycradiolab.tumblr.com/>

PARAMETER	HORSE	DONKEY
Capsular shape	<ul style="list-style-type: none"> • Circular solear profile • Capsule inclined • Truncated cone? 	<ul style="list-style-type: none"> • 'U' shaped profile with flare at heels • Capsule of upright, 'boxy' / quadrilateral appearance. Proportionally narrower than horse • Truncated cylinder?
Dorsal Hoof Wall Angle	<ul style="list-style-type: none"> • Forms 45-50° 	<ul style="list-style-type: none"> • Forms approximately 55° • More upright by 5-10°
Lateral/medial angles	<ul style="list-style-type: none"> • Inclined • Lateral 101.5° • Medial 101.5° 	<ul style="list-style-type: none"> • Almost perpendicular • Lateral 91° • Medial 88.5°
Capsular Dimensions Height ratio	<ul style="list-style-type: none"> • Relatively large hoof capsule • Midline: Quarters : Heel Ratio 3:2:1 	<ul style="list-style-type: none"> • Relatively small hoof capsule • Midline: Quarters : Heel Ratio 3:3:1.5
Heel	<ul style="list-style-type: none"> • Sloping heel 	<ul style="list-style-type: none"> • Strongly developed heel buttress to give upright appearance
Solear weight bearing	<ul style="list-style-type: none"> • Sole does not normally bear weight • Sole height up to 10mm 	<ul style="list-style-type: none"> • Evidence of solear weight bearing? • Sole height up to 13mm
Frog	<ul style="list-style-type: none"> • Intimate association with capsule. Contained within the other structures of the capsule 	<ul style="list-style-type: none"> • Frog appears to be separate from the other structures of the capsule
Periopic groove	<ul style="list-style-type: none"> • Merges with coronary groove 	<ul style="list-style-type: none"> • Widens at heel and fuses with frog • Periopic hyperplasia?
White line	<ul style="list-style-type: none"> • 2 - 3.5mm dorso-palmar depth, dependent upon bodyweight 	<ul style="list-style-type: none"> • No greater than 1 mm dorso-palmar depth
Dorso-palmar hoof wall depth (HWD)	<ul style="list-style-type: none"> • Tapers from the midline to the heel • HWD at MDC ~ 10mm 	<ul style="list-style-type: none"> • Does not appear to taper • HWD at MDC > than the horse?
Hoof function	<ul style="list-style-type: none"> • Recognized pattern of deformation during load bearing 	<ul style="list-style-type: none"> • Pattern not known • Modeled deformation indicates differences • Deformation not as pronounced?
Chestnuts	<ul style="list-style-type: none"> • The domestic horse is almost alone among extant equines in having chestnuts on the hind legs 	<ul style="list-style-type: none"> • Donkeys have no chestnuts on their rear legs.

Table 8. Some of the differences in distal limb between horses and donkeys (Collins, S.N. and Thielen Van, B., 2012).

9. DISEASES

Donkeys and horses share common diseases but in some cases they have slightly different response, clinical pictures or outcome. In general donkeys are a greater resistance to diseases and the clinical symptoms in donkeys are less pronounced than in horses. Treatment of diseases is the same, of course with adequate dosage and some specific features. Donkeys are capable to survive in harsh environmental with poor food, a couple days without water or even partly salt water. In the same way they withstand diseases without dramatically manifested symptoms. In many countries donkeys are held in poor regions, often highlands with restricted veterinary attention so a large number of donkeys were never a subject of serious veterinary actions.

Diagnostics in basics is the same as it is in horses. Physical exam maybe simpler in some elements in donkeys, when they are smaller and so that their fixation is easier to carry out. Smaller size has one fault; it is either impossible or very difficult to perform rectal exploration which is very significant to diagnose abdominal organs in horses. During diagnostics we could use all the specialized methods that are in use in horses with one restriction. We must take care of the fact that some of the physiological values are different in donkeys than the ones in horses – Table 3. Since donkeys are not used much in competitive pursuits, subtle changes in performance, as you would see in the horse, are not picked up soon and they may display disease signs when in an advanced stage (Duffield, H., 2008)

There is also a safety concern, when horses kick they usually give a warning and kick with back legs straight back, but when donkeys kick, it is often without warning and the kick can both be directed backwards or to the side (like a cow's kick).

Respiratory illnesses are pretty much important for this kind of equids, and they are not manifested, in most cases, as dramatically as in horses. But there are diseases in which clinical outcome could be more severe in donkeys. Among them, we find the example of influenza where horses usually recover from uncomplicated influenza within 10 days; the only symptom that can last longer is cough. If there is a secondary bacterial infection may prolong the recovery period. On the contrary, there is a relatively high mortality rate in donkeys (Daly, J.M. and Mumford, J.A., 2001), and the routine diagnostics shows a high titer of antibody against influenza in almost all adult individuals (Erdeljan, M. et al., 2013). In general younger donkeys are more sensitive to viral respiratory diseases but older donkeys usually suffer from chronic diseases like RAO, wheeze or chronic kidney damage.

Colics are also important for donkeys but there is no such intense expression of pain like in horses. Usually the only symptom is depression or anorexia. The mortality risk for all colics is higher than reported in other equids. A retrospective matched case-control study of all impaction colics indicated that older donkeys, those fed on extra rations and those that previously suffered colic and have dental disease were at increased risk of impaction. In contrast to other equids, impaction was the most commonly reported cause of colic (Cox, R., 2007).

Diagnostics of lameness could be hard to perform because it is not easy to make a donkey go the desired way or walk, trot or gallop because of their known stubbornness.

One of the important factors which follows the breeding of donkeys is obesity. It is more common in jennies in conditions of

lack of exercise and with nutrition with high values of carbohydrates. In these conditions donkeys usually accumulate fat on the sides of the neck and along the crest, but also in the abdominal and thoracic cavity, which is more dangerous. Horses that are obese, get fat more or less equal. If this condition prevails in donkeys its consequences is hyperlipemia which can be linked with laminitis.

The following two conditions are closely related to obesity in the donkey (Den Boon, P., 2012):

- Hyperlipaemia in the donkey is a life-threatening condition, where the donkey is affected by a stressor (e.g. disease, actual stress etc.) and stops eating its food. The resulting negative energy balance and mobilization of fatty acids from the adipose tissue quickly spirals out of control and can result in multi-organ failure and death. It is the practitioners challenge to recognize the symptoms (e.g. dullness) at an early stage and initiate the treatment.
- Laminitis is a common and often not recognized condition in the donkey, partly because of the stoical nature and their anecdotal high pain threshold. It is closely related to obesity and its treatment differs subtly from a horse, especially with regards to frog support and the different loading pattern in a donkey's foot. The treatment generally consists of the administration of oral analgesics (e.g. phenylbutazone), acetylpromazine and footpads covering the entire sole.

10. TREATMENT

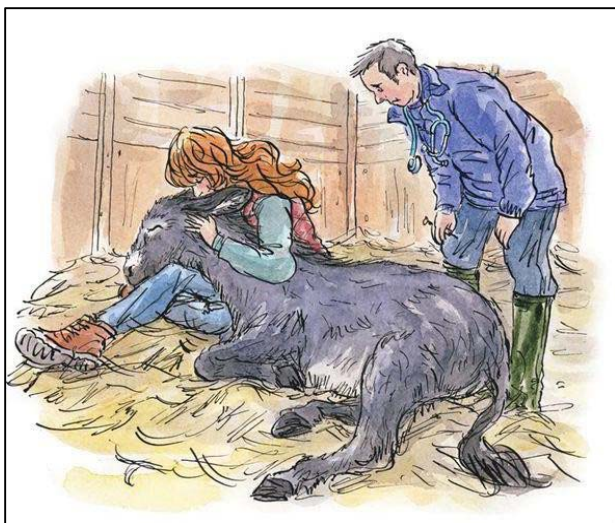


Figure 37. Susan Hellard (2013) Tear flow in the Hammond house as Rex the donkey falls ill [Photography] Accessed from <http://www.express.co.uk>

There are many physiological differences of donkeys versus horses which affect drug distribution and metabolism (Aronoff, N., 2010). Donkeys can maintain their plasma volume even when 20% dehydrated while horses cannot (Lizarraga, I. et al. 2004). Elimination of flunixin meglumine after a single dose has been shown to be faster in donkeys than in horses or mules. It has been suggested that shorter dosage intervals may need to be applied in donkeys though there have not been studies to confirm this fact. Clearance is fivefold higher for phenylbutazone in donkeys than in horses and the dosing interval may also need to be shorter in donkeys.

Differences have been reported for the aminoglycosides (gentamicin, amikacin). In Mammoth asses, a lower dose of gentamicin was required than in horses. Amikacin was rapidly cleared in donkeys, which might affect clinical use to prevent infection (Lizarraga, I. et al. 2004).al., 2004).

The literature supports the need to reduce dosing intervals in donkeys for many commonly used drugs, either as the result of increased metabolism or renal excretion compared to horses. Dosing adjustments

should be based on Pharmacokinetics / Pharmacodynamics PK/PD investigations in donkeys, preferably in studies directly comparing drug disposition with horses (Mogg T. D., 2012):

Antimicrobial drugs – penicillins:

- Na penicillin G – elimination $t_{1/2}$ shorter than horses
- Ampicillin – AUC less than horses and body clearance greater than horse, +/- due to more rapid renal excretion in donkeys
- Summary – penicillins may need be administered more frequently in donkeys

Antimicrobial drugs – trimethoprim / sulphonamide combinations (TMS):

- Sulfonamides – AUC and MRT less than horses, body clearance greater than horses
- Trimethoprim – MRT (Mean residence time) less than horses and body clearance greater than horses
- Differences in hepatic metabolism may be responsible for these differences
- Summary – TMS may need be administered more frequently in donkeys

Antimicrobial drugs – aminoglycosides:

- Gentamicin – pharmacokinetics similar to horses and no change to dosing regimen (except for Mammoth asses – smaller V_d (distribution volume), thus require a lower dose rate than horses)
- Amikacin – elimination $t_{1/2}$ shorter than horses, may require more frequent dosing

²The biological half-life or terminal half-life of a drug (or any xenobiotic agent) in blood is the necessary time for the amount of agent present in the body (or in blood plasma) to be reduced by half, by means of diverse elimination processes.

- Note – once daily dosing regimens have not been investigated in donkeys

Antimicrobial drugs – tetracyclines:

- Oxytetracycline – AUC (Area Under The Curve) less than horses, body clearance greater than horses, +/- due to more rapid excretion in donkeys
- Summary – tetracycline drugs may need be administered more frequently in donkeys
- Note – doxycycline has not been investigated in donkeys

Antimicrobial drugs – fluoroquinolones:

- Marbofloxacin – elimination $t_{1/2}$ longer than horse and body clearance less than horse
- Summary – despite PK differences no alteration to dosing regimen required in donkeys
- Note – enrofloxacin has not been investigated in donkeys

Analgesics drugs – phenylbutazone

- MRT less than horse, body clearance greater than horse, more rapid and greater metabolism to oxyphenbutazone (active metabolite) than horse
- PK differences even greater in miniature donkeys
- Summary – dosage may need to be higher and dosing interval shorter in the donkey

Analgesics drugs – other NSAIDs:

- Flunixin – AUC and MRT less than horse, body clearance greater than horse, may require more frequent dosing than horse
- Ketoprofen – V_d and body clearance greater than horse, +/- due to more

rapid renal excretion, horse dosing regimen less efficacious in donkeys?

- Carprofen – AUC and MRT greater than horse, body clearance less than horse for both inactive R(-) and active S(+) enantiomers, may require less frequent dosing than horse
- Meloxicam – MRT less than horse, body clearance greater than horse, very rapid clearance may preclude use in donkeys

Analgesics drugs – opioids:

- Tramadol – most parent drug metabolised to inactive metabolites but oral bioavailability greater than horse, more efficacious than in horses?
- Fentanyl patches – +/- donkeys achieve analgesic concentrations more rapidly than horses and may require more frequent patch changes

Anaesthetic drugs:

- Ketamine – metabolism more rapid than horse, may require more frequent re-dosing for maintenance of anaesthesia
- Guaifenesin – AUC and MRT less than horse, body clearance greater than horse, donkeys require a lower dose rate to produce recumbency

Anthelmintic drugs

- Macrocyclic lactones – some PK differences reported but recommended dosing regimens same as horse
- Triclabendazole (a flukicide) – some differences in metabolism between horse and donkey, but same as horse recommended dosing regimens



Figure 38. Winry Marini (2007) Horse being taken care of [Illustration]
Accessed from <http://winryequinegallery.blogspot.com.es>

The bottom line in the limited studies done on drug metabolism in donkeys is that they seem to clear drugs faster so they may need to have a shorter dosing interval and the drugs may need to be given more frequently. There are also differences found between the different donkey breeds, which is a whole area needing further studies.

In the case for neonatal donkeys, use the drugs normally used in horse foals but remember that the species differences may alter clinical response (Aronoff, N., 2010). There are some major clinical pathological differences seen in donkeys too. The serum of normal donkeys is very pale compared to horse serum.

11. REPRODUCTION (SEE BOOK 1, CHAPTER 7)

The cervical anatomy of the female donkey (jenny) differs from that of the mare not only in size (cervix being longer than the mares and smaller in diameter) but also in the existence of a large protrusion from the cervix into the vagina. There are dorsal and ventral folds in the vaginal region that impede passage to the cervix, but they can be relaxed (Vendramini, O.M. et al., 1998). A mare does not achieve the same degree of tone in her uterus when she is in foal to a jack.

In general mares and jennies have similar estrus cycle. The most important distinctions are lower conception rate which is approximately of 60-65% for mares and a longer gestation length. Male reproduction is also very similar but donkey testicles are relatively large, pendulous and have a testicular artery of considerable size that needs a ligature placed when gelded (Den Boon, P., 2012).

Gestation length may vary between breeds, age, genetics, environmental influences and many other factors but it is clear that there is a distinct variation between horses, donkeys and ponies – table 9. Twins are rare, but occur more frequently among donkeys than horses.

GESTATION LENGTH		
	Mean gestational length	Gestational range
Pony	330	320-345
Thoroughbred	340	320-360
Donkey	370	360-380

Table 9. Gestation length for some equids (Knottenbelt, D.C. et al., 2004).

Beside the fact that horses and donkeys have different number of chromosomes they can have a common offspring which is in 99.9% sterile. There are two

combinations – stallion (horse) x jenny (donkey) which produces hinny and another is jack (donkey) x mare (horse) which produces mule. During readiness for birth in the jenny, it experiences similar changes to the ones that mares go through in readiness for the new birth. The following signs are seen in jennies (Sewell, S.E., 2008):

1. Gradual enlargement of the udder in the last 30 days
2. Enlargement of the teats several days prior to foaling
3. Softening of the pelvic ligaments that create a groove along either side of the spinal column in the loin area towards the tail head. May not be noticed in maiden or hairy jennets
4. The vulva elongates
5. The jennet goes off to herself and shows restless behavior
6. Just prior to birth, the tail is carried out away from the body, lifted up and kinked to one side
7. Unlike mares, the jennet will foal any time day or night, so she needs to be watched very closely.

In horses, it is usually pretty easy to tell whether a foal is premature or dysmature. In horses, the breeding date is usually known and the gestation is more defined. In donkeys, especially miniature, the gestation length can range from 11 months and 1 week to in excess of 13 months. Because of this, it is hard to truly define a premature donkey foal. Premature donkey foals have the following characteristics (Gross, B.R., 2000):

1. General weakness
2. Low birth weight
3. Reduced suckling reflex
4. Delay in standing

5. Inability to maintain body temperature
6. Ears flopped downward and backward
7. Difficulty in establishing a normal jennet/foal relationship



Like a mare a jenny will come back into heat nine to ten days after foaling. But owners usually skip this "foal heat" because their rate of conception is low. Jennies have very strong maternal instinct and some of them will not come into estrus while they have a foal with them. Long gestation and skipping foal heat together usually last more than a year, so it is a very good result if a jenny gives birth three foals in a four years.

Donkeys also form strong bonds with herd mates and separation may increase the risk of anorexia and pining in the dam which can lead to other problems like hyperlipemia (Burton, A.J. et al., 2008).

Figures 39, 40 & 41. (Figure 39) HD4desktop.com, (Figure 40) Up To My Ears In Mini Horses & (Figure 41) Martha & Dowell Howard (2010-2014) (Figure 39) Spotted Irish Cob Mare and Colt, (Figure 40) Spotted Pony mare and colt & (Figure 41) Spotted Miniature Jenny and Foal [Photographies] Accessed from (Figure 39) <http://hd4desktop.com>, (Figure 40) <http://toadhillminis.blogspot.com.es> & (Figure 41) <http://www.donkeys.net>

12. THEIR ROLE AS WORKING ANIMALS

More than half of the worldwide population depends on animal traction, which is developed by 90 million of equids.

Equids, as working animals have multiple advantages for the development of rural activities:

- They are available local resources,
- They are renewable, and generate job positions
- They do not require fossil fuel
- They are relatively cheap, and at the end of their useful life they can be used by families, or sold together with other products.
- They are autosustainable, feeding upon available local food resources that would be wasted or scorned if not eaten by those animals (FAO, 2000).

Figures 42, 43 & 44. Francisco Javier Navas González (2014) (Figure 42) It is estimated that the worldwide equid population is around 44 million of donkeys, 15 million of mules and 65 million horses (Fielding & Pearson, 1991). (Figure 44) The 80% of the worldwide equine population (90 million animals) is found in developing countries (97 % out of all the mules, 96% out of all the donkeys and 60% out of all the horses (Pritchard et al., 2005; Wilson, 2002). (Figure 43) The half of the 44 million donkeys (most of them used to work), are found in Asia, a quarter of them in Africa, and the rest mostly in Latin America (The Brooke,

The recent increase in petrol prices at a worldwide level has especially affected poor countries, and consequently, in a lot of developing countries such as Pakistan and India, vehicles have experimented an increased abandon rate due to an increase in the use of animal traction vehicles (donkeys, mules, horses) (The Brooke, 2007).



Figure 45. ООО «Голд Мустанг» (2012) Donkey and horse riders toasting [Photography] Accessed from <http://www.goldmustang.ru>

In countries that are quickly getting industrialized such as Brazil, China, Ecuador, Egypt, India, Mexico, Morocco and Pakistan, donkey population stay stable, and it appears that this trend is going to be kept like this as long as a significant part of their population still have not got access to any kind of motorized vehicle (Fernando & Starkey, 2004; Starkey & Starkey, 2004).

Worldwide mule population has also increased, but horse population has been at a standstill during the last 30 years (Starkey & Starkey, 2004).

The most of working animals are property of people who use them as the only economical resource of their families, occasionally pretty numerous.



Figure 46. Helen Barnes (2012) A donkey and a horse pulling a cart [Photography] Accessed from <http://skyfaxa.blogspot.com.es/>

In developing countries, where we find 96% of worldwide donkeys and 60% of worldwide horses (Pritchard et al., 2005; Wilson, 2002), hundred thousands of poor people depend on them for their survival, using them as water carriers, or even as a tourism attraction. Up to 20 people can depend on each animal for their daily survival (The Brooke, 2007).



Figure 47. Bicycle Touring Pro (2012) A horse kissing a donkey [Photography] Accessed from <http://bicycletouringpro.com>

Apart from their traditional role as transport and mount animals, donkeys are highlighted because they are cheaper to maintain than oxen, more resistant to drought and so that are used more and more in light farming, threshing and water extraction tasks (Howe et al., 1997).

In fact, research suggests that working animals approximately provide a 50% percent of the agrarian power that the world needs (Swann, 2006).

United Nations foresees that less developed countries' population will have got doubled from 804 million to 1.7 billion in 2050; something that suggests that working equids in the above mentioned contexts is not only going to continue but highly increase (Biffa & Woldemeskel, 2006).



Figure 48. Kê Lang Thang (2009) A horse and a donkey playing [Photography] Accessed from <http://www.kelangthang.com/>

13. CONCLUSIONS

From what we have learned, donkeys are not just a smaller version of horse with long ears. The donkeys and the horses are all a fascinating animals with subtle differences and many similarities. Some of those differences are very important to veterinary practitioners, some of them are not, however for the ones who simply enjoy with donkeys the most of those differences are just interesting things to read about more than a list of disadvantages.



Figure 49. Pluvier-Croisette (2013) A horse and a donkey playing (but they could be fighting) [Photography] Accessed from <http://pluvier-croisette.deviantart.com>

CURIOUS FACTS

HORSE AND DONKEY: AN “UNLIKELY” FRIENDSHIP

Though there may not be any problem when keeping donkeys and horses together, it depends on the behavior of the animals that share the same space. Experience tells us horses tend to push donkeys around, and there is a significant risk that the horse(s) and donkey will not get along.

In addition, donkey physiology is such that their nutritional needs differ from that of horses. Donkeys do not need the same high protein pasture or feed commonly provided to horses. They gain weight quickly on a horse diet, and this presents a higher health risk. Ideally, horses and donkeys should be kept separately to provide the best care for the donkeys.

There is a particular moment in which an exchange has shown to be very useful. When donkey foals and horse foals reach their weaning time, it is useful to place young donkeys with mares and young horses with jennies (for a month –weaning period). Jennies show a stronger maternal instinct than mares, but it still makes it easier for the young to go through this “harsh moment”.

Also, donkeys have given great results when training horse foals. In the USA, It is common to place a jenny or a gelding with an untrained donkey (often those which have been grown up under semi wild state), in order to calm them down and as an introduction to a training program. To place a donkey with race horses before a race is also useful to relax them before racing, even more, when those horses have been transported from a relatively distant place.

Horse foals are usually weaned when they are around 4 to 5 months old (around at least 6 months when it comes to donkeys), but we may be able to wean them earlier in the case of a severe drought or if there is an unusual issue that warranted weaning sooner.

Once, weaned, donkeys can still be useful for horse foals’ training. Donkeys can do a much better job of establishing a Great Foundation for Halter Breaking than People can. Maybe they are not able to train horse foals at a high level but donkey trainers teach them the basics.

Many different horse attitudes towards donkeys, and vice versa, have been reported. These range from donkeys that live with a herd of horses and became much attached to one horse in particular, going so far as to be protected from other attacking horses, or mares which are terrified from them and are even able to bolt through fences to get away from them. Though it is true that a lot of horse and donkey couples have got on well as if they were sharing their space with a member of their same species, it has also been stated that it is the donkey, the one in need of companion, not the horse, so this relationship it is unnecessary.

As we may know, just like people, animals have their own behavior, so when companion is possible, they make great companions. For a calm, steady horse, one donkey will do. They do not mind being left behind if you take the horse for a ride or trip. For rude, frisky (young) horses, two donkey are preferable, that way they can tag team and have back up if the horses get too rowdy.



*Figuras 50 & 51 Figures 50 & 51. Moonlit Oaks Ranch (2012)
Before and one month after the rescue and care provided by
Ellis, the mare [Photographies] Accessed from
<http://www.wordreference.com>*

Colts, especially when they are not much old, tend to be obnoxious, when place with a single donkey in the same pen, but, when they are kept with two donkeys, they can manage to deal with the colt antics. One will play while the other rests. Though smaller in size, they are able to hold their own against colts. Donkey back feet are quick and agile, then, young horses will learn respect, quickly, but with no great harm done.

When young donkeys have suffered severe mistreatment, though it can be risky to keep them with mares (because of the aggression likelihood or the possibility of worm infestation), it has been shown that, when the mare has an easy-going temperament, and if we take the risk, they act as perfect surrogate mothers. They teach little donkeys and get to recover much better and faster.

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Chapter 5

Donkey Welfare and Care

Faith Burden

1. INTRODUCTION

The domestic donkey is a unique and much undervalued animal whose ancestors were African Wild Asses. Domesticated only for approximately 5000 years the donkey has been used for draught and production purposes, working and living alongside humans all around the world (*Rosset, S., et al., 2008*). More recently the donkey has also found a role as a pet, companion and therapist. Whilst the donkey has a rich and important role in human development and history including featuring in many religious texts and historical stories, the donkey has often been denigrated as a lowly beast of burden and is frequently looked upon as the 'poor relation' to its more respected cousin, the horse.

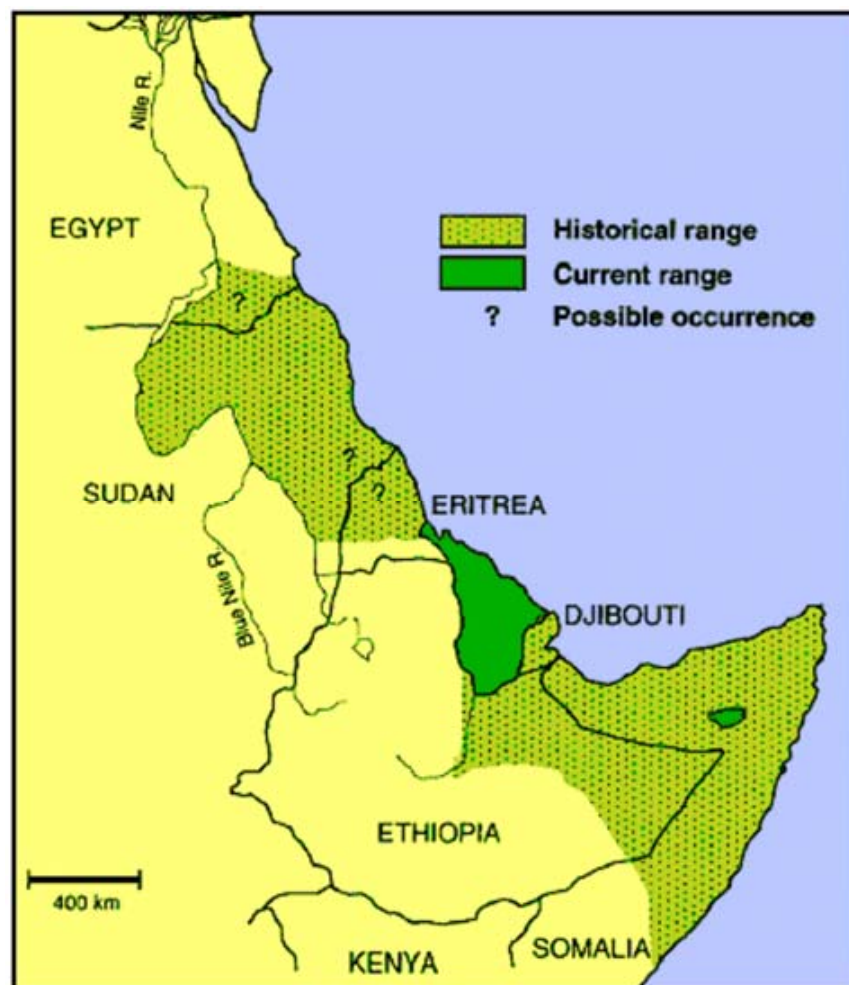


Figure 1. Happy Donkey Hill B&B and Holiday Cottages (2011) Race between a horse and a Jenny and her foal [Photograph]
Accessed from <http://www.happydonkeyhill.co.uk/>

The donkey is a unique, wonderful species with needs all of its own. This chapter aims to provide the reader with an overview of the nature of the donkey and how best to care for donkeys to improve their quality of life.

2. THE ORIGINS OF THE DONKEY (SEE BOOK 1, CHAPTER 2)

Descended from African Wild Asses the domestic donkey has retained many traits of its ancestors who would naturally live in semi-desert and often mountainous environments (Beja-Pereira, A., 2004), see Figure 6. Wild Asses would inhabit areas with sparse plant life and widely dispersed water sources with temperatures ranging from extremely warm in the daytime to very cold at night.



Figures 2 & 3. IUCN and the Equid Specialist Group (2014) (Figure 2) Distribution Map of Asian Wild Asses & (Figure 3) Distribution map of the African Wild ass [Maps] Accessed from <http://www.equids.org/>

CURIOUS FACTS

TRACING BACK A COMMON ANCESTOR, A GENOME WORLD RECORD

Dr. Ludovic Orlando and Professor Eske Willerslev, scientists at the Centre for GeoGenetics at the Natural History Museum of Denmark (University of Copenhagen) have sequenced the so far oldest genome from a prehistoric creature. They have done so by sequencing and analyzing short pieces of DNA molecules preserved in bone-remnants from a horse that had been kept frozen for the last 700.000 years in the permafrost of Yukon, Canada. By tracking the genomic changes that transformed prehistoric wild horses into domestic breeds, the researchers have revealed the genetic make-up of modern horses with unprecedented details.



Figure 4. Mikal Schlosser (2013) The past is cared for with space suits and clean labs at the University of Copenhagen [Photograph] Accessed from <http://news.ku.dk/>

CURIOUS FACTS

DNA molecules can survive in fossils well after an organism dies. Not as whole chromosomes, but as short pieces that could be assembled back together, like a puzzle. Sometimes enough molecules survive so that the full genome sequence of extinct species could be resurrected. Over the last years, the full genome sequence of a few ancient humans and archaic hominins has been characterized. But so far, none dated back to before 70,000 years.

First, by comparing the genome in the 700,000 year old horse with the genome of a 43,000 year old horse, six present day horses and the donkey the researchers could estimate how fast mutations accumulate through time and calibrate a genome-wide mutation rate. This revealed that the last common ancestor of all modern equids was living about 4.0-4.5 million years ago. Therefore, the evolutionary radiation underlying the origin of horses, donkeys and zebras reaches back in time twice as long as previously thought. Additionally, this new clock revealed multiple episodes of severe demographic fluctuation in horse history, in phase with major climatic changes such as the Last Glacial Maximum, some 20,000 years ago.



Figure 5. Ludovic Orlando (2013) Two pieces of the 700,000 year-old horse metapodial bone, just before being extracted for ancient DNA [Photograph] Accessed from <http://news.ku.dk/>

Terrain would frequently be steep with rocky substrates and narrow mountain paths being commonplace. This is in stark contrast to the wide grassy plains inhabited by the donkey's relative the horse. Sadly populations of Wild Asses in Africa and close relatives the Asian Wild Asses have suffered considerably in recent years. The Nubian Wild Ass is presumed to be extinct in the wild and there are fewer than 700 Somali Wild Asses thought to remain in existence in the wild with approximately 200 in captive breeding programmes, Somali Wild Asses are listed as critically endangered and are classified as 'red' on the International Union for the Conservation of Nature (IUCN) list. Asian wild asses have suffered similarly with many subspecies also being listed as critically endangered or threatened by the IUCN.



Figure 6. The Donkey Sanctuary (2011) Donkeys in their natural arid environment. [Photograph]

To truly understand the nature of the domestic donkey and its unique requirements it is important to appreciate these humble beginnings in the mountains of countries such as Eritrea, Somalia and Ethiopia. The evolution of the donkey as a desert dwelling animal able to survive in some of the harshest conditions on earth has been utilised (and often exploited) by humankind often with little thought for the true nature of this important species.

Throughout this chapter frequent references to the origins of the donkey will be made to illustrate key requirements. You can take the donkey from the desert but you cannot take the desert from the donkey!



Figure 7. Christophe Boisvieux/Corbis (2003) Yemen, 2003. A boy riding a donkey is almost swallowed by a sandstorm in Wadi Mur [Photograph] Accessed from <http://www.theguardian.com>

3. DONKEYS ARE NOT HORSES! (SEE BOOK 1, CHAPTER 4)

It is virtually impossible to discuss the donkey without making reference to its more famed and oft respected cousin the horse. Those lucky enough to understand, own or work with donkeys know that although there is shared heritage between the donkey and horse they are remarkably different in their physical traits and behaviour. Unfortunately many inexperienced people will assess, treat and try to train a donkey as one would a horse. This approach is often fraught with problems.

The commonly held beliefs that donkeys do not feel pain and are stubborn or stupid are almost certainly due to people looking at donkeys and judging them using the wrong behavioural and physical scales (i.e. those of the horse)! As we shall see later in this chapter the donkey displays more subtle behaviours than does the horse and may exhibit different behavioural repertoires when frightened, in pain or pressurised. Whilst the horse may exhibit obvious signs of distress such as snorting, fleeing or sweating the donkey may simply freeze, move more slowly or lose its appetite. Similarly veterinary care of the donkey must take in to account the many physical differences that the donkey has when compared to the horse, this will be discussed briefly later.

Where the worlds of the donkey and horse collide to produce mules (the result of a breeding between a jack donkey and horse mare) or more rarely hinnies (the results of a breeding between a jenny donkey and a stallion horse) the results are a hybrid equine with superior physical and mental traits when compared with either of its parents, often termed hybrid vigour (*Proops, L. et al., 2009*).



Figure 8. *My Life as a Bike* (2011) A donkey and a horse living together [Photograph] Accessed from <http://mylifeasabike.blogspot.com.es>

Sadly a consequence of hybrid breeding is that mules or hinnies are almost certainly sterile due to the difference in the chromosome numbers of their parents. An understanding of both horse and donkey behaviour and care is invaluable for those associated with mules.





Figures 9 & 10. Mandy (2008) A donkey and a horse living together in perfect harmony [Photographs] Accessed from <http://www.flickr.com/>

CURIOUS FACTS

THE LUNGWORM MISCONCEPTION

One of the greatest reasons, apart from behavioural agreement, which avoid donkeys being kept in same place as horses, is the possibility of lungworm infestation.

The Donkey Sanctuary has moved to dispel the myth that donkeys and horses cannot live together because of the lungworm parasite *Dictyocaulus arnfieldi*.

The Donkey Sanctuary, based near Sidmouth in Devon, England, says that despite the risk from lungworm, donkeys, horses and ponies can live together safely, provided a regular de-worming programme as advised by a vet is followed.

The charity is also keen to clear up misconceptions about parasite infection levels in donkeys in Britain. It recently presented the results of a study assessing parasite infection levels in donkeys to vets and parasitologists. It is often quoted that a large percentage - up to 70 per cent - of Britain's donkeys are infected with lungworm. Over a four-year period, the study carried out showed that only 4 per cent were infected with lungworm.

TOP LUNGWORM FACTS

- | | |
|---|---|
| 1 | Donkeys are assumed to be the natural host of this parasite. |
| 2 | Donkeys tolerate even a large manifestation of lungworms without apparent signs; whilst it can cause severe coughing in horses and ponies that contract the parasite. |
| 3 | Lungworm larvae can live on pasture for a considerable length of time, so good pasture management can help reduce infection. |
| 4 | Faecal sampling is the best way to diagnose lungworm in donkeys. |
| 5 | Donkeys, horses and ponies can live together quite safely, provided a de-worming programme as advised by a vet is followed. |

Table 1. The Donkey Sanctuary (2010) Top Lungworm facts [Table] Accessed from <http://www.horsetalk.co.nz/>

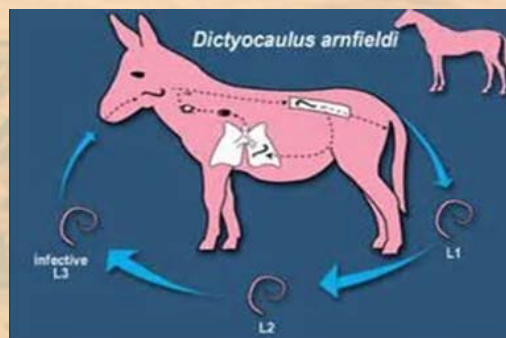


Figure 11. Bregvadzeebi.Ge (2010) *Dictyocaulus arnfieldi* Cycle [Illustration] Accessed from <http://bregvadzeebi.ge>

CURRENT INFORMATION:

An infection of the lower respiratory tract, usually resulting in bronchitis or pneumonia, can be caused by any of several parasitic nematodes, including *Dictyocaulus viviparus* in cattle and deer; *D. arnfieldi* in donkeys and horses; *D. filaria*, *Protostrongylus rufescens*, and *Muellerius capillaris* in sheep and goats; *Metastrongylus apri* in pigs; *Oslerus (Filaroides) osleri* in dogs; and *Aelurostrongylus abstrusus* and *Capillaria aerophila* in cats.

Other lungworm infections occur but are less common. The first 3 lungworms listed above belong to the superfamily Trichostrongyloidea and have direct life cycles; the others belong to the Metastrongyloidea and, except for *O. osleri* and *C. aerophila*, have indirect life cycles. Some nematodes that inhabit the right ventricle and pulmonary circulation, eg, *Angiostrongylus vasorum* and *Dirofilaria immitis*, both found in dogs in certain areas of the world, may be associated with pulmonary disease. Clinical signs relating to a cardiac or a pulmonary syndrome or to a combination of both may occur.

Diseases caused by the 3 *Dictyocaulus spp* are of most economic importance. The cattle lungworm *D. viviparus* is common in northwest Europe and is the cause of severe outbreaks of "husk" or "hoose" in young (and more recently, older) grazing cattle. The lungworm of goats and sheep, *D. filaria*, is comparatively less pathogenic but does cause losses, especially in Mediterranean countries, although it is also recognized as a pathogen in Australia, Europe, and North America. *D. arnfieldi* can cause severe coughing in horses and, because patency is unusual in horses (but not in donkeys), differential diagnosis with disease due to other respiratory diseases can be difficult. *M. capillaris* is prevalent worldwide and, while usually nonpathogenic in sheep, can cause severe signs in goats. Other lungworm infections cause occasional sporadic infections in many animal species in many countries.

EPIDEMIOLOGY:

Dictyocaulus spp —Adult females in the bronchi lay larvated eggs that hatch either in the bronchi (*D. viviparus*), or in host feces (*D. arnfieldi*) after being coughed up and swallowed. The larvae can become infective in feces on pasture after a minimum of 1 week in warm, moist conditions, but typically in summer in temperate northern climates will require 2-3 weeks. Once infective, the larvae can be further dispersed from fecal pats mechanically or by the sporangia of the fungus *Pilobolus*.

A proportion of infective larvae will survive on pasture throughout the winter until the following year but, in very cold conditions, most will become nonviable. The principal source of new infections each year is from infected carrier animals, with overwintered larvae providing a secondary but not unimportant contribution in some countries. In the case of *D. arnfieldi*, donkeys are the prime source of pasture contamination for horses. Because *D. viviparus* infection in cattle is the most economically important, it has been most investigated and many of the observations from it are applicable to the other species.

Clinical disease usually develops on first exposure to sufficient infective larvae; the severity of disease and stimulation of an immune response is related to the number of larvae ingested. In cattle and sheep, this usually occurs during their first season at pasture; however, an increase in the number of older cattle affected has been reported and is attributed to the efficiency of some prophylactic anthelmintic regimens, which prevent exposure at an earlier age. Because transmission of infection to horses requires infected donkeys, first infections can occur at any age in that species.

Once infected, adults generally become immune to further disease, but a proportion will contract subclinical infections during which they act as a source of further larval contamination. Occasionally, when previously infected adults or groups that have not been exposed to reinfection for more than one year, and in which immunity may have waned, are exposed to an overwhelming level of infection, clinical disease may recur.

In areas in which cattle are housed during winter and calves, during their first grazing season, are turned out in late April or May, the first infections can be seen between mid June and late July, but most severe infections develop in previously unexposed calves after multiplication of a second generation of infective larvae on pasture between August and early October.

CLINICAL FINDINGS:

Signs of lungworm infection range from moderate coughing with slightly increased respiratory rates to severe persistent coughing and respiratory distress and even failure. Reduced weight gains, reduced milk yields, and weight loss accompany many infections in cattle, sheep, and goats. Patent subclinical infections can occur in all species.

The most consistent signs in cattle are tachypnea and coughing. Initially, rapid, shallow breathing is accompanied by a cough that is exacerbated by exercise. Respiratory difficulty may ensue, and heavily infected animals stand with their heads stretched forward and mouths open, and drool.

The animals become anorectic and rapidly lose condition. Lung sounds are particularly prominent at the bronchial bifurcation. In adult dairy cattle, milk yield drops severely, and abnormal lung sounds are heard over the caudal lobes. The reinfection phenomenon in adult dairy cattle is usually seen in the Fall; although less severe than in initial infections, the signs are widespread coughing and tachypnea and a marked drop in milk yield.

The signs in sheep and goats infected with *D. filaria* are similar to those in cattle. Pulmonary signs are not usually associated with *M. capillaris* or *P. rufescens* in sheep, but the former can affect goats similarly to *D. filaria*. *D. arnfieldi* is associated with coughing, tachypnea, and unthriftiness in older horses, but few if any signs in foals or donkeys.

CONTROL:

Lungworm infections in herds or flocks are controlled primarily by vaccination or anthelmintics. Oral vaccines are available in Europe for *D. viviparus* (northeastern areas) and *D. filaria* (southeast). Two doses of irradiated infective larvae are given 4 weeks apart at least 2 weeks before the start of grazing or exposure to probable infection. Used properly, they prevent clinical disease, but some vaccinated animals may become mildly infected to the extent that larvae are excreted to perpetuate further infection.

Anthelmintic prophylaxis has become feasible with the advent of anthelmintics with prolonged activity (eg, ivermectin, doramectin, moxidectin, eprinomectin) and sustained-release intraruminal boluses containing oxfendazole or fenbendazole. With persistent anthelmintics, 2 or 3 treatments during the grazing season, the timing of which depends on local grazing practice and epidemiology, are effective and may, by disrupting developing infections, stimulate immunity to the parasite.

Boluses provide continuous anthelmintic protection but, as with the use of multiple treatments, they delay exposure to *D. viviparus* until the animal is adult, when infection (albeit usually less severe) can occur. However, these methods have become popular in that gastrointestinal parasites are controlled simultaneously. Other more sporadic infections can be controlled more easily by management, eg, avoidance of grazing horses with donkeys during infective seasons, indoor husbandry of pigs, and by not mixing sheep and goats on the same grazing.

4. WHAT IS WELFARE? (SEE BOOK 3, CHAPTER 15)

Welfare means different things to different people particularly when in the context of animals. When defining and assessing animal welfare it is important to realise that we are judging the animal's 'Quality of Life'.

When dealing with a domestic species such as the donkey much of the animal's quality of life is dependent on its owner and other humans with which it interacts. Domestic animals have few opportunities to 'choose' their living conditions, companions or workload; rather they must rely on caring, well-informed owners.

When assessing quality of life many 'systems' have been suggested but the most established is that of the 'Five Freedoms' which still nearly 50 years on from its development offers a good framework from which to discuss animal welfare. The Five Freedoms are:

- 1. Freedom from pain, injury and disease** – by prevention or rapid diagnosis and treatment of illness using an evidence base appropriate to the donkey.
- 2. Freedom from discomfort** – by providing an appropriate environment including shelter and a comfortable resting area.
- 3. Freedom to express natural behaviour** – by providing sufficient space, facilities, enrichment and companionship.
- 4. Freedom from hunger and thirst** – by ready access to appropriate and safe food and water.
- 5. Freedom from fear and distress** – by ensuring conditions and treatment which avoid mental suffering.

Practical ways in which the donkey owner, carer or user can ensure donkey welfare is a primary consideration in any management and care system are discussed in this chapter.



Figures 12, 13, 14, 15 & 16. (Figure 12) The Donkey Sanctuary, (Figure 13) SPANA, (Figure 14) RSPCA, (Figure 15) Brooke Hospital for Animals & (Figure 16) Blue Cross for Pets (2014) Donkey Welfare and care Charity Non-governmental organisations [Logos] Accessed from (Figure 12) www.thedonkeysanctuary.org.uk, (Figure 13) <https://spana.org/>, (Figure 14) www.rspca.org.uk, (Figure 15) <http://www.thebrooke.org/> & (Figure 16) <http://www.bluecross.org.uk/>

5. DONKEY BEHAVIOUR (SEE BOOK 1, CHAPTER 3)

The natural behaviour of the donkey has been shaped by its ancestral origins. The natural environment of the donkey may, on occasion, offer plentiful enough food and water to support the formation of small donkey herds which imitate the larger 'herd' structure adopted by horses with dominant stallions ruling a harem of mares; horses are capable of living in such a manner as food and water in their natural plains habitats is in abundant enough supply to support many equines. In the semi-desert, mountainous regions that are the natural environment of the donkey such plentiful resources are rare, the donkey has therefore adapted to live in very small groups of two or may be found as solitary animals, only coming together to breed or when resource availability improves. To improve the chances of finding mates a donkey jack may hold a 'territory', often around a water source (Woodward, S.L., 1979).



Figure 17. Atacama Large Millimeter/submillimeter Array (ALMA) (2014) Playing donkeys [Photograph] Accessed from <http://alma.mtk.nao.ac.jp>

Jenny may also guard food and water resources by establishing a territorial range, such territorial behaviour is different to that displayed by free-ranging wild horse populations who are not generally territorial. This explains why domestic donkeys may display territorial behaviour when living alongside other animals. Such behaviour may lead to the donkey coming in to conflict

with other species which it does not perceive as 'belonging', reports of attacks on small livestock or predators by donkeys (and mules) are relatively common and consideration should be given to this entirely natural behaviour when mixing new animals with donkeys (Burden, F.A. et al., 2006).



Figure 18. M Corti (2013) Grup of Kiangs/Tibetan Wild Asses in Tso Moriri [Photograph] Accessed from <http://www.fotocommunity.de/>



Figure 19. cowgirlrightup (2006) Jenny chasing a dog [Photograph] Accessed from <https://www.flickr.com/>

These guarding instincts have been harnessed by people around the world by utilising the donkey as a guardian to protect sheep, goats and other livestock from attack by predators such as dingoes and coyotes.



“Don't set out on a journey using someone else's donkey”
Somali proverb

“There's no making a donkey drink against his will.”
Dutch proverb

“The donkey won't drink if he can't see water.”
Italian Proverb

Figures 20 & 21. Clem Haagner (2012) Donkey and lioness fight in the western portion of the Kalahari Gemsbok Park across the Nossob River, which forms the international boundary between Botswana and South Africa. When the donkey caught scent of the lioness, it whirled around to face the predator. The lioness and the donkey stared at each other and crabbed sideways across the riverbed. When they got to the opposite side of the bed where the riverbank sloped up gradually, the donkey charged the lioness, which turned tail and ran up the slope with the donkey after it. In all the donkey chased the lioness for about 150 metres. The wind was blowing from the direction of the lioness and as the donkey picked up the scent, it swung around to face the bush. Instead of charging from behind the bush as I it could have been expected, the lioness cautiously emerged and stood staring at the donkey. The two animals stood looking at each other. Lions are used to catching fleeing prey or prey unaware of the carnivore's approach. In fact, a lion won't even attack an animal that stands its ground facing the lion.” [Photograph] Accessed from <http://www.capenature.co.za/>

As herbivores with many natural predators the donkey has evolved with a natural ‘flight or fight’ reaction. For many millions of years the donkey’s ancestors have chosen to run away from predators or when they feel threatened. However, if the situation warrants it they will use their natural weapons of teeth, feet and bodyweight to ‘fight’. The fight instinct of the donkey is more easily engaged than that of the horse whose default reaction is nearly always flight.



Figures 22 & 23. (Figure 22) Greg Anderson & (Figure 23) Michelle Oatman (2011-2013) (Figure 22) A miniature donkey foal chases a rooster at a farm & (Figure 23) Donkey running from other donkeys in a pen [Photographs] Accessed from (Figure 22) <https://www.flickr.com> & (Figure 23) <http://donkeysmiles.blogspot.com.es>

As donkeys frequently live on their own or with their foals fleeing is often not the best mechanism of defence, unlike fleeing as part of a herd you or your offspring are always likely to be the slowest and may end up being caught, fleeing in mountainous terrain also poses particular hazards. Therefore, donkeys are much more apt to consider their response to a threat and when fleeing does not appear prudent they will engage their ‘fight’ response. Donkeys are adept at stamping, biting, kicking and barging other animals that pose a threat. These responses are natural behaviours for the donkey and if exhibited should make an owner or carer question the level of training of the donkey, pain, previous experiences and the donkey’s environment.

Donkeys are naturally gregarious animals and despite the often solitary existence of their ancestors in the wild they prefer and thrive when provided with company of their own species. Donkeys bond strongly and studies have proven the phenomenon of lifetime or long term ‘pair-bonding’ in donkeys (Murray, L., et al., 2012). Although

donkeys will live contentedly with other equines for companion. Research has shown that when given choice they will tend to choose to bond and socialise with other donkeys when placed with a choice of donkeys, ponies and mules (*Proops, L., et al., 2012*).



Figure 24. Arpita (2010) *Lion and Onager (Wild Ass)* Mosaic, Roman, 150 AD. Blood flows on the ground as a lion tears into the back of a fallen onager, or wild ass, on this fragment of a Roman floor mosaic. Although set in a natural landscape, the appeal of this scene for the Roman viewer lay in the immense popularity of wild beast fights staged as public entertainment in the amphitheater. In these shows, wild animals would fight one another or humans - either unarmed criminals or armed professionals. In the 100s A.D., the Roman province of Africa, including modern Tunisia, was flourishing. The region was important both economically and politically and this wealth and power translated into artistic production. More mosaics survive from Tunisia than any other part of the Roman Empire. The mosaic is formed from tesserae, small cubes of colored marble, stone, and glass, set into a bed of mortar. A border survives on two sides of the mosaic, but the original extent of the mosaic on the other sides is unknown. The small size of the fragment suggests that it might be only part of a much larger floor depicting several scenes. Some parts of the mosaic appear to have been restored in antiquity, The J. Paul Getty Museum [Photograph] Accessed from <http://www.getty.edu/>



Figure 25. Michelle Oatman (2011) *Two jennies caring after each other embracing in a hug* [Photograph] Accessed from <http://donkeysmiles.blogspot.com.es/>

The complex nature of donkey bonding is not fully understood but our experience at The Donkey Sanctuary has demonstrated the importance of not underestimating this trait. For example, donkeys may become stressed and refuse food or water when removed from a bonded companion which may put them at risk of developing the potentially fatal disease, hyperlipaemia, furthermore if veterinary treatment is required a donkey's bonded companion should always be kept in close proximity to its friend. Donkeys undoubtedly prefer the company of other donkeys, however when another donkey or even equine is not available donkeys will bond closely with other stock including sheep, dogs and cows. In many cases the donkey – human bond is also very strong; when training, treating or otherwise working with donkeys and even more especially with mules it is important to have the animal's normal handler present as they will be trusted and often act as a source of reassurance and guidance to the animal (Figure 26).



Figures 26, 27, 28 & 29. (Figure 26) The Donkey Sanctuary & (Figures 27, 28 & 29) Brother Lapin's Pilgrimage (2012) (Figure 26) Donkeys bond very strongly, consideration should be given to the donkey-donkey bond and that of the donkey and its owner & (Figures 27, 28 & 29) Owner caring after his donkeys. Sitting down with this foal attracts the attention of his mother who comes over to join in. She stands over me and rubs her chin on his owner head, then sways from side to side over her foal and the owner, rubbing against his shoulder. The owner moves over to sit with another foal and she is really sleepy and sappy, making snoring noises and grunting occasionally when he rubs between her ears. Unlike the situation with the last mother and her foal, this foal's mother is not interested in joining but keeps her distance [Photographs] Accessed from (Figure 26) <http://www.thedonkeysanctuary.org.uk> & (Figures 27, 28 & 29) <http://brotherlapin.com/>



Despite many sayings to the contrary, the donkey is neither stubborn nor stupid. Unfortunately the donkey's natural propensity to freeze when threatened or frightened and their calm, stoic dispositions have led people throughout history to brand the donkey as such. Recent research carried out at The Donkey Sanctuary showed that both donkeys and mules outperformed horses (and in the case of mules they outperformed dogs) in a test of their problem solving abilities. Both donkeys and horses were more accurate and faster problem solvers and showed an ability to approach a problem in a calm manner (Osthaus, B., et al., 2013). It is always important to take account of this quick learning ability when training donkeys and mules as they are able to learn both wanted and unwanted behaviours very quickly. Donkeys in their natural environment would not be expected to be ridden, driven, farriered, injected, transported or any of the other multitude of tasks that we consider

'normal', it is due to their trainability that humans have managed to 'persuade' this once wild animal to perform tasks for us. When training donkeys it is important to focus on techniques which use 'positive reinforcement' techniques, the donkey will be more able to learn and results will be quicker and more refined.

CURIOUS FACTS

EDUCATION BASIC CONSIDERATIONS

To catch your donkey

Have a small area into which the donkey can be enticed or driven. Depending on the degree of difficulty, you may be able to get him into this area every day for his lesson, or if not, he may need to be kept enclosed for the duration of this training. All except the most nervous donkeys will probably be able to be caught after one lesson but as many donkeys are only caught when there is something unpleasant about to happen such as feet trimmed, teeth filed, or veterinary attention, you might be working against a lot of negative conditioning. If the donkey is really uncooperative you might need to leave on a halter (with a 6-12 inch rope with a knot on the end) for the duration of training. This gives you something to take hold of more easily than getting close enough to grasp the halter. Start by taking the halter everywhere with you so that he does not associate the sight of it with the need to escape. Then use it to rub his neck and back in the direction of the hair. Put your arm over his neck and rub the other side of his face with it, which will get him accustomed to the position you will be in when you finally put it on, all the time telling him how wonderful and intelligent he is. Finally, hold the nose band of the halter in front of him and feed him his treats through it. Once you have achieved this, you put the halter on without doing it up, exclaiming what a good donkey he is and giving him a treat, then remove it and repeat so that it is a wonderful game with happy voices and lots of rewards. If he is the difficult one who is wearing his halter all the time, then proceed as above but use another, larger halter to go over the permanent one until you are satisfied you can always get it on, then take both off. Apart from when this controlled training is needed, you should never leave your donkey in the paddock with his halter on. Many people do because they have doubts about their ability to catch their donkey but you have trained yours to love having his halter on. Don't think the job is done now however, and only catch him when needed for something nasty. Make sure you put the halter on every day for a while and even when well-trained continue to put it on occasionally for no reason. It is also a good idea to put it on in the paddock as well as in an enclosed area, as many donkeys will say, 'I know you can catch me in the yard, but no one can catch me in my paddock.'

To tie up your donkey

Do not move onto this until your donkey is happy being caught and the halter is no longer an issue. If you think there will be trouble put two halters with two lead ropes on, as donkeys are very strong and if he once breaks the lead rope or halter while learning he will always try to do it again. Make sure the post is equally strong for the same reason. While he is tied up with a quick release knot stay with him and feed him, praise him and maybe brush him. I say maybe as many donkeys love being brushed and find it as much a reward as a food treat, but others either do not care much either way or actively hate it. Check in with him first. Some people put a car tube several times around the post first and then tie the lead rope to the tube. The advantage is that, if we decide to provide food in the tube, the donkey may not figure out later that when we use it in the future it will mean that he is attached to a human (who is not very strong) and when there is no give he is attached to a post (which is strong). Never leave your donkey unattended while tied, even when he is quite relaxed about it, unless you have actually trained him to be tethered while eating (which is another subject altogether).

To lead your donkey

This is where the donkey comes into his own and says, 'will not and you cannot make me', which is quite true; they are so strong several strong men cannot make a donkey move if he does not want to. One way to get him started is to pull him sideways. He can brace his legs to resist a forward movement but by pulling him sideways in the start of a circle he is off balance and will have to take at least one step to the side to retain balance. This is enough to begin ... loud exclamations of praise, tell him he is the cleverest donkey in the world, and give him a reward. Donkeys really do like to please their owners but sometimes they haven't realised this! A lot of praise goes down well and they start to look for more. Maybe you will now have to pull him back the other way to get another step. More praise. Another trick is to put the halter on and then get someone to bring in a bit of hay. Get him to walk to it, praising him all the way, stopping every now and then to make him start again. If he is hard to stop, make him walk in a circle around you. This would be my last resort as you will not always be able to have him tempted with hay, but if that is what it takes to get him to move the first time you might have to try it. However, the principle behind this is that you find out where your donkey wants to go and lead him there. For example, if he likes going out of the gate to the left better than to the right then take the left turn until you know he is happy being led, then try the right turn when he is in a relaxed state. Another way is to have someone clap hands or rustle a plastic bag behind him. This is where you have to read your donkey. Some would be terrified at a plastic bag being rustled behind them, some would spin around looking for the carrots that come in plastic bags, and others will be just wary enough to walk on without being distressed. Of course the plastic bag shaker must stop the moment there is any movement. Say 'walk on' in a conversational manner. Say 'Walk On' in a determined manner. If he still will not walk get the helper to rustle the bag as you say 'WALK ON' in a no nonsense voice. As soon as he takes a step praise him effusively. If you think he is about to stop say 'whoa' just before he does, and praise him. Say walk on again in your conversational voice - if he does praise him to the hilt, if he does not get your helper to clap, click or rustle while your voice becomes more and more stern.

Remember that your donkey does not know that you wanted to walk the length of the paddock; if you think three steps is all you are going to get out of him the first time then stop after three steps and pour on the praise finishing the session, you can walk the length of the paddock another day. Be very clear in your voice, both with tone and words. Most people use 'walk on', 'whoa', 'stand' and 'trot on', but the words do not really matter as long as you are consistent. You cannot say 'walk on' one time, 'gee up' the next time and 'come on let's go' another time. Also try to match your tone to the urgency of the demand. Such as 'waalk onn' to start, then 'Walk On' if that doesn't work, then 'WALK ON'. If your donkey is being difficult and trying to pull away, we mostly tend to raise our voice bit by bit until we are shouting at them to 'WHOA!!' Whereas we should be slowing down from 'Whoa' to 'Whooa' to 'Whhooaa' in a slow deep voice. Because of the need a donkey has to freeze when there is danger, you will find donkeys will often stop and look into the distance while being led. Do not rush them, watch their ears, and do not ask them to move on until you can see the thing is no longer so interesting. The more your donkey goes about and sees different things, the less time he will need to check out possibly dangerous situations. If however, he is really concerned, say we imagine the presence of a cardboard box on the other side of the road, it is no good trying to get him to move on. You will have to leave him where he is, go over and pat the box, talk to it, examine it closely, then go back and tell him it looks OK to you, at which he will apparently say "You didn't think I was nervous, did you?" and walk past without another glance. My first clue as to how a donkey thinks was when trying to get our two out of a small dry paddock, through a gate with flood waters already running through it and onto higher ground. After two hours of using every method available I told them they would have to stay there and drown, and I went out the gate with water up to my thighs, at which they followed me. They knew what was required but all they wanted to know was how deep the water was and how fast it was flowing. It is also important to ask your donkey where he likes to be led from. Donkeys consider themselves to be equals and will pull back if you get too far ahead, so lead them from beside the head. Some prefer you to be half a step in front to cover the dangerous situations, while others prefer you to be half a step behind to show you are not trying to be superior. There is a place between the shoulder and the nostril where your donkey will feel you are doing it properly.

(Donkey Society of Western Australia Inc, 2014)

6. NUTRITION FOR DONKEYS AND MULES

There is a common saying ‘you are what you eat’, this is never truer than for donkeys and mules. The descendants of the domestic donkey evolved as browsers as well as grazers and survived on lignin rich, low energy, highly fibrous plant material which they would have to range for many miles to obtain. The donkey is a hindgut fermenter and has evolved to have a steady trickle of fibrous plant materials moving through the gut at all times. Donkeys would naturally spend 14 – 18 hours per day foraging and will travel 20-30 km per day (Burden F., 2011). Donkeys kept in domestic environments rarely have the opportunity to exhibit this combination of natural behaviours. Donkeys kept in temperate environments, are frequently fed high energy grasses and feedstuffs whilst being kept in relatively small paddocks with restricted ability to roam. Although working donkeys may travel 20 km or more in a day the requirements of their work may not leave enough time to spend foraging and performing other essential behaviours. Provision of appropriate types and quantities of food is undoubtedly one of the best ways of maintaining good health and enriching the daily lives of donkeys.



Figures 30, 31 & 32. (Figure 30) pgaborphotos, (Figure 31) Brother's Lapin Pilgrimage & (Figure 32) Gerrit (2004-2011-2013) (Figure 30) Donkey grazing in Hungary, (Figure 31) Donkey eating straw & (Figure 32) Grazing donkeys [Photographs] Accessed from (Figure 30) <http://www.pond5.com>, (Figure 31) <http://brotherlapin.com/> & (Figure 32) <http://commons.wikimedia.org>

When compared with horses, donkeys are highly efficient at digesting poor nutritional quality fibre, the donkey's maintenance energy requirements are considerably lower with stated levels varying between 50-75% of that which would be required by a horse of the same size dependent on climate (Smith, D., et al., 2013). Little research has been carried out to establish the protein, vitamin and mineral requirements of donkeys. Protein metabolism and utilisation in the donkey appears to be complex and experience would indicate that donkeys can survive on lower protein containing diets than can horses. Vitamin and mineral levels advised for horses appear to provide optimal levels for donkeys and can be safely extrapolated from (NRC, 2007).

Studies have shown that the daily appetite of the donkey for maintenance purposes is 1.3-1.8% of bodyweight in dry matter per day, in practice this means an average donkey of 160 kg requires 2-3 kg of dry weight feed per day. Feeding of fit, healthy donkeys should focus on providing large quantities of highly fibrous feedstuffs such as cereal straw (barley or wheat straw) or coarse, low energy hay to provide ‘bulk’ with



supplementary higher energy fibre sources such as grass, hay, haylage, alfalfa and beet pulp as required according to body condition and workload. Safe logs and branches should also be provided to satisfy the donkey's natural browsing behaviours (Figure 33). Donkeys do not require energy rich cereal grains, sweet feeds or molassed products; in fact the feeding of such products is poorly tolerated, often wasteful and frequently associated with the development of health issues such as laminitis, gastric ulceration, hyperlipaemia and colic (Burden, F.A., et al, 2009, 2011).

Donkeys are renowned for their thirst tolerance, which should not be confused with their minimal water requirements. Water requirements for donkeys are similar to that of horses and will vary considerably depending on workload, ambient temperatures and during pregnancy and lactation. Donkeys are able to tolerate water losses of up to 30% of their bodyweight without significant adverse effects and will maintain an appetite even when severely dehydrated (Maloiy, G.M.O., 1973).



Figure 33. The Donkey Sanctuary (2013) Donkeys enjoy browsing as well as grazing, branches and logs from safe trees should be provided for enrichment if dentition allows [Photograph]

When presented the opportunity to drink, donkeys will do so rapidly without any apparent illness effects. In spite of the scarcity of water in their natural environment donkeys are naturally suspicious of unknown or contaminated water and will often refuse to drink when

'away from home' or when water is dirty; donkeys will also refuse to drink extremely cold water. This behaviour may leave them at risk of becoming dehydrated or developing impaction colic when temperatures are cold during the winter in temperate regions.



Figure 48. Asim Patel (2013) Indian Wild Ass herd having meal together in Little Rann of Kutch [Photograph] Accessed from <http://commons.wikimedia.org>

CURIOUS FACTS

HYPERLIPEMIA AND OBESITY

ETYMOLOGY

Hiper – too much *Lip (id)* – fat *Aemia* – blood = Literally too much fat in the blood.

THIS IS A COMMON AND POTENTIALLY LIFE THREATENING DISEASE! IT IS A VETERINARY EMERGENCY!

RISK FACTORS

- Being a donkey! Naturally prone to develop it.
- Small pony breeds- Shetlands, Welsh Mountains, Miniature ponies
- Underlying primary disease
- Rapid weight loss
- Dental disease
- Increasing age (uncommon in donkeys less than 18 months old)
- Stress e.g. transport, management changes, separation anxiety (being separated from their companion which will include the death of a companion)
- Feeding cereal mixes also known as concentrates or “hard feed”
- Pregnancy and lactation
- Obesity
- Type of bedding (we only use straw, shavings or woodchip). A donkey may eat its bedding and if it is not digestible it may cause a gut blockage. Very sharp fibre bedding may perforate the gut wall.

PATOGENIA

Healthy donkeys store some energy in the form of fat! Healthy donkeys are in ‘neutral energy balance’. That means the calories they take in (food) are offset by the energy they use up. In this case the donkey’s weight will remain pretty constant. Most donkeys are in ‘positive energy balance’ – i.e. they take in more calories than they need and use up less energy than they should. So - they get FAT! That is bad enough but even worse is when a donkey goes into ‘negative energy balance’ – i.e. its energy needs are not being met by its feed intake. Should this occur the donkey will readily mobilise its stored fat as an energy source. In donkeys the ‘switch off’ mechanism does not seem to be very efficient so fat continues to be mobilised. The fat will enter the blood circulatory system and will infiltrate every organ it reaches via the blood system – e.g., liver, kidneys, brain. This will cause failure of the affected organs because they are literally stuffed full of fat.

CLINICAL SIGNS

Dullness, lethargy, “sham” eating and drinking (donkey going through the motions of grazing, eating from a bucket or drinking but not actually taking anything into the mouth) - so rather vague clinical signs but the observant owner should spot the early, subtle signs. If not treated immediately the signs may progress to:

- Depression
- Anorexia (refusal to eat)
- Halitosis (bad breath)
- Guts stop working/colic
- Abnormal deep red coloured gums
- Dry mucous covered dung/dry dung balls
- Muzzle and head swelling/puffiness
- Tachycardia (increased heart rate)
- Tachypnoea (increased rate of breathing)
- Ataxia – wobbly donkey
- Tremors, fitting, circling (as brain becomes affected)
- Recumbency (lying down/collapsed)
- Death

TREATMENT

A full clinical examination by your vet who will take a blood sample to check the level of fat (also called triglycerides). A useful ‘donkey-side’ test is for the vet to take the sample and leave it somewhere fairly warm. Once in the tube the blood cells will gravitate to the bottom of the tube and the clarity of the liquid which contains the blood cells (serum) can be assessed visually very quickly. Cloudiness will be due to excess fat which will confirm the diagnosis of hyperlipaemia and treatment can commence. Laboratory analysis of the blood sample will confirm the levels of triglycerides (the normal value of which is different in donkeys compared to horses but the donkey-aware vet will know that) but, in the meantime, it is essential to start treatment.

Hyperlipaemia may be loosely classified as mild to very severe depending on how much fat is circulating in the blood system and treatment will be matched to severity. All treatment is aimed at restoring the normal energy balance, thus stopping the release of stored fat, and that means getting energy into the donkey in one form or another. Hyperlipaemia frequently occurs secondary to a primary condition which has caused the donkey to stop eating. For example – if you had severe tooth ache you may not feel like eating! It is vital to try and establish what caused the donkey to stop eating in the first place (the primary condition) and treat for that condition as well!

IF THE DONKEY IS STILL EATING

- The chances of recovery are improved if there is voluntary food intake.
- Encourage with treats (ginger biscuits, grated apple/carrot, jam sandwiches), grazing, handpicked grass or leafy twigs such as hawthorn or raspberry bush (whatever you know your donkey enjoys from hedgerows).
- Hand feeding may be necessary.
- Offer warm water to drink.
- Nursing is every bit as important as any treatment the vet may provide!
- Avoid any extra stress to the affected animal by keeping a companion close by.

IF THE DONKEY IS NOT EATING

- If the donkey is not eating but its guts are working - Nasogastric Intubation (literally nose to stomach tubing). If gut sounds are present, life-saving fluids may be delivered directly into the donkey via a tube gently placed up the nose, down the gullet and into the stomach. The Donkey Sanctuary has produced a recipe of ingredients which are readily available and your vet may already have this or can contact us anytime.
- If the donkey's guts are not working - Intravenous* Fluids (*into the vein) - (life-saving fluids given directly into the bloodstream). A large bag of sterile fluid with all the salts and sugars (calories) the donkey may need will be administered to the donkey via a catheter (needle) placed in the large vein in the neck (jugular vein)
- The donkey will need to be stabled and, of course, in sight of his/her friend.

REMEMBER – THIS DISEASE IS LIFE THREATENING.

Call the vet at the first sign of a donkey behaving in a slightly dull manner or if a donkey has stopped eating. Every second counts!

NEVER UNDER-ESTIMATE HOW IMPORTANT YOU ARE IN THE TREATMENT OF THE DONKEY.

Good nursing – gentle handling, hand feeding, providing treats, taking the trouble to cut leafy browse or hand pick grass – could be the difference between a good or sad outcome.



Figures 34, 35, 36 & 37. Longhopes Donkey Shelter (2014) (Figure 34 –upper left corner) A beautiful 8 year old red-roan standard gelding donkey in perfect weight & (Figures 35, 36 & 37) After 24 months of being fed alfalfa and grain by a thoughtless owner the donkey became 60 pounds (27.21 Kg) overweight, with a fat neck, fat rump and fat pads on his side [Photographs] Accessed from <http://longhopes.org/>

NO HAND FEEDING THE ANIMALS

Never offer a donkey feeding with your hands. This is a fact that many of us will find strange. Hand feeding when there is not any problem which pushes us to do it, shows donkeys (especially jacks) how to bite.



Figures 38, 39, 40 & 41. (Figure 38) Jonathan Pain, (Figure 39) Mike Powell, (Figure 40) Island Photograph & (Figure 40) mjkov (2008-2009-2010-2013) (Figure 38) Do not feed the donkey, while he is pulling up a bucket of water from the well, (Figure 39) Mosaic depicting a Roman slave feeding a donkey with a basket. Not much remains of the Great Palace of Constantinople, built in 330 AD and home to Byzantine emperors for over 800 years. After taking the city in 1453, the Ottomans reduced the palace to rubble and eventually erected the Blue Mosque on top of it. But not all was lost. Excavations in the 1920s uncovered some brilliant mosaic patterns which had once decorated the palace's floors and walls. And these have been preserved in the Great Palace Mosaic Museum, (Figure 40) Lady feeding a donkey & (Figure 41) Donkey hand feeding [Photographs] Accessed from (Figure 38) <http://tapfob486.blogspot.com.es/>, (Figure 39) <http://istanbul.for91days.com/>, (Figure 40) <http://www.dixielandquidedoqs.org/> & (Figure 41) <https://www.flickr.com/>

CAUTION: DONKEY DO NOT SHARE THEIR MEAL (UNLESS THEY ARE TRAINED TO DO IT)

You may have to take especial caution when it comes to jacks, which are ungelded male donkeys, these will be more aggressive and harder to handle, and so that, more prone to attacking. Gelded donkeys actually give the fewest number of problems. A female donkey is called a jenny, and while they are unlikely to cause problems, they are usually more expensive, and can be moody from time to time.

Some people are used to feeding wild donkeys. Be aware that feeding at roadside is dangerous for both wild burros and human safety.

When feeding, jacks can develop much aggressive behaviors, because of being so territorial, even injuring or ripping off weaker animals. This is what happens when an animal is placed into a new location when there are animals previously living there. This is a critical moment, and it lasts until dominance relationships are established. Do not gather the herds together it can be dangerous and deadly. Always remember it is not recommended to feed wild burros because you never know when one will kick or bite, so it is strongly recommended that you admire them from a distance.

When feeding different animals at the same time we must be careful not to foster them to develop aggressive conducts, and always taking into account that if a donkey wants to eat he will be the one winning the battle.



Figures 42, 43, 44, 45, 46 & 47. (Figures 42 & 43) Rabbit2013fun, (Figures 44, 45 & 46) MrFunnYvideosZ & (Figure 47) Maxwell Kusi-Obodum (2013-2014) (Figures 42 & 43) Donkey and dog fighting for feeding, (Figures 44, 45 & 46) Donkey aggressively reacting towards a llama & (Figure 47) Man feeding donkeys [Photograph & Video Caption] Accessed from (Figures 42, 43, 44, 45 & 46) <https://www.youtube.com/> & (Figure 47) <http://m.dailyecho.co.uk/>

DONKEY BALANCED DIET

In their natural habitat donkeys will browse, eating highly fibrous plant material in small quantities throughout the day. During the spring and summer the donkeys at The Donkey Sanctuary have access to restricted grazing. In addition to the restricted grazing they always have access to barley straw to ensure they are getting plenty of fibre. The amount of grass donkeys have access to is controlled; either by strip grazing using electric fencing or by co-grazing with other species to prevent them getting too fat. During the winter months they are housed in large airy barns with concrete run out yards, without access to grass. Instead they have free access to barley straw and are fed a controlled amount of hay or haylage according to body condition. Old or sick donkeys may be fed additional high fibre feeds and supplements in special circumstances to maintain their body weight. If your donkeys have access to grass all year round then very little hay will be required, even during the winter months. Control the amount of grass and hay they have each day to maintain ideal body condition. Grazing should always be considered as supplementary to straw which should make up the majority of a healthy donkey's diet.

Straw

We recommend feeding quality barley straw as it is high in fibre and low in sugar, and closely resembles what a donkey would eat in the wild. Constant access to straw will allow a donkey to eat to appetite without consuming too many calories and therefore risk putting on excess weight which has associated risks of developing laminitis and hyperlipaemia. Oat straw may be useful for old or underweight donkeys as this usually has a slightly higher nutritional value than barley straw; wheat straw is very fibrous and has lower energy values, but may be fed to young healthy donkeys with a good set of teeth. Linseed straw is best avoided since the seed is poisonous unless it has been boiled, and it is very difficult to ensure that no seed is present in the straw. If straw is in short supply then priority must be given to using it as a feed source and an alternative bedding should be used.

Hay

If you anticipate feeding hay during the winter months then you need to plan ahead and make sure you have enough in store to see you through the winter as supplies can run out before the winter is over. Never feed mouldy hay, and try and build up a good relationship with your hay supplier, this will ensure you have a consistent supply of good, clean hay suitable for feeding for your donkeys. Different types of hay available include:

- Meadow Hay is a natural mix of grasses made from grass grown on old pasture and is good for feeding to donkeys.
- Seed Hay is also good for donkeys. It is a planted crop of specific grasses, such as rye or Timothy; which the farmer makes from the stems remaining after the grain has been taken.
- Hay produced from cow pasture will usually have higher energy levels and may be less suitable if fed on its own. However it could be fed mixed with a higher ratio of straw.

Ragwort (*Jacobaea vulgaris*) in hay is very poisonous to donkeys, but unfortunately quite hard to distinguish once it has dried, this is why it is important to know and trust your hay supplier. For more information on ragwort control and identification read the Ragwort Kills – information for owners factsheet found on The Donkey Sanctuary website. Weather conditions control the cutting season (late May to July). Remember that late cut hay will have lower energy values, which may suit your donkeys if they are overweight, but not if they are elderly/underweight and need feeding up. If the hay is cut later in the year a lot of the goodness will have gone out of the grass and some of the grass will have gone to seed. This type of hay is much lower in energy value than early cut hay and for that reason it is fine for feeding to donkeys. If the weather in May is good the farmers might make hay in the first week of June and get a second cut at the end of July. This 'second cut' hay is usually lower in energy value and again is fine for most donkeys. Freshly cut hay should be stored in a dry barn for at least three months before feeding. Do not suddenly introduce freshly cut hay as it could cause colic and laminitis. Reduce the risk by mixing the new hay with the previous year's hay, or mix it with straw over a few days so there is a gradual change over. If hay is in short supply in your area (or if it is very expensive) then you could look at the following alternatives.

Haylage

Haylage is semi-wilted grass that has been allowed to dry to only 55-65% dry matter (as compared to 85% in hay). The grass is baled, compressed and sealed in tough plastic and the resultant forage is virtually dust-free, highly palatable and nutritious. Once the plastic wrapping is broken (deliberately or accidentally) fungal spores start to grow so once opened the haylage must be used within 3-4 days (less in warm weather) or discarded. If there are any signs of mould or yeast growth on a bale once opened it should be discarded, as should any uneaten haylage. Haylage can be very variable in terms of nutritional levels, some haylage may be too high in energy to feed to donkeys. If you are unsure about the suitability of locally available haylage we would recommend having it analysed (most of the large horse feed companies provide this service for a small fee) or feeding a commercially available equine haylage marketed as 'laminitic safe'.

Silage

Silage is not suitable for feeding donkeys as the moisture level is usually too high, with a low pH, a low fibre and high protein level.

High fibre cubes

There are many brands on the market. Products marketed for equines prone to laminitis are a good choice as they are usually high fibre and low sugar. High fibre cubes are a good choice if you need more than grass, hay and straw to build up the weight of an old or thin donkey. Care must be taken that the donkey does not eat the cubes too quickly, which may cause colic, so add water and mix with a small quantity of low sugar chaff when introducing cubes for the first time. High fibre cubes can be soaked down to a mash which is particularly useful for donkeys who have poor teeth. Avoid any cubes which contain cereals as these are not suitable for feeding to donkeys. Products marketed as 'mixes' are usually cereal based and again not suitable.

Short chop chaff products

Chaff is a mixture of chopped up hay and/or straw and there are many types of chaff on the market. These contain variable amounts of chopped rye, timothy or alfalfa grasses & oat straw. Some have added oil, molasses, minerals, herbs or hoof growth supplements whilst others are high fibre and molasses free. Chaff products marketed for equines prone to laminitis are useful for donkeys that have difficulty eating grass, hay and straw due to poor dentition, and can be used as feed supplements or fed ad lib as a total hay/straw replacer. Always choose a chaff which is 'laminitic safe' and preferably with a sugar content of less than 8%.

Dried sugar beet pulp

Sugar beet is useful fed in small amounts to tempt a sick donkey to eat. Sugar beet is a useful source of succulent, nutritious, digestible fibre when added to the feed, although it cannot replace hay or one of its alternatives. We recommend un-molassed sugar beet to avoid laminitis. Dried sugar beet pulp is available in shredded or cubed form and **MUST** be thoroughly soaked before feeding and used within 24 hours once wet. Soaking times vary so refer to manufacturer's instructions. There are now some quick-soak un-molassed sugar beet products on the market which soak in under 10 minutes (although it is always advisable to check the product is fully soaked before use).

Succulents

Fruit and vegetables can be fed in small amounts (1 or 2 a day) to provide variety and encourage appetite; and are a worthwhile addition to the normal ration in winter and early Spring when fresh grass is not available. Avoid feeding potatoes, anything from the brassica family (cauliflower, broccoli, etc.), onions, leeks, garlic, stoned fruit and anything which is old, fermented or mouldy. Carrots, apples, bananas, pears, turnips and swedes are all safe and usually very popular with donkeys! Ensure that chopped fruit and vegetables are cut in a way that minimises the risk of choking, such as sticks not rounds.

Minerals and Vitamins

Donkeys usually obtain all of the required vitamins and minerals from the straw, grass and hay in their diets. However, we recommend that they have free access to an equine mineralized block, which contains various minerals including salt to supplement their diet all year round to prevent any deficiencies. Blocks designed for other livestock may be dangerous for donkeys as some contain inappropriate mineral levels.

Water

Water is perhaps the most essential of all nutrients since without it life cannot continue for longer than a few days (or less in adverse conditions). Clean, fresh water should be freely available at all times. Do remember to check water supplies in cold weather to ensure they have not frozen. Some donkeys, particularly the old or unwell, do not like drinking very cold water, so it may be a good idea to provide warm water in the winter if you are not sure if your donkey is drinking enough. If possible provide access to several sources of water to increase the choices available to your donkey thereby enriching their environment and encouraging them to drink sufficient amounts.

General considerations

- All feed stuffs should be of high quality.
- All equines are sensitive to toxins that can be found in spoiled feeds.
- All feed stuffs should be free from mould.
- All changes to diet should be made gradually. Over at least 7-14 days.
- Donkeys prefer to browse for their bulk and fibre throughout the day.
- Donkeys prefer to eat little and often. Provide *ad lib* barley straw.
- Do not over feed your donkey - check the body condition of your donkey regularly.
- Donkeys do not need high levels of sugar in their diets.
- If in any doubt about the energy value or the quality of any feed, it is advisable to seek expert advice.
- Always provide a mineral lick and permanent access to a clean water supply.
- **Never feed grass clippings** and ensure that your neighbours also know it, as they can lead to colic.

The ability of donkeys to access a natural diet significantly improves their quality of life and should be viewed as essential criteria for every keeper concerned with the welfare of their donkey or mule. Feeding correctly and with the unique requirements of the donkey in mind will lead to a more fulfilled animal capable of working effectively and which will live a healthier life.



Figures 49, 50, 51 & 52. (Figure 49) Maxwell Kusi-Obodum, (Figure 50) Practical Action/The Schumacher Centre, (Figure 51) Brian Lehmann / Circle of Blue & (Figure 52) Foto Natural (2013-2014) (Figure 49) A donkey asking for water, (Figure 50) Drought in Kenya. Two donkeys drinking water from a pool, (Figure 51) Donkey drinking water from a frozen water tank & (Figure 51) Donkey drinking water from a river [Photographs] Accessed from (Figure 49) <http://m.dailyecho.co.uk/>, (Figure 50) <http://practicalaction.org>, (Figure 51) <http://www.circleofblue.org/> & (Figure 52) <http://fotonatural.net/>

CURIOUS FACTS

MANUFACTURING DONKEY TREATS

Easy Donkey Cookies

- 5 cups oatmeal
- 1 cups flour
- 1 cup grated carrots
- ½ cup corn oil

Combine the ingredients in a bowl. Form into small balls, flatten lightly with a spoon, then place on a microwavable dish and microwave on high for six minutes per batch.

Oven-Baked Donkey Delights

- 1 cup oatmeal
- 1 cup whole-wheat flour
- 2 tablespoons molasses
- ½ cup water
- ½ cup grated carrot
- ½ cup diced apple

Preheat the oven to 350°F (175°C). Combine ingredients in the order listed. Form the batter into small balls and place them on a greased cookie sheet. Bake for 8 to 10 minutes.

Peppermint-Chip Cookies

- 3 cups pelleted feed, soaked in
- 3 cups of hot water for 1 hour
- 1 cup corn meal
- 1 cup molasses
- 1 cup brown sugar
- 1 cup corn oil
- 10 peppermints, coarsely crushed
- 1 tablespoon salt
- 1 teaspoon baking soda
- 3 cups oatmeal

Preheat the oven to 325°F (160°C). Mix all ingredients except oatmeal, and then add oatmeal 1 cup at a time until mixture is very doughy. Form into small balls, flatten lightly with a spoon, press peppermint bits well into their surfaces, and bake on a greased cookie sheet for 10 minutes or until well browned.

Crunchy Donkey Biscuits

- 1 cup molasses
- ½ cup brown sugar
- 4 large carrots, shredded
- 1 cup applesauce
- 2 cups Grapenuts cereal
- 1 cup sweet feed
- 1 cup oatmeal

Preheat the oven to 300°F (150°C). Combine molasses, brown sugar, carrots, and applesauce in one bowl. In another, mix the dry ingredients. Slowly combine the molasses mixture with the dry ingredients, adding just enough molasses mixture to form thick dough (add more Grapenuts if it's too mushy). Drop tablespoon size globs of batter onto a greased cookie sheet and flatten slightly. Bake for about 1 hour; turn and bake for an additional 45 minutes, until they are dried out (keep checking to make sure that they do not burn).



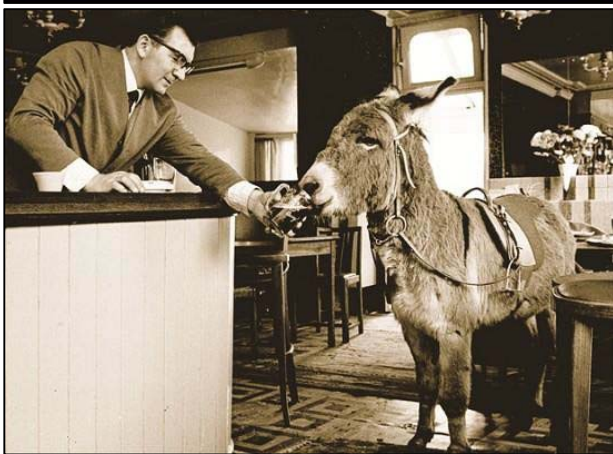
Figure 53. Bella & Frannie Party Supplies (2014) Belle & Boo Donkey & Treat Cart [Photograph] Accessed from <http://www.bellaandfrannie.co.uk>

7. DAILY CARE ROUTINES AND HOUSING FOR DONKEYS

Domesticated donkeys rely on their owners to ensure every aspect of their care, management and environment is suitable to their needs. When considering the welfare of an animal it is essential to assess every element of an animal's daily life.

Previously, we have discussed the importance of companionship for donkeys and how vital a suitable diet is to both physical and mental health. The donkey is, as all animals are virtually, appreciative of routine and consistent handling and care. To enable a suitable management system to be in place it is first important to assess the donkey's immediate environment.

the yard behind the Manby Arms pub in Stratford and popped in for a drink every lunchtime. He was named after the drink he'd have, which he enjoyed with a drop of lime [Photographs] Accessed from (Figure 54) <http://verdimnews.blogspot.com.es> & (Figure 55)



Figures 54 & 55. (Figure 54) MaritacNews & (Figure 55) Telegraph Media Group/ Steve Lewis (2014) (Figure 54) Donkey checking into a hotel & (Figure 55) Bass, the donkey, drinking a pint in the Manby Arms in Stratford. Bass the donkey lived in



Figures 56, 57, 58 & 59. (Figure 56) Compostwoman, (Figures 57 & 58) Alison Tse & (Figure 59) Facebook (2010-2014) (Figures 56, 57 & 58) Donkeys at their stables & (Figure 59) Mammoth jackstock colt resting on the sofa [Photographs & Video Caption] Accessed from (Figure 56) <http://www.the-compostbin.com/>, (Figures 57 & 58) <http://howyourweekend.blogspot.com.es/> & (Figure 59) <https://www.facebook.com/>

7.1. A SUITABLE ENVIRONMENT

Donkeys like all species appreciate adequate shelter from extremes of weather and appreciate access to an undercover area which offers protection from rain, wind, direct sunlight and flies. Although in some cases ‘natural’ shelter such as trees, hedges and valleys can offer some protection from high temperatures and wind they are rarely adequate for environments with high rainfall, this is a particular issue for donkeys as they do not have such a high content of oil in their coats as horses thus making them less ‘waterproof’. Simple shelters or barns with at least three sides are ideal for donkeys; doorways should be wide enough for the passage of multiple animals and should face away from the prevailing winds. Structures may be made of wood or brick, structures of corrugated iron or fabric are not ideal as they may heat excessively in the high temperatures or provide sharp edges for injury. If building a simple shelter from wood consideration should be given to ‘chew proofing’ the edges of doorways and walls of buildings, donkeys naturally view wood as a food item and many buildings have suffered from a hungry donkey snacking on it! Any structure should be big enough for the group of animals it houses to all use at the same time; a minimum of a 12 x 12 ft. shelter is advised for a pair of standard donkeys.

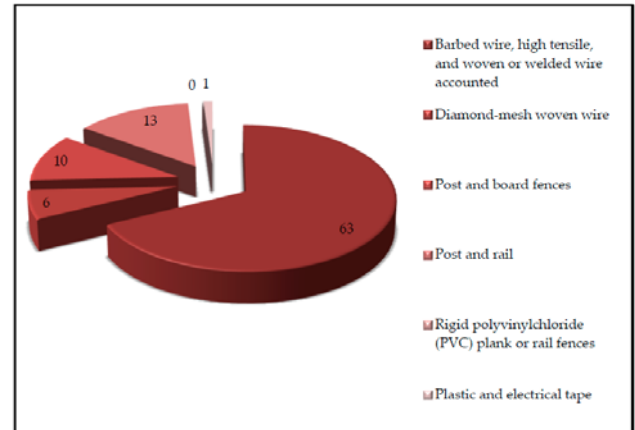


Figure 60. the Equine Research Center in Guelph, Ontario, Canada (1999) Results for the Injure percentage fence safety survey. Barbed wire, high tensile, and woven or welded wire accounted for 63 percent of injuries. Between 33 and 60 percent (depending on wire type) were serious. Diamond-mesh woven wire had only a 6 percent injury rate, and none required a veterinary call. Post and board fences accounted for 10 percent of the injuries; post and rail, 13 percent. Forty percent of the post and board injuries were serious, but most involved horses running into fences or kicking them, resulting in splintering, and these are not common behaviours in donkeys. Rigid polyvinylchloride (PVC) plank or rail fences were safest of all, with no injuries reported. Few injuries were reported with plastic and electrical tape, and the ones that were reported were minor. Most injuries occurred when a new animal was turned out with an established herd. Overcrowded lots, paddocks, and pastures contributed to horses running into fences [Graphic]

Ideally, all donkeys should have an area of hard standing available in their living area (Figure 61); this could be gravel or concrete in temperate regions with medium-high rainfall or sand in areas with low rainfall. Donkey hooves have evolved to have a more open tubule structure than that of the horse hoof to enable any moisture in the environment to be drawn into the hoof (Hopegood, L., et al., 2008), whilst this adaptation is of benefit in the low rainfall areas of the donkey’s ancestral home it is the cause of many problems for donkeys in temperate climates (Parkes, R., et al.,

2010). When kept in wet conditions the donkey foot will become waterlogged which predisposes to hoof problems such as white line disease and abscess formation. Providing areas of hard standing encourages the feet to dry out and helps to encourage natural wearing of the feet. If access to grass or another comfortable surface is not available the donkey should be provided with bedding in order to soak up urine and provide a dry surface to lie on. The best bedding choices for donkeys are barley or wheat straw or wood shavings. Due to the propensity of the donkey to eat high fibre products cardboard, paper, hemp, wood pellets and rape straw should be strictly avoided as they pose health risks if ingested.

plants and trees and when fruit trees are producing fruit they should be fenced off to prevent gorging. In order to keep donkeys from harm electric fencing should also be reinforced by a permanent perimeter fence, wooden 'post and rail' fencing is ideal but where this is not possible correctly tensioned wire stock fencing with a large enough hole to prevent hooves becoming entrapped can be employed. Barbed wire should never be used for donkeys.



Figure 61. The Donkey Sanctuary (2013) Providing donkeys with areas of concrete hard standing will help to prevent foot disease [Photograph]

Finally, donkeys should have access to an outdoor area, ideally this should contain some safe plants and grasses for the donkey to eat, and an area of 0.5 acres per donkey is acceptable. Access to grass should be restricted at times of the year when it is actively growing as free access is likely to lead to laminitis and obesity unless the donkey is working hard. Grazing can be restricted by the use of strip grazing or track grazing systems or by pre-grazing with other stock such as sheep or cattle. Donkey pastures should be free from poisonous

CURIOUS FACTS

FREQUENTLY ASKED QUESTIONS ABOUT DONKEY FOSTERING

Below are answers to some frequently asked questions about our foster scheme:

What will I need to Foster a donkey?

We generally ask our foster homes to provide:

- Around an acre of grazing per pair of donkeys.
- An area of hard-standing – donkeys' feet are really porous so they need to be able to have time off wet and muddy fields.
- A shelter or stable – donkeys don't have waterproof coats like horses. This will also provide shade from the sun on summer days.
- Robust fencing – donkeys can be great escape artists!

Don't worry if you haven't got any or all of these in place yet – our welfare advisors will be able to help you.

Can I choose which donkeys I foster?

Time will be taken to match you and your foster donkeys, so you can have long and happy lives together. If you like a challenge and have some equine experience, we have many donkeys in need of fostering who require a little extra care and attention, so do let us know what you have in mind.

Why are donkeys fostered in pairs?

Donkeys form very strong bonds, so we make sure that they stay with their friend(s) when they go out to foster homes. Most donkeys on our foster scheme are in bonded pairs, but sometimes we need homes for small groups of donkeys as well.

I have a lonely donkey, can I foster a companion for them?

Donkeys are companion animals so we would definitely recommend finding another donkey to keep your lonely donkey accompanied. We will do our best to provide a single donkey as a companion to your own but will need to chat through all the details with you first, so just call us.

Can I foster a donkey to keep my horse company?

As donkeys form such strong bonds we would not recommend keeping them with horses as they can get very upset if the horse goes out riding without them! If you already have horses you can still foster donkeys, but please house them separately to keep them all happy. It is fine for them to say hi over the fence though!

How much does it cost?

We will deliver your foster donkeys to your door, free of charge, but ask that you cover the cost of caring for them whilst they are in your care. As a general rule, it costs around £700 (893.644 €) per year to provide all the care a healthy donkey needs, but don't forget to get pet insurance or a contingency fund to cover any unexpected vet bills for your new friends.

How much time should I commit?

Donkeys are very sociable and would love you to spend as much time as you can with them! We recommend twice a day to pick out feet, groom, muck out and generally make a fuss of them. You could even be the talk of the town by taking them out for walks!

I don't know a lot about donkey care - does that matter?

Not at all – we invite anyone interested in fostering donkeys to come and find out more about donkey care at one of our free donkey care days at various locations around the country. These give you the opportunity to get hands on with donkey grooming and hoof picking, as well as meet our experts who will be able to answer any questions you may have. We are always on hand to offer support and advice whether you are considering fostering donkeys or are a fully-fledged foster owner, so just shout if you need us!

Sounds great, how do I apply?

We would be delighted to talk to you about the fostering donkeys' scheme and answer any questions you may have. Don't hesitate to call the Welfare Team on +4401395 578222 or fill out our online application form (http://www.thedonkeysanctuary.org.uk/foster-application?_ga=1.262727244.1587026129.1412624089) and we will call you back.

What happens after that?

We take great care in matching donkeys with both foster owners and the environment in which they will be living to make sure that you can enjoy long, happy lives together. To help us select the best donkeys for you, one of our welfare advisors will arrange to visit you at a convenient time to see your foster donkeys' new home. This helps us make sure we are not sending less mobile donkeys to foster homes with steeper grazing areas or donkeys that are scared of livestock to a farm! We will also give you details of our free donkey care days that are taking place nearest to where you live.

7.2 DAILY ROUTINE

With the donkey living in a suitable environment attention can then turn to the daily routine. Donkeys appreciate routine and any changes should be made gradually to prevent stress and ill health. Donkeys should be checked twice a day, fresh feeding straw should be available at all times even if the donkey has access to grazing, and this ensures a trickle of fibre through the gut. Feeding from a simple trough or container may be more suitable than nets unless the hole size is very small, this is important to decrease the risk of entrapment of hooves and legs. Dung and damp patches should be removed from the donkey's bed daily that should be topped up with clean, dry bedding as required. Wherever possible dung should be removed from pasture twice per week, this assists with reducing parasite infections and will also keep grazing in good condition.

Provide fresh water daily and if using strip-grazing systems provide a small extra amount of grazing once or twice per day. If providing supplementary feeds these should be split in to frequent small meals to avoid overloading the digestive system. Each daily check should involve a thorough check over of the donkey; spend time to check the coat, limbs, eyes and nose of the donkey for abnormal lumps, bumps or discharge. An assessment of the donkey's behaviour and demeanour is also essential, if the donkey behaving abnormally? Is it eating, drinking, dunging, urinating and socialising, as you would expect? Donkeys display very subtle signs of disease and stress so any change in behaviour should be treated with caution, the donkey should either be further monitored or in the case of refusal of food or other significant issues the vet should be called immediately. The 'dull' or inappetant donkey is a veterinary emergency and delay in treatment could be fatal.



Figure 62. Al Livingstone (2006) Happy donkey
[Photograph] Accessed from <http://www.flickr.com>

Finally, to prevent disease of the skin and feet (and to assist with training and the bond between owner and donkey) the donkey should be groomed and have its feet picked out with special attention being paid to removing grit and dirt from the white line area and grooves either side of the frog.

CURIOUS FACTS

DONKEY SLEEPING BEHAVIOUR

Donkeys do most of their sleeping standing up. Their legs can lock in place, enabling them to fall asleep without falling over. Because they are prey animals, donkeys often do not feel comfortable sleeping on the ground, and most of their sleeping is done during the day rather than at night when the predators are out hunting. Donkeys have straight backs, so they cannot get up quickly. If a predator were to come while a donkey was on the ground, they might not be able to get up fast enough to get away. However, donkeys do occasionally take short naps laying down during the day. This helps them to rest their legs.

It's believed that in order to get a deep, REM sleep, they need to lay down. You can sometimes find a donkey stretched out on its side, asleep in the sun, or laying on the ground with its legs folded under. When donkeys are in groups, they will often take turns 'guarding' each other as they rest, with one donkey standing up near the sleeping donkey. This behavior would help to keep a wild donkey from being attacked during a nap. To get into a deep REM sleep, donkeys do spend a brief amount of time laying down.

Donkeys often do lie down to rest for short periods of time if they feel comfortable doing so; they generally do not stay down for long periods of time, however, as their circulatory and respiratory systems are not designed for being on the ground. Donkeys that are stuck on the ground for some reason-- called being "cast", for example, their legs caught under a fence-- can suffer from brain damage or suffocation from lying down for too long.

Donkeys are most often observed lying down during short periods of rest. Donkeys will lay down if they feel it is safe, for example if there are other donkeys standing around calmly. Donkeys sometimes lay in the afternoon sun and take short naps. Foals tend to lie down often, sleeping at their mother's feet during the day. As they grow older they will begin to sleep standing more often.

Other reasons for donkeys to lay down include disorders such as colic, in which a donkey will lay down to try to stop the discomfort in their stomach, and may even roll or thrash the ground. Donkeys suffering from founder may also lay down from the hoof pain, in addition to displaying other signs of lameness. If you see your donkey laying down, it is most likely taking a short nap. Donkeys do not sleep nearly as much as we do, and rely on short naps throughout the day to keep them going. The donkey foals sleep a lot, like all babies, making snoring noises and grunting occasionally when you rub between their ears.

They cannot lay their head down and get this deep *REM sleep* if they are living all alone without a herd mate. Another reason to always have a companion for your equine.



Figures 63, 64, 65 & 66. (Figure 63) Second Life Wikia, (Figures 64 & 65) Donkey Whisperer Farm & (Figure 66) Bauer Consumer Media Ltd (2013-2014)
(Figure 63) Sleeping donkey, (Figures 64 & 65) Donkey waking up from his REM sleep & (Figure 66) Sleeping donkey foal [Photographs] Accessed from
(Figure 63) <http://secondlife.wikia.com>, (Figures 64 & 65) <http://donkeywhispererfarm2010.wordpress.com/> & (Figure 66)
<http://www.livefortheoutdoors.com/>

7.3. OTHER ROUTINE CARE

Donkeys also benefit from routine healthcare and management interventions to help to prevent disease. The donkey is stoic and signs of disease are often subtle particularly in the case of chronic disease. The Donkey Sanctuary has found that weighing or weight estimation and condition scoring are extremely useful tools for assessing the general condition and health status of donkeys when carried out on a minimum of a monthly basis. Often the first sign of deteriorating health is a gradual loss of weight; conversely if weight is being gained this is easiest to deal with if noticed early.

Weight can be measured using electronic scales, however most owners do not have access to such facilities, in such cases the use of a weight estimation calculator should be encouraged alongside a condition scoring system designed specifically for donkeys (further details on weight estimation and condition scoring can be found at www.thedonkeysanctuary.org.uk), and in *Book 1, Chapter 19*.

Donkeys benefit from regular hoof care from someone experienced in dealing with donkeys. Depending on workload and condition of the foot they should be trimmed on a 6-10 weekly basis. Donkey hooves are different in shape and wear patterns than those of horses and although often more durable with little need for shoeing they may suffer from particular issues such as white line disease and chronic laminitis. Regular care and assessment of the foot will help to prevent the development of serious issues that may make a donkey unable to work.










BODY SCORES		
SCORE		DESCRIPTION
1. Very thin (emaciated)		This donkey is clearly emaciated. His bone structure is extremely obvious; there is little muscle present. His belly is severely tucked up, and there may be a cavity under his tail. The donkey is weak and lethargic.
2. Thin		The donkey is emaciated. It's easy to see and feel individual spinous processes (the bony points rising from his backbone), ribs, hooks, pins, shoulder blades, and spine. His neck is thin, his withers are prominent, and his shoulders are sharply angular. He has very little muscle development.
3. Less thin		The donkey's vertebral column, ribs, pins, and hooks are prominent, and individual spinous processes can be felt. There is little fat on this donkey, but supraspinous musculing (the muscles along each side of his backbone) along the spinous processes is apparent. The loin and rump areas are concave, and there is little muscle or fat covering over his withers and shoulders.
4. Less than moderate		The donkey's vertebral column is visible. His pins and ribs can be felt but can't be readily seen. His hooks are rounded but visible, and his rump is flat rather than concave. His neck, withers, and shoulders have some muscle and fat cover, and his shoulder blades are less clearly defined.
5. Moderate (ideal)		This donkey's supraspinous muscles are developed and readily apparent; the vertebral column can be felt. His hooks and rump are rounded. Some fat can be felt in the shoulder area and at the base of the donkey's neck. His ribs can be felt but not seen, and his pins are no longer visible.
6. More than moderate (near ideal)		It's hard to feel this donkey's spinal processes. His back is becoming flatter and is well covered; his rump is convex and well muscled; and his hooks are barely visible.
7. Less fat		This donkey's back is flat, and his spinous processes can't be felt; his hooks are barely visible. The fat on his neck and his shoulder area are beginning to expand; his flanks are filling and his neck thickening.
8. Fat		This donkey is well covered. His neck is thick and the crest very hard. His back is quite broad, and his body is rounded with fat. His bones can't be seen.
9. Very fat (obese)		This donkey is obese. His bones are buried in fat. He has large accumulations of fat on his neck (bones), and the crest may list over to one side. There are also large accumulations of fat over his shoulder area and ribs. His withers can't be felt, and his back is broad and flat and he may have a crease down the middle of his back. His flanks are fully filled with fat, and fat may overhang both sides of the tail head.

Figure 67. Sue Weaver (2008) Body condition scores [Illustration]

CURIOUS FACTS

BEWARE OF JACKSTOCKS

Some owner state that when the mating season arrives, or when there is a jenny or jennies in heat in the farm, jackstock not only directly react to the jenny or jennies visual contact or odor, but to anything soaked in the jennies' odor, and that includes, human beings. Jackstocks can attempt to mate human being as well as show the same aggressive behaviours they show towards jennies when trying to breed. Also, some of the owners state that when a woman is menstruating, those reactions have also been shown. Education is the key to avoid such behaviours.



Figure 68. John Leech (2014) Jackstock attracted to women [Illustration]
Accessed from <http://www.jantoo.com/>

7.4. CONTROL OF PARASITES IN DONKEYS

Donkeys are host to a number of endo and ectoparasites; the lifecycles of such parasites are often similar to that seen in horses; however there are some notable differences (Matthews, J., et al., 2013). Parasite control should always focus upon prevention rather than treatment particularly in light of increased reports of drug resistance. Parasite control systems should focus on reducing environmental contamination with eggs and/or larvae in the case of endoparasites and adult and nymph stages in the case of ectoparasites. Good husbandry can contribute significantly to reducing parasite infestations, for example ensuring low stocking densities, quarantine of new animals, regular disinfection of buildings and fomites, regular collection of dung from pasture along with correct composting and ensuring animals are otherwise in good health.

7.4.1 Endoparasites

The main endoparasite species found in donkeys are:

Large Strongyles: Large strongyles are a highly pathogenic species of gastrointestinal parasite. However the incidence of this group of parasites has reduced significantly over the last 20 years with health issues related to this parasite now seen mainly in donkeys with no parasite control history (Burden, F.A., et al., 2009). This reduction in incidence is due to treatments with ivermectin or moxidectin based anthelmintics which are highly effective at controlling these species. Treatment with one of these compounds on a yearly basis is likely to contribute considerably to control of these parasites.

Small Strongyles: There are over 50 species of cyathostomin many of which are found in donkeys. The clinical relevance of

infection with cyathostomins is not well understood in the donkey; reports of severe weight loss, acute colic, diarrhoea and death are common in horses; however there is less evidence for such effects in donkeys (Matthews, J., et al., 2013). Control of cyathostomins in the donkey should focus on prevention of pasture contamination through good dung management and targeted treatment programmes. Targeted treatment programmes should be designed for each donkey herd under veterinary guidance but may be expected to include a once yearly treatment for encysted cyathostomins followed by a number of faecal worm egg counts (FWEC) to assess adult strongyle burden throughout the grazing season with treatments being undertaken when FWECs reach a predetermined figure.

Parascaris equorum: *Parascaris equorum* is commonly regarded as a parasite only found in young equids (< 2years) and it is expected that horses will develop natural immunity to this parasite species as they reach adulthood. Donkeys do not appear to respond to this parasite species in such a way and it is not uncommon to see patent infections in adult donkeys, in particular animals with other health issues seem prone to infection (Getachew, M. et al., 2008). *Parascaris* spp. has the potential to cause significant disease and death due to the feeding habits of the large (25-40 cm) adult parasites and their ability to cause blockages of the gut. Control of this parasite species should focus upon assessing infection status using FWECs and treating with selected anthelmintics. Selection of anthelmintics is of particular importance with this parasite species as there are numerous reports of ivermectin and moxidectin resistance (von Samson Himmelstjerna, G. 2012), benzimidazoles may be more appropriate in such cases. Finally, dung removal and management is

extremely important with this parasite as the eggs are able to survive many years on pasture due to their ability to survive freezing and UV light.

Tapeworm: Treatment for tapeworm should be considered in areas where it is known to pose a significant risk to equids. Research in donkeys suggests that they may be less susceptible to this parasite than other equines (*Burden, F. et al., 2009*); however they can carry large numbers of tapeworm under certain conditions the health effects of which can be significant if untreated.

Fasciola: Liver fluke is a parasite found in mammalian species throughout the world. Reports of infection in donkeys is common, particularly in areas where they are found co-grazing with ruminants in areas that are wet. Although research in to the clinical effects of fasciola infection is scant the work carried out by Getachew et al. (2010) suggests that pathology related to infection may be severe and life threatening.

CURIOUS FACTS

INSECTS PROTECTION FOR DONKEYS

INSECTS ARE IN ABUNDANCE THROUGHOUT THE YEAR, AND CAUSE GREAT DISTRESS AND IRRITATION TO DONKEYS

Good management is often the answer to reducing the annoyance and irritation caused by fly and midge attacks. To do this you need to know what insects your donkey is susceptible to and what insects are likely to be living in your donkey's environment.

Prevention is better than cure, which is why the location of stables, field shelters and the management of times of grazing are important factors in reducing insect problems. The use of fly repellents is only part of the solution and before purchasing and applying any chemical, herbal repellent or treatment to affected animals it is advisable to first consult with your vet.

FLIES

There are many types of fly; the common housefly, the stable fly, horse flies and the horse bot. The first signs of irritation by flies includes: excessive tail swishing, rubbing, stamping feet and head tossing or shaking; in some donkeys fly bites cause raised lumps and spots of blood may be seen.

Prevention – physical methods

- Remove manure frequently from grazing paddocks and the stable.
- Keep the stable environment clean; wash and disinfect the stable walls on a weekly basis, remove unwanted feed stuff and clean water troughs.
- Provide a field shelter, this will offer protection whilst the donkeys are in a paddock, they can rest and take refuge from the sun. Try to locate shelters in a shady and breezy location.
- Muck heaps should be positioned as far away from stables as possible
- Use fly strips or traps in the stable, remember to hang well out of reach of the donkeys
- Summer sheets or fly rugs can help alleviate irritation by preventing the flies from landing on the donkey's coat.

Use fly fringes or masks that can be worn whilst the donkey is grazing, the masks are also a useful way to prevent sunburn in pale skinned donkeys.

Prevention – chemical methods

There are a number of chemical or herbal fly repellents available. Before using these repellents please consult your vet and always read and follow the instructions of use. It is wise to perform an allergy test with any new product by applying it to a 5 centimetre patch of skin and waiting 24 hours to ensure there is not a reaction to the product.

Chemical repellents normally contain substances like N,N-Diethyl-meta-toluamide (DEET) or pyrethroids. DEET has a track record with effective results in animal and human use. Research has shown that the higher the concentration of DEET in a solution, the more effective and long lasting it will be.

Herbal repellents should be used with caution as there is no current scientific evidence that they work on repelling insects. Herbal repellents normally contain mixtures of oils; these can range from mint, eucalyptus, aniseed, cedar wood, clove, lavender, aloe vera, walnut, and sesame seed oils. Some of these oils claim to deter the flies and some are used to calm down the itching. Garlic is often cited for use as a fly repellent as the smell is thought to repel insects, however, there is no scientific evidence to support these claims and recent research suggests that feeding garlic regularly may be harmful to equines.

Most repellents come in a spray form which is easier to apply than a cream. However, if the donkey is nervous of the spray then creams can be more easily applied or a sponge can be used to apply the spray rather than direct application to the donkey. Chemical preparations will need to be applied morning and evening as these are the worst times of day for insect problems. They should be reapplied at regular intervals to maintain their effectiveness throughout the day.

MIDGES.

There are two thousand different species of flies and midges in the UK, but one of the most significant is the Culicoides midge which is responsible for the skin condition 'Sweet Itch'. This condition affects certain donkeys who are hypersensitive (or allergic) to the midge's saliva. The donkey's skin itches persistently which is extremely distressing, as a result the donkey will rub excessively on the areas most affected, especially on the mane and tail, and these areas often bleed, attracting more insects.

Midges are most abundant in Spring, Summer and Autumn and are most active at dawn and dusk, so preventative measures may need to start as early as February and continue until November depending on the donkey's environment and their location in the country. Cooler areas of the UK may have a shorter midge season.

Prevention – Physical methods

- Location of where your donkeys are kept is important, avoid marshy, boggy fields.
- Keep donkeys on more exposed, windy sites, e.g. hillsides or near the coast.
- Chalk based grassland will have fewer midges than clay based grassland as it consists of free draining soil.
- Keep muck heaps and old feedstuffs away from your stable and pasture.
- Stable your donkey at dusk and dawn, when midges are more prevalent.
- As well as using fly sheets, there are specific rugs and hoods available for Sweet Itch, these rugs cover the whole body, abdomen, head and neck. They are designed to be strong, tear proof and highly breathable to prevent over-heating in the summer period.
- Strips of overlapping transparent plastic placed in front of Windows and doors can be useful in preventing midges from entering the stable, but make sure you introduce these strips gradually to let your donkey become accustomed to them.
- When applying preventative repellents (whether chemical or herbal) try to start using them before the midge season, prevention is better than cure. Follow the instructions accordingly.

Prevention – Chemical methods

Fly repellents and DEET (see FLIES) can help with the symptoms, but you need to take veterinary advice before applying any type of repellent especially for the control of Sweet Itch. The chemical Benzyl Benzoate has been used for many years in the treatment of Sweet Itch. The liquid should be worked into the affected skin, but not be applied to broken skin. Gloves should be worn when applying this chemical and should not be applied by anyone who suffers with a perfume allergy. Discuss the use of Benzyl Benzoate with your vet before using on your donkeys. There are oil based formulations available which can help deter midge attacks; midges dislike contact with oil and tend to avoid landing on the substance. Oils tend to have a limited time period, as they don't stay on the coat for long, reapplication 2-3 times a day may be necessary. Greases are available which tend to last longer and are normally based on oil formulations; they can be messy and tricky to apply but are effective on small areas of Sweet Itch. Soothing creams can bring relief to the itching but they do not deter further midge attacks. It may also be beneficial to give your donkey a soothing bath once a week, weather permitting, with a suitable shampoo available from your vets. As with the fly repellents, there is no scientific evidence, as yet, as to the effectiveness of herbal treatments.

TICKS

Ticks are parasites that bite and feed on the blood of mammalian hosts before falling off to complete their lifecycle. Ticks tend to be common in areas with long grass and bracken such as the New Forest and moorland. Although the tick bite itself rarely causes more than local irritation ticks are a problem due to their ability to pass on infectious disease to equines and other mammals. The most well known of these is Lyme Disease which can cause severe illness in mammals including donkeys, horses and humans. It is important to be vigilant and check your donkeys over for ticks in Spring, Summer and Autumn, particularly when they are grazing in high risk areas with long grass cover. Common areas for attachment are in between the back legs, under the tail and in the ears. If ticks are found they must be carefully removed so that the tick mouth part is not left in the animal. Special 'tick removers' are perfect for the job and available from any veterinary practice. Traditional methods of tick removal including burning, squeezing or smothering in Vaseline should be avoided as they increase the risk of the tick regurgitating its stomach contents into the animal thus increasing the risk of infection.



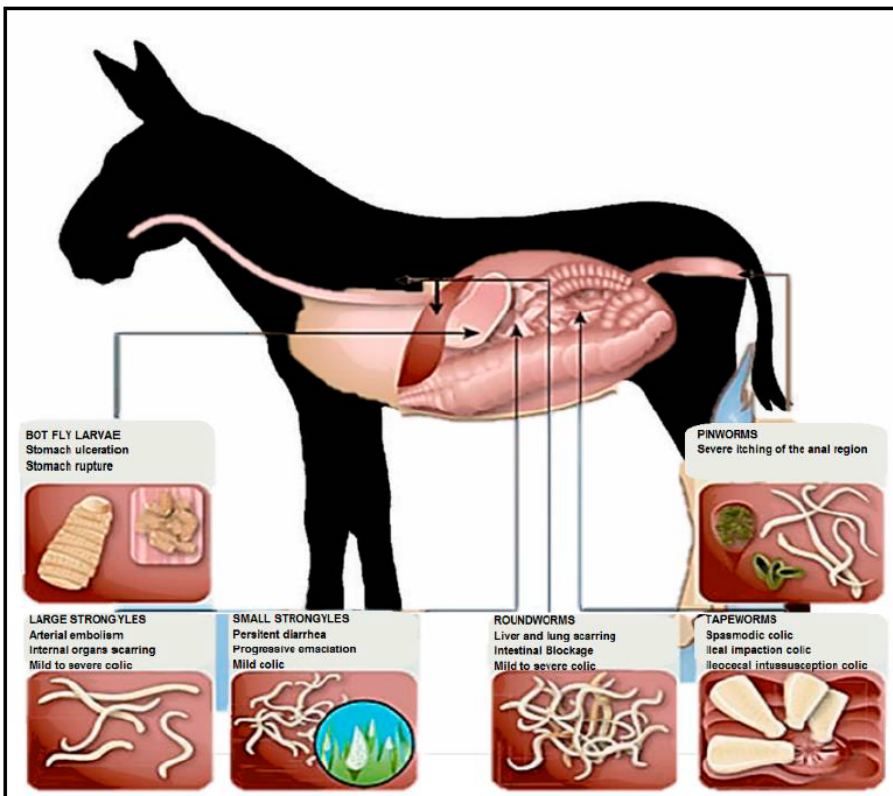
Figures 69, 70, 71 & 72. (Figure 69) hhcoconut, (Figure 70) Dinky Rugs & (Figure 71) Custom Pet And Tack & (Figure 72) Terra De Rucs/Tierra de Burros (2014) (Figures 69, 70 & 71) Donkeys wearing different kinds of fly masks & (Figure 72) Mosquero Spanish flymask [Photographs] Accessed from (Figure 69) <http://www.ebay.com>, (Figure 70) <http://www.tackandturnout.co.uk/>, (Figure 71) <http://custompetandtack.homestead.com> & (Figure 72) <http://www.terraderucs.org/>

Control through removal of donkeys from wet grazing and drug treatment when fluke has been confirmed through coprology is recommended. There are no licensed flukicides for use in donkeys, some extrapolation from other species must be used .

Lungworm: Donkeys are noted as the reservoir host for *Dictyocaulus arnfieldi*. Although this parasite may cause significant respiratory issues in horses it rarely causes clinical problems in donkeys unless they are immunocompromised or otherwise in poor health. Control of this parasite is essential if donkeys are co-grazing with other equines and is achieved by treatment with ivermectin. Lungworm larvae are also able to survive well on pasture for many months/years and prevention of contamination is important, for this reason treatment of all new donkey arrivals with ivermectin before turning out to graze is recommended.

contribute to the spread of serious infectious diseases such as babesia, trypanosomosis and African horse sickness. Control of ectoparasites such as ticks, lice, flies and midges is best achieved by a combination of repellents and barrier treatments. A number of preparations are licensed for use in equines to repel or kill insect pests; the pyrethroid group of compounds are commonly used although caution must be used as resistance has recently been reported to this group of compounds (Elise, L. et al., 2012). Housing animals at times of peak insect activity (dusk and dawn), avoidance of grazing long grasses in the case of ticks and of stagnant water will all assist in the control of flies and ticks. Lice may be controlled through clipping and bathing or application of drug treatments. Midges may be problematic for those suffering from ‘Sweet Itch’ the most effective treatment for such individuals appears to be the use of specialist anti-midge blankets which physically prevent bites from midges. Daily examination of animals and response to early signs of ectoparasite infestation will assist in the prevention of disease.

Figure 73. Francisco Javier Navas González (Edited from Gibson Veterinary Clinic) (2014) Donkey common endoparasites [Illustration] Accessed from <http://www.gibsonvetclinic.com>



8. DENTAL CARE

Dental disease is common in donkeys with up to 62% of donkeys examined by a study in Mexico presenting with serious dental issues (excluding sharp enamel points) (*Du Toit, N. et al., 2008*). Dental disease is associated with pain, weight loss and colic and can become so severe that if not treated can lead to death or euthanasia due to severe weight loss or secondary disease such as impaction colic or hyperlipemia. Donkeys should have their teeth examined by a trained vet or paraprofessional once per year with treatment being undertaken where necessary. When dramatic treatment is undertaken consideration must be given to providing analgesia and soft feedstuffs whilst the donkey recovers failure to do so can lead to donkeys becoming inappetant and refusing feed putting them at risk of hyperlipemia.



Figures 74 & 75. (Figure 74) Andy Merchant & (Figure 75) Anne M. Eberhardt (2012- 2014) (Figure 74) Donkey showing its teeth & (Figure 75) At first glance, your senior horse or geriatric donkey might not look particularly long in the tooth, but dental problems are all but inevitable for aging equids [Photographs] Accessed from (Figure 74) <https://www.flickr.com/> & (Figure 75) <http://www.thehorse.com>



Figures 76, 77, 78 & 79. Museum of Life and Science in Durham, NC (2011) Donkey Dental Care Routine. There are veterinary dentists out there that specialize in equine. Although the field back then was not as advanced as today with technology and equipment, the upkeep of a horse was very important just like an oil change is to a car. Remember, people depended on their animals for transportation and labor and the better the care the longer the animals lasted and the better their general health. During a donkey teeth revision, our donkey is given a sedative. Also, a special halter is put on them with a mouth speculum so the vet is able to work in his mouth without the donkey being able to close it. The most common routine is to get our donkey's teeth "floated" which means they smooth his teeth with a file so they are nice and even. If equine are not examined and proper care of their teeth are not taken, it can lead to problems with eating and comfort because the teeth can become jagged and develop sharp edges. This floating does not hurt because the nerve is near the gum line. The tool that is used on this donkey is electric powered and has a file like bit at the end of it that grinds the tooth down. [Photographs] Accessed from <http://blogs.lifeandscience.org/>

CURIOUS FACTS

DENTAL HEALTH

The second most common veterinary medical problem encountered by the donkey is dental disease. Every year, donkeys in the UK are euthanased through neglect to their oral health having first endured the chronic, widespread effects of severe oral disorders.

Often with the best intentions, experienced owners, carers and even some health care providers (vets, equine dental technicians, etc) are not aware enough of the differences between horses and donkeys and their specific requirements; more so in very advanced cases. There are still instances of succumbing to the notion that donkeys are the poor relatives of the horse and hence not much importance is afforded to their rights for high quality care; after all, they're stoic right? Or could it be that we can't read the signs as a painful donkey can often just look dull.

One in ten donkeys entering the Donkey Sanctuary are compassionately euthanased within 3 years of their return/relinquishment because their quality of life diminishes severely and irretrievably. The average age for these donkeys is 21 years; 77% have moderate to very severe dental disease. These donkeys are not necessarily euthanased solely due to dental disease, but being unable to grasp or chew food thoroughly enough to swallow, or perhaps harbouring the painful infection of gum disease when otherwise ill or when suffering multiple conditions places a huge and largely unnecessary burden on the animal's quality of life and prognosis.

It takes less than 5 years for a donkey with good oral health and conformation to deteriorate to serious levels of disease. In a donkey with poor oral conformation (congenital displacements for example), dental health may decline over just a few months in the absence of appropriate treatment.

Contrary to popular belief; donkeys usually start out with good teeth, yet over time their dental health declines severely. Thorough, high quality preventive dental care needs to be performed at fixed, regular intervals from an early age.

The vast majority of donkeys entering the Donkey Sanctuary have no previous dental history; compare this to the 86% of owners stating they provide their donkeys with regular dental checks and we have to question if ALL service providers are offering quality care?

The sanctuary has focused a drive on improving dental health amongst donkeys in the UK but we still find small numbers of owners making uninformed decisions when selecting service providers or even not providing dental assessments at all. The problem in the UK is that the cowboys rarely wear vet's coats the nice friendly dentist who local people swear by may have received very little or even no formal training at all. Regrettably, this is currently legal. Unfortunately, should anything go wrong, or if a problem arises, your insurance company may refuse to cover your animals if you have employed an unqualified dental technician. We wholeheartedly recommend that you use only qualified vets or equine dental technicians that are members of the British Association of Equine Dental Technicians (BAEDT).

Donkeys under treatment by BAEDT members have much lower levels of dental pathology. Unfortunately, the amount of donkeys treated by BAEDT members is around 1% of the population of the donkeys relinquished to the Donkey Sanctuary.

Just like other equines, donkeys need regular dental care to prevent pain and difficulty eating. Because of donkeys' stoic nature, they will not demonstrate symptoms of pain very often, which means owners must be proactive with dental care.

Horse owners sometimes notice dental problems when their horse develops problems wearing a bit. Since many donkeys never wear a bridle, donkey owners must watch for other signs that indicate tooth problems. Difficulty chewing. A donkey with tooth problems may tilt his head or spill grain as he chews, or he may drop balls of hay that he is unable to chew well enough to swallow (this is known as quidding.)

- Bad breath. In the case of gum disease, food matter collects around the teeth and begins to rot, causing a strong odor. This can lead to infection and abscess.
- Nasal discharge. Milky white, yellow or green discharge occurs when there is an infection. When this occurs along with swellings in the face, it may be an infected tooth root. Nasal discharge may also indicate a respiratory infection.
- Undigested feed in manure. If you notice whole grains or long strands of hay in your donkey's manure, this may indicate that he is unable to grind his feed sufficiently.
- Colic. Colic in donkeys may be caused by dental issues.
- Inability to eat. If your donkey is unwilling or unable to eat, or if he has dropped weight, it may be the result of dental disease.

In many cases, donkeys display no symptoms and may even appear healthy or fat, so regular dental care should always be a component of a donkey's routine health care regimen. Just like horses, all donkeys should have their teeth checked annually. Young and senior donkeys should be checked twice a year.

9. DONKEY HEALTHCARE

Veterinary care of donkeys is a vast subject and will only be mentioned in general terms in this chapter. There are many excellent texts and resources on donkey healthcare that can be consulted as detailed at the end of this chapter.

10. BEHAVIOURAL ASSESSMENT OF PAIN & SICKNESS IN THE DONKEY

When dealing with the donkey patient it is essential to understand that donkeys display different signs and symptoms of pain and sickness than horses or other species. The donkey is often described as stoic, which goes some way towards understanding donkey pain behaviour; however a more accurate description may be 'subtle' (Olmos-Antillon, G. et al., 2011). Contrary to the beliefs of many the donkey does feel pain and does display signs of being pain, there is as yet no evidence that the donkey has a different pain tolerance to that of other equines. Table 2 describes common behavioural signs of pain or sickness in the donkey (Olmos-Antillon, G. et al., 2011; Duffield, H. 2008) and a description of the behaviour.



Figure 82. The Donkey Sanctuary (2013) Donkey displaying lowered and unresponsive ear carriage – often described as helicopter ears [Photograph] Accessed from <http://www.thedonkeysanctuary.org.uk>

Table 2. Common behavioural signs of pain and / or sickness in the donkey [Table].

BEHAVIOURAL SIGN	DESCRIPTION
<i>Inappetance / anorexia / reduced appetite</i>	Donkeys often display reduced intake of food and / or water when sick or in pain. This is often the first sign of a developing clinical problem.
<i>Generalised dullness</i>	Carers often describe the donkey as dull or 'depressed' showing less interest in the environment, companions and less frequently displaying 'luxury' behaviours such as allogrooming and rolling.
<i>Sham eating</i>	Donkeys may appear to be eating but in fact merely pretend to eat by nuzzling food whilst intaking none, careful observation or hand feeding of the donkey is essential for assessment.
<i>Lowered head carriage</i>	A general sign of ill health characterised by the head being placed below the withers of the animal, this is occasionally accompanied by swelling of the muzzle.
<i>Unresponsive ears (little movement in response to changes in noise)</i>	Ears may not be responsive to noise or other stimulus and are less mobile than expected
<i>Lowered ear carriage</i>	Ears are carried low and / or backwards. Often referred to as 'helicopter' ears.
<i>Social isolation</i>	In latter stages of disease donkeys may attempt to isolate themselves from a group and appear uninterested in others they are bonded to. In some cases the 'herd' may exhibit aggressive behaviour towards a sick donkey.
<i>Increased recumbency</i>	Increased frequency of lying down or lying down for longer periods of time than usual, sometimes accompanied by faecal or urine staining. Donkeys may also experience difficult getting up or down to rest.
<i>Decreased recumbency</i>	In chronic conditions donkeys may become reluctant to lie down to rest as they become less able to rise and experience pain as a consequence.
<i>Weight shifting / limb guarding / pottery gait</i>	Lameness in the donkey is often more subtle than that seen in the horse and is difficult to assess as many donkeys are not 'athletic'. Donkeys rarely show the classic laminitic stance as seen in horses but are more often regarded as having a stuttering 'pottery' gait or display weight shifting of the front limbs.
<i>Hypersalivation, drooling, difficulty chewing</i>	Commonly seen in donkeys with dental disease and often accompanied by signs of partially chewed food, halitosis and food pocketing in the mouth.
<i>Anhedonia (depression – an inability to respond positively to normally pleasant experiences)</i>	Generalised depression is common in the donkey and can be assessed by tempting the animal with something that would normally be viewed as pleasurable. For instance a very tasty, high sugar treat such as a ginger biscuit may be offered, a companion offered or interest in other animals assessed.
<i>Tail twitching</i>	This is commonly seen in 'painful' donkeys but should not be confused with tail swishing associated with aggression, confusion or in response to flies. Only to be used in combination with other indicators.
<i>Excessive lacrimation, rubbing of eyes and blinking</i>	Indicative of eye issues but should be used in combination with other clinical indicators as may be due to fly irritation or weather conditions

CURIOUS FACTS

DUST BATHING

Dust bathing (also called sand bathing) is an animal behavior characterized by the act of grooming while rolling or moving around in dust or sand, with the purpose of cleaning fur, feathers or skin, and removing parasites. Dust bathing is a maintenance behavior performed by a wide range of mammalian and avian species. For some animals, dust baths are necessary to clean the feathers, skin, or fur, similar to bathing in water or wallowing in mud. In some mammals, dust bathing may be a way of transmitting chemical signals (or pheromones) to the ground which marks an individual's territory.

Many mammals, such as donkeys, roll in sand or dirt, presumably to keep parasites away or to help dry themselves after exercise or becoming wet. A sand roll, which is a stall or yard covered with deep sand, is traditionally included as part of stable complexes for use by racehorses after exercise.

Dust bathing has been suggested to have a communicatory function in several mammals such as the degu, (*Octodon degus*), the long-eared jerboa, (*Euchoreutes naso*), and possibly in Belding's ground squirrel as they leave a "pungent" odor in the dust bathing areas. It has been suggested that wallowing (a behavior similar to dust bathing) may serve functions such as thermoregulation, providing a sunscreen, ecto-parasite control and scent-marking.



Figures 80 & 81. FarmgirlFare (2012) Donkey dust bathing [Photographs] Accessed from <http://www.farmgirlfare.com/>

11. CLINICAL ASSESSMENT OF THE DONKEY

When assessing the donkey it is important to ensure that the correct baseline is being used. Although many of the same normally applied techniques can be used to assess the health of the donkey, different reference ranges often need to be employed.

12. TEMPERATURE, PULSE AND RESPIRATION

The donkey has different temperature, pulse and respiration ranges when compared to horses; reference ranges for adult donkeys are shown in Table 3 (Svendson E. *et al.*, 2008). Elevations of temperature may be seen in response to physical exertion, increased ambient temperature or infection and should be viewed as an easily assessed early warning sign of disease. Auscultation of the heart, heart rate and character of the pulse may also be useful for assessing cardiovascular status, tachycardia is a common sign of pain with an elevating heart rate often viewed as indicative of increasing crisis in many disease processes. Finally the respiratory rate and nature of respiration should be assessed with particular attention being paid to effort on inspiration and expiration, flaring of the nostrils and discharge. Respiration rate and character are easily affected by temperature and workload and should be judged in light of these factors. Of note is an apparently less developed cough reflex seen in the donkey when compared to the horse (Thiemann, A. 2011).

Tabla 3. Parámetros fisiológicos normales para burros adultos [Tabla]

PARAMETRO	UNIDADES	MEDIA	RANGO
Temperatura	° C	37,1	36,5-37,7
	° F	98,8	97,7-99,9
Pulso	Latidos/minuto	41	31-53
Respiración	Respiraciones/minuto	20	13-31

13. BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS

Donkeys have a unique physiology when compared to the horse and a different set of reference ranges should be employed when assessing the donkey patient. For example red blood cell counts and packed cell volumes are significantly lower in the donkey than the horse whereas mean corpuscular volume is significantly higher in the donkey. Likewise biochemical parameters may also differ, in the donkey total bilirubin levels are significantly lower and serum triglyceride levels are significantly higher than in horses. Details of up to date reference ranges can be obtained from The Donkey Sanctuary (www.thedonkeysanctuary.org.uk) or Wikivet (www.wikivet.net).

14. TREATMENT OF THE DONKEY PATIENT

When assessing and treating the donkey patient it is often essential to have their bonded companion present, this is especially true if the sick animal is to be moved for further treatment. Stress may contribute to the development of hyperlipaemia (*Burden, F.A. et al., 2011*). Avoidance of hyperlipaemia is imperative in the sick donkey, hyperlipaemia secondary to another clinical issue is common (72% of hyperlipaemia cases in one study), and unfortunately the mortality rate for such cases is high at 49% (*Burden, F.A. et al., 2011*). Prevention through reduction of stress and maintenance of appetite is important; dealing with pain associated with the primary disease process may assist as will offering small tasty meals and forages along with browse and fresh grass. Where appetite is reduced the vet may need to consider nasogastric tubing to maintain a positive energy balance until voluntary feeding is re-established.

When assessing the donkey patient clinical assessment can follow the same procedures as one would a horse with some important considerations:

Behaviour – as discussed previously expect the donkey patient to exhibit more subtle signs of pain or sickness particularly when in the presence of strangers.

Haematology and Biochemistry – important for checking triglyceride levels to assess potential for hyperlipaemia developing, note that the jugular vein is more difficult to access in the donkey due to the more developed cutaneous coli muscle.

Pharmacokinetics – the pharmacology of many drugs in donkeys and mules is poorly understood, in some cases (e.g. phenylbutazone) drugs are more rapidly cleared by the donkey, other drugs may be cleared more slowly. Further information

can be found in: Grosebaugh *et al.*, (2011).

Nasogastric intubation - may be complicated by the small diameter of the ventral meatus and differing angle of the larynx / pharynx opening as compared to horses. A small 'foal' diameter NG tube should be used in donkeys.

Veterinary care of the donkey is a complex area with many of the same underlying principles as veterinary care of the horse; however, respect for the anatomical, physiological and behavioural differences exhibited by the donkey will assist the veterinary surgeon and carer to more appropriately target treatment options to the donkey patient.

CURIOUS FACTS

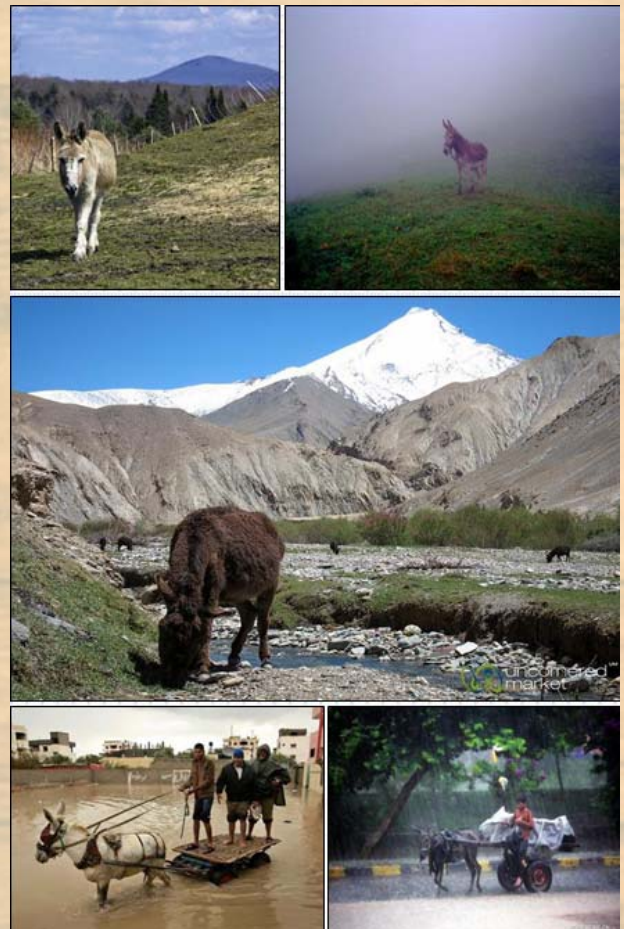
CLIMATE ADAPTATIONS

Donkeys have an array of different habitats and geographic locations due to their domestication. The ancient asses, however, were discovered in southern and central Asia and northern Africa. In these areas they are well adapted to live in rocky highlands and low land deserts and prefer to live in warmer, dry climates.

Donkeys have coats that tend to be longer and coarser than that of the horse, although texture can vary among North American donkeys. It is important to note that donkeys do not have the protective undercoat that horses do; therefore, they are more susceptible to climatic conditions such as rain, wet snow and wind. Insulation from heat or cold is largely created by air pockets between the longer hairs.

As desert animals donkeys do best in a temperate climate, although they will adapt to cold climates if provided with proper shelter and extra feed. They do not mind the cold. Donkeys dislike rain, and are susceptible to pneumonia and bronchitis when chilled. In Canada during late Spring, Summer and early Fall an open front shed will do for shelter if it is well bedded with dry straw. In winter, depending on the region of Canada, donkeys may be shut in a barn, but allowed to run out on good days, or they may be loosed housed in a comfortable shelter facing away from the prevailing wind. Some donkeys like snow, but others suffer from the cold. Guard them against chilling by the wind.

Wet snow can melt down into a donkey's coat, soaking the hair and causing the animal to chill. Snow should be scraped off a donkey when it is put inside the barn. During a rain, the horse will have water pouring off its back, but the donkey's coat will become sodden with the rain as it soaks down to the skin. Donkeys therefore needs adequate shelter during the cold rains of Spring and **Fall**.





Figures 83, 84, 85, 86, 87, 88, 89, 90, 91 & 92. (Figure 83) Vermont Lenses, (Figure 84) photos.boklm.eu, (Figure 85) Uncornered Market, (Figure 86) USA Today, (Figure 87) Xinhua/Jamil Ahmed, (Figure 88) Frank Rønsholt, (Figures 89 & 90) Klein-Hubert/KimballStock, (Figure 91) Rain Mac Whirter Royal Academy & (Figure 92) Meital Netzer-Israel (2011-2012-2013) (Figure 83) Donkey in the mountain, (Figure 84) Donkey in the fog, (Figure 85) donkey grazes under the gaze of a snowcapped mountain. Day 4 of Markha Valley Trek, Marhka to Hankar. Ladakh, India., (Figure 86) A Palestinian man uses his donkey cart to transport people across a flooded street in the Rafah refugee camp, (Figure 87) A boy rides on a donkey-cart during heavy rain in eastern Pakistan's Lahore on Aug. 31, 2013. Rain brought coolness to Lahore slashed by recent summer heat, (Figure 88) Donkey from Knuthenborg Safari, (Figures 89 & 90) Donkey Standing In Snowy Forest France, (Figure 91) Antique Print of 1871 Beach Scene Stormy Sea Donkey Rain & (Figure 92) Donkey under heavy rain [Photographs & Etching] Accessed from (Figures 83, 85 & 92) <http://www.flickr.com/>,

(Figure 84) <http://photos.boklm.eu/>, (Figure 86) <http://www.usatoday.com/>, (Figure 87) <http://news.xinhuanet.com/>, (Figure 88) <http://www.science.ku.dk/>, (Figures 89 & 90) <https://www.kimballstock.com/>, (Figure 91) <http://www.old-print.com>.

15. CONCLUSIONS

By using the 'Five Freedoms' approach to animal welfare it is easy to see the many ways in which appropriate and sensitive daily care and husbandry can contribute to an improved quality of life for donkeys whether they are working or companion animals. The provision of a natural diet, with appropriate shelter, companionship and handling which takes in to account the normal and natural behaviour of the donkey will lead to a more contented and healthier individual. Good preventative healthcare and, when needed, veterinary treatment which is sympathetic to the needs of the donkey also assists in maintaining a healthy animal with a good quality of life.

The donkey is one of the world's most important domestic species and is deserving of sympathetic and donkey-centred care, through the provision of which carers and owners also benefit from a donkey more capable of working, breeding and of living a long and healthy life.

16. FURTHER READING

Further excellent sources of information include:

The Donkey Sanctuary –
www.thedonkeysanctuary.org.uk

Wikivet (Donkey) – en.wikivet.net/donkey

The Professional Handbook of The Donkey,
4th Edn, Svendsen, Hadrill and Duncan,
2008

Anatomical Differences of The Donkey and
Mule. S. Burnham, AAEP Proceedings
2002

Practical Feeding and Condition Scoring for
Donkeys and Mules, F.A. Burden, EVE,
2012

Pharmacology and therapeutics in donkeys.
D.A. Grosenbaugh et al., EVE, 2011

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Chapter 6

Donkey Sanctuaries: Rescue, Defence, Animal Protection & Shelters



Francisco Javier Navas González and Bárbara Doulyeraki

Based upon the experience of many animal friendly people working intending just to create a better world for them (<http://bestfriends.org/http://www.thedonkeysanctuary.org.uk/>).

CURIOUS FACTS

GREEK LAW 2017 (1992)

“No one should pointlessly make an animal suffer or cause it distress. No one should abandon a domestic animal”

1. INTRODUCTION. THE CRETE ISLAND CASE: ONE AMONG THOUSANDS OF CASES WORLDWIDE.

Donkey rescue on the island of Crete only began about 10 years ago with a small sanctuary opening its gates to the many working donkeys on the island needing help, sick donkeys, mistreated donkeys and most of all the abandoned old donkeys.

Each year we see fewer donkeys on the island where as twenty years ago they were a very common sight, especially in the mountain villages. Donkeys have been used for thousands of years in Greece, as in the Middle East countries and today many farmers on Crete still use donkeys for work. Donkeys are very useful here as they are able reach places tractors and utility trucks cannot, for instance olives groves on the sides of mountains and hill where land is very arid and the terrain extremely rocky. Under these difficult conditions the donkey is used for carrying its owner, transporting heavy sacks of olives from the olive grove to the factory where they are pressed for oil, for carrying water to irrigate vegetable gardens, for ploughing fields and for carrying firewood and in general, for whatever transport.

Sadly over the last few years the need for the donkey has become less, the older generation whose main source of transport was the humble donkey are slowly dying, often, owners become ill or are unable any longer to care for their donkey who has so faithfully served them, uncomplaining for so many years.

Many donkeys are left to die alone, let loose with the risk of being hit and killed by vehicles, or tied to trees without sufficient food, water or shade. Sometimes an elderly owner has died or been hospitalized and the family call on the refuge to take the donkey and care for it which the refuge staff very happily will do.

The crumbling economy in Greece has also played a role, once a donkey is no longer working or needed, the owner cannot afford to feed and medicate the donkey, especially during the long dry summer months and during winter when there is no feed around for the donkey.

Until recently many old, sick and unwanted donkeys were shipped in primitive conditions, on old trucks and ships without adequate food and water for days on end to Italy where they ended up in the slaughterhouses as a prized meat for salami. This practice has stopped, as far as it is known although it is still very probable that some donkeys are still shipped away. With the support of six monthly visits by two excellent outreach teams the Agia Marina Donkey Rescue is able to visit various villages where many donkeys are still daily used for work and keep in contact with the owners and encourage the welfare of the donkeys.

The hooves are trimmed; teeth are checked and treated if necessary for various problem such as extractions and as well as rasping and floating labours are carried out. Owners are able to ask questions regarding the health of the donkey and medication given out when available. We hope that in the future more respect will be given to the humble Greek donkey who has played such an important role in Greece.

The refuges are very happy about offering these intelligent faithful donkeys a home where they are loved, respected and cared for...for the rest of their lives.



Figure 1. Sara Farid / Reuters (2014) Tears stained with coal dust run down a donkey's face as it looks out of its stable at the mine
[Photograph] Accessed from <http://www.ibtimes.co.uk>

2. DIFFERENCES BETWEEN A SANCTUARY AND A SHELTER

An animal sanctuary is a facility where animals are brought to live and be protected for the rest of their lives. Unlike animal shelters, sanctuaries do not seek to place animals with individuals or groups, instead maintaining animals until their natural death. In some cases, an establishment may have characteristics of both a sanctuary and a shelter; for instance, some animals may be in residence temporarily until a good home is found and others may be permanent residents. The mission of sanctuaries is generally to be safe havens, where the animals receive the best care that the sanctuaries can provide. Animals are not bought, sold, or traded, nor are they used for animal testing. The resident animals are given the opportunity to behave as natural as possible in a protective environment.

What distinguishes a sanctuary from other institutions is the philosophy that the residents come first. In a sanctuary, every action is scrutinized for any trace of human benefit at the expense of animal residents. Sanctuaries act on behalf of the animals, and the caregivers work under the notion that all animals in the sanctuary, human and non-human, are of equal importance.

A sanctuary is not open to the public in the sense of a zoo; that is, the public is not allowed unescorted access to any part of the facility. A sanctuary tries not to allow any activity that would place the animals in an unduly stressful situation.

One of the most important missions of sanctuaries, beyond caring for the animals, is educating the public. The ultimate goal of a sanctuary should be to change the way that humans think of, and treat, non-human animals.

On the other hand, an animal shelter is a facility that houses and disposes of homeless, lost, or abandoned animals. In the past, such a shelter was more commonly referred to as a dog pound, a term which had its origins in the impoundments of agricultural communities, where stray cattle would be penned up or impounded until claimed by their owners.

The goal of the modern animal shelter is to provide for the basic needs of an animal until it is reclaimed by its owner, placed in a new home, placed with another organization for adoption, or euthanized. Many shelters temperament test animals before they are put up for adoption to determine if the animal is adoptable and, if so, what the appropriate home environment would be.

Usually, public animal shelters around the world euthanize animals that are not adopted within a set period of time (usually 7 to 14 days) as it happens in small animals; others, however, limit that policy to only putting down animals that are in distress due to age or illness. Most private shelters typically do not sacrifice animals unless there is an unavoidable reason to do it. In Europe, of 30 countries included in a survey, only three (Germany, Greece, and Italy) did not permit killing healthy animals.

Animal shelters and wildlife sanctuaries are often confused. Many sanctuaries share characteristics with animal shelters, but essentially they are not the same. Sanctuaries are more modest, but also more permanent, while shelters, have a lot of intrusion objectives and are more temporary.



Figure 2. Sheepman Supply Co. (2014) Aluminum Donkey Crossing sign [Photograph] Accessed from <http://www.sheepman.com/default.asp>

Currently, donkeys tend to be protected in a kind of facility, which shares qualities from both, sanctuaries and shelters or refuges, as they tend to be taken care of within them, and let live their lives in peace, until they recover, and can be functionally relocated

or not, or even adopted. These facilities can also be used as school farms that help educating the young about how to understand these amazing animals.



Figure 3. The Ezio Experience (2011) A Donkey Sanctuary's aim is to prevent the suffering of donkeys worldwide through the provision of high quality, professional advice, training and support on donkey welfare. In the UK and Ireland permanent sanctuary is provided to any donkey in need of refuge [Photograph] Accessed from <http://www.ezio.freeserve.co.uk/>

CURIOUS FACTS

"The greatness of a nation and its moral progress can be judged by the way it treats its animals."

Mahatma Gandhi

3. BUILDING A SANCTUARY

Caring for animals requires patience, love, time, money and a lifetime commitment. The animals you rescue bring with them different needs and experiences, and the demands on you will be substantial. The rewards are worth every minute of care, and with this chapter we would like to help you understand exactly what “every minute of care” really means.

Opening a new Sanctuary involves interacting with people and entities, raising funds, building facilities, dealing with legal issues and more. But before you begin to think about all that, we strongly encourage you to do the following three things:

1. Visit and volunteer at a sanctuary or shelter near you, and attend as many formation courses as possible.

Sanctuaries and shelter are always open to visitors and volunteers. They often give courses on animal management, training or even first aids. Any information is useful for you to learn and use it in the future.

2. Plan.

It is advisable to have a plan in place before you start. Basic questions needing answers include:

- a. What species of animals are you sheltering – i.e. donkeys, dogs, cats, horses, birds, or other?
- b. How many animals are you planning to shelter?
- c. Where will you house these animals?
- d. Who will help you 24 hours a day, 7 days a week?
- e. What will it cost you to rescue these animals – i.e. time and money?

3. Be realistic.

How many animals can you really handle? Think about your current life and the effect taking care of animals will have on it. Money and space are not the only issues. So is your time and your commitment.



Figure 4. Darren Purcell (2009) Donkeys in a shelter
[Photograph] Accessed from <http://www.flickr.com/>

CURIOUS FACTS

THE DONKEY SANCTUARY

The Donkey Sanctuary is a British charitable organisation devoted to the welfare of donkeys. The charity, which is based near Sidmouth in Devon, England, was founded in 1969. It is one of the largest equine charities in the world with an annual income and expenditure of £22 million.

HISTORY

The Donkey Sanctuary was founded in 1969 by Elisabeth Svendsen. It was registered as a charity in 1973.

Svendsen was prompted to start the sanctuary following a visit to Exeter Market when she saw seven small donkeys crammed into a small pen. After she tried unsuccessfully to buy the donkey in the worst condition, she decided that instead of breeding donkeys she would try and save them.

By 1973 Svendsen was caring for 38 donkeys. In June 1974, she received a phone call from a solicitor who was the Executor of the Estate of the late Miss Violet Philpin who had been running the Helping Hand Animal Welfare League Donkey Sanctuary near Reading, Berkshire. The solicitor explained that Svendsen had been left a legacy of 204 donkeys.

At that time advertisements were appearing regularly in UK publications appealing for financial support for Violet Philpin's Donkey Sanctuary to the extent that the name Violet Philpin became very familiar in Britain with the care and welfare of donkeys.

After the UK Charity Commission allowed the two charities to merge, the Donkey Sanctuary purchased Slade House Farm near Sidmouth in south Devon. Since then more than 14,500 have passed through the Donkey Sanctuary's gates in the UK and Ireland. The charity operates in UK, Ireland and mainland Europe. It also conducts international operations in Africa and Asia. In 1980 Svendsen was made a Member of the Most Excellent Order of the British Empire (MBE) for her services to animal welfare.

In 2010, the charity faced re-homing problems as a result of the recession. It made an appeal for people to volunteer to provide foster homes for its donkeys. The Donkey Sanctuary is managed by seven trustees who are responsible for the charity, its assets and activities. In 2011, the Donkey Sanctuary founder Elisabeth Svendsen died aged 81.

ANIMAL WELFARE

Europe

The Donkey Sanctuary also provides a permanent home to more than 4,000 donkeys. Currently there are sanctuaries, holding bases and foster homes in nine European countries: United Kingdom, Ireland, Cyprus, France, Greece, Italy, Portugal, Romania and Spain.

Many donkeys arrive at the charity because they are unwanted or have been neglected. But others are donated because of health reasons, companionship or the owner's circumstances have changed. More than 40 welfare officers offer advice and support to donkeys owners throughout the UK. They also investigate reports of cruelty or neglect, monitor markets and fairs selling equines and check the well-being of all working donkeys. As part of this work, the charity organises an annual competition to find the best beach donkeys. In 2009 the winner was the town of Filey.

Worldwide

A feeding shelter was established by the Donkey Sanctuary in 1987, in Lamu, Kenya. The sanctuary operates major projects in Egypt, Ethiopia, India, Kenya, and Mexico. Support in these countries includes free mobile veterinary clinics and education for donkey owners, children and veterinary surgeons and students. By funding local teams including veterinary surgeons and education officers, the charity administers over 300,000 treatments to working donkeys annually. During their visit to a mobile clinic, the donkeys are given a full health check. Their teeth and hooves are tended and wounds are treated. Free advice and support is also given to their owners. Mobile clinics are fully equipped with all the veterinary supplies needed to treat most donkeys on-site.

Common problems for donkeys arriving at the clinics include signs of exhaustion, malnutrition and ailments of the teeth and feet. Donkeys may also be infested with worms or lice or have open wounds caused by poor harnessing or whipping. Injuries from road traffic accidents are also increasingly common and in some areas, terrible wounds can be inflicted by packs of dogs or hyenas, particularly to young foals. In Egypt, Ethiopia, India, Kenya and Mexico, the Donkey Sanctuary provides services in remote areas with great donkey populations.

EDUCATIONAL WORK

The charity trains vets, vet students and animal health assistants within project countries to improve the treatment given to donkeys. Its book *The Professional Handbook of the Donkey* is sent to vets throughout the world. Overseas teams have also developed a children's donkey welfare education programme that includes puppet shows, talks, cartoon sheets and story books. Its purpose is to make children learn more about the basic welfare and needs of donkeys.

ELISABETH SVENDSEN TRUST FOR CHILDREN AND DONKEYS ELISABETH

In 1989 the Elisabeth Svendsen Trust for Children and Donkeys was established to assist children with special needs lead a fuller life through interaction with donkeys. The trust, which offers free riding lessons, caters for more than 150 children a week. It operates from the sanctuary's main site in Sidmouth and through its other centres across the UK.



Figure 5. Sara Gee (2014) Elisabeth Svendsen, founder of the Donkey Sanctuary [Photograph] Accessed from <http://suttoncoldfieldlocal.co.uk/>

SLADE HOUSE FARM

The main headquarters of the Donkey Sanctuary in Devon are open to the public 365 days a year from 9.00am to dusk with free admission and parking. The charity estimates that more than 200,000 people visited the site in 2009. Donkeys of all ages live at the farm but a large percentage are elderly animals that remain there in order to be close to the veterinary hospital. In 2009 a film entitled *The Donkey Sanctuary, 40 years on...* was produced and narrated by Elisabeth Svendsen.

20 YEARS OF DONKEY ASSISTED THERAPY

This year The Donkey Sanctuary will become a milestone, because Sutton Coldfield's Donkey Sanctuary celebrates 20 years of assisted therapy. The Donkey Sanctuary assisted therapy centre, in Sutton Coldfield's Sutton Park opened in 1994, evolving from the charity The Elisabeth Svendsen Trust for Children and Donkeys founded by Elisabeth Svendsen in 1975.

The aim was to bring enjoyment and pleasure into the lives of the children giving them the satisfaction that comes with the achievement of learning riding skills.

The Birmingham branch started in 1989 and operated initially as a mobile unit from a field, taking donkeys to special needs schools. Following a generous donation from the Elise Pilkington Trust the centre in Sutton Park was purpose built and opened in 1994. It celebrates its twenty year anniversary later this year. Since opening, thousands of children have benefitted from regular therapy sessions with the donkeys that live at the centre. The centre caters for 20 local schools and around 200 children every week, and also visits local homes and hospices with donkeys as part of their donkey assisted therapy.

The therapy sessions are managed by a qualified British Horse Society riding instructor and manned by volunteers and staff. Each child has a holder and each donkey a leader. In each session the children are encouraged to perform a variety of tasks, communicate and follow instructions. Every term the children are given targets to work towards and every time they meet an achievement they are awarded a certificate. Some children have spoken their first words on a donkey, some have simply smiled. The children all look forward to their weekly donkey therapy session and get very excited.

The centre hold monthly Saturday clubs and Holiday clubs during school holidays where children with additional needs get the chance to meet and ride the therapy donkeys at the centre. Groups and schools are welcomed on day visits. No charge is made for the services and the centre is funded by donations to The Donkey Sanctuary. Donations are always welcome.

There are currently 20 donkeys at the centre, all are owned by The Donkey Sanctuary in Sidmouth, Devon. They are chosen to be therapy donkeys because of their special temperament and attitude. Each donkey has a tale to tell and they are all individual characters.

The centre is open to the public daily from 10 a.m. until 3 p.m., no appointment is necessary. You can meet the donkeys in their special surroundings of Sutton Park, a national nature reserve. There are indoor facilities and a donkey themed gift shop. They also hold several events throughout the year to raise funds all of which are open to the public.



4. SHELTER CHARACTERISTICS & CARE

Providing shelter for the animals means you need land and buildings. It is helpful at this point not only to decide on what kind of animals you will be rescuing, but how much space do we need to make all our animal necessities be covered properly. This will determine what size of land you will need, and what you will require for housing the animals. If we planned to build a donkey sanctuary, size will be different from the one we would need to build a dog rescue center, for example.

4.1. LAND & ZONING

Donkeys are rather hearty and can handle most moderate living conditions. Caring for your donkey should include a lean-to or shelter to keep them out of severe weather. They prefer to have their own area in a dark barn to get out of the summer heat and away from flies. Summer flies are extremely aggravating for donkeys, especially when pastured with cows. You may use fly sprays made for horses to keep the flies off of them.

In the winter this shelter helps to keep your donkey dry. A wet coat is the most undesirable thing to your donkey and can cause your pet to get sick. Providing access to a shelter will help to keep your pet in optimal health. Your donkey will need a fenced in area with a minimum of one acre (4046.8 m²) for two donkeys and an optimal size of three acres of pasture (12140.56 m²). For each additional donkey count on half an additional acre (2023.42 m²). Keep in mind the condition of the land. If your pasture is of poor foraging conditions you will need to supplement your animal's diet as it will be discussed later in this chapter.

Having selected some suitable land, find out what the zoning laws are for that land. Zoning laws regulate use of land, how many animals are allowed, and what species you can have on it. Agricultural zoning is the

most open to animals. But even that zoning does not cover exotics.

Zoning is only one of the issues to consider in the purchase of land. You also need to consider your neighbors' rights. Is there enough distance between the place they live at and the place our animals will normally be? For example, housing jackstocks or jennies in heat can be noisy, and if you do not have a buffer zone, like land or trees to dissipate the sound, your neighbors can legally file a complaint and perhaps force you to close down your operation.

Leasing land does not offer any stability for the animals. You do not want to be in the situation of having to relocate a large amount of animals if a lease is not renewed. So it is important for the sanctuary itself to own its own land. Problems can arise when an individual owns the land. If there is a falling out between that person and other sanctuary personnel, the animals could be in jeopardy. The characteristics of the terrain also need to be considered. Is the land prone to flooding? Is the property accessible to the public? Is there water and power on the land? If not, can it be brought in easily? Or can alternatives be provided in the form of solar units and water storage tanks? Are the access roads passable all year round? There are a lot of questions to ask in relation to a piece of land we could be considering to purchase. It is best to ask them all up front before getting into a situation which might prove to be unsuitable for what you have in mind.



Figures 6, 7, 8 & 9. (Figure 6) Longhopes Donkey Shelter, (Figure 7) Donkey Sanctuary Bonaire, (Figure 8) Keith Stokes & (Figure 9) The Donkey Sanctuary (2011-2012-2013- 2014) (Figure 6) Longhopes Donkey Shelter in Bennett, Colorado, (Figure 7) Feeding time at Donkey Sanctuary Bonaire (Bonaire), (Figure 7) Founded in 1977, Donkey Sanctuary Aruba is a home for about half of the donkeys on Aruba. The first ones were brought to Aruba by Spaniards, about 500 years ago & (Figure 8) Meet The Donkey Sanctuary's Family [Photographs] Accessed from http://braymere.blog_pot.com.es, (Figure 7) <https://www.4just1.com/> & (Figure 8) <http://www.formfiftyfive.com>

4.2. BUILDINGS

As desert animals donkeys do best in a temperate climate, although they will adapt to cold climates if provided with proper shelter and extra feed. They do not mind the cold. Donkeys dislike rain, and are susceptible to pneumonia and bronchitis when chilled. In some countries during late Spring, Summer and early Fall, an open front shed will do for shelter if it is well bedded with dry straw.



Figures 10, 11 & 12. (Figure 10) Abigail Jenkinson, (Figure 11) Claire McKenzie & (Figure 12) Sydnie (2008-2013) (Figure 10) Donkey in the desert & (Figures 11 & 12) Donkeys affected by cold snow [Photographs] Accessed from (Figures 10 & 11)

<http://www.flickr.com/> y (Figure 12)
<http://www.pinterest.com/>

In winter, depending on the region of the country we plan to locate our donkey sanctuary, donkeys may be shut in a barn, but allowed to run out on good days, or they may be loosed housed in a comfortable shelter facing away from the wind. Although some donkeys like snow, others suffer from the cold, and the same happens with the wind so guard them against chilling by the air draughts or snow.



Figure 13. Florentine Vermeiren (2009) Ancient rock cut house now used as donkey shelter in İhsaniye. Province of Afyonkarahisar, Turkey [Photograph] Accessed from <http://www.panoramio.com/>

Wet snow can melt down into a donkey's coat, soaking the hair and causing the animal to chill (we will see the donkey standing still, shivering because of the cold, but without moving. Protection against snow or drying the water out of the coat of the donkey is essential). Snow should be scraped off a donkey when it is put inside the barn. During a rain, the horse will have water pouring off its back, but the donkey's coat will become sodden with the rain as it soaks down to the skin. Donkeys therefore need adequate shelter during the cold rains of Spring and Fall.

CURIOUS FACTS

GUIDE TO THE IDEAL SHELTER

There is a number of points which should be borne in mind when designing a donkey stable:

- Adequate shelter should be accessible at all times. This is not only to offer protection during Winter, but also to give shade in Summer.
- There is a wide range of stables and shelters available on the market or you may already have one that is suitable, or would be with alterations.
- Allow approximately 4.5 m² (50 feet²) of covered area per donkey, approximately 9 m² (100 feet²) for a pair.
- A well-drained non-slip hard standing floor is essential e.g. concrete or stable brick.
- Provide a drained concrete run out yard.
- Avoid construction materials which allow condensation to develop – especially roofing.
- Ensure adequate ventilation with good air circulation, but avoid excessive draughts at donkey level. Consider the prevailing winds when designing your stable and face the back into the wind.
- Stable doors must allow donkeys to see over with ease – doors for horses are normally too high.
- Protect glazed windows with wire mesh.
- A floor level feed bin or corner floor feeder situated so that feed is not soiled. The use of a hay net is not advisable as it is better for donkeys to eat from the floor and hay nets when empty can become dangerous for the donkey.
- Fit tying up rings at the correct height for your donkey, i.e. his/her eye level.
- A covered, well lit area with hard standing is a great help to the farrier.
- Site stables or field shelters on well drained ground and avoid areas prone to fly nuisance. If mobile, move them once the ground starts to become muddy. (If this is not practical, a good, thick layer of bark chips spread around is an alternative preventive measure.)





Figure 14 & 15. Figures 14 & 15. Tierney Haines Architects (2014) Construction of a simple shelter for two donkeys. The form takes inspiration from the impression of a donkey's hoof in the mud. The roof is made from canvas and tar over a bent wood frame in a similar fashion to west of Ireland curraghs. The stone is slate from the local disused slate quarry [Photograph] Accessed from [http:// www.tierneyhaine.com](http://www.tierneyhaine.com)

You might find land that has a building or buildings on it. Often these can be adapted for your uses. Usually, though, you will need to start from scratch. You need to think about what kind of facilities the animals need to have quality of life.

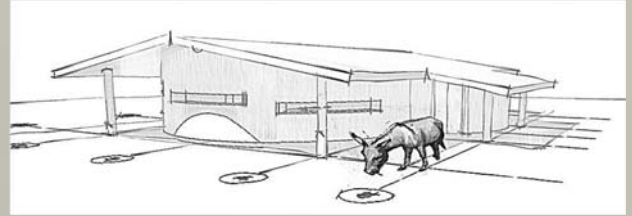
Unlike a traditional shelter, where the animals are for a short time, you will need to think about lifetime care. Here we have to consider that donkeys have a lifespan of 30 to 50 years, which is greater than that of the horse. When contemplating creating an adoption center or a donkey sanctuary, please consider their lifespan, luckily, if taken well care of, they tend to be whole lifetime companions. Though you will need common areas, as donkeys need companionship, and left alone, they are prone to depression. You will also need isolation areas, for the ill or troublemaker ones. If you are considering to adopt or rescue a single donkey, you might want to think about getting two. Other animals, such as sheep, goats, or horses, suffice, but donkeys are happiest accompanied by other donkeys.

CURIOUS FACTS

ANIMAL NEPAL STARTS CONSTRUCTION OF ECOFRIENDLY DONKEY SANCTUARY

With the digging of foundations, Animal Nepal started the long awaited construction of its new donkey sanctuary in Badikhel. Coordinated by overseer Norbu Kalden and engineering student Stefan Klaseboer, the building uses local and recycled materials. The stables will be build using the earthbag and adobe technique. The new donkey sanctuary will be a place where animals will be treated with kindness and compassion and where visitors will be able to learn about the abuse that takes place against equines in Nepal. Apart from stables catering for 25 rescued working equines, the project includes an education centre for children and an ecofriendly tented camp. Individuals and companies, such as the students from Little Angels School, who are interested in being involved in the project can do so by making their hands dirty and helping to build the stables using earthbags and mud. The project offers Corporate Social Responsibility (CSR) opportunities for teams who want to be part of this unique construction project, benefiting both the local community and countless working equines.

Animal Nepal has launched a sponsoring programme called Donkey Wall of Fame to build sufficient funds to complete and run the project.



Figures 16, 17, 18, 19 & 20. Animal Nepal (2013) Students from Little Angels School helping to build Animal Nepal's ecofriendly donkey shelter [Photographs] Accessed from <https://animalnepal.wordpress.com>





Figures 21 & 22. (Figure 21) Dinky Rugs & (Figure 22) The Donkey Sanctuary (2010-2014) Jennies wearing a rug to protect them from the snow [Photograph] Accessed from (Figure 21)) <http://www.tackandturnout.co.uk/> y (Figure 22) <http://www.flickr.com/>

Keep in mind that some donkeys are used as guard animals. This means that they are protecting the barnyard flocks from predators, i.e. dogs, coyotes, etc. Keep this in mind, since donkeys are not good companions for dogs.

Though some will be quite happy with a canine companion if they are raised together from a young age, and can actually become quite close to one another.

You will also need to create intake isolation facilities. In order to protect your resident population from exposure to disease, you will need to have a place to house any incoming animal for a minimum of two weeks (quarantine period officially ranges between 6 and 8 weeks depending on the place they come from and on whether there are health records of the animal). During that time you will be able to assess the animals' health and temperament. These facilities can be smaller as they will not be their permanent dwellings.

If you already have a complete health and temperament history of an animal coming into your care, then it is possible to waive the two-week isolation period. We have found it helpful, however, to keep the animals in a separate area until they get used to the new routines, new diet, and new personnel. It makes merging them into the general

population easier. If you do not have an architect to assist you at this stage, many sanctuaries or donkey breeders' plans exist and can be adapted for your unique situation. Visits to other sanctuaries will help you see what works and what does not.



Figures 23 & 24. Boughshire Dale (2010) Donkey kept in an isolation pen [Photographs] Accessed from <http://boughshiredale.blogspot.com.es/>



Figures 25 & 26. (Figure 25) Steve Hipps & (Figure 26) Cheryl McClure (2012-2014) (Figure 25) Buck lives on a small backyard pasture belonging to Steve Hipps. Steve lives on 9 acres in Simpsonville, S.C., which is just southeast of Greenville about 60 miles up I-85 from the Georgia line at Lake Hartwell. Buck used to share his pasture with a jenny, but after some baby donkeys showed up, Steve decided Buck would have the pasture to himself. Coyotes are not uncommon in his area, but this particular one was unusual. This one was coming out during the daylight hours -mid morning, early afternoon. One day, the coyote entered into his paddock and Buck stomped it. Then he reached down and picked him up by the neck and started

slinging him like a rag doll & (Figure 26) Tiki and Cloud practice, chasing Chester around the pasture. Livestock guardians for coyote, wolf, bobcat and mountain lion control [Photographs] Accessed from (Figure 25) <http://www.gon.com> y (Figure 26) www.youtube.com

The donkeys' stable or shelter should provide an area for the donkeys to get out of the heat and flies during the Summer and as a refuge from the bad weather in the winter. The stable should have a floor that drains well and have some form of bedding so that the donkeys can lie down in comfort.

There may be times when donkeys need to be shut in the stable such as when they are ill, when the vet is expected or while the electric fencing is being moved, so there should be a door with a bolt or slip rails to contain the donkeys.

4.3. STABLE MANAGEMENT: STABLE FACILITIES

Once we have built a proper shelter for our donkeys, we will also need to provide them with some facilities more. It is the same that happens when you move from one house to another; we prepare our new kitchen, bathroom, bedroom, etc.



Figure 27. Alessio Mesiano (2009) *The first Romanian Donkey Shelter* [Photograph] Accessed from <http://www.savethedogs.eu/>

4.3.1. Entrance door: Door height

The stable door should be as low as for your donkey not to lean over but high enough to prevent them from jumping out! Stable doors made for horses at 4' 6" (132cm) are too high for standard donkeys, but may be suitable if you have a large donkey breed. It is advisable to have a bottom bolt as some donkeys can learn to undo the top one! A

bottom bolt will also prevent the donkey from getting their foot caught in the door should it kick it. Kick bolts are the easiest to use as they can be operated with your foot, leaving your hands free.



Figure 28. Pics & Photos (2014) *View from inside the stable. Bottom Door Height 3' 6" (107cm) for standard donkeys and, ideally the door width should be 4' (122cm)* [Photograph] Accessed from <http://www.photographyblo.com>

4.3.2. Living room table: Straw feeder measurements

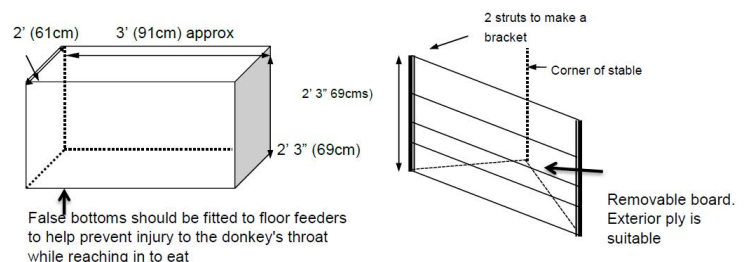


Figure 29. *The Donkey Sanctuary* (2014) *Straw feeder measurement scheme* [Illustration] Accessed from <http://www.thedonkeysanctuary.org.uk>

4.3.3. Plates: Floor level feeder

In the wild, donkeys graze with their heads down. It is not natural for them to eat from a

net or rack. If they reach up for their food from a net or rack then some particles of hay or straw could fall into their ears or eyes and respiratory problems can be exacerbated. To prevent this, provide a floor level feeder with no sharp edges. Place enough straw in the feeder so that they can browse through it, there will be no waste as the remainder can be used for bedding the following day. If possible, position the feeder so that the donkeys' feet are not on the bedding while they are eating. In the winter you may need to add a small amount of hay to the straw in the feeder if your donkeys are not maintaining their body condition with the grass and straw based diet.



Figure 30. Kristie Jorgensen (2005) Donkeys feeding from a floor level feeder [Photograph] Accessed from <http://longears-small.com/>

CURIOUS FACTS

WHY FEEDING HAY AND GRAIN FROM GROUND LEVEL IS IN YOUR DONKEY'S BEST INTEREST

You can reduce your donkey's risk of choke, colic and respiratory disorders and increase the amount of nutrients he gets from his ration by doing nothing more than eliminating chest- or head-high feed tubs and hay racks.

Floor-level feeding of both hay and feed mimics the natural heads-down grazing posture, which brings with it several health benefits

- Slowed rate of consumption-The donkey must be more meticulous in his chewing to hold onto the hay and grain he's processing. Compared to chest-high intake, each mouthful of floor-fed feed is smaller, more thoroughly chewed and better mixed with saliva, lowering the donkey's choke and colic risks.
- Improved processing-Increased chew time and greater salivation prepare each bite for more complete nutrient extraction down the line, increasing the nutritional benefits from each bite.
- Reduced exposure to respiratory irritants-Eating with a lowered head encourages airway drainage, the first line of defense against deep inhalation of feed-related particles and dust. Successful floor-level feeding involves safety and cleanliness considerations.

Stabled donkeys can be injured or entangled by sharp-edged or poorly designed feeding equipment taking up their foot space, and parasite infestation can be increased if they have to pick grain and hay out of soiled bedding.

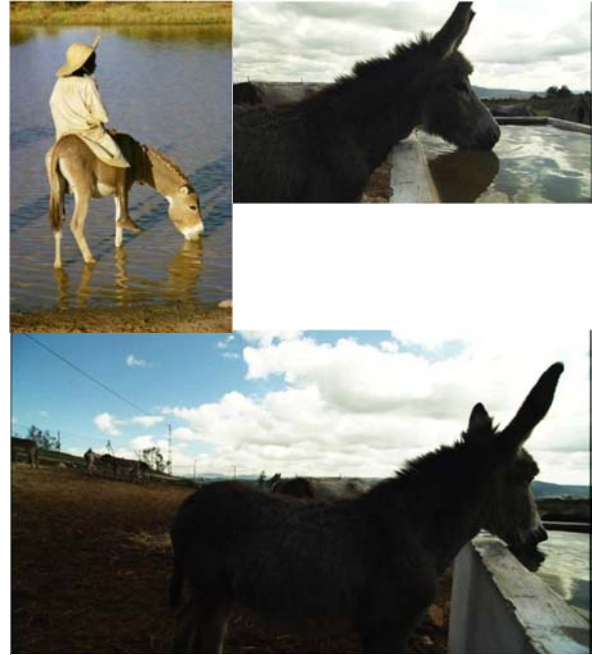
Orderly donkeys do well with their hay provided on the floor opposite from their usual droppings site and with grain fed in the shallow, reinforced rubber feed tubs designed for that purpose. Although the tubs are safe enough to remain in the stall round the clock, between-meal removal reduces manure contamination and wear and tear.

For donkeys who paw while feeding or scatter their hay and grain about, secure the feed tub in the clean corner with a length of baling twine, which will collapse if an entanglement occurs, and install a homemade or commercial hay "trough" that corrals hay at floor level. Take care that the hay trough construction is donkey safe.

4.3.4. Basin: Water dispensers and watering troughs

Donkeys should always have access to a clean water supply. They are very fussy about what they drink. A securely supported bucket or a self-filling trough should be constantly available and should be cleaned out daily. The use of buckets allows the accurate monitoring of water intake but a self-filling water trough does mean that the donkeys' water will not run out during the day or night. As a rough guide, the trough needs to be approximately 2' 6" (76cm) from the floor to the top edge of the trough.

To help prevent troughs from freezing during winter months a small floating football can be placed into the trough to keep the surface water moving or a float heater can be purchased, other more sophisticated antifreeze devices are also available. Plywood can be used to cover and insulate part of the trough leaving a smaller space for the donkey to drink from, and the trough, if mobile, can be sited somewhere it will catch the winter sun during the day, therefore making it less likely to freeze. If you are not at home during the day consider placing a bucket of water in their stable where it is unlikely to freeze.



Figures 31, 32, 33 & 34. (Figure 31) Dreamstime, (Figure 32) Jacques Jangoux & (Figures 33 & 34) Framepool (2007-2014) (Figure 31) Donkey drinking from a water dispenser, (Figure 32) Boy on donkey drinking water in pool in Burkina Faso, Africa & (Figures 33 & 34) Donkey Foal drinking from a watering trough [Photographs] Accessed from (Figure 31) <http://es.dreamstime.com/>, (Figure 32) <http://jangoux.Photoshelter.com> y (Figures 33 y 34) <http://footage.framepool.com>

4.3.5. Salt-Cellar: Mineral lick

An equine mineral block should be hung up inside your stable or shelter so that the donkeys can supplement their diet as they wish. Molasses treat licks are not encouraged due to the amount of molasses that they contain which can cause the onset of laminitis.



Figure 35. EST (2010) Donkeys licking a salt lick [Photograph] Accessed from <http://www.flickr.com/>

4.3.6. House wiring: Electric supply



Figures 36 & 37. OK Acres Shetlands (2011) Keeping a warm baby orphaned donkey with an ultraviolet lamp [Photographs] Accessed from <http://www.okacres.com>

Electric lights are highly desirable in the winter months and the facility for a heat lamp is useful, especially for old or unwell donkeys. All wiring should be encased in rat-proof tubing and all switches should be donkey proof and positioned outside the stable. Lights should have plastic covers and wire mesh guards. Clean cobwebs and dust off regularly.



Figure 38. Security Pest Control. Ant-Termite-Bedbugs-Rodent Control MA (2014) House mice gnaw through electrical wiring causing fires and failure of stable appliances [Photograph] Accessed from <http://www.securitypest.com/>

4.3.7. Bed: Bedding

Bedding on the floor of the stable keeps the stable clean and fresh and ensures the donkeys have a warm, dry place to lie down. Factors that will influence your choice of bedding include storage facilities, cost and disposal of manure.

4.3.7.1. Straw

There are three main types of straw: barley, oat and wheat.



Figure 39. The Flicka Foundation (2014) Donkey lying on a straw bed [Photograph] Accessed from <http://www.flicka.org.uk>

Barley straw is the preferred bedding for healthy donkeys. Barley straw is lower in feed value than oat straw but higher than wheat straw, it is comfortable for the donkeys to lie on and it drains reasonably well.

If donkeys have respiratory problems or require dieting then a dust free bedding should be considered. You will need to purchase Barley straw for the donkeys to eat, so it is convenient to also use it for bedding.

Oat straw is higher in feed value and more palatable. The donkeys tend to eat more of it and gain weight.

Wheat straw is the lowest in feed value and tends to have prickly ears and is not so comfortable to lie on. It does not drain very well and can be dusty, causing the donkey to cough.

4.3.7.2. Shredded wood fibre, Shredded paper or cardboard bedding & Dust extracted shavings

Shredded wood fibre is a breakthrough in dust free bedding. It is specifically manufactured from finely shredded recycled white wood such as palettes which makes it one of the ecological bedding products on the market. It is made to a very high quality standard and it is rigorously tested for cleanliness and consistency. Shredded wood fibre is sold in sealed 25 kg bales so it can be stored outside. It is free draining, yet absorbent which keeps the surface of the bed dry and because of its consistency is less likely to move when the donkey moves around or gets up and lies down, thus helping to prevent injury.

Shredded paper bedding is a dust free bedding material which is usually made from any unwanted printing matter such as newspapers and magazines. Bales come wrapped in polythene which makes them easy to store outside. Paper can make a warm and soft bed which is also highly absorbent. However, once wet the paper can become heavy to work with and on windy days will easily blow around the yard.

Shredded cardboard is an alternative to shavings making a comfortable, dust free bed for a sick or lame donkey. When dieting an overweight donkey as advised by a veterinary surgeon, cardboard bedding allows greater control over the amount of straw the donkey is eating. It is biodegradable but does take a long time to rot down. It costs about the same as shavings. Donkeys will eat cardboard bedding, so should be carefully observed to ensure there are no ill effects.





Figure 44. McHay (2014) Shredded cardboard bedding [Photograph] Accessed from <http://mchay.com>



Figures 40, 41, 42 & 43. (Figure 40) BarkSuppliers & (Figures 41, 42 & 43) Windt im Wald. A Wind in the Woods (2010) (Figure 40) Shredded wood fibre & (Figures 41, 42 & 43) Feeding paper into the Chipper/Shredder and loading shredded paper into horse stall [Photographs] Accessed from (Figure 40) <http://www.barksuppliers.co.uk> y (Figure 41, 42 y 43) <http://www.wiwfarm.com>

Another shredded material option would be dust extracted shavings. This kind of bedding should be of white/soft wood and dust extracted. Red/hard woods can be poisonous and cause respiration problems. Shavings can make an alternative bed for a sick or lame donkey that has problems moving around in deep straw. When dieting an overweight donkey as advised by a veterinary surgeon, the use of shavings allows greater control over the amount of straw the donkey is eating. Shavings are more expensive than straw and they take longer to rot down. The shavings absorb urine creating wet patches that should be removed daily.



Figures 45 & 46. (Figure 45) The Donkey Sanctuary & (Figure 46) Writtle Hay and Straw (2010-2014) (Figure 45) Donkeys over dust extracted shavings bedding & (Figure 46) Dust extracted shavings [Photographs] Accessed from (Figure 45) <http://www.thedonkeysanctuary.org.uk> & (Figure 46) <http://writtlehayandstraw.com>



Figures 47 & 48. (Figure 47) Levade Systems & (Figure 48) Happy-Horse-Training.com (2011) (Figure 47) Rubber matting stable & (Figure 48) A rubber-floored box with little or no bedding may look to us bare an uncomfortable, but for a donkey it is more important for them to be properly protected from the unnaturally hard and cold surface of a concrete stable floor [Photographs] Accessed from (Figure 47) <http://www.levadesystems.co.uk/> y (Figure 48) <http://www.happy-horse-training.com>

4.3.7.3. Rubber Mating

Provides a comfortable safe area for the donkeys to lie down. Some types have honeycomb areas on the underside for drainage. A shallow layer of shavings, straw or cardboard must be used to absorb the wet areas. Regular cleaning out is required and the slope of the shelter floor must be correct to allow good drainage under the mats. Rubber matting can be expensive.

CURIOUS FACTS

BEDDING OR NO BEDDING?

When it comes to stable flooring, it is difficult for us humans to remember that donkeys are not nesting animals! We love the look of a big comfy bed to snuggle into, but this is not at all instinctive for donkeys, who, in their natural state, lie down and sleep on solid ground.

A rubber-floored box with little or no bedding may look to us bare and uncomfortable, but for a donkey it is more important for them to be properly protected from a hard and cold concrete surface (which, under the weight of a donkey, makes itself felt even through thick bedding) than to have bedding to lie on.

How much bedding you use in conjunction with rubber matting is therefore not really a question of comfort, but it can play a role in how mucky the stable gets.

We will use donkey rubber mats with only a fine sprinkling of wood shavings to absorb surface moisture, and this makes our mucking out time very minimal, as well as the advantage of very little dust. However, there are also a few disadvantages to consider with using little bedding:

- Some donkeys do not like urinating on the rubber surface as it splashes more than outside or on bedding. These donkeys will tend to 'hold-on' until they have a chance to urinate outside, and would probably be happier with some bedding if they were in for a long period of time (although donkeys very rarely are).
- Donkey rubber mats stay very clean when the droppings etc. are swept back or removed fairly regularly, but obviously when donkeys are kept in overnight there is more mess, depending on how clean the individual donkey is. This does mean that the donkey and/or his rugs may get a bit dirtier than with other forms of bedding.

When we brought our donkeys in regularly, they come into the stables during the day, and go out at night. Rubber matting with no extra bedding is ideal for this routine, as the stables stay clean and our mucking-out time will be very short even with a remarkable number of donkeys. However, for donkeys coming in regularly at night, you may find it more practical to provide a small amount of bedding. This just requires a trial-and-error approach to find out what works best for your scenario.

OTHER USES OF DONKEY RUBBER MATS

Rubber mats are also very useful fixed onto the walls of a stable (door on Figure 48), both to protect the stable from kicking, biting and other aggressions, and to give cushioning to the donkey. They also add to the insulation of a stable in cold weather. Special lightweight rubber mats are available for this purpose.

Rubber mats are very good flooring on any stable-yard areas that are prone to slipperiness or sloped concrete ramps, washing and tying areas, crushes, and of course in trailers and donkeyboxes.

The extra grip they provide can help to avoid serious accidents. You will find many different types of mats adapted for these different uses, as well as pour-on liquid rubber.



4.3.8. Closing the garden: Fencing

There are many alternative types of fencing, or combinations of fencing, that can be used to contain donkeys. Two donkeys will require a field of approximately one acre. Add half an acre per additional donkey. The acreage required will vary according to the quality of the pasture. Where possible the field should be divided into two or three paddocks as this will allow greater control of donkey grazing and ease of pasture management. Fences should be arranged so that the donkeys have free access to the stable or shelter and fresh water at all times.

4.3.8.1. Hedges

Donkeys like the roughage that the brambles and hawthorn found in hedges will provide. Donkeys are great escape artists and can eat their way through a hedge before you realise what has happened, therefore you should always have additional perimeter fencing. Hedging provides natural shelter and is a natural windbreak. Remember that hedges can harbour poisonous plants that need to be removed such as: yew, laurel, rhododendron, foxglove, oak, bracken, ragwort and deadly nightshade to name a few.

4.3.8.2. Wooden post and rail

Although expensive, post and rail fencing with four rails is ideal. Standard post and rail fencing usually has only three bars. The extra fourth bar should be positioned 45 cm (18 inches) from the ground as some donkeys will wriggle between the third bar and the ground.

Wooden fences need to be treated periodically, with an animal friendly preservative.



Figure 49. WWF-Canon / WWF Switzerland/A. Weissen (2014) Donkey protecting a flock at a paddock surrounded by hedges [Photograph] Accessed from <http://wwf.panda.org>

Donkeys may chew the wooden fences. This may be because they like the fibre and roughage or because they are bored. If you provide some non-toxic bark covered logs for them to chew and ensure access to feeding straw they are less likely to chew your fences.



Figure 50. treshabarger (2014) Donkeys watching through a wooden, slatted fence [Photograph] Accessed from <http://treshabarger.com/>

4.3.8.3. Pig netting

Wooden posts with pig/sheep netting tensioned between them are a less expensive option. It is important to make sure that the netting is tensioned correctly and maintained regularly. If the

bottom of the wire is allowed to become slack and pull away from the fence then the donkeys could put their hooves through the wire and get caught up. A single wooden rail or a strand of well-tensioned plain wire should be positioned above the netting to prevent the donkeys from the dangerous activity of leaning over to reach the grass or hedging on the other side.



Figure 51. Escape. Animal Sanctuary and Conservation Centre (2011) This is an example of a fence panel, sold as cattle or hog panels but good for all types of livestock [Photograph] Accessed from <http://escapeascc.wordpress.com>

4.3.8.4. Barbed wire

Wherever possible you should avoid using barbed wire. If pig/sheep netting is against a boundary hedge then the top strand of wire could be of well tensioned barbed wire.



Figure 52. Adam Chilson (2010) Barbed wire pen full with donkeys [Photograph] Accessed from <http://www2.adamchilson.com>

If barbed wire is used in your pastures as a top strand for pig netting, the wire should be well

tensioned and regularly inspected. It is not safe to use barbed wire as a dividing fence between paddocks, as the donkeys could run into it. To avoid the risk of lower leg injuries do not use barbed wire below 3 feet (91.44 cm) off the ground.



Figure 53. John Corney (2014) Donkey through a barbed wire fence [Photograph] Accessed from <http://photographybyjohncorney.com/>



Figure 54. Zoological Center Tel Aviv - Ramat Gan (2014) Haim the donkey poses with his new therapeutic trousers next to his caretaker at the Safari in Ramat Gan. Before Haim the donkey arrived at the safari, he was regularly tied up with barbed wire behind his owners' home, where local children would abuse the helpless animal. Haim began a long rehabilitation process, gradually learning to trust his caretakers and even overcoming his fear of children. His physical wounds, however, took longer to heal. His lower legs, where he was bound, had the fur rubbed off, and flies would bite his raw skin. The flies caused Haim to bite and scratch his legs, leaving sores and cuts that in turn attracted more flies. The donkey was caught in a painful cycle. Staff at the safari first fashioned him a pair of socks to cover his wounds, held in place with medical tape.

Unfortunately, the daily switching of the socks and replacement of the tape aggravated Haim's wounds, and he tried scratching off the tape. Two caretakers, Becca Rivkin and Shira Inbar-Danin, came up with a solution. They spent four hours stitching a special pair of pants for the donkey that are held up by suspenders over his shoulders. The pants are double-layered, with a soft stretchy material on the inside, covered by a rougher baggy material that flies ca not bite through. The two women also rub cream on his legs every day. The special pants are working swimmingly, and Haim will soon receive pants for his hind legs as well. With his skin protected, his fur is expected to grow back quickly, and then Haim the donkey will be able to trot around bare-ass once again [Photograph] Accessed from <http://www.timesofisrael.com>

4.3.8.5. Electric fencing



Figure 55. HorseGuard Canada (2014) Cattle isolated from donkeys by electric fencing [Photograph] Accessed from <http://www.horseguard-canada.ca/>

This is a versatile and effective method of managing pasture. Electric fencing can be used to create paddocks within an existing field system or to strip graze. Strip grazing involves running the electric fence across the paddock and moving the fence a set distance each day to control the amount of grass the donkeys are getting. Setting up an electric fence involves setting out fencing posts, threading tape or wire through and linking it up to a battery powered fencing unit. At *The Donkey Sanctuary* they prefer to use the more visible tape than wire. It is important to measure the length of the

electric tape required so that the correct power unit can be purchased. If the power unit is incorrect the fence will be ineffective. The instructions supplied with the fencing unit should be followed carefully.

4.3.9. Garden entrance: Gateways

During Winter months gateway areas, or access points, will become wet and boggy. The obvious way to prevent this is to keep the donkeys off the land, shutting them in a covered area, with hard standing. They can then get turned out when conditions allow. Not everyone has this luxury so prevention is better than cure. At *the Donkey Sanctuary* hard wood chippings (bark) is put down during the winter months to prevent gateways becoming wet and boggy. Points to be considered:

- Always keep water troughs or feed containers away from gateways and trees.
- If you can use another access then do so, this prevents the area becoming too boggy and wet.

Gateways should also be designed to allow easy access both in and out of the field. All gateways should have good hinges and must be fastened securely, preventing the donkeys from escaping.





Figures 56 & 57. (Figure 56) Mighty Iron gates & (Figure 57) Kristie Jorgensen (2009) Iron gates [Photograph] Accessed from (Figure 56) <http://www.mightyirongates.com> (Figure 57) <http://longearsmall.com>

4.4. HOW DO WE FIND THE DONKEYS WE RESCUE? MEDICAL AID SUPPLY

This can be a make-or-break area. Every animal we rescue will need some medical attention. This can be as minor as making sure the vaccinations are up to date, or as major as orthopedic surgery on a leg or hip. We will need to be prepared financially, emotionally and physically to deal with sickness, injury and disease. Having one or several veterinarians working closely with us will make all the difference to the quality of medical care we can provide for the animals in our charge. If we are lucky enough to link up with one or more veterinarians who are sympathetic to what we are doing, they can help us with discounts on medicines and procedures. And some may even be able to do pro bono work selflessly. If we do not already have a veterinarian that we work with, then we will visit our local vets. Outline our plan and enlist their support. Many sanctuaries are able to employ a veterinary technician who is able, under the direction of a veterinarian, to take care of some of the basic day-to-day medical treatments.

4.4.1. Signs of good health

Every person working at donkey sanctuary will, at some time, be concerned that all is not well with the donkeys living at their sanctuary. By understanding the signs to check for it should be easier to spot an early warning of a developing problem. It is certainly our experience that donkeys are very stoical by nature. They generally do not show obvious or dramatic signs of illness or lameness until the problem is well-advanced. Familiarity with routine health checks and the behaviour of your own donkeys is the key to early recognition. For both the new and experienced donkey owner, it is certainly advisable to become used to using the following 5 point check list on at least a daily basis:

- Behaviour.
- Appetite and thirst.
- Faeces (and urine).
- Eyes, nose and resting respiration (breathing).
- Coat and skin.

4.4.1.1. Behaviour

This is perhaps the single most important check. A healthy donkey should be alert and aware, interested in what is going on around it with ears pricked. No donkey should spend prolonged periods lying down. Healthy donkeys should be able to get up and down easily, and move freely without limping, taking their weight equally on all four legs. Each donkey will have its own characteristics – e.g. a particular companion, grazing pattern, daily routine. It is sometimes only a slight change that indicates, at an early stage, a potential problem. Small changes in normal behaviour are often the first signs of illness, so get to know your

donkey's ways as soon as possible.



Figure 58. Mitasha (2011) An ill donkey. It is over at the knees and it is all covered in scabies. Note the most common pain signs; lowered head, amplified station base and ears backwards [Photograph] Accessed from <http://mitasha.wordpress.com>

4.4.1.2. Appetite and thirst

Donkeys would naturally graze for long periods of time. It is therefore important to control their diet to prevent obesity, but a healthy donkey should be looking to eat throughout the day and have no problems chewing or swallowing.

The amount a donkey will drink obviously varies according to air temperature, moisture content of food, workload etc. but routine checking of the water supply may provide evidence of its intake.

4.4.1.4. Dung, faeces and urine

Check for fresh faeces, the consistency of which may alter with diet. There should be regular output of normal, moist faeces formed into balls, which break up easily.

Male and female donkeys each adopt a different characteristic stance when urinating. Normal urine is yellow and watery, and may on occasions be cloudy. It

should be passed freely, without straining. Repeated attempts to pass urine, or urine which is obviously discoloured or bloody, should be viewed with suspicion. Jennies in season may be seen to attempt to pass urine more frequently.

4.4.1.3. Eyes, nose and resting respiration (breathing)

Eyes should be clean and bright, open and free from discharge. The nostrils equally should be clean and discharge free. At rest there should be minimal movement of the nostrils as the donkey breathes. In fact it is often difficult to make out the movements of the chest at rest, the movements of the flanks are often the easiest to observe. A flaring of the nostrils, a marked rise and fall of the ribs and flanks, or any noise associated with the donkey's respiration should be cause for further thorough investigation.

Exercise, stress, excitement and fever will increase the rate and depth of respiration.

4.4.1.5. Coat and skin

A healthy donkey should have a flat, clean coat with no signs of itching, bald areas, sores or abnormal lumps and bumps. It is a good idea to get your donkey used to you routinely running your hands over all areas of the body, legs and head – a donkey's coat can often hide developing problems.

4.5. MEDICAL ASSESSMENT ROUTINE

The above five points should be checked at least on a daily basis. If you are concerned that all is not well then there are a number of simple tests and checks that you can do yourself. These will certainly help in giving your vet a full picture of the problem should you feel it necessary to seek further expert advice.

Additional health checks:

- Temperature, pulse, respiration rate (“TPR”).
- Gut sounds.
- Feed test.
- Condition score/heart girth measurement.

VITAL SIGNS - “TPR”

A) Temperature

Normal values:

Adult Range 36.2–37.8°C (97.2-100°F), Average 37.1°C (98.8°F).
Young donkeys up to 2 years old 36.6-38.9°C (97.8-102.1°F).

Buy a clinical thermometer from your vet and ask him how to use it. We should get used to checking our donkeys’ temperature so that we feel confident should we suspect that there might be a problem developing. Donkeys are individuals and their normal temperature will vary, so taking our donkeys’ temperature will not only get them used to this procedure but will allow us to record their normal temperature range, being therefore able to find any abnormality.

B) Pulse rate

Normal range:

36-68 Average 44 beats/min. With a little practice anyone can learn to count the pulse in the artery that runs under and across the lower jaw. Count the number of pulses felt in 15 seconds and multiply by 4. Keep the donkey’s head still with a hand above the muzzle. Use the fingertips of the other hand to locate the artery (about 4 mm diameter) and by varying the pressure you will soon be aware of the pulsations corresponding to each heartbeat. Getting to know what is normal for your donkey is very important so that any changes can be measured against the normal range for the individual.

C) Respiratory rate

Average 12-20 inspiration/min. It is best to do this with the donkey undisturbed. Stand back to one side and either watch the rise and fall of the flank or chest or the vapor from breath coming out of the nostrils (on a cold day). Again count the number of breaths (a “rise” and “fall” = one breath) in 15 seconds and multiply by 4. Getting to know what is normal for your donkey is very important so that any changes can be measured against the normal range for the individual.

D) Gut Sounds

A normal donkey’s digestive system is generally a noisy machine with many squeaks, gurgles and rumbles. These are particularly evident when the grazing is good but are also audible on winter rations (hay and straw). Our vet will use a

stethoscope to hear these sounds but our own ear placed against the skin of the flanks (between the last rib and the hind leg) should pick up some of them, however great care should be taken as the donkey may kick particularly if in pain. If we get used to the normal sounds in a healthy donkey this can be a useful test – particularly if we suspect that our donkey may have colic (abdominal pain) or may not be passing faeces.

E) Feed test

A favourite test at *The Donkey Sanctuary* is the “ginger biscuit test” although many donkeys will take a biscuit, particularly if they are used to this treat, a lack of interest is a definite cause for concern.

F) Condition score/heart girth weight measurement

Keeping a written record of your donkey’s condition score and heart girth is a very useful exercise – especially in the elderly donkey where gradual weight loss might be missed. A simple measure of heart girth weight measurement recorded regularly will help to monitor your donkey’s condition. To do this accurately, a standard technique should be used. The donkeys’ height to their withers should be measured in centimetres while standing on level, hard ground. Although, once a donkey is over four years old this measurement will get almost constant, we recommend performing a new height to the withers measurement each time rather than using the same

measurement in future weighing estimations.

The heart girth measurement is taken in centimetres using an ordinary tailor’s tape measure. The tape measure should pass around the bottom of the donkey’s chest as far forward as possible and as close to the front legs as possible. The tape measure should cross the top of the donkey’s back 10 centimetres (a hand width) back from the withers. The front of the cross can be a good guide to the position of the withers. The tape measure should not be vertical around the donkey when viewed from the side. The tape should be pulled firmly but carefully around the donkey and the reading taken in centimetres.

The heart girth should always be taken in the same location preferably by the same person to ensure a continuity of the measurements taken. Both measurements can then be marked on The Donkey Sanctuary weight nomogram, which is included in the back of the feeding section (4.8.) in this chapter, and the donkey’s weight read off the centre scale. e.g. a donkey 110 cm tall and with a heart girth 130 cm would weigh approximately 217 kg.

The monthly weights can then be compared and feed rations and strip grazing adjusted according to the donkey’s dietary requirements. Please note that horse weight tapes do not work on donkeys due to their proportions being so different.

To condition score donkeys use the Body Condition Scoring Chart (see Book 1, Chapter 5). Donkeys are given a condition score between 1 and 9. 1 is very poor and 9 is very fat (obese). The ideal body condition score is 5. We recommend you weight and condition score your donkey at least once a month (see Chapter 4)



Alzada a la cruz (cm) Circunferencia pectoral (cm)
Figure 59. Figure 59. The Donkey Archives (2012) Height and heart girth measurements [Photograph] Accessed from <http://thedonkeyarchives.blogspot.com.es/>

4.6. SPAYING/NEUTERING PROGRAMME

We strongly recommend that every sanctuary is linked to an active spay/neuter program. Where possible, the sanctuary itself should offer these services, not only to sanctuary animals, but also to the general public. Best Friends, for example, operates a spay/neuter program for the local area. And every animal who is adopted out from the sanctuary is already “fixed”.



Figures 60, 61, 62, 63, 64 & 65. Julie Frazzle (2010) Male donkey foal neutering procedure [Photographs] Accessed from <http://photobucket.com>

Donkey overpopulation (in some countries), mistreatment and abandon are the reasons we have to create sanctuaries for unwanted donkeys, so one of the first priorities is to try and prevent more of these animals coming into the world. When talking about donkeys behaviour and mating control are the main reasons for neutering.

Contrary to popular belief donkeys are not stubborn-headed animals. They are actually quite intelligent and cautious. They are cautious of new experiences and environments and will stop to take in all that is around them before proceeding. They are careful to observe around them (i.e., other livestock, pets, land) before carrying out a task. This may be where the misconception of stubbornness arises.

But when dealing with jackstocks, their strong hormone influenced character is the exception that proves the rule. So when they are not going to be used in breeding programmes the best thing is to have them neutered as soon as we are able from 6 months (if testicles have descended). Geldings are much more easily to handle and predictable.

4.7. VACCINATIONS/MEDICATION AND DEWORMING

Your vet will be able to help you get some supplies at cost. Some feed stores sell basic medications, and many of the pet supply catalogs carry a variety of supplies at reasonable prices. Donkeys should be given an annual injection of a four-way equine vaccine every Spring. The injection provides immunity against eastern and western equine encephalitis, equine influenza and tetanus, which are all potentially fatal equine diseases. Check with a veterinarian about starting a vaccination program.

Deworm donkeys three to six times per year, using any of the equine paste wormers currently on the market. If the presence of parasites is suspected, a veterinarian should do a fecal test to determine exactly what type of worms are present and how best to treat for them. Rotation of deworming products is recommended. Unless internal parasites are removed by regular deworming,

donkeys will suffer internal tissue damage from migrating parasites, which may considerably shorten their life span.



Figure 66. Figure 66. Sidor Adventures (2011) Veterinarian about to vaccinate a donkey [Photograph] Accessed from <http://erikajake.blogspot.com.es>

4.8. FEEDING AND NUTRITION

It is important to feed good quality food to the animals in your care. This will be a constant expense. Getting food donated on a regular basis will help defray costs, but it often requires a lot of leg work and coordination, a good reputation, and a willingness to take whatever they want to give you.

The large pet supply stores and farming grocery stores often have broken bags to donate, but they usually require that you have a tax-exempt number and an official non-profit status, so that their donation is tax-deductible.

Try asking to any pet food distributors in your area, you can ask to be put on their list of groups to receive donations, offering advertising possibilities.

The only problem with donated food is that you might have a mixture of brands and types of food and this is even a greater problem in the case of the donkey, which is a strongly sensitive animal to any routine changes, including, of course, alimentary ones.

In their natural habitat donkeys are lean, fit animals browsing on fibrous plant material, eating small quantities throughout the day and often walking considerable distances. Donkeys browse as well as graze. Donkeys will forage through their pasture looking for grasses and plants to eat. Donkeys will eat coarse herbage, marsh grass, young thistles and shrubs in his pasture, feeds that most horses will not eat.

There is a subtle difference in the metabolism and physiology of the donkey and the horse. Donkeys have adapted to a high fibre diet, having their origins in regions where vegetation is dry and sparse. A donkey that is put into a grass pasture will need very little, if any supplemental hay, so long as the grass and other plant life is plentiful.

Be sure to monitor their weight to make sure they are not getting too fat. You may have to limit their grassing time. A well-balanced high fibre diet is ideal for maintaining a healthy donkey in the correct body condition.

4.8.1. Grazing

Adequate pasture for grazing and exercise is essential. Depending on the type of land and quality of grass, a one acre field correctly managed should provide sufficient for a pair of donkeys.

Donkeys can graze coarser pasture than a horse. Lush pasture is not recommended because donkeys have low energy requirements and are prone to obesity and certain metabolic disorders such as laminitis (founder) and hyperlipaemia if allowed free choice high quality pasture. Allow each donkey from one-half to one acre of pasture per month. This will vary with the quality and amount of growth in the area, and the size of the donkey. Obviously Mammoths will need larger areas than Miniatures or Small

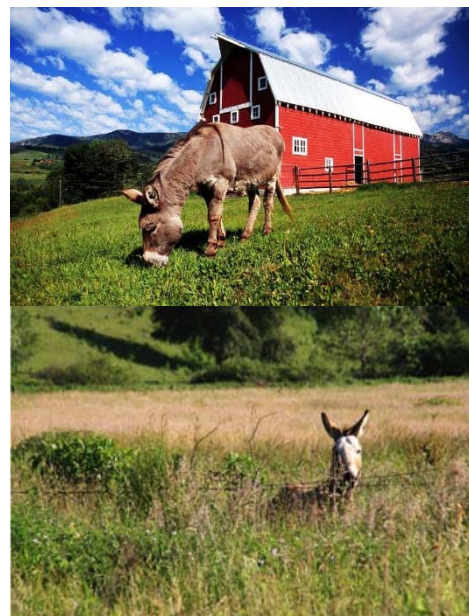
Standards. If possible divide pastures and alternate from one pasture to another.

When a pasture is at rest the long grass and weeds can be trimmed down well before the animals are to be returned to it. Harrowing the pasture will help to spread the manure and reduce parasite problems. Donkeys will make a place where they can take dust/sand baths during warm weather.

Pasture fencing can be page wire, plain or barbed wire (beware of cuts from the latter), electric or a combination of both. Donkeys quickly learn to be very respectful of electric fence.

From mid-May to early September, pasture will provide enough to meet the nutrient requirements of donkeys unless drought conditions exist. Make the change from dry food to grass slowly in the Spring, to avoid health problems such as grass founder.

Allow donkeys on pasture for thirty minutes per day at first, then gradually increase the length of time each day, donkeys should be turned out after they have been fed on dry feed. After a week, the donkey can stay on pasture all time.



Figures 67 & 68. (Figure 67) Ed George & (Figure 68) Leslie Timmons (2012-2014) (Figure 67) A donkey grazing near a large red barn & (Figure 68) Donkey standing at a tall grass paddock [Photographs] Accessed from (Figure 67) <http://fineartamerica.com/> y (Figure 68) <http://www.flickr.com>

CURIOUS FACTS

FOOD PASTURE MANAGEMENT

For good pasture management the following points should be considered:

- Most donkeys will become obese on unrestricted grazing. The sensible use of electric/moveable fencing will enable you to control your donkey's intake and maintain an area for haymaking if desired. Electric tape systems are preferable to wire as they are more visible. Always follow the manufacturer's guidelines. Keep your fence neat and well maintained and check it every morning and evening, moving as appropriate. The rotation of grazed areas can also be very useful in helping to control parasitic worms.
- Limiting grazing time can be a useful way to restrict access to grass as well as restricting grazing area by an electric fence. Limiting grazing to early mornings and bringing donkeys off pasture by mid-morning may also help prevent laminitis.
- Check perimeter fences regularly to ensure they are donkey proof and well maintained.
- Ideally pick up dung daily as this prevents the spread of worms. Where this is not possible dung should be removed from the paddock at least twice a week. Donkeys do not like to graze areas spoiled by faeces and a twice weekly pick up will really help to remove many parasitic worms.
- Check regularly for poisonous plants and rubbish, both in the pasture and through the hedge/perimeter fence. Ragwort, oak and acorns are the most likely problem plants and derivatives. Yew is also very toxic to donkeys. Bracken is potentially toxic and some donkeys may develop a taste for acorns, which can cause problems when eaten in quantity. Remember that poisonous plants are more likely to be eaten if other feed is in short supply. In the Autumn the area around oak trees should be fenced off to prevent donkeys from eating acorns.
- Be very aware of grass cuttings dumped in pasture – grass cuttings can cause fatal colic in donkeys. Also be careful if donkeys are allowed in gardens as many contain exotic plants, which could be poisonous.
- Be aware of the risks of laminitis from excessive consumption of grass (stressed grass i.e. frosty grass can also be a problem). Donkeys being turned out in the spring after winter housing are particularly susceptible. It is advisable to feed donkeys hay/straw prior to grazing, for a limited time only, when first turned out. Fields which have been previously fertilised may pose a greater threat. Spring, however, is not the only "risk period". Whenever grass is growing well it may be a potential problem. Frosty conditions can also increase the threat of a laminitic attack.
- Avoid grazing recently fertilised fields until the fertiliser has been taken into the soil by sufficient rain.
- Provide shelter and protection from the elements.
- Check water supplies daily and clean troughs regularly.

4.8.2. Feeding advice. Basic rules of feeding

- Feed little and often and keep feeding times regular.
- Any change in the feeding regime must always be carried out gradually.
- Always feed according to the donkey's age, weight and temperament.
- Avoid dusty or mouldy feeds.
- Always have clean water available.
- Access to an equine salt or mineral lick is advisable.

Regular worming and dental checks are necessary to enable the donkey to make efficient use of its feed.

General information about feeding your pet:

All equines are sensitive to toxins that can be found in spoiled feeds, so all feed should be free from mold. All changes to diet should be made gradually to avoid colic and digestion disturbances. Donkeys prefer to browse for their bulk and fiber throughout the day and prefer to eat little and often. Do not overfeed your donkey and this will be assessed by checking the body condition of it regularly as overeating is detrimental to your donkey's health. Donkeys do not need high levels of sugar in their diets. Always provide a mineral lick and permanent access to a clean (and unfrozen) water supply.

Hay: High quality hay should be fed in winter or when pastures are depleted in the fall. Legume hay (rich in alfalfa or clover) is not recommended as the only hay for donkeys because of its high protein levels. Timothy, meadow grass, brome grass or mixed legume-grass hays are suitable.

Hay composed of 50 per cent timothy and 50 per cent alfalfa is suitable for donkeys that, are growing, pregnant, nursing and during the coldest months of winter. If you anticipate feeding hay to your donkeys

during the winter you need to take into account the type of hay you are buying and the time of year that it was cut. The quality of your hay will make a notable difference in your pet's diet requirements/supplements.

Meadow hay is a mix of grasses grown on old pasture and is good for feeding to donkeys. Remember that late cut hay will have lower energy values. If you are purchasing hay from a local farmer keep in mind your local weather conditions (rainy wet weather, drought) control the cutting season (late May to mid-June). Buying local hay gives you an advantage in knowing the value of your purchase. If the cut is later in the year a lot of the nutritive value will have gone out of the grass and some of the grass will have gone to seed. This type of 'second cut' hay is much lower in energy value than early cut hay and for that reason it is fine for feeding to donkeys.

To reduce the risk of colic and laminitis mix the new hay with the previous year's hay or with straw for a few days. Make a gradual change over in the feedings. All fresh cut hay should be stored in a dry barn for approximately two months before feeding it to your pet.

Minerals and Vitamins: Provide fortified trace mineralized salt in block or loose form in the pasture or by the shelter. Check with the district agriculturalist to learn which minerals are deficient in the feeds of the region (e.g. selenium, copper, zinc, among other). These must be added to diets for donkeys, usually in the salt or mineral mix. It is recommended that your donkey have free access to this equine mineralized block. Donkeys obtain many vitamins and minerals from the straw, grass and hay in their diets. Blocks designed for other livestock may be dangerous for donkeys as some contain inappropriate mineral levels. Please check labels before purchasing and feeding.

Straw: Poor quality meadow hay is comparable in feed values as a good quality barley straw would be. Alternatively, oat straw can be fed; this usually has a slightly higher nutritional value than barley straw. Wheat straw is very fibrous but has lower feed values. Linseed straw is poisonous and should be avoided.

Chaff and Freeze Dried Grass: Chaff is a mixture of chopped up hay and straw and there are many types of chaff on the market. Consult your local feed/grain store for proper diet ingredients.

Dried Sugar Beet Pulp: Sugar beet cannot replace hay or one of its alternatives, but it is a useful source of succulent and nutritious fiber when added to the feed. If your pet donkey is sick it is also a good trick to keep in mind for getting him to eat.

Silage: When available, silage may be fed in small quantities with the balance of the feed to be made up of hay. Beware of mildew (grey dust) or mold on hay - They are poisonous.

Haylage: Haylage is semi-wilted grass that has been allowed to dry to only 55-65% (as compared to 85% in hay). Haylage is baled, compressed and vacuum sealed into heavy plastic bags and is highly palatable and nutritious.

Succulents: Turnips and carrots encourage appetite and are a worthy addition to the regular diet in winter and early spring when fresh grass is not available. Do not feed root crops that have been subjected to frost, or green potatoes as these may contain molds and toxins which are detrimental to your donkey.

Water: Clean, fresh water should be freely available at all times. Remember to check water supplies in cold weather to ensure they have not frozen. Fresh water is essential. Donkeys are very particular

about water being fresh and clean. They will drink from 10 to 25 litres per day.

Prepared horse feeds provide supplemental energy, protein, minerals and vitamins required by donkeys. Supplements formulated for cattle, pigs or poultry should not be used, because they may contain additives that are toxic (e.g. Rumensin).

*Note: Concentrate feeds, such as grain, are seldom needed by donkeys. However, growing youngsters and pregnant or nursing jennets may receive grain rations depending on their body condition. Donkeys need grain if they are used to work (driving, packing, predator control in sheep, etc.).





Figures 69, 70 & 71. (Figure 69) Marc Buma, (Figure 70) Ministry of Tourism, Civil Aviation and Culture Antigua Barbuda & (Figure 71) MsPumpkin.com (2008-2012-2014) (Figures 69 & 70) Donkeys feeding from a trough at the Sanctuary in Bonaire & (Figure 70) Barbuda island & (Figure 71) Donkey eating a [Photographs] Access@dmpkinfrom (Figure 69) <http://www.donkeysanctuary.org/>, (Figure 70) <http://www.visitantiguabarbuda.com/> y (Figure 71) <http://www.mspumpkin.com>

Assessing our donkey's single alimentary behaviours;

- It is a good idea to learn to body score your donkey. Donkeys should be weighed once a month on livestock scales. Where these are not readily available the heart girth and height measurement method should be used. A gradual change in weight can then be identified if the measurement is undertaken monthly and feed adjusted accordingly.
- Most donkeys, even those undertaking limited exercise, will only require a maintenance ration. Only underweight, old or sick individuals usually need any form of additional feeding. Restricted grass, hay, straw, with an equine mineral salt lick and water will be all that most healthy donkeys require. Late or second cut meadow hay is preferable because of the lower fructan sugar levels thus reducing the risk of laminitis.

- Any change in your donkey's diet should be made gradually, and if extra feeds are required they are better fed in small, frequent feeds rather than simply once a day. If a donkey is underweight, then a complete veterinary examination (dental, coprology, etc.) is likely to be necessary.
- Any donkey that is not grazing or is stabled should be given small amounts of fibre, such as straw throughout the day.
- All feed, whether hay, straw or purchased feed should be of good quality and never spoiled, dusty or mouldy. Particular care should be taken with the feeding and bedding of donkeys with respiratory diseases, particularly those caused by an allergy e.g. to fungal spores.
- When donkeys are at pasture their daily care should not be forgotten (see grazing). Excessive grazing and overfeeding with insufficient exercise is all too common in donkeys kept in the northern European countries like the United Kingdom. Obesity is associated with a number of serious problems and diseases. Prevention is better than cure and dieting an overweight donkey is not an easy task.
- Barley straw should be fed where suitable, as it increases the fibre content of the diet. However, old donkeys with worn or missing teeth may be unable to chew straw adequately.

4.8.3. Feeding dosage

The average Small Standard donkey (approximately 44 inches tall (11.76 cm) and weighing 400-500 lb (181.43-226.79 kg) that does little or very light work in winter, requires only two handfuls of whole

oats per day and some hay. Watch donkeys closely to determine whether they need more or less feed. Youngsters under the age of two and older donkeys that are more than 20-years-old have been found to do well on rolled oats or a 50 per cent rolled oat and 50 per cent rolled barley mix. Adult donkeys over the age of two years do well on good quality, clean whole oats.

An obese donkey should be fed only hay (2-4 flakes per day). A thick roll of fat along the crest of the neck indicates obesity in donkeys. This roll of fat is extremely hard to reduce once it has formed. Eventually the excess weight of the neck roll will cause it to fall over to one side of the neck, creating an unsightly malformation. Avoid placing the obese donkey on a starvation diet in the hope of rapidly removing excess weight. The loss of more than 2 kg (4.4 lb) per month can precipitate metabolic disorders such as hyperlipaemia according to *The Professional Handbook of the Donkey*

Adult donkeys in good condition will eat the same amount of hay, plus the ration of concentrates mentioned above. Naturally the amounts fed will vary with the size and condition of the donkeys. Mammoths or miniatures need correspondingly more or less feed, respectively.

A rough guideline is to feed a total weight (hay plus grain ration) of 1 kg (2.20 lb) of feed per 50 kg (110.23 lb) of body weight (two pounds of feed per hundred pounds of body weight). For example:

A 450 lb (204.11 kg) donkey

- at rest - approximately 4 kg (9 lb) total feed (hay plus grain) daily.
- at work - approximately 5kg (11.25 lb) total feed daily

The more hard work is required, the greater the amount of grain usually should be given

providing the donkey does not become too energetic and hard to handle. For example:

A 450 lb (204.11 kg) donkey

- at rest - 0 to 1 lb (0-0.45 kg) grain plus 7-8 lb (3.17-3.62 kg) hay daily.
- at work - 1 to 2 lb (0.45-0.90 kg) grain plus 9-10 lb (4.08-4.53 kg) hay daily.

A 950 lb (430.91 kg) Mammoth donkey

- at rest - 0-2 lb (0-0.90 kg) grain plus 15-18 lb (6.80-8.16 kg) hay daily.
- at work - 4-5 lb (1.81-2.26 kg) grain plus 16-18 lb (7.71-8.16 kg) hay daily.



Figure 72. FarmgirlFare (2011) An eating donkey
[Photograph] Accessed from <http://www.farmgirlfare.com>

The donkey is more of a browser in his eating habits. Therefore it is important to supply the donkey with free choice good quality barley or oat straw, along with his ration of hay and grain. Research at *The Donkey Sanctuary* in England has shown that straw in the ration may help the donkey produce natural biotin to improve skin and hoof condition. However, straw is a low quality feed and must not be used as a substitute for hay in the diets of donkeys.

Any animal that is frequently fed tidbits especially when fed by hand will spend its life looking for them and will soon learn, just as a horse or pony, to nip the hand even when there is no food in it. Feed any treats in a tub on the ground while petting and talking to the donkey.



Figures 73, 74 & 75. (Figure 73) Vik2010 & (Figures 74 & 75) Hal Jespersen (2010-2012) (Figure 73) Grazing donkeys & (Figures 74 & 75) Donkeys at lunchtime at Bonaire Donkey Sanctuary (The Caribbean). A truck charges all the food on it and it can barely serve it because of the donkeys almost jumping on it. A watchtower can be seen in the background [Photographs] Accessed from (Figure 73) <http://www.shutterstock.com> & (Figures 74 y 75) <http://www.posix.com/>

CURIOUS FACTS

MAKING YOUR DONKEY GO ON A DIET

Becoming overweight is always going to be a risk for donkeys kept in the UK and similar countries. It is a serious risk to health, putting excess strain on the limbs and hooves, affecting internal organs such as the liver and increasing the risk of potentially fatal diseases e.g. hyperlipaemia (a fat metabolism disorder which causes the blood level of one or several fat fractions to increase).

Dieting very overweight donkeys is to be strongly encouraged but it is by no means an easy matter. It can be frustratingly difficult and take much longer than might be expected. There are several questions we could ask ourselves in order to check our donkey's weight and body score condition.

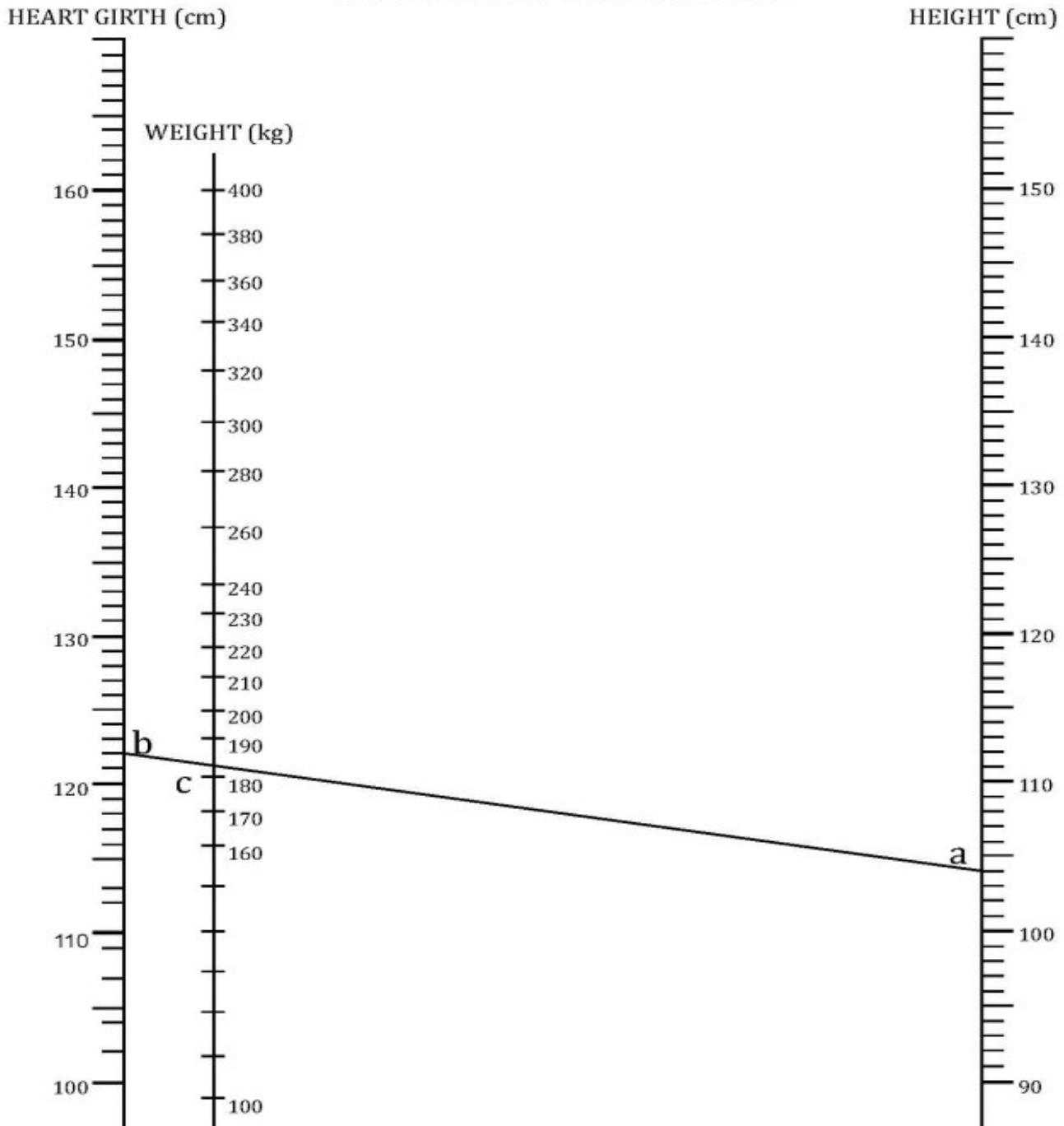
- Is he fat? Learn to condition score. We would recommend that a healthy donkey should be no more than condition score 5 (*Refer to body condition score chart in Book 1, Chapter 5.*)
- What does it weight? This provides an objective starting point to refer back to. Accurate livestock scales are obviously ideal but the heart girth nomogram is an alternative.
- Is it safe to diet? Newly acquired donkeys and elderly donkeys must be carefully assessed prior to starting any diet. Always allow a recently arrived donkey time to settle down, preferably managed and fed as he was in the previous home. If a certain donkey was mistreated changes should be performed even more gradually than in the above mentioned cases.

Only start the diet when it is content and has adapted to the new environment. Elderly donkeys may benefit from a full veterinary examination including a thorough dental check prior to dieting – they must be able to eat, chew and digest effectively any restricted diet or serious problems could ensue.

- What does it eat? Write down and estimate, or ideally, weigh everything he eats each day, including bedding (straw). This is obviously easier with housed donkeys but careful use of moveable fencing will restrict grazing intake. Work out a plan and stick to it. Estimate a reduction of approximately 20% of all food items eaten. Feed small, frequent meals rather than one or two large meals.
- Put down a non-edible bed such as wood shavings or cardboard.
- Encourage exercise – walking in hand or encourage the use of a bare grazing strip, with water at one end and a little feed and straw at the other.
- Repeat weight and condition score checks every week. It may take a couple of months before any changes are noticed, so perseverance is required. If there is no change after two months, review diet and reduce by a further 10% (and ensure that the other family members are not offering treats on the sly).
- Keep a close eye on your donkey for any signs of ill-health or problems developing (*Refer to 4.4.1. Signs of Good Health section in this chapter.*)

The Donkey Sanctuary

Sidmouth, Devon, EX10 0NU.
Tel: 01395 578222 Fax: 01395 579266



A donkey 104cm tall (a) and with a heart girth 122cm (b) should weigh 181kg (c).
The nomogram is accurate to within 10 kilograms.

Weight table for donkeys under 2 years:

Heart Girth cm	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Weight kg	46	47	49	51	53	55	57	59	61	63	65	67	69	71	74	76	78	81	83	86	88	91	94	96	99	102

For adult donkey; weight = $0.000252 \times \text{height}^{0.240} \times \text{heart girth}^{2.575}$
For donkey under 2 years; weight = $0.000283 \times \text{heart girth}^{2.778}$

4.9. SAFE AND POISONOUS PLANTS AND TREES ATLAS

Considering the wide extension that a donkey sanctuary accounts with (especially when it houses near a hundred donkeys) we have to be careful with the vegetation that exists on it. Poisonous plants may grow. Not all poisonings are fatal; sometimes the result can be serious digestive upsets, convulsions or your donkey may be off colour. We recommend that you buy good quality hay and check that it does not contain poisonous plants. Prevention is better than cure. If you suspect your donkey has eaten parts of poisonous plants or trees, or the donkey shows any unusual symptoms, call your vet immediately.

Before your donkeys graze any new pasture check it thoroughly for the presence of toxic plants. A list of common poisonous plants is below but this is by no means comprehensive. Please refer to one of the following books (*Allison, Keith (2011)* and (*Davidson, Sonia (2001)*), if you are not sure about plant identification or toxicity.

When grazing is sparse your donkeys may be short of food, i.e. in conditions such as droughts or heavy snow falls or during dieting, they will be more inclined to eat any available foliage. Bear in mind that donkeys can stretch over fencing to reach plants/trees growing outside the field boundary such as your prize rhododendron or the yew tree they can only just reach and leaves, fruits and seeds from remote plants wind can blow into paddocks.

They are also more likely to break out to gain access to gardens and woodlands where they will find all sorts of plants not normally available to them. Even when donkeys are turned out to pasture always ensure your donkey has access to suitable forage, we recommend providing barley straw so that there is always something to

eat or a short chop product if your donkey has poor dentition.

Poor pasture management and overgrazing can lead to the predominance of poisonous plants such as ragwort and bracken.

Some poisonous plants are bitter in the green (fresh) state but become sweeter if dried out e.g. if sprayed with weed killer, pulled and left in the field or baled in hay. If you are pulling up plants always remove them from the paddock immediately. Always check each section of hay and remove any dried herbage that is unfamiliar to you.

Thoughtless disposal of garden rubbish, such as hedge trimmings containing yew or privet etc, is the most common cause of sporadic cases of poisoning. Let your well-meaning neighbours, gardeners or paddock carers know that any garden waste such as hedge clippings or grass cuttings are potentially fatal, and should never be put in the paddock.

If you take your donkeys for walks or to events make sure they cannot access poisonous plants. For instance yew is one of the most toxic plants in the UK and is commonly found in church yards, so if your donkey is attending a Christmas Nativity they may attempt to snatch a bite.

Never underestimate the ingenuity of donkeys. If they can escape they will and then you have no control over what they may eat. Check the boundaries of your pen regularly.

Some trees are quite safe for most of the year but need to be fenced off during the fruiting season. This includes all fruit trees, beech and oak trees.

Curiosity and boredom are key factors in the eating of unsavoury foliage and plant matter; good fencing and the provision of safe boredom breakers such as bramble,

gorse or herb patches or cut branches from hazel, ash, hawthorn, apple, willow (beware, limited quantity), alder, lime and poplar trees.

4.9.1. Prevention is better than cure

Plants can appear and grow quickly so check all boundaries for evidence of poisonous plants weekly and remove immediately. Always dispose of poisonous plants carefully to prevent donkeys accessing them and seeds being dispersed.

Always be on the lookout for poisonous plants when moving strip grazing fences, changing paddocks or when cleaning our paddock from faeces.

If you suspect your donkey has eaten parts of poisonous plants or trees, or the donkey shows any unusual symptoms call your vet immediately.

4.9.2. Some common poisonous plants & trees

Please note that this list of poisonous plants does not include every existing poisonous plant.

Black Bryony	Horsetail (Mare's tail)	Trees to avoid:
Black Nightshade	Ivy	Black Walnut
Bracken	Larkspur	Elder
Buttercup	Lily of the Valley	Horse Chestnut
Celandine	Linseed	Laburnum
Charlock	Meadow Saffron	Laurel
Columbine	Monkshood	Laurel Cherry
Cowbane	Potato	Leylandii
Deadly Nightshade	Privet	Oak
Foxglove	Ragwort	Plum
Ground Ivy	Rhododendron	Peach
Hellebore	St John's Wort	Red Maple
Hemlock	Spurge	Sycamore
Water-dropwort	White Bryony	Wild Cherry
Holly Berries	Woody Nightshade	Yew

Table 1. List of poisonous plants [Table]
Accessed from <http://www.thedonkeysanctuary.org.uk>

4.9.3. Common Ragwort

Ragwort is a yellow flowering weed and is poisonous both dry and fresh. Ragwort is frequently seen on wasteland, verges and

railway land whereby it spreads onto pasture land. It normally takes two years to grow to maturity and then flowers biennially (every second year). However, if the stem is cut or mown, ragwort often becomes an annually flowering plant. Each plant can produce up to 150,000 seeds which have a 70% germination rate and can lie dormant in the soil for up to 20 years. Be very aware of this weed both on your pasture and in the hay. Ragwort can cause serious liver damage over a period of time. Ragwort must be pulled with gloves and burnt. It should never be composted. Pull the plant up before it flowers to avoid spreading seeds.



Figure 76. Carl Axel Magnus Lindman (1901–1905) *Senecio Jacobea* [Illustration] Accessed from *Bilder ur Nordens Flora*, C. A. M. Lindman

HOW CAN I CONTROL RAGWORT ON MY LAND?

Control of ragwort is the only way to avoid ragwort poisoning. The Code of Practice on How to Prevent the Spread of Ragwort, available from the Department of Environment, Food and Rural Affairs (Defra), can provide further help. To eliminate the danger to your animals it is important to remove all potential sources of poisoning as quickly as possible and a control strategy must be employed.

It is an offence under the Weeds Act 1959 (England, Wales and Scotland) to allow uncontrolled growth of ragwort. This legislation is enforced by the local authority.

4.9.4. Horsetail (Mare's Tail)

All varieties are poisonous but common horsetail and marsh horsetail are most likely to cause poisoning in the UK. It is a perennial plant with a creeping underground stem from which green, jointed, upright stems grow in spring. Control of mare's tail is extremely difficult, if you experience this plant on your land we would advise talking to an agricultural specialist about available control methods. Poisoning is most likely to occur when horsetail is present in hay or bedding.

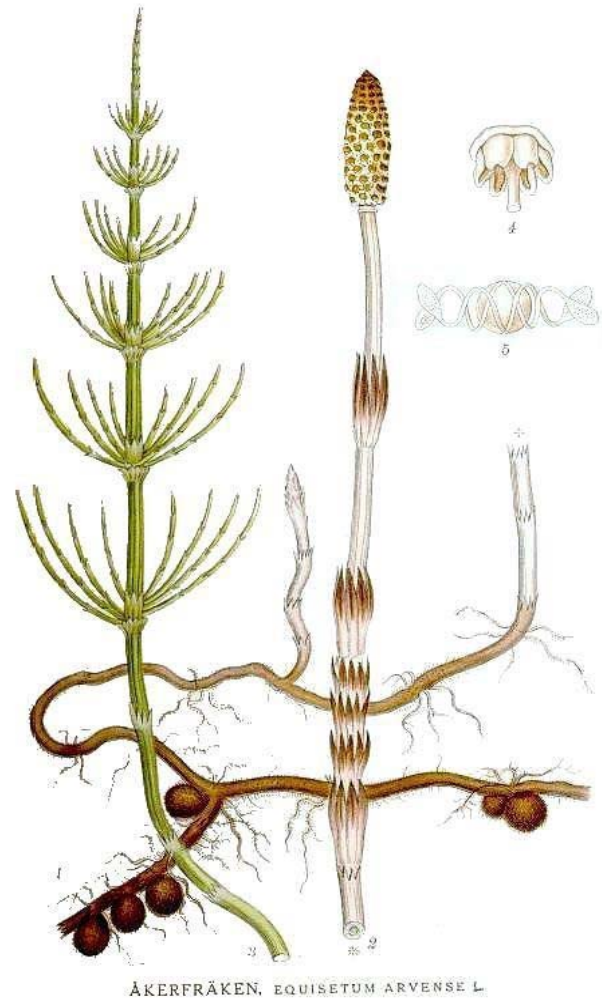


Figure 77. Carl Axel Magnus Lindman (1901–1905) *Equisetum arvense* [Illustration] Accessed from *Bilder ur Nordens Flora*, C. A. M. Lindman

4.9.5. Bracken

Bracken is a common fern that grows throughout Britain and you must be careful it does not dominate your grassland. The whole plant contains several toxic substances, some of which remain after cutting and drying. Donkeys may develop a taste for bracken when other forage is in poor supply. Poisoning tends to be cumulative over a period of time.



Figure 78. Carl Axel Magnus Lindman (1901–1905) *Pteridium aquilinum* [Illustration] Accessed from *Bilder ur Nordens Flora*, C. A. M. Lindman

4.9.6. Rhododendron

An evergreen shrub with tough and leathery elongated leaves, dark green above and paler beneath. The large cone shaped buds develop into domed clusters of bell shaped flowers. Rhododendrons are often eaten when animals escape and eat the garden hedgerow or garden clippings or when food is scarce. Can kill after a few hours of being eaten.

4.9.7. Privet (Ligustrum)

Wild privet is a branched shrub, found on chalky soils and garden privet is a popular hedge plant. The wild species has narrow, pointed, smooth leaves that are bright green and shiny when young and become darker

and dull as they mature. Those of the garden privet are shorter, rarely more than 3cm long and are more oval in shape with small white flowers with a tubular base and a sweetish smell, black berries appear in the Autumn. Most cases of poisoning involve garden trimmings.



Figure 79. Carl Axel Magnus Lindman (1901–1905) *Rhododendron macrophyllum* [Illustration] Accessed from *Bilder ur Nordens Flora*, C. A. M. Lindman



Figure 80. Prof. Dr. Otto Wilhelm Thomé (1885) *Ligustrum vulgare* [Ilustración] Recuperado de *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany

4.9.8. Hemlock

Common to Britain, generally associated with damp places, and often in the hedgerows. Hemlock will grow to 6 ft in height. It has large, fine, cauliflower type flowers in abundance on each stem and is easily confused with other similar plants. Poisoning is most likely in Spring when young leaves are eaten with other herbage, or on poor pasture.



Figure 81. Prof. Dr. Otto Wilhelm Thomé (1885) *Cicuta virosa* [Illustration] Accessed from *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany

4.9.9. Ivy

This evergreen climber is found all over UK, it is tough and attaches itself to trees, fences or walls and even climbs along the ground. Leaves are dark green and often in the shape of a triangle. Poisoning is most likely in Spring when young leaves are eaten with other herbage, while on poor pasture. If large quantities of leaves and berries are eaten it can become serious.



Figure 82. Prof. Dr. Otto Wilhelm Thomé (1885) *Hedera helix* [Illustration] Accessed from *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany

4.9.10. Floxgloves

Common throughout Britain. They can grow up to 1.5 m high. The flowers which appear through Summer are usually purple or white but can be in pastel colours as well. In the

autumn the plant dries to a stick. Toxins are present in foxgloves at all stages of growth. All plants should be uprooted, carefully removing the plants at the rosette stage of growth as well as those in flower.



Figure 83. Prof. Dr. Otto Wilhelm Thomé (1885) *Digitalis purpurea* [Illustration] Accessed from *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany

4.9.11. Yew

Yew is considered to be the most toxic plant in Britain. In many cases animals die within a few hours of eating yew, so signs are rarely seen. Donkeys should never have access to yew, care must be taken even with neighbouring trees from which branches or leaves may be blown many metres in high winds.

Be aware that yew trees are frequently found in church grounds. You must be aware of the risk if asked to take your donkeys to church for various religious festivals.

4.9.12. Oak and Acorns

British Oaks are usually deciduous trees up to 30 m tall with rough, fissured bark and broad spreading branches. Leaves have

smoothly indented wavy margins, and acorns are shed when ripe. If animals eat a large quantity of oak leaves or acorns then oak poisoning is likely.

The most likely time for this to happen is when grazing is scarce or when acorns are green or shed in large quantities in the autumn. Oak trees should be fenced off, wide enough for the donkeys not to reach any branches or falling acorns. Poisoning by oak is usually seasonal, being most common in Spring when the young buds or leaves are eaten and the autumn when the acorns are eaten.



Figures 84 & 85. (Figure 84) Prof. Dr. Otto Wilhelm Thomé & (Figure 85) Dear Picture Library (1885) *Taxus baccata* [Illustrations] Accessed from (Figure 84) *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany & (Figure 85) <http://www.gettyimages.es>



Figure 86. Prof. Dr. Otto Wilhelm Thomé (1885) *Quercus pedunculata* [Illustration] Accessed from *Flora von Deutschland, Österreich und der Schweiz 1885*, Gera, Germany

4.9.13. Box Elder (*Acer negundo*) Found in the USA and Sycamore (*Acer pseudoplatanus*)

Both are implicated in a frequently fatal condition known as Atypical Myopathy (AM). This condition leads to massive muscle loss and most fatalities occur within 1-2 days of symptoms appearing. Research is pending but it is thought that the 'helicopter' (paired samaras) sycamore seeds contain a toxin leading to severe metabolic damage. The best way to prevent this happening is to fence sycamore trees off when seeds are present and ensure adequate provision of food to prevent donkeys searching out unusual feedstuffs.



Figure 87. Johan Carl Krauss (1802) *Acer negundo* [Illustration] Accessed from *Afbeeldingen der fraaiste, meest uitheemsche boomen en heesters*



Figure 88. Johan Carl Krauss (1802) *Acer pseudoplatanus* [Illustration] Accessed from *Afbeeldingen der fraaiste, meest uitheemsche boomen en heesters*

4.9.14. Fruit trees

Although rarely poisonous, we have included fruit trees, because during the Autumn when they are full of fruit, the fruit can cause

digestive upsets in donkeys. We recommend that the trees should be fenced off to prevent donkeys gorging themselves on the fruit. It is not recommended to feed or allow donkeys' access to stoned fruit trees (e.g. cherry, peach etc.) as these fruits and trees may also contain poisonous substances. Always remember: "something that is not poisonous for humans does not have to necessarily be safe for donkeys"



Figure 89. Zastavki.com (2013) Fruit [Photograph] Accessed from <http://www.zastavki.com>

4.9.15. Safe trees and shrubs for donkeys

PROVISION OF SAFE BRANCHES

Offering your donkeys access to safe trees and shrubs is a great way of supplementing their diet with fibre as well as providing mental stimulation. Donkeys (like other equines) are mixed feeders, meaning that they will browse for tasty leaves and branches in trees, shrubs and hedgerows as well as graze. You may also find that giving your donkeys some fresh branches to chew on helps stop them chewing your fences and stables!

Branches or small logs can be cut and placed (with bark and leaves on) in the enclosure. As with any new toy/boredom breaker the novelty can wear off so branches are best removed and replaced once the donkeys have stripped them. Care should be taken when introducing anything new to your donkeys, and this is no exception. Just

introduce one log to start with giving them time to get used to it and ensure no fighting is occurring over the new branch, if there is any problem, provide another log to avoid confrontations.

Recommended tree and shrub species:

- Alder
- Birch
- Blackberry
- Blackthorn
- Dogrose
- Dogwood
- Heather
- Quickthorn
- Poplar
- Raspberry
- Sweet briar rose or *rosa rubiginosa*
- Willow (limited quantities)

Access to hedgerows or cut branches provides not only a source of food but also mental stimulation as the donkeys indulge in a more natural style of feeding. Taking time to select, grasp and chew their food is the opposite to 'bolting a meal down' in a bucket and means more time spent in the pleasant occupation of foraging every day. By giving donkeys the fibre that they crave and keeping them busy for hours searching for it; we not only benefit their health by minimising inappropriate feeding but also their state of mind by keeping boredom at bay.

THE FORAGE TREE

If resources allow it, you may like to go one step further and consider planting donkey friendly shrubs and trees to create hedgerow browsing areas. The concept of providing trees as a food source or 'forage tree' has been used with other livestock, but is fairly new to donkeys, mules, horses and ponies. More commonly donkey owners will be familiar with the fact that their donkeys love browsing the hedgerow. Thick hedging and overhead trees can also provide a degree of shelter from the sun and wind, although due

to the low levels of grease in a donkey's coat they should never be left out in wet weather without a field shelter.

We are not really sure what it is about browsing a hedgerow that really gets donkeys going, whether it's the different eating heights, the choice of new shoots or woody branches or the variety of tastes and textures.

CURIOUS FACTS

BENEFITS OF FORAGE TREES AND SHRUBS

- Variety of diet
- Variety of feeding heights
- Provision of macro (particularly fibre) and micronutrients (dependent upon species)
- Shelter from the weather
- Conservation of soil
- Natural habitat for wildlife
- Mental stimulation
- Natural feeding system

We are not really sure what it is about browsing a hedgerow that really gets donkeys going, whether it is the different eating heights, the choice of new shoots or woody branches or the variety of tastes and textures.

Planting or re-establishing a hedgerow can take some time. Young plants will need to be protected until their roots are established, and may take up to 5 years to grow into a recognisable hedge. It is always advisable to plant more than is necessary as some

younger plants will die or be eaten by wildlife. If you are thinking of establishing a new hedgerow contact your local tree warden via the local council as they will be able to advise you on suitable species for your area and may even have funding available.

Autumn is generally the best time of year for undertaking this sort of project.

Faster growing shrubs such as gorse and heather may be used to plant up a corner of a paddock to provide some variation to diet and environment. Donkeys are perfectly able to browse gorse, avoiding the spiky spines and instead stripping the branches and eating the leaves and flowers.

Trees and hedgerows are a natural part of our rural landscape and home to a multitude of wildlife including birds, small mammals and invertebrates. Hedgerows have been reintroduced over the last decade or so into our agricultural landscapes as their value in providing 'wildlife corridors' has been recognised. Their deep root systems, and mulch from fallen leaves is also important in preserving the landscape and preventing soil erosion.

Free choice access to hedgerows or forage trees needs to be carefully considered and all plants identified before introducing your animals to any new grazing or woodland area. If you cannot identify the species yourself using a book then we recommend contacting a specialist to be sure. Avoid allowing donkeys to consume any plant that you cannot positively identify as safe.

Trees that bear berries/fruit may need to be restricted in the Autumn as your donkeys are at risk of colic if they gorge themselves on an abundance of fruit. Stoned fruit such as plums, cherries or apricots should not be fed as there is not only an increased risk of choking but also the stones contain toxic substances.



Figure 90. Figure 90. The Donkey Sanctuary (2013) Donkeys eating a branch [Photograph] Accessed from <http://www.thedonkeysanctuary.org.uk/>

4.10. Hygienical concerns

We should keep our donkeys and their stables as clean as possible. Plenty of diseases appear due to hygienical problems derived from bad management. At least, about every two days, you might need to muck (clean) your donkey's stall or lean-to.

4.10.1. Cleaning stables

Wet patches or dung on straw, shavings, shredded wood fibre, cardboard or paper beds can either be removed daily or kept on a deep litter system. A fork, broom, shovel, wheelbarrow, disinfectant and a "pooper scooper" are required to maintain and clean the shelter. Daily mucking out is the best way to monitor your donkeys' environment and observe any changes in behaviour during your absence. A deep litter system is a handling system in which dung is removed from the bed and, once a day, a layer of fresh bedding is scattered over the base to keep the surface dry. The base becomes packed and any urine drains through to the bottom. Deep litter bases should be removed every four to six weeks. Problems with deep litter beds include the smell and the build up of bacteria.

Daily mucking out

This is the preferred method, as all dung and wet areas are mucked out on a daily basis.

Clean, dry bedding should be moved to one side as the dung and urine patches are removed. Sweep the floor area clean and disinfect the floor if necessary. Leave the bedding up until the floor is dry. The bed can be left up during the day and put down later in the afternoon. When putting the bed down, spread all the piled up bedding level across the floor. Add fresh straw along with any straw left in the manger that was not eaten the previous day. When opening a fresh bale of straw take care to remove the baler twine as this could lead to injury.

Once some banks of straw are built around the walls of the stable to the height of about 40 cm (16 inches) a level bed of about 20cm (8 inches) can be laid, banks will provide a cushion to prevent the donkeys lying too close to the wall and becoming "cast" (stuck on their backs) if they roll over. Banks will also prevent draughts.

By routinely creating a tidy bed for your donkeys you will be able to tell if one of them has been rolling more than usual, as the bed will be disturbed, this could be an indication of a health problem. When you muck out make a mental note of the number of droppings and their consistency, as a change could also be an indication of a health problem.

If donkeys have to stay in the stable for a period of time it is a good idea, if space allows, to leave an area of floor space without bedding as this may help keep their feet healthy

Muck heap

Management of your muckheap is an important issue for donkeys, owners, keepers and neighbours.

- The donkeys should not be able to get to the muck heap.

- It must be sited where it will not contaminate water courses, rivers, streams and ground water.
- It must also be sited where it will not cause a nuisance to houses and users of public rights of way.
- Your muckheap must have easy access from both your stables and the road if it is to be collected for disposal.
- It should not be too close to the stables as it may cause a nuisance to your donkeys from flies or a fire hazard as muckheaps can become very hot.
- Your muckheap should have solid base and sides to enclose it, so that any liquid can be contained. Any temporary muckheap (for example one which your local farmer or allotment owner takes away weekly) should be at least 10 m from any water course and at least 50 m from a well, borehole or Spring that supplies water for human consumption or dairy use.

Disposal of your straw muckheap can be done by local agricultural contractors, farmers, used on your flowerbeds or given to gardening friends and family. But it must be left to compost for a year. If you are not using straw bedding then a contractor or farmer would be a good option as other bedding takes a lot longer to rot down.



Figure 91. Tim Platt/Iconica/Getty Images (2010) Cleaning stables [Photograph] Accessed from <http://horses.about.com>

4.10.2. Hygienical routine

Donkeys enjoy being groomed. Brush them with a fairly stiff brush in the direction the hair grows. Be gentle with the ears, do not twist or hold them tightly. In Spring, a shedding blade is useful for loosening the thick winter coat.

Do not be too hasty to help shed the Winter coat. Donkeys take up to two months longer to shed their hair coat than horses and will easily catch a chill if the coat is shed too early in the Spring. Use caution when grooming in Winter. Grooming destroys the natural air pockets in the coat that provide insulation, so groom only on warm days. Clipping is not recommended unless adequate protection from inclement weather is provided.

In Summer, grooming is almost hopeless because donkeys take dust baths. This natural method of bathing is used by animals that do not like water.

Watch for the donkey that rubs its coat, especially at the tail head - it may have lice. If evidence of lice is seen, check with a veterinarian for the best preparation to remove the lice.

CURIOUS FACTS

STABLE CLEANING ROUTINE

1. Dress for the Job

Dress in appropriate clothing. Gloves can prevent blisters. Urine can erode the stitching on the soles of leather riding boots. Save yourself boot cleaning time by changing into work or rubber boots.

2. Clear the Work Area

Take your donkey out of the stall. A good time to muck out is when your donkeys are grazing in the pasture. If you cannot put them out, place them in an empty stall. Remove all the feed tubs, water buckets and stall toys.

3. Assemble Your Tools

Get your cleaning tools and park your wheelbarrow or cart close to the stall door facing in the direction you'll want to go when the barrow is full. It is easier to maneuver an empty wheelbarrow than a full one.

4. Dig In

If the stall is bedded with straw use a pitchfork to remove manure and wet or soiled bedding. If shavings or sawdust have been used, use the shavings fork to remove manure and wet bedding. Fork the manure into the wheelbarrow or cart. Sometimes it's easier to pick up wet bedding with a shovel.

5. Head for the Manure Pile

Wheel the filled barrow and dump out the contents in the assigned area (the manure pile). It is tempting to fill the wheelbarrow really high, but this can make it hard to push and easy to tip. It's frustrating having to clean up manure a second time because you have tipped over the wheelbarrow!

6. Do a Thorough Job

Continue cleaning out the dirty bedding. Scrape the unsoiled bedding to one side, and check that there is not wet or manure soiled bedding hiding underneath.

7. Even The Surface

Once you have removed all the manure and wet bedding, spread the cleaner bedding back over the whole stall area. Check around the edges of the stall as clean bedding sometimes gets tossed against the walls as the donkey moves around. This leaves a thinner area in the middle or where the donkey usually stands. Distribute the bedding evenly.

8. Add Clean Bedding

Add new bedding to replace any that has been removed. You will either add a whole bale of straw, or portions of one. Fluff it with a pitchfork. Some stables have truckloads of loose shavings piled, or some buy bags of compacted shavings. Use your wheelbarrow to transport fresh shavings to the stall, or open a bag and fluff the compacted shavings with the shavings fork.

9. How Thick To Bed

Gauge how thick to bed by what type of floor is under the bedding and what season it is. If there is thick rubber matting on the stall floors, bedding can be thinner. On concrete, especially during cold weather, add more bedding to provide padding and urine absorption. Sand floors are easier on the donkeys' legs, but may get saturated with urine quickly if not enough bedding is put down.

10. Weekly Maintenance

You may want to completely strip a stall occasionally. In this case, keep filling your wheelbarrow until the stall floor is bare. Use the shovel to scrape up remnants of bedding and the broom to sweep it clean. You may want to put down odor control solution or stable disinfectant. Let the floor dry before re-bedding.

11. Keep Alleys and Doors Clear

After you have finished cleaning and bedding the stall, use the broom to sweep up spilled manure, straw or shavings in alleys and doorways. Scoop up the sweepings into the shovel and toss them into the manure pile. Manure, chaff and bedding pushed out a doorway will turn into a muddy mess in wet weather.

12. Prepare Tools for Next Use

Put all the tools away where they do not cause a tripping hazard.

13. Ready for your donkey

Replace feed tubs, buckets and toys so the stall will be ready for your donkey when he comes in.

Tips:

- Always turn the wheelbarrow pointing in the direction you want to go out /in.
- Inexpensive hangers keep cleaning tools safely out of the way.
- Some people leave a thick padding of bedding for warmth and only clean the top surface during winter months.
- Use the broom to knock down spider webs every so often.
- Inexpensive riding gloves with the sticky rubber dots are handy for handling tools and shavings bags without slipping.

What Do You Need?:

- A wheelbarrow or cart
- Pitch fork (Five pronged is best.)
- A shavings fork for moving shavings or sawdust
- A broad shovel
- A stable broom
- Gloves (optional)
- Rubber boots (optional)

Donkeys enjoy grooming sessions. These sessions are a good time not only to clean up but also to bond with it.

While grooming, you should also check his body, as well as his legs and hooves, for any cuts, scrapes or incipient skin issues. That way, you might take care of some minor problems before they become more serious.

4.10.3. Grooming

Grooming a donkey is not the same as grooming a horse. Keeping a donkey truly clean is almost impossible. In summer, they love to roll in the dust. It helps keep parasites off them, but makes cleaning a true chore. Frequent bathing is not an option. Many donkeys do not care for getting wet, but even those that do tolerate it should not be bathed more than once or twice a year. Bathing removes protective oils from their coats. For basic grooming, you will need a stiff brush. Brush in the direction the hair grows. This basic grooming tool gets rid of surface dirt and encrusted mud. Use a soft brush for his face and ears.



Figure 92. Richard Dunwoody (2013) Donkey being washed by his owner [Photograph] <http://richarddunwoodyphotography.com/>

4.10.4. Winter Grooming

Your donkey grows a thick coat in winter. This coat protects him from snow and sleet, so you must take care when grooming in cold weather. If you are familiar with horses, you know that their coats begin shedding heavily in early spring. Donkeys are different. They do not shed out as early, so your donkey might be quite hairy even when the horses display their spring coats.

Let nature take its course. You can use a shedding blade on your donkey's coat, but do not use it until it is warm in the spring. You should not groom your donkey as much when it is cold. Air pockets in his coat provide insulation, so you do not want to inadvertently destroy them.



Figure 93. Pete Markham (2008) Washing a jenny before her performance [Photograph] Accessed from <http://www.flickr.com/>

4.10.5. Show Grooming

If you show your donkey, you need more extensive grooming. He must look his absolute best before the judges. If he has still got his winter coat before an early spring show, you will need to clip him. However, that means he will need a blanket to keep him warm if it is still chilly. Clip at least a week before the show so any unevenly shorn hair can grow out a bit. Before heading off to the show, put some hoof polish on his feet to make them shine.

5. LEGAL ISSUES

Legalities may appear to have nothing to do with your desire to rescue animals. However, they are an important part of what you hope to accomplish and, without ensuring that they are done correctly, you could jeopardize your whole operation.

5.1. LEGALITIES

Tax exemption, 501(c)3 status is acquired by filing the necessary forms with the IRS (Internal Revenue Service). It is helpful, but not essential, to have a professional (attorney or accountant) to do the paperwork. There are many advantages of having non-profit status.

1. Donors of goods, services, or money can claim their gift as an offset against their taxes, which may well increase their giving.
2. Having non-profit status lends credibility to your organization.
3. It ensures proper separation between the charity and personal finances.

Once you have completed the necessary paperwork, the status may take three to nine months to obtain. Then you will need to file a Form 990 annually with the government. This details the money taken in and the money spent on behalf of the charity. It is important to keep good financial records. Without them, your status could be revoked by the IRS. Laws may change from one place to another, so that we will need to be informed about every certain case.

5.2. ZONING

We covered this area in an earlier section relating to the acquisition of property. But it bears repeating. It is extremely important for the welfare of the animals you will be rescuing, that the place you set up your sanctuary be zoned for this work. You do not

want to be required to move your whole operation because of a zoning issue.

5.3. INSURANCE

We recommend you carry insurance. Insurance can give you peace of mind around visitors and volunteers should someone get injured from the direct or indirect relationship with your sanctuary and with the animal who lives in it. All countries require you to have your staff covered by workers compensation insurance.

5.4. ATTORNEY AND/OR ACCOUNTANT

It is wise to find an attorney and/or an accountant with non-profit knowledge and sympathy for your cause. Though legal fees can be expensive, good professional advice is key to running your sanctuary correctly in the eyes of the law.

5.5. RELEASE FORMS

There are several areas where some kind of release form would be appropriate. For example, in your adoption contract you can cover limits of responsibility for health and behaviour of an adopted animal. When you receive an animal, have the owner sign a release form stating that the animal is now the property of your organization.

And you may wish to have any volunteers that are working with the animals sign a release form, indicating that they know that working with animals can be unpredictable. In our spay/neuter program, we include a release form for surgery in our admittance form. If you plan to board animals at your facility, then a release form would be advisable, too.

5.6. ZOOLOGICAL NUCLEI LICENSES

Some municipalities may require a zoological nuclei license. It would be good to

find out ahead of time if this affects you and what the conditions would be. Some areas make licenses hard to get. Some areas have special clauses, as for example some insist that all the neighbors in the immediate area have to agree to the location of the new zoological nucleus, before a license is granted.

6. FUNDRAISING

To start, and then continue running a sanctuary you need money. The amount you need will be dependent on the plan you have developed. Your plan should include details on:

- how many and what species of animals you will be taking care of?: i.e, donkeys.
- where you will be locating your facilities?
- what you plan to accomplish?

Planning in advance for the money needed monthly will ensure that the animals receive the care they need.

Note: No matter what you think it will cost to save one or many animals, it will always cost a lot more!

Fundraising basically divides into two basic areas:

Operating expenses. These are the continuing daily expenses of feeding the animals, paying the staff, etc.

Special projects. These are one-off events, like a spay/neuter drive or a new building. There are many ways to raise funds. Here are some suggestions based on the experience of *Best friends*.

Operating expenses. Operating the sanctuary needs a continuing and reliable source of funding. This might be a private endowment that guarantees a certain amount every year, or perhaps an annual grant from a foundation.

But unless you know for sure that the foundation will deliver each and every year, you should be wary in case you suddenly find yourself with a lot of empty mouths and anything to give them to eat. Indeed, most foundations do not offer funding for operating expenses.

Like in most other successful animal organizations, to rely on a membership program to meet the operating costs of the sanctuary may be a good option.

Like in most other successful animal organizations, to rely on a membership programme to meet the operating costs of the sanctuary may be a good option.

The basic components of a membership program are:

1. A way of reaching people and inviting them to sign up as members. This might include having a table or booth at a popular store.
2. A way of keeping in touch with your members. Newsletters are the usual way of doing this.
3. A simple computer database that keeps track of what you have sent out, who is responding, and what the donations are.

You can make your membership programme as simple or complex as you like. You can invite people to sponsor some of the animals, hold membership drives, buy mailing lists (quite complex); or just have a few kind friends who are committed to helping you pay the bills (quite simple). But your basic rule-of-thumb must always be:

Never commit to caring for more animals than you can pay the bills for now.

Your membership programme is the backbone of your fundraising efforts. People give money to something they believe in and to people they know. Developing your membership programme is the most important thing you can do in this whole area.

Keep your members informed and involved in your work. Use your literature to do this.

In the beginning, just a one-page letter can keep your members and supporters in touch. As you grow, your literature can also expand to a several page newsletter.

People will support you because they like what you are doing for the animals. Keep the focus on your animal work in your publications. Stories of your rescues and adoptions are a lot more interesting to your members than details of your board meetings. Also, make sure your publications are well prepared and printed. Use professional expertise if you can.

Ask yourself what you like to read and hear about. We have found that people prefer to be uplifted than made to feel guilty by what they read about our work.

Maintaining your membership program is as important as initiating it. Thank-you notes for the donations you receive; responses to questions asked; assistance with animal problems. Keeping up with this whole area will give your members confidence in your whole operation. This will ensure that they will continue to support you as best they can.

These days, sophisticated but easy-to-use, database programmes for the computer make this job a lot easier. For example, at *Best Friends*, they have an office staff to answer mail and send out information to our members. This is as much a part of our work for the animals as feeding and mucking out, because without our members we could not do any of it.

Using the telephone. If a person includes their phone number when they put down their name and address on a membership sheet at a table or event, our staff should call them at home asking if they would like to be a member.

We keep these calls brief, and never pressure people into being part of the work.

We outline the different levels of involvement, from basic member to further levels of contribution, so they can choose for themselves.

We also call people if we have not heard from them for more than a year. They may simply no longer want to be involved, but often they have moved or have lost the address, so they appreciate the call. We have found that some people respond more to a phone call than to a letter. They like to be called, and enjoy hearing about our work with the animals.

Be careful with direct mail. People sometimes call us and ask how to start a direct mail programme to raise funds for their shelter. They are often a bit desperate for money and are hoping that if they buy lots of names from other people's mailing lists and send out lots of letters, this will be an answer to their funding problems. But this is not like that.

Direct mail programme can help build memberships. But they are a slow and expensive operation. If you do not know what you are doing, you can end up losing the money you invested in all the printing, mailing and tracking that is involved.

People at home are already receiving more mail than they know what to do with. So, unless you can give them a very compelling reason to support something that is not in their local town and which they have never heard of before, they are unlikely to respond.

Publicity. On the other hand, there are plenty of other ways of getting the word out in your local region. Heartwarming stories about animals are always welcome on television and in the local newspapers. Most television news programs end with a light piece about children, animals, or other human interest subject.

If you can get your story on television, make sure you have literature available, so that if people call or write in you can get right back to them (you should also be prepared for people calling simply to ask if there would be room for an abandoned, mistreated or which cannot be taken care of donkey)

Literature. Professional-looking literature is a must. It conveys to the public that you know what you are doing. Many high schools and community colleges offer desktop publishing courses, or perhaps one of your supporters works in graphic design or publishing and can help you put it all together. A lot of printing will be needed. You need to get the word out about your plans, ideas, and work to as many people as possible.

Special projects

These might include spay/neuter drives or a new add-on to your sanctuary. They can be paid for from different kinds of fund raising events. For example:

- **Bake sales and car washes** are good ways to get young people involved. Proceeds will probably not be large, but the events are always fun.
- **Donation cans in stores** around the neighborhood draw a small but steady income. Someone needs to be relied upon to go and empty them regularly.
- **Tables or booths** outside popular stores are good ways of meeting people, talking about what you are doing, collecting donations, and signing up new possible members at the same time.
- **One day's profits from a store.** Stores will often work with you and donate a percentage of the sales to benefit the animals. You will need to

help them promote the day, since the benefit to them is drawing more animal lovers to their store.

- **Sales of products** (T-shirts, hats, jewelry and other items) can help raise funds. Many groups utilize the creative abilities of their supporters in this area.
- **Benefit dinners**, fashion shows, and other larger-scale events can raise considerable amounts of money, but take a lot of very good planning and organization.

Every event requires staff or volunteers, and a lot of coordination. Tables and booths outside of a busy grocery store can generate a lot of funds and valuable names for your list. Make the tables look interesting with photos of your rescued animals, and lots of literature to give out. You will need to ask the individual store managers if you can set up outside one of the doors.

Most stores are only too happy to help a community project. But you need to respect their wishes about table placement and on how you approach the store's customers. You will want to develop a good relationship with the store so they are happy to have you return on a regular basis.

Donations-in-Kind, many companies are willing to donate goods and materials to your programme. Just think about what you need and who could provide it. Using some imagination and fun helps put a smile into the giving and the receiving.

Lumber companies may help with building materials. Paint and vinyl can be relatively easy to acquire if you are not too fussy about colors or patterns. Many places have end runs, or less attractive merchandise that they are prone to donate for a tax write-off. Hotels and motels change their bedding often. We have found them to be very

generous with the old blankets, sheets, and bedspreads.

Places that are not in a position to donate outright, will often give a non-profit organization a special deal. If you need something for your work with the animals, do some research, and call the company or store with the product you need and ask them to donate it. If that is not a possibility, then ask for a discount or special payment. It never hurts to ask. People enjoy giving, and you can make some very good friends this way who give regularly.

Guidelines when asking for donations of products

1. When you call a store, ask to speak to the person in charge of donating product.
2. Explain what your organization does for animals. Be brief and friendly.
3. Follow up your call with a letter to the person in charge, on headed stationery, stating your request to be considered for their donations. If you have your non-profit 501(c)3 status, include that in your letter. Then the company knows it can write their donation off against their taxes.
4. Send samples of your literature or brochures.
5. If they agree to donate, follow up with a personal letter of thanks to the person in charge.
6. Whatever you are offered, accept it. Be prompt in your pickup of the items. If it is not something you can use, share it with other needy groups or individuals. The companies will require you to sign a paper stating that you will not sell the product, but there is nothing to stop you from sharing it, as long as they abide by the same requirement.

7. At the end of the year, remember those who have given to you – with a plaque or some small gift. You can also mention their giving in your newsletters, which will encourage your members to support those businesses.

7. STAFF

Caring for animals is a 24 hour a day, 7 days a week job. That is very hard on just one person. How much help you will need depends on how many animals you will be taking care of. People sometimes underestimate the stress of caring for many lives, and “burn out”. This can be avoided by getting in some help early on.

Although we are doing this work because we love the animals, we also have to work closely with people.

Staff is people, and so are the folks who will be coming to you in distress about their failure to keep a pet. And most importantly, your financial supporters are people, too. People are going to be central in your life.

You will want to have staff that is pleasant and considerate, both in person and on the other end of the phone. They will be representing your sanctuary. It is possible to see a lot of places that have problems in this area.

They tend not to be very successful. It is all too easy to allow oneself to become angry and overwhelmed by the public’s disregard for what is so dear to us. But this approach is short-sighted.

It is best to adopt a position of kindness and compassion to all – including the people. After all, that is what ultimately helps the animals. Every encounter is an opportunity to share your philosophy, especially by your example.

Listening, sharing, and kindness seem to work better. It is not always going to be easy, but we should just remember what is best for the animals in the long run, and bite the bullet, so to speak.

For example, *Best Friends* employs staff in a variety of areas: animal care, animal medical, office, accounts, fundraising, maintenance, manning the telephones,

counseling, outreach programmes, adoptions, and education. Many of the staff wear a number of hats. For example, an education director, that when he or she is not speaking to schools or showing groups around the sanctuary, helps feed donkeys. We try to get as many people as possible involved in direct animal care, even if their main job is at the computer. This helps remind people why they are working at a sanctuary.

8. VOLUNTEERS

Some programmes cannot exist without the help of volunteers. In fact, many of them are run entirely by people who volunteer as much time as they can. Even if you have some full time staff, having volunteers on the team enables you to do more and is a wonderful way of including people in your work.

Although volunteers are not on the payroll, they do require “payment” of sorts. People like to be noticed and acknowledged for what they give. They like to be listened to and appreciated. So be prepared to give these things to your volunteers.

Sometimes a volunteer just does not work out. If you have done the best you can to solve whatever may be the problem, it may just be that this person is not compatible with your way of working or with the rest of the team. Just because someone is giving their time, does not mean that you have to accept their involvement.

Thank them for their help, explain that there is a problem (without accusing them of anything), and tell them that you think it is best if they stop working with you. It may be an awkward situation, but the sooner it is done, the better! Good and consistent volunteers are like gold and can make a big difference in the success of your programme. Treat them well.

9. ADOPTIONS

Finding a good home for an animal in your charge is a wonderful thing to do. A fact of life in a no-kill sanctuary is that unless an animal finds a home, he or she lives out his natural life in your care. This means that you will not be able to respond to other animals who need your help.

Finding new homes for as many animals as possible is a goal we should all pursue. There are many ways to go about doing adoptions. You can adopt from your own facility or utilize one of the major pet superstore chains that offer space to non-profit animal groups.

Best Friends offers a booklet – *Finding Good Homes for Homeless Pets*, which covers some basics in screening for a new home. You are going to be looking for a permanent home, with a secure facility, and with people who can afford the time and the money to care for a new member of their family.

Training and Education

Many of the animals that will be coming to your sanctuary have problems. Among these problems we will find some which derive from the abandon and mistreatment situation they have previously suffered itself. Working with a trainer to prepare the animals to be successfully re-homed is very important.

A lot of behaviour patterns are very responsive to training and education, and we usually suggest that the adopter finds a trainer to continue a training programme once the animal is re-homed.

Breed Rescue

There is a large network of breed rescue groups or associations around the world, established locally where the different breeds live.

Networking

Working and collaborating with other agencies to place animals is essential. And, on occasion, being able to take in unadoptable animals from other groups to live out their lives at the sanctuary. It is a wonderful opportunity to work together for the good of the animals. Obviously this only works well if the groups share the same feelings and guidelines for adoption.

10. EDUCATION

CURIOUS FACTS

“The more we come in to contact with animals and observe their behaviour, the more we love them, for we see how great is their care of their young.”

Immanuel Kant

Human education is another vital part of your sanctuary work – and not only for children. Every encounter with the public offers an opportunity to educate and inform.

A lot of problems people experience with their animals stem from lack of knowledge about them and their behaviour. So, giving the necessary information can often keep an animal in his or her home. This is part of your education program.

Visiting local schools and sharing your insights about animals and how to take care of them can be a fun experience for everyone. There are a lot of materials available for children of all ages.

Having children visit your facility will help them understand some of the problems of unwanted pets first hand.

Publishing literature that enlightens people about animals and the problems they face is also part of your education programme. For example, there may have been a rash of pet thefts from people’s yards or ranches in your locality.

Getting information out to the community about how to protect their animals is also education. Some also have an internship programme. Young people who are interested in careers in the animal field spend time working alongside us at the sanctuary. This gives them a good first-hand experience of what is involved.

We should also invite people who are thinking of working in animal welfare to come and spend some time at the sanctuary to see if this is really what they want to do. This experience will often help people to focus on their goals, and clarify their vision.

Planning for the Future

As well as knowing what your limits are now, you should also plan for the future.

There will come a day when you can no longer take care of the animals. This may happen a long time from now, but it could also happen tomorrow. Who will take care of the animals you have rescued?

We hear sad news too regularly of a sanctuary or small rescue group that has failed. Someone else, like a nearby humane society, has to step in and try and rescue the animals. Perhaps the founder has died or become incapacitated without making provision for the animals. Or maybe he or she got in over their head, could not say no to taking in more animals, and consequently became overwhelmed.

You need to have a plan in place early on for the animals in your care. And it is not feasible to think that larger sanctuaries like *The Donkey Sanctuary* or *Best Friends* can step in and relate to hundreds of new animals when the crisis occurs.

Earlier in this chapter we recommended that you do not take on the care of more animals than you can afford right now. We know

that this is hard because the needs are so great, but it is even harder to have to cope with a failed situation when so many lives are involved. So get together with everyone involved in starting up your sanctuary and make a plan that covers a variety of eventualities. Write it down, too. It can be amended as you go along and as your organization changes, but it will give you some security should a crisis occur.

CURIOUS FACTS

BREED RESCUE RESERVES

Tradition, *trəˈdiʃən* /trəˈdɪʃən/ n. [uncountable] the handing down of statements, beliefs, etc., esp. by word of mouth or by practice.

This is the point where the love towards a donkey breed starts, the love towards the Andalusian donkey breed. In Andalusia we find two donkey breeds. One which is unofficially recognized, the Moorish or moruno donkey, the small Andalusian donkey breed, a highland donkey. Recently Agrarian regional office from Ronda (Málaga) and the University of Córdoba, has studied the existence of this breed in the Andalusian donkeys. It mainly distributes in the Andalusian highlands, From Sierra de Segura until Serranía de Ronda, and it seems to have its origin in the small asses existing in the north of Morocco, it also seem to be connected to Zamorano leonés and Catalanian donkey breeds. This breed is small to medium height, normally wears a dun coat, or even a different range of a wine-coloured gray one, in which mule mark, eel stripe, spinal stripe, or list is almost always present along the spine, and shoulder stripe that usually crosses the withers and extends down the shoulders, among other primitive markings such as; Leg bars and markings, "zippers", zebra bars, tiger stripes, or garters. Leg bars are the most common accessory to the dorsal stripe. Leg bars are most commonly seen on or above the knees and hocks and reflect the underlying coat color. Leg bars on bay duns are black within the points, and reddish above them. It has a round nape or the back part of its neck.

So that the differences between this breed and the Great Andalusian donkey breed one would be: Smaller height, below 130 cm tall. Red hair presence (unadmitted in the Andalusian donkey breed), not compulsory. No compulsory presence of spinal stripe and shoulder stripe. Exists in highland and it is less present in lower countryside areas. It was selected to work and for driving, not for mule production. It is a rustic and noble animal, easily tamed. It was used to perform agrarian activities and driving, also for good, food and agrarian tool transport. It resulted especially useful for the small farmers owning vineyards and vegetable patches, for their daily promenade between the village and their smallholding, charged with the bundle, to pull from small ploughs and to stop and come back with fruits and olives, among others. Although it is still possible to find donkey herds in villages and Genil and Guadiaro river Valley Paths, this breed is disappearing from the Andalusian highlands, there are only 250 remaining individuals, taken care of by elderly people and accounting with an almost inexistent breeding regeneration.



Figure 94. Colectivo Cultural Giner de los Ríos (2012) Moorish donkey [Photograph] Accessed from <http://www.colectivoqiner.com/>

CURIOUS FACTS

THE ONLY OFFICIAL ANDALUSIAN DONKEY BREED

Officially recognized, the great Andalusian donkey breed or Andalusian Donkey is a big and robust donkey breed, with a great general development and a height at withers above 130 cm at least. Head is big and it presents a wide forehead; its neck shows a great muscle development; its trunk is long and cylindrical and has a strong chest; limbs has a great bone and muscle development. Gray coat (torda/rucia), varying from light to dark, frequently dappled; hair is fine and short turning to be coarser in winter. It is a strong, noble and meager animal. The Andalusian donkey was selected in order to produce mules and to work; the best jackstocks (male donkey of a great height) were kept to mate with mares, over all in the Guadalquivir Valley, cradle of the breed. With country mechanization, mules turned to be unuseful, and from 1950 to 1990 andalusian jackstock production was abandoned until it reached the current extinction risk it suffers today. From 1995, The Andalusian Regional Government set up combined actions for its recovering, with the University of Córdoba, the Spanish Army and several keen on breeders.

Currently it is mostly used for leisure, as a pet, for equestrian tourism, donkey assisted therapy, and mule production, still necessary for cork extraction and hunting parties. Preferently settling all over the basin of the Guadalquivir River, especially along the Cordobesian countryside, and being previously considered as a synonym of the old Cordobesian or from Lucena Donkey Breed, would reach its maximum concentration in the area during the early past Century, making it possible to establish this breed as the most remarkable one from the Spanish Southern territories. Its wide distribution extends even beyond the Andalusian frontiers, this fact has not excluded it from being recognized as endangered by the Official Spanish Livestock Breeds Catalogue, being necessary, since 2009, to set up conservation strategies for this breed.

The creation of a breed association and a breed reserve such as, stockbreeding centres "Malpica", "Fundación Casa del Burro" or "Las Bellotas", starts by looking for animals fitting the standard of a certain breed. This would not had been possible without the creation of an association of Andalusian donkey breed breeders, in which they could collaborate and work together. Assisted by Spanish Horse Breeding Military Centre in Écija and the University of Córdoba, The Great Andalusian donkey breed breeders Association was set up on 23/10/2001. On 1st February 2002 it changed its name to The Great Andalusian Donkey Breed Breeders and Mule drivers' Union (UGRA). The first points were to state a breed standard, something which was carried out by the University of Córdoba, as well as the inscription of the studbook regulation Project. It all started with 120 animals a quantity which has reached 914 in 2014 and which is still growing. Occasionally we are able to see certain mixed blood individuals between both Andalusian donkey breeds registered within the studbook of The Andalusian Donkey Breed as Andalusian donkeys, because of the coexistence between breeds and the initial recovery stage the breed is in.



Figures 95, 96 & 97. Miguel Sánchez (2011) Andalusian donkeys [Photographs] Accessed from <http://www.yequadapre.com>

10. KNOW YOUR LIMITS

Providing quality lifetime care for animals that cannot find a new home, or for the animals waiting to go to a home, is our goal. But it is not always an easy job. Dealing with painful situations can be very stressful. It helps to have friends to share your feelings and frustrations with. It is only too easy to “burn out” when we see the animals that we dearly love being treated with cruelty and neglect. So do not try and take on the whole burden by yourself. If you become overwhelmed, who else is going to help the animals?

Dealing with ignorance is very distressing, especially when it affects the innocent. It is only too easy to slip into negative attitudes and emotions towards those who do not treat their pets with love and respect. But it is a short term approach. Hatred and negativity can eat you up, and soon you will not be able to do the work. So share your feelings with those of like mind. Take time out to be good to yourself. Prepare to be doing this work over the long haul. Because it will take time to change attitudes towards the animals.

We have all come a long way. Adopting from a shelter or sanctuary is more and more popular every time. News stories about cruelty to animals draw a huge outcry from the public. More and more people are choosing not to wear fur or eat meat. Large companies that test products on animals are finding themselves hurting in the marketplace as more and more people refuse to buy their products.

There is still a long way to go. But if each of us does what we can to promote a world of compassion and kindness, one day we will

see a very different world. It will be a world where we are all living in harmony with each other and with nature. Sounds too good to be true? Maybe, or maybe not. We will never know until we try.



Figure 98. Barbara Doulyeraki (2014) Donkeys at Agia Marina Donkey Sanctuary in Crete [Photograph]

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Chapter 7

Donkey Species Reproduction

Esperanza Domínguez Iralde & Jesús de Gabriel Pérez

1. INTRODUCTION

Asses are animals that have traditionally been destined to work with men in farming, transport of goods and people or in the accompaniment of livestock during herding. Reproduction has never been a priority use for this species. Currently, due to the extinction risk situation of some donkey and the abandonment of traditional tasks by their owners, the number of adult animals that are dedicated exclusively to their reproductive function has increased in order to try to maintain, or even recover its census.



Figure 1. A pair of Zamorano-leonés donkeys plowing [Photograph]



Figure 2. A Zamorano-leonés donkey pulling a cart loaded with firewood to prepare for the Winter next to an elderly couple [Photograph]



Figure 3. A pair of Zamorano-leonés donkeys are driven back to the barn after a day's work [Photograph]

CURIOUS FACTS

In the wild, wild asses smaller herds consist of one male and several females. However in large herds we can find several males and females. There seems to be a permanent union between individuals, describing herds that are highly flexible and fluctuating, dividing and reorganizing almost daily. The dominant male wild ass sometimes defends large territories in which many potential mates are too. Subordinate males are also tolerated in territories ruled by a dominant male (Nowak, 1997). The most typical mating system is polygamy.



Figure 4. Dr. Altay Zhatkanbayev (2011). Dominant male chasing a subordinate male with the herd in the background. [Photograph]. Recuperado de www.arkive.org.

With this work, the number of females which mate each year could be pointed out as the factor of greater influence on the future of the population of zamorano-leonés asses. By doubling this number, the trend is reversed and the population doubled in 20 years. This justifies the need to increase the number of females in reproduction or secondarily to improve fertility, since otherwise the number of animals decreases.

2. GETTING DOWN TO BUSINESS: SPECIFIC SITUATION OF THE ZAMORANO-LEONESA DONKEY BREED

A study with data from Zamorano-leonés asses (*J. Donate, 2000*) allowed determining the factors of greater importance in the regression of this donkey population and which was represented in:

1. A 70% as a result of the reduced number of reproductive females each year (only 30% of females at a reproductive age) this was due to the advanced age of the jennies, the difficulties of the farmer to move to places where the jackstocks were found, the lack of stimulation of the farmers, the use of females in other tasks or as a result of an inadequate reproduction management sometimes based on folk customs (once a year system).
2. A 15% due to the low fertility rate obtained at the end of each breeding season. We could say that jennies are animals that have a low fertility rate in comparison with other equidae such as mares, whose fertility rate per heat (pregnancies achieved during the total time of heat used for breeding) is 55-60%, versus the 30% obtained in jennies and total fertility rate (pregnant females from the total of mated females) is 80-90% compared to the 60% when practicing natural mating or immediate artificial insemination (conservation for less than half an hour)
3. Another 15% corresponds to other factors such as abortion and perinatal mortality usually associated with infectious diseases and poor management.

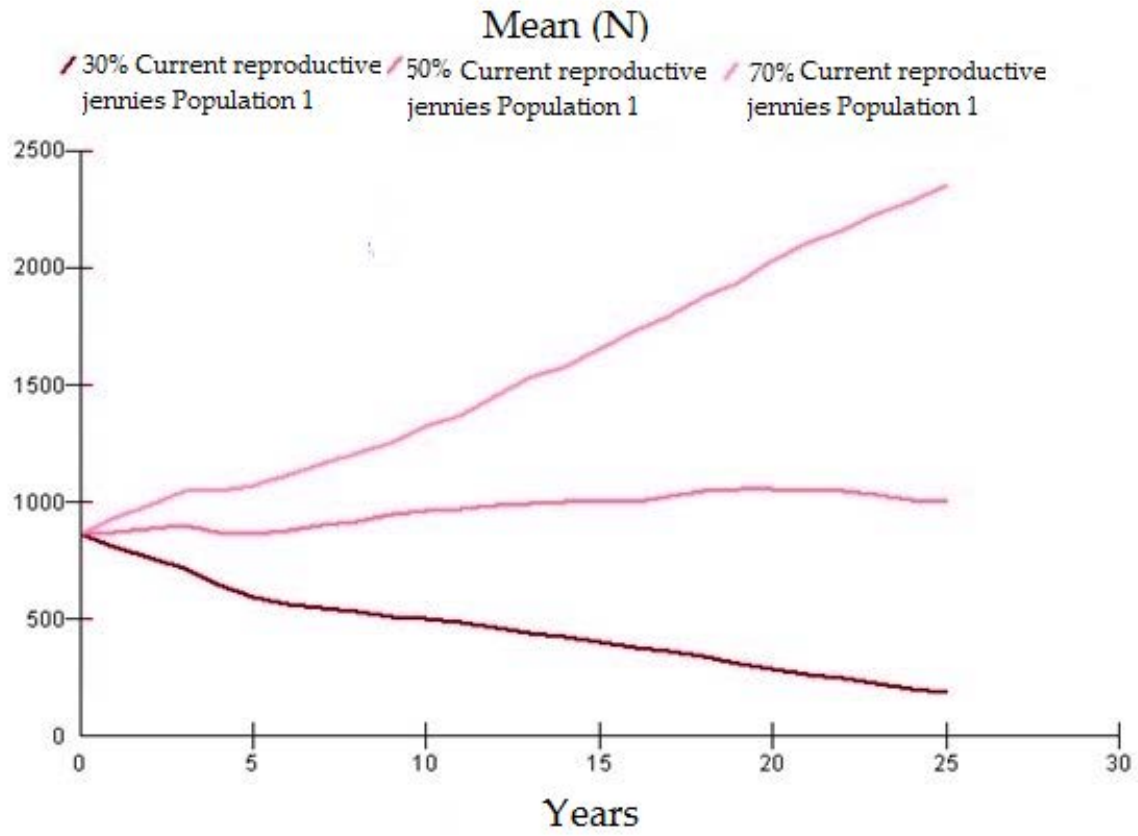


Figure 5. Evolution of the population of Zamorano-Leonés donkeys [Graphic]

This change in the orientation of the animals has led to a higher incidence of risk situations especially for females; which are subject to a reproductive management for mating or artificial insemination, gestation, parturition and lactation, with greater demands at a nutritional, health and facility level. Being decisive for the development of different projects of collaboration between associations of breeders and universities or Government agencies, in order to study and improve the reproduction of asses. Although the studies and research up to this day remain insufficient to make reproduction of asses successful and to make it become the response to the situation of endangered breeds.

The Association of breeders of the Zamorano Leonés donkey (ASZAL) works in this regard since 2000, carrying out research and establishing of programs dedicated to optimize the reproductive outcomes of the animals belonging to this breed, so that the reproductive characteristics as well as the data that will be presented in this chapter correspond mainly to the work carried out with animals belonging to this donkey breed declared endangered since 1987 and whose census seems to be recovering, going from getting 40 births in 2002 to 150 in 2012.

CURIOUS FACTS

Domestic donkeys can reproduce at any time of year, however wild asses usually breed in the wet season. The gestation period lasts 11 months and they usually give birth by the twelfth month. The foals weigh between 19 and 30 pounds (8.6 to 13.6 kg) at birth. The donkey foals are fully developed at birth and can usually stay and nurse about 30 minutes after birth. Young foals are weaned by the mother when they are around 5 months old. Females reach sexual maturity at two years of age and give birth to a foal (sometimes twin births occur) every year since. Males should reach sexual maturity as soon as they reach two years of age but usually become dominant enough to control matings when they are from 3 to 4 years old.



Figure 6. Ron Magill (2012) For the first time in the history of Miami Zoo a Somalian Wild Ass was born, the last remaining predecessor of our domestic donkey and which is critically endangered. Only a few hundred individuals of this ass are free. Something as simple as a flood might be enough to extinguish this species. The female foal was called "Hani" meaning full of joy in Somali and is immersed in a careful controlled captivity breeding program designed to maintain healthy populations of such extremely rare animals for the enjoyment of future generations. [Photograph] Accessed from San Diego News, Miami Herald & NBC Miami News.

The results obtained during different breeding campaigns in which immediate artificial insemination (dose retained less than 24 hours) is mainly practiced and sometimes working with the same group of jennies, let you check that though fertility rates show annual oscillations, they seem to improve discreetly and that these increase as the number of heats used for breeding increases as well.

SEASON	2006	2007	2008	2009	2010	2011	2012
Number of jennies	79	86	60	47	69	45	31
Number of heats	147	144	105	72	158	88	62
Number of heat/jenny	1,86	1,67	1,75	1,53	2,29	1,95	2
Number of pregnant jennies	48	40	44	30	55	26	22
Fertility per heat	32,65 %	27,78 %	41,9 %	41,67 %	36,07 %	35,23 %	40,32 %
Fertility per season	60,76 %	46,51 %	73,33 %	63,83 %	79,71 %	57,78 %	70,97 %

Table 1. ASZAL (2013). Reproductive results evolution.

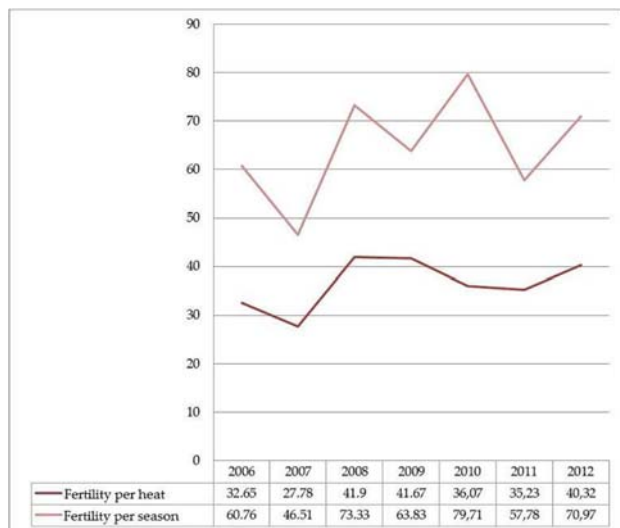


Figure 7. Fertility rates evolution [Graphic].

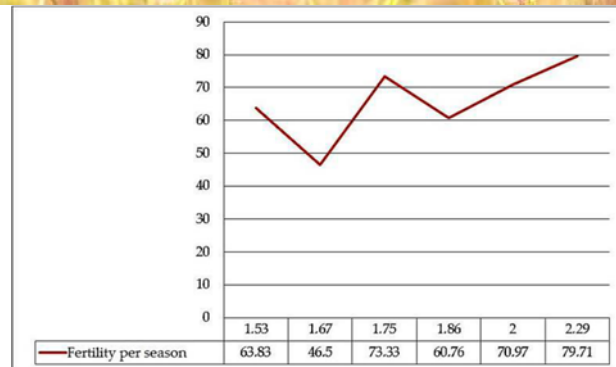


Figure 8. Fertility per season according to used heats [Grafic].

Fertility per heat provide us with a more real sense of intrinsic fertility of individuals, male and female, while seasonal fertility is more influenced by external factors such as management, the ability to detect heat, the duration of the breeding season, etc. (Ana L. Álvarez, 2005)

Ana L. Álvarez (2004) determined the influence of age on fertility of the jennies to study the results of different groups and could highlight that the most fertile animals are in the range of 3 to 5 years.

	3-5 years	5-10 years	11-15 years	16-20 years
Number of heats AI	13	42	42	16
Number of jennies AI	8	26	26	11
Number of pregnant jennies	4	11	11	3
% Fertility per heat	31%	26%	26%	19%
% Fertility per season	50%	42%	42%	27%

Table 2. ASZAL (2013). Fertility per heat and per season according to the age groups of the jennies.

CURIOUS FACTS

Reproductive Key Issues

- Iteoparous (reproduce and produce offspring more than once throughout their life).
- Seasonal breeder (are animal species which successfully mate only during certain seasons) Species of wild asses.
- Continuous breeders (species that mate successfully for several times a year) Domestic breeds.
- Gonochoric/gonochoristic/dioecious (separate sexes) with very little sexual dimorphism.
- Sexual Reproduction.
- Viviparous.



Figure 9. Munich (2011). Oinochoe (wine jug). Attic red-figure pottery which represents two asses mating. [Photograph]. Accessed from Isager, S. & Skydsgaard, J.E., 1995.

It is considered that the success of each breeding season, and in consequence, of the work to restore a population, is determined by the number of offspring born alive and that survive the critical the peripartum period. While setting the number of pregnancies that end up wandering without obtaining a viable offspring, the main causes we find are abortions, dystocic or born dead animals and perinatal death (Table 3). The incidence of this reproductive failure has been a constant in the last 5 years, even with a tendency to increase the number of accidents.

FINAL RESULT	2007	2008	2009	2010	2011	2012	2013
Abortions	12,50 %	12,50 %	15,91 %	16,67 %	16,36 %	12,50 %	18,18 %
Dystocia/Born death	6,25 %	15%	9,09 %	10%	9,09 %	4,17 %	9,09 %
Perinatal death	8,33 %	7,50 %	6,82 %	6,67 %	7,27 %	12,50 %	9,09 %
Viable female donkey foals	37,50 %	20%	40,91 %	30%	32,73 %	37,50 %	27,27 %
Viable male donkey foals	35,42 %	45%	27,27 %	36,67 %	34,54 %	33,33 %	36,36 %

Table 3. ASZAL (2013). Results of the obtained pregnancies.

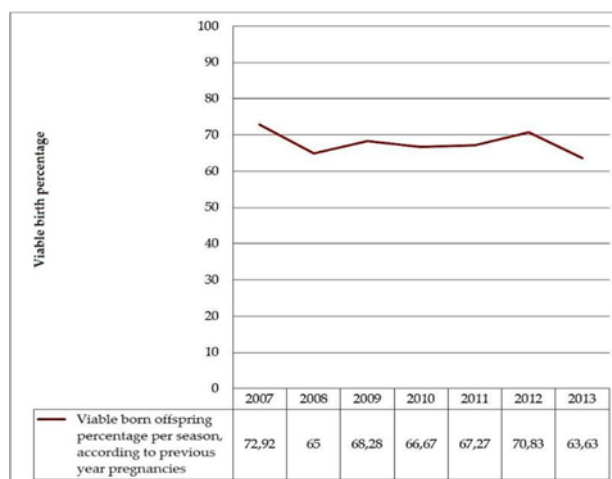


Figure 10. Birth of viable donkey foals. Percentage of viable offspring born each season, according to the pregnancies obtained the previous year [Graphic].

We can conclude that, inevitably, as of today, keeping the reproductive practices and current management, sanitary conditions and with the available means and knowledge, in order to increase the number of animals of this breed we should increase the number of females that are used for breeding, working with young animals and dedicating the largest possible number of heats for this purposes.



Figure 11. Walters Art Museum/Zakariya ibn Muhammad Qazwini (ca. 1203-1283) Muhammad ibn Muhammad Shakir Ruzmah-i Nathani (1934) This page 33 cm (13 inches) long by 20 cm wide (7.9 inches) of the Walters manuscript (W.659, Access number W.659.84B) represents a domestic donkey and a wild one and dates from the 1717 A.D. (1121 D.H. *Hijri year) of the Ottoman period (1281-1924) [Manuscript] Accessed from commons.wikimedia.org

CURIOUS FACTS

REPRODUCTIVE FIGURES AND STATISTICS

- Birth interval: 1 time each year.
- Breeding season: breeding usually occurs in the wet season in the wild, although domestic breeds and some feral populations mate throughout the year regardless of the season.
- Average number of offspring: 1 (<http://genomics.senescence.info>)
- Average Gestation Period: 12 months.
- Average Gestation Days: 359 days (<http://genomics.senescence.info>)
- Average weaning age: 5 months.
- Average age at sexual or reproductive maturity (female): 2 years.
- Average age (in days) at sexual or reproductive maturity (female): 708 days (<http://genomics.senescence.info>)
- Average age at sexual or reproductive maturity (male): 2 years.
- Average age (in days) at sexual or reproductive maturity (male): 1005 days (<http://genomics.senescence.info>)
- Wild ass females breastfeed and care for their foals until weaning occurs at around 5 months (about 6 months in the case of domesticated donkeys). wild ass foals are able to stand on foot and follow their mothers a few hours after birth (even about 30 minutes later) (Nowak, 1997)
- Parental investment (in evolutionary biology and evolutionary psychology, is any parental expenditure (time, energy etc.) that benefits one offspring at a cost to parents' ability to invest in other components of welfare (Clutton- Brock 1991: 9; Trivers 1972). The components of this welfare include the existing offspring' health, parents' future reproduction, and the welfare that parents are provisioned. Parental investment must not be confused with the care or effort provided by parents. This potential negative effect of maternal investment was explicitly formalized by Trivers (1972), who originally defined the maternal investment term to refer to any investment by the parent that would increase the chances of survival of the offspring (and therefore the reproductive success) to the detriment of the ability of parents to another breeding. Clutton- Brock (1991) extended the concept of maternal investment in order to include the cost of any item for welfare without the existence of sire's investment.
- Precocial
 - Before fertilization
 - Protection
 - Female
 - Before birth
 - Feeding
 - Female
 - Protection
 - Female
 - Before weaning
 - Feeding
 - Female
 - Protection
 - Female
 - Before the independence
 - Feeding
 - Female
 - Protection
 - Female

3. REPRODUCTIVE CHARACTERISTICS OF THE JENNIES

- Jennies unlike mares, are not seasonal polyestric and traditionally are bred throughout the year tending to skip the hottest and coldest months, thus preventing the following year's birth from occurring under extreme temperatures. There are studies (Ginther, 1987) which show how during the winter, the ovulation rate decreases, anestrus (no heat) periods are shorter, lengthening the duration of oestrus and increasing the period between ovulation. According to this study, 34% of the jennies suffered seasonal anestrus in winter.
- They are considered suitable for reproduction when they reach three years of age to ensure the full development of the jennies and prevent problems in parturition. In addition, breeding females must reach an optimal body condition that ensures their health status and receive a proper diet.
- The period of time between two ovulations determines the **estrous cycle** and in the jennies, it has an average duration of 24 days (21-27) on the other hand, clinical estrus occurs between 4 and 8 days and is characterized by the acceptance of the mating. The female in heat will stand still in the presence of a male or even another female, letting them to mount her, sometimes it is the jenny in heat the one mounting or also both of the jennies may even be in heat (Henry, 1991). This author pointed out that 78% of the jennies which bray are in heat. Simultaneously the female in heat separates the posterior limbs and increases her urination frequency, also urinating a denser urine.

Masticatory movements are characteristic, it is said that it "chews", while it lowers its head and stretches the neck while putting her ears back. This behaviour appears a day before and disappears a day after the rest of characteristic signs of estrus (Vandeplassche, 1981)



Figure 12. "Chewing" jenny [Photograph]

As well as in mares the thickening of the vulvar lips, tail lifting and vulvar contractions showing the clitoris, redness and brightness of the vaginal mucosa with the presence of clear mucus inside can be appreciated.

This sexual behaviour varies depending on the jenny, the age and the day of the cycle. There are animals with absence of these signs, something which could be due to behavioural problems, especially in isolated animals. It may be pathological, as a consequence of hormonal or physiological alterations, as it is the case of the first heats after parturition, when signs of heat are more discrete or may not even occur (only 33% of the jennies which has recently given birth express heat associated behaviors according to Dadarwal, 2004). The opening of the cervix, which is more elongated and sinuous in the case of the jennies, with decreased uterine tone and the appearance of edema occurs during estrus.

Simultaneously, the growth of one or several follicles in one or both ovaries (dominant follicles) takes place inside of which oocytes mature. These follicles reach an average size of 3.6 cm (3.3-3.9) 48 hours before ovulation and before the detection of a corpus luteum.

The percentage of **double ovulation** is relatively high, a 6.08% of the heats (study of 585 heats) can finish in twin gestation and as it happens in mares they are usually viable, but also a frequent cause of abortions, dystocic parturitions, or even of the death of the females. This factor is repeated in a significant way in the jennies and suggests certain heritability (*Guintier, 1992*). Guintier indicates that multiple ovulations could be either presented in proportion to the size of the animal, as it happens in horse breeds, in which their incidence is greater in larger animals or may be linked to certain family lines. According to the author there is a significant seasonal effect on the incidence of multiple ovulations with a 25% of them occurring on the same day, while in the rest of the animals it can move forward by, from 1 to 11 days, between ovulations.

CURIOUS FACTS

Twin births in the case of domestic breeds of donkeys are truly rare. In a year is quite possible that this circumstance appears about 3 or 4 times in total population of one breed and country (in a documented way).

A twin pregnancy, besides being really unusual, means a serious risk to both foals and mother, who might even perish in the attempt.

Normally if the offspring have not enough space as it happens in those small breeds such as the Miniature Mediterranean Donkey they can be damaged especially in the limbs showing deformities that are not compatible with proper locomotion unless surgical treatments were applied, which are very expensive (\$ 25,000 / € 18,500) and continue for a long time, even three years (see Book 1, Chapter 8)

On many occasions the jennies accept as their own only one of the two foals or reject one of them sometime after birth, so that the patient labor of the owners who must strive for the suitability or for artificial feeding will be necessary.

Another fact to consider is the wide possibility of premature births and abortions (two fetuses born at 6 months or one born at term while the other will be premature) given a twin pregnancy, thus resulting in offspring that either are never born or frequently born dead or which die not many days after birth.



Figures 13 & 14. (Figure 13) ABC South West WA - Australian Broadcasting Corporation & (Figure 14) Bobby Aryan (2008). (Figure 13) Twin donkey foals born in West Australia & (Figure 14) Lonagan, the Miniature Mediterranean donkey breed male twin born with malformations in its forelimbs. [Photographs]. Accessed from (Figure 13) <http://www.abc.net.au> & (Figure 14) <http://groups.yahoo.com>.

4. PRIOR CONSIDERATIONS

Today it is necessary to perform serological and microbiological genital transmitted diseases sampling to all males and females that mate naturally to prevent the spread of infections causing fertility problems such as Contagious Equine Metritis, Equine Viral Arteritis and Equine Infectious Anemia. In females the sampling consists of:

1. Sterile genital swab in a preservative medium with smears from the inside of the uterus or taken from the clitoral glans and hood for microbiological culture of the causative agent of contagious equine metritis (*Taylorella equigenitalis*).
2. Blood samples in EDTA tube for the serologic study and antibody determination of the viruses that cause of Equine Viral Arteritis and Equine Infectious Anemia.

Albizu, Dr. Rafael Baselga, (Figure 16) The Donkey Sanctuary & (Figure 17) El Noticiero del Huasco (2002-2008-2013). (Figure 15) Sterile vaginal swab, (Figure 16) EDTA Donkey blood sample & (Figure 18) Donkey blood simple taking. [Photographs]. Accessed from (Figure 15) <http://www.vet-uy.com> (Figure 16) www.thedonkeysanctuary.org.uk/ & (Figure 17) <http://elnoticierodelhuasco.cl/>.



Figures 15, 16 & 17. (Figure 15) Dra. Elena Gracia, Dra. Gema Chacón, Dr. Bernardino Moreno, Dra. Ana Fernández, Iñaki

5. CONTROL OF THE SEXUAL CYCLE AND OVULATION OF THE DONKEY

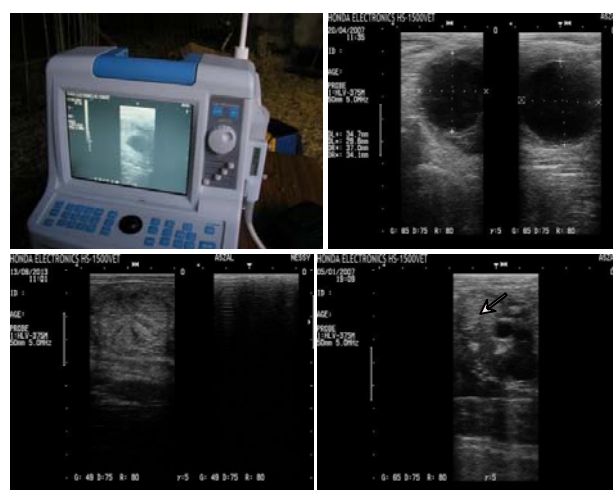
In the case of anestrus jennies the lysis of the corpus luteum may occur when it is more than 5 days old through the use of prostaglandins. This way, the beginning of another cycle takes place and the female will come into heat in 5 to 7 days, provided that there is no follicle growth, ovulation occurs 10 days after injection. This treatment can be used to synchronize the heat of different groups of females.

Unlike what happens in mares the effectiveness of the HCG for the induction of the ovulation is not clear so that GnRH is studied to be the treatment of first choice.

- **Gestation** has an average duration of 375 days (352-396) producing the first postpartum estrus 12 days later (8-14) and in which fertility is somewhat lower than in the rest of heats (25%).
- The knowledge of the cycle of the jennies contributes to the improvement of fertility and requires the control and reproductive monitoring by technicians. This study begins with the general exploration of females, followed by palpation, both rectal and vaginal. The realization of serial ultrasound assessments and laboratory study (cytology, bacterial cultures, antibiograms and biopsies) helps to evaluate and solve fertility problems.

For the ultrasound, a transrectal 5 mHz probe that runs through the genital from the cervix, body and uterine horns reaching the ovaries, thus valuing the changes taking place during the different phases of the estrous cycle, is used. In the uterus, during the heat the image of "wagon wheel", which corresponds with the edema can be identified and the growth of follicles can be appreciated by measuring them. This

information, along with the number of days that the jenny has been in heat, is used when choosing the optimum time for mating/insemination something that will be repeated on alternate days in order to detect ovulation by the presence of a corpus luteum.



Figures 18, 19, 20 & 21. (Figure 18) Ultrasound scanner, (Figure 19) Dominant follicles in both ovaries, (Figure 20) Uterine body edema & (Figure 22) Corpus luteum. [Photography & ultrasound].

The ultrasound study helps to detect silent heats on jennies without heat symptoms, makes diagnosis of pregnancy and to determine reproductive diseases (uterine cysts, endometritis, anovulatory follicles, etc.) easier.

First pregnancy diagnosis is performed 15 days after ovulation, something fundamental for the resolution of detected twin pregnancies, they can be reviewed at 30 and 45 days to diagnose the resorptions that sometimes occur and in which the jenny does not return to heat until 4 months later.



Figure 22. 17 days embryonic vesicle [Ultrasound].



Figure 25. The Hospital for Large Animals at the Cummings School of Veterinary Medicine (2013). Pregnancy is positive, on the ultrasound you can see both the skull and the vertebral column of the fetus [Photograph] Accessed from <http://tuftscummingschool.blogspot.com.es>.

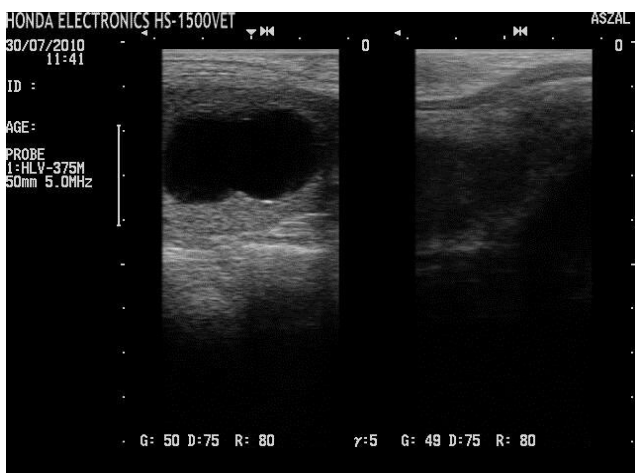


Figure 23. 15 days Twin pregnancy [Ultrasound].

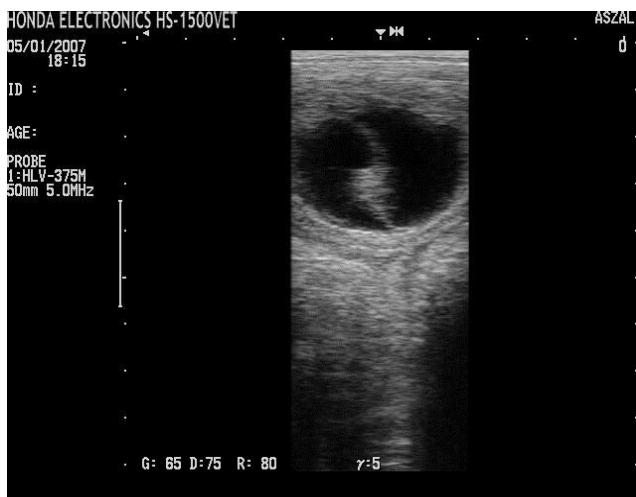


Figure 26. 30 days gestation [Ultrasound].



Figure 24. The Hospital for Large Animals at the Cummings School of Veterinary Medicine (2013) Dr. Wade Tenny, assisted by the assistant Erin Synnott, performs an ultrasound scan to Duchess a Poitou Jenny while the owners, Larry and Doug Davis look forward to the ultrasound screen [Photograph] Accessed from <http://tuftscummingschool.blogspot.com.es>.

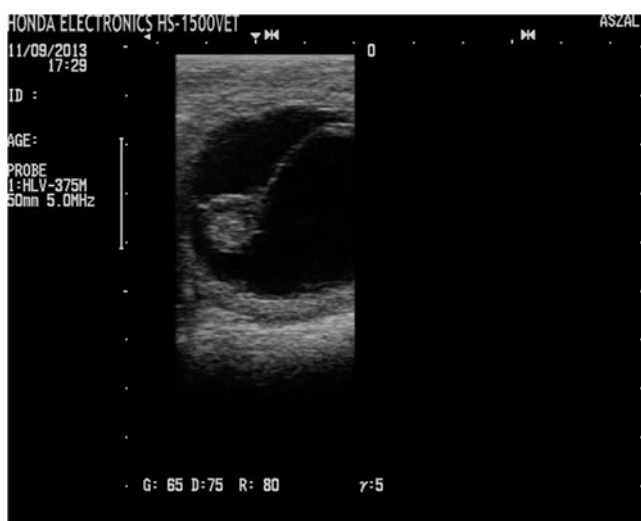


Figure 27. 45 days gestation [Ultrasound]

CURIOUS FACTS



Figure 28. Dr. Altay Zhatkanbayev (2011). Kulan, Mongolian wild as sor chigetai female showing an aggressive behaviour that could be seen in the early stages of estrus [Photograph]. Accessed from www.arkive.org.

COURTSHIP

- In arid climates such as the African one, both domestic and wild donkeys control the access of females to natural resources such as water, to thereby increase their access to females in heat (estrus), as a similar system of mating has also been noticed in Grevy's zebras (Moehlman 1998).
- In wetter habitats, jackstocks have a harem of females associated which he will defend from males from outside of it (wild horses and zebras also have this reproductive behavior) (Moehlman 1998)
- The feral jennies in heat that are outside the territory of a jackstock may attract a certain number of males which will fight in order to be able to copulate with her, although in the end all of them will mount her (Klingel 1998)
- The receptive females will place their hind limbs and tail apart to one side (Klingel 1998)
- Mating sequence: (Klingel 1998)
 - Jackstocks sniff out the females
 - The female kicks against him following a ritual ceremony and follows him (Figure 28).
 - The jackstock follows her, driving her for an average distance of 20 m (65,6 ft).
 - Domestic and feral asses and male onagers lead or chase the females for some distance before mating.
 - When the female stops the male mount her and they mate.

6. REPRODUCTIVE PATHOLOGY

The most common **reproductive diseases** found in the jennies can be enumerated basing upon the location or part of the genital tract that is affected. This way, a remarkable and irreversible increase on the size of the ovaries is usually produced, in females at an advanced age, when it is due to the existence of ovarian tumors that can cause hormonal alterations. Sometimes, young animals may present bruising, after birth whose resolution is possible using an anti-inflammatory based treatment.



Figure 29. Ovarian hematoma [Photograph].

Postmating endometritis, inflammation of the uterine mucosa which can cause infection and sometimes is accompanied by the presence of purulent content are frequent in the jennies. They occur as a response to the seminal fluid and often when the female is not at an optimum time for the mating. It requires specific antibiotic treatment and its incidence diminishes by making the covering or insemination come closer to the time of ovulation, being certain about the female heat status and thus, reducing the number of mounts or inseminations in each heat. Other endometritis occur because of the loss of uterine tone that happens with age and with deliveries, can turn out to be chronic when fibrotic tissue appears and the number of glands decreases. These endometritis are characterized by the presence of uterine cysts that make it difficult for the embryo to

nidate and for the beginning of a possible pregnancy.

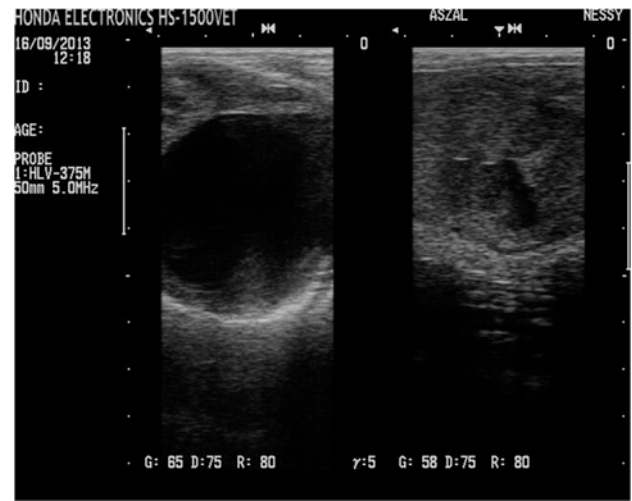


Figure 30. Postcoital endometritis: (on the left in A) a dominant follicle, (on the right in B) intraluminal liquid can be seen [Ultrasound]

Sometimes the presence of content is not detected but it produces infertility and it is diagnosed with microbiological cultures and antibiograms indicating what the treatment of choice should be. In the year 2006 we checked how when taking samples from 8 females supposedly affected by infertility, without observation of intraluminal liquid, in 5 of them bacterial growth turned out to be positive, being possible to isolate several species of *Staphylococcus*, *Enterobacteriaceae* and *Enterococcus*. This microbiological study proved to be crucial for solving these infections since in all the 5 cases the causal agent turned out to be penicillin-resistant and sensitive to amikacin and gentamicin.

Other problems that can occur at a uterine level are placental retentions and uterine prolapses, that often follow dystocic deliveries. It is considered pathological when the jenny is not able to get rid of the fetal membranes after six hours, increasing the risk of infection and septicaemia in the jenny. Uterine prolapse results from the

eversion of the uterine light exposing its mucosa to the outside with the consequent risk of infection and tearing of the uterus. Both cases are considered veterinary medical emergencies that require the manipulation and the establishment of specific treatment for each case.



Figure 31. Umbilical cord with amniotic bag while allantoic membrane is attached to the uterine [Photography].

The narrowness of the entrance of the cervix could be associated with the incidence of dystocial births that alter the natural entrance of the uterus conformation producing tears, adhesions and fibrosis that may hinder the passage of sperm in subsequent breeding (Vendramini, 1998). In these cases it is necessary to explore the jenny with a vaginal speculum to assess the damage and study the artificial insemination as a possible method of conception.

In the vaginal vestibule there are cases of persistent hymen and vaginal prolapse in nulliparous females whose cause has not determined yet.



Figure 32. Vaginal prolapse in a two-year-old female donkey foal [Photography].

CURIOUS FACTS

ESTRUS

- Estrus in jennies takes place every 21 or 28 days and lasts between 2 and 10 days. In domestic breeds, the breeding season begins when the days are longer and ends with the arrival of winter. Under certain climates such as the Mediterranean donkeys are cycling almost throughout the year.
- Females can be in heat up to 8 days (*Grinder et al 2006*)
- Feral jennies and female African wild asses which are in a group do not come into heat all at once (*Moehlman 1998*)
- The peak breeding season may vary among different feral populations according to dry / wet season periods (*Grinder et al 2006*)
- Due to the large size of the territories the dominant male cannot totally exclude other males, indeed, the intruders are tolerated and treated as subordinates, but maintained as far as possible of resident females. When detecting the presence of estrous females, males bray at high volume. Females also call the males when they are receptive.

GESTATION

- 11 months and birth occurs in the twelfth month. Some breeds of wild populations have gestations which last up to 18 months, hence the saying "it will last as much as a jenny's gestation".

CURIOUS FACTS

LIFE STAGES

Birth

- Single births, twin births are rare but still described
- Weight: 25 kg (55 pounds)

Infants (<1 year old)

- Donkey foals can begin to nibble plants after 5 days when incisors erupt (*Moehlman 1998*)
- They browse regularly through the vegetation around two weeks but rely on breast milk for fluids (*Moehlman 1998*)
- Weaning takes place around 6 months, although in some wild relatives as Kiang it takes place around 12-14 months (*Grinder et al 2006*)
- When they reach their first year they still spend most of their time no more than 10 meters (32.8 feet) away from of their mothers at most (*Grinder et al 2006*)

Adult

- Sexual maturity in males is reached at about 2 years old, but they can produce viable sperm time before (*Grinder et al 2006*),
- Females reach sexual maturity at 1.5 years old but they will not usually reproduce until 2 or 3 years old (*Grinder et al 2006*)
 - Observed Wild or Mojave Desert (USA) donkeys usually give birth to their first foal later, at around 3.5 to 4 years of age (*Moehlman 2002*)

Longevity

- Average age of 20 years in the wild (*Klingel 1990*)
- The domestic ass lives an average of 47 years (*Nowak 1999*)



Figure 33. Joanna Van Gruisen/www.arde.com (2005). Male Kiang driving a female harem during the heat season [Photograph]. Accessed from www.arkive.org

7. SEXUAL BEHAVIOUR

Anatomically the reproductive tract of donkeys is different to the one of the horses in terms of the size of their external genitalia, testicles and penis are proportionately higher. Its accessory glands are the same but the verumontanum (seminal colliculus) is wider (Pugh, 2002).

Males reach sexual maturity at the age of 3 but after 18 months his sperm may be fertile.

As in the case of females all the jackstocks used for artificial insemination or natural servicing require a microbiological and serological study with the aim of preventing from equine contagious metritis (swab with genital smear of the scrotum, fossa and preputial areas, urethra and pre/spermatid liquid if possible), equine viral arteritis and equine infectious anemia (blood sample).

The behaviour patterns of the donkey facing towards the female in heat includes brays, naso-nasal contact, nibbles on the head, neck, forelimbs, body, flanks, perineum and tail, investigating the urine and feces of the jenny in heat as well as smelling the vulva and flehmen. This interaction is repeated during brief episodes interrupted by several runaways. Also one or more coverages can happen before the erection until finally, in one of these retreats, erection occurs and the jackstock mounts the jenny without virtually interacting with it.

The jackstock needs space to approach and go away from the jenny, some achieve an erection better when they are at some distance from the jenny. This process can be more effective if it interacts with two or more females like it would with a sexually active group (McDonnell, S. M., 1998).

A high reaction time is characteristic of these animals, since it can take between 5 to 30 minutes until it reaches erection and

ejaculates. The full ejaculation occurs within 6-12 seconds (Pugh, 2002).

During the coverage, attention of the farmer and breeding facilitator is required so that the coverage is correct and no injury is being caused to the female, being necessary to sometimes guide the penis into the jenny's vagina. It is advisable to wash the perianal area of the donkey with water and soap and then dry it, if it is dirty, especially if there are remains of manure. The jenny may possibly spill part of the ejaculate after the mount but this is not related to the final result.



Figures 34, 35, 36, 37 & 38. Coverage sequence (Figure 34) Flehmen response [Photographs] Donkey needs space to approach and go away from the jenny, some achieve better erection when they are at some distance from the jenny. This process can be more effective if it interacts with two or more females as if it were a sexually active group (McDonnell, S. M., 1998).



Figure 39. M. Chinchilla/Ganadería 'El Burro Andaluz' (2009). Semen extraction from the Andalusian jackstock Ceferino with the help of a breeding facilitator (paradista) for artificial insemination [Photograph]. Accessed from <http://www.elburroandaluz.com/>

The mounts must occur in a safe place for animals and for the caregiver. This includes a safe non-slip floor surface and a high enough ceiling.

Castration is indicated when the donkey foal is between 6 and 18 months old. This practice should be performed in winter, when low temperatures reduce inflammation and there are no flies. The fact that the donkeys require a few special considerations must be borne in mind (*Tes Sprayson y Alex Thiemann, 2007*):

- The spermatic vessels are of a considerable thickness that makes it necessary to use sutures to bind them (in the majority of cases is not enough with emasculating), thus increasing the risk of infections and foreign body reactions.
- The small size of some donkeys disables to perform the practice of standing castration requiring general anaesthesia, monitoring and help to make the animal lay.
- Some jackstocks are castrated at a more advanced age. In these animals there are scrotal and inguinal fat deposits that set up sexual behaviour patterns thus complicating their postoperative process.

- We must bear in mind that the stoic behaviour of these animals can hinder pre and postoperative troubleshooting.
- The donkey should be vaccinated against tetanus and if it were not, or we were not sure we should apply a dose of antitetanus serum.

The technique we will follow must be selected depending on the size, behaviour and age of the donkey, as well as the experience of the practitioner. Thus a closed castration is performed on young, slim, and without sexual activity donkeys, being able to perform it in the field since it does not access the abdominal cavity. Semi-closed method via scrotum is indicated in quiet, sexually inactive adult animals, but which may contain important deposits of fat within the spermatic cord and with a good development of the tunica vaginalis, it will need accurate aseptic conditions and a longer duration of anesthesia. In sexually active jackstocks a semi-closed inguinal castration is recommended which also requires conditions of asepsis and greater postoperative care.

Castration in neonates is contraindicated, due to the susceptibility these animals present to stress, compromising the immune status of the donkey foals and causing neonatal sepsis.

CURIOUS FACTS

Donkey males typically have a bigger penis and testicles than horse stallions. Although it only seems to be a curious fact, it is very important to bear it in mind and we must consider it to proceed with the castration of donkeys and mules (although they are hybrids and thus infertile, castration is applied to modulate behavior, because although mules and hinnies male does not produce sperm do produce testosterone).

There are many references that suggest that donkeys and mules have a remarkable increased tendency to bleeding after castration. This is usually attributed to the fact whereby larger testicles possess greater vessels that provide them with blood and therefore a greater amount of tissue to remove during castration and therefore a more consistent amount of blood loss.

As a result, it is not recommended that standing castration of these animals is performed. Additionally, some practitioners prefer to use an emasculator that separately has a crusher action above the cutting surface to minimize the possibility of severe bleeding. In addition, many donkeys have thicker and therefore larger blood vessels in the scrotal tissue.

Therefore, in cases in which the veterinarian sectioned part of the lower part of the scrotum, as a step of the castration methods, the risk of scrotal bleeding increases compared to the castrations applied to horses (Hagstrom, Debra J., 2005)





Figures 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62 & 63. Vandoleroburguillano (2012) Male donkey castration sequence. [Video Screenshots] Accessed from www.youtube.com

CURIOUS FACTS

Many donkey breeders are frustratingly familiar to a peculiarity of male donkeys, which is the added time required to reach erection and ejaculation when compared to horses. A male donkey with experience usually needs 5 to 30 minutes to complete the reproductive act, while most of stallions (horses) complete it in 10 minutes or less.

It can take extremely long for a jackstock to cover a jenny, even when referring to older males mating with jennies (The less experience and when trying to breed them to other species, the more complicated it will be). It takes hours for some jackstocks to cover or never complete the reproductive act at all (Hagstrom, Debra J., 2005).

8. ARTIFICIAL INSEMINATION IN ASSES

As we have already mentioned above, the percentage of fertility in cases in which the natural mating is practiced are similar to performing an immediate artificial insemination, but this technique provides a number of key advantages such as:

1. Reduces the risk of transmission of sexually transmitted diseases, thus protecting both female and the jacks.
2. Allows to know the quality of the jackstocks.
3. Makes working with jennies with injuries in the genital area easier and decreases postcoital endometritis issues.
4. Allows the reproduction of animals in locations where there is no jackstock or where there is one, but there are a large number of females to breed to.
5. Requires a follow-up ultrasound of females by which you choose the optimal time for insemination.
6. Decreases the number of mating by the jackstock thus avoiding accidents.

For the collection of semen and subsequent processing for the preparation of seminal doses for the insemination, required specific sterile or disposable, tempered material is needed as well as having a set up laboratory.

The collection process requires the presence of a jenny in heat or a mannequin, which can suppose a previous training. In the latter case, the use of urine of a female in heat can be useful to stimulate the jackstock.

You can use a Missouri type artificial vagina, used with most of the horses, or the Roanoke one, specific for donkeys. This, has to be protected inside with a single-use plastic shirt, as a kind of condom and trying

not to leave wrinkles that could bother the jackstock later when collecting. It should be filled with 1.5-2 litres of hot water to 42 - 45 °C and the rest must only be filled with regular water or air, adapting a previously tempered to 38°C collector container, and then placing the protective leather. Prior to mounting, we will lubricate the inside part of it with a non-spermicidal gel and an arm is left inside to avoid the loss of temperature (S.R. Purdy, 2005). Ejaculation depends on the temperature and pressure that the artificial vagina presents and this varies according to the male.



Figure 64. Sperm extraction with an artificial vagina and using an elder jenny [Photograph].

When the jackstock reaches the erection and stands on top of the jenny, the person in charge should approach with caution and divert the penis inside the vagina. The appreciation of pulse in the base of the penis is an indicative of the ejaculation. The donkey, as well as the horse has a three-phase ejaculation, before mounting it eliminates a few drops of pre spermatic fluid that comes from the prostatic gland and contains no sperm. Ejaculation occurs in the form of jets in which sperm concentration gradually decreases and finally, it eliminates a gel fraction that comes from the bladder glands and whose presence and volume depend on the degree of excitation of the male.

CURIOUS FACTS

The coverage of a mare is not a natural instinctive behavior for most donkeys. Given their low libido, in the case of Young inexperienced asses, or those that have not been bred to mares it can be a real challenge to use them as breeding males.

Of course there are always exceptions, but generally a donkey that has not been raised among horses will show no interest in covering a mare. Although there has been no specific research about it, there are many anecdotal evidence attesting to this.

It is widely and commonly known among breeders of donkeys and mules, that if a male donkey is bred with donkeys, horses and mules, it will not naturally want to breed to mares. However, if a male ass is raised in an environment in which there are only horses present, separated from donkeys and mules to carry out weaning, they will show a much higher affinity for the mares.

It has also been observed that in situations where there is more than one male ass at a farm, once one has bred to a mare (provided that the rest of them has seen it) the other male asses will often copy this behaviour in a short period time.

Given that the interest of a male donkey to a mare must be cultivated so carefully is very rare to find a donkey which is willing to interchangeably breed both mares and jennies.

Therefore, it is advisable to separate male donkeys that are directed to the breeding of mares and those which will breed to jennies. If we use the same male to cover both species, the right thing to do would be to consider artificial insemination.

As in the case of horse stallions, male donkeys may be trained in a relatively quick period of time for semen extraction using an artificial vagina.

Donkey semen can be handled in a similar manner to that of a horse using the same diluent and storage techniques (always considering that individual diluents and cryoprotectants testing will give better results when there is enough amount of semen available). The donkey semen can be frozen with liquid nitrogen for its use at a later insemination (*Hagstrom, Debra J., 2005*).

9. SEMINAL CHARACTERISTICS

Once in the laboratory the ejaculate is filtered to eliminate the gel fraction and impurities and placed into a double boiler at 37.5 °C while we assess and process it.



Figure 65. Reproduction laboratory for the processing of samples after extraction [Photograph]

Semen assessment includes the determination of the following parameters:

- *Ph.* It should be approximately around 7.6 (7, 4-7, 8) and their variations are indicative of contamination with urine or of the presence of infections.
- *Total Volume* and/or without gel (ml).
- *Concentration (sperm/ml)*. It can be assessed by using an hematocytometer (Thomas, Neubauer or Burker Chamber) spectrophotometer, an electronic counter, or a CASA system.
- *Total number of sperm in the ejaculate (volume x concentration)*.
- *Total and progressive motility (%)*. Assessed in a subjective way by the visualization with an optical microscope of the movement of the sperm in a cool and diluted ejaculate sample. There are computerized systems which allow its objectification.
- *Total sperm with progressive motility (%)*.
- *Morphoanomalies (%)*. Are determined in a smear of semen using different stains. These

anomalies may be located at the head, middle piece and sperm tail and are classified into primary or higher (M) and secondary or minor (m) as they have their origin in the process of spermatogenesis and sperm maturation (the first being more severe). We also determine the proximal and distal cytoplasmic droplets.

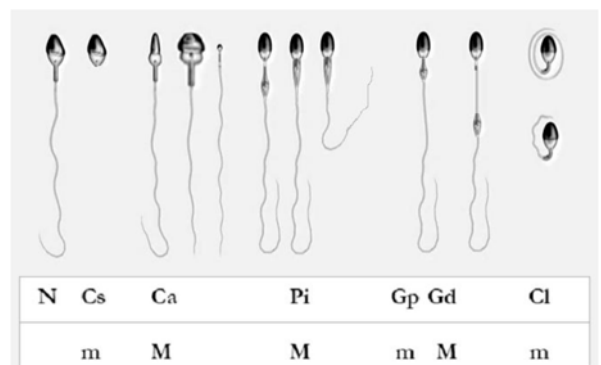


Figure 66. Ingenes (2013). Teratospermia: (N) Normal, (Cs) head without tail, (Ca) abnormal heads, (Pi) neck and abnormal middle piece, (Gp and Gd) Proximal and distal cytoplasmic droplets, (Cl) abnormal tail [Scheme]. Accessed from <http://www.ingen.es>

- *Total number of normal and with progressive motility sperm.*

Table 4 ASZAL (2013). Compared seminal characteristics of the equidae family.

	AVERAGE		RANGE		Horse(a)
	Miniature Donkeys (a)	Zamorano-leonés (b) Donkey	Miniature Donkeys(a)	Zamorano-leonés(b) Donkey	
Volume (ml)	25-50	63,07	21-115	13-140	20-150
Concentration (x 10 ⁶)	200-500	316,26	75-877	40-614	60-350
Progressive motility (%)	80-90	68,85	65-90	60-90	40-90
Morphoanomalies (%)	10-20	12,61	8-31	1-34	10-25
Useful spermatozoa per ejaculate (x 10 ⁶)	5000-11000	12040,32	3307-18000	746,48-53491,68	less

(a) Miniature Donkeys/horses Data: Brian Ramsey, Tyler (Purdy, 2005)

(b) Zamorano-leonés ass Data: Ana L. Álvarez (Feagas, 2003)

These parameters may be influenced depending on the individual, breed, time of abstinence, overstimulation or overuse. Seasonal differences in the livid has been observed but there is no alteration in the seminal parameters.

There are other easy to evaluate parameters in a routine test, as it is the percentage of motility and morphologically normal spermatozoa in diluted and refrigerated during a given period semen. This percentage is related to the semen viability once refrigerated or frozen.

CURIOUS FACTS

There are both cyclical and anatomical differences between breeding jennies and mares. In the mare, the average length of gestation is 335- 345 days while the jenny's is between 360-375 days or more.

The birth of perfectly normal donkey foals has been described from 10½ months to 14 months of gestation. The estrous cycle of the jenny ranges from 23 to 30 days, while the mare has a slightly shorter estrous cycle between 21-25 days.

Additionally, the jennies usually have a mating period ranging on average between 6 and 9 days. This is substantially longer than what is described in mares, in which the heat can be as short as three days or reach 8 days. In jennies the ovulation occurs 5-6 days after the onset of estrus, while mares ovulate 12 to 24 hours before the end of estrus.

In addition, the foal heat begins 5-13 days postpartum while mares do not start this foal heat until 7 days after delivery. In general, the jennies have stronger maternal instincts and are excessively overprotective towards donkey foals especially during the first weeks after birth.

Consequently, it is not normal for them to be receptive to the presence of a male during this foal heat under a natural breeding program. The second or third estrus after delivery, however, they will be more relaxed, showing themselves less concerned about their offspring and paying more interest to the jackstock (*Hagstrom, Debra J., 2005*).

10. PREPARATION OF SEMINAL DOSES

Semen is characterized for being sensitive to agitation, light and temperature changes. Due to this thermosensitivity ejaculate should be diluted immediately after collection, both for fresh management and for its later conservation.

The most commonly used conservation means for immediate and deferred artificial insemination, are semi-skimmed milk and thinners consisting of milk such as INRA (82 and 96) or Kenney's diluent. With each thinner you can select a storage temperature (4°C to 15°C are the most common) with a slow cooling rate (- 0.2 °C). Conservation at 15°C, requires aerobic conditions, since the metabolism of sperm is still running. In this case, the damage suffered by the sperm because of the shock produced by cold is less, but their metabolism produces toxic waste substances to which it appears to be sensitive.

Conversely, the preservation at 4°C occurs under anaerobic conditions, sperm metabolism is decreased and it can save energy to re-establish its motility when the sample is heated later. Studies with Zamorano-leonés ass do not find significant differences in the motility of the sperm refrigerated at 4 ° C and 15 ° C, but they do find that the damage in the plasma membrane is significant, being lower in the case of conservation at 15°C (Serres C., 2001).

Consuelo Serres studied the effect of semen centrifugation prior to the preparation of seminal doses in order to remove the seminal plasma, which has a beneficial effect on the refrigeration of semen, but this protocol increased the incidence of postcoital metritis since the seminal plasma exerts an anti-inflammatory effect on the uterine mucosa.



Figures 67 & 68. (Figure 67) Taking a sample for the evaluation of the motility of a donkey's seminal simple & (Figure 68) Sperm count in chamber [Photographs].

The preparation of seminal doses involved the dilution of a part of the semen in the thinner of choice for a particular number of sperm. Different protocols exist in this terms, ranging from the 1:2 to 1:3 dilution, getting the amount of 200 to 500 x 10⁶ of normal sperm with progressive motility in 10 to 30 ml doses, up to the choice of the technician according to the storage time and the seminal parameters of each ejaculate or even depending on individuals.

Nowadays donkey semen freezing seems to be viable and horse semen freezing protocols have been used. Mainly, two cryoprotectants have been used, glycerol, and dimethylformamide at different concentrations, resulting in better results with the second at a 2.5% concentration (Ana L, 2004). The problem of this technique comes when inseminating the jennies, since it seems that the use of these products causes reactions in the uterus that prevents pregnancy.

In this way, it has been tried to reduce the concentration of these products or even to eliminate them through centrifugation and filtration, in order to mitigate their effects on the uterine mucosa. The application of anti-inflammatory drugs have also been studied at the time of insemination. But still a successful protocol for the use of donkey frozen semen doses has not been established in the jennies, since these same doses do work when it comes to inseminating mares.



Figures 69 & 70. (Figure 69) Aerobiotic dilution & (Figure 70) cooler box for dose transport [Photographs].

CURIOUS FACTS

Donkeys tend to be more fertile than horses, with an average fertility rate of 78% while the rate of average fertility in mares is around 65%. Besides the multiple ovulations are much more common in donkeys than in horses. Thus, twin births occur more frequently, especially in American Mammoth Donkey and other standard sized donkey breeds.

Researchers in the field have placed the incidence of twin births around 40% as it was echographically diagnosed on the 21st day of pregnancy in small herds of donkeys.

The procedure to be followed when handling twin pregnancies in jennies is similar to that of the mares, so that the aim is to suppress one of the two embryos. That is, the rarest fact is not that a twin pregnancy occurs but having the two embryos develop and be born successfully. If a veterinarian unsuccessfully attempt to crush or to apply compression on one of the embryos manually, often full gestation is aborted. The same as mares have complications associated to term twinning, jennies also present similar problems in such cases (Hagstrom, Debra J., 2005).



Figure 71. Sara Gividen (2009). Fred curls up next to his mother Wilma while his twin brother Barney lies behind them [Photograph]. Accessed from www.state-journal.com

11. INSEMINATION TECHNIQUE

The technique of artificial insemination has to be more aseptic as possible. To achieve this, the vulva and perineum of the donkey should be cleaned with a disinfectant solution and then dried with paper, since these solutions are spermicides. This cleaning should be done from medial to lateral to remove dirt from the vulvar lips.

It is recommended that rectal palpation gloves and catheters be sterile to prevent the introduction of environmental contaminants inside of the uterus.

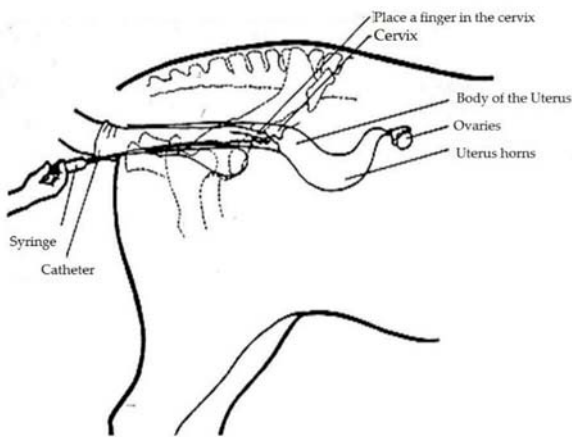


Figure 72. 임경순등(1998) Insemination method used in the jenny [Scheme]

For the insemination, the first thing to do is to wear a rectal examination glove and after lubricating the hand with a non-spermicide gel to enter it protecting the tip of the catheter with the fingers. Once in the vagina, put one or two fingers into the inlet of the cervix, something which will serve as a guide to the catheter. We should take into account that this opening is more narrow and elongated in the jennies than in the mares, especially in primiparous animals. The catheter must be 52 cm long and flexible in order to reach the body of the uterus and direct it towards the horn where there is a dominant follicle. Once it is properly placed we insert the semen followed by around 5 ml of air to empty the

contents of the catheter. Finally, the catheter is removed and massages are performed in the cervix to stimulate uterine contractions and thus facilitate the travel of the sperm.

CURIOUS FACTS

The jennies have a longer cervix than mares, however it has a smaller diameter. If we also add the fact that the cervix protrudes into the vagina farther than in mares it can make artificial insemination techniques more difficult than they are in the mare.

The jennies also have a higher incidence of cervical adhesions rate and that is the reason why jennies are reported to present a greater foaling difficulty than mares. Veterinarians or the personnel who manage their deliveries should remember that dystocia is much more common when it comes to attending a jenny and therefore should be prepared to attend to a complicated delivery, and thus help to ensure the birth of alive offspring (Hagstrom, Debra J., 2005).



Figures 73, 74, 75, 76 & 77. (Figure 73) ASZAL & (Figures 74, 75, 76 & 77) Asinerie du Bocage (2013). (Figure 73) siringe to insert semen into the insemination catheter, (Figure 74) Artificial vagina, (Figure 75) Semen extraction to apply techniques of assisted reproduction, (Figure 76) Semen filtering & (Figure 77) Viewing the semen collected samples to the microscopy [Photographs]. Accessed from <http://www.asineriedubocage.com>

12. GESTATION

The absence of symptoms of estrus after a mating is usually significant of a pregnancy, but it is convenient that a veterinarian is able to confirm it by using ultrasonography. In addition, to thus identify twin gestations frequent in these animals and whose resolution can only be performed during the first 20 days of gestation if we want to eliminate an embryonic vesicle. A review from the fourth month of gestation is used to detect possible cases of abortions.



Figure 78. Kevin Smith (2010) Rear view of a pregnant jenny
[Photograph] Accessed from <http://www.flickr.com>

The pregnant female must do physical exercise according to the activity carried out before being pregnant, always getting a balanced diet that requires nutritional adjustments. The body condition of the jennies during pregnancy and lactation, affects not only their own health but also the health of the offspring.

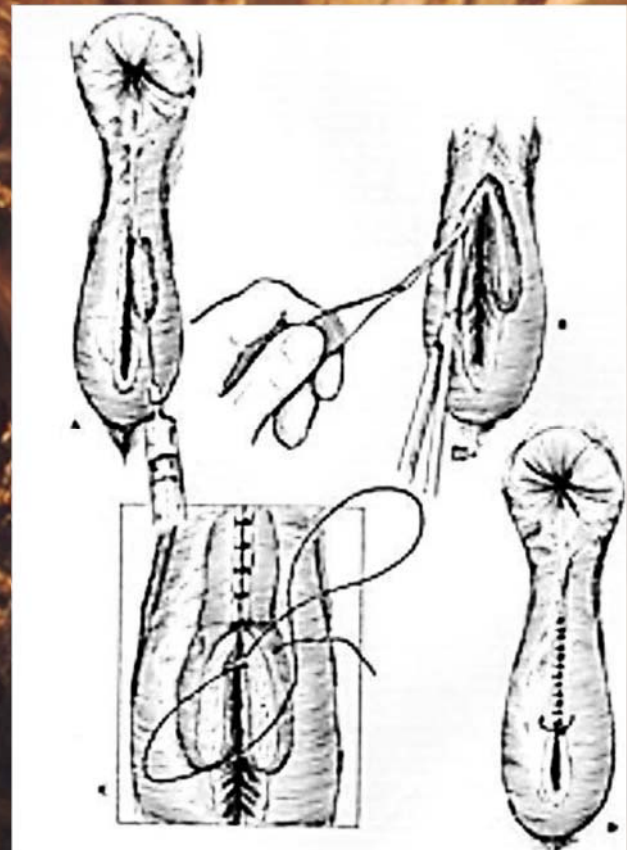
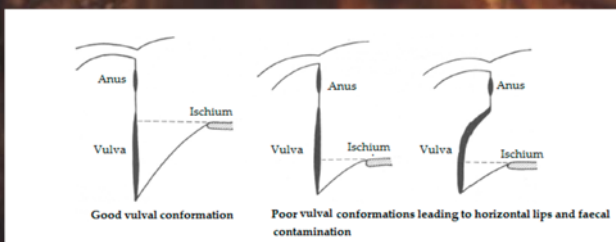
In the first 8 months of gestation, the fetus is very small and does not require much from mother at a nutritional level. During this period, the feeding program of the jenny resembles the one of a working animal. Sufficient amounts of energy, protein, minerals and vitamins are needed to keep

the jenny in good body condition, without letting it get too fat. A good fodder and a minimal amount of food concentrate (0.5 kg per 100 kg Live Weight) should be enough.

The last four months of pregnancy include the period in which the growing of the offspring occurs acquiring 60% of his birth weight. Protein and carbohydrates are the nutrients the jenny needs in large quantities during the end of pregnancy to allow the appropriate development of the offspring (in this period the jenny must have access to about 1 kg per 100 kg of live weight). Nutritional deficiencies during this period of rapid growth of the offspring irreversibly compromise the animal's development.

CURIOUS FACTS

Jennies require the application of Caslick's surgical technique to prevent their vagina from the access or suction of air and less frequently, from the contamination by feces. Anatomically, the pelvis of a jenny is quite inclined downward (when viewed from front to back). This leads the tip of the vulva to describe a much more desirable angle in which the bottom thereof is more cranially orientated than its upper part. This slope also makes problems related to the contamination of the vagina by urine less frequent. However, it makes rectal palpation much more complicated than it is in the case of the mare. In addition, rectal contractions of donkeys tend to be stronger. These factors appear to make the detection of early stages of pregnancy by palpation more difficult (Hagstrom, Debra J., 2005)



Figures 79 & 80. (Figure 79) Rossdale y Ricketts & (Figure 80) Snaphu (1980-2013). (Figure 79) Good vulval conformation & Poor vulval conformations & (Figure 80) Caslick's Procedure [Schemes] Accessed from <http://quizlet.com/>

13. PARTURITION

A remarkable increase in the size of the mammary glands, with a thick and yellowish content when milking occurs when approaching the date of parturition.

The jenny requires an isolated and sufficient space at the time of delivery as well as being provided with a clean and safe area to do it so.

Normal delivery consists of three phases:

In the first stage, on occasions, the formation of "wax plugs" at the end of the nipples when the colostrum is being produced can be noticed. The contents of the udder becomes whitish and more liquid when approaching the expulsive phase. The relaxation of the sacroiliac ligaments and the vulva can occur. The jenny presents altered breeding patterns, is restless and seeks isolation.

The next stage is the expulsive phase in which the liquid output through the vulva and abdominal contractions that favour passage of the forelimbs and snout through the pelvic canal take place, all wrapped in a white cloth (amnion). At this time, the jenny can stand or turn to facilitate the expulsion of the thorax of the offspring. The donkey foal is born inside the amnion and breaks it when trying to stand. It is necessary for the umbilical cord to link mother and offspring for a few minutes and must break spontaneously when the jenny stands up.

In the third stage of parturition the placenta (allantoidal membrane) is released, this usually occurs within 2 hours maximum after delivery and is important to ensure that it has been driven out entirely. If after this period it has not been released, the intervention of the veterinarian is necessary because of the risk of infection that can lead to septicemia and laminitis.

CURIOUS FACTS

Normally, heat detection is not complicated in the case of the jennies as these will manifest their status very obviously when they are ready to be covered. It is very common that just the sound of a male braying in the distance trigger these signs of heat.

Jennies share some of the most typical signs of estrus that appear in mares even, frequent urination and assuming a typical riding allowing position stretching hindquarters and placing them apart. They will also have their ears back and show a characteristic submissive masticatory movement with their mouth known as chewing.

Jennies also produce more sounds that mares during estrus. They even exhibit these signs of estrus in the presence of other jennies, especially if there is another one in heat too. In addition, jennies often mount other asses during estrus as has also been observed in cows, something that is rarely seen among mares (*Hagstrom, Debra J., 2005*)



Figures 81, 82, 83, 84 & 85. Birth of a donkey: (Figure 81) amnion emerging through the vagina (Figure 82) The amnion has been broken, the jenny is giving birth while standing, (Figure 83) the donkey foal has been born, but it is still attached to its mother by the umbilical cord, (Figure 84) The Jenny grooms the newborn donkey foal, allantoidal membrane is seen behind & (Figure 85) the donkey foal stands upright [Photographs]

When the position of the donkey foal is not correct or the donkey foal remains trapped in the birth canal, the presence of the vet is necessary in order to reposition the offspring and thus facilitating the expulsion of the donkey foal through the use of lubricants or even anesthetics that facilitate the procedure. You should never pull from offspring if the position is not correct and we will never attach it to a vehicle or similar. If we pull, we must always do it downwards and when the donkey has a contraction.



Figure 86. Veterinary risk procedure to attend a donkey during a dystocic delivery [Photograph]

CURIOUS FACTS

MONITORING AND ULTRASOUND FETAL DEVELOPMENT

The regular ultrasound assessment of the jennies has two main aims:

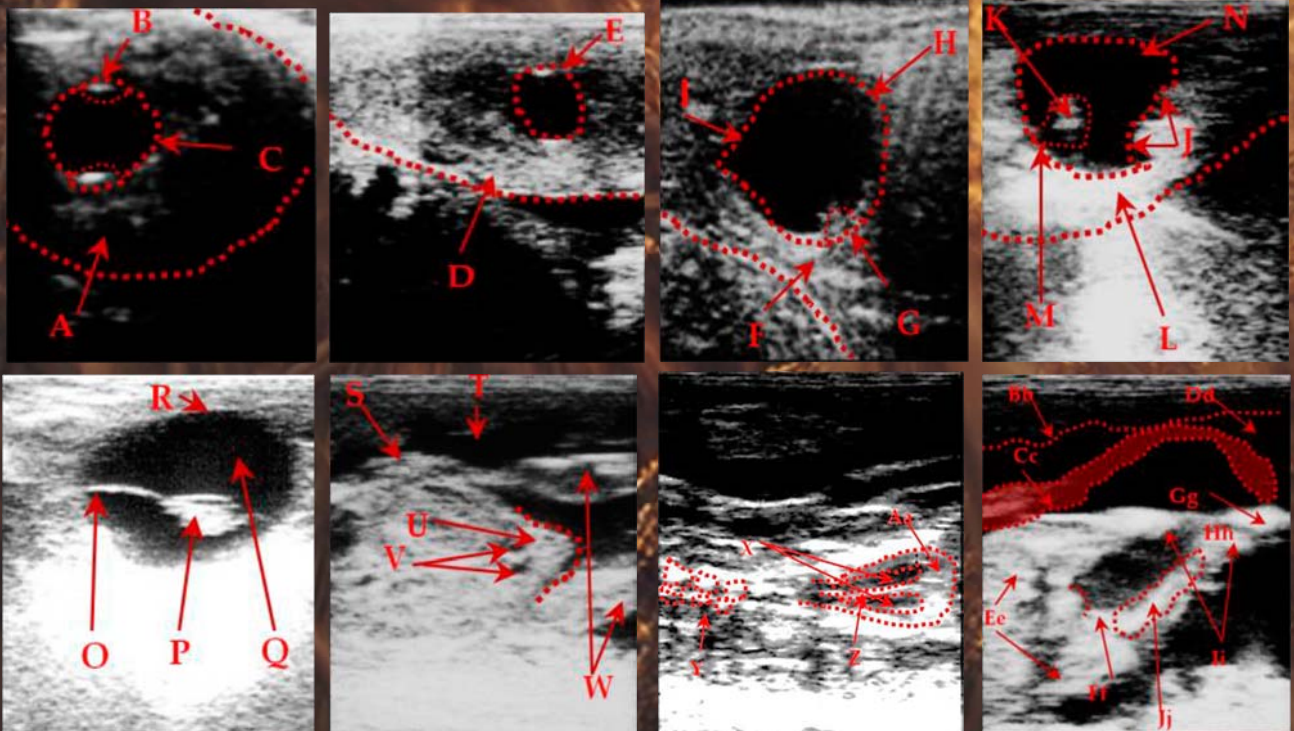
a) Corroborating her pregnancy status to ensure that the female has been fertilized. Thus the veterinarian may consider possible causes and provide treatment when necessary.

b) To control for possible twin pregnancies. These are not recommended because both donkey foals may develop problems or be born prematurely. Veterinary surgeons usually recommend to bring only one of the embryos to term, eliminating the second by performing a puncture. This procedure should be performed as soon as possible, within the first three weeks.

Therefore it is advisable to practice an ultrasound 15 days after coverage or what is the same, after the end of estrus.



Figure 87. Asinerie du Bocage (2013). Ultrasound assessment of a jenny [Photograph] Accessed from www.asineriedubocage.com



Figures 88, 89, 90, 91, 92, 93, 94 & 95. Asinerie du Bocage (2013). (Figure 88) Ultrasound at 15 days of gestation. It can be observed: (A) Uterine horn, (B) Hyperechogenic zone (C) embryonic vesicle (Figure 89) Ultrasound at 15 days of gestation. It can be observed: (D) Uterine horn (E) embryonic vesicle (Figure 90) Ultrasound at 21 days. It can be observed: (F) Uterine Horn (G) Embryo, (H) embryonic vesicle (I) placentation (Figure 91) Ultrasound at 1 month of gestation. It can be observed: (J) placentation, (K) Embryo, (L) Uterine Horn (M) umbilical cord (N) embryonic vesicle (Figure 92) Ultrasound at 1 month of gestation. It can be observed: (O) Umbilical Cord, (P) Embryo, (Q) amniotic fluid, (R) embryonic vesicle (Figure 93) ultrasound at 3 months of pregnancy. It can be observed: (S) placentation, (T) Amniotic fluid (U) genital Apex, (V) genital area. Testicular Bag (W) hock tips (Figure 94) ultrasound at 3 months of pregnancy. It can be observed: (X) ventricles, (Y) vertebrae, (Z) transverse septum (Aa) Heart walls (Figure 95) Ultrasound at 3.5 months of gestation. It can be observed: (Bb) placentation (Cc) Umbilical Cord (Dd) Amniotic fluid (Ee) Butt (Ff) Groin, (Gg) Fetlock (Hh) Separation between both limbs, (Ii) hock tips & (Jj) Tibia. [Ecografías] Recuperado de www.asineriedubocage.com.

Some clinicians and farmers prefer to promote the delivery in order to avoid certain accidents that require intervention and thus allowing them to control the entire process.

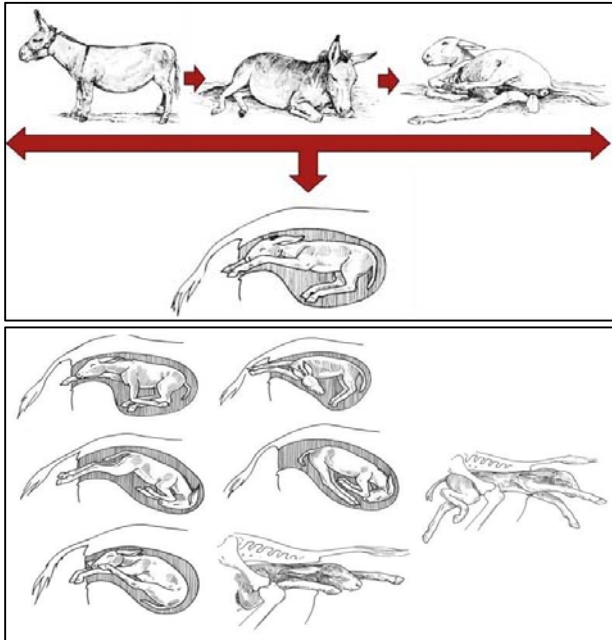


Figure 96 & 97. Elayne Sears (2013) (Figure 96) stages of parturition and normal position that a donkey foal would present in the stages near parturition. The forelimbs are extended and the head and neck rest on them. The later will extend back as the body comes out & (Figure 97) several atypical presentations of a donkey foal and therefore lead to dystocia. Some of these presentations can be a serious threat for both the donkey foal and its mother and require surgical removal of the donkey foal. Fortunately, not all presentations threaten life and many of them can be easily corrected by a qualified assistant. In this species, it is highly recommended to have a vet perform an ultrasound exam to our animal prior to the breeding season so he/she may explain the procedure that owners should carry out when facing a dystocia. From left to right and from top to bottom: **a limb backwards**, push the donkey foal back, carefully cover the backward hoof with our hand and reposition it; **donkey foal with head turned backwards**, push the donkey foal back, and try to reposition the head, which can also appear down between the limbs, **breech donkey foal delivery with legs backwards**, donkeys usually have no problem in these cases, whether it will be adequate to help them deliver the donkey foal once the hips appear since its umbilical cord will be pressing against the bottom of the pelvis of his mother; **Complete breech delivery**, we will try to have a veterinarian perform it, but if it is not possible, we will try to raise the hind legs of the jenny, pushing the donkey foal forward and guiding our hands to pass its body and grabbing one of the hocks, turning it out of the body. Holding the leg in that position, with the index and little fingers of the same hand, we will try to

place the foot in a correct position. Repeat on the other side and try that the jenny safely delivers as soon as possible because the umbilical cord will be pinched and the donkey foal will be at risk; **Donkey foal with four limbs at the same time**, we will attach a couple of limbs of the same type with a clean and soft rope of small diameter and will push the body of the animal backwards to where we can arrange it in a position that facilitate the birth; **A trapped elbow**, a forelimb is delayed with respect to the other so that the hoof of the delayed limb is placed at the same level of the hock of the advanced one. By pressing the animal backward we will place the donkey foal in a position where delivery is most appropriate, **pelvic entrapment**, we will try to move the donkey foal pushing it down and right and then down and to the left and repeating this until the donkey foal has passed through pelvis [Schemes] Accessed from Weaver, S., 2013.

14. PERINATAL CARE

After birth, it is necessary that jenny and offspring have a quiet environment so mother can lick and groom it for the necessary time. The offspring intends to stand practically after birth and after several attempts it will get it to start nursing approximately after two hours from birth. You must ensure that the offspring is nursing correctly by checking that it grabs the nipple and make sure that it nurses, or even that it swallows by palpating the esophagus. During the first 12 hours of life it should take the colostrum to strengthen its immune system, this involves intakes of 250 ml every two hours approximately. In case that the jenny does not have enough colostrums, artificial colostrums can be administered.



Figure 98. A donkey foal ingesting colostrum [Photograph]

To have an extra natural colostrum reserve can be useful in certain situations, such as the lack of colostrum of the jenny, when a mother rejects the offspring and does not let it nurse or in more serious cases such as the death of the mother during parturition. This colostrum is obtained by freezing the colostrum from previous deliveries or from other jennies. Frozen colostrum is preserved in perfect conditions for an unlimited period. On the other hand, it is important to keep the newborn offspring in a clean environment. The navel should be disinfected with a disinfectant solution daily, from birth and until it is dry, since it is a very important opening to ascending infections.

To ensure the elimination of meconium (first hard and brown stool that the donkey foal eliminates) can be a revealing data in some cases.

CURIOUS FACTS

There is an important fact worth noting and that should be known by those who are dedicated to producing mules or are interested in mule production above all. It is very common for a mare to find the proximity or approach of a braying jackstock extremely unpleasant. Breeders often tell stories about mares that have not been shown receptive to copulation even showing signs of extremely strong heat. It is unnatural for the mare to allow a male donkey cover it. In an attempt to successfully dissuade the jackstock from mounting a mare, it can seriously hurt the male donkey. Therefore, we recommend using containment elements in mares, to protect both the breeding facilitator and the male ass. These elements may include horse twitches (labial or ears), obstacles and constraining rings, breeding traps, chemical restraint or any of their combinations in order to facilitate the safe natural mating between a mare and a Jackstock.



Figure 99. Jenper (2012) Mare and Young jackstock [Photograph].

Accessed from <http://www.pano-ramio.com>

Donkey breeding, either to perpetuate the species or to produce hybrids, can be an exciting and interesting task. In some areas from several countries like the United States or France it has contrastingly proved itself to be quite lucrative. However, to be certain about it and over all, succeed without major arising complications it is important to receive instruction on the reproductive idiosyncrasies of the donkey species, to thereby facilitate the challenge of producing hybrids between horses and donkeys (Hagstrom, Debra J. 2005)

Factors such as a proper colostrum ingestion and nursing, the elimination of meconium, a clean and quiet environment and the good health condition of mothers (Influenza/tetanus vaccination and worming) are decisive in the prevention of **neonatal sepsis**, which means an important percentage of losses once the gestation is at term. Neonatal septicemia produces a characteristic clinical picture and occurs in animals born 15 days before the planned date of delivery as well as in animals that are born on the scheduled date. J. de Gabriel (*Feagas, 2002*) identifies the following symptoms in cases of neonatal septicemia:

- Drowsiness
- Conjunctival congestion
- Tendon retraction
- Inability to stand up
- Loss of sucking reflex
- Inflammation of joints

After the histopathological and microbiological study *Echerichia coli* and *Actinobacillus equuli* have been identified as disease-causing agents linked to poor sanitary conditions and a massification of animals. Sick donkey foals require immediate medical treatment based on the application of antibiotics, antiendotoxics, fluid therapy or transfusions of serum to help restore the immune system of the donkey foals. On the other hand, the author considers determining animal welfare measures and the code of good practice in order to reduce the incidence of these cases.



Figure 100. Tendon retraction [Photograph]

15. LACTATION

For unweaned donkey foal, the first natural food source is breast milk. A jenny at the beginning of lactation produces up to 5% of its weight in milk a day with an average production of 10 to 12 liters of milk a day and requires 50% more energy to produce milk in addition to their own support. Some jennies produce enough milk to meet the demands of their offspring up to 2 or 3 months of age, but many do not get this production, being necessary from a certain height to complement the donkey foal's supply. Lactation peak occurs at 3 months after parturition and it is important that the diet of the jenny not only contains enough energy but also protein, calcium and phosphorus for maximum milk production.



Figure 101. M. Chinchilla/Ganadería "El Burro Andaluz" (2009). Nursing andalusian donkey foal [Photograph]. Accessed from <http://www.elburroandaluz.com/>

and in particular during the first 4 months the donkey foal needs its mother to breastfeed at any time and have a complete development. It is also essential that the offspring receive solar radiation from the first day of its life for the assimilation of some vitamins. The practice of taking the jenny out to work, leaving the offspring confined at the stable is a stressful situation for both mother and offspring and thus it is completely inadvisable. Jennies and their donkey foals must not be separated until weaning.

The weaning of donkey foals can be done from the sixth month, abruptly, something which is somewhat stressful for animals or gradually, leaving the offspring dry its mother whenever it does not mean detrimental for her body condition. The offspring must be incorporated into the calendar of deworming and vaccinations applied to the rest of the group.

The donkey foal must have access to pasture (a great way to develop physically), fodder and compound feed, taking care not to let adults eat their part. During lactation

CURIOUS FACTS

A donkey foal can become orphan due to the death of its mother, because it is rejected because of an antagonist behaviour, or can be malnourished due to an insufficient milk supply. Alternative means of maintenance should be implemented until the donkey foal reaches 5 months of age.

Adoptions

To find a nursemaid jenny has many advantages, but they are rarely available. A jenny which has just lost its foal will be ideal. Success depends on a number of variables that affect the jenny-donkey foal relationship, including:

- The jennies that have given birth to a stillborn or those which have not nurse will be less likely to accept another donkey foal.
- The greater amount of time pass between the death of the adoptive donkey foal and the introduction of the orphan foal, the less the chance of success will be. After two or three days during which any breastfeeding has taken place, the milk secretion of the donkey can be interrupted.
- If the difference in size between the jenny and the donkey foal is very noticeable, the opportunity of acceptance will be less.
- If the donkey foal has never nursed before, it will gradually lose its instinct.
- The maternal instinct of a jenny varies among individuals. Some jennies show an extreme hostility at the beginning but, which once they accept the donkey foal, can become the best mothers.

Rejection of the newcomer

There are a large number of ways to help prevent the rejection of a newcomer adoptive donkey foal:

- Move the jenny to an alternative stable apart from which the one it could associate to the death of her donkey foal.
- Adoptive donkey foal must be smeared with the amnion, meconium or dead donkey foal skin until it is presented to the adoptive mother.
- Have a strong odor near and on the nostrils of the jenny, for example, a bit of 'Vicks' vapour rub. Also place this on the donkey foal, especially on the hindquarters, head and neck. Renewing it periodically.
- Bring the donkey foal closer to the mother when it is hungry, for example every three hours. Make the adoptive jenny approach the donkey foal when her udder be prepared.
- Encumbrances such as tranquilizers drugs or obstacles can be used. The need for the use of these encumbrances should decrease at each subsequent meeting.

We should observe the jenny and the donkey foal when they are together for the first time. There are some jennies and donkey foals that are best if separated by a partition within the box. This will favour the sight and the sniff of the colt, but at the same time it will protect it.

If the first meeting is unsatisfactory, re-insert the foal after a brief period of time, since success can be achieved after successive attempts. If the jenny shows an antagonistic response even after ten to twelve hours then the chances of success are poor.

Colostrum

Colostrum should be provided within the first 12 hours of life; the first shot should be provided within the first 2 to 4 hours from birth. The recommended amount is 250 ml every hour during 6 hours, until reaching a total of 1.5 litres.

In case of the rejection of the donkey foal, the colostrum obtained from the mother by milking, is the most preferable option, but it could also be obtained from another jenny within the days since it has given birth. A healthy jenny should produce enough milk as for us to be able to extract 250 ml once her own donkey foal has breastfed. Clean hands and the udder of the jenny before milking it and sterilize all utensils.

A cow colostrum is not ideal, but if it is provided in large quantities is better than none.

Collect colostrum and freeze it from -15° to -20 °C. Store them in batches of 250 ml. When required, thaw it slowly in hot water until it reaches 38°C (100 °F).

If the donkey foal has not received any colostrum, then plasma must be administered intravenously or enterically during its first 12 hours of life.

Supplementary feeding

If a jenny is not producing enough milk to nurse her foal, its diet may be supplemented as long as it is during lactation. To try to increase milk production, the following methods can be successful:

- An injection of oxytocin that stimulates the flow of milk.
- Fed lucerne (alfalfa), or allow the access to this green grass pasture *ad libitum*.

Hand feeding

There may not be any alternative but to feed a foal by hand. To do this, the following points should be considered:

- **Staff:** Raising a foal by hand is neither easy nor cheap, and those people involved should be prepared to commit their time and resources. Thorough staff with experience is essential.
- **Companions:** A foal may develop poor behavioral features because of being raised by hand without any other animal contact. Sheep and goats make good companions, but you should allow the donkey foal to interact with other equids. When going out onto the field (once the donkey foal is just above the month of age), it can be accompanied by a pony or quiet donkey. This companion will act as a model to follow.
- **Exercise:** make sure the donkey does regular exercise, especially to measure that it becomes greater and stronger. Since milk has very little vitamin D, the foal should be left to rest beneath the light of the sun. In donkeys exposed to sun for at least 3 hours a day precursors to generate vitamin D are activated, something which is essential for proper bone development.
- **Environment:** The donkey foal should be kept in a warm and dry place sheltered from the wind. A spacious and clean stable with a clean bed is ideal. This must have been empty for two to three weeks before hosting the foal and there should not be any incidence of enteric disease associated with the area.
- **Hygiene:** the stable and all the equipment used should be cleaned, disinfected and/or sterilized. All staff entering the stable should take necessary hygiene cautions, in particular, the first 72 hours.

Bottle feeding

It requires much time, but it is preferable to feeding from a bucket or probing. It could be used in the transition period until a foal is trained to drink from a bucket. Lamb teats are the ones that approach the most in shape and flexibility to those of the jenny. If the foal rejects the teat, place your index finger in its mouth and if it does not suck it, move your finger against the palate. Replaces the index finger with the nipple slowly once the intake has begun. Be patient, keep the bottle in an upright position.

Bucket feeding

Takes less time once the foal has been trained, but it is much more difficult to introduce it than bottle-feeding. It is usually best to start it when the foal is two weeks old or older. Milk should be used *ad libitum* in a wide, shallow bucket located at the height of the head. The bucket should be filled in twice a day and kept clean thoroughly. To train, place your fingers on the mouth of the donkey foal, and when it starts to suck, slowly lowers your hand until you have placed it into the bucket. It may be necessary to push the head of the foal down to teach him where the bucket is. It can take a whole day until a foal is capable of learning how to drink from a bucket.

Nasogastric probing

Sometimes a weak foal needs to be fed via nasogastric tube catheterization. The inclusion of the probing can be difficult and a great care should be taken while it is being placed to make sure that the tube is located in the esophagus. We will use a tube of the lowest diameter available, between 10 or 12 Frenchs (French measure scale, 1 French = 0.33mm) and with capped ends to avoid aerophagia. We can fix at this location with a surgical tape or similar, adhering it to the head of the tube (Svendson, E.D., Duncan, J. and Hadrill, D. (2008)



Figures 102, 103, 104, 105 & 106. (Figure 102) Guy Thomas, (Figure 103) Joe Hollins/BMJ Publishing Group Limited 2012, (Figure 104) The Donkey Sanctuary, (Figure 103) Keros nv & (Figure 104) Brenda Short/Short ASSETS Ranch (2009-2011 2012-2013). (Figure 102) Orphan foal drinking from some cubes, (Figure 103) Nasogastric probing in an orphan foal, (Figure 104) Ashely, a filly being fed with a bottle of 400 ml. (Figure 105) Orphan donkey foal being breastfed by a mare & (Figure 106) when we face the fact that a jenny has rejected her foal, it will be too late, that even its milk secretion will have decreased, and all the other methods explained above have failed or because the mother is dangerous for the foal because of the risk of aggression. The first thing we must do is to make sure the newborn baby donkey is provided with colostrum. Bottle feeding with milk replacers, might be exhausting given the frequency and attention for the intakes needed, especially when they must be compatible with other tasks. Using an igloo refrigerator like the one appearing in figure 104 (or something similar) and removing the faucet, replacing it by threading a PVC pipe in this position. We place a lamb teat at the end of the PVC pipe and fix it with a flange or a hose clamp. Mix the milk replacer, place it in the fridge and remove the lid. This will not only keep milk warm but it will prevent flies from entering inside. You can hang it on the access fence or within the stable slightly above head height. Then we will only have to make the foal be used to nursing from this device instead of feeding from the feeding bottle with the same procedure (Short, B., 2011). [Photographs]. Accessed from (Figure 102) <http://www.guy-sports.com>, (Figure 103) <http://vetrecordjobs.com/>, (Figure 104) <http://www.thedonkeysanctuary.org.uk>, (Figure 105) <http://www.keros.be/> and (Figure 106) <http://www.shortassets.com/>.

Hand-rearing protocol

We will have milk tempered to 38°C (100°F) for the initial shots, gradually decreasing until room temperature during the first week. Changes should always be made slowly for the first 24 to 48 hours.

A 10 kg foal requires 30 kcal/kg (125kJ/kg) daily. A sick or premature foal requires 36 kcal/kg (150kJ/kg) daily. The recommended milk volume for a healthy foal is 100 ml/kg of body weight daily. For a foal of 10 kg this means a litre of milk per day, or what is the same 10% of its body weight.

A donkey foal will naturally nurse seven times a day. Ideally it should be fed at intervals of 2 to 3 hours, while the first week it is preferable that these intervals take from 1 to 2 hours. If the donkey foal is ill, it may not be able to tolerate more than 50 to 100 ml every hour, so more intensive rearing or care will be necessary. As this improves we will be able to increase this volume up to 200 ml every hour.

PERIOD OF TIME	DAILY AMOUNT	INTAKES PER DAY	SUPPLEMENTS
1 st and 2 nd Day	Feed with 100-120 ml every two hours (10-15% of body weight)	10 or 12 daily intakes	None
From the 3 rd to 7 th day	Increase the volumen of each intake to 150-200 ml (25% of the body weight).	Reduce the number of intakes up to 8 a day, feeding every 2 to 3 hours.	Milk pellets can be offered from the 1 st week of age. When they are eating enough of them, they should be replaced by a cereal based feed (grain).
2 nd and 3 rd Week	Give 300-350 ml in each intake	Reduce to six times a day every 4 hours	Allow Access to fresh water and salt, and considerer training so that it will feed from a bucket. Provide grains of great quality and a limited amount of good quality hay to start the weaning of the donkey foal. Transition feed should present an 18% protein percentage.
4 th Week	Feed 500 ml	5 times a day.	Do not wean, or delete the proportion of milk until del donkey foal ingest an adecuate percentage of dry food. The change shoul be gradual to allow the digestive enzymes to adapt.
From the 8 th to 12 th week	Feed 1 litre	Weaning can be progressive at this time. 4 times a day at 8 weeks, up to three times a day at 12 weeks. The donkey foal may be still taking 1 or 2 litres of milk a day	A donkey foal raised by hand must be fully weaned about 5 months.

Types of milk

Ass or Mare milk: This is obviously the best choice for the donkey foal, but is not always available. Milking a jenny is very time-consuming.

Cow or goat milk: This is much easier to obtain but these types of milk have a different composition. They contain a higher percentage of total solids, fat, and protein, but considerably less sugars (needed for a proper development of the brain). The need to mix powdered milk tends to be avoided, because it can be expensive, particularly in the case of goat milk.

The composition of cow milk could approximate the one of the jenny if we added a teaspoon of honey to a pint (0.48 liters) of milk with 2% fat. The milk of the Jersey bovine Breed should not be used given its high fat content. Goat milk seems to be very palatable. It is considered a good adoptive milk as blood cells and fat particles are smaller than in cow milk so it is more easily digestible.

Cow milk can contain a surprising level of bacteria so it will be advisable to pasteurize by heating to 70°C for 15 seconds. The milk must be cooled then and dextrose can be added before feeding the donkey foal.

Suggested formula

- 300 ml of cow milk.
- 150 ml of lime water (50g of garden hydrated lime in ten liters of water to make it sediment in the evening, and then separate the water from lime sediment.)
- 20 g de dextrose, lactose, molasses, honey or brown sugar.

(Svendsen, E.D., Duncan, J. and Hadriil, D. (2008))

Milk replacers

The ideal formula contains 15% fat, 22% of total protein and less than 0.5% of fiber.

The milk replacers for cattle are not recommended. They are a poor source of high quality protein and often contain antibiotics. There are some formulas of milk replacers for calves without antibiotics that may be recommended.

Human preparations should be avoided, since they are not well tolerated by the gastrointestinal tract of the donkey foal. However, there are reported experiences, especially in developing countries where human milk has been used without any problems.

Poor milk replacers can cause stunted growth. It should also be taken into account that according to the manufacturer's instructions they can cause dehydration and constipation. You may have better results using a 12.5% milk replacer solution, providing the foal with a 10% of its body weight slowly increasing it up to 20% around the 10th day after.

There are many brands of artificial milk available and suitable for donkey foals.



Figures 107, 108 & 109. (Figure 107) Thomas Rudolph, (Figure 108) Madeleine Innocent & (Figure 109) SPANA. For the working animals of the world (2013). (Figure 107) Donkey foal resting, (Figure 108) Albine donkey foal resting in the arms of a man & (Figure 109) Mensi, an abandoned donkey foal which found a new home [Photographs] Accessed from (Figure 107) <https://now.ehow.com/>, (Figure 108) <http://naturalhorseshealth.com/> & (Figure 109) <https://spana.org/>.

Infant diarrhea

Causes and prevention

- The process of replacing the milk causes the loss of basic amino acids. *A good quality milk replacer with 22% of total protein should be chosen.*
- An excessively liquid milk substitute in any food can make digestive enzyme system and control the acidity of the stomach become overloaded, causing the quick proliferation of enteric pathogens. *Give food in small amounts and frequently.*
- An infection can rapidly be contracted from the environment, the human contact and dirty utensils. *Keep hands and utensils clean.*
- Milk that is let settle allows the growth of bacteria. *Use only fresh milk.*
- Commercial milk may contain very high levels of bacteria, which may or may not be pathogenic.
- Sudden dietary changes can alter the digestive enzymes. *Changes should be always made slowly.*

Treatment of infant diarrhea

The milk substitute should be removed and replaced with a solution of 50 g of glucose in 500 ml of warm water, boiled for 1 or 2 days. The return to the milk should be gradual, and alternatively with the dissolution. The number of times a day should be increased, while maintaining the same daily intake. We should consider the supplement with *lactobacillus* during diet changes.

Milk replacers intolerance causes colic, diarrhea and/or inflammation, swelling or numbness. This could also indicate gastrointestinal ulcer, so Sucralfate should be administered routinely. We can try to decrease volumes or to increase the frequency, or a change to an alternative source.

(Svendson, E.D., Duncan, J. and Hadrill, D. (2008))

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Chapter 8

Donkey Shoeing and Hoof Care

Francisco Javier Navas González & Joaquín Álvarez Muñoz

1. INTRODUCTION

The ass, humble relative of the horse, has been used since ancient times for labour, transport of goods and materials, where other equids did not resist because of the low quality of the food in arid and depressed areas. Yet they carried out a very important task in the development of humanity with its quiet and efficient work.



Figures 1, 2 & 3. (Figures 1 & 2) Aleksandrs Tihonovs & (Figure 3) The Granger Collection, NYC (1865-1872-2011) (Figures 1 & 2) Farrier tools at an ancient blacksmith's & (Figure 3) Farrier shoeing a donkey in Turkestan [Photographs] Accessed from (Figures 1 & 2) <http://es.123rf.com> & (Figure 3) <http://www.granger.com/>

This continuous work of sacrifice, loads, draft and long days used to make them suffer from pain, chafing caused by harnesses (cavalry

leads), and the main aim of this chapter: the wear of their prized hooves.

Men in exchange for work and countless aid rewarded it by feeding it and relieving these nuisances, with horseshoes.

Horseshoes are equids' 'shoes', and in the case of our asses, protect their hooves from the excessive wear and tear that occurs resulting from their requirement to collaborate in the development of our work.



Figure 4. ISPCA (2013) Donkey foal laying his head on a gate to look over it [Photograph] Accessed from <http://www.ispca.ie/>

2. FIRST WESTERN HORSESHOEING EVIDENCES

Several sculptures, etchings and drawings dating from the second millennium BC represent both men and women riding donkeys .

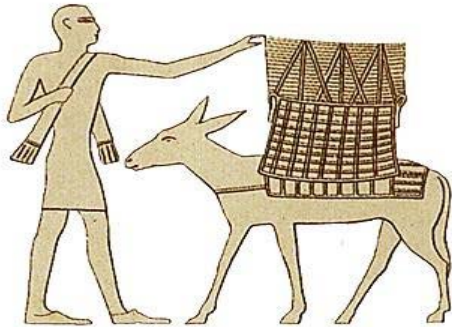


Figure 5. Alkhem (2007) Hieroglyphic depiction of a donkey and a man [Drawing] Accessed from <http://www.ace-egypt.org.uk/>

There is evidence, although always surrounded by great controversy, from the fact that humans mounted equids not long after the first processes of domestication, possibly as early as 4000 BC.



Figures 6, 7 & 8. (Figure 6) François Spiering, (Figure 7) Del Parson & (Figure 8) Henry Singleton (1620-1800-1981) (Figure 6) The Meeting of King David and Abigail, (Figure 7) Abraham takes Isaac to sacrifice him & (Figure 8) Caleb and his daughter Axá [Tapestry, Oil on canvas & Print] Accessed from (Figure 6) <http://www.friendsofart.net/> (Figure 7) <http://www.friendsofart.net/> (Figure 7) <http://www.friendsofart.net/> IRI/iamthewordthecomforter.blogspot.com & (Figure 8) <http://www.georgeqlazer.com/>

CURIOUS FACTS

Worldwide, donkeys have been used and are still used as draft animal for the transport of goods on their backs, with a saddle and saddlebags or sacks and bags. This cheap way of transport for both goods and people, even more in cases in which the activities they develop are carried out on precipitous terrains and with hills. While the load is properly placed on their backs and always when a suitable load system is used, a donkey can easily carry between a 27% and a 40% of its own live weight (Goe, 1983). This means that a donkey with around 190 Kg can normally carry a load ranging between 51 and 76 kg.

Multiple references contained in the many different historical artistic disciplines from all times, since the beginning of time, are a direct witness of the relevance of this species and its conjoined evolution beside humans.

Whether they are paintings, oil paintings and watercolors, engravings, poems and songs, or implicit and explicit examples in the literature, Biblical fragments and other religious texts (see Book 2, Chapter 10), they allow us to move our mind to another time when this faithful companion, was the most fashionable mean of transport, the family vehicle or even the limousine of the great personalities.

Among the equipment used to carry out this work, the first predecessor of what could

have led to our current saddle, were the tasseled cloths or cushions used by Assyrian cavalries around 700 BC that were held with a girth or surcingle that included straps for the chest and a crupper for the rump that are even used today in some territories of the Asian steppes.



Figure 9. National Geographic Traveler Photo Contest 2012 (2012) Taking in Afghanistan. This girl of Kyrgystan prepares her donkey for its march to the school that will take them 2 hours of walking [Photograph] Accessed from <http://www.treecreativity.com>

In the first depictions, this and other type of equipment became a symbol of status, to which, in order to show such status, various ornamentations as a produced work of sewing and tailoring and leather, stones and precious metals such as gold, carvings in wood and bone, among others were added. The stirrup and the throatband will also come from these Asian steppe societies.

Each of them will receive noticeable and subsequent developments in Medieval Europe. In the case of the oldest vestiges, from which there is evidence, in what refers to horse shoes they date from 2400 BC., with the discovery made by Auguste Quiquerez in 1864 in the canton of Jura in the northwestern part of Switzerland (territory which consists mainly of the mountains of the Jura in the southern part, and the plains of the Jura in the northern part, in the region called Ajoie).

Apparently, farriery was very presumably invented by different nations around the same period of time, during the Nations great migratory movements occurred, so that each region had a model adapted to the characteristics of the terrain and climate in which it had developed.

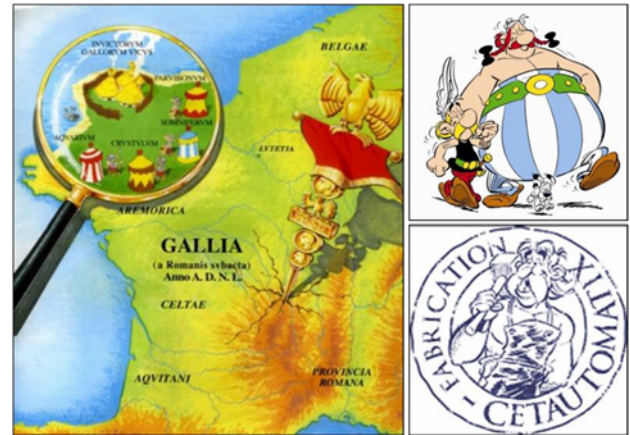
It is estimated that the Persian civilization and/or the Egyptians were the creators of the first horseshoes that surely were born from the need to protect the hooves. The first protections used in the walls were made from nets made of grass like sandals which were fastened to the pastern and fetlock. The next step consisted in creating protections made of wet skin which were placed covering the sole and wall, and then let dry to acquire the shape of the hooves. From here, they practically moved to the Merovingian Horseshoe (approximately in 750 AD) which was a very covered horseshoe, flat and with six nail holes, which only left the frog touch the ground.



Figures 10 & 11. Dr. Doug Butler & Jacob Butler (2013) First tries to protect the hoof [Drawing] Accessed from *Principles of Horseshoeing*, 3rd Edition, 2013.

Centuries later, for the Celts¹ or the Gauls², (as the Greeks¹ would call them until the Roman conquest² by Julius Caesar, who headed towards the Celt tribes of the Gaul between 58 and 51 BC), people (since that it is thought that this name not only designated a single village but those people who moved and stood in certain territories, really identifying them with the hyperboreos) in continuous migration, whom the Greeks called *keltoi*, that spread

throughout Europe centuries before the arrival of the Romans.



Figures 12, 13 & 14. (Figure 12) Ciencia afición, (Figure 13) Yorick Allen & (Figure 14) El Sitio Oficial de Astérix (2008-2011) (Figure 12) Map of Gaul, (Figure 13) Astérix, Obélix and Idéfix & (Figure 14) Fulliautomatix's Quality sign, blacksmith of the Gaul village of Astérix [Drawings] Accessed from (Figure 12) <http://namfort.com/>, (Figure 13) <http://www.loseternautas.com> & (Figure 14) <http://www.asterix.com/>

The territory, in which this people settled currently occupies the whole France, was called in ancient times by the Romans, Transalpine Gaul. Also other groups of Gauls had settled in the North and center of Italy, they were called Gauls from the Cisalpine Gaul.

Other Celtic groups had followed their way across the Pyrenees to Hispania, where they mixed with the indigenous people and whose fusion gave rise to what historians called celtiberians, (whom the transfer of asses to the Iberian peninsula is attributed to, according to some of the assumptions made).

For them forging was considered as something magic close to the religion, the fact of hard metal and without form becoming a malleable thing adopting the desired shape with fire, had to be something close to witchcraft. For this reason, it was practiced by the Druids, and would be thanks to the horseshoe that the Gauls invaded various regions to reach Asia.

Also formed part of the Cavalry of warriors and conquerors towns like Carthage (5000 Gallic horsemen appeared in Hannibal Barca's Army), and subsequently in Rome, which contrary to what is thought, they did not worry too much about their cavalry.



Figures 15, 16 & 17. (Figure 15) Dr Stukeley, (Figure 16) Alexandre Cabanel & (Figure 17) tuscriaturas (19th Century-2007) (Figure 15) Druids making a sacrifice in honor of the Sun in the temple known as Stonehenge, from a plane from Stonehenge at the Ashmolean Museum of the University of Oxford founded in 1683 (named after Ellias Ashmolean, antiquarian who donated the first collection), (Figure 16) A druidess. Many Druids were women; Celtic women enjoyed of more rights and freedoms than women in any other contemporary culture, including the rights of going into battle or divorce their husband and (Figure 17) Druid donkey. [Etching, Drawing and oil on canvas] Accessed from (Figure 15)

<http://mystonehengewiki.wikispaces.com>, (Figure 16)
<http://commons.wikimedia.org> & (Figure 17)
<http://tuscriaturas.blogia.com/>

The origin of the farriery with nails as it is provided today has not been chronologically dated yet. The belief according to which in Gaul, Britain and Germania horses were shod before the Christian era seems to extend, but it is not known with certainty where or who invented the horseshoe and even when they fastened it to the hoof by means of nails, of course, pointing that, these barbarian people of the East of the Roman Empire would already use some nailed protections at least since the IV-II

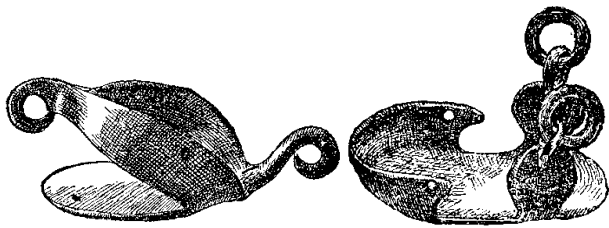
centuries BC. It seems that the Celts could be the first to use the horseshoe around the sixth century BC. Anyway there can be no doubt about that, when Julius Caesar conquered the Gaul in 52 BC this people shod their horses and should have done it so long before, because there were already three kinds of horseshoes: the undulating, with rectangular nailholes and the Eastern horseshoes and two kinds of nails, violin plug and cuboid head ones.

The Gallo-Roman era horseshoe was a light horseshoe (250 g.), little covered, with undulating rims caused by the nailholes, and fixed by hand forged nails too that were nailed but were neither cut nor clinched, just writhed in the form of a corkscrew, rolled up on themselves.

Thus Southern horseshoes were characterized to be very thin metal sheets with one flattened edge, covering the hoof completely; like the ones from the Mongol tribes from Central Asia or horseshoes with studs; while the people from the North of Eurasia, like the Normans, should be attributed, with great probability, the invention of fixed or seized horseshoes, specifically for the protection of the toes.

It is instructive to know, that not many years ago, when the borders of Chinese Mongolia opened, horseshoes and nails had not evolved at all from the model described above; and it is only little more than a few tens of years ago.

All the varieties of horseshoes from southern Europe are easily distinguishable from the Roman ones also called healing horseshoes, from which several have been found at archaeological sites and are displayed today in several museums throughout the world, each one represented by thin metal sheets, covering the whole hoof, and which in some cases had a several centimeters in diameter opening in the middle.



Figures 18 & 19. Veterinario del Distrito de ZIPPELIUS, de Wurtzburg, translated by S.E. Weber (2013) Roman healing horseshoes [Drawings] Accessed from <http://chestofbooks.com>

These sheets, apparently designed to suit both the body conformation of the animals from East and West, are either directly provided with loops or have a several cm high edge around the outer margin, where the rings were held. Small ropes were passed through the loops or rings and in this way the horseshoe was fixed to the crown of the hoof and the pastern. Sufficient security for the toes was required.

Because of this, the movement of the animal wearing them should be indeed very clumsy, making both the crown of the hoof and the pastern get injured in a short period of time. One of the apparent goals of these shoes was to prevent the animals from slipping, as well as to protect them from the excessive friction derived from the continuous contact with the ground, so it presented three 1½ cm high cubes of iron, which kept the same relationship as would be established today when shoeing between the toe and the studs, something which offers a very early proof fairly well founded according to which this kind of

shoeing would have not appeared by mistake but that would have been voluntarily promoted by the local inhabitants of the Central European mountainous regions whose climate and terrain features inevitably conditioned their life.



Figures 20 & 21. (Figure 20) Museo del Prado de Madrid and (Figure 21) L'ânese Cosmetics (2007-2008) (Figure 20) Bust of Xenophon and (Figure 21) herd of donkeys from the arcadia used for the production of jenny milk intended for the production of cosmetics [Photographs] Accessed from (Figure 20) <http://djkonservo.wordpress.com/> (Figure 21) <http://lanesse.gr>

Xenophon (historian, philosopher, writer and Athenian general) was a great man of horses and the first who wrote about horse riding, among his works we can find references to it, as they also can be found in the case of Homer and Pliny II, to Greek donkey breeds like the ass of the Arcadia.

"The Commander of the Cavalry" and "Equestrian Art" (approximately 500 years BC) tell us about putting horses on an irregular and hard ground to strengthen the hooves, speaking only about "embatai" (a kind of leather sandals tied to the foot of the horse), from which the existing references are almost nil.

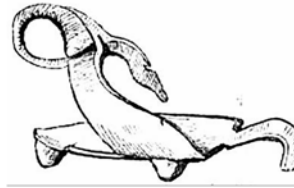
CURIOUS FACTS

L'anesse Cosmetics is a company responsible for the manufacturing and production of donkey milk based cosmetics of the highest quality. From its farm in Belgium known as 'L'Asinerie du Pays des Collines' (The donkey farm from the country of the hills) located around the Mottes Castle (military outpost) and in whose surroundings, around 100 dairy jennies graze, from which the most belong to the Arcadian donkey breed, that Xenophon had already mentioned in their treaties.



Figures 22 and 23. (Figure 20)(Figure 22) and Sabine Rich branch (2010-2011) (Figure 22) a donkey dreaming about being part of the Roman cavalry, extracted from the tale of a donkey (A Donkey's Tale) by Didier Martin. Apparently in the Roman army, they employed both donkeys and mules, although these were smaller than the latter and can therefore carry less heavy loads. A small donkey could load around 120 pounds (54.5 Kg), a large one the same as a mule & (Figure 23) a Hipposandalia scheme [Drawing and Diagram] Accessed from (Figure 22) <http://www.mywonderstudio.com/> (Figure 23) <http://commons.wikimedia.org/>

Apart from the so-called healing horseshoes applied in case of illness, it is very difficult to find references about horseshoeing or hoof care, coming from the Roman era; this is why special attention should be paid to the literature dealing with these findings and treat it with caution.



Figures 24 & 25. Jean Benoit D. Cochet (1866) (Left) in 1861, in the clearings of l'Abbaye forest, an iron hipposandalia was found, the only exemplary that had ever been discovered up until then in the site of the Roman settlement of Archelles, near Arques or extracted from the soil in Caudebec- lès-Elbeuf, the ancient Uggate. This Hipposandalia discovered in Saint-Saëns was collected by Robert Chevreux, who kindly donated the attached drawing, (right) Saint-Saëns, is not the only Department of the lower Seine (France) in which there have been similar findings to this one, while it is true they have different characteristics. In Normandy, in the Thibouville basin (Eure Department), in Vieux, near Caen it was found an hipposandalia like the represented in the drawing made by Roach Smith and MM. Bonnin et Chevreux found at Vieil-Evreux, (formerly Mediolanum Aulercorum) and currently preserved in the Museum of Caen [Drawings] Accessed from Librairie Historique et Archéologique de Derache, 1866. Désiré Cochet, Jean Benoît.

The Greeks and Romans would not hand down, as we have previously mentioned, references about the horseshoe and the nail, just talking about the common use of metal protectors to cover the hooves of horses. When it was necessary to apply an *calcea* or *solea spartea* of leather, reeds, plaited palm tree leaves or Esparto grass or even a «hipposandalia» (from the Greek *hippodemata* or *kardatinai*, of leather from the 4th century AC) or its predecessor «*solea férrea*», iron plates with side tabs where a belt passed to tie it to the pastern, constituting a mobile metal, esparto or leather protections, fixed with ribbons, that were only used promptly since they increased the adhesion to the ground of draught animals, hence they were applied on donkeys and mules mainly depending on the difficulty of the terrain or the length of the trip and being mainly used mostly to avoid sole injuries caused by thistles (iron with many tips that was used to prevent the advance of the cavalry). We can easily imagine the wounds caused by this style of shoeing. The hipposandalia which will be shown around the middle of the 1st century

AD will be the next step, but there is no literary text about the use of horseshoes prior to the 9th century AC.



Figure 26. Lupa Ibérica (2000) Soleas Sparteas Facsimile [Photograph] Accessed from <http://lupaiberica.com/>

The finding of the horseshoe attached to the hoof by means of nails took place, when in the tomb of King Childeric I (circa 436-481, Tournai, Belgium), King of the Salian Franks in the year 457, a copy in perfect condition and which retained all its elements was found, which suggests that this and the hipposandalia would have co-existed for some time.

According to Pliny II, Poppea Sabina (see Book 2, Chapter 7), wife of Nero, Emperor of Rome, was accompanied by four hundred breeding jennies, with golden horseshoes and buckles made of precious stones, that ensured her two daily donkey milk baths in the morning and evening on each trip (*Hist. nat. lib. XXXIII, XIth Chapter. About Zoology*). Apparently, from this fact is from which the superstition derives that to find a horseshoe would get you good luck. Nero, also applied this initiative of his wife to the horses that he had in higher esteem. It has also been reported that the mules which were pulling from Nero's carts wore silver horseshoes, while the ones serving his wife Poppea wore them in gold.



Figures 27 & 28. (Figure 27) Master of the Fontainebleau School & (Figure 28) Romanstrelchenko (Second third XVIth Century circa 1570) (Figure 27) Poppaea Sabina & (Figure 28) Golden horseshoe Facsimile [Oil on board & Photograph] Accessed from (Figure 27) <http://commons.wikimedia.org/> & (Figure 28) <http://es.dreamstime.com/>

Although some evidence has been found in the art of the period that seemed to indicate that at that time, horseshoes fixed with nails were used already as they would now be employed. Subsequently, it was confirmed that these scarce and strong signs such as the appeared in one of the reliefs depicting a hunting scene of the Emperor Gallienus, in the Palazzo Mattei, had been found in works which had been restored entering such changes given a poor study of historical context of the works that were being restored.

As it could have been expected, in the case of Roman horseshoes, the fitting method did not satisfactorily met the needs that it was required to, so that certain changes were imperatively introduced to remedy the situation. It is impossible to establish with certainty at what period of time the Eastern nations began implementing iron protections at the feet of their horses and to fix them with tabs or nails. As an anonymous writer of the Journal United Service mentioned in 1849, the oldest method of Asian horseshoeing, later known as iron cup-soled Horseshoe would be modelled after a Circassian or Abkhasian horse breed known by the name of Shalokh, usually owned or bred by Eurasian Circassian tribes.

Evidences found avoid that any trace about the antiquity of this form of horseshoeing may appear, since exact homologous representations can be found from the period in which the Ionian Greeks began setting up symbols that represented their cities or communities. According to the reverse of the Lycian coins (best known in Numismatic as Triquetas). The existing differences are perhaps found in a row of points present in Lycian type, as if the Horseshoe had been perforated by small nail holes. Apparently the selection of this object as a symbol of the region comes from the fact that Celt breeders in the most remote antiquity seem to have begun here their trade for mules for the first time, task for which logically asses were necessary.

Since early historians do not mention farriers, the horseshoes appear to have been of this Lycian form, or at least they almost certainly were not fastened with nails driven through the horny hoof. It is difficult to escape an assertion according to the one horseshoes of this kind are as old as the Ionian establishments in Asia Minor, unless by denying that neither the Circassian brand-mark nor the Lycian Triqueta represent them; a conclusion which at least is totally at variance with the denomination of the mark by which the Kabardian breed is known.

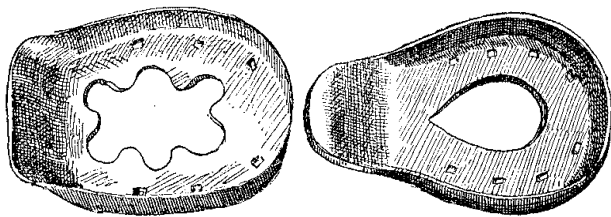


Figures 29, 30, 31, 32, 33, 34 & 35. (Figure 29) Veterinario del Distrito de ZIPPELIUS, de Wurtzburg, translated by S.E. Weber, (Figure 30) Sir William Allan & (Figures 31- 35) George Fleming (2013-1843-1869) (Figure 29) Iron cup-soled horseshoe would be modelled after a Circassian or Abkhasian horse breed known by the name of Shalokh, (Figure 30) Circassian Chief and his stallion & (Figures 31-35) from top to bottom, Circular sole horseshoe with three tabs to attach it to the hoof. After that, depictions of coins from the Old Lycia prior to the reign of Alexander, preserved at different Museums in London such as the British Museum (imprints and impressions were donated thanks to Sir. A. T. Murray) [Oil and drawings] Accessed from (Figure 29) <http://chestofbooks.com>, (Figure 30) <http://commons.wikimedia.org/> & (Figures 31 - 35) Fleming, G., 1869.

From a perfectly circular shape, which instead of being fastened to the hoof by means of nails attached to the horny hoof, was fastened by means of three tabs that according to what it seems to have happened were closed on their outside part or ascending surface, evolving to this horseshoe plate, which probably originated in the 12th Century, which covered the whole foot sole surface, the same as roman horseshoes did, with the exception of the hoof wall, which contains a 1 cm high rim and three pick-shaped projections, around 4 cm high and with a 1 cm wide basis which got over it on the side related to the heel,

directed upwards and turned over themselves like a hook fixing themselves to the hoof wall.

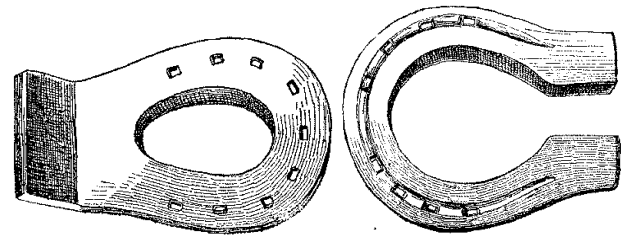
This attachment mode was obviously insufficient as well, so the fastening of the horseshoe by means of nails was adopted. The iron plates used for the horseshoes were too thin to allow recessed-head nails to be used, so nails with leaves and cube-shaped heads were only applicable. The heads of nails, in a number which ranged from 6 to 8, left the part of the finger and the back of the heel free, serving at the same time to ensure the horse from slipping, something that with no doubt, smooth plates covering the entire surface of the hoof promoted.



Figures 36 & 37. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) 12th Century Horseshoes from the Iberian Peninsula, preserving the roman morphology and shoeing style, but being attached to the hoof by means of nails [Drawings] Accessed from <http://chestofbooks.com>

Horseshoes from this type have been found, after the ancient Roman style, with a very strong edge bent upward, which probably would have proved to be very comfortable for the objective of protection in the territories of Peninsular Pyrenees Mountains (of the Iberian peninsula in particular), where they apparently seem to have been used for a long period of time. From the 12th century the frequency of farriery will be generalized, in countries like Spain, horseshoes which preserve the shape of Roman horseshoes can be found, exclusively attached to the hoof with nails.

Initially these horseshoes apparently ended in the heel, but apparently after being used for a time, promoted bruises, these horseshoes were extended up to the level of the heel to soar this part in order to prevent them from early wear, these types of shoeing, both the Spanish model as its modification, were subsequently exported to England.



Figures 38 & 39. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 38) Initially these horseshoes apparently ended in the heel, but apparently after being used for a time, promoted bruises, these horseshoes were extended up to the level of the heel to soar this part in order to prevent them from early wear, these types of shoeing, both the Spanish model as its modification, were subsequently exported to England & (Figure 39) The horseshoes containing a groove made their first appearance into Central Europe around the 15th Century [Drawings] Accessed from <http://chestofbooks.com>

The horseshoes containing a groove made their first appearance into Central Europe around the 15th Century. From then on, according to what we know today based on the evidence derived from archaeological findings the period of Roman horseshoeing style will cease. Its influence, however, lasted much longer, even until today. Its successor was partially formed from Arabic or Turkmen horseshoe and partly from the Southwest European horseshoes.

3. THE CONFRONTATION WITH THE METHODS OF THE EAST AND SUBSEQUENT DEVELOPMENTS

The circular horseshoe used in the old Arabic method is obviously a modification of the Circassian or Lycian one, being external tabs omitted and holes for the nails replaced.

That the Arabs of the Hijra (migration or journey of the Islamic prophet Muhammad and his Muslim followers from Mecca to Medina) in 622 AD, or the ones belonging to the later generation, shod their horses is completely clear, moreover, if we believe the opinion according to which this work of smithing was manufactured after a horseshoe belonging to Abbas, the uncle of Muhammad, following the orders of his daughter Fatima.

According to the legend it was brought, from Arabia by the Sheikh Sed Reddeen, son of the Sheikh Sofi, descendant from sheikhs, like Muslims did. If the intention had been to reveal a mere falsehood with historically dated back information, it is possible that some doubt could also arise, according to which, if Fatima or the Prophet himself had brought this Holy horseshoe to one of the famous mares, it would be logical that these belonged to the breed from which many of the early breeds of Arabia would derive, as it is alleged on the lectures of devout Muslims. However collateral doubt also arises, such as those relating to the fact of how it was possible that the uncle of Muhammad possessed horses, if the Bein Koreish tribe, did not have, and the Prophet himself, at the beginning of his career had only three.

Despite the relationships that seem to clarify the origin of this type of farriery, as it has already been mentioned in the previous paragraphs, in which circular horseshoes horseshoes are applied attaching them to the hoof by means of three nails, in a rudimentary way but at the same time

keeping as many similarities, it still causes multiple inconsistencies between the existing data and in the one recovered from the archaeological pieces that have been preserved in the collections of the National Library of Paris and the British Museum (*Lycian and Triquetas coins*), and with those coming from the possible theories issued over time by various personalities versed in the matter.

This does nothing more than making any conjecture about the origin of the farriery in eastern regions doubtful, as it is the case of references to Tartar horseshoes that follow the same circular pattern, with three points or nails by which they were attached to the hoof (*The Natural History of Horses*).

Heusinger would make reference to the name of several authorities which were of the opinion that the art of horseshoeing was brought to Constantinople by Germans.

While that is true, it will be in 'Tactita' by the Emperor Leo VI 'The Wise', written in Constantinople at the end of the 9th century, when the first written piece in which modern horseshoes with nails would be mentioned. One of the copies dating back to that time are preserved today in the Museum of the ironwork of Saumur (*Musée of the Maréchalerie de Saumur*), France.

The Byzantine emperors had a guard of Honor composed of Saxons from the earliest stages of the Empire. Under the reign of Emperor Michael from Constantinople (1038) of the Greek Cavalry horses were also shod. The hooves of the Sicilian horses during that period were protected in the same way.

CURIOUS FACTS

The fact that horshoeing was known by the Arabs, even in the time of Mohammed, seems certain. And in verse 25 of chapter 57 of the Quran he is quoted: *"We have sent Our messengers with explanations, and sent the Book and the Balance down along with them, so that mankind may conduct themselves with all fairness. We have sent iron down laden with grim violence as well as (other) benefits for mankind, so that Allah may know who supports Him and His messengers even though [He is] Unseen. Allah is Strong, Powerful"*.

The author of this translation, George Sale, explains this quote, "We have sent iron down" in the following way. That is, he taught them to extract it from mines. The medieval Muslim scholar Abu al-Qasim Mahmud ibn Umar al-Zamakhshari better known as Al Zamakhshari added that as it was reflected in the Hebrew myth that tells about the Fall of Men, in the writings, Adam after being expelled from Paradise brought five things made of iron with himself, namely, an anvil, a pair of pliers, two hammers (one bigger and one of a smaller size), and a needle. Other versions tell that Adam and Eve were expelled from the Eden on the First Friday, the day when both were created and had sinned. On the first Saturday, Adam rested and begged for God's forgiveness.

When he finished he went to the High Gihon, the mightiest of rivers, and there he did penance for seven weeks, stuck in midstream with water going up to his chin, until his body was as soft as a sponge. Then an angel came to comfort Adam and taught him how to use fire tongs, the blacksmith hammer and to manage the oxen, not to be delayed by plowing (Graves, R. y Patai, R., 2011).

In verses 1 to 4 from the chapter 100 of the Qur'an entitled Surat Al Adiyat (The war horses that run fast) and translated as 'The steeds' is quoted: "[1] By the panting steeds, [2] They make sparks fly, [3] Saddled dawn, [4] Raising, this way, a cloud of dust · from what the reader could clearly tend to bear the thought in mind of how could it be possible, otherwise, for the horses to make sparks fly against the stones of the floor had they not been shoed, although it is necessary to use an interpretation rather than a based evidence.

The Arabs on the other hand, claimed that the first blacksmiths came from far lands as Fes, Tunisia, Masarca, Tlemcen and Constantine aboard boats, perpetuating their name and expertise in certain families from generation to generation. The practice of shoeing between these people is curious, and would almost indicate an independent origin, as well as a great antiquity.

Contrary to the accepted opinion, according to the General Daumas, the Arabs from the

Sahara had the custom of shoeing their horses, in all four limbs, according to the ground of the territory they were settling on.

So those who inhabited territories with stony grounds would shoe the four hooves of their horses, and they were the majority of them. A universal practice is to remove horseshoes in the Spring, when the animals are grazing, affirming that care should be given to avoid having to check the renewal of blood that occurs in this season of the year.

Horseshoes were kept ready and always led to a guaranteed sale. The Arabs prepared its supply for a full year, which consisted of four sets for the forelimbs, and four for the backlimbs. Tabs to attach them, were presumably made by the blacksmiths.



Figures 40 & 41. (Figure 40) Direct Media Publishing GmbH & (Figure 41) Ghirlandajo (2005-2011) (Figure 40) mosaic of the Imperial door of Hagia Sophia, representing the Emperor Leo VI 'The wise' worshipping a Pantocrator and (Figure 41) page of the manuscript from the 11th century by John Skylitzes representing the emperors Leo VI (on the right) and Basil I (on the left) [Drawing] Accessed from (Figure 40) The Yorck Project: 10000 Meisterwerke der Malerei & (Figure 41) <http://commons.wikimedia.org/>

When riders wanted to have their horses shod, bringing with them their own horseshoes, the farrier was paid for his service, and when mounting again once this was already shod, they exclaimed: *'Allah*

have mercy on your parents!' Then the rider continued with his way, and the farrier with his work. Had their own horseshoes not been brought with the rider, two boudjous (also budju, monetary unit used in the Ottoman Empire) should be provided to the farrier in exchange for a complete horseshoe set, expressing his gratitude to the simplest formula of Arabic courtesy. *'Allah give you strength!'*, when retiring.

In the Sahara, Syria, and through all Arabia, horses are cold shod. On the foot of the horse, riders from these regions say, there are hollow interstices, as the frog, heel, etc., over which applying heat is dangerous, even with the mere fact of bringing the hot metal plate sheet closer to them.



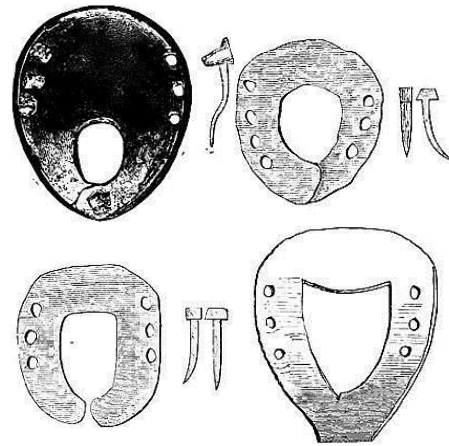
Figure 42. Jeremy (2011) Arab man kissing his donkey [Drawing] Accessed from <http://www.pixelchrome.com/>

This aversion, based upon the destructive action that an extreme degree of heat can have on the delicate parts of the foot, is so strong between them, than in the bivouac, (camps or temporary shelters to protect themselves from the elements of the open field during the night or a few days), when the Arabs of the Sahara saw the French shoeing their horses by placing red-hot horseshoes on their hooves, used to exclaim: *"Look at those Christians pouring oil on fire!"* or what is the same, they could

not understand why someone, especially in long journeys, in which the own exercise causes toes to tilt more, should wish to increase the natural warmth by the action of the incandescent iron.

The horseshoes are very light, but made of well-wrought iron. On front horseshoes, only three nails are inserted on each side, through round holes that are very close to each other. The toes remain free, since as the Arab used to tell nails located in that part of the foot would interfere with its elasticity, and would cause that the horse, when its hoof comes in contact with the ground, experiences exactly the same sensation experienced by a man when you use tight shoes. Many of the accidents that occurred, they claimed, derived from this fact. Hooves are not filed or notched, said Daumas, leaving the corneal wall grow freely, and being the very stony ground and the relentless work, the one that naturally controls its overgrowth when it exceeds the limit of the horseshoe.

The need for trimming is only conceived when horses have long been tied in front of the tent without any job or have aged in the Tells (soil mound shaped archaeological sites that are the result of the accumulation and subsequent erosion of material deposited by the human occupation at a place for long periods).



Figures 43, 44, 45 & 46. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 43) Syrian Horseshoe, (Figure 44) Horseshoe coming from Constantine, Oran (Algeria), (Figure 45) Algerian horseshoe & (Figure 46) Horseshoe found in Morocco at the tent of a blacksmith after the battle of Isly (1844) [Drawing] Accessed from <http://chestofbooks.com>

In this case, the Arabs, simply made use of frequently hauled pointy knives. This method has the added advantage that if a horse loses a horseshoe it can still continue its journey, since the sole will remain firm and hard. 'With you', they explained, ' and your practice of cutting the foot, if the horse loses a horseshoe the rider must retire, or see it bleed, hesitant, and suffering'.



Figure 47. Galería Chabix (2013) Resin blacksmith with donkey [Jointed Resin Mobile] Accessed from <http://www.galeriachabix.com/>

CURIOUS FACTS

THE MYTH OF THE FALL OF MAN

Adam and Eve were expelled from Eden on the first Friday, the day that both were created and have sinned. On the first Saturday, Adam rested and begged for God's forgiveness. When he finished he went to the high Gihon, the mighty rivers, and there did penance for seven weeks, stuck in the midst of the current with water up to the chin, until his body was as soft as a sponge.

Then an angel came to comfort Adam and taught him to use tongs to fire, an anvil and a blacksmith hammer, as well as to handle the oxen, so as not to be delayed when plowing.



Figure 48. Sin Guido Nincheri (2013) Adam and Eve at The Garden of Eden, Saint-Léon de Wesmount (Montréal) [Stained glass] Accessed from www.pontip.com

In Syria, however, hooves are trimmed, and matched with the sole wall. Shoes are a bit round or pear-shaped, and riveted, welded, fully circular closed on itself, or by leaving the heels open. The observed horseshoes found in the African continent are somehow squared around the toe approaching a small V shape.

The central opening is somewhat triangular, and the Moorish horseshoe heels are welded and lean toward the frog, since they conceived that horse may suffer in the part of the hoof which is more sensitive, and not in its hardest part, being compulsory to protect the frog, of course, against any accident. Horseshoes should therefore cover the frogs. But this practice, and the excessive curvature which metal plates confer on the heels, produced great damage to some parts of hoof for whose protection they were initially intended.

Pebbles and gravel when they wedge between the horseshoe and the frog, harm it seriously; While the horseshoe point, unduly pressing on the heels, produces so much damage that the poor horse is often forced to walk on their toes without resting on its heels. The pressure exerted by the horseshoe sole is definitely beneficial, and it is largely the reason for, the almost total absence of compressions in hooves and for several lamenesses that are the bane of our horses.

They gave them to the head of nails the shape of the head of a grasshopper, the only way, as they argued, that enables the nails to be adjusted to the maximum without breaking.

However they approved our method of imposition of the nails on the hooves, screwing them from the outside, something that prevents the animal from being wounded or cut. The iron shortage forced Arab Farriers to limit to hammering nails

close to the face of the hoof, sometimes in a kinky way, like Celt nails or tabs, so they kept this nails in a proper state allowing the blacksmith to use them for a second time, only being forced to manufacture a new head.

If a horse were overloaded, heels were cut and light horseshoes were attached to the forelimbs, having the heaviest ones in their hind legs, careful not to let some of the limbs shod while others stay without horseshoes. During a trip, if a horse had the possibility of losing one of its front horseshoes, and its rider did not have a fresh supply to replace it, they proceeded by removing the horseshoes of the hind limbs, replacing the lost front horseshoe with one of them, and if the animal was shod only in its forelimbs, the rider withdrew the horseshoe from the other foot instead of letting the horse in the previous condition. If a horse should be shod, after a long journey, something that riders of the desert made in a quite frequent way, and which is not something that goes out of the ordinary was to place a piece of felt between the horseshoe and the foot.

The need for horseshoeing the horses of the Sahara, caused in part by the nature of the land, and in part by the length of their trips, has shown the convenience of getting the foals used to horseshoeing without any resistance. Therefore they were offered *kouskoussou*, pastries, dates, among others, as they allowed their masters to raise their foot and hit it. Then, they caressed their neck and cheeks, and spoke in a low voice, so that, after a time, it lifted their feet whenever they were touched.

The little difficulty that can arise, thanks to this early training, has probably derived and resulted in the Arabic hyperbole: *'so wonderful is the instinct of the pure breed horse that, if you lose a horseshoe, it will show his foot to warn the rider about such*

loss'. This exaggeration, at least, shows how docile these horses are when trying to shoe them, and also explains how each rider in the desert must have the knowledge and means to shoe his horse, during any trip. This is a point to consider of the utmost importance. It is not enough to be very skilled in riding, or training a horse in the most perfect way, to acquire thorough reputation as a rider, in addition to all of this, he/she must also be able to shoe his/her horse if necessary. Therefore, when setting off for a distant expedition, each rider would lead in their *djebira* (Arabic word for knapsack) horseshoes, nails, a hammer, pliers, some strips of leather to repair his harness and a needle. When a horse had lost a horseshoe, the rider would unmount, unleash the reins, passing one end around the saddle *kerbouss* (Arabic word for knob) and the other around the pastern, joining both ends leaving a length such that compelled the horse to show his/her foot (Figure 49). The animal will not move one centimeter, and its rider would be able to shoe it without any assistance. If the lost horseshoe comes from the hindlimbs, the rider would support the foot above the knee, and shoe it with the help of his/her neighbors. To avoid a mistake, it passes its awl through the holes of the horseshoe where nails or tabs fit, to ensure in advance about the exact direction that nails should take. If, by chance, the horse is restless, you will get the support of a comrade, who will twist or will pinch the nose or ears of the animal in order to shoe its hind limbs.

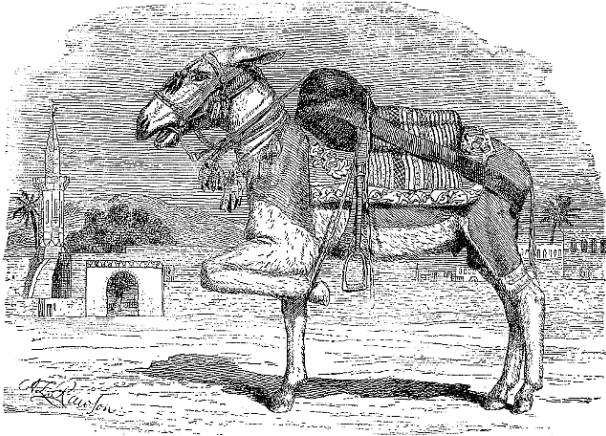


Figure 49. McGarvey., J.W. (1998) Egyptian donkey showing the typical horseshoeing position when its rider carried journeys on its own without the help of anyone [Etching] Accessed from McGarvey., J.W., 1998.

For the forelimbs, he would simply push the rump of the animal against a thick, spiny shrub, or in any other improvised mode of punishment, with a backpack (also spritsail, blanket that places the food of the horses in the field) full of soil. These cases, however, are rare.

The Saharenes declare that the French shoes are much too heavy, and in long and rapid excursions must be dreadfully fatiguing for the articulations, and cause much mischief to the fetlock joints.

'Look at our horses,' they said, 'how they throw up the earth and sand behind them! How nimble they are! How lightly they lift their feet! How they extend or contract their muscles! They would be as awkward and as clumsy as yours did we not give them shoes light enough not to burden their feet, and the materials of which, as they grow thinner, commingle with the hoof, and with it form one solid body.' When to these remarks General Daumas answered, that he did not discover any of the inconveniences pointed out in the European mode of shoeing, the Arabs replied: *'How should you do so? Cover, as we do, in a single day, the distance you take five or six days to accomplish, and then you will see. Grand marches you make, you Christians, with*

your horses! As far as from my nose to my ear!'

Petrus Bellonius Cenomanus (Aldrovandus, U., 1639), more than two hundred years ago, stated that the shoes used by the Turks for their horses were in his day scarcely one-half the weight of the European shoes in a way that the latter had enough material to make two of the former. The Turks were accustomed to buy both large and small shoes ready made, as it happens at present, but the holes were not made in them.

They were fitted to the feet, and the holes formed when it was required for their use. The smith sat like a tailor with his legs doubled under him; and bending over the anvil, with a well-tempered punch and hammer the shoe was perforated, and another sharp square punch was twisted round in them to widen them to the proper size. The shoes had no calkins, as the horses did not require them either when at rest or when at full speed, because of the nails with which they were fastened on, and which had large oblong heads, in shape like the heart of a pigeon.

He also mentions that when horses were lightly worked, it was thought to be a good custom to shoe them only for half the year; so that, during war, the hooves may stand wear a long time without shoeing .

Though all the Arabs are cognizant of shoeing, and the advantages to be derived from it, yet, as we have seen, among the most valuable properties of a horse, they certainly conferred very much importance to hard, strong, and sound hooves. Abd-El-Kader explicitly mentions that the best Arab horses for traversing stony ground without being shod are those of the Hassasna tribe in the Yakoubia. Horses are not shod in Muscat, and nevertheless perform long journeys (Stocqueler, J. H., 1831).

It may well be considered very strange that none of the celebrated Arab hippiatrists of the early or middle ages, and whose treatises are yet extant, speak of the farrier's art. Researches have been fruitless in this respect. Abou-Bekr, the author of *Nacéri*, a popular Arab work on the horse, and which is supposed to have been written in the 14th century, never mentions it save as an orthopodic resource. Hizâm, an ancient veterinary writer, recommends castration for horses whose hooves are naturally thin and undeveloped, on the supposition that the horn is always thicker and stronger in emasculated animals.

It is curious to observe, that the circular shoe is yet worn in some of the countries which were invaded by the Moors or Turks in the middle ages. The Portuguese, according to Goodwin and Rev, still employ it. It is the same flat plate of iron, with a sharp ridge round the outer edge, like the Syrian, Persian, Barbary, and Turkish shoes, but in substance it is thicker. It is flat on both sides; the nail-holes are of an oblong square shape, very large, and extend far into the shoe, which is nearly round, covering the bottom of the foot, except a small hole in the centre. The heel, however, unlike the others, is turned down to the ground, for greater security in travelling. The principle of nailing is the same as in the French shoeing, and being flat on both sides, is superior to both the English and the French horseshoeing method.



Figures 50 & 51. (Figure 50) *Antiquemapsprints & (Figure 51) Fleming, G. (1863- 1905) (Figure 50) Persian views – A native farrier shoeing a donkey & (Figure 51) Portuguese horseshoe [Photograph & Drawing] Accessed from (Figure 50) <http://www.ebay.com/> & (Figure 51) Fleming, G., 1869.*

Spain preserves the upturned heels, the plane surfaces, and the circular, sharp, projecting rim of the Oriental shoe. This may be accepted as a proof that the Moors shod their horses while occupying Spain.

Additionally, as another proof that shoeing was practised in the 11th century, in the time of Rodrigo Díaz de Vivar 'the Cid', we have the story of King Alphonso escaping from the captivity imposed upon him by Ali Maymon, the Moorish King of Toledo, and a certain Count Pedro Ansúrez, advising him to have his horse's shoes nailed on in reverse—heels to toe, and so mislead his pursuers. Alphonso effected his escape, though it is not mentioned whether this cunning device, which in after-ages was resorted to, had any influence in promoting it. Since the invasion of the Turks, their mode of shoeing has prevailed more or less in Transylvania, though the shoe somewhat resembles that of the Moors, but more covered. The heels are brought together like the letter V, and welded so as to form a wide patch projecting behind. The holes, three on each side, are circular. *'Wherever the Mussulman has exercised his authority for any length of time,' says Defays, 'some traces of his shoeing remain'.*



Figure 52. Domingos Sequeira (1793) *The Miracle of Ourique* (*O Milagre de Ourique*), describing the battle of Ourique which took place in 1139 [Oil on canvas] Accessed from <http://en.wikipedia.org/>

The Iberian peninsula has been successively invaded by the Romans, who introduced among the Lusitanians a branch of the wide-spread Celts; by the Germanic tribes (Alans, Suevi, Goths, and Vandals), and finally, by the Saracens, who were expelled after the decisive victory of Ourique, in the current lower Alentejo (South of Portugal) in 1139, during which the Christian troops, commanded by Alfonso Enriquez and the muslim ones contended with each other, in a quite greater number. As a consequence of these invasions, it appears that at the present day we have traces of the characteristic shoeing existing which was practised by each of the foreign races.

The circular shoe, more or less modified in shape, prevails over a large extent of the continents of Africa and Asia, but we are left in grave doubts as to the origin of this particular form of hoof-armature. It would be naïve to consider that this is an isolated invention, without any predecessor. The form is but of secondary importance, garnishing the foot with a metallic plate, and attaching it by means of nails driven through the horny envelope, is what makes this shoeing method and the time when it is supposed to have appeared so relevant. The paucity of written evidence in regard to the introduction or origin of this art among Eastern peoples leave us no room to hope for a satisfactory investigation of the

subject. Many nations in Asia, though aware of its existence, never require its aid; while others resort to various contrivances instead. Yet among those who shoe their steeds, the practice appears to have been adopted at a comparatively recent period.

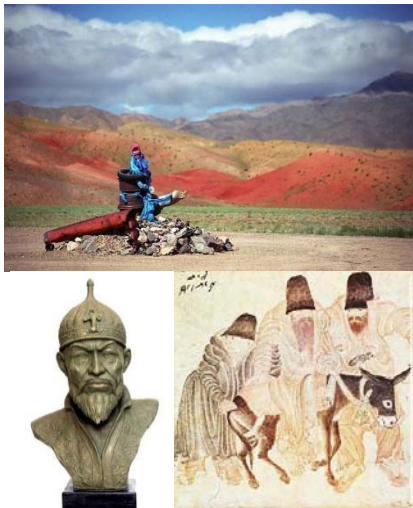
In the vicinity of Tomsk, on the upper Obi, far towards the high land of Central Asia, a great number of tumuli are scattered, which for centuries had occasionally suffered hard spoils to the Calmuck Tartars (Kalmuck, Kalmyk, Хальмгуд, Halm'gud), given name to the Oirats, Western Mongols in Russia, present tenants of the soil whose ancestors migrated from Dzhungaria in 1607). The veracious old Scotchman, John Bell of Antermony, who travelled over-land from St Petersburg to Peking, in 1719, with a Russian embassy placed within these mounds, the cradle land of our race. 'About eight or ten days' journey from Tomsky, in this plain, many tombs and burying-places of ancient heroes, who in all probability fell in battle, can be found. These tombs are easily distinguished by the mounds of earth and stones raised upon them. When, or by whom, these battles were fought, so far northwards, is uncertain.

The Tartars in the Baraba steppe tell that Tamerlane or Timur, Tarmashirin Khan or Emir Timur, Timur 'the Lame', as they call him, had many engagements in that country with the Kalmucks; whom he in vain endeavoured to conquer. Many persons go from Tomsky, and other parts, every Summer, to these graves; which they dig up, and find, among the ashes of the dead, considerable quantities of gold, silver, brass, and some precious stones; but particularly hilts of swords and armour.

They also find ornaments of saddles and bridles, and other trappings for horses; and even the bones of horses, and sometimes those of elephants. Whence it appears, that when any general or person of distinction

was interred, all his arms, his favourite horse, and servant, were buried with him in the same grave; this custom prevails to this day among the Kalmucks and other Tartars, and seems to be of great antiquity. It appears from the number of graves, that many thousands must have fallen on these plains; for the people have continued to dig for such treasure many years, and still find this archeological site inexhaustible.

Several pieces of armour, and other curiosities, have been found in these tombs; even an armed man on horseback, cast in brass, of no mean design or workmanship; also figures of deer, cast in pure gold, which were split through the middle, and had some small holes in them, as intended for ornaments to a quiver, or the furniture of a horse.



Figuras 53, 54 & 55. (Figure 53) Jacques-Jean Tiziou, (Figure 54) bridgemanart & (Figure 55) M. Gerasimov (Siglo XV-1941-2002) (Figure 53) mongol Ovoo (burial mound) (Figure 54) Mongol nomads with a donkey, 15th Century, located in the National Gallery, London, Reino United Kingdom & (Figure 55) Forensic Facial Reconstruction of Timur [Photograph, Etching & Sculpture] Accessed from (Figure 53) www.jitiziou.net, (Figure 54) <http://www.zazzle.es/> & (Figure 55) <http://commons.wikimedia.org/>.

Sometime after, the Russian government sent officers to examine those tombs that had not yet been rifled at last; and, among others, they discovered one of three stone vaults, containing the skeleton of a man with

costly arms by his side, resting on a plate of pure gold several pounds in weight; and another of a woman similarly laid on a gold plate, having bracelets and jewels of great value on the arms; while the third held the remains of a war-horse richly caparisoned, with horse-shoes on the feet, and metal stirrups for the rider.

This tumulus, no doubt, contained the remains of some mighty Khan, though not of great antiquity, since the stirrups attached to the horse's saddle prove a comparatively late date. The shoes, by the form they displayed, may have been of European workmanship, and the whole deposit of the time of the great Tartar invasion of Russia and Poland, between 1237 and 1241. When the Tartars were visited by medieval travellers, they were already in what has been called the iron stage of civilization. Marco Polo, who was one of these visitors, when travelling in Badakshan, in the 13th century, remarks that the country was an extremely cold one, but that it produced a good breed of horses, which ran with great speed over the wild tracts without being shod with iron. This notice would almost lead to the belief, which the people among whom he had been previously travelling had resorted to. This defence, and it is also an evidence that he was acquainted with the practice in Europe.

Beauplan, travelling among the Tartars of the Ukraine and the Crimea in the 17th century, says that 'when the ground is hardened by frost or snow, the Tartars fasten (*cousent*) under the feet of their horses bits of old horn, with the intention of preventing their slipping and preserving their hooves from wear. Pallas would write of the Cossacks of Jaïk (Orembourg), that their horses are not shod, because the dry soil induces them to have very fine and very hard hooves.

Wood, who travelled in Turkestan six centuries later, informs us that the Uzbeks shod their horses on the fore-feet, and the shoes are in shape a perfect circle.

In one of the oldest Astrakan Tartar songs, composed around the end of the 14th century, entitled 'Adiga,' and written in the Nogay-Tartar dialect, the extravagant fashion of shoeing is alluded to. A Mongol Khan was jealous of Adiga, a Tartar chief, who was in consequence compelled to fly to the desert.

When he was brought back he was offered a numerous stud of mares, so that for him to drink kumiss (also called koumiss, kumys or kymys, a dairy product made of milk kéfir. Traditionally made of mare milk, although nowadays cow milk is the most commonly used, see Book 2, Chapters 1 and 3), and have the meadows of Karaday for the pasture of the horses that he would later hunt, where they would be made fat as 'lions' thighs.' The Mongol, full of wrath because he would not accept this splendid offer, ordered many horses to be killed and a great quantity of mead to be brewed, in order to feast all the tribes whom he wished to assemble in conference before going to war with Adiga's people. None of his nobles could advise him; but they referred him to a sage named Sobra, who lived some distance off, and who could give advice, so that, he bid the horses are put to his golden chariot (*kûs*), be shod with golden shoes and silver and having covered them with golden trappings, let them go and fetch Sobra (*Wood, J., 1872*).

That horses were shod in this part of the world with plates like those now in use in Europe, in the 16th century, we find the testimony in another Tartar song on the capture of Kazan by the Russians in 1552. Alluding to the famous war-horse of a prince, it relates that '*under the feet of Argamack the horse-shoes look like new moons. Its tail and mane are painted*

with hennah; on its back hang silk trappings; on its neck, in a talisman, round like a ring, is a prayer.'



Figure 56. Edmund Schluessel (2006) Kumis glass and bottle [Photograph] Accessed from <http://commons.wikimedia.org/>

It is a remarkable circumstance, that in the neighbourhood of Peking, and from thence throughout Eastern Tartary (Tartary or Great tartary, in latin: Tartaria Magna), was a name used in the Middle Ages until the twentieth century to designate the great tract of northern and central Asia stretching from the Caspian Sea and the Ural Mountains to the Pacific Ocean inhabited mostly by several Turkic and mongol peoples, who were called «tartars» in general. It incorporated the current areas of Siberia, Turkestan (Included Eastern Turkestan), the Great Mongolia, Manchuria, and sometimes Tibet).

Shoes resembling in shape those of this country are in general wear. Although the origin of this horseshoe remains unclear it can be stated that they are extremely primitive, and very like those we have been describing as Celtic. In journeying toward the eastern termination of the Great Wall, you cannot help bestowing a passing glance at the operations of the *Ting-chang-ta*, as the shoer of hooves is denominated, for you may require his assistance frequently during your travel to secure your pony's clanking shoes, or to adjust a new pair.

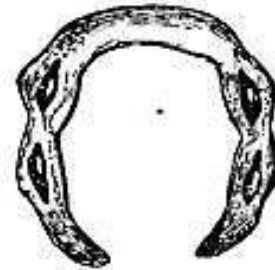
We can be sure that we will find him busy whatever it is in the most crowded thoroughfare, or in the most stirring corner of the market - place.



Figure 57. Nicolaes Witsen (Editor: Carolo Allard) (1705) East Tartary map. Amsterdam, 1705. (*Tartaria, sive magni Chami Imperium ex credendis amplissimi viri, Amsterdam 1705*) [Map] Accessed from <http://purl.pt/4107>

These professionals are not, generally, very bold men in their calling, nor they have much patience with skittish or unmanageable solipeds; for they too often make it their practice to secure the unruly or vicious brute in the old-fashioned "trevises," or stocks—exact counterparts of those employed by country farriers in Britain and the Continent half a century ago, where it is firmly bound and wedged in by ropes and bars, and a twitch (an instrument of punishment still tolerated in some countries nowadays) twisted to agony round the under-lip of the subdued beast, until its extremities have been iron-clad. The more docile and submissive animal is, the less harshly will be to dealt with, for it is allowed to stand untied, with one of its feet flexed on a low three-legged stool, while the workman shaves off great slices of superfluous horn from the thick soles, with an instrument which differs in no particular that we can see from the now obsolete "buttress" of England, or the present *boutoir* of France.

Perhaps a fidgety draught animal does not quite relish the idea of parting from its worn-out shoes; and the squeamish shoer, to avoid sundry uncomfortable contusions on his shins, stands some distance off, and hammers at the end of a long thin-pointed poker, inserted between the useless plate of iron and the hoof, to twist it off. Whether aware of it or not, like the French, the Chinese seem to prefer the foot in process of shoeing being held up by an assistant, instead of courageously grasping it as our farriers do. In the Tartar ponies being light-paced and small, and the roads not very stony, the shoe is light, thin, narrow, and quite ductile.



Figures 58. Fleming, G. (1863) Tartarian Pony Horseshoe [Drawing] Accessed from Fleming, G., 1869.

It is, in fact, nothing more than a slight rim of tough iron, pierced by four nail-holes, with a separate groove for the reception of each nail-head; and heels are drawn so thin, that when the shoe is nailed on the foot they are bent inwards to catch each angle of the inflection of the hoof, to support the nails in this way.

Altogether, it is far more similar to one of our own horse-shoes than those of the Afghans, the Arabian or Barbary, or the Persian and Turkish, and certainly very far superior to the straw sandal everywhere used in Japan to protect the horses' feet. There is little care and a great deal of dexterity exhibited in nailing on one of these iron plates. The excellent strong feet of the ponies afford every ease for a rough-and-ready job. The overgrown horn is shaved

away to a level surface; a single blow makes the shoe narrower or wider without heating. The horseshoe is applied to the solid crust, and one by one the unbending nails are sent through the whole thickness of the insensitive part of the hoof with a few sharp taps, the tips of the nails being only simply twisted and hammered close to the face of the hoof; and that is the way in which the correct pony blacksmiths of the region proceed. At odd intervals one comes upon a group of these tinkers arming the hot, painful, road-worn toes of prostrate struggling bullocks with a nearly semicircular plate of metal on the outer margin of the hoof; so smartly, that the bellowing creatures have hardly been thrown on the ground and secured that they are up again, proof against the hard, sun-baked roads (*Fleming, G. 2010*).

Perhaps we are not making a very wide ethnological jump, if we pass from this part of the Old World to the Rocky Mountains of the New Continent, and note the customs among the equestrian, though not horse-loving, tribes of Indians in that wild region. The horse has had little influence in civilizing the many clans who have become horsemen since this species was introduced by the early Spaniards, and they have done as little in attempting to prevent its degeneracy as it was in their hands.

Iron shoes are never worn on the hooves, but when travelling over rock ground, and the unfortunate animals become footsore, a substitute for the metal is found in what is termed 'parflèche.' This is the untanned, sundried hide of the buffalo or elk, in which the pounded flesh or 'pemmican' made from these beasts is wrapped up and preserved, and on which these people largely subsist. The thick, hairy skin, makes an excellent temporary covering for the foot, forming, when tied round the pastern, a convenient hoof - buskin, like that made from camel's hide in the Soudan.

Tracking the descendants of the Numidian light cavalry (the Numidian cavalry was formed by harassing riders that initially got their enemies exhausted from the distance. In the Ancient times, the Numidian cavalry was not only considered the best in all Africa, but from all the Mediterranean territories), the Roman and old Spanish horseshoe was evidently too heavy for their sandy, roadless deserts, so they made it thinner and omitted the bent-up rim, because it prevented the quick movement of the horse.

For the protection of the nail heads the outer margin of the shoe was staved, so as to form a small rim on the outer surface of the shoe, thus preventing the nail heads from being worn and the shoe from being lost too soon.



Figures 59 & 60. *The Canadian Encyclopedia*/René, R. Gadacz (2006) Parflèches [Photographs] Accessed from <http://www.thecanadianencyclopedia.com/>

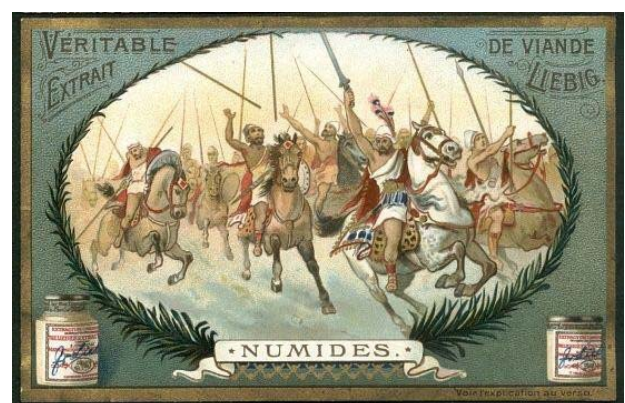
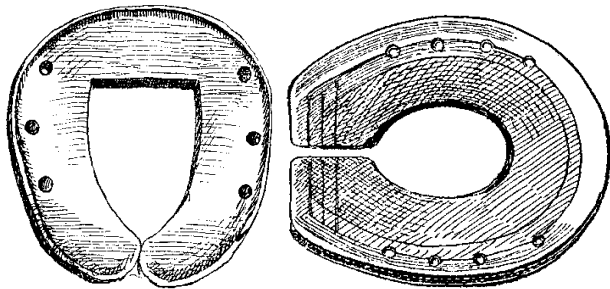


Figure 61. Liebig (1903) African Numidian cavalry [Advertising card] Accessed from www.ebay.com

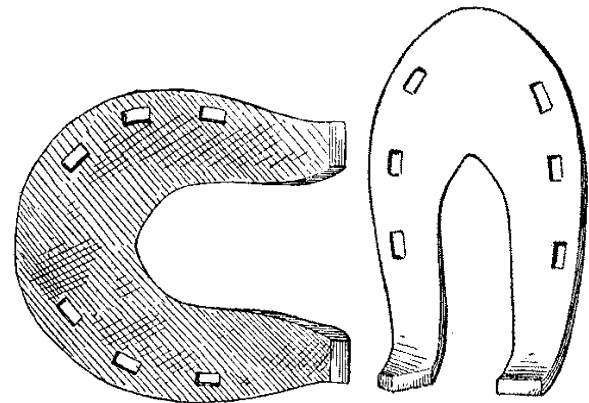
This kind of horseshoe was used in North Africa in the twelfth century, and became the model for all forms of horseshoes of the Mahometan tribes. Even now quite similar

shoes are made south and east from the Caspian Sea, at the Amu-Darja, in Samarkand, and other nearby regions, which were probably introduced under Tamerlane, the conqueror of nearly the whole of Asia Minor in the 14th century.



Figures 62 & 63. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 62) North African horseshoe from the 12th Century which could have typically been used by the Numidian Cavalry & (Figure 63) Horseshoe made in the south and east of the Caspian sea, around the river Amu Daria (formerly valled llamado Pamir and Oxus, by the greeks) in Samarkand, and other nearby regions [Drawings] Accessed from <http://chestofbooks.com>

The so-called "Sarmatische" (Sarmatian) horseshoe, of South Russia, (shows in its form, at the same time, traces of the last named shoe, however, greatly influenced by the Mongolian shoe, the "Goldenen Horde," —in Tartar: Алтын Урда, Altın Urda— was a mongol state which included part of the current Russia, Ukraine and Kazakhstan after the rupture of the Mongol Empire in the decade of 1240) which at the turn of the sixteenth to the seventeenth century played havoc at the Volga and the Aral. The unusual width of the toe, and especially the lightness of the iron, reminds us of the Turkomanic horseshoe, whereas, on the contrary, the large bean-shaped holes, as well as the calks, were furnished after Mongolian influence.



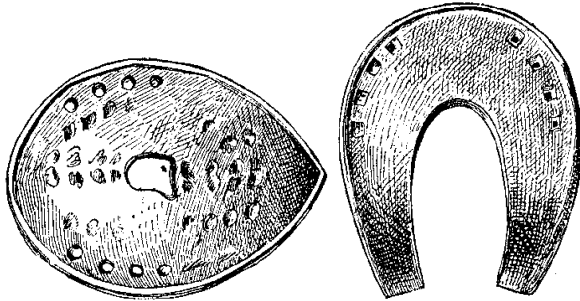
Figures 64 y 65. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) Sarmatian horseshoes [Drawings] Accessed from <http://chestofbooks.com>

The Sarmatian tribes were principally horsemen, and it is not surprising, therefore, that the coat of arms of the former kingdom of Poland in the second and third quadrate shows a silver rider in armor on a silver running horse shod with golden shoes, and that at present about 1,000 families in 25 lineages of the Polish Counts Jastrzebiec or Boleszyn, the so-called Polish Horseshoe Nobility, at the same time also carried the horseshoe on their coats of arms. The silver horseshoe in a blue field appears here as a symbol of the autumnal horse, to which, after the christianization of Poland, the golden cross was added. The noblemen families who took his sword and would later murder the holy Stanislaus, while he was celebrating a mass on 11th April, 1076 under the orders of King Boleslaus had to carry the horseshoe reversed on their escutcheon as a penance.



Figure 66. Blog de Heráldica (2008) Coat of arms from the former reign of Poland after its unification with the Reign of Lithuania in 1389 [Coat of Arms] Accessed from blogdeheraldica.blogspot.com.es

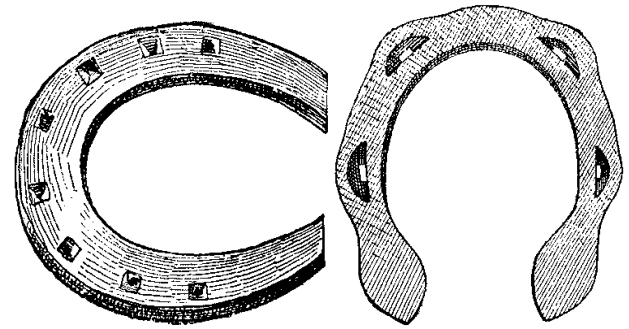
From the African and Turkomanic horseshoe, through the turning up of the toes and heels originated the present Turkish, Grecian and Montenegrin horseshoe later.



Figures 67 & 68. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 67) Present Turkish, Grecian and Montenegrin horseshoes & (Figure 68) Former open Spanish horseshoe [Drawing] Accessed from <http://chestofbooks.com>

By the Moorish invasion in Spain, the Spanish-Gothic horseshoeing was also modified, through which the shoe became smooth, staved at the margin, very broad in the toe, and turned up at toe and heel, and at a later period the old open Spanish national horseshoe was developed. As we thus see, we can in no way deny the Arabian-Turkish origin of this shoe.

As France had received her whole culture from the south, and as the crusades especially brought the Roman nation in close contact with them for centuries, so it cannot appear strange that the old French horseshoe (a form of which has been preserved by Bourgelat), still remained in the smooth, turned up in front and behind, like the shoe of the southern climates, with Asiatic traces, which hold on the ground, the same as all southern shoeing, by the nail heads.



Figures 69 & 70. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 69) Former French horseshoe & (Figure 70) Hun horseshoe [Drawings] Accessed from <http://chestofbooks.com>

In the 5th Century, Attila, known in the Western World as ‘Gods’ scourge’, was the late and most powerful leader of the Huns, a tribe probably coming from Asia, though its exact origins remain unknown. Attila governed over the greatest European empire of its time, from 434 until his death in 453. His possessions extended from Central Europe to the Black Sea, and from Danube River to the Baltic Sea. During his reign he was one of the most relentless enemies of the Roman Empire, which was divided into two parts in this final stage: The Eastern Empire with its capital in Constantinople, nowadays’ Istanbul, and the Western Empire, with its capital in Rome and later in Ravenna. He invaded the Balkans twice, nearly took the city of Rome and even laid siege to Constantinople.

He marched through France even arriving in Orleans, until the Roman general Aëtius forced him to back down at the battle of Chalons (also called the Battle of the Catalaunian Fields) in 451 (Châlons-en-Champagne). He managed to make the Emperor Valentinian the III flee from its capital, Ravenna, in 452. The next prayer in German comes from those days of terror:

"Kleiner Huf, kleines Ross, Krümmer Säbel, spitz Geschoss- Blitzschnell und saddle fest. Schirm uns Herr von Hunnen pest.", Which could approximately be translated into "Small hoof, small horse, sword bearer fixed

chair lightning, protect us from the plague of the lord of the Huns"



Figure 71. Thorsten Bühmann (2004) Thuringian Forest [Photograph] Accessed from <http://de.wikipedia.org/>

The memory of those times in which fear was planted much more than crops everywhere, reappears whenever during mount clearing and wrought of land for cultivation, a small and crudely horseshoe appears in the South of Germany, almost as far as the water barrier limiting the Thuringian forest (free State among the 16 federated states of Germany), or occasionally in it, mainly around Augsburg (German town whose traditional exonym in Spanish is Augusta), and in France up to the Loire River.

These horseshoes, covering the margin or the hoof wall, show slight traces of having been bevelled on the bottom surface, and contain two bent studs very superficially placed. They are occasionally edged and are arranged in two directions. The characteristic holes for nails in the form of bean/bean are tapered inside, and are often located so close to the outer edge of the horseshoe that hooves used to break suddenly under pressure. The heads of the nails had the shape of a ski or a sled blade and were almost completely sunken into the horseshoe. Obviously, they did not curve

upwards at the toe, as the ancient form of this type of horseshoes.

These horseshoes, according to the conception that we currently have about fitting methods, were so carefully finished, that many scientific circles specialized in conducting historical research had considered it part of the saddle or perhaps other elements alike, and not like the horseshoes that they are, until very recently.

This horseshoe was for some time, given it was very easy to find it in France, recognized to have Celtic origin; but it is certainly not the case, since its origin lies in the Huns villages or has a Hungarian nationality. However, it is true that an accurate scientific proof, according to the present knowledge that we have, does not exist; although, we can keep this hypothesis while an error that contradicts it appears. This peculiar kind of horseshoe has been found from the South of Germany and North East of France, to the region of Orleans, where, as it has been shown, the Huns appeared.

This, therefore, speaks on behalf of his descendants: in the first place, the widely extended and however specifically marked places where we can find this horseshoe; Secondly, its small size corresponds to the historically proven smallness of the Huns' horses; third, being made carelessly and in a hasty tridimensional way, a hasty and careless composition, that does not indicate that it was made by sedentary workers; Fourth, the Horseshoe denotes the Hun quality, present in Chinese horseshoes today, in which, making the holes for nails, shows touches of the productions of their Mongolian ancestry.

CURIOUS FACTS

The elder Zhang Guo Lao was a Taoist hermit from the Tang Dynasty, and one of the eight immortals, from whom historical records indicate that he truly existed. Despite being an old man, he was very entertaining and all admired him because he rode a white donkey backwards to wander between the Fen River and Chin territories for his whole life (Werner, Edward CT, 1986-2002) and being known for riding at least 10 li, on a white donkey (The li is a traditional Chinese unit of length whose value ranged from slightly higher to lower distances depending on the period, and which modern value has been standardized at 500 meters). Once the trip was over, he bent his ass and kept it in his pocket or in a small box. Whenever he wanted to use the ass again he would spread water on it with his mouth and this recovered his form (Maspero, H., 1981)



Figure 72. Yeuan Fang/La Gran Época (2013) The Elder Zhang Guo Lao riding his donkey backwards [Etching] Accessed from <http://www.laگرانepoca.com>

According to the legend, the emperor of the Tang Dynasty was very curious about the fact that he was able to ride a donkey backwards, so that he invited Zhang Guolao to the Imperial Palace Garden. The elder rode his donkey backwards along the road to the royal garden effortlessly, and as the Emperor was amused he gave the donkey wine to drink as a reward. As soon as the donkey drank the wine, he collapsed as if it were wet paper.

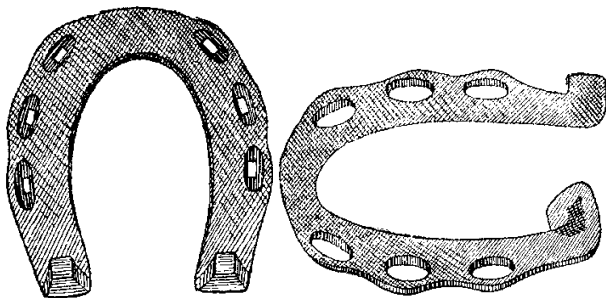
Zhang Guolao said the astonished emperor that his donkey was just a paper donkey, but with magic it really looked like a donkey, and wine had returned it to its original form. "The truth will remain and the false will not last" said the parable.

The elderly Taoist traveled the country taking its musical instrument, fish drum often depicted in paintings as a bamboo cylinder with two iron bars or bundles at the end.

He liked to sing songs about Taoist philosophy. His lyrics were very deep and used to tell that people were lost in the world looking for profit, fame, feelings and desires, and such behaviours were contrary to the principle of "returning to the truly original self". For this reason he believed that "to progress" was really to go back. It was believed that he rode the donkey backwards to remind this to people.

Aside from the peculiar shaped nail holes, the characteristic of the Hunish shoe consists in the changes of the calks for summer and winter shoeing, as well as in the sinking of the nail heads. The Huns, therefore, aside from the indistinctly marked attempts of the Romans in this direction must be regarded as the inventors not only of the calks, but partly, next to the Normans, also of the sharpened winter shoeing, and of the not unimportant invention of sinking the nail heads observed.

The Hunish shoeing was therefore an important invention for the Germans. After centuries later, wherever horseshoeing was practiced, it was done solely according to Hunish methods; whereby the shoe was very possibly made heavier, was more carefully finished and in course of time showed an attempt to bend the toe.



Figures 73 & 74. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) German modifications over Hunish horseshoes [Drawings] Accessed from <http://chestofbook.com>

In the Bamberger Dom, offically Imperial Cathedral of Saint Peter, Saint Paul and Saint George, one of the most remarkable monuments from Germany, and the most famous place from Bamberg since it were finished in 13th Century, we find an equestrian statue, not unknown in the history of art, and know as 'the Bamberg Horseman' which was formerly held to be that of Emperor Conrad III. At present however the general opinion prevails generally that

it represents "Stephen I., the Saint", who would later be Saint Stephen.

Stephen I., the first king of Hungary, formerly was a heathen, and was named "Vajk", but later baptized Stephen or Stephan. Although it still remains unknown precisely, his birth must presumably have taken place around 972, he reigned from 997 to 1038. His most important events were the many victorious wars led against rebellious chieftains of his country, and his canonization took place in 1087.

Consequently, his equestrian monument in Bamberg Dom was, hardly made before the year 1087. Notwithstanding that the Huns had been defeated 500 years before on the plains of Catalonia, the horse of the above mentioned monument carries, the Hunish horseshoes, modified, however, by blade-shaped calks just then coming into use. This is proof that, at least in Hungary, the Hunish method of shoeing was preserved an extraordinary long time.

By this it has not become improbable that at least the many shoes of this kind which were found on the Lechfield come, not directly from the Huns, but from their successors, the Hungarians, whose invasions took place in the first half of the 10th century.

About the same time when the Hungarian invasions took place, the Normans began to disturb the southwestern part of Europe with their Viking expeditions. Their sea kings seem to have been equestrians at very early times, and to have had their horses shod, although perhaps only in winter; at least the excavation of the Viking ship in 1881 disclosed the remains of a horse which was shod.

The shoeing consisted only of a toe protection - "Brodder" (Bruder, Brother) -

provided with a small sharp calk, and fastened by two nails.

When later, in the year 1130, the Norwegian king Sigard Yorsalafar, during his journey to Jerusalem, entered Constantinople, his horse is said to have only carried small toe-protecting shoes.



Figures 75, 76 & 77. (Figures 75 & 76) Berthold Werner & (Figure 77) Gyula Benczúr (1875- 2008) (Figure 75) Bamberg Dom, (Figure 76) The Bamberg Horseman, is a life-size stone equestrian statue in the cathedral of Bamberg, Germany. It is considered to be the first equestrian life-size sculpture from the Middle Age & (Figure 77) The Baptism of Vajk, from Hungarian National Gallery [Photographs & Oil on canvas] Accessed from (Figures 75 & 76) <http://commons.wikimedia.org/> & (Figure 77) <http://blog.artmagazin.hu/>

The art of horseshoeing, immediately after the migration of the nations, came close its nowadays improvement, especially near the reputed discoveries met, which simply consist of an iron protection for the

margin of the hoof, fastened by nails. The heads were sunk into the shoe so as to increase its firmness. Special consideration was given to local and climatic conditions through the introduction of toes and heels.

The mechanism of the hoof also found remarkable consideration, in as much as they apparently avoided driving nails too close to the heel end of the shoe. Notwithstanding this early improvement in the art of horseshoeing, the Huns (as stated before) took a prominent part. It appears to have taken a long time after the migration of the nations for shoeing to become general, as is shown by various descriptions of tournaments, pictures of horses, etc.

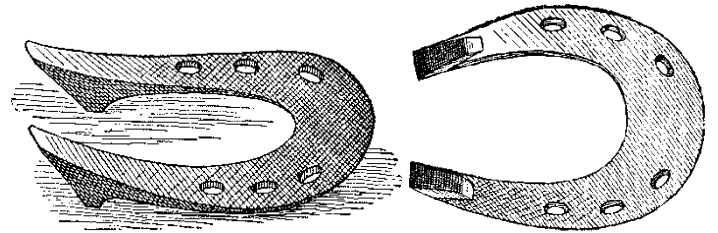
We will mention, in the first place, the "Parzival by Wolfram von Eschenbach," among others where there is a great deal said about horses, horse grooms, and tournaments, but nowhere in those works is any mention made of horseshoeing. Likewise it is found in the horse on the coat of arms of Wolfram von Eschenbach, in the Manessi collection in Paris, which begun in Switzerland in the 14th century. However, although we find this horse more beautifully finished, it was not shod.

During the time of the crusades, 1096-1291, however, appeared suddenly in Central Europe a plate-like horseshoe of southern character, which was occasionally bent upward at the heel end, and was very heavy. The toe was very broad sometimes, and was also bent upward. In this form we have seen the shoes of the Balkan and Iberian peninsula. The shoe was remarkably narrow at the heel, and was supplied with calks, which accounts for the highness of the back part of the shoe.



Figure 78. I.E.S. María de Molina (2014) map from the main Crusades from the Cluny Abbey in France [Map] Accessed from <http://www.educa.madrid.org>

Frequently we find one calk set diagonally, but the other drawn out wedge shaped, and sharp; so that there existed a great similarity between this iron shank and that used by Count Einsiedel for winter shoeing. Sometimes both shanks were sharpened in this way, or were provided with blade-shaped calks well set forward. The form of nail holes used was very characteristic of that of the Huns, but they were decidedly smaller and squared, as seen in the African shoe of the 12th century. The nail heads were slightly sunk, agreeing southern customs.



Figures 79, 80, 81 & 82. (Figure 79) FotosImágenes.org, (Figure 80) Carlos Martel & (Figures 81 & 82) Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) (Figure 79) Godfrey de Saint-Omer (also know as Gaufred, Godefroi, or Godofredo de St Omer), was one of the founders of the Templars in 1119, (Figure 80) Muslim surrender when facing the Crusaders & (Figure 81 & 82) Horseshoes belonging to the stage during which the Crusades took place, 1096-1291 [Drawings & Etching] Accessed from (Figure 79) <http://www.fotosimagenes.org>, (Figure 80) <http://www.historia.templodeapolo.net/> & (Figure 81 & 82) <http://chestofbooks.com>.



CURIOUS FACTS

PETER THE HERMIT, FROM THE BEGINNING OF THE CRUSADE OF THE "PAUPERS" UNTIL THE ARRIVAL AT CONSTANTINOPLE

Peter, was a monk of Amiens, born in the year 1050, approximately, who had tried to travel alone to Jerusalem years before the Council of Clermont in November of 1095, but who, severely mistreated by the Turks, had been obliged to return without fulfilling his goal of visiting the Holy places of Christianity.

According to the chroniclers of the time, as a theologian and historian of the Benedictine order, Guibert de Nogent, he was of short stature, swarthy complexion, had some overweight, and he was always accompanied by a donkey. He didn't eat meat or bread, only fish and wine, owning, despite its humble appearance, the power of dragging the crowd since *"anything he said or did, seemed almost divine to people"*.



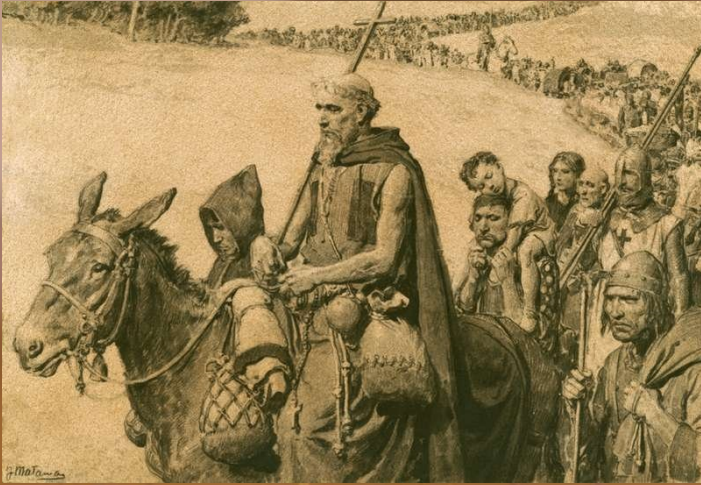
Figure 83. *Roman du Chevalier du Cygne/Captain Blood* (1270) Manuscript from the 12th century depicting Peter the hermit at the gates of Jerusalem [Manuscript] Accessed from Bibliothèque nationale de France, fr. 3139, fol. 176v. *Roman du Chevalier du Cygne*

Very little after the Pope Urban declared the crusade according to what dozens of Lords and Princes from all Europe (mostly French) would come to the Holy land to liberate the Holy places from the yoke of the Muslim Turkish infidels to the cry of *Deus le volt!* (God thus wants it), Peter was already preaching for it. He began his journey in Berry, going, in the following months to Orleans and Lorraine, and from there to Cologne, where he spent Easter. The urgings of Peter the hermit were very easy to take for the peasants. For them, Peter could remove them from their current miseries and would take them to a land over which milk and honey ran, as it had been reflected on the Sacred Scriptures, away from those looted and ruined towns and fields of work, severely punished by feuds and natural disasters.

The fact that this group of Knights did not have a preset military organization brought its division so that, one of its portions overtook at the moment of arrival established by Pope Urban II, once crops were collected, coming at a time when the provisions were therefore insufficient, leading to armed clashes between the advanced group and the Byzantine soldiers guarding Belgrade. This fact would lead these advanced troops, led by Gualterio Sans Avoir (Walter the poor), Lord of a small village on the outskirts of Paris, to move towards Nish (Niš) in the current Serbia, from where, after Nicetas, the Byzantine Governor of the province, had provided them with provisions continued to reach Constantinople.

Knowing that the rearmost group was much more numerous and eager to avoid problems, Nicetas went to Belgrade, to meet Peter and his followers there, and avoid them to continue the trip until the crops were harvested so that they would have no supply problems.

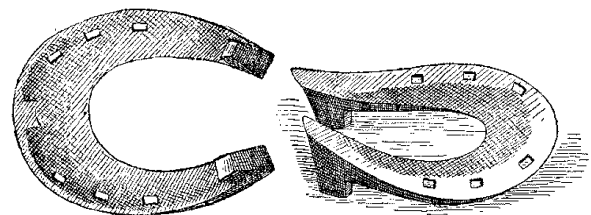
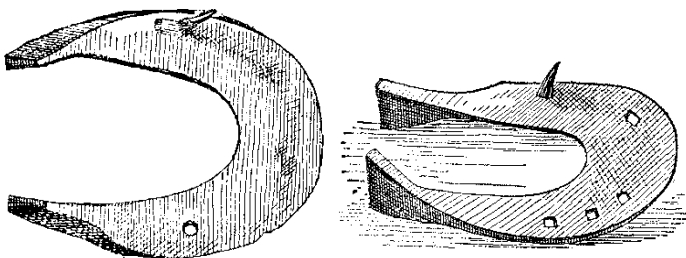
Several clashes occurred subsequently that they boosted both Peter as his followers speed up their journey to Constantinople, fearing the revenge of the Hungarian King Kalman, as well as being afraid of Nicetas desperately wanting to get rid of the threat they represented, both the Crusaders and the disorders deriving from their stay on his territory, conflicts that would end with the return of Peter on his donkey to meet Nicetas and thus trying to fix the situation, without success, given the belligerent nature of the crusaders which fostered the cancellation of the talks and his almost complete defeat, leaving a trail of dead and prisoners, both men and women and children. Peter, a couple of their main gentlemen and other 500 pilgrims were able to flee the massacre, thinking that they were the only survivors. The next morning other 7000 pilgrims who had managed to escape joined them.



Figures 84 & 85. (Figure 84) Fortunino Matania/Bridgeman Art Library / Private Collection / © Look and Learn & (Figure 85) Francesco Hayez (1828-1920-1930) (Figure 84) Peter the Hermit arrives in Constantinople & (Figure 85) Peter the Hermit preaches the People's Crusade [Print & Oil on canvas] Accessed from (Figure 84) <http://www.magnoliabox.com> & (Figure 85) <http://www.wonderfulpainting.com>

That this shoe really belongs to the period of the crusades is proved by the numerous horse pictures which have been preserved from that time; of which we will mention the manuscript of Heinrich von Veldeke ("Eneid") in the year 1180, which belongs to the most valuable parts of German history of art.

This south European Hunish horseshoe had remained the standard form during the middle ages and until the thirty years war, at least in South Germany. The shoe was continually improved, and reached its highest point of perfection about the time of the Revolution of the Peasants, at a time when, under the leadership of the Renaissance, the whole art of mechanics, and especially that of blacksmithing, had taken an extraordinarily great stride.



Figures 86 & 87. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) Improvements made on the Hunish horseshoe during the Middle Age until the Thirty Years' War [Drawings] Accessed from <http://chestofbooks.com>

Figures 88 & 89. Veterinarian from the District of ZIPPELIUS, from Wurtzburg, translated by S.E. Weber (2013) 16th Century horseshoes found in Franconia [Drawings] Accessed from <http://chestofbooks.com>

The horseshoes found in Franconia (southern region of Germany, located in the northern part of the The Free State of Bavaria), in all places where, in the 16th century, battles had been fought with the rebellious peasants. We may, therefore, be justified in fixing its origin mainly from that period, for which also speaks its high perfection of form. We still find the bent-up heel and toe (the latter broad and thin) of the south European form.

The staved rim of the Spanish Arabic Turkomanic shoe is observed to be undergoing a change to that of a groove. The broad surface of the shoe evidently led to its beveling, so as to lessen sole pressure. The size of the nail holes remains still like that of the Huns; but the unsunk southern nail heads yet serve to improve the hold on the ground. The calks were next placed forward, perhaps from an uncultivated sense of beauty, or from the high bending up of the hind part of the shoe, which would need a high and heavy unsightly calk.

Thereafter farriery will decline rapidly, and will lose any scientific backing after the Thirty Years War. Meanwhile, the use of the studs as a way of protection for the fingers had spread north to south of Central Europe, being this innovation not very well received in England due to its temperate oceanic climate.

CURIOUS FACTS

THE LEGEND OF SAINT ELIGIUS

Circa 1200. The Camargue, France, a pagan priest who had converted to Christianity under the name of Saint Eligius in Europe, and known in Spain as San Eloy, was assigned supernatural powers to correct and treat horses' limbs. He lived between 588 and 660, and would become the patron saint of blacksmiths from all over the world, receiving special devotion in France and, in particular, in the Camargue. Unsurprisingly, Eligius means chosen, preferred. His feast is celebrated on the first day of December, and his image, work by Nanni di Banco (1345), is in the church of Saint Michele in Florence. Although the legend dates back to the thirteenth century, Saint Eligius lived around 600, and although we do not know if he really forged, this legend was captured in the fresco that can today be seen in that Florentine church, and in a stained glass of the Treffuntec church in the French Brittany.

Eligius, proud of his ability to smith wrote on the label of his forge "Master Teacher". God the Father sent his Son, Jesus, to punish his arrogance, taking the appearance of a farrier. Knowledgeable as anyone of all systems, Jesus laid aside the *English system or cold*, and chose the *hot system or French*; because even when alone, he did not even need the foot holder.

After bleeding the forge with the spit and having prepared it with the staff, the Son of God cut a hand of the horse up to the third metacarpal at a single stroke; with knife and hammer removed rivets, and with extraction tongs took out the old horseshoe. Then having lit the forge, and after handling the swab, heated a new horseshoe until it was cherry red, and applied it to the hoof, taking her by its front rims with second callus tongs, and for the quarters with the branches of other pliers. Supporting these on nail holes, he blew to deflect the plume that clung and looked to the right, the left and rear to see if it was narrow, wide, long or short. Then he carved the hoof to the proper degree and aplomb, lowering the blade and drift, or the curette, and cutting with the cutting pliers.

Later in the anvil he reviewed and corrected the defects; to finish it he rounded the toes – although it was not called rolling then – for a better comfort he gave a progressive relaxation up to the heel. And with good justura (higher or lower concavity of the horseshoe), he avoided pressures in the palm. With the pyramidal punch or stamp, he opened the nail holes. He put the horseshoe back to fire, and with the help of butteries or gouge and rasp, established it. To attach it, he put the toe nails first, then the heel and the rest at his leisure. Finally, alligator tongs, he clinched and later adjusted the tabs to the shrouds, ending with the final nail riveting, which he embedded well in order not to not put the shoe "into question".

Finally he went over the hoof with the rasp, giving it the appearance of a well done job. Later, with his divine power, he placed the member back in its place. When Eligius, amazed, wanted to do the same, blood gushed out of it, raising fears for the life of the horse. Jesus then healed him and Eligius, to recognize him, implored him to forgive his audacity. From that day he removed the sign of his forge and simply sought to continue as professional as he had always been. The label went on: "Master Teacher" to "Master Farrier".



Figures 90 & 91. (Figure 90) Laurom & (Figure 91) Pablo Remacha (2010) (Figure 90) Glass from the Ttreffuntec church depicting Saint Eligius (French Brittany) (Figure 91) Saint Eligius miracle, fresco from The Church St. John The Baptist in Salbertrand (Turin) [Photograph] Accessed from (Figure 90) <http://www.saddock-news.com/> & (Figure 91) <http://commons.wikimedia.org/>

In addition, studs in England, as well as in the countries of the South, which had the same type of ground, could not be taken under any circumstances. This, however, will not interfere with the use of studs in the colder South of Germany, where after their use for nearly 1500 years, its climate and local adaptation were maintained. Despite occasional imitations appeared at the hands of foreigners, its original form was victoriously preserved, being subsequently elected in many countries.

Horseshoe's historical development in general, from the beginning of the time of Emperor Maximilian until the Seven Years War, provides a faithful image of the confused condition of things coming from this period of time, something that, to make it intelligible would require a complete and separate treatment. The toe and the studs are maintained in the current Central European Horseshoeing method, evolving from this period and the clear English influence that can be seen in horseshoes today.

In the middle ages, during the 10th and 11th centuries, the Knights had the obligation not only of taking care of their weapons and their horses, but also of horseshoeing. As a result of the important role which the cavalry played in the battles of the Middle Ages as well as its even greater and greater utility, provided by horseshoes to war horses, the position of the farrier was enlarging quickly, until reaching to the point of receiving rare distinctions in those days. Marshal titles date from that time, even today in France the Farriers are referred to as Maréchal- Ferrant (Marshal-Farrier), and Constable (count of stable), both titles which were only owned by blacksmiths.

It is approximately in the 15th century, when the horseshoe adopts a circular slot between the nail holes, something which

allows using flat blade nails, clinched to the hoof. It is also at this time when a kind of tab appears.

In the 16th century the art of horseshoeing evolved at the same time that horseshoes did, on these tabs appeared, but still a cold horseshoeing method was used. The first written treaties finally appear: "Libro de Albeitería" (1536) by Francisco Reyna Zamorano, "La Maréchalerie" by the Italian rider Laurenti Rusi (1563), "La Grande Maréchalerie" by the French Jean Massé (1563) and above all "Trattato dell'imbrigliare, atteggiare, & ferrare cavalli" ("The good method to get on bit, handle and shoe horses") by César Fiaschi (1564). The Horseshoe becomes heavier, to cushion the weight of armors, weapons and horses, which are therefore also more massive. Still in this century (1583) the book entitled "Confrontations of Gineta (riding method) and the manner and order of the Italian horseshoeing for the safety of the horse", which speaks of the elasticity of foot for the first time, written by Eugenio Manzananas, is reprinted in Toledo.

In the 17th century, other works appear among others, "The perfect rider", "The big blacksmith" and "The real knowledge of the horse" by Carlo Ruini (1598) in which he describes the first half-moon horseshoe, among other pathological horseshoes.

But above all Jacques de Sollysel stands out in this century, Squire of the King and the author of "The Perfect farrier" (1664), in which among others we find the first slippered horseshoe to retrieve an castellated hoof or prevent its castellation.

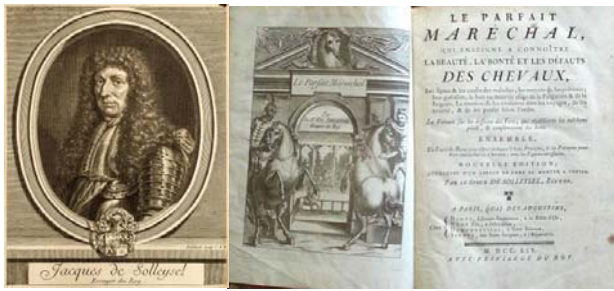


Figure 92 & 93. (Figure 92) Gérard Edelinck & (Figure 93) Libreria Ninon (1700-1754) (Figure 92) Portrait of Jacques de Sollysel, Squire of the King and (figure 93) *Le Parfait Marechal* (the perfect farrier) [Etching] Accessed from (Figure 92) <http://art.famsf.org> & (Figure 93) <http://articulo.mercadolibre.com.ar>

We arrived at the "The Age of Enlightenment" with authors such as La guérinière (1733), Saunier (1734) or Garsault (1741), without changing much on the science of horseshoeing. The Valencian Salvador Montó (1742), provides technical novelties. In this same century Lafosse (1756) and Bourgelat (1771) would be the ones who already spoke of the importance of good limbs, the justura (regular and calculated curve of the upper part of the horseshoe), hot horseshoeing, etc.



Figure 94. Johannes Visscher (from the half until the end of the 17th Century) Farrier shoeing a donkey [Etching] Accessed from <http://www.philamuseum.org/>

The art of horseshoeing did not stop improving, pathological horseshoes emerged losing their simplicity, became completely unusable complicated works such as the dilating horseshoe at times.

With the creation in Germany of the first school opened in 1847, an extraordinary impulse was given to the art of horseshoeing. This was followed by others aimed at the training of military and civilian farriers, qualifying and enabling them with a degree and diploma of competition. Something like this took place in the Austro-Hungarian Empire and other nations such as France, Italy, Russia and England, where this positive influence was noticed and the art of horseshoeing was granted a high regard, was flourishingly and renewingly reborn.

The most ambitious publications date back from this period. The first journal on this subject was published in 1833 (Lungwitz, Dresden, Germany).

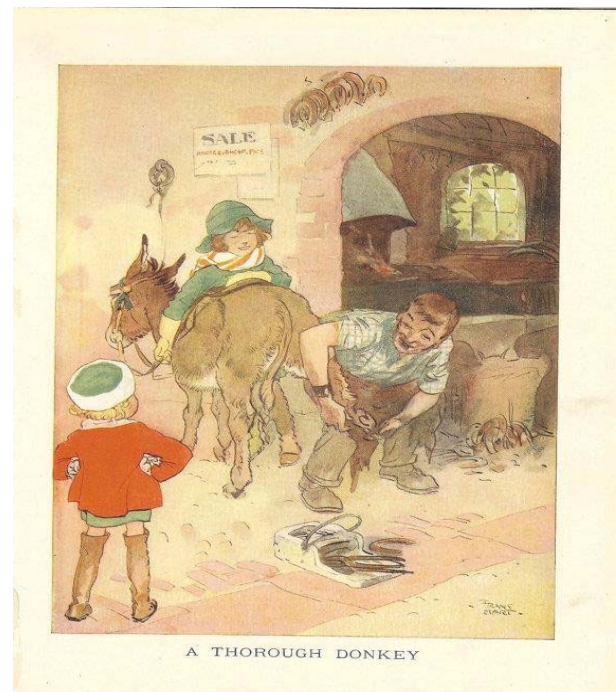


Figure 95. Frank Hart (1925) Children Illustration from the 1920s entitled "A Thorough Donkey", representing a donkey being shod next to a blacksmith's forge, while two girls look at them [Illustration] Accessed from *The Chummy Book*, 13th Edition.

In countries where these schools stopped, languished or disappeared, there was a progressive decline that led to the crisis of competent farriers with significant influence in the anatomical and functional integrity of

the foot and consequently in lower achievement and performance of the horse.



Figure 96. Historicair (2007) Different types of winter shoes used during the World War First. On the left, Horseshoe nails for ice. On the right, Horseshoe with normal nails and notches for heels or crampons for ice (Verdun Memorial, in the town of Fleury-devant-Douaumont in Meuse in Lorraine) [Photograph] Accessed from <http://commons.wikimedia.org/>

As after any war, a breakthrough is promoted concerning armament and the provisioning of fighting troops, blacksmithing experienced a breakthrough and improvement during the World War First, so that different types of horseshoeing were developed to adapt to the present conditions of the territory and weather. The First World War (also called the Great War) was a world war started on 28th July, 1914 and ended on 11th November, 1918. It involved all the major powers of the world, which was aligned into two opposing camps: on the one hand, the allies of the Triple Entente, and on the other, the central powers of the Triple Alliance.

In the last half of this century, the farrier profession has evolved in a surprising way. Farriery has been disappearing together with traction horses and those dedicated to farming.

A generation of leisure and sport horses emerged slowly, and there were not qualified professionals to meet this most pressing demand. Without a doubt, it was not easy to play the riddles in regards to the place reserved for the horse in today's society, richer than the old one, and with more time to consume activities which are linked to leisure.



Figures 97 & 98. (Figure 96) Judy's Lovelies & (Figure 97) Mary Evans (1920-Beginning of the 20th Century) (figure 96) Tin box of English Huntley and Palmers brand varied crackers representing a scene in which a donkey is being horseshod while two girls dressed in typical clothing of the riders of the early 20th century look at it and (Figure 97) donkey being shod on a farm in Deal [Photographs] Accessed from (Figure 96) <http://www.rubylane.com/> & (Figure 97) <http://www.allposters.com/>

Everything suggests that, galvanised by the needs of the sector and the interesting economic gains, the art of shoeing is on the eve of a new fully vital resurgence. Horseshoeing is both art and science, and it is absolutely essential that people who practice the craft do it so, on the basis of solid scientific principles.

Thus its evolution continues and will continue forever and although way behind, the donkey will inherit, as any younger brother would, the innovations or the renewal of this tradition made in first instance for horses.

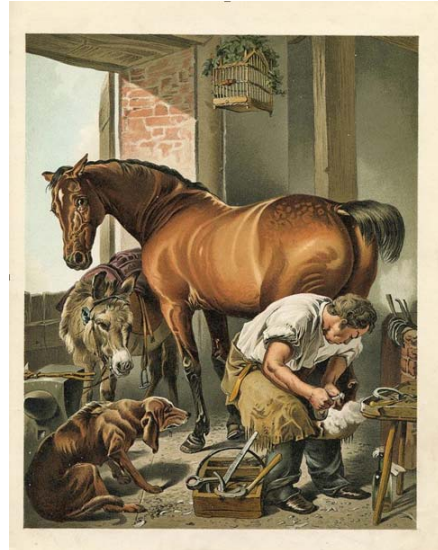


Figure 102. Ravenet (1870) Blacksmith workshop [Lithography] Accessed from <http://www.ebay.com/>

CURIOUS FACTS

We know that during the Gallo-Roman period Gauls slaves or freedmen shod, and were considered hardly any time in society, but later as a result of the important increasing role that the cavalry played for fighting and the use that horseshoeing provided war horses with, the farrier's position became greater and greater until the point of receiving rare distinction in those days. The kings of the Merovingian dynasty, and even more Charlemagne and his successors imitated it in turn by the great feudal lords, had quarterbacks and farriers at their service. These were under the command of the "constable" who, during the Middle Ages, would be responsible for the horses of the monarch called upon the Latin expression comes stabuli or "stable companion (of the monarch)," as it was the case of Leudaste, farrier and "constable" at the court of Charibert I, Merovingian King of the Kingdom of Paris. For all these reasons the art of horseshoeing was estimated as a noble Art, and therefore was part of the teachings that a gentleman should receive. Don Quixote himself tells us that a knight should know how to prepare, adapt and nail a horseshoe.



Figure 99, 100 & 101. (Figure 99) Kolling, A., (Figure 100) Jacqueline Lavidalie & (Figure 101) Jean-Joseph Dassy (1837-1973-2012) (Figure 99) Altar Piece of Aix-en-Provence which represents a pair of tongs for horseshoeing and two Farriers treating two horses, (Figure 100) Don Quixote and Sancho Panza and (Figure 101) Charibert I, Merovingian King of Paris and The West of Gaul, painting conserved in the National Museum of the Palace of Versailles and the Trianons [Altar piece, Acrylic and Oil on canvas] Accessed from (Figure 99) Heeren, S., 2009 (Figure 100) www.artelista.com & (Figure 101) <http://www.culture.gouv.fr/public>

With the development of Veterinary Sciences, complex orthopedic horseshoeing methods would appear during the 19th and 20th centuries. The 20th century will witness the emergence of new materials and alloys.

Today there is a wide variety of horseshoes, made of different materials and in different styles, developed for different types of horses and the work that they do. The most common materials are steel, aluminum and plastic; although some specialized horseshoes are made of magnesium, titanium, or copper, and have silicone and composite resins-based cushions to reinforce the hoof wall.

CURIOUS FACTS

The 13th and 14th centuries brought the widespread manufacturing of iron horseshoes. Hot-shoeing, the process of heating the horseshoe before shoeing the horse, became common in the 16th century (until then only cold shoeing was applied). All this happened much longer before the first horseshoe was ever patented.

NOTABLE PATENTS IN THE UNITED STATES

Henry Burden

In 1835, the first U.S. patent for a horseshoe manufacturing machine was issued to Henry Burden (1791-1871) of Troy, N.Y. Burden's machine made up to sixty horseshoes per hour.

J.B. Kendall

J.B. Kendall of Boston patented an improved horseshoe and possibly the first composite horseshoe U.S. patent #33709 issued in 1861.

Oscar E Brown

Oscar E Brown patented an improved double or compound horseshoe, which consisted of; an upper shoe secured to the hoof of the animal and a lower auxiliary shoe irremovably attached to the upper shoe. The object of invention was the provision of a secure and reliable lock for fastening the lower shoe to the upper shoe, which will permit the lower shoe to be readily applied and removed from the upper shoe whenever it becomes necessary to renew the lower shoe or sharpen its calks. U.S. Patent #481,271

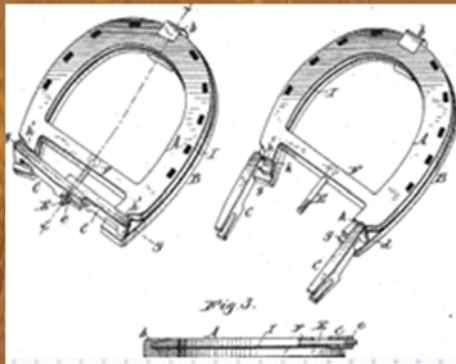


Figure 103. Oscar E Brown (1892) Double or compound horseshoe. U.S. Patent #481,271. [Scheme] Accessed from <http://inventors.about.com/>

4. BUT, IS IT REALLY NECESSARY TO SHOE OUR DONKEY?

As we have seen in the previous sections, while the origin of the farriery is not concretely historically set, we can precisely locate the appearance of the first cases of farriery of donkeys much less probably.

Perhaps the reference quoted above takes us back to the times of Poppaea (30-65) and Nero (37-68) to find hardly locatable references to farriery applied to asses.

Then the doubt could arise casted on why we want to know the evolution that the horseshoe has suffered, if we could easily understand that this is rather linked to horses than to asses itself. As well, we will quickly understand it when contemplating any of the horseshoes which are applied today to one of the specimens from this species, since in its particular evolution, as any younger brother would serve from the clothes of his older brother, the donkey has used such progress, without distancing much nowadays from the techniques practiced to those first horseshoes attached with nails to the hoof of the horses.

Fundamentally, the cause of this late methodological application is, we might say, the knowledge of the anatomical differences between their morphology, anatomy, physiology and pathology, and use that these animals have been given by their human fellows.

Today, it is even discussed whether domestic horses should be shod or not. Wild horses, amble (move of an animal moving the foot and hand on one side at a time) when free for long distances every day, usually over rough meadows, something that gradually provides them with hard wall hooves. Wild horses typically develop weaker hooves because of intermittent exercise, often on a soft soil and that

dampens shock, something that sometimes is further exacerbated by an unbalanced diet. In those horses that are expected to perform arduous crossings on hard surfaces, horseshoes can particularly prevent weak hooves from wearing and tearing or crumbling.

Anecdotally, it is often established that donkeys have harder hooves, probably derived from its wild ancestor (African wild ass) that evolved in arid, often mountainous habitats. Although studies showing scientific evidence that donkey hooves are harder than the ones of a horse have not been conducted, biomechanical analysis by computerized methods suggests that stepping causes less stress on donkeys than horses. This is rather due to its elasticity and resistance to fast natural wear and tear than to the toughness that has traditionally been attributed to them. Even so, non-natural domestic environments and little balanced diets can weaken the hooves of our asses.

Another aspect that we must regard is the ability that asses have to mask pain being able to bear it without showing signs that allow us to know that the animal is suffering from it, or they can even physically endure hoof problems that would make a horse disabled, i.e. problems which would mean manifest limp in a horse may result in an unchanged behaviour in an ass suffering from the same problem.

There has always been controversy around the decision to or not to horseshoe asses. While it is true that the features of the hooves of asses allow donkeys hooves not to be branded routinely. Anyway it is also true that such hooves should be trimmed approximately every 6 to 8 weeks. In some larger breeds such as the American

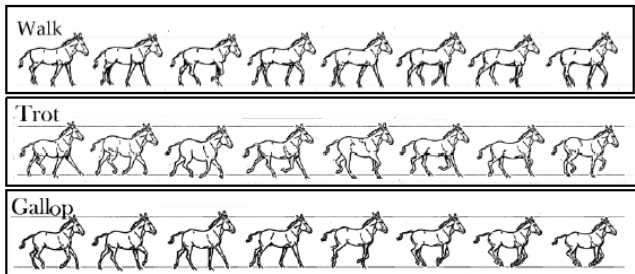
Mammoth Jackstock, especially in those cases in which they are mounted on a regular basis, horseshoeing can be beneficial when the wear and tear of the hooves is faster than its growth. We can therefore even get deeper than always when carried out by a skilled master farrier, when their asses work sufficiently hard and this work is carried out on such an abrupt or hard ground that it alters the balance between wear and growth it may be an option to consider although regular trimming to keep the hoof fit is all that must be rigorously kept.

Their regular trimming may be necessary; and its abandonment can result in a permanent damage. Therefore working donkeys and some donkeys carrying out extensive and arduous journeys on hard surfaces may also require to be shod. Horseshoes designed to be applied on donkeys are similar to the horses but commonly smaller and without clamping flanges.

We pay attention to several factors and which differentiate these equid species and which therefore also make the shoeing systems that we have to apply differ.

5. MORPHOLOGY, CONFORMATION AND GAITS

The morphology of the ass is essential when applying horseshoeing practices, as its physical conformation determines their walking, jogging or galloping way, i.e., the development of their locomotion.



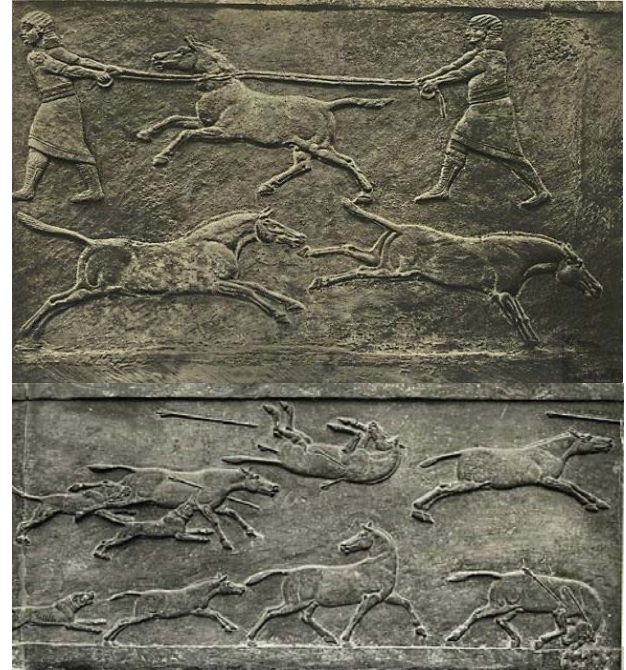
Figures 104, 105 & 106. Francisco Javier Navas González (2013) Gait or movement sequence develop by asses, namely; Walk, Trot and Gallop [Drawings]

Depending on the characteristics of its back, neck, shoulders, rump, among others. Its biomechanics will be conditioned (Navas et al. 2013), hence all body regions have an important role to keep in mind whenever we shoe limbs. Conformation is a hereditary trait which means that any defect that they present, as long as we are not under the special circumstances of a prenatal or postnatal accident, will always be a breeding feature. Therefore, the knowledge of the conformation is essential for breeders.

The reason why men hunted and domesticated the donkey, after eating it (it and products derived from it) for a time (a habit which has been resumed today in some cultures see Book 2, Chapters 1 to 6), was basically used as a beast of burden. In order to perform this task, the donkey had to be able to both carry the load entrusted as well as the riders or both of them.

Since forward motion and momentum originate in the hindlegs, a logical sequence to study the limbs would be its breakdown. A proper conformation will provide a correct bone structure and its proper proportion in relation to muscle, that

joints and the angle between the bones is optimal will contribute to the ass being mechanically efficient and effective, whatever it works at or task is entrusted to it.



Figuras 107 y 108. Life/Time Inc.© (2008) Wild donkeys hunt relief from the wall of the Palace of the King Ashurbanipal in Nineveit, 7th century, 668 BC Most likely the first domestic exemplary proceeded as it has been indicated by the archaeological evidence found, from animals that would have been hunted from their wild environment. These hunts were carried out in different ways. Dogs were normally employed (these dogs were used even as an aid for the hunting of lions, and it could be said that they had a trotting profile as our current Mastiff, smooth and short hair, strong limbs, with heavy necks, head and a long tail, small pointed but fallen ears and with a hairy long tail slightly prone to curl). All the hypotheses suggest that they should present a very broad chest, and a good general development which was more remarkable in the forelimb than in the rear ones, although their hind legs would still be considerably strong and muscular. They must have been extremely bold if they really faced the hunted lions and their step must have been considerable, considering they were useful in the pursuit of wild asses. Hunters are represented surprising wild asses in harems, among which there is a certain number of foals. The King and his advisers follow the hunt on horseback, armed with bows and arrows, discharging them in their path. Dogs, also - without being fastened with belts or chains but free - join the hunt, exerting pressure and generally separating some individuals out of the herd, young wild ass foals as well as adults sometimes. The riders occasionally knock down asses with their bows. Dogs are represented running until they corner adult animals waiting for the arrival of the hunters.

Taking into account the speed an adult wild ass can reach, which is currently considered to be almost impossible to achieve, we should conclude that these animals probably would have been previously wounded; since it can be sparingly assumed that some dogs with a conformation as heavy as the Assyrian dogs could have caught a totally healthy wild ass. Instead of shooting at wild asses, or hunting them until its death with dogs, sometimes an effort to capture an individual alive was made. A kind of bond with noose seems to be practiced crisscrossing two strings (in a way which cannot be set exactly) around the neck of the animal, and hold it so that all efforts to get rid of it were in vain. This capture mode seems to resemble the use of loop or bola in South America and to the use of the slip knots by different Nations, not exclusively to hunt but as a war strategy. However it is not clear, whether the Assyrians practiced tactics that resembled any of the above. This slip-knot, if it could be called so, took place in a very peculiar way. It was not through a noose at the end of a single rope but it was by interlacing two ropes together. There is a great difficulty to understand how strings were placed in such position. Certainly no simple loop chuck would have arranged the strings around the neck of the ass in the represented fashion, nor could the capture have succeeded, according to appearances by a single hunter. At least two people should have been required for combining their efforts, one of them moving forward and the other behind the animal, to capture it (Rawlinson, G., 2005) [Photograph] Accessed from <http://www.images.google.com/>

From the head, which must be well balanced and keep such a strong enough system as to keep it upright, all other regions of the body influence in shaping and therefore in shoeing.

The neck should be proportioned and strong, aspect that not only allows that the head be upright but facilitate the leading of the animal.

In general, the body must maintain a symmetry and balance that confer the harmony to the animal that allows it to satisfactorily develop all the movements that this will.

A back at an angle of 45-50° helps the ass not only loading heavy goods but it also enables them to develop the power to move any vehicle such as a truck.

A generous ribcage enables sufficient space for the organs and for the expansion of the lungs during breathing. Also gives scope for the chest and space between the forelimbs.

A good back line contributes to a good balance and harmony. Very long or short backs seem unbalanced and contribute to a clumsy and poor development of movements. Loins, when very long weaken the back and interfere with the transfer of power from the hind legs forward. When the distance between the ribs and the prominence of moths is too much it contributes to a clumsy and unbalanced appearance that translates into a lower efficiency of the movement of the animal.

The hindquarters confer most of the momentum of the ass and act as pistons to propel the animal forward. A thin and inclined 'rump goose' may indicate that the animal is in a poor condition, and can result in a body disproportion reflecting on a poor conformation.

Although, a chapter offers very little space to expose in detail and address in depth the issues concerning the work of a farrier committed to the job that he performs. We cannot help devoting an exclusive section to limbs and limb conformation.

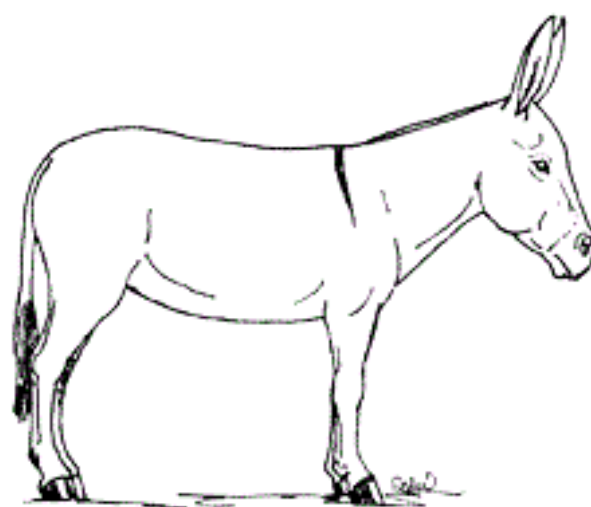
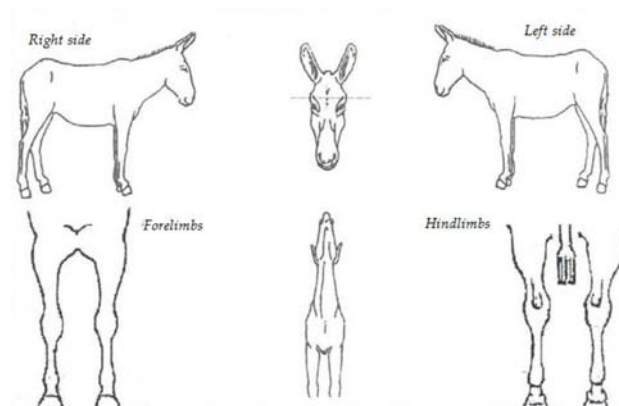
6. LIMBS AND LIMBS CONFORMATION

Limbs should be positioned and upright when contemplating them from any angle, with a proper proportion of bone allowing the animal to provide its movements with strength and balance. There should be space between the front ends to allow a good breath of the chest involving a wide space so that the lungs to expand. The hindlegs should have enough space to move forward following the fore limbs without rubbing and chafing at hocks.

A working animal needs strong, upright and correct limbs to be efficient and thus prevent injuries, sprains or strains or lameness. A choppy, rigid or very slow movement could be a sign of disease or poor conformation. Those 'cow-hocked' animals in which hocks come 'together' will more significantly get lame more easily and will promote an irregular wear of the hoof.

We understand limb conformation as each of the vertical lines that determine the direction that an equine's limbs should have so that for it to be well-formed. Therefore we can also define them as, the direction of the limbs in its entire length and/or in their different regions separately, so that the body is supported in the strongest way and at the same time, the most favourable for movement execution.

Limb conformation is normal, when all four limbs holding the animal are bearing the same effort and allow their easy displacement. The distribution of pressures on different joint surfaces, the sole of the foot, tendons and ligaments is balanced.



Figures 109 & 110. (Figure 109) UGRA & (Figure 110) the national Miniature Donkey Association (NMDA) (1996-2013) (Figure 109) Qualification sheet for donkeys which evaluates among other regions, limb conformation and (figure 110) ass standing, maintaining itself at the position that should be present at the time of the examination [Drawings] Accessed from (Figure 109) UGRA & (Figure 110) The Official National Miniature Donkey Association Miniature Mediterranean Donkey Breed Standard, 1996.

Limb conformation is abnormal, when it shows deviations in either direction, in the regions separately, or together, making the limbs support different pressures, which devalue the zootechnical conformation of the animal and generally hinder their movement. Some of them influence the ability for servicing in breeding males.

The distribution of pressures in abnormal limbs occurs in the following way:

- a) In **'outward or inward'** deviations of the limbs, bone surfaces from the knee or hock distally, will have an

overload on the *opposite side to the deviation, because of the strain or ligamentous hyperextension will be taking place on the opposite side* (i.e. on the side of the deviation).

- b) When deviations are 'forward or backward' (as in the Camped- under or standing under ones and Sickle-hocked or standing under ones) tendons suffer from exaggerated tensions. Limb conformation can influence the strength of the support base, direction and tension of the vertebral column, the angles of the joints, on the range and on the safety of movements.

Whenever we examine limb conformation of a certain donkey there are certain fundamental concepts that we must deal with and determine.

1. SUPPORT CENTER: located in the centre of the hoof of each limb in the ass and other equidae.
2. PLAIN OR SUPPORT BASE: is the space in a trapezoid shape obtained from the union of the donkey's four support centers (C). Seen from above, it acquires a trapezoid shape (as it would happen in a horse). This normally derives from the fact that animal's chest is normally larger than the diameter of their rump. It is possible that the centre of gravity is relocated ahead given the shorter length of the neck with respect to the one of the horses'.

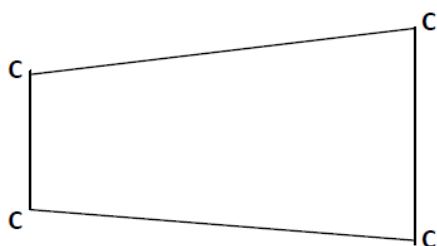


Figure 111. FCV – UNNE (2013) Base of support of the equidae [Drawing] Accessed from *Introducción a la Producción Animal - FCV – UNNE*.

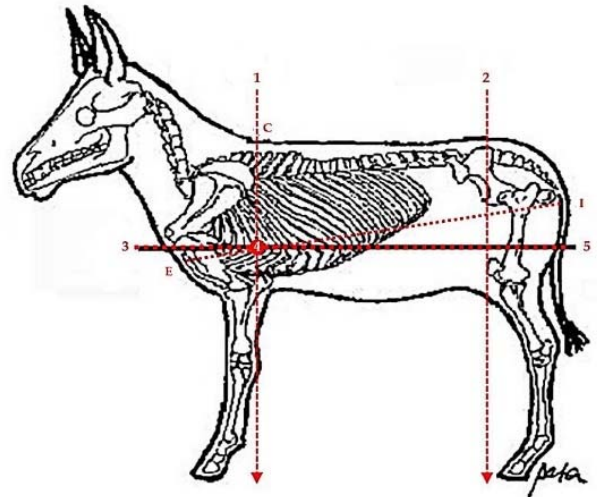


Figure 112. Peta A. Jones (Modified by Francisco Javier Navas González) (2005) Location of the forces that are exerted on the skeleton of a donkey: (1 and 2) vertical strength weight on those points where the bones are stronger, thoracic and pelvic junctions (3) horizontal force (resistance or traction), (4) Center of gravity. This Center is the point which intersect two imaginary lines that join the end of the chest (E) and the ischial tip (I) more or less horizontally and vertically, a line that goes from the highest point of the cross (C) to the ground and (5) line of the center of gravity [Drawing] Accessed from Peta A. Jones, 2005. *Donkeys for Development. Donkey Power, South Africa*.

3. CENTRE OF GRAVITY: Located in the vertical drawn from the edge of the middle and lower third of the trunk and the middle third of the chest (between the ninth and tenth rib) through the rear end of the xiphoid process of the sternum. This vertical is known by the name of "**line of gravitation**". Other authors such as Giovanni Alfonso Borelli used a method according to what the center of gravity is the vertical line passing through the Centre where the diagonals of the support plane cross. But we should keep in mind that both the neck and the head (which have no equivalent in the posterior third), make the center of gravity be placed closer to forelimbs and at the height of the upper third of the thorax and the xiphoid process of the sternum. The disadvantage of this method is that it requires determining a new axis of the center of gravity whenever the position

varies, or what is the same thing everytime the basis plane is changed.

4. **BALANCE:** When the line of gravitation or vertical axis which descends from the center of gravity falls within the base of support we can say that the animal is balanced. Therefore the greater balance occurs in animals whose limbs are short and located separately. Animals with long limbs placed one near the other, are less balanced, it is the case of racing animals, because *speed requires a "less stable balance"* as the greater the risk of falling is, the greater its speed increase will be. The horse runs behind his center of gravity, because when stretching its head and neck moves the center of gravity ahead from the base of support, this does not happen so clearly in the case of the asses due to the shorter length of the neck. The equilibrium is stable while gravitation line falls into the base of support through the intrinsic muscle forces (passive) or extrinsic (active). This balance will be more stable the closer the line of gravitation falls to the centre of gravity and will break whenever the line of gravity falls off the base of support.

5. **SQUARELY STATION IN A NATURAL POSITION:** Position that the animal presents when an animal is standing still and supported on its limbs.

a. **Free Station:**

The body rests on three limbs and the fourth (one of the subsequent) remains slightly flexed resting on the toe and alternately (tripedal), as occurs in horses.

b. **Forced Station:**

The animal places four members, distributing the weight of the body

among them. The forelimbs bear greater weight (60-65% of the weight) (cuadripedal). The animal will not usually acquire this position but it is forced to adopt it. There are different variants:

1. **Forced normal, or aplomb:** the animal stops leaning on its four members making the support centre and the suspension of that limb, parallel to the median plane of the body. For the assessment of limb conformation the animal should be kept in this position.
2. **Centripetal station:** When the hindlimbs converge under the trunk. It is momentary and preparatory for the jump, station on its hindlimbs, kicking, or mounting when intending to breed.
3. **Centrifugal station:** It happens when the forelimbs are moving forward and the hindlimbs strongly backwards. There may be two variants:
 - **Artificial:** When it is compelled to give a proud of itself and elegant look.
 - **Natural:** Position adopted by males at the time of urination. After evaluating it squarely standing we must make the animal walk to ratify or rectify the defects or detect weaknesses in our test when the animal was squarely placed. The definiton of suspensión centres in the live animal is not at all easy, in addition the verticality of the direction of the axis does not exclude relevant regional deviations, as it happens in the stifle, the hock and the fetlock.

We therefore employ the so-called "*Plumb lines*" to determine or assess limb conformation, which are imaginary lines, whose direction can be indicated with educational purposes by using the plumb line and that may allow us to assess the

forelimbs and hindlimbs. They are assessed frontly, from the profile and from behind showing deviations of the limbs as a whole or by regions. Limbs should be measured in the first place, facing the front of the animal, secondly, from both sides, and finally, from behind. Depending on the position from which we appreciate the animal. We will be able to detect one or other conditions.

Before shoeing, we must conscientiously analyze those aspects relating to the limbs, since the valuation of the limbs from all the previously marked points will complete our diagnosis of the situation of the ass that we are going to treat, thus making us able to act accordingly.

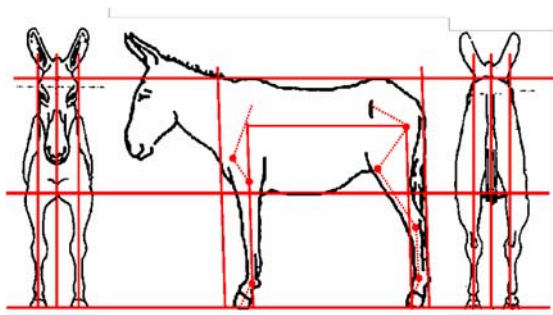


Figure 113. Francisco Javier Navas González (2014) Views and proportions from the animals. From left to right: front, profile and from behind [Drawing].

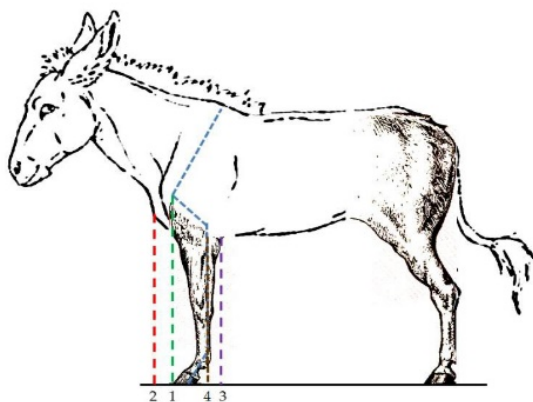


Figure 114. Francisco Javier Navas González/PrinzeBurnzo/FCV - UNNE (2014) Normal forelimb aplomb lines: (1) first plumb line starts from the rotation center of the joints of the chest, just behind the posterior portion of the tubercle of the humerus, and reaches the soil coinciding with the center of the length of the hoof (Pereyra, 1997;) Sanchez, 2005b; 2009A);

According to Ruthe et al. (2000), a forelimb in a side view is straight or regular when the vertical that starts from the middle of the dorsal wall of the hoof reaches the articulation of the chest, keeping vertical the forearm and the metacarpal bones; furthermore the fetlock angle is greater than 140° (Sánchez, 2006). Aguera y Sandoval (1999b) take the cranial portion of the tubercle of the humerus as a reference and, in this case, according to these authors, the plumb line will coincide with the own toe of the limb under study, (2) for the second plumb they take as reference the point of the chest, which will touch the ground at a distance of once the length of the hoof of the same limb ahead from the toes of the limb under observation (Pereyra Member 1997; Sanchez, 2005b; 2009A); However, Aguera and Sandoval (1999b) propose a plumb line, drawn from the most salient part of the chest, which should touch the ground at about ten centimeters ahead of the toes, and Olhagaray (1984a) and Funtanillas (2004a), a vertical drawn from the tip of the back, which should touch the ground approximately a palm of a hand ahead from the toes, although we do not know what kind of horse or hand these authors attribute these absolute measures to, (3) for the third vertical we start from the tip of the elbow, and the plumb continues a tour in which passes palmarly from the fetlock joint, slightly touching it, to reach the ground and located within once the length of its own hoof behind the heels of the observed limb (Pereyra 1997; Sanchez, 2005b; 2009A) and (4) a fourth plumb uses the rotation center of the elbow as a starting point and divides the limb under study into two parts, passing through the axis of the radius, running through the centers of rotation of the carpal, metacarpal shaft, the rotation center of the fetlock, and finally reaching the point where they make contact with the soil (Pires and Lightowler heels, 1989a; Toucedo, 1993; Pereyra, 1997; Stashak and Hill, 2003; Sanchez, 2005b; 2009A) [Modified drawing] Accessed from <http://pookyns-5.deviantart.com/> Introducción a la Producción Animal - FCV – UNNE.

Figures 115, 116, 117, 118, 119, 120, 121 & 122. Francisco Javier Navas González/PrinzeBurnzo/FCV – UNNE (2014) Forelimb conformational defects (figure 115) **Camped out forelimbs:** The hoof is placed at a shorter distance or touches de plumb line. That is to say the hoof overtakes the plumb line. It is rarer than the next and its effects are minor. Equids can adopt it because of certain diseases as lameness, sores in the hooves (escarza), among others. (Figure 116) **Camped under forelimbs:** When the plumb line falls ahead from the toes of the hoof. The body seems to be inclined forward. Limbs are close to the Centre of gravity, it decreases the base of support, and balance is less stable. Support limb touches the ground, predisposing to frequent trips and falls. It is said "they reach each other" because the toe of the hindlimb hits the heel of the forelimb. In draught animals is less severe because the harness holds the animal, (figure 117) **Fine boned:** Regarded from the side, this alteration seems like a step back or "cut" on the Carpus - metacarpian joint intersection. It is believed that this is a formation caused by the weakness of the soft tissue or it may be consequence of developing orthopedic disease, because there is an inconsistency between the bones of the cannon and the distal row of the carpal, since it does not follow a regular dorsal line with the carpal bones; It also has to do with inflammation and thickening of dorsal soft tissue of the Carpus, osteoarthritis and even carpal arthritis (Stashak and Hill, 2003; Sanchez, 2006; 2009a), (Figure 118) **Calf-kneed, to be back at the knees:** a side view of the limb shows that the flexor tendons seem to be too close to the cannon bones, just distally to the Carpus, noting a palmar step, an incongruity resulting in the usual line that must follow from the Carpus towards the cannon area. Is it linked to sagging, weakness or thinness of the flexor tendons, and is regarded as an undesirable finding that appears to inhibit free movements. A strong fetlock may give lead to the appearance of a "Calf-kneed limb conformation" even when such alteration is not present (Stashak and Hill, 2003; Sanchez, 2006; 2009a), (Figure 119) **Buck-kneed, to be over at the knees:** knee exceeds the plumb line forward. It can be acquired after birth by permanent retraction of the flexors, or may be congenital and independent from alterations of the flexors (bilateral). It produces the overload of the extensors and the early deterioration of the musculoskeletal system. Less serious than the following (Figure 120) **Camped under/ram kneed:** the knee is behind the plumb line. It is more serious than the previous one. Produces hyperextension of flexors and damages forelimb joint sides (figure 121) **Pastern too long and flat** (as it is usually), "coon-footed". The fetlock is behind the plumb line, and the angle formed between the pastern and the soil tends to close, becoming lower than normal (55 °). It predisposes to injury of sesamoid flexor tendons and suspensory sesamoid ligaments. This is more serious than the next (figure 122) **Short pastern** fetlock is placed somehow ahead from the plumb line, and this is too close to the heels. This increases the effects of bruises or bumps on the fetlock. Tends to be associated with narrow based and pigeon footed animals. It is more frequent in short and muscular limb and little angled shoulders equines. [Modified drawings]. Retrieved from <http://pookyns-5.deviantart.com/> Introduction to Animal production - FCV - UNNE.

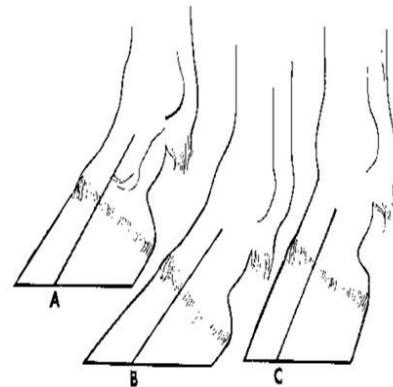
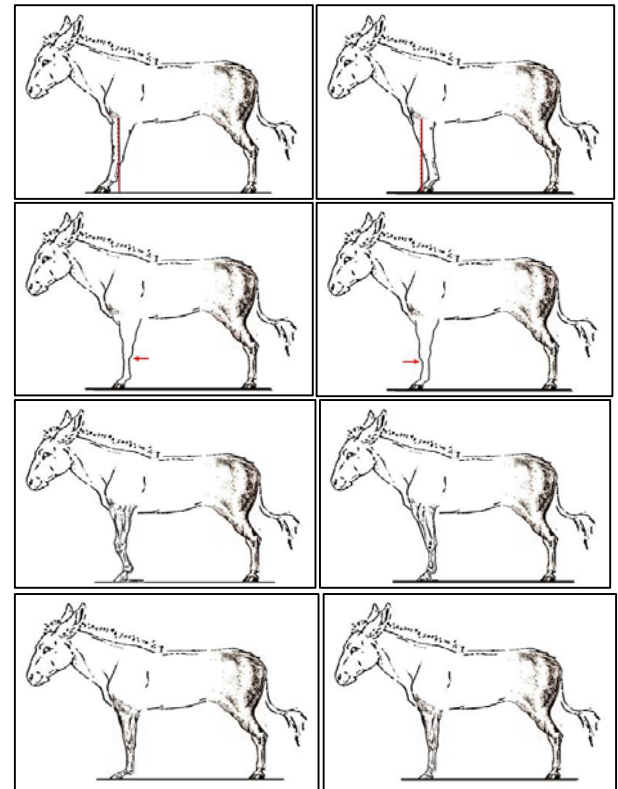


Figure 123. FCV – UNNE (2013) Forelimb and hindlimb Foo Phalangeal axis A) 55°, normal (45° in horses); B) lower than normal (less than 45 °) angle; C) higher than the normal angle (greater than 55) (Adams, 1982). [Drawing] Accessed from *Introducción a la Producción Animal - FCV – UNNE*.

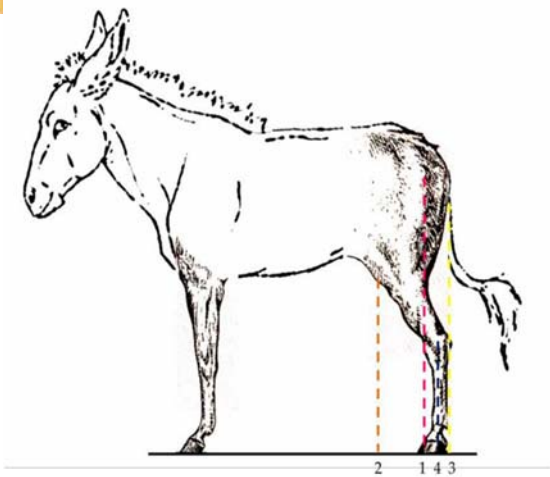


Figure 124. Francisco Javier Navas González/PrinzeBurnzo/FCV – UNNE (2014) its function is to provide with impulse and propulsion. It supports 40 percent of the weight in horses. Diseases affecting this species are less frequent and less severe. Normal aplomb of the pelvic limb lines: (1) the first starts from the center of rotation of the hip joint and reaches the soil coinciding with the center of the length of the hoof, (2) the second takes as reference the cranial boundary of the stifle joint, and touches the ground, (3) place a hoof length measure ahead from the toes (Pereyra 1997; Sanchez, 2005b), (3) in the third vertical, we take the tip of the ischium as a reference and this, in its course, passes through the tip of the hock and reaches the soil at a measure of the length of the hoof behind the heels (Pereyra, 1997; Sánchez, 2005b), Toucedo (1993), Ruthe and Col. (2000) and Stashak and Hill (2003)) mention that this vertical ends its course slightly behind the heels; While according to Pires and Lightowler (1989a), Agüera and Sandoval (1999b), Jones (2007) and Romei (2008), that line will end up reaching the floor about seven to ten cm behind the heels, but these authors still do not specify the type of horse which they refer to in this case and (4) for the fourth Plomb line, we use as an origin, the center of rotation of the ankle, This follows its course through the metatarsal axis and the rotation Center of the fetlock to, finally, reach the point where the heels make contact with the ground (Sanchez, 2005b). [Modified drawing]. Accessed from <http://pookyns-5.deviantart.com/Introducción a la Producción Animal - FCV – UNNE>.

Figures 125, 126, 127 and 128. Francisco Javier Navas González/PrinzeBurnzo/FCV – UNNE (2014) (Figure 125) **tucked behind or over**. The plumb line falls away from the hock and the heel. Limbs come to the center of gravity. Croup tends to be more oblique, closes the hock and the fetlock drops. It exaggerates the joint angles which predisposes to deformations and excessive pressure on its heels. If this flaw appears on both limbs (forelimb and hindlimb) the static balance breaks, and the animal is not suitable for its functions, (Figure 126) **Camped-out**, the plumb line falls on the hoof of the animal. Limbs move away from the center of gravity. Croup is more horizontal and tibial angle increases, the hock is made straight (front side), (Figure 127) **Standing under**. The plumb line falls considerably ahead from the toes. The hock describes a very open angle. It predisposes to a surgical pathology, Craneal luxating patella or tricky knee. It is less serious than the camped under condition, although it is important from the point of view of the jump and (Figure 128) **Sickle-hooked**, the plumb line falls far behind the toes, because the angle which the hock describes is much closed. There is great pressure on the plantar side of the Tarsus. They are aesthetically undesirable, they produce less limping, and it is less serious than the previous flaw. We must not overlook the fact that these defects are heritable and that descendants therefore present it [Drawing] Accessed from [Introducción a la Producción Animal - FCV – UNNE](http://pookyns-5.deviantart.com/Introducción a la Producción Animal - FCV – UNNE).

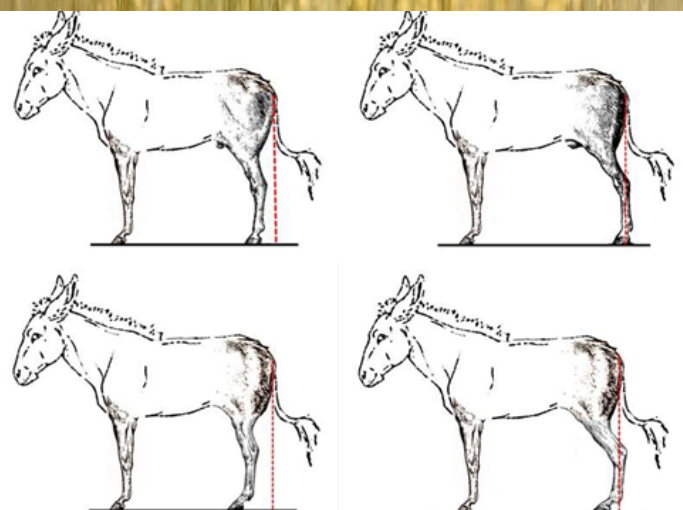
CURIOUS FACTS

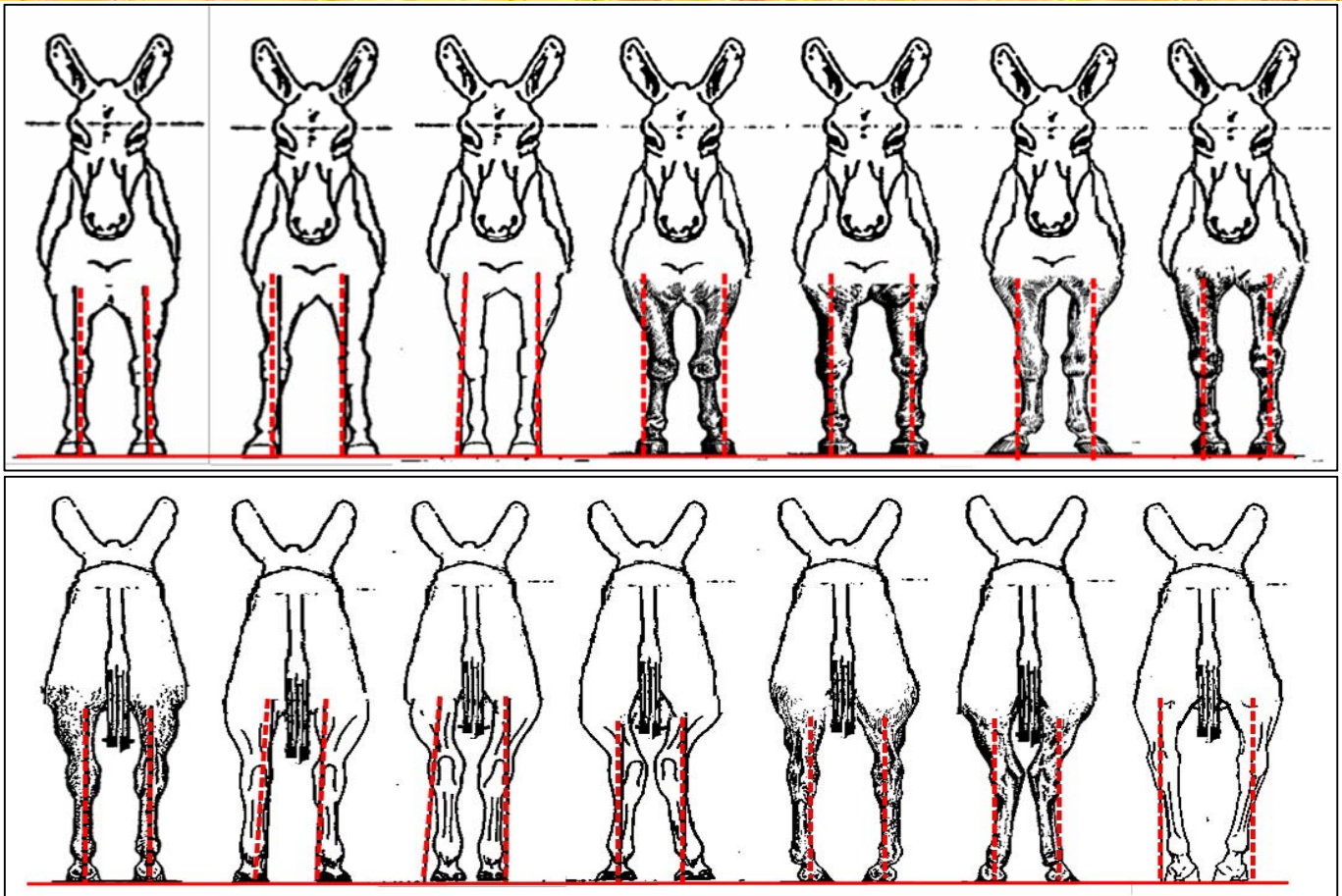
Asses always have the same aplomb from its origins given implemented corrective actions have not been implemented, being possible for them to present any virtue or defect common to their parents, grandparents, and other ancestors. Thus, such origin being usually genetic, that is to say, it is going to be transmitted hereditarily.

In cases where the genetic inheritance is not clearly studied at least, the likelihood of developing certain problems is known. However, defects can also come from diseases, deficiencies, obesity, accidents, impaired growth and other causes.

For example, a simple break of a hoof piece of a foal strongly galloping after stepping on a sharp stone, cannot even cause apparent limping in the individual and so that apparently seem not to matter. However, a long growth period of a foal stepping in the wrong way with a hoof that has parts in excess could distinguish a limb from another and therefore make a problem appear in a donkey which had not been limped ever before, in the future.

The opposite can also occur. A long injury in a donkey foal, treated by professionals with proper care which does not produce future sequels.





Figures 129 and 130. Francisco Javier Navas González (2014) (Figure 129) Different conformations of the forelimbs of the ass, from left to right; (1) **correct or normal limbs**, Faults; (2) **Base-wide**: the separation between the hooves is greater than the separation at the level of the chest. The limb is out of the plumb line. It is common in narrow chested animals. The inner edge of the foot, which makes first contact with the ground, has a greater wear (3) **Base-Narrow**: space at the level of the chest is greater than the separation between the hooves. The limb remains inside the plumb line. It is often seen in animals with a too developed chest. The bearing basis capacity decreases. Feet converge towards each other. The animal makes contact with the ground with the outside edge of the hoof (requires trimming or cutting the inner part of it to level it), (4) **Knock-kneed, valgus, and Ox-kneed**: The deviation of the knee is inwards the plumb line. A small deviation in cattle is normal, but it is considered a fault in equine. It may be accompanied by "Toed-out". In this case, pressure and lesions in the joints structures, are opposed to the previous one, (5) **Varus, Bench-kneed**: knee is outwards the plumb line. In general may be accompanied by Toed-in and bow-legged. There is great pressure on inner side articular faces of the knee and great tension on ligaments and tendons on the external side, (6) **Toed-out**: the toe is slightly directed outwards. The limb can either start closing from its origin or get worse from the fetlock or knee. While moving the left foot forms an arc with convexity, which can injure the opposite limb. It also intensifies the possibilities of interferences to walk when the animal is base- Narrow, since the affected limb, reaches the ground in front of the opposite limb. Injuries can occur as a fracture of the second phalanx of the internal sesamoid, and medial face of the third metacarpal (7) **Toed-in**: the hoof is slightly deviated inward the plumb line. The deviation can also be total or start only from the fetlock; it occurs usually in base-narrow. In these, when the animal walks, performs an arc movement with sagging outward (rowing action) is a fairly common abnormality. The foot begins the movement with the outside of the wall and reaches the ground again with it. This can cause interference (especially in the Base-narrow and Toed-in) especially in the fetlock joint. (Figure 30) Different conformations of the hind limbs of the ass, from left to right; (1) **correct or normal limbs**, Faults; (2) **Base-wide**: The limb is out of plumb line. It is less frequent than the next. It is associated with the hocks, closed (3) **Base-Narrow**: limbs in line, the distance between the feet is less than that between the thighs. It is usually bowlegged or bandy legged. The foot can be toed out. They can be straight up to the hock and thence divert. When there a good forelimb conformation and Base narrow there is also interference produced between fore and hindlimbs, (4) **Valgus**: the hocks deviate toward the inside of the plumb line. The foot is usually twisty or left out. It is also associated with sickled-hocked (profile view). It is a combination of the most serious and predisposes to the bone sparvin (5) **Varus or bowlegged/Bandy-legged**: hocks deviate outside the plumb line. The foot is toed in (should be rejected), (6) **Cowhocked or splay-footed**: this case occurs in a rotation in the lateral direction of the phalanges and the hoof, so during locomotion, in the flight phase, the hooves follow a trajectory of medial convexity. Asses with this conformation, if it is mild and does not cause interference or secondary lesions, are especially suitable for speed tests; But if the defect is exaggerated, has resulted in the appearance of lesions that have already been described above concerning the toed out fault referred to all of the limbs: calcification of medial cartilage of the third phalanx, arthritis, desmitis of medial collateral ligaments, exostosis of the pastern, distal interphalangeal joints overcrown, quarters on the medial face of the hoof, etc. (Pires and Lightowler, 1989a; Sanchez, 2006; 2009a) and (7) **Pidgeon-Toed**: in this case there is a rotation of the hand or foot, both of the pastern and hoof, towards medial; for this reason, while moving, during the flight phase, extremities advance describing a trajectory of lateral convexity. Asses with this conformation, if it is mild and does not cause interference or secondary lesions, are particularly suitable for traction or load work, but if the defect is exaggerated, it has resulted in the appearance of lesions that have already been described concerning the defect bowlegged or bandy-legged referred to the whole of the limb: third phalange lateral cartilage calcification, arthritis, desmitis of the lateral collateral ligaments, exostosis of the pastern or Ringbone, distal interphalangeal joints overcrown, etc. (Pires and Lightowler, 1989a; Sanchez, 2006; 2009a) [Dibujos]

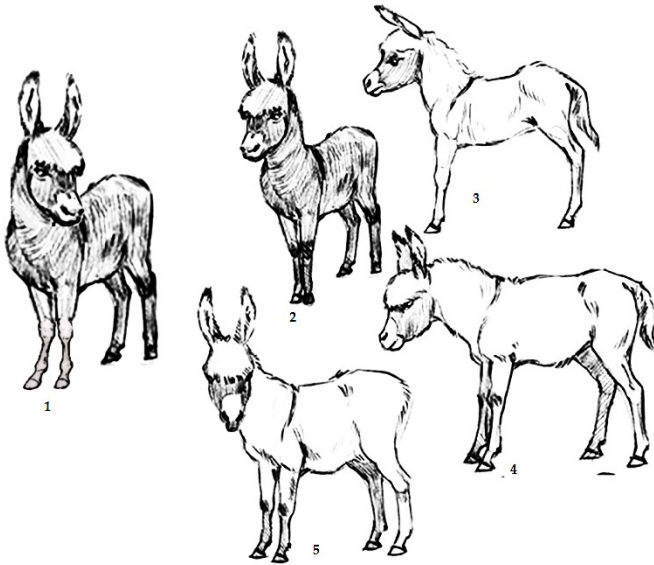


Figure 131. Charlotte Belland (modified by Francisco Javier Navas González) (2013) Donkey foal limb conformations. The marked hereditary component affecting the limbs is not at odds with the fact that the defects of limbs may also be caused by reasons beyond control, intrauterine positional or postural malformations, diseases, injuries, etc. (1) rocked, whipped or tousled by the wind (Hallux valgus affecting one limb and Hallux varus affecting the other): it is a congenital angular deformity, in which we can observe a varus carpal (or Tarsus) and a valgus one, and that usually arises in immature foals. This deformity can be associated with intrauterine malpositions, laxitudes joint, defective endochondral ossification, and it can be inherited; also included within the complex of development orthopedic diseases. In addition, this conformation can be caused also by problems in the ligaments, whether traumatic or orthopedic, (2) Knock-kneed (3) Camped under Fore and hindlimb, (4) Camped out forelimbs (5) Bow-legged hindlimbs [Dibujo] Accessed from <http://bellandpixel.wordpress.com/>

Studies carried out in different racial groups (Peña, F.J., 2011) of asses (Zamorano-leonés), pony (pony of the Americas, Falabella), Baroque horses and related (Spanish pure breed, Lusitan, Aztec, Appaloosa, Frison, Uruguayan Creole, Mixed Breed - PRE), Hot-blooded Horses (Thoroughbred, American Quarter Horse (QH), Mixed Breed - QH, rest of Crusaders, Purebred Arabians, Anglo-Arabian, Andalusian Arabian), Heavy Draft Horses (Hispano-Bretón) European sport horses (Spanish sport horse, Hanoverian, Dutch Harness Horse, Selle Français Horse, Oldenburg horse, Mixed breeds), revealed that when it comes to asses the most common defects were the following in contrast with the other breed groups:

- a) Forelimbs Club feet: A 57.1% of the asses was affected by this fault, presenting, given the statistically significant differences found between donkeys and warm-blooded horses ($\chi^2 = 18.19$, $p < 0.001$), an 18 times higher risk to present such fault (OR = 17.93, 95% CI: 3.23-105.79) in the first ones than the second ones; between asses and Baroque horses and similar breeds ($\chi^2 = 7.96$, $p=0.0047$), with the first showing a 9 times greater risk (OR = 8.95, 95%CI: 1.64-51.96) than the second ones. Taking into account that the number of females represented 25.5% of the sample, while the jackstocks and gelded males respectively accounted for 46% and 28.5% of it. The difference in the incidence of the defect (22.5%, 5.4% and 5.2% among females which had and did not have the defect, gelded males which had and did not have the defect and jackstocks which had and did not have the defect, respectively) is statistically significant ($\chi^2 = 34.11$, $p < 0.001$) between females and gelded males, determining a 5 times higher risk (OR = 5.13, 95%CI: 2.78-9.56) for the females than for the geldings; as well as between jackstocks and females ($\chi^2 = 49.32$, $p < 0.001$), with the first taking a 5 times greater risk (OR = 5.30, 95% CI: 3.15-8.96) than the second ones.
- b) Forelimb Valgus: when studying "valgus" fault only a 1.9% was represented by affected asses.
- c) Front carpal valgus: the increasing incidence of the problem occurs between asses, with 57.1% of the Carpus valgus donkey foals. Statistically significant differences ($\chi^2=33.71$, $p < 0.001$) between donkeys and warm-blooded horses, with the first taking a 33 times greater risk (OR = 33.33, 95% CI: 5.77-

204.79) than the second ones; Similarly, we found significant differences ($\chi^2 = 17.12$, $p < 0.001$) between asses and Baroque horses and related, with donkeys having a 17 times greater risk (OR = 17.25, 95% CI: 3.08- 102,68) to present such fault than horses with an Iberian descent. When relating the defect "Carpi valgus" with sex, we observed that 43.6% of Knock-kneed equine were castrated, 29.1% were females, and 27.3% were stallions and jackstocks, being the incidence of the problem of 8.0%, 6.0% and 3.1% in geldings, females and stallions and jackstocks, respectively. We observed statistically significant differences ($\chi^2 = 8.39$, $p = 0, 0037$) between the geldings and stallions and jackstocks, with the first ones taking a 3 times increased risk (OR = 2.72, 95% CI: 1.34-5.54) than the stallions or jackstocks. In our study, we have found highly significant statistical differences in relation to the presence of the defect of valgus Carpi, between donkeys and pure breed horses, with donkey foals showing a 33 times greater risk to present such defect than warm-blooded horses. In the same way, we find statistically significant differences, in terms of the presentation of this defect, between donkeys and horses from Iberian descent, with them taking a 17 times higher risk of suffering from this defect than the second ones. Lorenzo and col. (1997, 1998) and Lorenzo (2000a, b) provide us with an explanation for these results, these authors find this conformation in 65.45% of asses observed by them, in a study which virtually evaluated 100% Zamorano-Leoneses asses inscribed in the stud book of the breed at that time, taking into account that all the asses observed in the study we are talking

about are Zamorano-leonés breed ones; animals from this breed, in general, are narrow in the chest, which can make them Bench-kneed; This defect causes an imbalance of the forces of compression and traction on the Carpi and can deform them, compressing its lateral face and easing the medial one and, thereby, predisposing them to be valgus; In addition, these same authors also found that posterior diameter of the chest in these animals is much narrower than the previous one, resulting in elbows which turn towards medial making the animal become toed out. As Denoix (1998) and Auer (1999, 2006) affirm, all angular deformity usually entails a rotational one and vice versa, therefore, the simultaneous appearance of Carpi valgus and toed out faults is normal. In the same sense, Ranilla (2011) found, in a more recent study on Zamorano-Leoneses asses, that a large number of individuals observed by this author had this defect of conformation, as well as a high incidence of development orthopedic diseases linked to such conformation.

- d) Forelimb fetlock valgus: the incidence in donkeys is 57.1%, much higher than the percentage of Baroque horses and related (4.6%), or warm-blooded (0.8%) of fetlock valgus. We found statistically significant differences ($\chi^2= 111,54$, $p < 0.001$) between donkeys and warm-blooded horses, with donkeys presenting a 172 times greater risk (OR = 172.00, 95% CI: 22.26-1582,70) than the second ones; in the same way, we observed significant differences ($\chi^2= 27.30$, $p < 0.001$) between asses and Baroque horses and related, with the first ones having a 27 times greater risk (OR = 27.47, 95% CI: 4.75-

168.87) than the second ones. When we correlated the "fetlock valgus" fault with the age of the studied animals, it was found that young adults grouped a 71.4% of the animals with this fault, followed by the foals and the older donkeys with a 14.3% each group being the oldest animals affected in a 26.7%, which almost doubles the number of afflicted foals (14.8%) and exceeds the tenfold of the adult young fetlock valgus. We found statistically significant differences ($\chi^2= 9.48$, $p = 0, 0020$) between foals and young adults, taking the first ones a 6 times greater risk to present such fault (OR = 6.52, 95% CI: 1.73-22.48) than the latter; we have also found significant differences ($\chi^2= 21.21$, $p < 0.001$) between the elderly and young adults, taking almost a 14 times higher risk (OR = 13.64, 95% CI: 3.32-52.21) when comparing old animals to young adults. When we correlate the "fetlock valgus" fault with sex we found that 57.1% of the affected equids were females, 28.6% were geldings and 14.3% were stallions and jackstocks and, being the fault most prevalent in females (6.0%) than in castrated males (2.7%) or stallions and jackstocks (0.8%). Statistically significant differences were found between females and each of the other two groups, with the first ones taking an almost eight-fold greater risk of presenting this default (OR = 7.62, 95% CI: 2.36-27.24) than castrated males ($\chi^2= 15.69$, $p < 0.001$) and a 4 times greater risk (OR = 4.08, 95% CI: 1.80-9.33) than stallions and jackstocks ($\chi^2 = 13.53$, $p = 0.0002$). As we have already mentioned all of our asses were ZamoranoLeonese and, since according to Lorenzo and col. (1998) and Lorenzo (2000a, b), these donkeys, in general, are particularly narrow in their posterior

chest diameter, which causes that the elbow is directed medially, towards the ribs, and according to Castelijns (1998), Denoix (1998), Auer (1999; 2006) and Snchez (2006; 2009a), this causes an imbalance of the forces at the level of the Carpus and the fetlock causing increased pressure in the lateral aspects and a greater stress on the medial ones; Consequently, during the growth of these donkeys, a disharmonic development of these joints can be produced, and it eventually flows into these asses acquiring a valgus, carpal and fetlock deformity, more often than in horses, and the truth is that, according to Ranilla (2011), there are many Zamorano Leonese donkeys suffering from this development orthopedic disease.

- e) Forelimb distal interphalangeal joint valgus: donkey incidence was 1.0%. 42.9% of the asses of this study was affected. By linking the defect "distal interphalangeal joint valgus" with sex, we found that 52.1% were jackstocks, followed by geldings with 27.6% and, finally, jennies with a 20.3%, which represented an incidence of 34.0% between jackstocks, 29.1% geldings and 24.0% among females. Statistically significant differences were observed ($\chi^2 = 7.74$, $p = 0.0054$) between jackstocks and females, taking almost a 2 times higher risk (OR = 1.64, 95% CI: 1.15-2.33) the first ones than the second ones.
- f) Forelimb varus: 4.9% from the studied asses had this defect. Thus, except for asses, from all the affected groups ones which presented the highest problem incidence were the European sport horses and the heavy draft ones, with a 26.7 and 25.0%, respectively, followed by the Baroque and related

horses (16.7%) and warm-blooded ones (8.5%). To study the relationship between the "Varus" fault with age, we found that 61.5% of varus horses were young adults, followed by adults with a 22.4%, the elderly with 7.7% and infants, foals and youngsters with a 2.8% for each of these groups. These data in our study determined a 73.3% incidence among the elderly, significantly higher than that reached in any other age group (28.3% among adults, 26.7% among infants, 14.8% between the foals, 11.4% versus 3.7% among young individuals and young adults. Statistically significant differences were found between the elderly and all age groups, with the first ones always bearing a higher risk than the following: young ($\chi^2=53.31$, $p < 0.001$), OR = 71.50, (95% CI: 13.05-466.90); young adults ($\chi^2=45.70$, $p < 0.001$), OR = 21.31, (95% CI: 6.1181.29); foals ($\chi^2=11.95$, $p = 0.0005$), OR = 15.81, (95% CI: 2.70108.98); adult horses ($\chi^2=10.10$, $p = 0.0014$), OR = 6.96, (95% CI: 1.86-28.28) and, finally, infants ($\chi^2=4.80$, $p < 0.0284$), bearing a 7 times greater risk in the elderly (OR = 7.56, 95% CI: 1.19-55.93) than the newborns. We have also found statistically significant differences ($\chi^2 = 5.23$, $p = 0.0222$) among young adults and young foals, having the first ones a 3 times greater risk (OR = 3.35, 95% CI: 1.16-10.97) than the second ones; we similarly found significant differences ($\chi^2=22.76$, $p < 0.001$) among adults and young individuals, taking the first ones a 10 times greater risk (OR = 10.27, 95% CI: 3.28-35.77) than the second ones; on the relationship between adults and young adults ($\chi^2=24.67$, $p < 0.001$), there were a 3 times greater risk for the first group than (OR = 3.23, 95% CI: 1.97-5.28) the second one; in the case of infants

and young individuals we observed significant differences ($\chi^2=7.96$, $p = 0.0047$), with the first ones taking a 9 times greater risk (OR = 9.45, 95% CI: 1.67-54.76) in the newborn foals than in the young foals. By linking the "varus" defect with sex, we note that 41.3% of varus in our study animals was castrated, 39.2% were females and 19.6% were stallions and jackstocks. We also found that the incidence of this defect was significantly lower in stallions and jackstocks (5.8%) than females (21.0%) or geldings (19.7%).

- g) Distal interphalangeal joint varus: Total asses of this study had this defect.
- h) High heels: the 2.3% remaining corresponded to the asses of this study.
- i) Hindlimb Clubfeet: analyzing this defect in each of the four groups in which it was found, we find that its relative incidence is greater in the group of asses (57.1%), followed by the ponies (55.6%), Baroque and related horses (3.7%), and finally the warmblooded horses group (1.5%). We found statistically significant differences ($\chi^2 = 72.61$, $p < 0.001$) between donkeys and warmblooded horses, being the risk of presenting this conformation defect 85 times greater (OR = 85.33, 95% CI: 13.10-605.60) in asses than in warm-blooded horses; Similarly, we observed significant differences ($\chi^2 = 33.78$, $p < 0.001$) in asses than in Baroque horses and related, with the risk being 35 times greater (OR = 34.67, 95% CI: 5.87-218.12) for the first group than for the second one. When we compare the incidence of the defect of clubfeet in the different breed groups, we found some highly significant statistic differences between donkeys and warm-blooded horses, being the risk for presenting

this defect of conformation 85 times higher for a donkey than for a warm-blooded horses; Similarly, we note a significant difference between donkeys and Baroque horses and related, being the risk for presenting this defect 34 times higher in a donkey than in an Iberian horse. We see that out of the groups of animals which were most likely to present hindlimb clubfoot faults, donkeys and ponies. The fact that they are both suffering minor locomotive utilization by their breeders, seems to affect a lower formation and concerns regarding their foot health, according to Lorenzo et al. (1998), Lorenzo (1998; 2000a, b) and Ranilla (2011), because they are reared for conservation purposes or simply as companion animals, and therefore not having an immediate utility for which good physical abilities may be needed, nor they seem to care, in view of our results, neither its conformation nor the influence of it on their musculoskeletal health. Another explanation for these results is found in a series of educational and cultural issues, since for many years this defect has been regarded as morphologically physiological and normal in asses, so it has often been common to observe, preserve and cause this defect; but actually this may be both result from poor breeding practices, promoting causes for developmental orthopedic diseases as bad harnessing or horseshoeing methods in which high heels or short toes, are both left as circumstances which end up causing the retraction of deep digital flexor tendon (Ranilla, 2011); The pain at heels level can also be a predisposing cause for this conformation, a problem which makes the animal not to use them and so that there is a homogeneous wear of the hoof, resulting in a

clubfooted hoof (Sánchez, 2006, 2009a).

- j) Hindlimb valgus: 57.1% of the donkeys presented a valgus fault. We found statistically significant differences ($\chi^2= 10.48$, $p = 0, 0012$) between the group of asses and hot-blooded horses, being the risk to present such fault 11 times higher (OR = 11.05, 95% CI: 2.03-64.07) in the first ones than in hot-blooded horses; Similarly, we observed significant differences ($\chi^2 = 13.89$, $p = 0.0001$) between asses and Baroque horses and related, with donkeys taking a 14 times greater risk (OR = 14.23, 95% CI: 2.56-83.96) than horses from an Iberian origin.
- k) Hindlimb distal interphalangeal limb: the incidence of this defect was 57.1% in asses. Statistically significant differences were found ($\chi^2=4.68$, $p = 0, 0305$) between donkeys and European sport horses, taking an almost 8 times higher risk the first ones than the second ones (OR = 7.56, 95% CI: 1.15-53.68); Similarly, we observed significant differences ($\chi^2 = 19.20$, $p < 0.001$) among the donkeys and Baroque horses and related, being the risk for donkeys to present such fault 19 times higher to the one of those horses from Iberian ancestry (OR = 19.24, 95% CI: 3.41-115.24).
- l) Hindlimb high heels: El 42,9% of the donkeys were suffering from this defect.

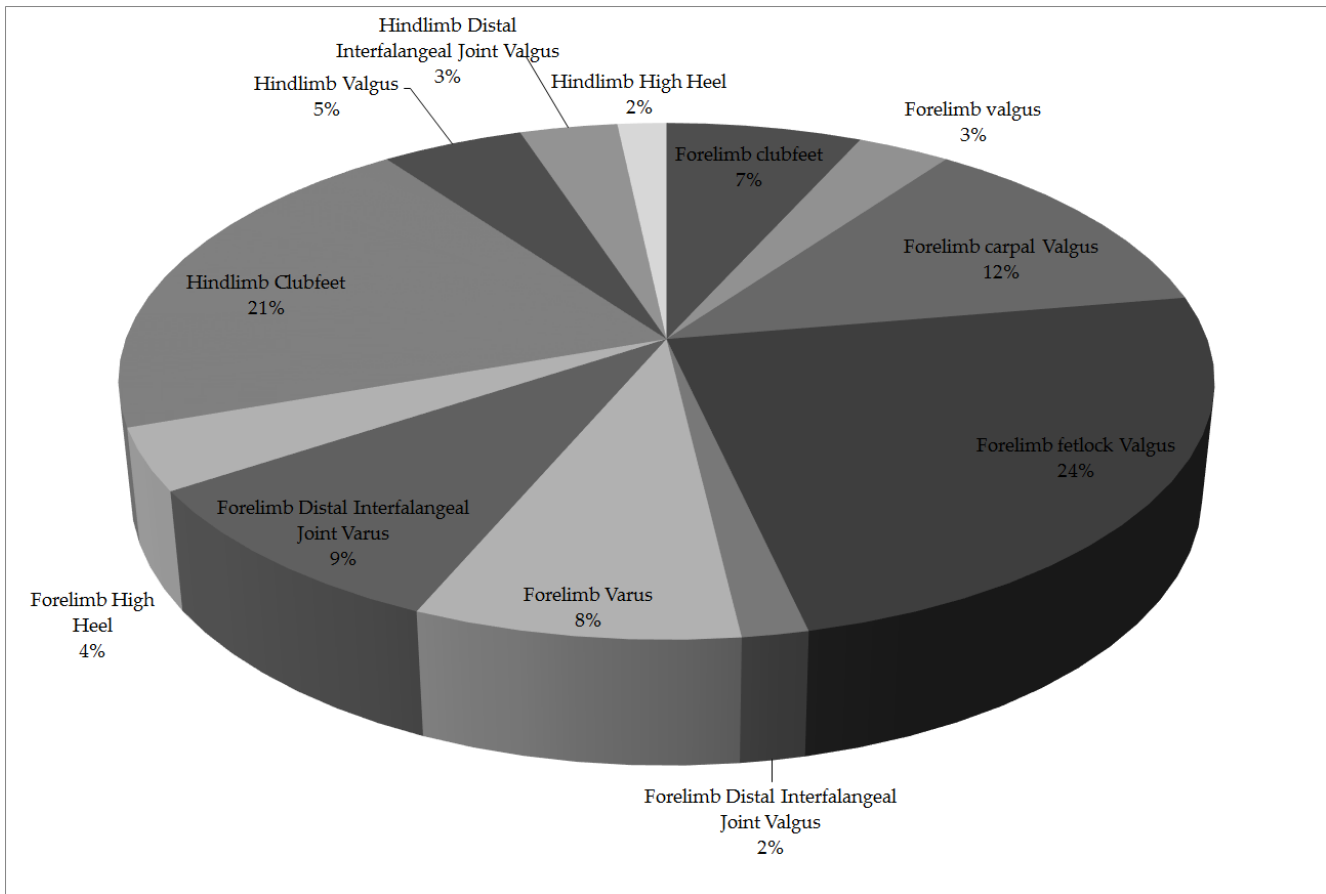


Figure 132. Francisco Javier Navas González (2014) Distribution graphics for the incidence of defects in asses' aplombs. The listed defects were Forelimb Camped out, forelimb camped under, Buck-kneed or to be over at the knees, Base wide, Base narrow, toed-out, toed-in, coon-footed, Straight fetlocks/short pastern, **Forelimb Clubfeet**, valgus, carpal valgus, Fetlock valgus, distal interphalangeal joint valgus, forelimb valgus, carpal varus, fetlock varus, Forelimb distal interphalangeal joint varus, tiered front heels, **forelimb high Heels**, forelimb Low Heels, shortened front Heels, long front Heels, elusive front Heels, Camped out hindlimbs, Camped under hindlimbs, straight hindlimb hocks, Standing under, Base- Narrow Hindlimbs, Toes-in hindlimbs, Cowhocked or splay-footed hindlimbs, straight hindlimb fetlock, **Hindlimb club-feet**, hindlimb valgus, tarsal valgus, hindlimb distal interphalangeal joint valgus, hindlimb varus, hindlimb distal interphalangeal joint varus, hindlimb high heels, hindlimb low heels, hindlimb shortened heels, hindlimb long heels, hindlimb elusive heels (Peña, F. J., 2011). [Graphics]

7. CLASIFICATION AND EVOLUTION

As a result of the evolution which occurred, the foot of equids, including that of the donkey derived to a single finger. This, among other signs is part of fingerprints that have marked us the path described and the one that we can pay attention to when contemplating one of the branches of the evolutionary tree of the genus *Equus* in more detail. The increase in body size, reducing the number of fingers of the legs and the morphology and consistency of the crown of the molars, as well as feeding patterns, are the witnesses which we have today in order to be able to provide us with the understanding about what happened.

- DOMAI: Eukarya¹
- KINGDOM: Animalia²
- PHYLUM: Chordata³
- CLASS: Mammalia⁴
- ORDER: Perissodactyla⁵
- FAMILY: Equidae⁶
- GENUS: *Equus*⁷ (Carlos Linneo, 1758)
- SPECIES: *Equus asinus*⁸

¹Eukarya: the donkey can be classified within this domain because it is a multicellular species whose cells contain a true nucleus and organelles bound by a membrane.

²Animalia: this is the Kingdom that the donkeys belong to because they are multicellular, eukaryotic, heterotrophic, mobile and lack of a cell wall. They reproduce sexually and do not undergo alternation of generations.

³Chordata: this species may be classified as Chordate because at a point in their life they have a notochord, a dorsal tubular nerve cord, pharyngeal sacks, an endostyle, and a postnatal tail.

⁴Mammalia: the donkey is considered a mammal because it is homeothermal or has the ability to regulate its temperature internally. Their bodies are covered with hair and possess glands such as sweat, sebaceous and mammary ones.

⁵Perissodactyla: the donkeys are ungulates somewhat peculiar, since they have an odd number of toes. This order has a central toe which is larger than all the others. Other animals within the order perissodactyla include rhinos and tapirs.

⁶Equidae: This is also known as the horse family. Donkeys are included in this family due to their long heads and necks and to have a crest. All equids walk on the tip of their fingers. Donkeys are also grazing animals.

⁷*Equus*: Donkeys are also classified in the genus *Equus* because they have only one finger. Other animals of this genus are zebras and horses.

⁸*Equus asinus*: The donkey has a slender body with a straight back and long ears with an enlongened head, which helps to determine its species.

The family tree shows the development of the genus *Equus*.

The evolutionary factors used to develop the tree include, as we have already mentioned above, morphological differences in feet, limbs, and dentition.

The oldest organisms had four front toes and three back ones, in addition to small, sharp teeth. Evolution and natural selection produced that the *Equus* genus possessed thin limbs equipped with a single finger and flatter and larger teeth.

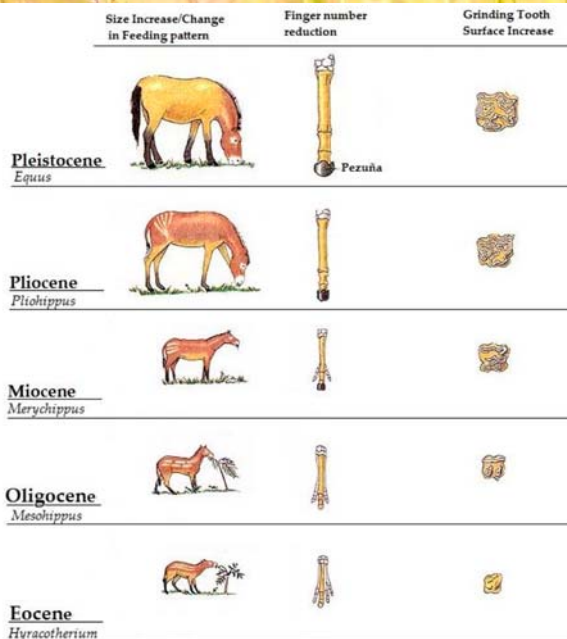


Figure 133. Pontificia Universidad Católica de Chile/Facultad de Ciencias Biológicas/Curso Bio100 (Modified by Francisco Javier Navas González) (2014) *Equus* genus evolution [Drawing] Accessed from <http://www7.uc.cl>

Eohippus ("Dawn horse"): also known as *Hyracotherium* ("mole beast"). It lived during the Eocene 50 million years ago in North America, Europe and Asia. When its remains were found in North America it received the *Eohippus* name although it was equal to the European *Hyracotherium*. This animal may also be the ancestor of rhinos and tapirs (also of the perissodactyls order, which are odd-toed ungulates, otherwise Artiodactyla, which have even toes, as for example, deer, cattle, sheep, etc.). The *Hyracotherium* was small, like a fox terrier. It had 4 toes on their fore feet and three on the hind ones, ending in hooves. Adapted to a marshy environment and possibly feeding on leaves or grasses from that environment.

Miohippus ("Small horse"): approximately 33 million years ago (Oligocene). It was more advanced than the *Mesohippus* and its descendant, since it had changes in its molars for crushing herbs more effectively. It had the size of a lamb and a slightly more elongated skull. Although it still grazed in forests, it was not completely a prairie animal.

It had 3 fingers and only the third was in contact with the ground.

Merychippus ("Ruminant horse"): lived in the Miocene, approximately 17 million years ago. They still kept two residual fingers next to the third main finger, but they hardly were in contact with the ground. Its teeth would already set the origin of the modern ones, more prepared and deeper in order to withstand the abrasive power of herbs. This equine already reached 1.20 m tall.

Pliohippus ("Big horse"): It lived 5 million years ago and it is the latest in the evolutionary line of the horses. While his teeth were not deeply rooted, it already did not almost have side toes. They were nearly chipped or like a bone overgrowth, a step towards modern horse. It exceeded all previous examples in size and it was already a remarkable speed animal, unlike its small predecessors which lived in forests and swamps. It spread to South America and gave rise to some species in South America (*Hippidion*), with a deep nasal cavity (what has made us think it may not be the direct ancestor of modern horses, although they share many anatomical similarities). However it happens the same with the *Astrohippus*, for which it is said that they would not be the direct predecessors of the modern horses because of similar reasons. We are left, therefore, with the *Pliohippus*. Its also synonym *Dinohippus* (from the Greek 'Terrible horse'), possessed a single hoof, ate almost wholly on grass and was believed to endemically live in North America from 11 to 4 million years ago, it is thought to be the current closest known ancestor for the *Equus* genus. It would be around 4.5 to 4 million years ago when it would begin to mark the evolutionary split that would result on the one hand in the asses and on the other, the horses of the Pleistocene, ancestors of the current horse.

Equus: Equus is a genus of perissodactyl mammals of the family *Equidae*. It is the only surviving genus of a once prosperous and diverse family. It includes horses, donkeys, and zebras.

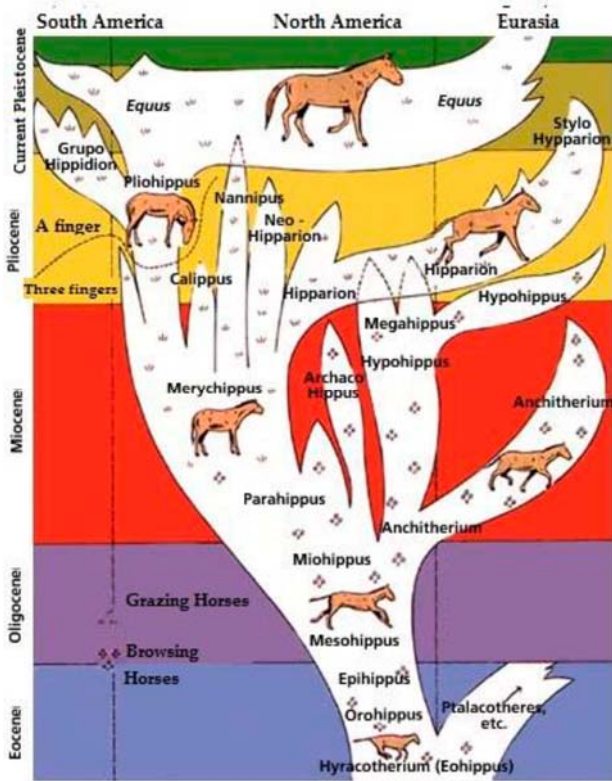
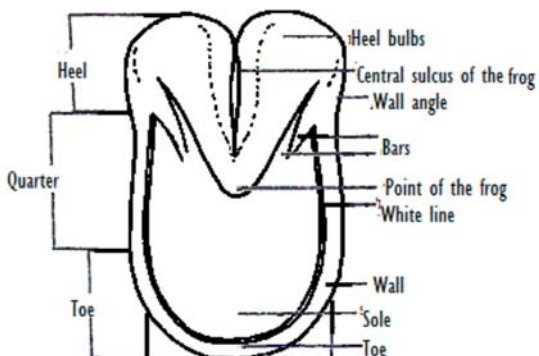
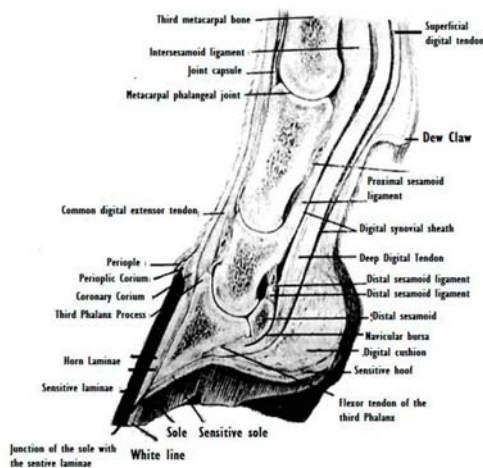
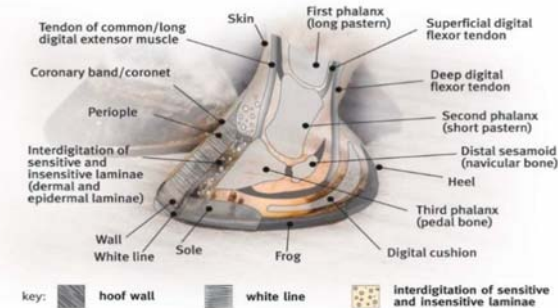


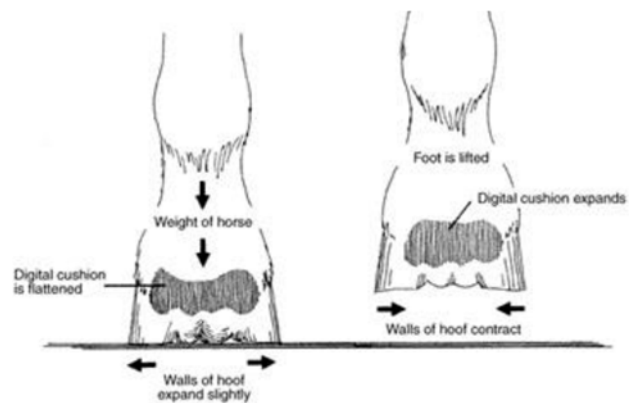
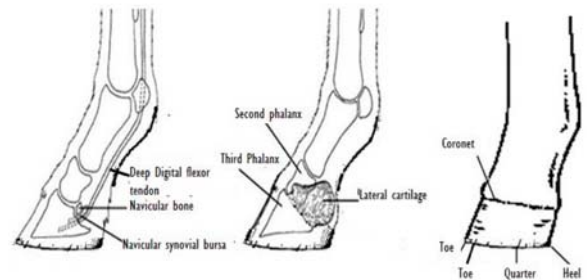
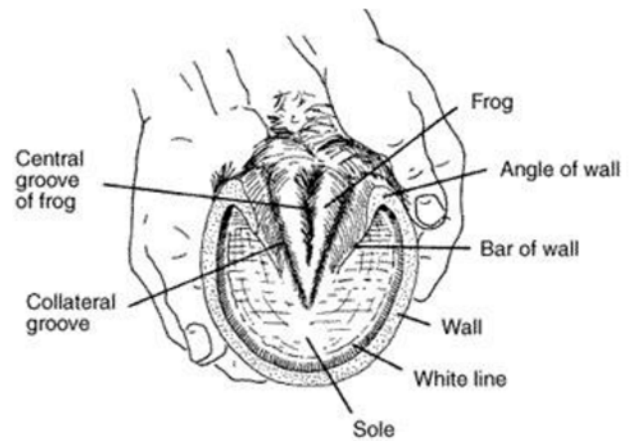
Figure 134. Pontificia Universidad Católica de Chile /Facultad de Ciencias Biológicas/Curso Bio100 (2014) Complete evolutive tree of the Equidae family of the Equus genus [Drawing] Accessed from <http://www7.uc.cl>

8. THE FOOT

The foot of an ass tends more to verticality than the one of a horse (between 5 and 10° greater), and its hoof has a distinct morphology as a way of a box (the one of the horse has a more tapered morphology), due to the fact that the soles are morphologically different. The hoof is the coating of the animal's own finger, which protects the medial and distal phalanges, as well as the navicular bone along with the joint mechanism of the finger. The structure and parts that the hoof is composed of can be observed in the following schemes



Figures 135, 136 & 137. (Figure 135) Carr & Day & Martin, (Figure 136) Emery, L., Miller, J. & Van Hoosen, N & (Figure 137) David Hadrill (1977-2002-2014) Structural and parts of the hoof of the donkey schemes (Figure 135) Tridimensional scheme, (Figure 136) Transverse cut of the distal third of the limb & (Figure 137) Donkey hoof lower view. Notice the U shape [Drawing] Accessed from (Figure 135) <http://www.carrdaymartin.co.uk/> & (Figure 137) <http://www.horseshoes.com>



Figures 138, 139 & 140. Phillip D. Garrett (1993) (figure 138) Donkey hoof conformating structures. Wall, bars and frog are the hoof weight supporting structures, (figure 139) Internal and external foot structure and, (figure 140) flexible hoof structures expand and contract with each step, at the same time that weight is transferred from one limb to another while supporting [Drawings] Accessed from Functional Anatomy of the Horse Foot, 1993, <http://extension.missouri.edu/>.

The hoof is the horny case that completely covers the distal end of the equine foot. We must study it here in relation to the underlying dermal structures, considering it as a modified skin.

The knowledge of its histological structure is of utmost importance, in particular to understand the pathophysiology of many important clinical syndromes of the equine foot. Anatomically, three regions are distinguished in the hoof: the wall, the sole and the frog.

The wall, is the visible part of the hoof when the foot touches the ground and extends from the coronary edge until the sole.

In the hindlimbs (heel) it is reflected inward to form *the sole bars*. The wall is separated from the sole by the *white line*.

The sole or palm, It forms the most of the basal surface of the hoof.

Frog, consists of a dough wedge in the back of the sole formed from the chorion of the frog. The *collateral grooves* separate it from the *bars*. It is considered that it represents a modified version of plantar pads from other mammals.

Histologically, from outside inward, three strata are differentiated in the **wall**:

1) External, periopic, tectorium, or cuticle stratum: it is the most superficial. It is composed of a thin layer of horny material, of a white and bright coloration (it is not pigmented), which extends over the wall and thickens at the bulbs.

It originates above the coronary region, in a narrow strip between the hoof and the normal skin of the foot (periople). In old animals becomes thinner and it can disappear or does not exist. It is believed that its further development in foals tends to

prevent the loss of water from the hoof during its growth.

The periopic epidermis interwave with the dermis (or corium) by papillae of 1 to 2 mm long (papillary corium), highly vascularized and facing down. Down growth of the epidermis that surrounds the papillae originates corneal tubules and the intertubular horn, formed by hard keratin formation.

2) Medium, coronary, tubular or protective stratum: it forms the hard and thick region of the epidermis of the hoof. It originates in the coronary edge, immediately below the periople. As in the previously described region, also here the dermis or corium and the epidermis is interwoven forming a papillary corium. The horn tubules are formed in correspondence with the dermal papillae of the coronary corium. These papillae are longer (4 to 6 mm) and thicker than in the periopic corium. As soon as it originates it slightly turns down to be disposed in a parallel to the hoof wall direction.

The epidermis grows to form the tubular and intertubular material characteristic of this layer in the following way: concentric cell layers that form tubules are oriented mutually in different directions, as well as the haversian bone systems collagen fibers, which favours (as in the bone) the mechanical strength and elasticity of the tubules.

Normally, the more central cells of tubules (medulla), experience a rapid degeneration so distal tubules appear hollow.

Between the horn tubules, intertubular horn appears, usually

pigmented, and originated in the basal stratum which covers the interpapillary areas of the coronary corium. Unlike the tubular horn, in the intertubular horn, keratinized cells are arranged in overlapping layers of cells parallel to the ground.

It has been postulated that the tubular structure of the hoof wall served to increase the mechanical strength. Recent research, however, suggests that mechanical strength is higher in the intertubular horn than in the horn tubules. However, the tubules contribute to addressing the force lines that have an impact on the hoof, which make it more resistant to fracture.

3) Inner or laminar stratum: is the innermost layer of the wall and its corium contacts the periosteum of the third phalanx, pedal bone or coffin bone (P3, bone that can also move in cases of severe laminitis). Is not composed of tubular horn as the previous two, but it is organized as parallel dermal and epidermal interdigitating laminae.

In the equine hoof we differ primary and secondary epidermal laminae (insensitive laminae), the latter originated from the primary at an acute angle as if they were a feather barbs. Primary laminae are about 550 to 600, and each of them originate between 150 and 200 secondary laminae. The epidermal laminae are interwoven with the dermal laminae of the laminar corium (sensitive laminae), much vascularized. The dermis firmly adheres to the periosteum of the third phalanx, which presents multiple perforations for a better fixation by means of solar corium, highly

sensitive (innervated), closely linked to the periosteum of the third phalanx through microscopic papillae. It gives origin to the sole. Outwards, the primary epidermal laminae merge by their base with tubular and intertubular horn which characterizes the middle stratum.

The intimate junction between the dermis and epidermis, derived from the complex interdigitation of primary and secondary laminae, has a greater importance for hoof attachment and mechanical impact absorption. This is called laminar gear. The system of primary and secondary laminae provides the hoof with a total surface area of contact which is estimated at 2.4 m², or what is the same thing, more or less the total surface of the skin of a human being. At an ultrastructural level, the great folding of the basal cell membrane of the cells of the germinativum stratum and abundance of hemidesmosomes contribute to this gear.

Moreover, the keratin formed here is softer and more elastic. Thus, with each impact of the hoof against the ground warps laminae, which helps dissipate the pressure exerted by the weight of the ass in motion.

Before reaching the ground, dermal laminae are transformed into *terminal papillae*, whose epidermis originates the tubules of the *white line* (see below), in continuity with the papillae and tubules of the sole.

During *Laminitis* a laminar separation of the dermis from the epidermis occurs. This alteration (of a widely debated etiology for many years) is due to the loss of adhesion proteins

(laminin among others) of the basal membrane, simultaneously with an alteration in the vascularization of the laminae.

The **sole** or bottom portion of the hoof has a slightly concave shape to facilitate thus its strength and grip. Its structure is similar to the one of the middle stratum of the wall, i.e., tubular and intertubular horn originated from *dermal papillae* directed downward to upholster the wide surface of the sole. The only differences are that the horn is softer, the dermal papillae are longer and the hypodermis is thicker.

The *white line*, represents an area of soft keratin and lacking in pigmentation that, although shown from the sole side of the hoof, actually belongs to the thickness of the wall and has a thickness of 1 mm (may be observed when scraping). It represents the distal projection of the inner region or laminating, including (for experts) the innermost area of the coronary region, both depigmented. It forms an elastic yet firm connection between the wall and the sole.

Assumes a special importance during the horseshoeing, because nails can be entered safely without penetrating the dermis at this level. It has further clinical importance because it may reflect internal alterations in the fixation of the hoof system. Their pale coloration does not only obey the absence of pigmentation but also the presence of tiny cells of air in their intimate structure. In its conformation *horn laminae* (which are the primary horn laminae distal projection of the laminar region), among which *corneal tubules* are (originated from the *terminal papillae* of the dermal laminae, and intertubular horn.

The **Frog** structure is similar to the one of the sole, apart from the fact that the *dermal papillae* (cuneal corium) are shorter, and the *horn tubules* and the *intertubular horn*

are made of a softer keratin, so it has a greater elasticity than the wall. The *hypodermis* is particularly thick on the frog and contains a *digital pad*, composed of adipose tissue masses with elastic connective tissue and collagen. The frog is of great importance for the absorption of impacts to allow a slight lateral expansion of the hoof during the stance phase. On the central area of the frog, *merocrine sweat glands* empty, branched and following a spiral pattern.

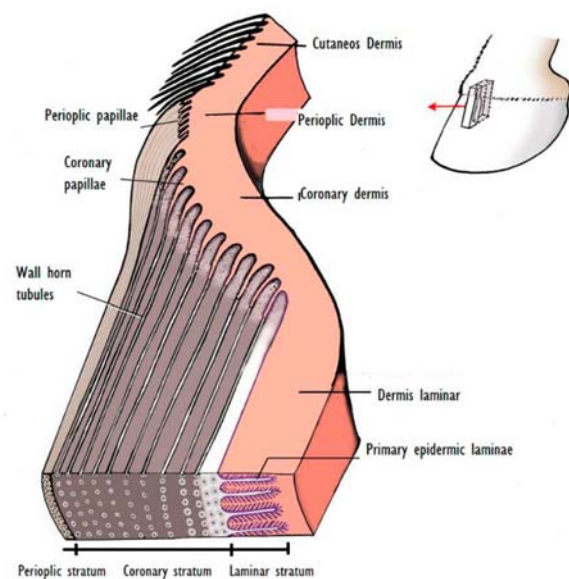
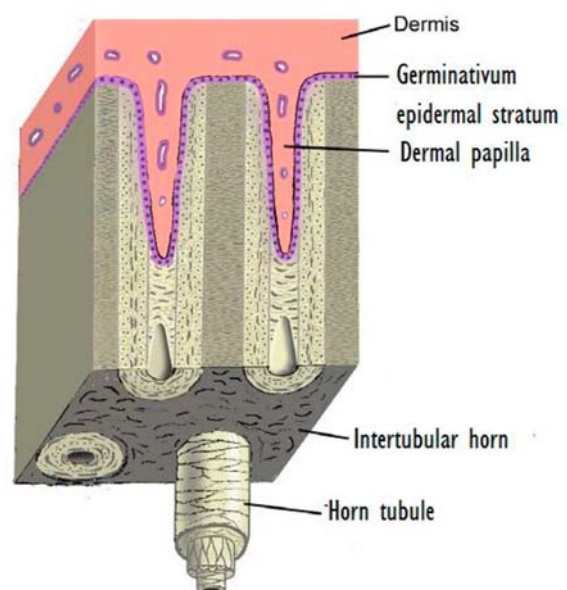
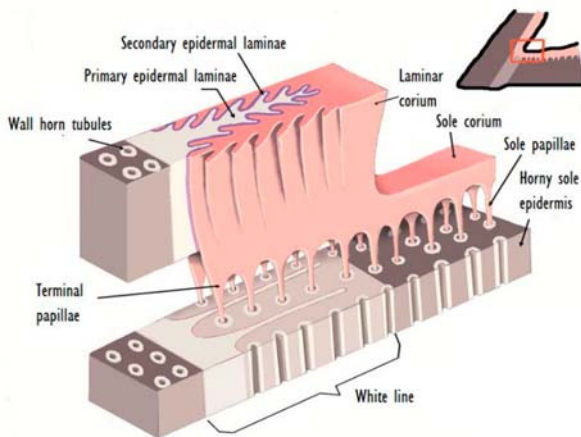
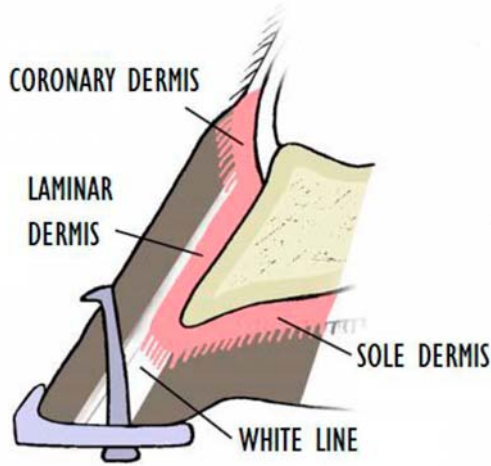
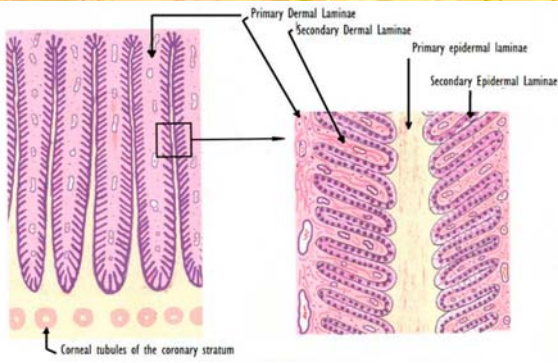


Figure 141. Juan A. Claver & Alejandro Gimenez Urquiza (2003) Hoof cut which allows to appreciate the three stratum of the hoof Wall and the way they originate at the level of the coronary edge [Drawing]





Figures 142, 143, 144 and 145. Juan A. Claver and Alejandro Gimenez Urquiza (2003) (Figure 142) diagram illustrating the formation of corneal tubules and the intertubular horn from the areas of growth, (Figure 143) scheme of the laminar stratum cuts, (Figure 144) schematic section of the hoof which illustrates the place where the Horseshoe nails are inserted and (Figure 145) three-dimensional diagram that illustrates the transition between the Wall and the sole [Drawing].

9. GROWTH AND RENEWAL OF THE HOOF

The hoof has a continuous growth throughout the life of the animal, similar to what happens with the nails in other mammals as the man.

The regeneration of the *wall* takes place at the level of the basal layer of the epidermis that covers the coronary corium, in the proximal part of the hoof. Above the *dermal papillae*, the horn tubules originate, while the intertubular horn emerges from the epidermis that covers the interpapillary areas. The same applies to the perioplic layer.

The *sole* and the *frog* grow similarly to the coronary region.

The growth of the *laminar region* is different. The basal stratum overlying dermal laminae has a very slow proliferation and the keratin which is accumulated between them (primary epidermal laminae) is dragged down very slowly by the growth of the medium stratum.

Only the primary laminae move distally. The secondary and the stratum germinativum do not suffer displacement. This type of slide is known as *contact sliding* and assumes a constant rearrangement of desmosomal joints between epidermal cells. Something similar occurs during the growth of the nail above the nail bed.

The whole hoof grows in a supportive manner and at a speed that is offset by the wear in the distal regions. Growing at a rate of between 8 and 10 mm per month and being all its structures completely renewed in 8 to 12 months. As growth is uneven across the wall, the renewal is faster in the heels than in the toes. Growth compensates for the wear of the sole against the ground. In shod asses, as such wear does not happen, the farrier should lower the hoof regularly (trimming). In the case of horses

the sole wears out as it grows, this does not happen so in asses being therefore necessary to proceed to its trimming.

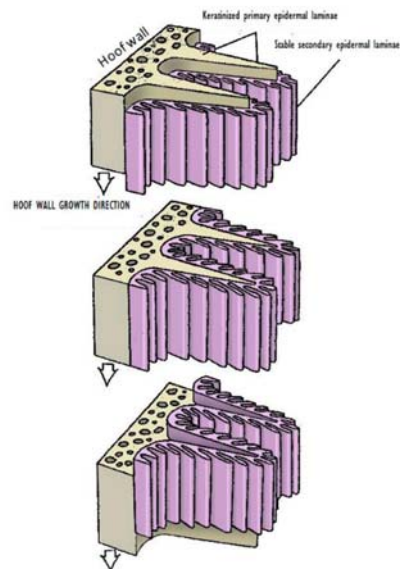


Figure 146. Juan A. Claver and Alejandro Gimenez Urquiza (2003) scheme that illustrates the growth at the regional laminar level [Drawing]

10. HOOF VASCULARIZATION

The different dermal regions, on which the hoof rests provide it with the adequate vascularization needed for nutrition and its growth. Areas with increased capillarization are the growth ones, i.e. the coronary and the sole regions. The laminar region, as it does not actively participate in the growth, consequently presents a lower blood supply only suitable for the maintenance of the stratum germinativum and the dermo-epidermal junction.

The hoof presents numerous arteriovenous anastomoses, which are important in *thermoregulation* of the foot. So that horses can withstand very cold climates without getting their feet frozen. Usually, these anastomoses are closed and the flow is slow, going through all the capillary networks (maintenance circulation). When the foot temperature lowers to critical levels anastomoses are opened, and move on to a fast circulation (of global warming). As a result, it could be stated that the hoof grows more slowly in winter than in summer.

The extensive venous system of the foot, apart from its circulatory function, acts on the damping of shock absorbing part of the impact of the stance phase. The veins of the foot do not possess valves and the same foot acts as driving pump of the venous return.

During stance phase the venous plexuses are compressed between the hoof and the third phalanx, thus forcing blood upwards toward the leg, as the pressure increases and the shape of the digital pad and frog changes. Once the foot is elevated this compression is released and the blood returns flowing through the veins again.

Therefore, moderate exercise promotes blood flow, the oxygen supply and the

correct growth of the hoof, while a lack of exercise will entail not only the drying of the hoof horn wall but a poor nutrition of it and the consequent delay or absence of growth.

11. DISTRIBUTION OF FORCES ON THE HOOF

The digital pad is a mass of flexible material that contributes to the formation of the heels. This structure is one of the primary impact absorbers of the foot.

Therefore, much of the concussion for the movement is absorbed by the hoof and this structure located beneath the pedal bone, which absorbs and dissipates the weight from the short pastern bone.

This mechanism widens the lateral cartilage, which expands the heel, absorbing the contusive forces shared over a greater surface area, i.e., when the weight is distributed over the hoof, the pressure is transmitted from the phalanxes to the wall and from the digital pad to the frog.

The frog, a highly elastic wedge-shaped mass, usually makes contact with the ground first, press the digital pad, which is flattened and is forced out against the lateral cartilage. The frog also flattens and tends to push bars away separating them from the wall, widening the surface on which the forces act and easing pressures.

When the foot is raised, the frog and other flexible foot structures go back to its original position.

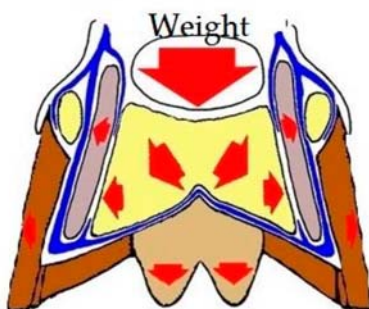
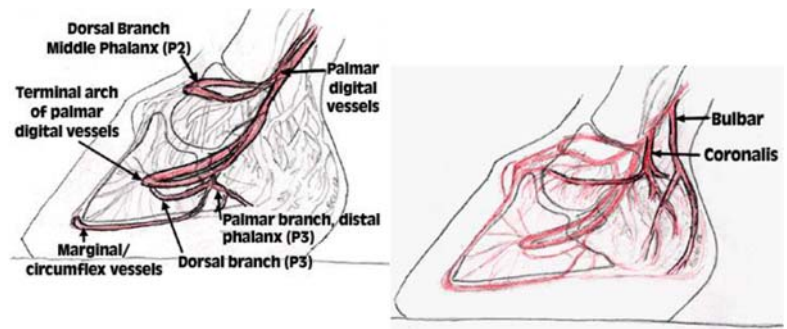


Figure 147. Craig Wood (2013) Mechanism of propulsion of the blood of the hoof [Drawing] Accessed from <http://www.extension.org>



Figures 148 & 149. Amy Rucker (2003) (Figure 148) blood supply of the hoof in which the main vessels that compose the blood supply of the hoof are shown and (figure 149) diagram which shows the main blood vessels of the hoof - bulbar and coronary arteries. Bulbar artery originates from the pastern and provides the heel with irrigation. So that even with a significant rotation, many animals affected with laminitis or laminitis, will even have a blood supply for both the heel and the frog [Scheme] Accessed from <http://www.thehorse.com/>



Figure 150. Effigos and Hoofcare Publishing (2013) Tridomentional Image of the vasularization and lymphatic drainage of the equid hoof [3D] Accessed from <http://hoofcare.blogspot.com.es>

12. HOOF ASSESSMENT PREVIOUS CONSIDERATIONS

When we assess the condition of the end terminals of the limbs, a terminology that facilitates any helper that we have, or any professional who treats the same animal, after the procedures implemented for each case, is necessary.

Proceeding methodologically always prevent us from ignoring any region that provide us with information about the status of the animal.

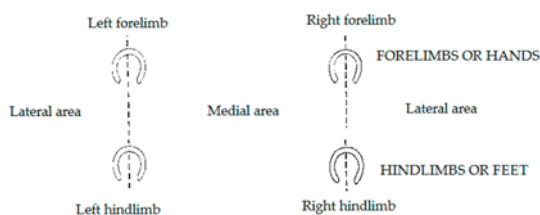


Figure 151. Francisco Javier Navas González (2014) *Spacial distribution and Donkey hoof terminology [Drawing]*.

Once all the points previously described in the scheme have been valued, we can issue a verdict that will allow us to apply the corresponding farriery methods according to our diagnosis treatment, applying all the necessary care to the animal at the same time, from cleaning the hoof with a suitable tool (hoofcleaner) so that we preserve its sanitary and hygienic condition, remove stones that may have been accidentally embedded in roads to removing the manure from the stable which could lead to an infection of the foot, among others.

13. HOOF CHARACTERISTICS AND COMPOSITION

The hoof, as well as being the corneal case that protects the bottom of the short pastern, pedal and coffin bone and, the lowest portion of the deep digital flexor muscle tendon, preventing it from wearing, serves, along with the described junctions that begin in the pastern, to cushion the impact on the ground).

The ass hoof tends to be cylindrical and to present a small size, showing a good quality and high hardness, always when they belong to a healthy animal, in particular, at the level of the wall.

A healthy and strong hoof will present a solid and resistant corneum stratum, able to protect the internal structures from external pathogens, and the hardness and roughness of the ground, reducing the pressures that are exerted on the animal because of the weight. As it is well known, hoof care is essential for the proper performance of activities involving the use of equidae. So there will be a higher incidence of diseases such as laminitis, or foot sepsis in those cases in which animals suffer from a poor health and general care.

In the case of asses, the most of the problems arising in the hindlimbs, used by the equidae for their propulsion are closely associated with a poor hygiene. A resistant hoof can promote self-regulation or its natural care, reducing the need for care and hygiene operations to regular trimming (Tocci and al., 2010).

The quality of the corneal wall depends on endogenous and exogenous factors. The endogenous factors are chemical composition, the structure of the corneum stratum, its chemical composition, the amount and distribution of the intracellular fluid, and type of keratin, its quantity and distribution within the cell.

On the other hand the exogenous factors are the management methods carried out, diet, weather and climatological seasonal effects. Always considering that there may be differences between the different existing donkey breeds' hooves. The ass hoof tends to be cylindrical (ratio between the circumference of the Crown and the circumference of the sole of the foot equal to 0.91, and therefore superior to the ideal standards for horses (Catalano, 1984), 0.86) and of a small size in a standard way for the different donkey breeds (Bossi, 1926). Donkeys have a more compact and less conical hoof (more cylindrical than horses).

Donkey hooves are more upright, harder, more resistant, and more elastic than the horses. The asinine hoof bulbs are less developed and its fusion with the heels is less complete, being naturally long heels. The pastern angles are greater than the horse ones. The frog is not developed in order to support the load of the weight (McClinchey et al., 2011).

Provided that they belong to a healthy animal they will show a good quality and high hardness especially in the wall ($H = 126.5 \pm 3.3$), followed by the sole ($H = 105.2 \pm 3.3$), and the white line ($H = 74.0 \pm 3.3$), which is justified since this last region is the conjunction between the wall, the sole and the internal structures of the hoof.

This region is the softest and therefore the most vulnerable against fungal and bacterial infections (Budras et al., 1998; Faravelli et al., 2004).

Donkey hoof proves to be stronger than the horse one or at least proves to be more rustic skills. Its wall has a medium thickness equal to that shown in the references for the horse found in literature. While the white line shows an average of about 3.98 mm thickness (3 mm for horse, 1/8 inch) (*Farcus and Alloway, 2010*). Its composition would confer it properties according to which when reduced to ashes this would be applied as a medical remedy since the ancient Greece (see Book 2, Chapter 3).

ELEMENT/MINERAL	WALL	SOLE
Aluminum, ppm	315.2±25.2 ^A	216.9±25.2 ^B
Calcium, ppm	1350.0±54.2	1354.6±54.2
Iron, ppm	437.8±65.5	589.2±65.5
Potassium, ppm	1067.7±112.8	1690.5±112.8
Magnesium, ppm	286.7±20.5 ^b	347.7±20.5 ^a
Manganese, ppm	54.4±6.3 ^a	35.2±6.3 ^b
Sodium, ppm	267.6±15.0	249.2±15.0
Phosphorus, ppm	193.5±12.6 ^A	234.3±12.6 ^B
Zinc, ppm	108.7±3.7 ^b	120.1±3.7 ^a

^{a,b} P<0.05; ^{A,B} P<0.01

Table 1. Sargentini, C. et al. (2012) High concentration mineral composition in the donkey hoof.

ELEMENT/MINERAL	WALL	SOLE
Copper, ppm	4.4±0.6	3.5±0.6
Lithium, ppm	0.7±0.05 ^A	0.2±0.05 ^B
Nickel, ppm	23.5±4.9 ^A	3.7±4.9 ^B
Lead, ppm	3.6±0.2 ^A	0.9±0.2 ^B
Selenium, ppm	3.8±0.7 ^A	0.4±0.7 ^B
Strontium, ppm	4.4±0.9	3.2±0.9

^{A,B} P<0.001

Table 2. Sargentini, C. et al. (2012) Low concentration mineral composition in the donkey hoof.

Raw protein content is very high, higher than the existing data references in literature. The high concentration of heavy metals (Al (from the environment), Li (6.5 ppm in the wall and 1.5 in the sole), Ni (23.4 ppm in the wall and 3.7 ppm in the sole) coming apparently from a diet rich in seeds with high content in Ni 2-3 ppm, Pb (3.4 ppm in the wall and 0.7 ppm in the sole) and Se, (the low content of this mineral, 0.1 ppm is beneficial since a high content of it has shown to cause hair and horsehair loss, laminitis and fragmentation

and wall fracturing). Some authors add that any altered hoof has double the Se concentration than a normal one), especially in the wall, contrary to cause problems in the hoof, indicates the high adaptability of this species to hostile environments for the foot of equids, showing their natural resistance to toxic elements from the environment that surrounds them. The sole has a high Mg, P and Zn content, showing reverse trends compared to existing bibliographic references concerning the horse. It seems that those hooves which presented pigmentation possessed a more elevated content in this mineral.

The average content of Cu 4.5 ppm, is equal to its contents on the Earth's surface which seems to find its origin in the environment surrounding the animals. The positive correlation between Li, Pb and toughness confirms its tolerance to harmful elements. The negative correlation between K and hardness can be correlated with the high accumulation of organic matter that causes hoof softening.

The negative correlation between Zn and hardness can be explained since this element is involved in the building of keratin (Zn-Protein), but it is not related to hoof hardness.

The negative correlation between the K with Li and Pb is very interesting, which may indicate the tendency of K to remove potentially harmful elements thanks to its osmotic activity. The hoof appears to act as a bioacumulador and as a purifying or emunctor body of harmful elements.

Sr can derive both from the diet and the environment and has a high antioxidant activity meant by its relationship with the enzyme Superoxide dismutase (SOD), which together with the relation that this mineral has with Ca favours a better quality hoof.

The hoof, as we have seen is a very complex structure and the factor that will mainly mean a 99% of the sound information of animals, a tool that can provide us with the diagnosis of problems that we must consider with caution as lameness, laminitis, etc.

The balance between the growth of the hoof and its wear has frequently been altered since these animals have suffered a domestication process throughout history that has relegated them to be placed on territories in which the characteristics of the land did not precisely favour this balance.

Given these animals evolved over a rough terrain, to make sure that an animal is exposed to healthy living conditions and care this it should perform a daily movement of at least 15 Km regardless of the routine of exercise or gait which is described (walk, trot or gallop) on hard ground so that the hoof can be developed correctly.

This ensures the proper blood supply to the internal structures of the hoof and proper oxygenation derived from it, as well as an adequate interception of impacts, aspects that provide hooves with a good quality corneum stratum avoiding them to weaken and damage themselves thus resulting a vital fact to animals.

The corneum stratum of the hoof consist of very fine helical corneal tubules, which are only visible as vertical lines in the capsule of the hoof. Incredibly, a donkey hoof has the same number of corneal tubules and these are as large as athe ones in a horse one, therefore, why do thir hooves have a higher hardness?

With these hooves being usually smaller, the tubules are packaged in a more compact way, something that makes the hoof of asses harder and therefore more difficult to wear, especially on soft ground.

This can lead to problems if the donkey does not do the daily necessary exercise on the appropriate ground, or if regular trimming processes are not held in order to stimulate wearing.

One of the ways in which the owner can help his/her pets to keep this natural wear, is to have gravel or river stones on those entrance routes or places where they feed on hay or feed, so that even in winter and fall when the ground is wet, the feet of his/her animals walk on solid ground.

14. THE IMPORTANCE OF MOISTURE

The low moisture content ($\% = 11.7 \pm 3.2$), highly influenced by seasonal, geopedological, animal management factors and which condition the mechanical qualities of the hoof, is higher than in the sole but lower than the one found in literature for horse references but still remaining the same in the Mediterranean donkey breeds, which can be related to the African origin of this species.

Therefore, moisture conditions by far the quality of the corneum stratum of the hoof and its content of water-soluble substances. The moisture of the sole is connected with the absorption capacity of this region, particularly in the closest portions to the white line which has less storage capacity (*Bertram and Gosline, 1987*).

The moisture content is less than the one found in literature (*Butler and Hintz, 1977; Bertram and Gosline, 1987; Kung, 1991; Douglas et al., 1996; Patan and Budras, 2003; Landers, 2006; Putz, 2006*) for different horse and pony breeds, varying in such cases from the 16, 20, to 35% according to the authors. In general, the higher moisture exists the more flexibility will increase and hardness will reduce resulting from a greater drying, complicating in this way the possibility of breakage.

Normally, the hoof wall grows at a rate of 0.95 cm per month (3/8 inch, taking 8 months to 1 year for it to grow from the crown to the ground, i.e., to be renewed completely), with this renewal taking place in a more evenly way than in the wall, and more quickly in the heels than at the toes. New layers are added to the hoof wall continuously downwards from a band of tissue called the crown or coronary band (coronary corium), located at the transition between the skin and the wall of the hoof.

The hoof wall is covered with a material called periople that regulates the humidity and prevents it from evaporation, produced from the perioplic corium, which gives it origin from below the frog, which is so important to maintain the flexibility of the hoof or on the other hand to avoid its hardness and dryness and that tends to be removed during the process of farriery.

When the presence of this material is poor, the hoof becomes dry and a wearing, lamination or excessive cracking could take place. Proper hoof coating prevents it from drying out too much.

The raw protein content, predominantly keratin represents a 98% from the dry material, showing higher values than those found in literature for horses, ranging from 93 to 94% (*Huntington and Pollit, 2005 and Jackson, 1996*, respectively).

The moisture of the hoof is intimately linked to external weather conditions.

When the weather is dry, it is essential that asses get proper hydration in their hooves, to thus allow their adequate flexibility, since as it has been previously mentioned we must understand the hoof as a mobile structure.

A dry hoof will not allow a proper expansion of its walls. If a hoof may not expand properly, the blood circulation and the absorption of impacts will be reduced.

A reduced expansion will mean a reduced circulation, which is essential for the tissues that build the internal structures, called corium, from which the corneum stratum grows. If the blood is reduced due to a hard and inflexible hoof, the corium will not be capable of producing a good quality corneum stratum, contributing to problems in the hoof.



Figure 152. Cooksweell Jikos (2010) New Year's Eve Bath in Shela, lamu [Photograph] Accessed from <http://www.flickr.com>

During the very hot and dry seasons, hooves can become too dry, hardening and cracking as a result. Moisture can be returned or reconstituted with a daily water bath. Using a very soft brush to make the outer layer or periople which will be weakened on these occasions not to be damaged.

In the wild, donkeys look for a source of water daily. They get into the water to drink. Therefore, hooves have adapted to this and require this custom to maintain themselves flexible. In order that this custom can be kept in pets, it is important to soak the donkey's hooves above their crown for 10 to 15 minutes every day when the weather is dry.

Alternatively leave our animal rest over a shallow pool or in a course of water for a few minutes every day until hooves become softer and less fragile. This can be carried out in a bath enabled for this purpose, with tubs, buckets or individual containers for each limb, building a kind of ford or pond around the water source that would normally be placed at a higher position, preventing this contact with hooves, trotting along the beach, or resting in rivers and streams flooding an area and using an old

carpet to prevent slips, among other options.

Sometimes oils or fats are rubbed on hooves prior to a show. Special hoof oils or fats may be helpful. However this is not necessary if the donkey is being provided a balanced diet. Hoof oil prevents moisture to escape but as it will also prevent this from penetrating from outside. Therefore, it is not a good idea to use oil in hooves that are suffering from dryness or those showing an apparent fragility.

The continuous contact with the ground and extreme temperatures that hooves typically resist, often reheats them too much, especially during the summer season. It is above all, in this dry season when moisture should be preserved. A proper cleaning and applying fat to hooves (for sale in specialist shops), if the situation allows it, tend to solve the problem.



Figure 153. Shravan Vidyarthi (2014) The bath of a donkey on the coast of Zanzibar [Photograph] Accessed from <http://www.shravanvidyarthi.net>

Depending on the environment in which the donkeys live, they may be located on a muddy or too humid ground, as it happens in those areas with high rainfall, cases in which we will use an ointment made from juniper tar.

15. BEHAVIOUR AND EDUCATION WHEN FACING HORSESHOEING

Once assessed and issued a proper diagnosis, we must approach the animal with decision but respect at the same time. While it is true that the subjects of our work may have previously been educated in the task of being receptive and let us handle their limbs as far as possible without presenting an added difficulty to the mere development of the activities that horseshoeing, cleaning and maintenance of the hooves consist of. Donkey handling, care, shoeing and hoof trimming can be one of the situations for which an ass may choose to kick.

The first thing that you must try is to gain their trust and show that it has no reason to be uneasy or scared and therefore show that there is no reason why to kick when they are having their hoof worked on. A priority we should bear in mind is to stay safe. The donkey can kick both backwards and sideways.

When we do not know which it will be the way our ass will react when we handle its legs and feet, we will try to place ourselves near the back, or as close as possible to it. The more comfortable our animal be the easiest it will also be proceeding with its management. Brushing its neck, shoulders and back can be a good optimal starting point. We should not start directly by any act that may be strange or make it be uncomfortable. A nice brushing will soothe it and distract its mind from the tasks that we are carrying out and that could scare it away.

In this way, from a safe position and being attentive to their reaction, we will brush its forelimbs down. If the donkey is not comfortable with brushing on its forelimbs, we will brush their back or neck once or twice, and then we will extend one of the strokes from the back up to their limbs. After

that, we will brush their back a few times more.

Repeat this procedure by increasing the reached distance from the back up to the tip and continue observing that our ass is comfortable. Our donkey will associate the fact that nothing bad happens when this strokes 'accidentally' go further, so that they should not be frightened when we touch it in this region. The first thing that you must try is to gain their trust and show that it has no reason to be uneasy or scared and therefore show that there is no reason why to kick when they are having their hoof worked on.



Figure 154. FarmgirlFare.com (2010) Donkey being brushed in the neck [Photograph] Accessed from <http://www.farmgirlfare.com>

Once the ass has accepted all brushing up and down and around its forelimbs, we will proceed to work with the hind ones. We will start with their backs, area where the brushing will give them comfort. When they relax, start brushing backwards in the direction to the hip. If the animal shows signs of discomfort at any time, return to any area in which the animal may be comfortable and start again. We will continue applying this comfort pattern slowly proceeding from its hips toward the hocks, around the flank and between its hind legs, always when such comfort allows us to move forward.



Figure 155. Jon Katz (2013) María grooming Simon and Lulu while Fanny awaits [Photograph] Accessed from <http://www.bedlamfarm.com>

It may be that we should start stroking with some sort of extension (for example, a glove at the end of a short stick, or a whip), so that we can stay out of the range of any kick to be sure that the ass is comfortable with what we do and that it will not kick us. Once we see that the ass allows us to brush it without becoming uneasy when varying the extension and getting more down towards the limb, we can start to use our hand to stroke it and brush him in the same areas. Take things calmly and only proceed as soon as the animal shows peaceful signs.

Depending on the past experiences of each animal and its trust in the person who carries out this training, we can successfully complete the first sequence from few minutes up to a few weeks. Patience and observation of the reactions denoting the comfort of our ass are the key for success during this process. Once our ass is comfortable allowing us to brush its hips, hocks, and between their hind legs, we will continue with the training sessions.

Each step can take us a few days until for it to be successfully completed, but we must not fall in despair, we must take our time and we will not be able to proceed until the ass is ready. An assistant will be very useful facilitating the following phases of training, holding the leading rope or guiding the animal or keeping it tied firmly.

In this way, the ass cannot move far away from us as we try to teach it how to lift its foot for the first time. To begin this sequence, forelimbs tend to be the best option, since donkeys usually show less anxiety when they are able to see our position while proceeding. We will resume the first grooming phase by repeating the steps until the animal is comfortable and relaxed.



Figure 156. *Els Rucs del corredor* (2012) Kids grooming a donkey
[Photograph] Accessed from <http://blog.canguroencasa.com>

Meanwhile, positioning ourselves facing the tail, we will support and gently slide a hand down the front side of the front leg up to just above the joint of the fetlock. This will be the hand on which the lower portion of the leg will rest once we lift the limb. If we are right-handed, and use our left hand for lifting their feet, we will have left our right hand free to operate with the hoofpick or any other tool.

With the other hand we will slightly pinch the back of the forelimb, in more or less the same position, often on each side of the flexor tendon. This small pinch will encourage them to raise the foot.

As soon as they allow us to raise the feet, we will return it to the ground immediately, but carefully, and we will congratulate and generously reward them. We must make sure we return the foot to the ground rather than simply drop it since this could damage them and thus make them more reluctant to cooperate with their feet elevation in future attempts.

Positive reinforcement through the immediate greeting is very important. Usually the animals were surprised the first time we lifted up their feet and hold them in the air. The return of the feet to the ground and the immediate reward, will let them know that they correctly performed the assigned task and this was a pleasant experience.

As a reward, from food bribes, strokes on their favorite body parts (inner surface of ears very rich in nerve endings, for example) or a combination of both can be used.

Once we have congratulated them, begin brushing its back and legs again until they are relaxed and comfortable. We will ask our donkey to lift one of its forefeet again and repeat this task a few times with each of the forelimbs.

This phase can be achieved very quickly or take a few days until the ass is able to carry it out in a completely comfortable way, so that we can proceed in this way.

We should be patient, at the end of these phases our ass will rely on us, and this will be a solid basis on which to support future training sessions.

Then we proceed with the hindlimbs in the same way. For this, we will need a $\frac{3}{4}$ inches thick in diameter cotton rope (1.9 cm) that will be difficult to find in some supermarkets.

It is important that the rope is made of cotton because synthetic strings will promote burns derived from the friction of the rope. We will need about 4.60 meters (15 feet) of it.

First, we will hold the rope slightly rolled over itself (do not roll it around our hand as we could hurt ourselves), and start to stroke the ass body with the hand full of rope, starting from the back and backwards and vice versa.

CURIOUS FACTS

THE BLACKSMITH AND THE DEVIL

Once there was a poor blacksmith who had no coal, no iron, or anything to eat.

One day Jesus and Peter passed their house by, with a donkey. And Jesus told the blacksmith that if he wanted to get the donkey they were carrying shod. The blacksmith said yes, but also that he had almost anything with which to do it so. He put some coal he had in the corners of the coal cellar together with his nails and said:

-Now I need iron ... I'll dismantle a hammer. And from the hammer he built the horseshoes and was finally able to shoe the donkey.

-Well ... Now let's see how much your fees are' Said Jesus Christ.

Well, what am I going to ask you for? Said the blacksmith. You may be so poor ... you don't have anything nor do I.

-Well, sure, three things you ask me for I can give you, told Jesus Christ.

And Saint Peter, who was with Jesus Christ, whispered the blacksmith in his ear:

-Ask him for the glory. Ask him for the glory

Then the blacksmith told Saint Peter:

-and you? Why do you mind what I am going to ask for? And the blacksmith asked Jesus Christ:

ask for anyone who sits on my chair not to be able to get up without my permission..

-wish granted –answered Jesus Christ.

-The second thing: I ask for anyone who climb my sour c herry tree not to be able to get down from it without my permission.

-Granted.

-The third one: I ask for everything that come into my pocket not to be able to leave it without my permission .

-Granted.

Then the blacksmith was left as he had always been starved to death, with his dog called, Necessity.

Then it turned out to be that, once he was thinking, as he was not able to find the way to earn for a living. So that he agreed to sign a contract with the Devil in exchange for his soul, as long as he send him wealth. The devil accepted the contract and, providing him with life for ten years. During that time the blacksmith received all the wealth he had wished for and made a palace out of his vegetable garden.

Once the ten years passed, the Major Devil came in search for the blacksmith.

-“OK, look”, he told the Devil. “As it is going to be the last time, let's have a jug of wine to cheer up as we go down.

-Sit! Sit on the chair!”.

The Major Devil sat on the chair and once the wine jug was finished, the blacksmith said the Devil;

-“Well... Let's go whenever you want”

-“The question is that I am not able to get up”, answered the Devil.

-Well, who's holding you? If nobody does it.

Let's go man!

Let's go whenever you want!

-“I can't”, told the Devil

-“Well so if you can't, what can I do?”, told him the blacksmith.

There you stay... How many years do you give me more life for, and I will let you go

-“I will let you live 10 years longer”, replied the Devil.

10 years later three demons came to take him. Again he told the oldest devil to sit on the chair, and also told the two other to climb the sour cherry tree up, and told them,

-“Get some sour cherries to have tea together”

He offered a wine jug to the Oldest Devil, and started to have tea, while the rest of the devils came back from the tree

Then the Oldest Demon told both of the other demons,

-“Ok, the ones on the sour cherry trees, don't you go back with us?”

-“Yes!”, told the blacksmith, “Is time for you to come back!”

-“We cannot go down”, said the other demons.

-“So, who is depriving you if nobody holds you?”, told the blacksmith.

To which they replied;

-“We don't know but we cannot go back...”

Then, and considering both demons were not able to get down, the oldest demon said;

-“OK...if they cannot go back, we will go together” But he was not able to get up and said;

-“But I can't get up either”

-But, who is depriving you?, told him the blacksmith.

-Nobody does, but I can't get up

Then the blacksmith told him;

-“Well so if you can't, what can I do?”, told him the blacksmith.

There you stay... How many years do you give me more life for, and I will let you go

-10 years longer.

Ten years later three thousand demons came to get him, and he said as he had always said to the Oldest Demon:-“Sit on my chair”.

He prepared another wine jug and sent other two demons to get some sour cherries from his tree, so that all of them could eat them together.

After some time he told them;

-“Well; but, are you coming back here to eat them together?”

-“We cannot get down”, they told.

-But, who deprives you?, Told them the blacksmith.

And he said to the rest of the demons that were present.

-So clever you are; So much knowledge you have!And they said;

-We know how to do many things.

-“You do not know how to do anything!”, told them the blacksmith.

-“Of course we do many almost impossible thingsChap”, said the ter 8 demons

-“OK, I dare you to get inside the body of that ant”, told them the blacksmith.

-“Of course we do!”

-“I bet you don’t! I bet that you do not know how to do anything! Do you?!”

-“You will see we can!”-“OK, Let’s see it!”

And the demons got into the body of the ant, and the blacksmith took it and place it into his pocket. As they were not able to get out from there, neither the ant nor the demons, said the blacksmith.

-“You are not going to bother me anymore, I have got all of you caught”

The wars ended because there were no devil; the scribes starved to death; the judges and lawyers also did. And when all of them knew that the blacksmith had all the devil trapped, they intended to kill him by giving him a beating, because all of them were starving to death.

So that the blacksmith got to an agreement with the demons

-“I will release you if you do not bother me again, if you do not accept I will kept you in...”

-“Sure, Let us be free”; answered the devils- “if you let us go we won’t bother you again and won’t remind about you anymore”.

The demons went away, and the blacksmith, who was called Misery, stayed with his little dog called Necessity.

One day the blacksmith got to his time of death; and knocked on Heaven’s door.

Saint Peter opened and told him:

-“Go away from here!, I told you to ask for Heaven, now go away!”

Then the blacksmith went to purgatory, but they still did not let him in.

So that he went to Hell. Knocked on the door and the Oldest devil put her head out, saw him and scream:

-“Close it! Close it! He will bother us!

He is more of a devil than we are.

And the poor blacksmith, went back to Earth with his small dog, Necessity, where he is still walking

Castilian Tale. Anonymous. Arbejal, Palencia. Narrador XLIIth Narrator 24th of May, 1936. Source: Aurelio M. Espinosa, Jr.

<http://casadelabuelasilvia.com.ar/>

Once the ass is comfortable with these rope strokes around its backs and hips, we will pass the rope through and between the hind legs, around one of the two limbs, so that in this way we have both ends of the rope in our hands and the tie loosely arranged around one of its hind legs above the hock (Figure 157). This part should be done well having the donkey tied or with an assistant holding the leading rope to prevent the ass from going away.



Figure 157. Kristie Jorgensen (2005) We will pass the rope through and between the hind legs, around one of the two limbs, so that in this way we have both ends of the rope in our hands and the tie loosely arranged around one of its hind legs above the hock [Photograph] Accessed from <http://longears-small.com/>

If the donkey is comfortable with this step, slide the rope carefully back to front so that this gets used to having something touching it moving around its leg. As the donkey get adapted to this gesture of moving the rope back to front and top to bottom, let the rope go downwards slipping closer and closer each time until it is comfortable when you slip the rope up and down and back to front around any point of its limb (Figure 158). If at any time the animal began to be uneasy or uncomfortable, we will return to the point of the leg where it was still comfortable and we will start again thence.



Figure 158. Kristie Jorgensen (2005) If the donkey is comfortable with this step, slide the rope carefully back to front so that this gets used to having something touching it moving around its leg. As the donkey get adapted to this gesture of moving the rope back to front and top to bottom, let the rope go downwards slipping closer and closer each time until it is comfortable when you slip the rope up and down and back to front around any point of its limb [Photograph] Accessed from <http://longears-small.com/>

The advantage of this training according to the standards we are describing is that we can be sure outside the scope of a possible kick, while our ass is getting used to having its limbs handled.

Once you can slide the rope around any point of the leg of the ass, let the rope slip down until it be placed at the end of the pastern, just above the hoof (Figure 159).



Figure 159. Kristie Jorgensen (2005) Once you can slide the rope around any point of the leg of the ass, let the rope slip down until it be place at the end of the pastern, just above the hoof [Photograph] Accessed from <http://longears-small.com/>

Then we will pull from the rope a few times, applying pressure on the area. Normally at this point the ass will hesitate or show signs of insecurity when facing the action we are carrying out (Figure 160). We will resume the previous step sliding the rope up and down and around its limb then proceeding to apply pressure again.



Figure 160. Kristie Jorgensen (2005) Then we will pull from the rope a few times, applying pressure on the area. Normally at this point the ass will hesitate or show signs of insecurity when facing the action we are carrying out (Figure 160). We will resume the previous step sliding the rope up and down and around its limb then proceeding to apply pressure again [Photograph] Accessed from <http://longearsmall.com/>

Once our ass stops hesitating or showing insecurity when we apply pressure, we will ask it to let us lift its foot by adding more pressure to the rope and then carefully returning it to the ground, releasing the pressure. This is usually the point in which most of the donkeys which are likely to kick will do it. The goal is to try to avoid reaching a point in which asses decide to launch a kick, showing them our authority with a dry and diligent voice just prior to their kicks, so our animals can learn that they should not throw kicks unless they want to get into trouble with the trainers.

Once the ass is relaxed and it let us move the rope sliding up and down and around the hind legs, and it is not bothered when we lift its foot with the rope (Figure 161), we can continue with the process. The use of a

relaxed or calm voice that soothes the animal at this point will be extremely useful.



Figure 161. Kristie Jorgensen (2005) Relaxing the donkey which allows us to lift its foot [Photograph] Accessed from <http://longearsmall.com/>

Still using the rope, we will ask our ass to let us raise their hind feet and return them back to the ground carefully. Repeat this action several times increasing the time that we ask it to keep its foot above the ground.

Some donkeys become impatient or nervous if we keep their feet lifted more than a few seconds at first, but with practice and patience, they will soon learn to expect that we return their foot to the floor.

Once our ass is completely comfortable with this, it does not doubt or is opposed to do it, and it simply rests standing while we hold its foot with the rope, we will move forward to try to lift the foot with our hands. First we will lead our hand down by the external side of the hind leg, from the hip to just below the hock.

Then we will gently lift the limb with the hand without surround it all, only holding it as it can be seen in Figure 163, with our hand in this position we can keep ourselves safe from any attempt of kicking when performing this task.



Figures 162 & 163. Kristie Jorgensen (2005) (Figure 162) We start leading our hand down from the hip until placing it below the hock & (Figure 163) we lift [Photograph] Accessed from <http://longearsmall.com/>

We will raise its leg and return it to the ground, repeating the process until our animal is completely comfortable with it.

As it grows in comfort with our operations, we will begin to get more down its leg, holding its back foot at the level of the hoof, and finally swinging it back and pounding as a way of preparation for the real care of the hoof.

We must be patient and go slowly so that our ass trust us. If we maintain a relaxed attitude and our ass is comfortable with our proceedings, it will be a much more enjoyable experience for both.

Once our donkey accepts and is comfortable with lifting up both of its forelimbs and hindlimbs, we can proceed to adapt it to the hoof care tasks and trimming. We will normally start with forelimbs in the first place.

We will flex the forelimb holding it by the hoof.



Figure 164. Kristie Jorgensen (2005) We will raise its leg and return it to the ground, repeating the process until our animal is completely comfortable with it. [Photograph] Accessed from <http://longearsmall.com/>



Figure 165. Kristie Jorgensen (2005) We will flex the forelimb holding it by the hoof [Photograph] Accessed from <http://longearsmall.com/>

While we hold the hoof in this position, you can use a hoofpick to clean the dirt that may have accumulated. We must bear in mind that there may be more sensitive points inside the hoof of our ass when we be manipulating them.

Generally, they should not be bothered because of our manipulation, but sometimes there are some softer areas, and asses will suffer when we work deep or hard on them.

We should care more when working on these areas since doing damage on them can act as a negative reinforcement, if the animal associates pain with keeping the acquired position or during the procedure of hoof cleaning.

Then once our ass shows no uneasiness and the comfort is total while we elevate its hoof and clean it, we can teach it to behave during trimming. It is important to wear some leather gloves on when using tweezers or tongs for horseshoeing or rasps, since it is very easy to slip and scratch their skin, if we do not put security and protection methods into practice.

When we start rasping the hoof for the first time, we should hold the hoof in the same position shown in Figure 165, and carefully file through the lower part of the hoof a few times. This will cause the hoof to vibrate a bit as we file through it, but our ass will soon adapt not to worry about this.

The following thing that we will do will be educating our ass while we maintain its hoof between our thighs as a farrier would make it, this of course depends on the size of the ass (large sized breeds) with small asses it would not be effective and we could harm them.



Figure 166. Kristie Jorgensen (2005) We will hold the forelimb between our legs. [Photograph] Accessed from <http://longearsall.com/>

We should be at our ass' side, facing its tail. We will rise its forelimb like we do it in training, and will place it between our legs, usually at the level of the knees. We must try not to bend the limb too far from the side since it will be very uncomfortable for our animal. While holding the foot between our legs, our hands will be free to work with horseshoeing irons or the rasps to file the hoof more quickly. The practice of these tasks before the visit from the farrier will let him work much easier.

For small sized donkeys like miniature donkeys, once they are quiet while we lift their hooves and hold them, we will get on our knees by their side, and we will leave their hoof resting on the other knee, to work with it. This only works if the donkey is standing still, and it is much more comfortable for it if we hold their limb between our knees.

We can also practice by tapping and swinging the forelimbs while holding them under different positions, so that they can get accustomed to whatever action we have to perform.

We will work with the forelimbs for a week and will spend the following week working on the hind limbs. i.e., once our ass is totally adapted to us while handling their hooves, rasping and trimming his fore hooves, we can proceed with the hind ones.

Our donkey should be already adapted to lifting its hindlimbs hindlimbs. The next thing that we will do is to teach it not to react to cleaning or trimming in its back hooves. If at some point, we observe that our ass is not comfortable we must only return to the stage in which it be comfortable again and we will continue again until it let us continue working.

We will then begin to educate our ass facing the same way to hold its hoof in which the farrier will do it so when reviewing their

hooves. We will lift and hoof the hind hooves as we already did it during training (Figure 163). Then, we will place our knee in the curve described by the inside part of the hock joint. It may take some time until our animal gets used to this position. This position between standing and squatting can make us be very tired when staying for a long time, therefore we will perform the cleanup work in multiple working stages and resting both, the donkey and we, between each stage. With our donkeys' leg resting on our knee we will have our hands free to work with that hoof.



Figures 167, 168 & 169. Kristie Jorgensen (2005) (Figure 167) we will place our knee in the curve described by the inside of the hock joint and (Figure 168 and 169) with our donkeys' leg resting on our knee, will have our hands free to work with this hoof (different views). [Photographs] Accessed from <http://longears.com/>

We will strongly hold its hoof while we clean it with the help of our hand. We will practice cleaning the hooves of our asses. As with the hooves of the forelimbs, we will be more careful with more delicate or softer areas from the hindhooves. We will proceed in a similar way to how we proceeded in the forelimbs for scraping and trimming of the hooves.

Some donkeys accept these processes more quickly than others.

Often it depends on your situation and your age. If these donkeys have been mistreated when performing these tasks before, it will be harder to rebuild the confidence of these animals again. If they are just a baby and they are only insecure about what we are asking them to do, it can go very fast, it is only necessary to have patience and proceed step by step, always keeping a few simple safety rules. Then we will only have to prepare our donkey for the visit from the farrier. Once the farrier has finished cleaning and trimming its hooves, it will be necessary to file the edges so that for the hoof not to split at the edges. Many farriers use a stand for hooves for this task.

We will have to familiarize our ass with these supporting structures, so, in addition to move its hoof backwards as we have moved it forward until now.

We will start with the forelimb. We will ask our ass to raise its forelimbs as usual, and then put our hand over the front knee, and move its leg forward and upward. We can often make these after having saddled donkeys, to gently stretch the skin below the waist.

We can perform the same action with the hind legs. We raise the limb like we normally do, holding it a few (cm) inches below the hock and carefully raising it forward. We must be careful to maintain and move the limb in the comfortable range of motion of the ass, without overextending or overflexing. The first few times our ass will attempt to move its limb out when we lift it, but then and once they get used to it, they will relax and allow us to do whatever we want with it.

With the help of a block of wood of about 10-30 cm (4 to 12 inches) depending on the size of our ass, we will practice by raising

the limbs of our ass and placing them on the wood block. It may be that we have to hold the limbs to prevent it from withdrawing them out of the block the first times, but it will soon understand what we want to do.

Once we got it, and are able to raise and maintain the limb on the top of the wood block during different time periods, it should be prepared for a farrier to trim its hooves. A patient and friendly farrier will always help our ass to cooperate in the future and be confident in that, what we are going to do, is on their own behalf.



Figure 170. Karen Griffith/peninsula Daily News (2013) Using a hoof support structure for trimming [Photograph] Accessed from www.peninsuladailynews.com/

Another method to continue the process of training (alternative to the rope) also begins with the forelimbs. If our ass is still very nervous with the handling of its feet, we will start moving our hand down the knee congratulating it and rewarding it if it does not take its limb out. If your donkey is one of those donkeys which like being brushed, this may contribute to facilitate us this task, brushing it as low as we can. You will finally be able to lead your hand around all their forelimbs without any problems. Every time it does not accept our hand in a certain position start again returning to a previously accepted position.

As we have already mentioned putting the game of using a more diligent voice into practice when we want to condition our

animal's behaviour until it reaches a calmer attitude when we have already achieved our commitment will greatly help. Once we can lead our hands around all its hands, take one of them by leaning against its back, so that the weight of the animal because of being unbalanced, fall on its other forelimb in this way. We will only raise the limb so that the hoof is out of the ground, but not much more than about one inch above it (2.5 cm).

We will return it to the floor, congratulating it and giving some other bribery as a positive reinforcement. We must make sure not to have our hands around the fetlock (ankle) when we pick up the limb, but if we can put our hand ahead from the hock, surrounding it makes asses be scared, because that makes them think that their limb has been trapped, one of the most dangerous status for a horse.

Once we can raise the foot we will play a little bit with it, making small circles, giving small pats with the toe on the floor, swinging it back and forth congratulating and bribing for each movement that allow us to perform.

We will eventually be able to raise the limb up to the height to which the farrier will raise it during his/her visit. We will start giving it a bribe whenever he raises one of its limbs, then only when two of them have been raised and after that we will not bribe the animal until he has raised all four members. The hind limbs are more problematic in those cases where our animal is not trained.

We will begin by brushing and stroking it but if kicking is a persistent problem we must make use of methods that allow us to get to our animal accustomed to the handling of its limbs, as it has previously been described. We should always employ a clear and diligent 'Don't' every time our ass simply tries to kick, without forgetting that our ass

is just nervous and needs comfort more than anything else.

Having our ass on a rack in which we can stroke it without putting us in danger of being kicked is the best way to proceed. The help of a skilled person and knowledgeable enough or even a skilled farrier will help us in cases of asses that are so unhappy that they reach the point of being dangerous. We must never start to manipulate our ass in their limbs if we do not know how to face it since the concern of our animal will increase with ours.

The majority of donkeys are reasonably easy to train, but something that will make the work much easier is, to ensure that its owner is able to raise its limb and clean it completely or at least to handle it without any problem before buying or purchasing any animal. In this way we will know if an ass is familiar with farriery and hoof care. Once we have begun to train our donkey to lift its limbs, we must make a weekly reminding session so that asses are fully trained, and relaxed to facilitate the work of the farrier or even to make the task of finding a farrier who agree to treat them easier for us (*Helen McIntyre, 2006*).

16. THE OLD DONKEY FARRIER SPANISH OCCUPATION

The occupation of donkey shoeing, despite our lack of knowledge from it, was traditionally highly valued in many municipalities scattered throughout the Spanish national territory (though disused, there are many racks in an excellent state of preservation in the province of Avila, as well as in the Northwest of Toledo and in the southeast of Spain) and this is something that, today, continues in countries around the world that still maintain a close relationship with rural areas, even in large cities as it could happen in some areas from Africa, Asia and South America.

From being carried out by an skilled person in the treatment of these animals up to professional blacksmiths, livestock farriery was a common practice in the municipalities with a transhumance tradition, because cattle had to be shod before leaving; but not only horseshoes were placed onto transhumant cattle, but also on the animals that were used for tillage, and who could be a more remarkable example than the faithful donkey, which was used to be exposed to horseshoeing for a few days prior to carrying out their work, like any other during the preparations for the awaiting tasks that would be carried out in the future (see Libro 3, Capítulo 15).



Figures 171, 172, 173 & 174. *La Cosecha/Puerto Seguro* (2013)
A pair of donkeys being used for tillaje [Photograph] Accessed from Puerto Seguro, 2013.

Dressed in an apron with a bib of leather, the blacksmith or ferrador (in Galician) could be seen shoeing male donkeys and horses, to which he meekly fold their legs, letting him shod them, even at the street, at the entrance of the blacksmith's.

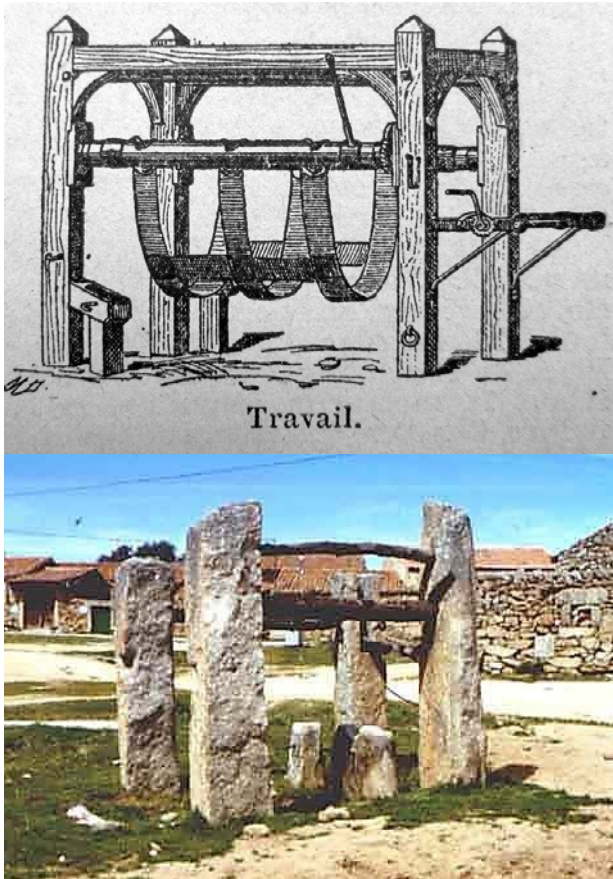
As we have previously stated this trade was put into practice in different locations in different villages, from the main square the food market to known racks near the forge of the town and employees were periodically established to develop not only the farriery of asses, but mainly the one for cattle and horses.

A shoeing rack is a structure allowing to hold the horses, donkeys or even cows to facilitate that they could be shod or to heal any wounds previously caused.

In general, it usually consisted of four vertical stone posts, although they could be made of wood, on which wooden beams were rested allowing to tie the animals properly. The different parts of the rack are: *a yoke with halter* (yoke and straps for the cervix of the animal).

Hooks for straps or cords (front strap and back strap), passing below the belly of the animal; *sticks*, oblique struts leaning on the back posts; *Lever*, a beam that is passed in front of the hind legs below the belly of the animal and that snaps on both sides in the back posts.

Straps or cords pass under the body of the animal and are fastened by means of hooks to the longitudinal beams that are placed at a half-height. One of these longitudinal beams turns on the posts.



Figures 175 & 176. (Figure 175) Marc Roussel & (Figure 176) Navamorales (2007- 2008) (Figure 175) A shoeing rack scheme & (Figure 176) El Ejido's Rack (Almería) [Drawing and Photograph] Accessed from (Figure 175) page 1049 from the Edition of 1925 of "Nouveau petit LAROUSSE illustré" dictionary & (Figure 176) <http://commons.wikimedia.org>

Making this beam turn using a stick that is used as a lever we shorten the reins until the legs of the animal no longer rest on the ground, impeding the recoil movement while blocking the lever.

- *Maroma or strap*: straps or cords with which we attach the animal.
- *To hang*: lift the animal.
- *Roller*: Longitudinal beam with rotation movement.
- *Coat hook*: The corresponding beam, but affixed.

The cervix of the animal bends with the yoke, one of the front legs is tied firmly to the lower longitudinal beam, i.e. the *Stringer* and the corresponding back on the *stick*, or to one of the oblique posts. Tied in this way,

the animal already represents no danger for the farrier.

If the animal shows, however, signals of concern, or tries to kick, straps are strained by rotating the roller.

The horseshoe is attached to the hoof by means of four *nails*, which are stuck with a hammer, after smoothing the bottom of the hoof by *paring-iron*. The knife used to cut out the remains of the corneum stratum and nails: *blade*. Nails are kept in a kind of cloth bag filled with tallow, similar to a pin pad, to soften them and prevent them from rusting. This bag is called *rag full of tallow*.

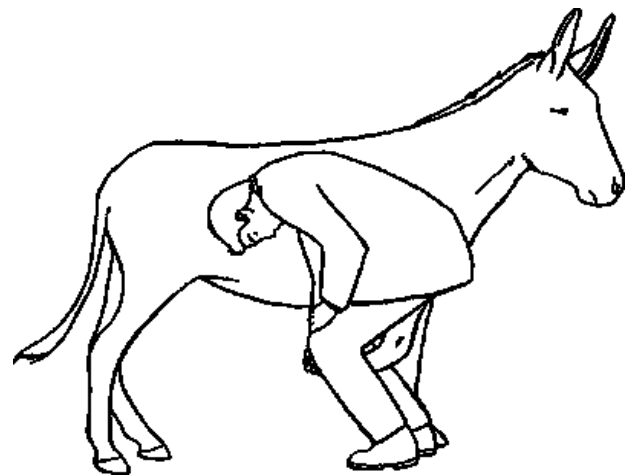


Figure 177. David Hadrill (2002) Scheme of the position of a farrier while shoeing an ass. Depending on the size of the ass we are shoeing the limb should be hold securely between the thighs (larger asses) or at a lower height to avoid sprains [Drawing]

17. PREVIOUS STAGES TO HORSESHOEING

A farrier must periodically make a visit to our asses on a regular basis, and this fact is perhaps one of the most important aspects to take into account especially when we want to keep our animals under minimally adequate living conditions. The frequency or regularity in which this visit should occur depends on the type of ground on which the donkey normally inhabits and the use that it is given, but normally, most donkeys need a minimum of 4 visits per year. In those asses that are not shod the review of hooves must be performed every 4 weeks or earlier.



Figure 178. Combined supplies (2014) Farrier tolos
[Photograph] Accessed from
<http://www.horseshoeshop.com.au>

First of all we must not forget any of the steps previously considered. Economically, today it is more interesting to use industrial shoes, rather than ones hand forged by us. Any well considered farrier, should be able to shoe any equine or cattle forging all of the four horseshoes, and so will need to make use of the following tools and material:

-AN IRON BAR, use it to manufacture horseshoes; fresh or forged iron is typically used, which is iron almost in its purest form, containing about a 0.04% of charcoal. Steel is an alloy of iron and charcoal. Mild steel has a low content in charcoal, between about 0.2% to 0.3%. When heating mild steel it becomes ductile and malleable and if it cools quickly becomes extremely hard and fragile, for this reason when we cool shoes we should do it slowly, in four or five times, and not blowing. Mild steel has a firmer quality than wrought iron and it is cheaper and easier to mechanise, so it is

already used universally, given forged iron is not produced at large scale any longer. Most common mounting plate flat measures are 20 mm wide x 8 mm thick, although these measures may vary depending on the type of horseshoe to manufacture.

-PUNCH, is used to mark the location of the horseshoe where we will then open the nail holes, to use it we should grab it with the whole hand, closing our fist.

-BLADE, used to match the hoof, clean up the frog and trim the sole. My advice is for it not to be too large, since it may be more difficult to handle, and if we make a mistake when cutting, this will be bigger. It should always be well sharpened.

-UNNAILER OR UNCLINCHER, is used to straighten the old rivets, and thus remove the horseshoe without damaging the wall. It has a ridge that is applied on the bent rivet, always hitting on the other side with the nylon hammer. On the other side it has a narrow, slightly curved tip, which is used to remove old nail pieces which are within the wall without a head. If we do not have this tool, we can use an old knife to straighten the rivets.

-RASP, I recommend that they are wide and not too long, since they are handled in a better way. We must use a rasp to level the hoof wall, and other older to rasps the corneum stratum that protrudes out of the horseshoe, and to perform a silver thread. It should be clean with a brush, in order to prevent dirt from embracing them.

-DRIVING or farrier hammer, one end has a square or rectangular end which will be the one with which we will open the nail hole, stamping, while at its other end has a flat face to hit with the forge hammer.

-FURNACE or smithy, tends to be portable and propane gas is used to start them. Its mission is to heat the horseshoes red hot.

-CURETTE or gouge, also called English knife, is used to remove surplus pieces of the frog, and clean side gaps of the frog.

In soft hooves you can use it to cut the sole and even part of the wall. It is also useful when drilling the sole as the point over which to drain an abscess, etc.

-HOOFPICKS, it is a tool that a farrier should never miss to carry in its tool box, to be able to thoroughly clean the hoof and in order that he is able to clearly see the work he has to perform. We should never remove the trash and remnants of sand or any other object within the hoof, with the blade tool, since they would quickly lose its edge.

-HARMMER to nail, there are several types. I usually use the Spanish hammer, who has no ears, though either is good; the key lies in getting used to your hammer. Remember hammer nailing must only strike upon the heads of the nails and never on the blade or the unnauler, since it could skip a piece of steel with its consequent danger for the eyes of the farrier, apart from the fact that the blades break much sooner. As a recommendation for the use of the hammer, we say that our eyes should be fixed in the place where you want to leave the nail, and not in where the head of the nail is.

-FORGE HARMMER, used to work the horseshoe on the anvil. The most usual weighs 1.5 kg., and has a flat side and a round one.

-NYLON HAMMER, used to hit on the blade, the unnauler and when used on the mortajera. We also say, that as with any other type of hammer, when we use it, our eyes should stare at the place where the tool is being used rather than at the site where we are hitting with it.

-CLINCH CUTTER OR BUFFER, is used to make shrouds or niches on the wall of the hoof, destined to the rivets, these niches can also be prepared with the edge of the RASP.

-PRITCHEL, use it to open the nail holes in the upper face of the Horseshoe, its tip should be rectangular.

-NAIL PULLER, this tool has several advantages: allows you to remove a nail at a time, this is only important when you suspect that one of them touches or crosses the podophilous tissue; It also allows to gently unshoe donkeys in which the manipulation of the foot or the fetlock joint is painful (such as phalange fractures).

-CUTTING PLIERS, only serves to cut the portion of the hoof that you want to remove, it should not be used for cutting nails or to catch them since it would lose the edge. To use it, we will have to be careful to handle the iron in order to let the surface of the wall flat, It must never be cut bevelled.

-NAIL PLIERS, used to cut nails, to remove and to make rivets on the wall of the hoof, for this latest utility we must apply the clamp closed on the head of the nail, giving a rotation movement to the clamp while we hit on the head of the nail with the hammer, in this way we will form a rivet when bending the tip of the nail against the wall of the hoof.

We should use this kind of rivets in soft hooves, chipping or brittle ones; or what is to say, always when using crocodile pliers can damage the hoof wall. There is a type of tongs with lateral grooves in both bits, which are used to open the horseshoe.

To do this, we can do it with the horseshoe out of the horse, placing the bit of the tongs inside the horseshoe, and pressing on the sponges, which will open both forks of the horseshoe.

-UNSHOEING TONGS tend to be larger than the previous ones, they are used to take the horseshoe out of the hoof, after having the rivets open. In order to do this, they must always act by rotating them toward the tip of the frog (inside the hoof). We should take the nails out one by one.

-FORGING PLIERS are used to hold the horseshoe (or iron bar), when we are working on the anvil. We will obviously use it whenever we have to hold the hot horseshoe, but we must also do it so when we work with the horseshoe in cold, this form will avoid many accidents caused by eyelashes.

-RIVETING PLIERS, also called crocodile pliers because of the special provision that they have on their bits. Used to make rivets, we must be careful when using very dry or very soft hooves since it exerts a considerable force on the wall, causing them to split; in these mentioned cases the rivet must be performed with the hammer and pincers.

-ANVIL, if it is attached to the blacksmith's it will tend to be a heavy anvil, more than 40 kg, but if we are going to use it when drive from a site to another it will be a lighter anvil of from 25 to 30 kg, for this aim, we will make it a detachable tripod, we have to care that the assembled leg that is alone is on our left and matches the round horn of the anvil.

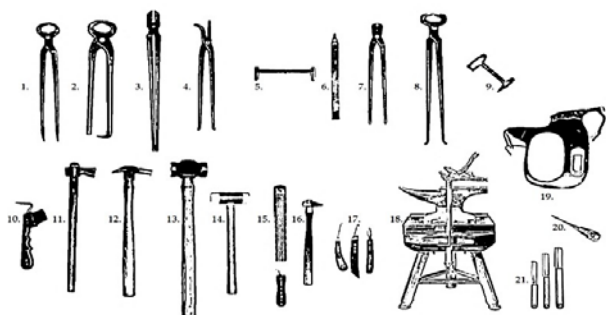


Figure 179. Francisco Javier Navas González (2014) Horseshoeing tools: (1) Universal hoof clipper, (2) Unshoeing pliers, (3) Forging pliers, (4) Riveting pliers (Crocodile), (5) Buffer, (6) Pritchel, (7) Nail puller, (8) Nippers, (9) Clinch cutter, (10) Hoofpick, (11 & 12) Shoeing hammer, (13) Forging hammer, (14) Nylon hammer, (15) Rasp, (16) Nailing hammer, (17) Rasp, (18) Anvil, (19) shoeing leather apron, (20) Hoof knife and (21) Blades [Drawing]

Horseshoeing is basically divided into the following stages:

- a) Unshoeing; is the phase in which the farrier removes the horseshoes that the animal had on it from the former shoeing actions. This is carried out with an unnailer and a hammer, straightening the nails holding the horseshoes, and rivets with a specific clamp levering on both heels for thus disengage it without forcing the limb of the animal. Obviously, it will not be necessary to perform this stage in cases in which the animal is not shod because of inactivity, convalescence, or any other cause. We will first work on one side and then work with the limbs on the other side so that the animal does not get unbalanced, something important to consider when we have to hold the limb of the animal for some time.

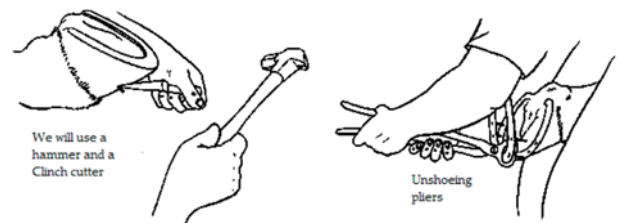


Figure 180. David Hadrill (2002) Unshoeing [Drawing]

- b) Trimming; this process is the cutting of the hoof, or more specifically of the wall, the frog and the sole that will have grown from its latest horseshoeing, since when we attach the horseshoe wear stops we must therefore trim the dead and overgrown hoof. For this stage, we will use tools such as knives, files, cutting pliers and rasps that allow us to give it the finishing touch.

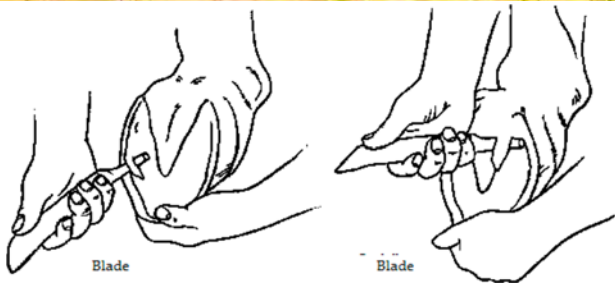


Figure 181. David Hadrill (2002) Trimming [Drawing]

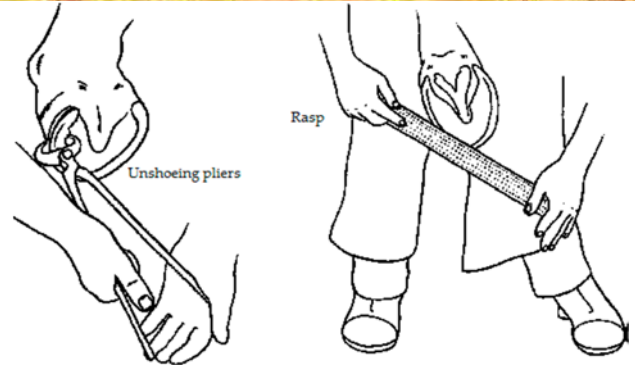


Figure 182. David Hadrill (2002) Trimming finish [Drawing]

CURIOUS FACTS

THE LAME DONKEY AND THE BLACKSMITH WOLF

There was a donkey calmly grazing on a hill, not realizing that a lurking wolf was approaching slyly. The donkey, accusing the presence of danger, started limping ostentatiously.

The Wolf came and got interested in its limp.

The donkey explained that he had dislocated a horseshoe and that this was the cause of his ailment.

The Wolf said to him, Ah! I am really good at being a blacksmith.

Then the donkey bent his leg and the Wolf came to pull the nail out.

The donkey took the moment to strike the Wolf out and kick it on the mouth, tearing all the roots of all its teeth.

The Wolf, among moans and groans, sadly lamented:

The fault is mine for having offer myself as a farrier being a butcher.

“Anthology of fables, tales and legends of Basque Country”

by Barandiaran Irizar, Luis



Figures 183 & 184. Mike's Donkeys (2006) Farrier performing his regular visit for trimming donkey hooves [Photographs]
Accessed from <http://www.mikesdonkeys.co.uk/>

One of the main aspects that differentiates donkey farriery from horse farriery techniques is the variability of the existing size between some donkey breeds and others, something that remains somehow more stable between horses.

The position that the farrier will keep will more typically look like the one which an operator would acquire to shoe a horse holding its hoof between his/her thighs, as far as the height of the animal is similar to the one of a horse, while the blacksmith will also be forced to approach its body to the ground as the height of the donkey diminishes. In addition, arthritic changes can favour that asses are resent to lift their limbs, so that this compel us to go down to their level. Small height donkey breeds like the miniature Mediterranean donkey, do not enjoy of

much popularity among blacksmiths given the low height at which the experts are forced to operate. When in stables and stud farms or hatcheries in which it is necessary to treat various animals (up to more than 60).



Figure 185. Mike Waldorf (2014) Horseshoeing a donkey on a swivel chair [Photograph] Accessed from <http://www.americanfarriers.com/>

One of the innovations that tends to result more successful, is a small height artisan swivel chair, like the one used for carpentry housework and crafts, for example. To which well added forging wheels and a platter can help us have our tools handy (if the chair is not provided with them in advance.

In this way we can work comfortably and safely when our workday lasts longer than usual.



Figures 186. arignagardener (2011) Farrier visit. The height of the donkey is the greatest conditioning factor to which we must adapt [Photograph] Accessed from <http://arignagardener.wordpress.com/>

18. HORSESHOE ADAPTATION

After the previous stage we will adapt the horseshoe to the hoof. Taking into account the previous diagnosis, and once we have studied the formation of the limbs in each case, we will adapt a horseshoe so that its shape promotes locomotion and help improve, correct and supplement any effect or keep the physical conformation of the animal.

Horseshoes are normally found on the market in different sizes and presenting a wide range of qualities. The currently manufactured in mass tend to be made of «soft steel» or sweet iron. We must consider when choosing a horseshoe that it should protrude approximately something less than a cm behind the heels to ensure the support and protection from the forces that fall on the navicular bone.

New materials seeking the purpose that horseshoes are lighter and pliable, using mixtures of various materials such as mild steel, aluminum, and other synthetic materials (plastics, resins). Today, it is not necessary, almost at any time, having to forge a horseshoe on forge out of an "iron bar".

Once you choose the kind of horseshoe that is more appropriate, we will shape it and give it the form that best suits us at the anvil with a forging hammer, adapting it to the hoof as an insole would adapt to a shoe.

This work can be performed both in cold and hot. Cold farriery is performed in the same way as hot farriery but the adaptation of the horseshoe to the size of the hoof is made in cold conditions with no heat source. According to *Garcia and Izcara, 1900*, both methods are good, provided that they are put in practice properly, and are applied to the cases that specifically need them.

Once selected, the horseshoes that he introduces them in a small oven, normally functioning with gas (butane). Charcoal (oak, holm oak, heather, black poplar, ash) was used in forges or ancient ovens, in which horseshoes were manufactured, and using mineral or stone, from coal deposits as fuel.

Following with horseshoeing, the horseshoe is heated to red hot for a few minutes and subsequently removed and brushed to remove possible dirt before bringing them closer to the hoof, using special pliers, leaving the horseshoe shape marked on the basis of the hoof, then mould it on the anvil or worktable by tapping it with a hammer, thus adjusting the horseshoe to the specific shape of the hoof which we are going to shoe. Once contoured he/she places it again at the basis of the hoof and introduces it in cold water, proceeding to its placement later.

Before placing it, the farrier performs a bevel on the outer edges of the heels using electrical filing and at the inner edge of the toes lowers it with a hammer to give it the rest position and to adapt it to the hoof. We will then place the horseshoe on the hoof with special nails suitable for each type of horseshoe and use which the animal is going to be destined to in particular.

By means of nails, we embed the horseshoe with nails via the holes present on its underside, in the right direction, towards the outside, through the hoof to the outside wall, leaving the tips of these standing out through the wall.

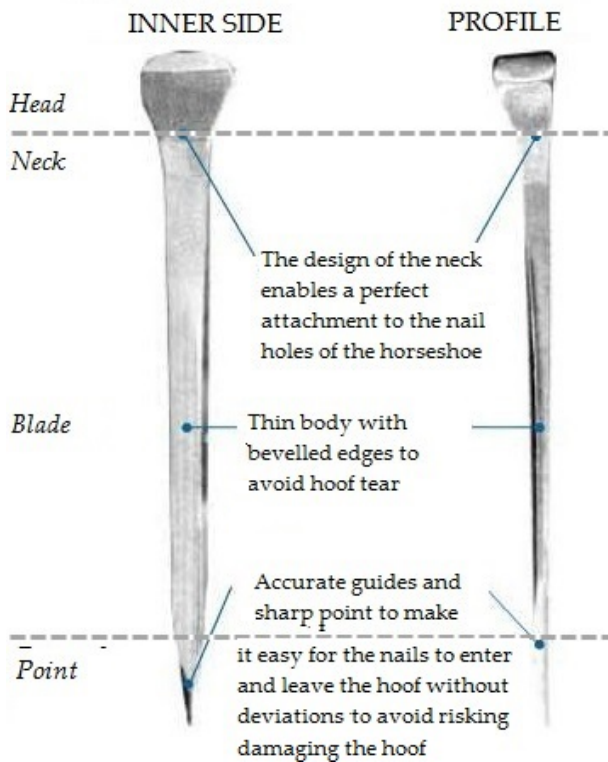


Figure 187. Deacero (2014) Nail structure and its characteristic in relation with the horseshoe [Photograph] Accessed from <http://deacero.com/>



Figure 188. Eki (2014) Tips of nails protruding through the wall of the hoof [Photograph] Accessed from <http://www.eki.es/>

The first nails are introduced in the first two nail holes, on both sides of the toes, alternately on either side of the forks of the horseshoe, up to six nail holes, which are enough for the horseshoe to be attached to the hoof (horseshoes are supplied with eight holes). Once entered the nail, head may be jutting out of the surface of the underside of the horseshoe.

The nails should be implanted on the line between the hoof surface and the white line, space that separates it from the sole. If we are using an appropriate nail we will have to address the point towards the frog and hammering nails against the pliers to adjust them. Once the horseshoe is placed nails points stand out, when it has been properly done, one third of the length of the hoof from the ground, through the wall. To remove them the farrier cut them leaving a length of about 3 mm above the surface of the wall of the hoof with a pair of pliers, with the rasp he/she will practice a small hollow just below the outstanding end of the hoof. With the hammer we turn the tip of the nail into the hollow, so they are levelled with the surface of the wall of the hoof.

To remove a badly nailed nail, we will straighten the end, we will hammer the horseshoe on each side of the nail head, we will apply pressure with tweezers closed over the head of the nail and when enough nail surface projects from the soleplate we will remove it with the tweezers.

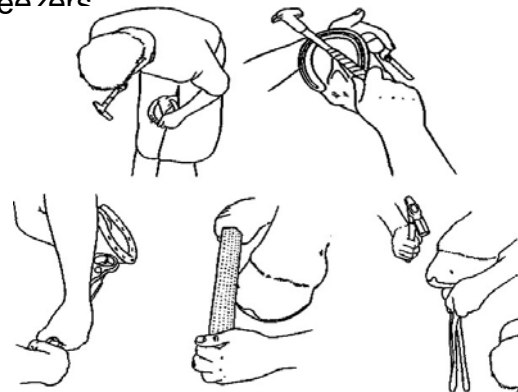


Figure 189. David Hadrill (2002) Nailing a horseshoe, riveting the points of the standing out nails and finishing [Drawing]

We will rivet the points of the nails that have stand out after practicing a small slit below the point of the nail, by means of a «clincher cutter» and a hammer, which embeds the remaining nail point and then crush it with crocodile pliers, which prevents the nail from coming out and our ass from missing the horseshoe.

Finishing the process, we will file the surface of the hoof wall again, at the points where we have carried out this process. This operation aims to avoid that the animal can cause injuries itself with these parts of the nail standing out of the wall of the hoof.

After this process, horseshoeing is finished. It usually starts in the hooves of the hands or forelimbs (left side) and ends with the feet or hindlimbs.

19. DONKEY HORSESHOES. MOULDING

Donkey hooves are generally, not only smaller than those of a horse, but are also more compact and tough, but at the same time more flexible. Therefore, as we have previously mentioned they are not worn naturally under the conditions under which we preserve them in domesticity. For this reason the regular trimming may be required, so that negligence in their proper care can lead to irreversible damage. Donkeys are used for work, and as today it is not possible to understand a species that does not play a role, therefore when working, donkeys should be shod when it carry activities that make it necessary.

Donkeys horseshoes are similar to those used in horses but usually smaller (as of a mule and without a tab for the hindlimb) and with a characteristic U- shape.



Figure 190. Justlettersandnumbers (2011) Ass horseshoe with nail holes (place where the nails are inserted) photographed in Monti Reatini near Cantalice, province of Rieti, Italy. Notice the morphology that describes the horseshoe, preserving the U - shaped form of a donkey hoof [Photograph] Accessed from <http://commons.wikimedia.org/>

Trade houses almost never manufacture horseshoes for mules and donkeys, so farriers are forced to modify horse horseshoes to adapt them to these animals.

Traditionally, horseshoes for donkeys and mules, were rough and the farriery of animals was of little scientific importance and it was carried out in careless manner. Today, the recovery of these animals as draft animals, has returned the horseshoeing of mules and donkeys to the place that it deserves, comparable to the farriery of sport horses. The hoof of the donkey, and its heir, the mule, possess certain characteristics that differentiate it from the hoof of a horse. Therefore, the shape of the horseshoe is also different, to adapt it to the shape of the animal.

In general, the donkey and mule hoof is characterized by more or less straight U-shaped branches, with a strong bar and a powerful frog. The top, thick and strong, is very insensitive to fungi and hoof wall disease. To get a donkey or mule hand horseshoe, we must preferably use a horse's hand horseshoe. The hand hoof of a Mule or a donkey, has the same shape as the foot one, although it is more width at the toes.

Generally, the hands of the mules or donkeys are shod with a low, and wide flange while the feet are shod rimless. We will heat the horseshoe but not drive it too hot, to avoid damaging the grooving or stamping to the flat part of the anvil. In the anvils with traditional form, i.e. a round horn and a squared one, this task is easier than in modern ones, more appropriate for the management of horse horseshoes.



Figures 191 & 192. Gabino Fernández (2008) (Figure 191) Mule hoof & (Figure 192) To get a donkey or mule hand horseshoe, we must preferably use a horse's hand horseshoe [Photographs] Accessed from <http://www.farriergabino.com/>

We will hold the horseshoe at the edge of the anvil toward the second nail hole, because we want to achieve a wide toed horseshoe. We will then gently tap the horseshoe in the area behind the nail holes, to straighten the fork without damaging the grooving and stamping. Mule shoes tend to be of a small size, so we will always use low numbering horseshoes.



Figures 193 & 194. Gabino Fernández (2008) (Figure 193) We will hold the horseshoe at the edge of the anvil toward the second nail hole, because we want to achieve a wide toed horseshoe. We will then gently tap the horseshoe in the area behind the nail holes, to straighten the branch without damaging the grooving and stamping & (Figure 194) When straightening the branches, these remain open, so we will proceed knocking on their edge to close the horseshoe. [Fotografías] Recuperado de <http://www.farriergabino.com/>

When straightening the forks, these remain open, so we will proceed knocking on their edge to close the horseshoe. We must not forget that if we want the horseshoe arms to close symmetrically, we have to hit it at the highest point, while we hold it by its symmetric point. When points of support and hammering are not symmetrical, the horseshoe will be closed on one of the shoulders. Then we bent the faces of the horseshoe, hitting its lower face, in order to protect the grooving. The horseshoes of mules and donkeys, rarely carry a regular

curvature in the upper side of the horseshoe, standing almost flat. This is because the sole of a mule or donkey hoof is much more concave than horse ones. The largest area of support of the horseshoe in the hoof, which ensures its solidity, because they are rarely hot-shod.



Figures 195 y 196. Gabino Fernández (2008) (Figure 195) Then we bent the faces of the horseshoe, hitting its lower face, in order to protect the grooving, (Figure 196) This is the aspect of the horseshoe once we have straightened the forks. Corns are still running inside, so you must build them in order that they turn out in its last portion, to give the horseshoe the accurate shape of the mule or ass hoof [Fotografías] Recuperado de <http://www.farriergabino.com/>

This is the aspect of the horseshoe once we have straightened the forks. Corns are still running inside, so you must build them in order that they turn out in its last portion, to give the horseshoe the accurate shape of the mule or ass hoof. Depending on the shape of the hoof, we will adapt the horseshoe to it, closing it or straightening the forks more or less.

In Figure 197 we can appreciate the horseshoe of a donkey or mule, ready to be placed. It has a 5X0 size, i.e. a small size for a horse, but a very common one in large donkeys and mules.

For hindlimb horseshoe, we start from a horse foot horseshoe from which side tabs have been removed. As we can see in Figure 198, we support the horseshoe in the first nail hole, because we want a horseshoe with the pointed toes.



Figures 197 & 198. Gabino Fernández (2008) (Figure 197) Donkey or mule hand horseshoe & (Figure 198) For hindlimb horseshoe, we start from a horse foot horseshoe from which side tabs have been removed. As we can see in Figure 198, we support the horseshoe in the first nail hole, because we want a horseshoe with the pointed toes. [Fotografías] Recuperado de <http://www.farriergabino.com/>

The process is the same as for the hand horseshoes, with the proviso that in the external blade of the foot horseshoe, we emphasize the curve out of the heel, and as if we were dealing with a small American blade.

This change, made properly, greatly favours the stability of these animals' step. The smallness of horseshoes, makes their forging difficult.

In the Figure 200 we can observe a finished foot horseshoe. It has a 4X0 size, since mules or donkeys tend to have the foot a little bit smaller than the hand, due to the extra width of the latter. Therefore when making horseshoes for a mule from a smooth plate, we must cut the iron bar one centimeter longer for the hands.



Figures 199 & 200. Gabino Fernández (2008) (Figure 199) The process is the same as for the hand horseshoes, with the proviso that in the external blade of the foot horseshoe, we emphasize the curve out of the heel, and as if we were dealing with a small American blade and (Figure 200) Mule or donkey foot horseshoe [Photographs] Accessed from <http://www.farriergabino.com/>

Comparing hand horseshoes to foot ones (Figure 201), we can see that the hand

horseshoe is generally wider than the foot one. The internal blade, is always a little more straight than the outer one, more rounded. In addition, the external heel can be more pronounced than the internal one.

In general, mules and donkeys are fittingly shod and without leaving a rest portion on the horseshoe, since the harshness of the work and the ground where they move, makes horseshoes tend to be walked on. In mules used for pulling cars or which were used for towing barges in canals (towpath) we let them a rest portion, but performing a good beveled internal edge on them.



Figure 201. Gabino Fernández (2008) Donkey and mule, hand and foot horseshoes [Photograph] Accessed from <http://www.farriergabino.com/>

In Figure 202 we show the comparison between a mule horseshoe obtained out of an industrial horse horseshoe and the forged from a piece of iron. The horseshoe on the right is a number 0 donkey horseshoe, the smallest which is forged. It corresponds to the model called Biscayan, characterized by having thin heels, in order to strengthen them on the heel of the hoof. Two square prints, for large head nail tops and just five centimeters in width small horseshoe.



Figures 202. Gabino Fernández (2008) (Left) Donkey or mule horseshoe modified out of a horse one & (Right) Handcrafted forging donkey horseshoe [Photograph] Accessed from <http://www.farriergabino.com/>

These rough manufacturing horseshoes, as well as the so-called hechizas or Castilian, correspond to a time (fortunately already overcome) in which you must provide a product that would be affordable for farmer's or carrier's pockets, so that in their forge, material, coal, and time-saving took precedence.

20. HOW DO WE MAKE SURE THE HORSESHOE IS THE PROPER SIZE?

We will take measures in the three places reflected in Figure 202, the diagonal from one of the heels following the same side bar as the clamps on the opposite side; the horizontal one fourth parts to each other at the level of the apex of the frog and finally, the distance between the wider end of each of the heels.

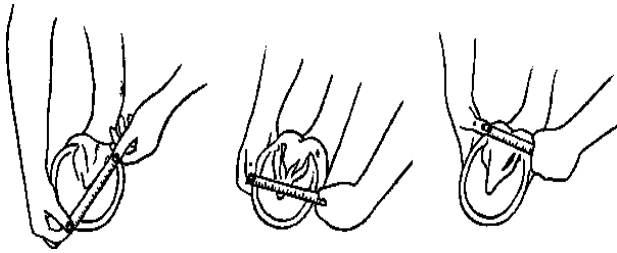


Figure 203. David Hadrill (2002) Measuring the hoof to adjust the horseshoe [Drawing]

Then we will adapt the horseshoe if necessary, expanding it and flattening it with the help of a hammer and an anvil.

21. HYGIENICAL BASIC ROUTINE: CUTTING AND TRIMMING

In donkeys that have frequently been abused, one of the signs that are often seen is the severe hoof overgrowth. Even a small amount of overgrowth can cause important damage to an ass. We only have to imagine what it would be like to walk on your heels for a whole day, when a donkey has an inordinately overgrown hoof suffers from an analogous pain.



Figure 204. The Kiwi Care Team (2013) Severe overgrowth of the hoof of an ass. The donkey was supporting its weight on the back of its hand [Photograph] Accessed from <http://www.nzva.org.nz>

The hoof tends to crumble at the edges and spread on the ground, especially at the level of the quarters. Scraping the edges of the hoof can reduce this. We must ensure the performance that the hoof has, i.e., the relationship between the growth and wear of the hoof, which depends on, among other factors, the characteristics of the ground, of the use for which the animal is intended, the frequency at which the activity takes place, to thus protect our ass from injuries resulting from excessive wear. However, given the characteristics of the hoof of the asses, problems that will make presence much more frequently are those derived from overgrowth, which will make trimming or cutting work necessary.

As a perfect routine, hooves should be checked daily to remove embedded dirt in them every morning and at the end of each evening. For those asses which are not working and are kept on a soft floor, we should set visit from the farrier to which the animal must be trained previously. Many owners say that it is difficult to find a skilled farrier when it comes to horseshoeing donkeys, however, owners tend to make their work easier by casting a hand whenever possible. An hour before it will be good to confirm the attendance of farrier and have the ass ready, if they were free in a yard, fence or box. Once reached we will hold our ass firmly preferably from the collar. The main objective of trimming is to promote the efficient and comfortable locomotion of the animal, ensuring at the same time that any growth of the hoof and wear resulting from its use does not separate acceptable parameters between one hoof routine and the other.

The most of European asses do not need to be shod, as they produce sufficient corneal material in terms of quantity and quality, allowing a regular job to be perform even staying unshod, even on cobbled or paved floors. In this way, the routine to carry out will be to cut and trim the hoof rather than shoe it and farriery care. Those asses that perform little work will present an unbalanced growth that will need associated trimming tasks to be carried out as a faithful comrade.

As an optimal frequency, it would be advisable to carry out a monthly review, 6 week intervals should be considered the maximum limit. When it comes to trimming and cutting the sole we must take into account the following list of factors and criteria.

The order of study and review of each of them are essential. The price of a trimming is around €12 (\$16.56) per treatment.

22. ANGLE OF INCIDENCE WITH THE FLOOR AND THE FOOT LENGTH

Usually donkey feet are from 5 to 10° straighter than the horse ones. However, each ass requires its own treatment. The angle of the foot after treatment should produce a hoof with a straight pastern axis (without breaking). We will study the relationship between the following profiles:

- Frontal profile of the hoof wall.
- Frontal profile from the pedal bone (P3). Axis of the hoof with the pastern (PI -P2-P3). Scapular spine.

Therefore, by touching the pastern and the spine of the scapula with ass standing on a rectangular (square) basis, we can examine the desired angle. For those who are just unfamiliar with this technique you can find it useful to paint the optimum angle with the ground with a chalk in the hoof.

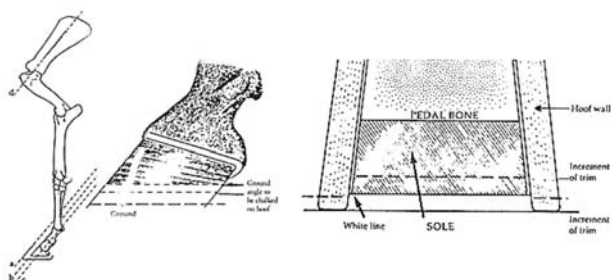


Figure 205. J. Fowler (2014) (Left) Parallel relationships of the axis between the hoof and the pastern, (Right) Diagram of the cross section of the foot [Drawing]

We will follow the 'rule of the thumb'. This rule is literally to apply pressure with the thumb. The sole should be trimmed at increases of around 0.25 cm (we will reduce this trimming as the shape we want starts to appear).

While each increase is removed, we will apply a greater pressure with the thumb on the sole. With the minimum sign of depression, i.e. when the sole goes down the least possible, we will have reached the recommended thickness, and it will be around 1 cm thick.

We will always cut the sole first, in each increase, followed by the occlusal face of the hoof wall, always keeping it in parallel with the 'angle with the ground'. When we lead the last cut (i.e. with the depression being just detectable) the hoof will be able to be filed in order to level it.

The outer perimeter of the edge of the hoof wall should be bevelled with the fine side of a rasp to prevent it from splitting. At this point, we can see that the height (highest point from the ground to the coronary edge) will be less than the length (length from front to back of the occlusal surface).

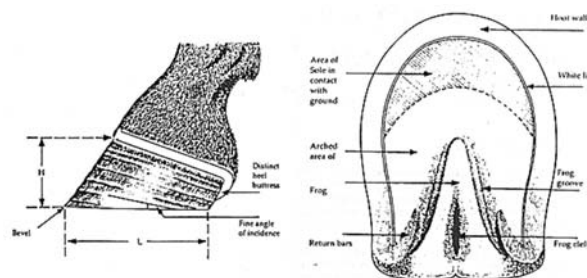


Figure 206. J. Fowler (2014) (Left) Last hoof trim when its Length > Height, (Right) Weight bearing surface of the hoof [Drawing]

Distal laminar rings on the outside surface of the hoof wall should now keep a nice angle of incidence with the ground. We must also appreciate that the foot profile of the ass, is a quadrilateral structure with a marked brow at the level of the heel (more thickened area). The next thing we must consider is the distribution of the force of the weight on the foot.

The occlusal face (sole) of the foot has a distinctive U shape, often with a slight expansion towards the heels. The hoof wall must have the same thickness at both levels, toe and heels. Approximately one third of the sole (forethird) should be in contact with the ground.

The white line (which is only white when it has just been cut or scraped) should have a uniform width of 1 mm.

An increase of the white line may well indicate either disease or an abnormal weight load on that part of the wall of the hoof adjacent to the collapsed white line so that indicating the need for reshaping the area as a remedy and an increase in the thickness could be an indicator of laminitis or seedy toe.

Frog central groove must be cut so that it is open, allowing a pencil to fit inside. The occlusion of this groove collects dirt and bacteria and finally it facilitates bacterial necrosis of both the frog and the sole.

Similarly, paracuneal grooves must be opened and V-shaped to facilitate its self-cleaning in addition to having return bars trimmed to the same level that the sole is. If an ass spends much time on land filled with mud, manure or muddy ones, a deep bed, or in those countries such as United Kingdom in which weather conditions do not allow hooves to dry, as well as trying to avoid by all means that the hooves stand on a muddy surface and provide animals with a clean bed, wood chips, or beds made of cardboard are very useful (especially in animals with chronic damage in the limbs). It will be useful to have a well dried and drained of water area of exercise, which will be especially useful in the winter, when being enclosed, daily walks are needed.

Conversely, if the donkey works regularly on hard surfaces (a donkey that is often mounted, for example) bars should be levelled with the heels of the hoof wall. Basically the sequence of steps that we follow is as follows:





Figuras 207, 208, 209, 210 & 211. Danni (2011) Donkey hooves must be provided with a special care during the wet season and above all, when the bed over which they live is not clean or it is muddy [Photographs] Accessed from <http://critterfarmgirl.blogspot.com.es/>

Put a tether to our ass and attach it a leading rope. We will desensitize our ass patting it on the dorsum, the back and then from here underwards the leg with our hand.



Figure 212. Longhopes Donkey Shelter (2013) We will tie our ass with a leading rope [Photograph] Accessed from <http://longhope.org/>

Asses are more comfortable when we lift one of their limbs forward before lifting it towards the back. Repeat and verbally reward our ass and caresses the neck or the front of the back. We will raise the hoof back and clean them with a hoofpick.



Figure 213 & 214. Longhopes Donkey Shelter (2013) We will lift the forelimb of the ass forward and then backwards [Photographs] Accessed from <http://longhopes.org/>

We move to the hindlimb. We slightly pull from the leading rope so that the ass turn the direction in which we are and thus see if able to see what we are doing. This will allow us an added safety, if the ass tries to escape we can pull the rope and the head will move towards us, moving the the back away from the kick range. For the hindlimb, we will lead our hand from the hip to the leg. We will ask our donkey to lift its hoof forward. Praise and reward it when it fulfill our request. We will repeat this action several times until we can raise back the hindlimb and clean it. If a donkey refuses to do it so, we will have the leading rope place over the forepart of the back on the side we are working and we will make a loop go around the hindhoof. We will lift the hoof with the rope backwards and forwards before attempting to do it with our hand. If a donkey kicks, we will pull from the rope attached to the tether. The head will turn back to you and the hindlimbs will move away so that the ass will not be able to kick us.



Figure 215, 216 & 217. Longhopes Donkey Shelter (2013) Always trying to move apart from the kicking ratio we will work on the hindlimb. If a certain donkey kicks we will seize its hindlimb up to protect ourselves [Photographs] Accessed from <http://longhopes.org/>

For the trimming, we will remove the detached parts or loose soles with a blade for hooves, having cleansed any sick material or in poor condition. We cut the edges of the frog with the blades until it present a clean V- shape by slashing the

hoof, the aim is to get a form as close as possible to the one of a normal hoof (as it has previously been described). After shoeing, the pastern and the hoof must have the same angle. If the heel has not been cut enough, the hoof becomes too straight, and this can be a possible cause for laminitis. Observe the hoof and decide how much to cut. After trimming, the hoof should be balanced on each side and the walls of the hoof should not be below the level of the broad side of the frog. With the knife, cut the sole around the white line until reaching the depth that should be removed from the wall of the hoof.

Starting with one of the heels, we will cut around the wall of the hoof with pincers to shorten the hoof. We will file the soleplate until it is flat and uniform. Check that the hoof and the pastern maintain a straight line. We will alter the shape of the hoof if necessary. We will file the outer edge so that the wall have the same height in the background. Neither will we file the bright outside part of the upper part of the hoof nor will we file the outer layers of the wall, opting for bevelling them with a lime to prevent them from breaking. Once we have finished the sole must be concave and the vertex or apex of the frog or midpoint of the sole should be approximately around 6 mm (1/4 inches) above the wall so that it bears the weight and it does not fall on the sole when the footsteps. Not only will the health of our asses be compromised when their hooves are handicapped. One of the first signs, derived from a hoof in poor condition is the alteration of its behaviour. It will be our obligation to keep the hooves of the animals in our care in the best possible condition.

Hooves are usually the reflection of the environment in which they are found. A hard and rough environment will produce rough and hard hooves. A soft, rich in grass, and humid environment is usually a disaster for hooves that will crack and become brittle (as

it happens in countries such as the United Kingdom) predisposing the animal to suffer certain derived diseases. The hooves of many species are the result of evolution and adaptation to the wild environment where they lived and developed. In the case of those of donkeys that live in rough environments, with rocky and mountainous terrain, it seems that they have ideally hard hooves. Many domestic donkeys living in boxes, pens or backyards, or even in solitude, often have hooves of a much lower quality than the optimal one for good health and comfort.

This situation can easily be remedied by applying regular hoofcare, providing a lone animal with company, having gravel around and under the supply of water and in those areas in which our ass moves more frequently or even sacrificing the advantage of keeping our ass in the backyard and keep it in the company of other donkeys in a rocky meadow nearby. This option is often the most difficult to take for some owners, who think that they will lose control over their pets, so it is not directly often even considered. But if we think about it carefully it can be beneficial to both. The only prerequisite is to have built a good relationship of confidence with our animal. The donkeys are social animals that require the company of counterparts from the same species to maintain their mental and physical well-being to interact and communicate, to socialize, to play, to learn or even with those with which to fight and this is easier if we stop thinking in our comfort to give some preference to the well-being of our ass. Maintaining a fluid donkey-human relationship, in which animals are well suited to handling and act in a cooperative way, will facilitate any task you want to perform with them. Any trimming professional will pretend that their work be carried out quietly, quickly and precisely. Something that benefits both the operators

and the treated animal. Of course on the other hand, is the fact that farriers are paid to treat the hoof and not to educate the animals, which would be more expensive.

A good routine that should be implemented by all the owners, is the previous work to the visit of the farrier for acclimatization. Building trust and cooperation is very important and we must apply all the knowledge stated above, from the first day (either by birth or acquisition) that a new animal arrives at our farm. In this way we will have an animal which will be more easily manageable and that quickly understands that when the farrier comes it should stay still and let him do his job, so that in this way the experience is less traumatic than it could be with a restless animal. A goal would be to get that trimming is carried out without having to tie the animal with the leading rope, surrounded by the rest of the harem or herd.

In conclusion, as we have already studied the hooves of the equines grow indefinitely. The growth rate is variable and is to be considered jointly with the hoof wear ratio. Donkey hooves grow at a greater pace than those of the horse (growing more at the heels when we compare them to the toe, and with the soles showing more or less the same growth rate that the wall), and within the hoof of those asses which are kept under a domestic habitat, will wear less than those which are under a wild or feral status or working ones.

Fences are responsible for this increase in the rate of growth with respect to the rate of wear, since they tend to be associated with less movement and less movement means less wear. Less wear, means overgrowth and hooves with overgrowth need constant management for the welfare of the animals that we are evaluating. It is frequent that pathologies associated with the hoof of domestic asses do not appear or are rare in donkeys that live in the wild.



Figure 218. Arjan Haverkamp (2012) Hoof care of a small ass in the Dierenpark Amersfoort, a zoo in the Netherlands [Photograph] Accessed from <http://www.flickr.com/>

Humans have put the animals and put the animals frequently under situations that compromise their health and well-being, and unless we be proactive and lead the situation, we will not be able to redirect it, to adapt it to the requirements derived from the natural evolution experienced by our asses.

The proper and regular care of the hoof is a basic requirement which must be performed well by the owner, or by a skilled farrier.

Long, chipped, broken or cracked hooves are simply painful for the animal. Suffering from diseases and fungal infections adds only pain to them.

Another reason why the hooves of our asses are so often abused is the surprising capacity of asses to mask the pain, so that many of these problems go unnoticed until it is too late. So it will be our duty to take extra care.

23. DONKEY FOALS IMPRINTING

The imprint of the donkey foals, consists of a technique of desensitization of newborn animals, which if performed correctly, allows us to achieve many things.

The donkey foal will accept people as a routine part of its normal life since the beginning, it will be comfortable with us stroking it throughout the body when we handle its legs and hooves, and so it will be easier to handle it and lead it by moving it wearing a tether, as it will also be easier to adapt them to a harness or a saddle if that is going to be their future use. The imprint must not however allow animals be so confident that they become disrespectful towards people, because of this it will also be necessary to apply discipline in this technique (see Book 1, Chapter 3).

24. LIMB PATHOLOGICAL ATLAS

Asses are adapted to dry environments, thriving in the semi-arid regions of the planet, where the ground is dry and rocky, and in which, during most of the year, vegetation has a poor feeding and it is very fibrous. Its feet are more effective absorbing water than the horse ones.

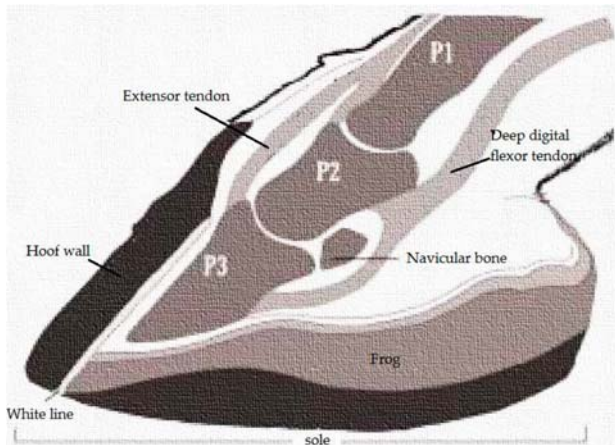


Figure 219. *The Donkey Sanctuary (2006)* Cross section of the hoof. P3 is also known as the third phalanx, or pedal bone that moves in cases of severe laminitis. In relation to the hoof of the horse a greater part of the P2, second phalanx or short pastern bone rests inside the horny hoof case. [Photograph] Accessed from NHC101:11.

This is probably the adaptation to the environment surrounding them that they got with their evolution. This factor is so important that in fact the asses which have overweight are more predisposed than asses which possess an adequate body condition to suffer problems in the limbs.

It seems that most of the problems experienced by the donkeys on their feet are the result of human intervention - either directly as a result of an injury, or indirectly, resulting from a failure when providing them with the environment in which their feet must be kept healthy, not to mention of course, the rest of their bodies and their minds.

Perhaps this is the moment for the owners to give a step forward from the traditional maintenance on grass toward a better

recreation of their habitat, or even multiadventure yards for their animals. If grasses were plowed and grazing lands with native low quality forage, billboards replaced with hedges or stone walls, having areas of hard substrate, even possibly including areas for climbing, planted with native, non-toxic, and planned fodder so that asses are encouraged to continuously play and explore the environment, we could surely teach the owners of asses one or two facts to consider.

Asses can develop the same problems on their hooves as horses. Problems such as cracks, lameness, navicular syndrome, among others.

Disease and foot problems are very common in the asses. The proper daily care is essential if the problems are to be avoided or minimised in those asses in which a certain condition from the following ones is taking place.

Although it could be predicted, among the treatments involving the most stunning corrective improvement over the pathologies that correct, those which solved problems of the limbs, are among the ones in which the rapid alleviation of the situation or improvement that produce seems almost unbelievable.

Supplements that support the growth of the foot should only be used when the veterinarian advises it, applying other treatments whose consequences could be less potentially harmful in the first place. The first thing to consider is the fact that the position that we must keep to care for the hoof of a donkey is not the same as in the case of horses. It can be very painful to lift and bend the limb, especially in elderly asses which have arthritis. Therefore we will often need to bend and semiflex our knees so that both are comfortable, we and the ass

which we are dealing with. Previously we have come across the defects which may occur in the limbs. Among them, there are some in which the application of a corrective system allows us to greatly alleviate the defect.

CURIOUS FACTS

6 RULES TO KEEP OUR FARRIER PLEASED

1. We will bring our ass, making sure it is prepared to be bound by a secure tight halter and harness.
2. Ensuring that the legs and feet are dry and clean from mud.
3. Provide preferably cemented, airy and clean area, protected from the elements.
4. Stay with our animal and show interest in what our farrier is doing. Thus our farrier will work with enthusiasm.
5. Find and follow any advice our farrier could give us, especially the date of the next visit.
6. Provide a cup of tea and prompt payment for his/her services.

25. LIMBS FAULTS AND DEFECTS

Asses naturally have a slight tendency to be close-hocked or cowhocked (conformation default in which hocks tips come together and fetlocks get separated more than normal). This is not just owed to being draft animals but to the fact that they descended from draught animals. Draught animals are used to work and to be close-hocked helps it to pull from a load because the animal can place its limbs under its body what helps it to pull.

However, when this defect is present in a severe way, the bone structure of the leg is not lined up, and compromised the ability of the limb to handle loading forces. Looking at them from the front, they should not be nor valgus (genu valgum) or varus (genu varum) kneed on the legs. If they do, twisting or rotation will be shown in a subsequent way to movement.

This will affect the joints and soft tissues since one side of the leg will support more strength and weight than the other, causing pain and tension. Being varus or valgus may limit the age that a donkey reaches and its efficiency. When this default is expressed in its greatest exponent animals are forced to walk on the sides of their limbs instead of on their hooves damaging the muscles of the back and the corresponding thoracic or pelvic limb in which the defect takes place.

The treatment of choice in this situation consists of adhering a plastic horseshoe which would act as an extension of the hoof. Then with silicone or other fast glue we will rebuild the lacking wall that it needs to help keeping the horseshoe in its place, preventing this from moving upwards at the same time as the animal walks. We will not rebuild it with adhesive material from the sole without placing the horseshoe since the animal will startle it and therefore it will not

stop hitting the leg to get rid of it. This treatment seems to somehow eliminate immediately pain bringing the leg toward the position in which it should be.





Figuras 220, 221, 222 & 223. Tab Pigg (2012) Hoof correction of an elderly cow-hocked donkey [Photographs] Accessed from <http://www.vettec.com/>

This palliative care is primarily applied to adult individuals. Anecdotally corrective surgeries are practiced to younger animals due to the fact that their weight makes it easier, not only for carrying them out but in that their recovery and rehabilitation will not be so complicated.



Figuras 224, 225, 226 & 227. Richard Shears (2008) Donkey foal affected by valgus knees defect before and after its surgery. After having performed a radiographic study it had some plaster allowing to straighten the bones of the leg, as months passed guides or orthopedic splints that were replaced every day were applied. Subsequent operations should be carried out in addition to the imposition of orthopedic screws that strengthen its limbs [Photographs] Accessed from <http://www.dailymai.co.uk/>



26. CLUB FEET OR CLUB FOOT

A club foot, club feet or clubfoot is a defect that has sometimes been mistakenly considered as a normal conformation in asses. While it is true that when a horse takes this defect it would acquire a similar conformation to the one with the foot of a donkey, we must not forget that the extremities in both species and their spatial conformation is different, therefore asses suffer from club feet similarly, the only thing is that this defect occurs in a different way from that of the horses'.

This problem occurs most frequently in elderly asses especially if they have been subjected to thorough routines of work throughout his life. It is common in the southernmost areas of Europe such as Portugal, Spain and Greece. They are often the result of inadequate work collars or that do not agree the animal anatomy and hurt it or when they have been tied by the pastern to shorten their range of movement. The damage above the foot derives to a range of reduced motion, shortening the step.

The reduced length of the step is usually accompanied by a change in the sequence of support of the foot which will step with the tip of the finger before the heels, which reduces heels wear level favouring the hoof to present a more vertical layout. By definition, one foot therefore becomes more upright than the other, being more prevalent this defect in one of the forelimbs.

The routine procedure of farriery consists of treatment of the feet in pairs, whether they are the forelimbs or the hindlimbs, to ensure that they are at the same level in this way. The result is that a widening remains in the foot, since it seems to represent the angle of a normal hoof this way.

This displaces the point of pivot forward, as well as shorten the stride and favours the

foot is straight (breakover point) (terminal standing stage during which the heels of the hoof rotate around the foot, which is still in contact with the ground.

In other words, the point of pivot or pivot time, is the amount of time that takes for the hoof to actually leave the ground after the heels have lost their contact with it. It can also be defined as the physical location of that point of rotation at the end of the quarter).

The only other way of leveling the hoof is to discharge the heels. However, if this is carried out very aggressively, the portion of the living sole will be cut and react making stubs which will grow much more in response, aggravating the problem.

The best way to avoid or correct this problem is to stop worrying about whether or not the feet is levelled, and the individual application of trimming to each hoof. We will reduce the heels at the level of the callous sole (basically pointing at something like the red line in Figure 228, taking the time that is necessary to do it), remove dilatation, as shown in the grey line, and apply the Mustang Roll to favour a better placed pivot point (the application of a "Mustang roll" refers to the conformation of the edge of the hoof of a horse to resemble the one which is located in American wild Mustangs).

This unique feature is an integral element of natural care of hooves, and serves to prevent the separation of the white line (laminae), as well as jump out of an excessive length of the hoof and the burning of the hoof wall. Applied correctly, the mustang roll is at once attractive and essential for the proper and healthy functioning of the holding mechanism that reflects an extraordinary wear and tear suffered by the capsule in all its outline and how this avoids that any rift appears).



Figures 228, 229 & 230. (Figures 228 & 229) Anna Larson & (Figure 230) Charlie Johnston (2005-2009) (Figures 228 & 229) Corrective treatment of one ass affected with Clubfeet and (Figure 230) Mustangs in Nevada [Photographs] Accessed from (Figures 228 & 229) <http://annalar16-ivil.tripod.com/> & (Figure 230) <http://nevadamaqazine.com/>

Feet will not seem to be a perfect couple with which to start, but steps will begin to lengthen, sole will drift more, pushing up the internal structures of the hoof at the same time, and the heel will naturally be reduced while the outsole be recessed.

If the source of original damage can be diagnosed, we must take it into account and solve it so that the problem does not progress (for example, damage to the suprascapular nerve and atrophy of the back, among others). After some time and after not to insist on levelling the hoof at the same level (paired), we will allow that they naturally level themselves.

We must monitor the hoof all the ways that we can to prevent recurrent cases, always maintaining the correct angle and considering the cause of the problem.

Elderly asses which suffer from this problem will have a well deserved retirement, or changing harness work or collar in young animals. Tying an animal by the pastern only enables or aggravates this problem, especially if we employ a knotted rope or chains.

We must promote as much movement as possible, with 24-hour assistance. To walk much on hard ground will help the animal's step develop and that its muscle is rehabilitated as much as possible.

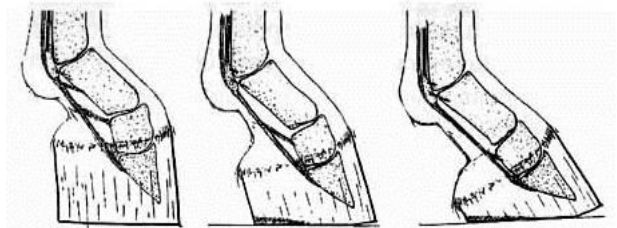


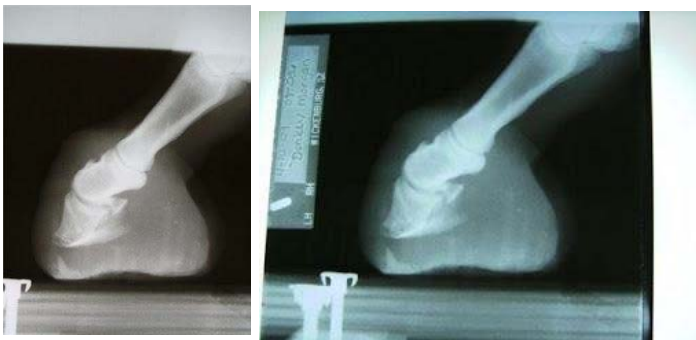
Figure 231. Dr. Strasser (1999) Method to correct club foot or club feet. A club foot describes a limb whose direction is correct but which has not rotated yet at the level of the navicular bone. Trimming the hoof is the solution, but it will take a long time to let enough sole and wall grow to fill the toe sole, but at least the navicular bone will have a better position. This illustration may be a little confusing but the wings of the navicular bone should be parallel with the ground [Photographs] Accessed from <http://www.naturalhorsetrim.com/>

This defect is caused by a shortening in the tendon and it can be corrected surgically at early ages, although it tends to be compensated by the age and animals get used to the discomfort, and even do not limp in some cases.

It all depends on whether the members of the affected limb bones are damaged or not, so that not to be so, with a regular cut, in which a bit of corneum tissue is removed from the heels area could be enough for the feet to level thus allowing the animal to walk more comfortably. Always review and regular treatment are essential.



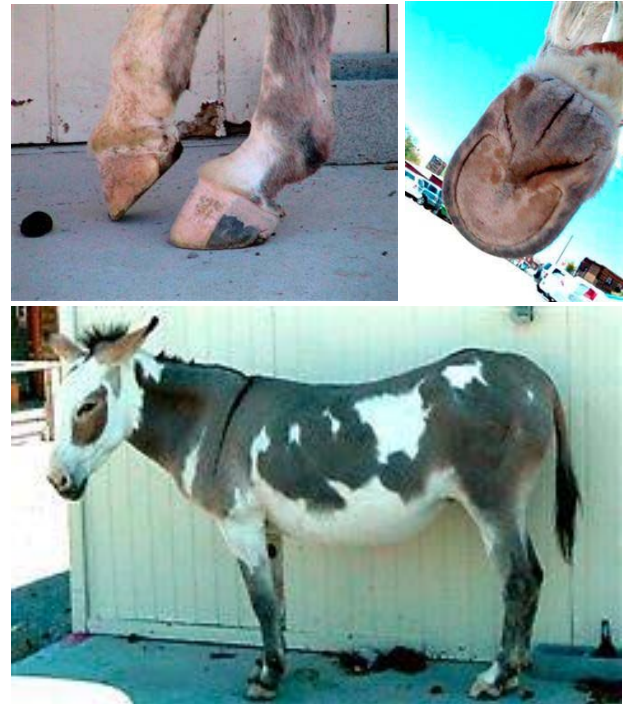
Figures 232, 233, 234 & 235. Painted Promise Ranch (2009)
From left to right, Correct hoves, and the ones from
Mephibosheth, a Club foot affected animal [Photograph]
Accessed from <http://paintedpromiseranch.blogspot.com.es/>



Figures 236 & 237. Painted Promise Ranch (2009) X-rays for the
case of Club foot of Mephibosheth [Photographs] Accessed from
<http://paintedpromiseranc..blogspot.com.es/>

27. CIVILISATION DISEASES

We know this group of diseases such as those resulting from the way in which we handle our animals. These pathologies include damage due to water overexposition, flat-soled vertical foot, separation of laminae and abscesses, among others. The main causes of these diseases are the fact of having them removed from their natural habitat and depriving them from the exercise they need to keep their feet healthy. The natural environment of asses is rocky, with weeds, rough scrub and semi-arid highlands. Its hard and small hoof with thick wall and sole, has great traction. The hoof wall absorbs water more easily than the horse's, allowing it to keep an adequate level of humidity in its dry habitat. Plenty of movement on rocky terrain models the soleplate, which will be more concave than in the case of horses. The foot is rounded in a similar way to the Mustang Roll, perhaps in what we should know as a donkey Roll.



Figures 238, 239 & 240. Cindy Sullivan (2007) Hooves belonging to a feral American spotted ass that freely grazes in the vicinity of Oatman, Arizona. This is the aspect which the hoof of a healthy ass should have and to which we must direct our attempts to [Fotografías] Recuperado de www.tribeequus.com

28. VERTICAL FEET AND FLAT FEET

It appears as soon as a donkey is led to live on soft ground. Even when plenty of exercise is not sufficient to drive the mechanism that makes the sole concave and maintains the internal structures of the hoof in an elevated position within the corneal hoof case.



Figures 241 & 242. Esther Allerton (2007) The hooves that can be seen in the photographs present a strong and healthy constitution, and remain so thanks to regular exercise more than thanks the trimming tasks carried on them, but the soil is not hard enough to produce the desired Mustang Roll and despite the fact that the exercise is quite sufficient to allow enough hoof trimming and the proper development of the frog, the soleplate is very flat and the foot is beginning to acquire an unwanted vertical position [Photographs] Accessed from NHC101:11.

Many people consider that donkey feet are supposed to be vertical, but if we study the conditions and characteristics of the hooves of feral donkeys, we quickly understand that this is not the truth. Hooves that have the status shown in the photographs allow us to foresee that in cases in which the vertical position of the foot shortens the feet stride can become increasingly vertical at the same time that the heels are used less and less. Similarly, when there is not enough exercise on hard ground that tamp down under and around the wall, it may be advisable to perform trimming and the white line may assign, letting an infection to get in. Perhaps an area equipped with hard substrate could prevent this from happening. A farrier could be tempted to hollow out the sole, making it look more natural. However, if the internal structures of the town are not well redirected inside the hoof to a higher position, this can

make it too thin-soled and relegate the donkey to a susceptible position in relation to abscesses and haematomas due to contusion.

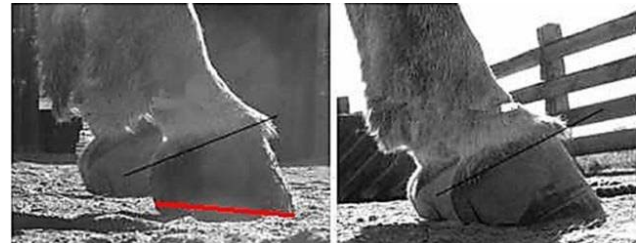


Figure 243. Esther Allerton (2007) The goal that we need to achieve is that the pedal bone (distal phalanx) is parallel to the ground, something which could be denoted by a 30o coronal line (of hair above the hoof) [Photographs] Accessed from NHC101:11.

A farrier who recognizes that the hoof of an ass, as the one you can see in the pictures, is too upright can trim along the red line shown in Figure 243, but as the hoof of donkey flat sole shows, this is not always possible without cutting invading the living sole. Regular exercise on hard ground not only directs the sole to a higher position by making it more concave, in those asses that have vertical feet it also deviates up more around the heels, allowing them to wear without having to cut the sole.

It is always recommended that the owners or keepers in cases in which their asses have vertical feet and soles ensure enough exercise on hard ground. Exercise by itself just does not seem to be sufficient to ensure the perfect health of the foot in the ass. Their feet are, as we have mentioned before, adapted to cope with hours of daily exercise on hard, dry and rocky terrain up to the point of this adaptation, which does not seem to work without them. A hard substrate area can be very useful. Donkey owners perceive that the hooves of the feet of the animals require trimming much more often after the manger where they live have been covered with cement and rubber mats. In extreme cases, drastic actions are

required so that we redrive an animal to a point from which it can be able to progress towards a healthy state.



Figures 244 & 245. Esther Allerton (2007) Ass in rehabilitation. 4 months before the living tissue of its soles was in contact with the ground. A step exercise routine was applied during which the animal was led by hand an hour a day on hard ground. The sole while still leaving living tissue to contact directly with the ground at the level of the finger began to grow on the heels, so that there is an edge of hoof ready to be trimmed or simply worn out. A few days after these photographs were taken the wall of these areas began to wear out quite quickly and noticeably, so rather than allowing nature to follow its course, we scraped the outgoing edges. Surprisingly reduced heels seemed to allow the whole process expedite and two weeks later exactly the same effect appeared and so that we could proceed with the trimming of the heels even more. The concavity on the sole had also deepened quite significantly during the same period. Trimmed heels allowed the mechanism of the hoof that pumps the blood inside the hoof during the exercise to function more efficiently, providing more nutrients and eliminating waste substances faster. The ripples in the hoof wall also seemed to disappear considerably, although it is not clear if this is due to the extra blood that allows more matrix of the hoof to be produced from the lamellar corium, filling the hoof wall, since it may also be due to wear on the slopes of dust and sand on which the rehabilitation was carried out. [Fotografías] Recuperado de NHC101:11.



Figure 246. Pete Ramey (2007) In the case of this hoof the severe withdrawal of the remaining sole is shown. The frog is at a very high position within the capsule, showing that you can be sure to cut a good thickness of the capsule of the sole because all the internal structures are away from our cutting path unless they can be damaged. If the frog were lower, it would not be possible to do it so. Sometimes drastic actions are needed since no matter how much exercise we undertake we will not be able, by itself alone, to recover the situation. [Photographs] Accessed from NHC101:11.

29. WATER DAMAGE

Another problem related to the maintenance of donkeys on soft surfaces, especially in the more humid areas of Western Europe such as United Kingdom and France, is its susceptibility to water damage. The donkey hoof wall is adapted to dry and rocky terrains and absorbs water much more easily than the hoof wall of horses does. A soft ground does not compact the corneum stratum to form a dense mass, therefore making it even easier for it to absorb too much water. The result is water damage.

The main problem that leads to the appearance of this condition is that the owners and some farriers usually pay attention to the wall of the hoof, when it shows an apparent state of dryness and then they soak the hooves and then cover them with oil so that it retains the moisture inside. This does not help to solve the situation.

Hooves need a chance to allow them to dry. Once again, a hard preferably covered rest surface or one that be well drained at least, should be provided in an area in which the same animal itself decides whether to use it or not, possibly at the same time as an alternative represented by hay, or its favorite rest area in its stable.

Anointing with oil has been relegated more from being a treatment element to a harmful element that tends to soften the hoof wall. It can be beneficial to apply oil to dry the foot preventing too much hydration to dampen the hoof, especially when the donkey will remain in the stable overnight before moving on to a soaked grass during the day.



Figure 247. Esther Allerton (2007) Excessive moisture affected hoof cracking [Photographs] Accessed from NHC101:11.

Experimenting with dry chips detached from hooves cut-out it can be checked that those which are immersed in oil almost never be encircle, even when they have then been submerged in water, suggesting that the oil effectively prevents water from seeping. The chips of hoof that were submerged in water to unwind them remained however that way several days after being out of the water given they were soaked in oil before being given the chance to dry out.

Those which were not anointed with oil began to roll up in a few hours. The most important thing is to ensure that hooves have a chance to dry. Once they are thoroughly dried, the oil can help prevent moisture to be absorbed by the hoof. Anointing a wet hoof with oil only will retain the water inside.

30. ABSCESSSES

Conditions of humidity that allow the sole and the hoof wall to become soft and permeable, and a ground characterized by a low hardness (soft) which prevents the sole from being compact and hardens, it becomes concave, and direct foot internal structures until higher inside the capsule, predisposing the foot to develop abscesses which can reach up to several cm in depth. In those latitudes where much oscillation between very humid and very dry times (such as those in Northwestern Pacific) cause this moisture allow particles of sand or small stones reach the weakest part of the hoof, the white line, something which is usually accompanied by or that allows the proliferation of bacteria and other microorganisms.

White blood cells trying to eliminate this infection accumulate generating pus between the old wall and the internal sensitive tissue. The pain is often intense and tends to get worse unless the pressure derived from the production of pus is released. These donkeys would rather remain lying and only walk slowly trying to charge the lowest possible weight on the affected limb. These abscesses, therefore, are recurrent arriving the wet season. If any living foot parts, in particular the coriums, from which the corneum stratum wall, the frog and the sole grow, is damaged or infected, the movement within the hoof is often insufficient to let the affected tissue be removed by natural means and a portion of damaged or dead tissue is built, as shown in Figure 248 pointed with the red arrows.

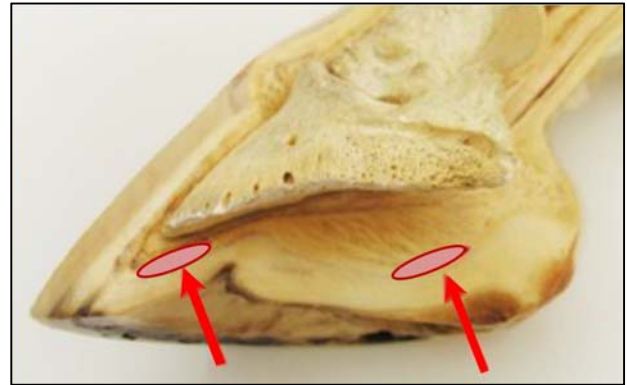


Figure 248. Esther Allerton (2007) Pouches of dead tissue that accumulate when the blood of the old drainage is insufficient [Photographs] Accessed from NHC101:11.

Often as a result of a wound which penetrates the soleplate or the white line, an abscess may develop when the wound is infected and pus is generated. Sometimes the damage is caused by an injury, such as a nail or thorn that penetrates the foot through the soleplate or the coronary band. A thick and hard sole more rarely allows such injuries from occurring. Due to the characteristics of these wounds there is a potential risk of suffering from tetanus, therefore our animal must be vaccinated periodically, and this actions will prevent us from having to worry about this.

A very vertical foot as it would commonly happen in asses, concentrates the weight of the animal in a small area at the tip of the pedal bone. Being frequently accompanied by a finger that supports and first carry out its step sequence, it adds even more pressure to this area. The compression of the corium here is very likely to lead to damage, especially if the white line has given in and is softened, thus allowing infectious agents to enter and travel towards the compressed area. Sometimes this makes the heels vertically contract and that the circulation of the area of the lateral cartilages is uneven. Part of the tissue will die, and finally an abscess will be formed.



Figures 249 & 250. Bay Sstate Brumby (2012) Abscess in the hoof of a donkey which is being treated, waiting to be opened to the outside to allow working on it [Photographs] Accessed from <http://baystatebrumby.blogspot.com.es/>.

The hoof is a rigid structure and any inflammation will cause intense pain, in a way that a donkey with an abscess will probably limp quite suddenly and in a remarkable way. There may be heat in the foot, and only one of them is frequently affected.

As the pressure grows, the abscess will begin to expand throughout the weaker route it finds to develop. Frequently it will travel down through the sole, sometimes it will open way down through the white line and sometimes upwards opening to the outside through the coronary band.

A donkey which possesses an abscess or hematoma due to the impact of a stone, may not lay on the damaged foot and will apparently seem to have the leg broken.

We will seek veterinary assistance as soon as possible and follow any advice actively and thoroughly. The owner must make sure that he/she understands the way he/she must apply the treatments needed to retrieve this condition, and if not, the vet should direct him/her to carry such guidelines out properly, which side or beneficial effects to expect and what is the progress that the lesion should present.

Traditional treatments tend to dig into the inside of the sole and damping the foot with baths soften the sole even more, favouring the abscess burst to allow it to open to the outside through a small cut. This is

equivalent to surgery and many farriers or donkey hoof carers currently prefer to let nature take its course, being possibly assisted by foot baths in a solution of vinegar.

Once the abscess has opened, the pain should ease. The foot should be kept clean and the wound can be cleaned with bathrooms or serum syringes. The most important part of the treatment, however, is exercise.

Large amount of mild exercise will increase the circulation of the foot, allowing the toxins and waste products are removed and nutrients and oxygen supplied to tissues during the regeneration of the foot. The best way to treat abscesses is to prevent them.

A pair of hooves that are kept dry and are exercised on hard ground will be compact and hard, forming a solid corn that resists the penetration of water, dirt, bacteria and from getting mouldy. The sole will be thicker and also more concave, providing additional protection.

In those hooves which are not very vertical and in which the finger is not the first part which touches the ground during the sequence of step or exercise, neither the corium nor the finger will be compressed. Hooves that are too long in the toe and have a natural conformation as a Mustang roll will not expand and pull from the white line, not so easily allowing for the bacteria to penetrate the hoof through the upper part of the wall.

We will provide our animal with shelter and protection at its disposal, water nearby and we will make sure that it never ceases to eat. We will also avoid that healthy animals hoard all the food.

Hoof bandages must be kept clean and changed regularly, daily is probably the best pattern of renewal to continue (waterproof

adhesive tape and patches for silage, are very useful as covers that allow us to protect affected hoof from conditions of ground moisture and dirt.). We have to be alert.

Some very lame animals, seem to improve if the infection opens through the coronary band. Prompt veterinary attention is still required. A damp and muddy ground, sharp and small stones in the exercise tracks and the floor of the stable, the delay of farriery tasks and episodes of laminitis among others facilitate the risk of abscesses.

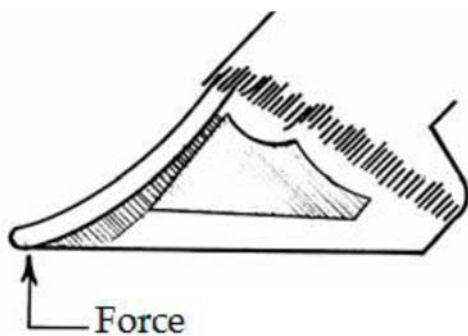


Figure 251. Esther Allerton (2007) Representation rather exaggerated the distribution of forces in a Mustang Roll type hoof [Photographs] Accessed from NHC101:11.

Veterinary care in time greatly improves the prognosis. The drainage of an abscess stops the massive pain once removed the pus and infection after being treated. We will make a small hole to drain it and then we will wrap it in a bandage with iodine.

Applying a poultice with magnesium sulfate (Epsom Salt) or English salt abscesses tend to evolve in 24 hours depending on the abscess and open to the outside through the coronary band. Then keeping the foot cleaned and wrapped for about 5 days, continuing to keep the coronary band clean.

There is much debate about whether we should leave that a veterinarian practices a shallow hole or have a wet bandage.

In the most of the cases, relieving pressure immediately is better to avoid that animals suffer more than necessary. The wait for an abscess to evolve up to breaking to the

outside can cause more pain than it is necessary. You should always consult a veterinarian to prevent them from mutilation.





Figures 252, 253, 254, 255 & 256. Melody Johnson (2010) (Figure 252) Treatment of an affected hoof with an abscess. Shows the material needed to make the bandage or lining of the hoof, tape, povidone iodine, sterile gauze pads, sanitary cotton and magnesium sulphate, (figures 253 and 254) mode of proceeding to make the wrapping and apply it to the hoof and (figure 255) very aggressive treatment in which the abscess has been cut (figure 256) and less invasive treatment in which we trepan the abscess to allow it drain, which is less invasive and more easy to cure. [Photographs] Accessed from <http://donkeywhispererfarm2010.wordpress.com/>

One of the ways in which we demonstrate that we provide good care to our asses is to provide a large amount of food. Unfortunately, this overprotection may backfire especially in spring and early summer when the grass has a high sugar content.

On many occasions asses must withstand the pain of an abscess on their hooves as a result of a diet based on grass which is too rich, and they can be affected even when they have not apparently overweight.

Phases of an abscess vary from episodes of lameness in which the animal rests on three limbs to those in which it exploits making its way through the soft tissues. The pain the ass will be supporting at this point would be the equivalent as if someone had hit his/her thumb with a hammer and it became inflamed or swollen, and also had blood trapped under the nail.



Figures 257, 258, 259 & 260. Natural Horse World Pty Ltd. (2003) Different abscesses in the hoof. [Photographs] Accessed from <http://www.naturalhorseworld.com/>

Finally the pus and serum are forced from the internal structures of the hoof and out through the coronary band or the area of the bulbs of the heels.

Sometimes a milder abscess is not even evident in donkeys that do not regularly do exercise, only appearing when the person who manipulates the hooves discovers a rotten hole on the soleplate or on the wall of the hoof.

If we suspect of an abscess is a good idea to put a poultice to the hoof affected, changing it every day so that the crown and the bulbs of the heels are soft enough to allow the abscess to find an easy way to escape to the outside. This may take up to a week, but if a donkey is lame for longer than this, as if we were in the case that something more serious was going on with our ass.

Of course if we want to prevent the occurrence of abscesses we must restrict the grass intake, especially in the afternoon and during the night when its sugar content is higher.

Better than confining the animals in a small dirty courtyard with nothing to eat, a large area in which to move will be a better option and a hay damp (to reduce sugars) must be provided to prevent intestinal ulcers, colic and development of vices and stereotypic

movements such as pica to relieve it from hunger. Do not use hay or cereal such as oats, wheat or barley straw since these can have even a higher content in sugars than grass. The best option is to enclose a circular area around the area of pasture of asses that may be grazed by sheep, cattle or other horses in the early season. We could even till or plow the grass if a donkey is affected of laminitis or lame with insulin resistance, in order to eliminate all grass while we provide them with a place to move.

Movement is vital for the ass to consume calories and shed of boredom. Another ass companion promotes game and therefore movement, and is a much more healthy method than any other when keeping an ass in captivity. Those animals affected by laminitis and living alone will dampen and this will have repercussions in a prolonged recovery.

If we cannot provide our animal with a track (especially if it is a little abrupt) or companion for its movement, then we must exercise it by mounting it, driving it or leading it as essential, as well as it will be the companion of another domestic animal like a cow, a goat or a sheep.

Another option is to make our ass run through large areas of shrubs or poor grasses on which sheep have grazed. Yet the supply of hay under sugar is necessary.

An abscess in the hoof is a warning sign that a donkey has suffered an episode of laminitis, and therefore predisposes it to new abscess formation unless the guidelines and characteristics of the food are modified. Providing too much food is counterproductive and may contribute to the worsening of the problem. Bribes such as carrots, apples, sugar, bread cubes have carbohydrates which increase the required intake up to even exceed the maximum

limit, as it would happen in a case of diabetes.

An alternative to such bribes may be sunflower seeds or scraping or brushing them well in their favourite areas (inside of the ears, among others).

Grain, pellets, or even oat straw are rich in carbohydrates, so we must feed them alternately on speedi-beet (micronized beet pulp without molasses) or by soaking oats straw or using a very small amount of alfalfa.

If we detect the early signs of laminitis we must take our pet out of the grass area on which it may be and proceed with the care of the hoof to relieve symptoms. Always be alert not to overfeed or underfeed our animals is the best caution that we could take with them. Let us not forget that only treating the hooves makes no sense if we do not pay attention to the rest of the factors involved, among which the most important are diet and exercise.

31. EXCESSIVE OVERGROWTH

Causes:

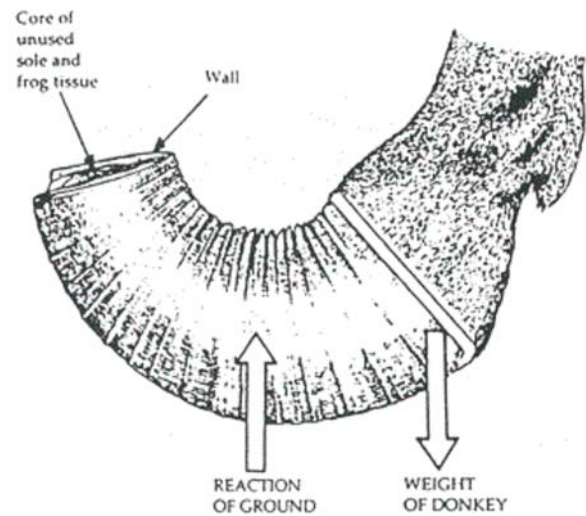
- The absence of care of the hooves.
- Irregular and infrequent clipping or trimming.
- Fresh and soft paddocks instead of stony and hard ones to allow a correct balance between hoof growth and wear.

If the foot of an ass is left without trimming for a long enough time, the foot becomes so long that it becomes unstable and loses its balance. This forces phalangeal joints to hyperextension.

However, and because of that we must understand the hoof as a dynamic entity, composed of a flexible substance, this responds to unusual forces that distort it and collapse until it acquires a curved shape in the same way as Turkish slippers or a corkscrew.

Weight falls then on the heels, which collapse inward, surrounding the disused sole and frog. The frog grows as a core inside the hoof. The scholars agree that if we want the new hoof to grow in a natural way, all the forces that distort it must be eliminated immediately. This can be carried out using a template in the correct way on the distorted hoof.

However, there is one aspect that saves it helping us with this condition. The extensor process of the third phalanx (pyramidal process of the pedal bone) almost always maintains the same spatial relationship with the anterior part of the coronary band (if there is any doubt we will make a radiographic study). Therefore, the coronary band becomes the reference for our template line.



Figures 261 & 262. (Figure 261) J. Fowler & (Figure 262) Anita Padilla (1995-2014) (Figure 261) scheme of an overgrown hoof and (figure 262) Sully, a 15 years ass which is affected of severe overgrowth and can barely walk. To treat it with a power saw cutting off the corneal excess given that the animal was hard hit and then proceeded with the normal trimming tasks [Drawing and Photograph] Accessed from (Figure 261) J. Fowler, 1995 & (Figure 262) <http://www.thedenverchannel.com/>

All the tissue of the hoof that remains beyond the template should be removed in different stages, as it would happen in a normal process of clipping or trimming, as described previously. During the original process of distortion, many blood vessels break, leaving a live stained pinkish bluish colour on the substance of the hoof. The veterinarian must have sufficient confidence in their knowledge of anatomy and his/her technique to realize that this stain is not actually sensitive tissue.

As you can see in the figure 263, the distortion of the hoof wall includes most of the break of the laminar band between the pedal bone (P3) and the wall. This can leave a vacuum that can be filled with amorphous substance of the hoof. This area may have to be exposed in the remedy process (and requires constant cleaning and coating until the hoof has grown again). Great care must be taken to avoid scratches and therefore the aggression of the existing remnants of the pedal bone.

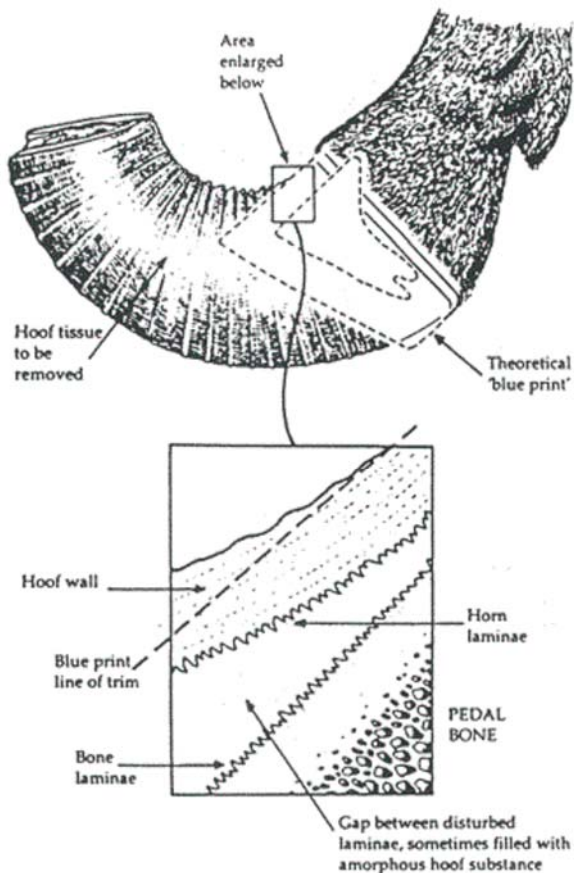


Figure 263. J.Fowler (1995) Detail of the torn laminae area [Schemes] Accessed from J.Fowler, 1995.

The final effect could resemble the present Figure 264. The laminar area exposed soon will grow over it. The ass will only adapt immediately to the new support basis and the proper position of the feet, unless the deformity has been present for so many years that joint remodeling had occurred.

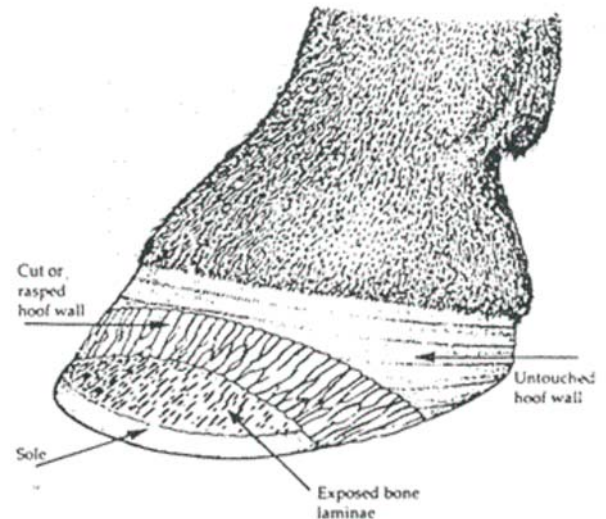


Figure 264. J.Fowler (1995) Distorted hoof post trimming (in the illustration the hoof has been represented less deep than it is in reality) [Scheme] Accessed from J.Fowler, 1995.





Figures 265, 266, 267, 268 & 269. Horse Lovers Forum (2010) Treating the overgrowth problem of a donkey which is about 16 years old. We must understand that it is not enough with a single corrective treatment in these cases but that the visits of the farrier must at first be more frequent to thus monitor the correct development of the treatment until the ass regains the ability to walk and eliminate underlying pathologies [Photographs] Accessed from <http://gallopingfree.forumactif.com/>

Derived from this problem the following will appear.

32. LAMINAE SEPARATION

The laminae that join the hoof wall to the pedal bone, are complex and highly sensitive to damage. In this case we will focus on the study of such damage, and more specifically in the one deriving from some overgrown fingers, since it is the most common cause of laminitis in asses. Many donkeys' hooves grow very vertically, with long heels and short toes, but in other cases many fingers grow enough to move the pedal bone.

The laminae, we could say, resemble one of those locks present in reusable plastic bags, running from the outside inwards joining the inner wall of the hoof to the pedal bone. These 'locks' of the pedal bone remain in their place, but those of the inner portion of the hoof grow down from the coronary corium at the same time as the hoof grows, but remaining attached to their counterparts in the hoof wall.

If the finger is kept short and rounded through exercise on hard ground these locks will remain linked when it is placed apart from the ground, but if the finger is long, forces are applied on them, when the donkey rides, pulling from the latches out, but contrary to what would happen with bag locks, these do not interlock again. Once they have been separated, they not only remain separate but favour the locks established in upper portions also be separated. This can begin rather insidiously, as it can be seen in the extensive visible white line on the flat sole that can be seen in figure 241.

The white line is the visible limit of the laminae (or 'locks'), which seem to dilate when they have begun to separate. If the feet grow more, then the separation will be apparent when looking at the profile of the hoof wall, as you can see in Figure 270, (represented by the red line concavity).



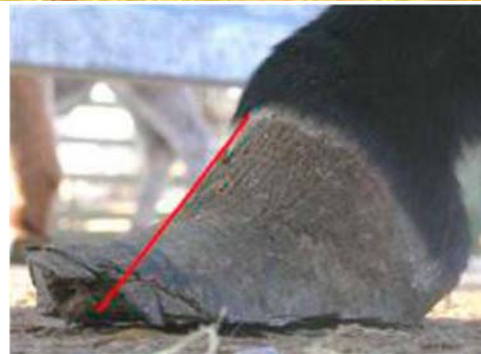
Figures 270, 271, 272 & 273. Esther Allerton (2007) The white line is the visible limit of the laminae (or 'locks'), which seem to dilate when they have begun to separate. If the feet grow more, then the separation will be apparent when looking at the profile of the hoof wall, as you can see in Figure 270, (represented by the red line concavity). This foot must be trimmed, by removing all the wall which is lower than the sole. The dilatation of the toe

should be removed as it can be seen in Figure 272, represented by a red line, rebonding the finger makes the white line rest. [Photographs] Accessed from NHC101:11.

At the same time that the finger grows, less weight will be placed on the toe and the heels. This decreases the growth rate of the toe in the hoof, so any visible ~~visible~~ space between growth rings will be closer in the toe than it will be in the heel, as you can see in Figure 271.



Figures 274 & 275. The Donkey Sanctuary (2007) The joints are hyperextended and laminae can be separated, however, the pedal bone usually stays in the same position in relation to the coronary band. If the situation is allowed to continue, the feet can finally remain in this position. The x-ray shows that, in this hoof, only the highest section of the hoof stays attached (locked) to the pedal bone. The lamellar separation is almost complete. The initial treatment is quite similar in all personnel responsible for the care of the hoof both, traditionally or naturally and consists of removing the dilatation of the end, reshaping the foot completely. [Photograph] Accessed from NHC101:11.



Figures 276, 277 & 278. The Donkey Sanctuary (2007) (Figures 276 & 277) Start cleaning, trimming and shaping the sole and the frog first. Always when trimming we must take into account the position of the pedal bone. The width of a finger above the coronary band can be taken as reference for the angle of the front surface of the hoof wall, (figure 278) the toe in a lighter color corresponds with exposed laminae. There is an alternation between a filed surface and the surface which has not been intervened in the sides [Fotografías] Recuperado de NHC101:11

The picture on the left shows how much overgrowth of the wall can be trimmed. Firstly, the section in a worse state of the finger is cut out, then remove the worst of the expansion, approximately following the red line. The wall is trimmed using the sole as a guide, eliminated the dilated parts where appropriate. At the end of the trimming the foot will have the appearance on the figure 278.

While the toe is kept short and rounded, laminae fastened at the top of the hoof will remain locked at the same time that the wall grows downward from the coronary band. Enough exercise will increase the supply of blood flow allowing the laminae to remain healthy and strong, preventing them from cracking and separating from the pedal bone. Exercise on hard ground will encourage that the heels remain low and keep the toes rounded, preventing excessive force from pulling the laminae

apart and separating them while the
ass walk.

33. FROG INFECTION OR THRUSH

The infection of the frog or the infection of the adjacent parts on the sole of the hoof triggered by the accumulation of dirt (mud, manure, wet bed) especially in the adjacent parts to the frog bars because of an incorrect application of the tasks of trimming, that favours the absence of air and the proliferation of fungi and anaerobic bacteria making the animal be sick and whose progression causes frog ulceration, particularly to the bulbs of the heels (wet and sliding bandages or poultices which have been applied for a long time can also easily lead to the development of an infection).

Causes:

- Stone contusion.
- Bad hygienical status of the stables.
- Scarce or unexisting regular cleaning of the hooves.
- Wet conditions.
- Overgrowth.

This situation caused by anaerobic bacteria (*Fusobacterium necrophorum*) that generates a blackish dark, purulent exudate and extremely and unmistakably smelly, is installed in the frog as a result of any of the reasons set above, forming a paste of sticky, wet dirt collecting in this area.



Figures 279 & 280. (Figure 279) User Triangle & (Figure 280) Charlotte Cantley/New Zealand Veterinary Association NZVA (2014) (Figure 279) Infected frog (Thrush) & (Figure 280) The result of a chronic infection of the frog is an exuberant granulation tissue that destroys the frog, causing discomfort which compels the animal to walk on its toes [Photographs] Accessed from (Figure 279) <http://www.usertriangle.org/> & (Figure 280) <http://www.nzva.org.nz/>

The way to combat it goes from different ointments such as Nilatte liqueur or other products with drying action that we can find in the market.

The formula for Nilatte liquor that has good results in the treatment of this condition is as follows:

- 30 g of Copper sulphate.
- 30 g of Zinc sulphate.
- 60 g of liquid Lead acetate.
- 400 g of vinegar.

A way to prevent it, is the regular cleaning of the foot and preventing the animal from being on a wet floor for long periods. Treatment is not always successful in those cases affected for a long time. This includes all of the affected tissue cutting and the use of antibiotics and disinfectants to control the infection.

This problem must absolutely be treated by a farrier with experience, since we are going to manipulate and alter the delicate area of the frog due to its importance, on the irrigation and distribution of the weight on the foot.

We have to keep the bed of the place where the animal rests or spend more time, clean and dry, and this must be lifted and removed for airing it or even changed twice a day, at least until the problem is controlled. If we have softness conditions, moisture and dirt within the stable we must enable an area that presents the opposite to these features where the animal may be enabled to rest the most of the time.

After the farrier has removed the portion of sole or affected frog, we scrub the sole and the frog with a dilute Betadine® solution twice a day to ensure that the dirt is descaled and crevices are clean. We will make it with a tooth brush with just the size that allow us to enter into these recesses.

Another option is to fill a bottle with sprinkler type spray with a part of water and another part of 3% peroxide of hydrogen (hydrogen peroxide) solution. We carry the spray and shake it several times so that the ingredients mix well. Remove as much dirt as possible from the hooves until the sole is fairly clean, around the frog and in the spaces between.

Then one by one we carefully sprinkle the soles of each of the limbs with the mixture. Ideally we hold a few seconds the hoof upside down and take advantage of the concavity of the sole as a bowl filling it with the mixture so that it acts in it for a few seconds and penetrate between the small cracks and fissures in the hoof before returning the foot to the ground to allow it drain. We will try this method once or twice a day for a week, which will clean hooves and all its sole surface up in a fairly effective way. Once we have eliminated the problem, all we need to do is to repeat the treatment regularly preemptively.

After washing, rinsing and drying, we will sprinkle it with an antibiotic spray as Nolvasan or Kopertox or Nilatte liqueur.

Detailed hoof trimming to eliminate any excess of tissue below, remembering to check the four feet. The conditions in which the donkey has been maintained so far should be improved to prevent recurrence, particularly if it is not possible for animals to be locked up for a somewhat longer period of time.

Something very important is to note that if we have an affected ass, the others may have a high risk of being affected, therefore it will also be necessary for the farrier to check the animals. It is always better to prevent than cure, since severe cases will require further attention from an experienced veterinarian.

34. SUBSOLAR ABCESS OR HORMIGUILLO

This is a fairly common problem in these animals. Anaerobic bacteria cause cavities in the plates of the hoof producing pain. The best solution to this condition consists of trimming the affected part and leaving it exposed to the air, combining this action with the application of merbromin.

35. QUARTERS

Quarters are cracks that occur on the wall of the hoof. The cause of this condition is usually:

- Dry helmets.
- As a result of a bad fitting that degenerates into a bad cast of the pressures that the hoof supports.
- Accidents.

In damp areas, when hooves that have not been shod have been allowed to grow long enough, they have not been shod and are completely neglected, these cracks often appear and are called quarters of grass.

The treatment is fairly simple. We will solve the imbalance of growth and practice a correct farriery, in addition to greasing them with laurel oil.

36. LAMINITIS AND CHRONIC LAMENESS

The union between the corneal hoof case and the last bone of the limb is progressively weakened on each episode of laminitis. As a result from repeated episodes of laminitis, which often go unnoticed, long-lasting and often permanent changes in the structure of the hoof will appear. The present signs that demonstrate this problem include the following:

- Growth rings on the outside of the hoof are closer together at the toe than at the heel (the hoof wall when appreciated from the outside should be more vertical at the top near the coronary band than at the bottom.)
 - A convex sole and that possibly will be thin and painful.
 - The ass can move at a slow walk, loading more weight on the heels with prominent shoulders.
 - Recurring problems of feet as abscesses, seedy toe and white line disease.
 - A clinical history of obesity, grass excess and irregular horseshoeing.
 - The owners of donkeys suffering from these problems should consider the following advice, which can help them to stabilize the condition and maximize the quality of life of their animals.
 - Follow veterinary advice regularly and apply for a routine general check-up at least once a year.
 - Trimming with care, being checked-up by farriers regularly.
 - The growth rate varies from one ass to another and therefore the intervals between trimming sessions must be adjusted according to it.
 - A deeply clean and well-organized bed provides a comfortable rest for the season when the animal has injured its feet.
- Fat animals must be applied carefully dieting.
 - A high in fibre balanced diet should be provided with supplements and additives only under veterinary prescription.
 - Avoid and beware any predisposing factors that could trigger an episode of laminitis.
 - Avoid muddy stables and wet and dirty beds.
 - Clean dirt hooves at least once a day.
 - Unfortunately it is inevitable that some donkeys' hooves deteriorate to a point where the damage is constant. A treatment that includes pain relievers, may not be sufficient in these cases, leaving, sadly that euthanasia is the last act of charity towards our animal that we can carry out.

It is a frequently unrecognizable inflammation from the living parts of the foot, which leads to a destabilization of their structures. Repeated episodes and untreated can lead to severe damage of the hoof structures. In this disease the important union between the bones and the hoof case capsule, is damaged simultaneously with the inflammation of the sensitive tissue associated with it.

It always requires attention and Veterinary advice even just when we suspect that our animal may be suffering from it. Laminitis is a multifactorial disease that almost always attacks the forelimbs and the most common potential causes are:

-Very caloric food, carbohydrate-rich and decompensated (rich in grain and too caloric grass, as new outbreaks or fast-growing herbs) and too much concentrated food based on mixtures of cereals. Asses

thrive with a high in dietary fiber diet and can easily acquire overweight or become lame if they are not properly fed. The laminae are layers attached to the whole of the structure of the hoof wall. These layers can be very painful and inflamate, leading to an episode of laminitis and ignite.

- Obesity.
- Colic or delivery and parturition.
- Overgrowth in the hoof length and por work of farriery.
- Some diseases which laminitis is a derived complication from.
- Hard work for a long time.
- Among others.

The signs that will call our attention the most will be that the animal has trouble walking and loads all its weight on the hind limbs, being the animal reluctant to move, preferring to lie down or rest on a soft soil or soft bedding. Shows a change in the station, in which the weight is loaded now on the heels. We can observe animals that raise their limbs alternately changing the weight from one to another forelimb. Frequently and given that trigger alterations are often systemic four limbs will be affected, presenting an increased digital pulse in the arteries and on each side of the fetlock joint.

It requires veterinary care from its early stages as soon as possible (even when it is a mere suspicion) as well as of our perfect synchronization and collaboration with the farrier. To prevent laminitis, we will restrict access to new grass or rapid growth areas, through the use of a mobile electrified fence, or limiting asses while they graze.

We will feed on hay or straw prior to the change of feeding since in this way we will help lower the consumption of carbohydrate-rich grass. We should always avoid obesity, conscious and carefully

controlling the food that we provide it with, adding any additional food slowly and always feeding in frequently administered small amounts.

Similarly we will reduce or change food slowly and gradually. We will use high fiber and low starch food. New good quality hay may have to be introduced slowly in limited quantities. We will of course keep the hoof regularly trimmed.

If we suspect that our animal may be suffering from an episode of laminitis we must follow all the advice we receive carefully, emphasizing on those aspects which we do not understand well, about how to apply bandages and protectors, dosage, if necessary, apply some type of drug that combats pain or even about what would be the progress and prognosis we should expect. We will prevent animals from the access to an excess of additional feeding, of course or to more than adequate grazing, without depriving them from food. We will limit the amount of hay, straw or foods with a high fiber and low in carbohydrates composition. It will be very useful to provide a stable whose floor is covered with a fluffy and deep bed. Rest and minimize the walking exercise will allow damaged tissues to recover. In asses, chronic laminitis is a very common condition especially in those animals that arrive at shelters after being severely mistreated or neglected.

To minimize the risk of future problems with laminitis, we will restrict the access to new outbreaks, and fast-growing grass, limiting the time we let animals graze using a mobile fence. All of the food changes must be made gradually. We will avoid highly energetic foods rich in carbohydrates and will try to provide fiber rich food, with a special care for obese asses. The vast majority of donkeys in countries where their use is lost, exclusively relegating them to the position of pets and those which do not

develop any work, since they do not bear the weight of the activities that keep the family economy as it happens in developing countries, therefore suffering from equine metabolic syndrome, an imbalance between over-eating and lack of exercise. For those unexperienced farriers it can be difficult to try to work with a hoof of an ass basically due to the size and characteristics of the hoof and to their lack of skills to do it. This will make the time between trimmings or tasks for the care of the hoof extend too much.

All these factors contribute to the development of laminitis.

In addition to the distinctive form of U. The compact tubule coating, which is relatively thin in the horse hoof, extends the thickness of its wall more than half more. Apparently the front third of the sole should be in contact with the ground. Asses Feet are usually from 5 to 10 degrees more upright than the feet of the horses, but they should still have a straight foot with the pastern axis.

Frequently, asses' hooves are trimmed too straight and because of this, the axis of the foot is often broken forward.

The union of the coronary band with the dorsal angle of the wall, is as in horses and ponies, pretty consistent, and ranges around 105°. So that we can suggest that if its feet are trimmed so that the angle between its dorsal wall and the soil becomes too acute, the forces affecting the dorsal surface of the pedal bone will make such hooves more prone to laminitis as well as it will also increase the possibility of recurrence of this condition.

Obviously a radiographic study will help us to discern the state of our animal, but to do this, we must know what the characteristics that a donkey physiologically has, are, to

thus compare them with each specific case and proceed to its assessment.

The first aspect to consider is that the radiographic anatomy of the hoof of a donkey is not the radiographic anatomy of a horse, and our diagnosis, if we are not accustomed to such existing differences, can be altered.

Generally, the anatomical structures of the foot of the ass tend more to the verticality than those of the horses', but it will be when examining the asinine hoof details more in depth thoroughly when we will find the most important differences. The absolute values for key radiological parameters in donkeys are different from those accepted for the horses. Among them are very pronounced differences in the slope of the wall of the hoof, the alignment of the phalanges and the position of the distal phalanx in relation to the hoof wall. In particular, the average value for the distal position of the distal phalanx is 3 times greater for asses than that observed in ponies (*Cripps and Eustace, 1999a*). The value observed in the asses is comparable to the one found in Thoroughbred and warm blood of larger breeds (*Linford et al., 1993; Cripps and Eustace, 1999a*).

These data corroborate Reilly (1997), Eley (1998, 2000) & Collins et al. (2002) empirical observations according to which the distal phalanx is more distally positioned inside the corneal case of the hoof from where it is placed in the hoof of a horse. Therefore, the extensor process is not aligned with the coronary band, as it happens in the horse. The average depth of the integument measured at the middle point of the distal phalanx (PDM) is around 25% (3mm) presenting a higher value than the one given for the ponies by Cripps and Eustace (1999a). Although the mean of the values recorded for the PDM approach

the results presented for the Mammoth donkey by Walker et al. (1995), were lower than the average registered 22.5 mm for the same breed in other studies.

This may indicate important differences between donkey breeds, as it has already been reported for the same parameter between the different breeds of horses, or may also reflect differences in terms of body weight, between Mammoth ass and European breeds of a smaller size. Therefore, and as it was expected, the donkey presents a unique radiographic anatomy, which makes it inappropriate to apply models of study of horses to this species.

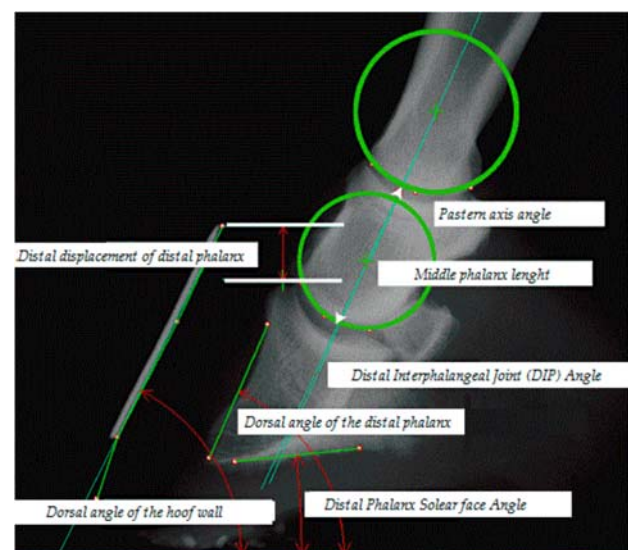
While it is true that different management regimes and depending on the applied study protocols, the conformation of the distal portion of the limbs can be affected, they do not affect the displacement of the distal portion of the distal phalanx nor the average tegument depth measured at the middle point of the distal phalanx. This should especially be considered when evaluating the state of certain diseases such as laminitis. Critical values were found for this disease for the previous parameters of ≥ 15 mm (Linford et al. 1993), and ≥ 8 mm (Cripps and Eustace 1999b), respectively in the case of the Thoroughbreds. However, these values are similar to the standard found in asses.

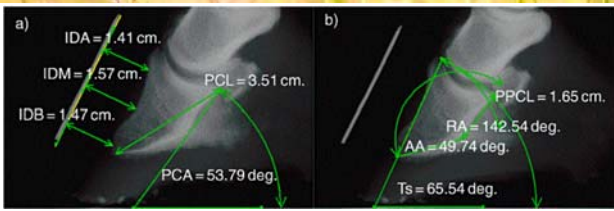
RADIOLOGICAL DIRECT AND DERIVED ANGULAR PARAMETERS OF THE FOOT (DEGREES)				
PARAMETRES	HEALTHY N=83	LAMINITIS N=74	MEAN COMPARISON	
	Mean (\pm s.d.)	Mean (\pm s.d.)	P value	SED ¹
S: dorsal angle of the hoof wall	61.61 (5.24)	59.03 (6.93)	0.01	0.988
TS: Dorsal angle of the distal phalanx	64.11 (4.70)	71.55 (8.18)	<0.001	1.078
U: angle of the proximal phalanx	59.83 (9.07)	59.10 (8.41)	0.60	N/A
C: angle of the Middle phalanx	54.72 (7.46)	56.71 (9.36)	0.14	N/A
SA: Solear face angle of the distal phalanx	8.26 (4.75)	10.89 (6.37)	0.004	0.903
PAxis: The axis of the pastern angle	5.11 (5.20)	2.39 (6.48)	0.005	0.943
HPA: Angle of the axis of the pastern with the hoof	-1.78 (10.90)	0.08 (11.24)	0.30	N/A
Ang H: angular deviation between the dorsal aspect of the distal phalanx and the back of the hoof wall	2.50 (3.07)	12.52 (9.40)	<0.001	1.137
A: Phalangeal rotation angle	-9.39 (9.16)	-14.80 (10.7)	0.001	1.597
Ang F: angle of the distal interphalangeal joint (DIP)	-4.30 (10.40)	-12.40 (11.60)	<0.001	1.764

RADIOLOGICAL DIRECT AND DERIVED LINEAR PARAMETERS OF THE FOOT (MM)				
PARAMETRES	HEALTHY N=83	LAMINITIS N=74	MEAN COMPARISON	
	Mean (\pm s.d.)	Mean (\pm s.d.)	P value	SED ¹
IDA: Depth of the integument of the dorsal aspect of foot (proximal end)	15.46 (2.38)	17.76 (2.67)	<0.001	0.405
IDB: Depth of the integument of the dorsal aspect of foot (distal end)	16.20 (2.48)	20.18 (3.59)	<0.001	0.497
IDM: Depth of the dorsal aspect of foot (Middle dorsal end)	15.60 (2.60)	20.36 (4.13)	<0.001	0.557
D: distal displacement of the distal phalanx	10.40 (3.66)	13.02 (3.98)	<0.001	0.612
MPL: Length of the Middle phalanx	26.83 (3.21)	26.59 (2.28)	0.59	N/A
DIRECT AND DERIVED LINEAR PARAMETERS OF THE FOOT (MM)				
PARAMETRES	HEALTHY N=83	LAMINITIS N=74	MEAN COMPARISON	
	Mean (\pm s.d.)	Mean (\pm s.d.)	P value	SED ¹
PPWA: Angle of the proximal palmar wall	52.64 (5.18) °	59.13 (7.72) °	<0.001	1.059 °
RA: palmar reflex angle	147.99 (4.41) °	141.40 (5.83) °	<0.001	0.831 °
AA: The apex angle	44.66 (3.78) °	51.70 (6.37) °	<0.001	0.729 °
PWL: Length of the palmar wall	34.72 (3.18) mm	32.40 (3.30) mm	<0.001	0.518 mm
PPWL: Length of the proximal palmar wall	15.93 (1.99) mm	15.66 (1.47) mm	0.32	N/A

¹SED: Standard Error of the difference between two means
Tables 3, 4 & 5. Collins SN et al. (2011) (Table 3) Overview of hoof angular and (Table 4) linear radiological parameters in groups of healthy asses and those affected with laminitis and (Table 5) highlights of the morphometric characteristics of the distal phalanx in healthy asses and those affected with laminitis.

Significant changes appear in the hoof, in the alignment of the hooves and the interrelationships and morphology of the distal phalanx in cases of laminitis. These anatomical changes are characterized by significant increases in angular deviation between the dorsal aspect of the distal phalanx and the back of the hoof wall and its interphalangeal rotation, as well as a distal proximal phalange also increased displacement will be found.





Figures 281 & 282. Collins SN et al. (2011) Lateromedial x-rays from the foot of a healthy donkey showing the angular and linear parameters [X-rays]

Bearing in mind that the differences among the factors conditioned by the body weight of the individuals in each of the examined groups were not significant, such as; the length of the middle phalanx (MPL) or the length of the proximal palmar cortex (PPCL), isometric scale effects can be ruled out as responsible for the differences between the depth of the integument of the dorsal aspect of the foot (ID) and the distal displacement of the distal phalanx (D).

The low or moderate correlation coefficients suggest that displacement events were not related and clearly pointed an inherent variability among individuals, both in the case of healthy individuals and those affected. This variability suggests that confidence in a single parameter to examine the presence of laminitis or its lack thereof is improper, thus compelling us to assess the factors in full as part of a whole looking for complementarity and better reliability in the diagnosis. The morphometric characteristics of the distal phalanx collectively show that an extensive remodeling of the distal phalanx and lysis takes place in the foot of a laminitis affected ass. This may be particularly relevant in terms of prognosis and remodeling in the affected horses, because laminitis relegates the animal to a state which is refractory therefore having recurrent episodes of pain (Johnson et al. 2000).

Though certainly the relationship between remodeling/lysis of the distal phalanx and a laminitis refractory status is unknown, the loss of bone intuitively reduces the effective

area over which the body weight of the animal is beared inside the capsule of the hoof, hanging by means of the lamellar interface and the suspensory apparatus of the distal phalanx (Collins et al. 2010). In addition, laminitis severely affects to the properties of the materials in the suspensory apparatus (Hood 1999). Therefore the reduction of the surface of suspension, together with changes in the properties of the materials, results in a greater displacement of the capsule of the hoof during weight-bearing actions, causing an increase in the deformation of the solar dermis and associated vasculature and the subsequent stress and elevated pressure inside the suspensory unit which additionally increases its structural integrity. It creates a vicious circle of degenerative changes that clinical veterinarians and farriers must attempt to break, stabilizing the foot and preventing the progressive bone lysing with time pass.

Some authors like Eley and French (1993) suggest that the evaluation of remodeling of the distal phalanx within the foot of an affected ass with laminitis is of significant importance in establishing prognosis tasks to carry out. The same authors will later state, (Eley, 1998, 2000) that treatments must be primarily directed toward the prevention of the progression of the degeneration of the distal phalanx, which should be examined and monitored during the follow-up of each clinical case.

A close relationship between the degree of angular deviation between the dorsal face of the hoof wall and the distal phalanx and the distal phalanx morphometric change extension has been shown. In this way, an increased angular deviation between the dorsal process of the distal phalanx and the back of the hoof wall can result in an increase in the pressure of focal contact at the apex of the distal phalanx during weight-

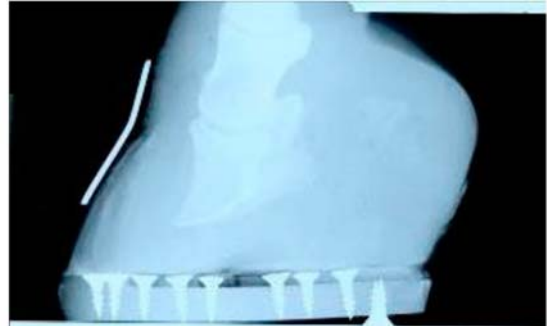
bearing, resulting in its renovation, due to pressure-induced lysis.

This also explains why similar morphometric changes related to displacement were not observed with the distal displacement of the distal phalanx. In this case, the focal pressure at the apex of the distal phalanx rarely occurs. These differences in reactive bone, can explain, in part, the empirical observation of authors as *Eley (1998)* according to which the ass can more easily withstand a distal displacement of the distal phalanx than its rotation.

In some donkeys with laminitis the soleplate may be too thin to trim it. We will apply pressure with our thumb to appreciate the difference between an hematoma and live blood supply.

Stands for the frog and heart bar shoes are not suitable for their use in laminitis affected asses. They transfer the weight to a point of the frog that is about 2 cm behind the point of support of the P3. We will pad the sole completely and the foot by extension with a thick cotton pad and a bandage.

As we have already mentioned, the frequency of regular trimming must be maximum every 6 weeks. However we must consider, a lower frequency and make each visit at a shorter time between them, in those cases in which the growth is increased after an episode of laminitis.





Figures 283, 284, 285, 286 & 287. The Donkey Sanctuary (2006) Different hooves belonging to laminitis affected asses. Also some pre and post implementation of palliative treatments to alleviate the effects of the disease rays are observed. A close relationship between the degree of angular deviation between the dorsal process of the hoof wall and distal phalanx, and the extension of morphometric changes of the distal phalanx has been demonstrated. Thus, an angular offset increased between the dorsal side of the distal phalanx and the back of the hoof wall can result in an increase in focal contact pressure at the apex of the distal phalanx during weight bearing, which can result in its remodelling due to lysis induced by this pressure. [Photographs & X-Rays] Accessed from NHC101:11.

37. NAVICULAR SYNDROME OR NAVICULAR DISEASE

Problems in limbs of the individual to atrophy problems in the hoof may be caused by bad shoeing or an extremely hostile environment, i.e., a very hard or stony ground can cause this claudication. They can also be caused by a softening of the navicular bone, excessive tension in the tendon of the deep digital flexor muscle, among others.

The diagnosis must be issued by a veterinary specialist in equidae lameness, in collaboration with a farrier to carry out the appropriate treatment that will correct this situation.

Some of the shoeing methods that apply to this condition may include:

- Egg bar horseshoes.
- Rigid pack between the horseshoe and the hoof with soft silicone that protects the area from bruises.
- Horseshoes with quite fitting and much rolling in the toes.
- etc.

38. ESCARZA OR HOOF WOUNDS

Injuries resulting from bruises on the wall or at the heels of the hoof. These bruises are produced by hard terrain or even, on occasions by one pressure higher than normal of the medial heel of the horseshoe in an inappropriate shoeing system.

Everything is solved shoeing properly so that the distribution of pressures redistribute properly. Cleaning the area thoroughly, relieving the pressure that it supports to recover it as quickly as possible.

Causes of lameness are so diverse that it would take only one book to be able to treat them, here are the most common ones.

A well developed and healthy foot is pretty and is essential to allow the proper locomotion of ass. Between shoeing sessions, good food and necessary care from cleaning to the implementation of corrective measures will make our animal be able to carry out the tasks we demand from them more happily and therefore more friendly and volitional, and with fewer difficulties, thus achieving a higher work performance and greater satisfaction from our part since we have collaborated on the protection and welfare of our donkey friend.

39. SEEDY TOE AND WHITE LINE DISEASE

“Seedy toe” is a condition that affects the wall of the hoof especially, the white line, and which seems to dispense from an obvious point of penetration in it. Apparently an incorrect morphology of the hoof, which has an overgrowth affected corneal case or which is incorrectly trimmed. When this horny case does not reflect a direct pattern of the pedal bone, it distributes the forces that act on the hoof incorrectly, the white line, its bone structure and the internal tissues of the hoof, compromising the proper growth of the corneum stratum and making the bacteria, which are always present in it or in the environment, grow and penetrate it.

Bacteria and fungi that are normally present in the environment, are multiplied in these spaces and cause the alteration of the normal structure of the hoof. The wall of the hoof acquires an abnormally grey texture which seems to crumble. The affected areas range in size from barely visible until there is a vast gap between the old wall and the underlying white line. These larger cavities can be filled with a mixture of rubble and altered hoof wall, sounding hollow when tapping on them with knuckles.

These problems itself are usually not painful, but predispose the animal to make it suffer one higher risk of abscesses, which could cause a more severe lameness. Factors that may contribute for this problem to occur are:

- Wet and dirty bed.
- Muddy meadows.
- Continuous contact with feces and urine.
- Poor diet.
- Postponed shoeing.
- Chronic or recurrent laminitis.
- Advanced age.

All of these factors should be considered when we want to find a treatment for the

disease of the white line or seedy toe. Certainly it seems that the more dirty and damp the environment is the harder the worst changes of chronic laminitis will be solved. A treatment will succeed more often when the owner, veterinarian and farrier work together, but each will play its role. Unfortunately there is no simple or quick remedy. The white line is the weakest part of the base of the hoof between the wall and the sole. The white line disease appears when this area is filled with small stones and other debris.

We can commonly define this disease as the penetration or infection by a fungus through the white line when it is weakened as a result of previous damage, such as the derivative of a too long hoof, a grain of sand or the horseshoe nails, and may even extend, in severe cases until reaching the coronary band. Some authors distinguish them explaining that seedy toe refers to the fungal infection while the white line disease refers to a physical damage as the derivative from dirt, grains of sand, among others.

The affected corneum stratum will display a gray texture, as crumbles with lesions that range in severity from crevices or cracks under in the hoof wall to extensive cavities with separation of the wall from the white line. Lesions known as seedy toe are rarely painful, but they can lead to the formation of an abscess in which case they will cause a very apparent and painful limp. In severe cases, the farriers should synchronize their work with a veterinary surgeon. All colorless or necrotic material must be removed so that healthy stratum corneum is exposed to the outside. It gets its name as the most common part in which we will find it is the toe area although it can occur in any other part of the hoof. The white line disease not only affects horses but also donkeys, in which its gravity is greater

due to the characteristic softness of this corneum stratum.



Figures 288, 289 & 290. Horse Resource Net (2011) White line disease affected donkeys [Photographs] Accessed from www.horseresourcenet.wordpress.com

In countries like the Netherlands, white line disease is common in donkeys because they are normally overweight, a situation that easily causes laminitis. The donkey hoof wall is softer than the horse one and, therefore, more prone to fungal infections, causing them to become fully affected by such condition.

The donkey hoof has an elongated shape and has less mobility than the horse one, something which also promotes it being affected. In those places where the integrity of the white line has been compromised (stretched or pricked) fungi and bacteria can enter from the ground as it happens in foot rot in sheep and as they go destroying the tissue, making their way towards the inside of the hoof wall, to thrive in conditions of darkness and humidity.

What at first may seem like a small rotten area, when cut or scratched with a knife can reveal a great deal of damage, causing chronic lameness in severe cases. As the primary infection is usually fungus, it means that you do not have a consistent treatment to return the hoof to its good health status.

The only way to correct this defect permanently is to keep the hoof trimmed in order to keep its physiological morphology, something that will eliminate the wrong forces that affect the hoof and allow it proper expansion, so that a good quality corneum stratum can develop. Therefore the ass

must receive the amount of movement or exercise that it would naturally carry out, approximately 15 Km a day, so that new corneum stratum replace the damaged one. It is also useful to soak an affected hoof with seedy toe in water as well as spray it with Apple Cider vinegar, which will kill the bacteria but will not dry out the corneum stratum as it happens with other substances such as copper sulfate.



Figure 291. Natural Horse World Pty Ltd. (2003) Appearance of a white line disease affected hoof once the wall has been removed [Photographs] Accessed from <http://www.naturalhorseworld.com/>

Owning a donkey, as owning a horse or any other animal, is a great responsibility that must be carefully considered. A certain amount of time will be required each day to exercise our animal and to soak its hooves, for them to necessarily be regularly trimmed, as well as they must be provided with an environment that allows them to live healthily.

The first thing we will do will be to trim the hoof of the affected animal, removing both the damaged hoof wall tissue as much as possible (you will notice that it seems to crumble) to open the infected area so that it is in contact with the light and air and stops the fact that dirt build up inside it. We will

always ask for advice to a specialist when we not know how to proceed to remove only the wall of the hoof (neither the sole nor the sensitive laminae inside the white line) with safety and care.

The following is to use an antimicrobial agent to soak the hoof in one or twice a week. We can use any powerful but safe disinfectant such as those used for sterilizing and disinfecting materials in contact with young children as reusable diapers (Milton®), at a concentration of 1:10 or what is the same, 1 part of solution every 9 parts of water. For example mix 200 ml of solution in a 2 litre bottle from which the rest will be filled up with warm water.

The problem of the bleach that is commercialized is that although they have the same concentration of sodium hypochlorite, it is in different concentrations, so we will have to readjust the dosage.

The donkey hoof wall is easier to treat than the horse one, given the donkey does not bother when more invasive treatments are being carried out on it as much as the on the horse, it especially allows us to reach deeper into the wall of the hoof, eliminating all or most of the affected material thus making us able to perfectly work on the palmar surface. The only solution would be the withdrawal of the entire wall. Donkeys are able to sustain their weight on the rest of the hoof. This is not possible in horses. After about 11 months the hoof will be fully recovered.

Using a boot to soak the hoof or if we use a bucket, the section of a inner tube of a wheel bent over in about half of the hoof and tied around the pastern will be equally effective. After cleaning the infected area thoroughly with a wire brush or with a sharp knife or nail to be able to remove all the dirt, put the boot and knife tip, sprinkle enough

solution to cover the hoof until it reaches the level of the middle of the pastern.

After 10 minutes, we get the boot empty and add new solution. Repeat this twice more after 10 minutes, so that the total of bath has taken 30 minutes. While the hoof is clean, we sprinkle the area with a solution of 1:10 of povidone iodine, Betadine ® (diluted iodine), not Betadine ® at the concentration of 1:10, it can be very destructive.

We can spray this solution twice a day if we are facing a severe infection, otherwise we must do it as often as possible between baths.

The use of other compounds such as Formalin and copper sulfate can poison the area since, the area affected by bacteria is alive and it actively absorbs these chemicals and redistributes them directly into the bloodstream.

Once you have this infection under control the wall will grow and if we maintain relevant care routines it will not cause problems. We must consider the type of substrate on which our animals inhabit is a predisposing factor so that any dirt (like in soft and wet areas) seems to be in the enclave of a greater quantity of fungi and bacteria than other substrates. Therefore it is essential to keep the ground on which our animal and by extension its hoof rests, dry and clean.



Figures 292, 293, 294, 295 & 296. The Donkey Sanctuary (2006) A cheap and effective home remedy would be the application of "Sugardine" (made by mixing an antiseptic solution like the povidone iodine with granulated sugar of lumpy texture) that has a powerful antibacterial action and fungicide, promote drying and hardening of the lesions. Applying it to the sole, we will keep it here with a thick cotton pad, bandages and patches for silage bags [Photographs] Accessed from NHC101:11.

40. THE USE OF PLASTIC SHOES

In some cases the application of silicone or plastic shoes can be helpful. Always after the consultation of a veterinary surgeon who studies radiographically our animal since these shoes may not be appropriate in some severe cases of laminitis or lameness in asses.

Those plastic shoes that reduce the weight on the sole, should be helpful in chronic cases of disease.

We will trim and clean up the foot, scraping the surface of the hoof wall with a sandpaper or the kind of paper used in crafts and decoration, as a sponge rubbing down it. We must make sure that we do not remove the cleft from the caudal part of the wall. The hoof must be dry.

We will draw the hoof on a plastic plate base with an indelible marker, with a slightly greater size than the hoof. We will cut it with a hacksaw. We will soften the edges with a file or rasp and file the surface with a circular saw.

We adjust the grip sleeve to the soleplate, it may be possible that we have to cut the sleeve tabs if the hoof is small. We endorse the sleeve to the base plate with superglue or 'Loctite 406' fast glue, pressing until it is fully adhered to it.

We will secure it with self-tapping type screws (POZI HP25 3.5 hardened steel), by inserting first the front screw, making sure that the heads are levelled. We file inside the tabs of the sleeve with a circular saw. We will place two self-tapping screws in the section of the heels as a clasp.

We attach and fit the horseshoe to the wall of the hoof with ("Loctite 406") superglue. This is only a temporary measure to keep the Horseshoe on its place. It is not advisable to use an excessive amount of glue. We will start with both rear tabs

without having our ass bearing weight. Press the base plate with the hand.

We put the hoof back on the floor and secure the sleeve tabs with glue, we will start at the end of the sleeve clasp allowing the adhesive to flow, to then press sticking the base plate. To ensure the horseshoe, we will apply a resin or silicone to the wall of the hoof between and above the tabs, gently with a spatula. It is important to spray this mixture carefully since it must not interfere in the space between the sole and the base plate.

When the resin reaches a consistency like butter (to 3 or 4 minutes) we will extend it between the tabs. It is essential that we wear gloves for this). In cold climates it can be take a little more time for it to solidify. It is advisable to carry the silicone cartridge in the back pocket of our trousers for 10 minutes to warm it up before using it, in these cases.

We will leave the ass tied or attached during over 10 minutes before walking. Neither must we allow the hoof to get wet nor will we let it soak in no way, also avoiding that it makes contact with the bed of the animal during this time.

After fitting the horseshoe, there should be a space between the sole and the base plate, it should be checked daily to preserve it and ensure that it always stays clean.

Change shoes every 4 weeks, but if our donkey becomes lame, or any kind of former lameness worsens, or if the ass shows signs of being uncomfortable, we will immediately withdraw the horseshoes. To do it, cut clips with a hoof knife and scrap the previous resin.





Figures 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307 & 308. *The Donkey Sanctuary* (2006) *Plastic horseshoe application to a donkey* [Photographs] Accessed from NHC101:11.

41. INTERNATIONAL VISION: ALTERNATIVES

Farriery developments not only hover over the mere art of horseshoeing, but over the fact that since ancient times, changes can be seen in the manner, methods and even tools that apply around the world.

Donkey horseshoeing has always forced farriers to innovate on the existing methods and adapt their knowledge to this species, from any different point of view.

Either standing or within racks as it was carried out in Spain, tying the donkeys and locking their hindquarters as in the North Africa (Morocco), or lifting asses from the ground grabbed by strings that were interlaced forming a kind of mesh that prevents the animals from obtaining support from which to kick or even move, the horseshoeing of asses reaffirms its usefulness or rather its necessity in some areas of the world of our time.



Figures 309 & 310. (Figure 309) TimeA & (Figure 310) The Donkey Sanctuary (2011) Cyprus traditional horseshoeing evolution since 1900 until the present [Photograph & Postcard] Accessed from (Figure 309) <http://upload.wikimedia.org> & (Figure 310) <http://www.donkeysanctuarycyprus.org/>

The significance of farriery and other hoof care duties on donkeys is such that this craft even transcends through art. In multiple locations in the continents of Africa and Asia, there are many scenes that bring asses to markets where their hooves are checked and treated, exactly in the same way a car is repaired in a garage.



Figures 311, 312, 313 & 314. (Figure 311) Richard Towell, (Figure 312) Tom Skrinar, (Figure 313) Mariano Fortuny & (Figure 314) Nicola Kerslake (1870-2007-2010-2013) (Figure 311) shoeing a donkey, (Figure 312) ass waiting to be shod in the market of Kashgar, (figure 313) Moroccan farrier. Museu Nacional d'Art de Catalunya, Barcelona. Acquired by the Committee of the museums of Barcelona in 1922, this painting is because of its technique one of the most peculiar works carried out by Fortuny. When the catalonian painter arrived in Morocco for the first time he was highly impressed by their light and the atmosphere they breathed there; soon it became one of the more interested artists in showing the Moroccan life in its most varied aspects in his paintings. In this painting there are two men in a wide square, closed at the bottom by a white wall, at the time of shoeing a donkey. Hens swarm around the characters as several men figures thoroughly insinuate. The scene is full of vitality and spontaneity, away from the exotic elements of romanticism as this issue was part of the visual clichés of the orientalist myth and (Figure 314) Shoeing an ass in the Taklamakan desert in China [Photographs] Accessed from (Figures 311 & 312) <http://www.flickr.com/>, (Figure 313) <http://www.historiadelarte.us/> & (Figure 314) <http://www.behance.net/>

Already in the traditional method of Spanish shoeing there were only three types of horseshoe forged, namely horse hand ones, mule hand ones and goat leg or cortadillo ones.



Figure 315. Gabino Fernández (2013) Simple heel mule Biscayan horseshoes. Left hand one and right foot one [Photograph] Accessed from <http://www.farriergabino.com/>

The goat leg horseshoe was a horseshoe with the targeted toes, which served for both horses and mules. I had already made a distinction between the way of shoeing horses, mules and donkeys. Donkey's horseshoes only differed from the mule in the smallest size that they had. Hand's, both horse and mule shoes, could be, according to their thickness and width, Biskaian, with narrow and thick branches or Castilian, with thin and wide branches.

Interestingly, despite the simplicity in the three types of horseshoes there were differences between left and right shoes. The external branch, was wider and with more squared heels, while the internal was slimming as it approached the heels. The external branch was also more rounded and longer than the internal one, shorter and straighter. It may be worth mentioning the particularity of a mule foot horseshoe called Provençal or Catalanian, whose internal branch was completely straight.

CURIOUS FACTS

FIONA, THE KENYAN FARRIER

Fiona Too Chelagat is an 18 years old Kenyan farrier who lives with her family in Kericho, project area Kendat Heshimu Punda Programme, in which since 2010, a severe lack of skilled farriers was detected as a major lack of animal welfare to be remedied immediately. Because of her nationality, the most or almost all the animals that they care after are asses, however, unlike in most regions of Kenya, donkeys are managed by women.

To help address this problem, the Heshimu Punda programme began collaborating with the District Veterinary Officer to launch awareness sessions and community education, to train animal health professionals and community farriers. Her surprising enthusiasm about horses and their welfare overwhelms anyone who knows and exchange impressions about the animals that have been treated by her. Among her enthusiasm about animal welfare, there is no doubt on the importance of the art of shoeing and the need for a foot to be properly shod seeking its balance

These farriers go through a series of training modules before being qualified and before being allowed to perform shoeing procedures. In Kericho 10 farriers have been trained and qualified. In her area, traditionally only men had been appropriate to carry out the work of shoeing and trimming asses, and at first it was something complicated for the community to accept her dedication to this work.

Fiona dreams of going to college and becoming a veterinarian, or if this is not possible to carry out any other work that allowed her to earn a living helping working donkeys, something for what she only needs an opportunity.



Figure 316. Freya Dowson (2012) Fiona, donkey farrier in Kenya [Photograph] Accessed from <http://blog.thebrooke.org/>

42. CONCLUSION

The age of our animal, season, habitat, hygiene of the ground where grass grows, type of grass, food provided by us, if they are in company or on their own, exercise performed, when they are provided with supplementary food, dentition status, natural behaviour, mineral deficiencies and vitamin supplements, the relationship they have with humans and a long etc. are the factors that contribute to the good health of our ass and that the problems that we have studied do not occur, therefore there is much more to look for to care well after our animal more than knowing that it has food when it requires it.

Very few vets know which is the appearance of the healthy hoof of an ass and therefore much fewer know what diseases can often be so subtle that when they show up its gravity is such that it is too late to perform a treatment without leaving sequels. Therefore, receive instructions and information from a skilled professional becomes then the best tool that we have in any case and the health of our donkey's feet one the best witnesses of it being applied properly.

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Chapter 9

Donkeys as Pets

Isabel Ortiz Jaraba

1. WHY TO CHOOSE A DONKEY AS A PET?

Donkeys are very funny animals with lots of character. Asses are versatile animals that can be used for different applications such as riding for children, exhibition animals and light pack animals, companion animals, or simply as a pet. Many people choose donkeys as a pet because of their friendly and sociable nature. It is easy to get them used to human companion and under proper supervision, they respond well to training. These animals have proven to be faithful and loyal colleagues through History.

Although it is a common misconception, donkeys are not small horses, are different physically, mentally and emotionally. Donkeys are more stoic than horses and do not scare so easily. Compared to horses, asses show their fear to new situations less explicitly than horses, what can lead to confusing stress with stubbornness.

In addition, we should take into account that donkey training requires a different approach to the one that is adopted with a horse, we cannot force them to do something that they do not want to do.



Figure 1. maur61 (2008) A donkey cleaning itself up on a field of violet flowers in Lentini, Siracusa, Italy [Photograph] Accessed from <http://www.panoramio.com/>

CURIOUS FACTS

THE BIRTH OF THE DEMOCRATIC EMBLEM

In a very curious way, the obstinacy and stubbornness that have unfairly been attributed to the ass are the source that was chosen as the iconic mascot of the U.S. Democratic Party.

During the Presidency of Andrew Jackson (1838-1842) it began to be used as a symbol of the more liberal half of American politics because of the obstinacy which the President's democratic administration showed, which insisted on rejecting a law that was intended to approve the creation of the National Bank.

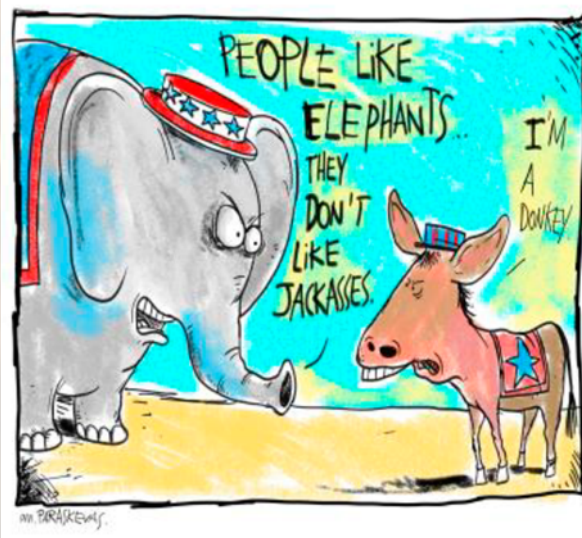
Newspapers were responsible for disseminating and consolidating what, unknowingly, would become the new icon of the Democrats, with their political cartoons, which did not precisely granted it with positive qualities.

The person who eventually consolidated the image of the Democratic Party was a famous and acid cartoonist, Thomas Nast, who used the donkey to represent a Democrat pacifist faction (with connotations of passivity), a characteristic of the party with which he did not agree. Later, he returned to use it as a metaphor for the insecurity which the Party showed on some issues.

The symbol drew the attention of the public and the artist continued to use it to identify some Democrat editors and journalists. Later, a cartoon about the campaign of the candidate Garfield-Hancock in the 'New York Daily Graphic' showed the Democratic candidate mounted on a donkey, leading a procession of Crusaders.

This way, before 1880, the donkey had already been established as the mascot of the Democratic Party, although the members of the party did never "take it" as their official symbol.

The Republicans, who have as the elephant as their official mascot, see the donkey as stubborn, silly and ridiculous, but Democrats see it as a symbol of humbleness, elegance, intelligence and affection.



Figures 2 & 3. (Figure 2) BD2412 & (Figure 3) M. Paraskevas (2006-2011) (Figure 2) comic representation of the democratic donkey by Thomas Nast in January 1870 & (Figure 3) the Republican elephant and democratic donkey discussing. The elephant says "People like elephants, they don't like jackasses" and the donkey answers "I'm a donkey" [Illustrations] Accessed from (Figure 2) <http://en.wikipedia.org/> & (Figure 3) <http://donspapers.com>

2. CONSIDERATIONS TO BEAR IN MIND BEFORE BUYING A DONKEY AS A PET

- Before adopting a donkey, it is important to know that being an owner of a donkey is a long term responsibility: the average lifespan of a donkey is about 27 years but there are some which have come to exceed the age of 40.
- Asses are sociable animals that need to live in the companion of other living beings, if we are going to keep this new member of the family living alone and only visiting it to provide it with food, we will have an unfortunate animal.
- Domestic equids (horses, donkeys and mules), like any animal, eat, drink and need exercise every day of the year. Having a pet with these characteristics is a twice a day, 365 days a year responsibility. So if you cannot meet this responsibility and do not have anyone who meets them for you, do not have a donkey.
- Donkeys are large animals that need a lot of food each day. If you do not have a large meadow where they can graze, it represents an important economic outlay. Always considering there is not any unforeseen issue such as an illness, transportation, injury or accident.

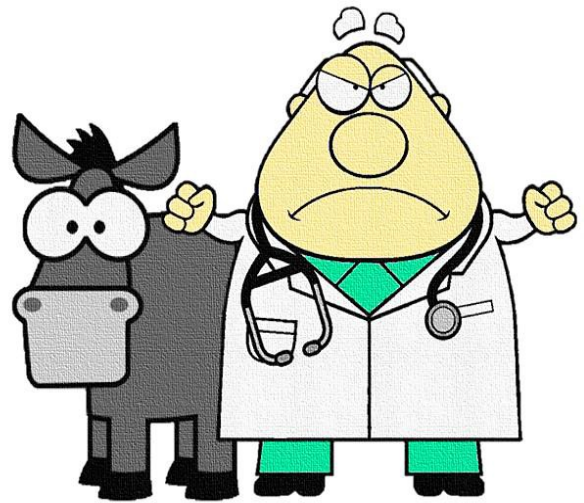


Figure 4. Francisco Javier Navas González (2014) Angry veterinarian protecting his ass [Illustration] Accessed from <http://www.how-to-draw-funny-cartoons.com/> & <http://www.thecoloringpics.com/>

3. CHOOSING THE APPROPRIATE ANIMAL

Some of the most important points to take into account are:

- Study and learn about the complete history of the animal: knowing what tasks it has been engaged to develop for the rest of its life, at what type of accommodation it has been living, feeding, coexistence with other animals of the same or different species, etc. Since, although the changes in its routine are possible, it is necessary to know their background in order to avoid surprises and unexpected reactions.
- Ask everything about the character of the animal that we are going to purchase: when purchasing a pet we not only have to take into account the character of the animal, but also the experience that we have in the management of such type of animal, the lower our experience is, the more necessary will also be to choose a docile, patient and strong-willed animal.
- Be accompanied by a person with previous experience in buying, breeding and care of donkeys. It is perhaps the best way not to make novice mistakes.
- In terms of the sex of the animal, as a pet it may be more advisable to choose a female or a gelding, because their temperament is more stable and predictable in general. A jackstock should only be purchased if you have experience in the management of these animals.
- But we must never forget that the relationship you establish with your pet and the way you treat it, will decide the character that it will greatly express when it becomes your property.



Figures 5, 6 & 7. (Figures 5 & 6) DyD & (Figure 7) Lash's Unique Animals (2007- 2014) (Figures 5 & 6) Dog dressed up as a donkey. The same way we should not treat a dog as if it were a donkey, we will not treat a donkey as if it were a dog & (Figure 7) Owner reprimanding her Miniature donkey [Photographs] Accessed from (Fig ures 5 & 6) <http://www.amazon.com/> & (Figure 7) <http://www.lashuniqueanimals.com>

Communication with your children is essential, since you have to use this tool to make sure that a donkey is the animal they want. A good way to 'test' would be that they spent a season at farm schools or centres of horse riding, in the majority of these places they have their own animals and children may experience a closer deal before taking the decision to adopt its own.

One factor to bear in mind is, as always, the "possible fraud" factor. To avoid fraud and "paint job" of the animal in which you are interested, you must visit the animal more than once to check that the animal shows the characteristics we are looking for at all times. It is quite interesting to include a pre-purchase exam in the treat, during the pre-purchase exam a vet check the animal prior to the transaction and warns of the possible problems that the animal may have. In addition to this test a return guarantee can be decree within a few terms.



Figure 12. Disqus (2014) Father talking to his children
[Photograph] Accessed from <http://galleryhip.com/>

4. FAMILIES AND DONKEYS AS PETS: ASPECTS TO TAKE INTO ACCOUNT

When families decide to buy a new pet, the fact that they decide to buy a horse, pony or donkey is becoming more frequent. If you are a parent interested in adopting a donkey for your children you must carefully think on the situation in long term. Asses require much attention and care. You must make sure that your children are capable to deal with the responsibility and if not, that you should you assume that responsibility. Among the basic needs of a donkey are feeding them several times a day, brushing and grooming the stall and exercise.



Figures 8, 9, 10 & 11. (Figure 8) Ronan Donegal, (Figure 9) travellinginabox, (Figure 10) Postcards from a Small Place, (Figure 11) iStockphoto (2012-2013-2014) (Figure 8) Children feeding some donkeys in the Kylemore Abbey, a Benedictine Nunnery founded in 1920 on the basis of the castle of Kylemore, in Connemara, Galway County, Republic of Ireland, (Figure 9) child and his mother feed a pair of donkeys in Margaret River, a town in the South-West of Western Australia, (Figure 10) children brushing a donkey in L' Âne de Gouttière, a farm school located between Rennes and Dol de Bretagne, near the Mont Saint - Michel, (Figure 11) children cleaning the stables of a school farm. It has been shown that children that spend time with farm animals and their stables see the possibilities to develop an allergic disease in the course of life reduced [Photographs] Accessed from (Figure 8) <http://www.pinterest.com/>, (Figure 9) <http://travellinginabox.wordpress.com/>, (Figure 10) <http://lapoussine35.wordpress.com/> & (Figure 11) <https://student.societyforscience.org/>



Figure 13. Master Sgt. Dawn M. Price (2011) U.S. Army Captain Jill Lynn, Veterinarian assigned to Combined Joint Task Force-Horn of Africa, 402nd Civil Affairs Battalion Functional Specialty Team, deployed to Camp Lemonnier, Djibouti, conducts an examination on a donkey during a veterinary civic action project in the rural village of Kagamongole, Uganda on 6th June. This is the first of three phases sponsored through collaborative efforts between the task force CJTF-HOA, the Ugandan Government and the US Embassy in Uganda as well as the United States Air Force [Photograph] Accessed from <https://www.flickr.com/>

Due to its small size and the greater docility in comparison with ponies many families decide to choose a donkey for riding for your children, if you want to dedicate the animal to that end, it is important to ensure that the animal is trained and is docile enough to leave it in the hands of a child. In this particular case, an adult animal with experience with children is more advisable than a young animal, but in no case should small children be left alone with animals of this size.





Figures 14, 15, 16, 17 & 18. (Figures 14, 15, 16 & 17) Turning pointe Donkey Rescue & (Figure 18) Ferengi in Addis (2005-2012) (Figures 14, 15, 16 & 17) Girl riding a rehabilitated donkey from an animal shelter and (Figure 18) a child riding a donkey backwards while this grazes in Adis Abeba, also written as Addis Abeba o Addis Abbaba (del amárico , Ádisa Ábäba, «New Flower») is the capital and the most ተላላ ለሰዓዊ ከተማ city in Ethiopiaa [Photographs] Accessed from (Figures 14, 15, 16 & 17) <http://www.turningpointedonkeyrescue.com/> & (Figure 18) <https://ferengiaddis.wordpress.com/>

Taking care of an animal will teach children to be responsible and they also have a faithful friend. A donkey will teach your child to be patient, calm and responsible for another living being, not to say he/she will have a "great" friend.



Figure 22. John Drysdale (2014) Girl pulling from a reluctant to move donkey ridden by a chimpanzee [Photograph] Accessed from <http://art2order.next.co.uk/>

CURIOUS FACTS

THE DONKEY OR MULE OF THE MANGER ON THE DOLE



Figure 19. Alter Eddie (2013) The ox and the mule from the manger protest and demonstrate against Pope Benedict XVI's statements [Photograph] Accessed from <http://blogs.elespectador.com/>

One of the greatest headlines of 2012 when it comes to religious news was, without a doubt, the controversy created around the animals surrounding the episode of the Nativity of Jesus. Almost all of the major media in the world echoed the hypothetical denial by Pope Benedict XVI on the presence of an ox and a mule in the manger. Let's do a brief review that in no way intends to be exhaustive, as it is striking how a subject which was at first irrelevant, invaded the covers and headlines of the Spanish press.

In *El País* from 21st November, 2012 headlines read: "The Pope affirms that there was neither a Mule nor an ox in the manger in Bethlehem" then the body of the news claimed "there were not animals in the manger".

El Periódico from the same date said in its headline: "The Pope says that there were neither an ox nor a Mule in the manger", to then assert that "Ratzinger says that there were not any ox or any Mule in the manger in Bethlehem".

La Vanguardia was entitled: "Jesus was not born with an ox and a mule, according to the Pope". And *el Diario Vasco* on November 21 from its part said also in its headlines: "neither a Mule nor an ox: the Pope put upside down the manger in Bethlehem" to assert then inside: "the theologian Joseph Ratzinger argues that the humble birthplace of Jesus had no ox nor an ass".

El ABC wrote headlines, already on 22nd of the same month: "We must remove the Mule and ox from the manger this Christmas?", to then indicate that "in his latest book, the Infancy Narratives of Jesus of Nazareth Pope Benedict XVI remembers there was no animal at the time in which Jesus was born in a manger".

Once all these words have been mentioned, see what Pope Benedic XVI, Joseph Ratzinger literally says, in the Spanish translation of his book Chapter 9 'The childhood of Jesus', which by the way, dedicated this concise paragraph to the issue:

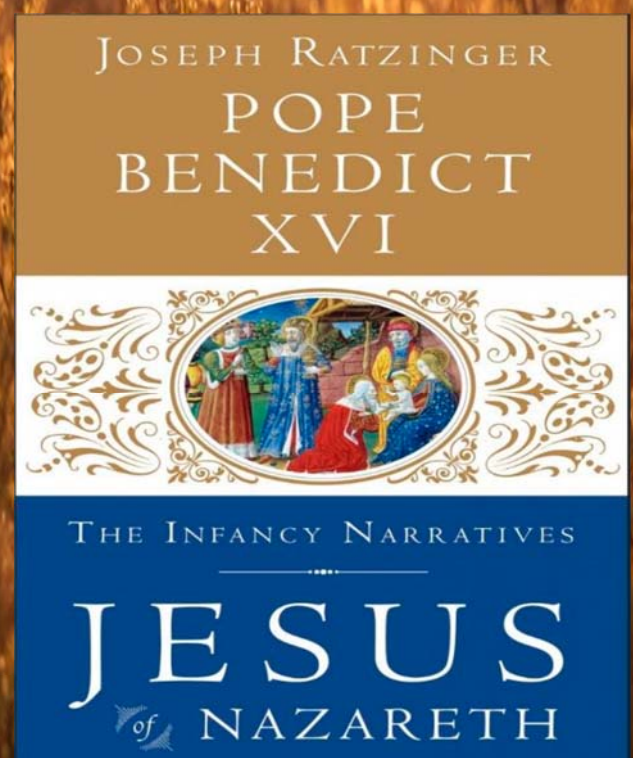
"As it has been said, a Manger makes us think of animals, because it is there where they eat. The Gospel does not refer to animals in this case. But meditation guided by faith, reading the old and New Testaments, soon has filled this gap, referring to Isaiah 1, 3: "ox knows his master, and the ass its owner's manger; Israel does not know me, my people do not understand me"" (p. 76)

Is it really the same to state that *"in the Gospel they do not spoke about animals"* (certainly not without previously claiming that *"a manger make us think about animals"* and highlighting that *"meditation guided by faith, reading the old and New Testaments, reciprocally related has fulfilled this lagoon very soon"*) as to say *"there was neither a Mule nor an ox in the manger in Bethlehem"* (El País);? *"in Bethlehem manger there was not an ox nor any Mule"* (El Periódico); *"there were no animals in the manger at the time when Jesus was born"* (El ABC); *"Jesus was not born with an ox and a mule"* (La Vanguardia); or *"neither a Mule nor an ox: the Pope put Bethlehem's manger upside down"* (Diario Vasco)?

Few times it is so patent that *"don't let news spoil you a good headline"*. Our journalists should be a little tougher and spun a little bit thinner, even out of the respect for the Pope, but out of the respect for what should be its most precious working tool: language.



Figures 20 & 21. (Figure 20) Miki&Duarte & (Figure 21) Editorial Planeta (2012) (Figure 20) Vignette showing the donkey and the Ox at the dole queue & (Figure 21) Hardcover from "The infancy Narratives" by Pope Benedict XVI, Joseph Ratzinger [Illustrations] Accessed from (Figure 20) <http://soledaddehuevoar.blogspot.com.es> & (Figure 21) <http://www.librolibro.es>



5. BASIC CARE

We must understand that all animals have evolved and have undergone a process of domestication back from their wild environment. This makes new conditions also require some adaptations to the medium to which they are introduced. We could say that within the domestic sphere, the use of donkeys as pets may be another step forward.

This new situation requires that the owners or keepers fit daily routines and the environment as far as possible so that they adapt to the characteristics of donkeys, and thus combine a quality life with human contact in the field of home.

5.1. ACCOMMODATION

Donkeys can either live free in a pasture or at an enclosure. If they are going to live free in the meadow, an area of a half hectare of grass is required per animal in order to avoid having to provide them with supplementary food, at least during the seasons of the year in which there is pasture available. If they are to be kept in stables, the stable must be at least 3.3 m² per animal.

Although donkey hair is usually longer and harder than the horses' one, especially in winter, they do not produce as much fat as the latter which makes them more sensitive to bad weather such as rain or snow and less waterproof. This factor makes it essential to put a refuge or shelter at the disposal of our pet donkey where they can have water and dry food available.



Figures 23, 24 & 25. (Figure 23) Karen Chandler, (Figure 24) Black Cat Photos & (Figure 25) TravelMail (2011-2012) (Figure 23) ass in front of a barn and stable, (Figure 24) Carrom and Chum, two asses of The Sanctuary Wildlife Centre on the outskirts of Morpeth (England) remaining in a separate stable since young asses are very voracious and given that these donkeys are sick they do not have enough time to feed themselves before other donkeys eat their food, (Figure 25) Fiona Turton, Brighton put its stable up for rent, at £12 (15.20 €) per night, so tired travelers rediscover Christmas and live, at least for one day, in the same way that Mary, Joseph and the baby Jesus did, of course, with the amenities that life requires; a bed of straw for two, tea making tools, an armchair, a trough and even a donkey. Shepherd costumes, Wi-Fi and bath towels are also included at a small extra charge. The benefits were intended for leukemia and Lymphoma research [Photographs] Accessed from (Figure 23) <http://karenchandler.files.wordpress.com/>, (Figure 24) <https://www.flickr.com/> & (Figure 25) <http://www.dailymail.co.uk>

CURIOUS FACTS

DONKEY'S HAIR

Donkeys love to be groomed and brushed. When brushing the m with stiff barbs in the direction in which the hair grows they are very comforted. We have to be careful in the a rea of the ears, without twisting them or grabbing them s strongly. In spring, a shedding blade can be very useful for removing the winter hair coat, but we must use it with care. It takes two months for a donkey to change its winter coat hair and may easily get cold if we rush.

We will be careful when brushing our ass in winter. Brushing destroys the air chambers which are naturally formed and that isolate it from the external environment, thus we will endeavour to carry out the brushing and grooming on warm days. Trimming the coat is not recommended unless they are provided with an adequate protection from the weather. In summer, brushing is practically useless because donkeys usually take dust baths and wallow. This natural method is used especially by animals that are not very a ttracted to water. We must pay attention to any ass rubbing its hair coat, especially on the dock of the tail, it could be assumed that the donkey is infested with lice. For them c ontact with a veterinarian who will explain how to proceed.

Donkey coat tends to be longer and thicker than horses' one, although its texture varies. It is important to consider it does not produce natural oils such as horses and therefore are more susceptible to weather conditions such as rain, wind and snow. Mostly, what insulates heat or cold are the air bags which are formed among the longer hairs. Donkeys evolved from a desert environment and therefore are more suited to temperate climates than to cold ones. To do this, they require a greater energy input (more food) and a shelter that should be adequate.

While donkeys bear large temperature fluctuations, such as those occurring in the desert however, they are not adapted and will shun rain. They are sensitive to bronchitis and pneumonia if they get a cold. In not very cold countries, in the late spring, summer and early autumn an open area if it is well covered with a clean and dry bed of straw, will be a perfect accommodation. In winter, depending on the region, they may need to be locked during the cooler hours in the barn, allowing them to go walking and running on warm days or to stay comforted watching from inside the barn as the wind blows while they are protected.

Hygiene is very important with these animals, if animals are enclosed, feces and urine of the stable must be removed once a day, changing their bed by a dry one. The bed can be made with straw or chips, taking care, especially with chips, for them not to eat it too much.

Accommodation, whatever it is, must have clean, fresh water available at all times. Water can be found in natural ponds, water dispensers and trough (preferably automatic), bathtubs, or large containers with water. We have to make sure that our pet knows where the water is and how to access it (especially in the case of automatic waterers).

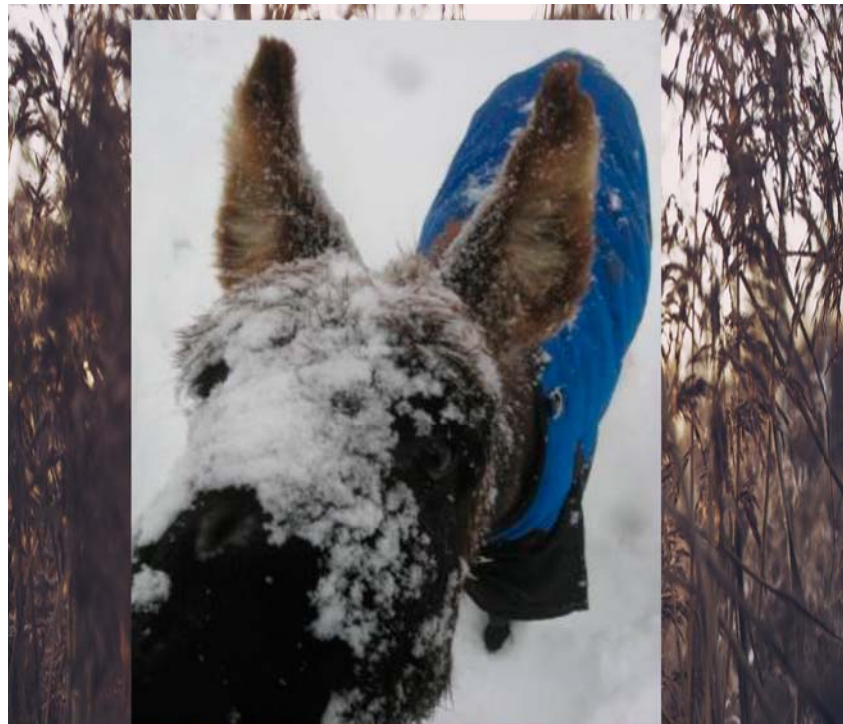


Figure 26. *The Dancing Donkey* (2013) Small donkey covered in snow
[Photograph] Accessed from <http://thedancingdonkey.blogspot.com.es>

Some asses enjoy snow, but others get adversely affected by the cold. The wind and air currents should be checked to avoid they catch a cold. Wet snow can melt under the coat of a donkey, making the hair get wet and causing the animal to catch a cold. This snow must always be removed from the hair coat when returning it to the stable. During rain episodes, the fat present in the coating makes water slide on the coat of a horse, but in the case of asses it soaks it (as they do not produce so much). This makes it extremely important to adequately protect asses especially against spring and autumn cold rains.



Figures 27, 28, 29 & 30. (Figure 27) Neven Milinković, (Figure 28) Paul Snook, (Figure 29) Chris DeRidder & (Figure 30) Amit Dave/Reuters (2011-2012-2014) (Figure 27) Donkey drinking from a river, (Figure 28) A White donkey drinks water from a natural fountain near the village of Moolia in Khyber Pakhtunkhwa, Pakistan, (Figure 29) Donkey drinking from a trough & (Figure 30) A group of donkeys drinks from one of the tanks at the camel fair of Pushkar, in a remote small village from the Indian state of Gujarat, in which one of the most important donkey markets of the world takes place [Photographs] Accessed from (Figure 27) <http://www.123rf.com/>, (Figure 28) <https://www.flickr.com/>, (Figure 29) <http://www.shutterstock.com> & (Figure 30) <http://online.wsj.com/>

CURIOUS FACTS

PILGRIM DONKEYS FROM THE WAY OF ST. JAMES

On foot, by bicycle, on horseback, by car, by bus, and why not? On a donkey.

The Way of St. James is a route that pilgrims from all over the world take to the city of Santiago de Compostela, where the alleged relics of St. James the Greater are venerated. During the Middle Ages it was very busy, then was slightly forgotten and today it has become a great boom. The French Way of St. James and the French road routes were declared World Heritage by Unesco in 1993 and 1998 respectively; European Cultural Route by the Council of Europe and has received the honorific title of Main Street from Europe.

There are numerous routes of Saint James pilgrimage that have been created both in Spain and in Europe over the centuries.



Figure 31. Turismo de Galicia (2013) European st. James's Way roads Map [Map] Accessed from <http://www.turq Galicia.es/>

The inclemencies of the weather, the orography of the land of some of the routes, and the large amount of Km that on a daily basis are walked on the road, require that both biped and quadruped pilgrims should be assisted properly.

There are companies such as "El Burro Peregrino" (The Pilgrim Donkey) that make the realization of the pilgrimage or St. James's Way easier on a donkey for groups with a minimum of 5 donkeys and a maximum of 8 animals. Accompanying the pilgrims and their animals all the way and providing them with the necessary care both on departure and on arrival at the destination.

There are many pilgrims who face the pilgrimage with the immeasurable help of asses. Among them, Segundo Borlan is one of the most unique pilgrims that has gone through the Way of Saint James. In 1999, at the Clinic Hospital of Barcelona, his daughter was hovering between life and death as a result of leukemia. After three months of intense struggle and painful treatment, the young manages to overcome the disease. His father decided to then undertake a journey on an ass to the Galician capital «to thank her cure» and to escape «from all the suffering experienced». After this, Borlan published 1.000 kilometers of the Way of Saint James on a donkey, a book collecting his experiences in the Jacobean route. In 1997 he had a motorcycle accident and was disabled. He could not walk if it was not on crutches and thought that, the only way to do it would be on a donkey. This experience was followed by those from 2000 and 2001. The first time, took him almost two months to travel the one thousand kilometers that separate Santiago from Roncesvalles, which throws a lower than twenty kilometres average distance per day. Donkeys are highly adapted animals and are used both to work and to walk; however given the complicated terrain of some of the routes or their length or the rainy weather conditions that hover over this area of the Iberian peninsula, donkeys should always be attended by health personnel, even more if we consider, that they are often loaded either with belongings or with the own pilgrims. In fact, Borlan employed up to three specimens of this species to complete his journey, because of the successive illnesses that the asses suffered from. Such a prolonged and intense experience made the pilgrims knew him by the nickname of "El Sancho Panza of the way", always on the back of a donkey.



Figure 32, 33, 34 & 35. (Figures 32, 34 & 35) El Burro Peregrino, (Figure 33) Brother Lapin's Pilgrimage (2010) (Figure 32) Members of the Association "El Burro Peregrino" ("The Pilgrim donkey") and pilgrims to the Cathedral of Santiago de Compostela next to their Zamorano-leonese asses, (Figure 33) Brother Lapin and his ass during a stop on Saint James Way & (Figure 34) news article which speaks about the proposal that the "El Burro Peregrino" ("The Pilgrim Donkey") company made to put a programme of trips in carriages pulled by donkeys into practice & (Figure 35) "El Norte de Castilla" newspaper clipping which mentions that the "El Burro Peregrino" ("The Pilgrim Donkey") company has been selected by Trotaparamus to make a documentary about the Castilian and Leonese land with asses as protagonists. In June the recording will be held by the towns of the Way of Saint James from Madrid [Photographs & newspaper clippings] Accessed from (Figure 32, 34 & 35) <http://www.elburroperegrino.com/> & (Figure 33) <http://brotherlapin.com/>

5.2. FEEDING

Donkeys are animals that graze up to 16 hours a day when free. They have a very efficient metabolism and therefore their energy requirement is lower compared to other equidae of similar size as for example the pony. This makes it very easy to overfeed them, leading to serious problems such as hyperlipemia and laminitis and other organic imbalances. Ideally, donkeys should eat 1.5% of their body weight a day in forage for maintenance. If a donkey does not have a high rate of training it is on a pasture with the appropriate dimensions and have grass all year it will not need extra supply. Asses originally come from areas where the vegetation is dry and scarce, and therefore are adapted to a high in fiber diet. To adapt them to the characteristics of their new habitat, we will have to assess whether their fencing is suitable, insufficient or even, if it is necessary to restrict the outputs to the pasture at certain times of the year.

If they are not going to be kept at a paddock, a grass hay diet, which can be combined with straw should be provided. It is also important to give a salt stone to lick, free access to clean and fresh water and vitamin supplement in the times they need it.



Figures 36, 37 & 38. (Figure 36 & 37) lam Burn & (Figure 38) Such life in the Tropics... (2011-2014) (Figure 36) Donkey having a snack before its afternoon nap, (Figure 37) Donkey licking a salt block & (Figure 38) Ass rummaging in the refrigerator [Photographs] Accessed from (Figure 36 & 37) <http://www.flickr.com/> & (Figure 38) <http://suchlifeinthetropics.blogspot.com.es/>

5.3. EXERCISE

Asses are animals that are physiologically designed to travel long distances in search for food daily. Thus, the exercise becomes a daily need of vital importance. Walking regulates hoof growth, it promotes venous return from the limbs and improves the intestinal motility.

The mere fact of having our pet into a large fence or taking it for a walk on foot or mounted is going to save many visits from the farrier and vet. In addition, an exercised animal is much more easily manageable both by hand and on the ride.



Figures 39, 40, 41 & 42. Klein-Hubert/KimballStock (2014)
Contentin donkeys playing and exercising on a French meadow
[Photographs] Accessed from <http://www.kimballstock.com>

CURIOUS FACTS

TRADITIONAL SIOUX TALE "THE PET DONKEY"

There was a chief's daughter once who had great many relations so that everybody knew she belonged to a great family.

When she grew up she married and gave birth to her twin sons.

This caused great rejoicing in her father's camp, and all the village women came to see the babies. She was very happy.

As the babes grew older, their grandmother made for them two saddle bags and brought out a donkey.

"My two grandchildren," said the old lady, "shall ride as is becoming to children having so many relations. Here is this donkey.

He is patient and surefooted. He shall carry the babies in the saddle bags, one on either side of his back".

It happened one day that the chief's daughter and her husband were making ready to go on a camping journey.

The father, who was quite proud of his children, brought out his finest pony, and put the saddle bags on the pony's back.

"There," he said, "my sons shall ride on the pony, not on a donkey; let the donkey carry the pots and kettles."

So his wife loaded the donkey with the household things. She tied the tepee poles into two great bundles, one on either side of the donkey's back; across them she put the travois net and threw into it the pots and kettles and laid the skin tent across the donkey's back.

But no sooner done, the donkey began to rear and bray and kick. He broke the tent poles and kicked the pots and kettles into bits and tore the skin tent. The more he was beaten the more he kicked.

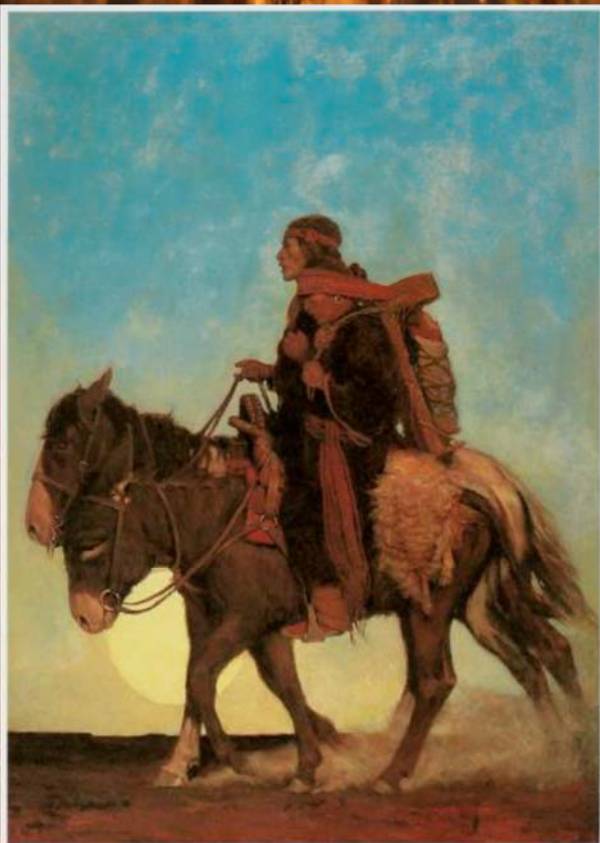
At last they told the grandmother. She laughed. "Did I not tell you the donkey was for the children," she cried. "He knows the babies are the chief's children.

Think you he will be dishonored with pots and kettles?" and she fetched the children and slung them over the donkey's back, when he became at once quiet again.

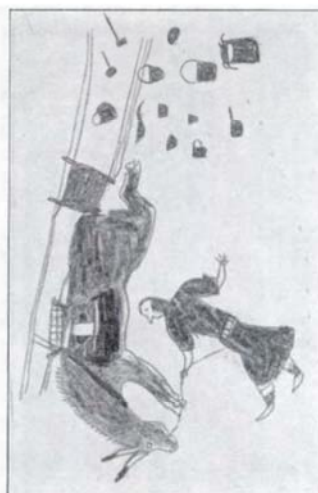
The camping party left the village and went on their journey. But the next day as they passed by a place overgrown with bushes, a band of enemies rushed out, lashing their ponies and sounding their war whoop.

All was excitement. The men bent and seized their lances. After a long battle the enemy fled. But when the camping party came together again -- where were the donkey and the two babies?

No one knew. For a long time they searched, but in vain. At last they turned to go back to the village, the father mournful, the mother wailing. When they came to the grandmother's tepee, there stood the good donkey with the two babes in the saddle bags.



MYTHS OF THE SIOUX



THE DONKEY REFUSED TO CARRY KITCHEN UTENSILS

Figures 43 & 44. (Figure 43) N.C. Wyeth & (Figure 44) Marie L. McLaughlin (1908-1916) (Figure 43) *On the October Trail* (Navaho family) & (Figure 44) *donkey refused to carry kitchen utensils* [Oil on canvas & Etching] Accessed from (Figure 43) <http://www.zazzle.es/> & (Figure 44) *Myths and legends of the Sioux*, 1916.

5.4. VACCINATION PLAN

Annual vaccination of tetanus and influenza is highly recommended. If we are going to carry our donkey to concentrations with more equidae vaccination against influenza is compulsory.

The tetanus vaccine is highly effective and our pet will be protected against an infection that if not being vaccinated, may be exposed to high mortality rates.

The veterinarian will inform us of the best time to carry out the vaccination and he/she will recommend us whether there are other diseases which our animal has to be immunized against according to the characteristics of each animal and each zone.



Figure 45. Animal Rahat (2012) Vaccination campaign against tetanus. Thanks to the anonymous economic efforts in collaboration with Animal Rahat, 330 donkeys could be vaccinated against tetanus, a common condition associated with brick factories that frequently ends with the death of the animals in the village of Udgaon in Shirol Taluka of the Kolhapur district, Maharashtra, India. [Photograph] Accessed from <http://www.animalrahat.com/>

5.5. WORMING

Parasites that affect donkeys are comparable with those which affect horses with certain exceptions. For example, there are ten species of small strongyles which are specific to donkeys. *Parascaris equorum* is associated, in the case of horses, with young or immunocompromised animals, but donkeys are susceptible during their lifetime. On the other hand, asses are asymptomatic carriers of the *Dictyocaulus arnfieldii* lung worm, which can cause respiratory problems in horses and ponies. This makes it very important when donkeys and horses live together, treating both with ivermectin or moxidectin so that one not infect the other. In order of importance the species of small strongyles found are *Cyathostomum montgomeryi*, *Cylicostephanus minutus*, *Cylicocyclus nassatus*, *Cylicocylus auriculatus*, *Cyathostomum tetracanthum*, *Cylicostephanus bidentatus*, *Triodontophorus nipponicus*, *Cyathostomum coronatum*, *Cylicocyclus Zanzibar*, *Cyathostomum alveatum*, *Triodontophorus serratus*, *Cylicocyclus elongatus* and *Cylicodontophorus bicoronatus*.



Figures 46 & 47. (Figure 46) The Donkey Sanctuary & (Figure 47) Klein- Hubert/KimballStock (2013-2014) (Figure 46) Veterinarian carrying out a parasitological scrutiny on feces samples and (Figure 47) Contentin asses gathered under a tree eating straw. Crowds of animals always present a higher incidence of parasitosis [Photographs] Accessed from (Figure 46) <http://www.thedonkeysanctuary.org.uk> & (Figure 47) <http://www.kimballstock.com>

GROUP	NO.	AGE (YEARS)	DATE OF NECROPSY	TOTAL OF FINDINGS	OF ADULTS (%)	L4 (%)	LS (%)	NUMBER OF SPECIES
1 Dry season	1	2	7 Jul. 1986	32870	78.8	8.4	12.8	10
	2	2	7 Jul. 1986	53408	82.4	5.6	12.0	11
	3	2	14 Jul. 1986	55110	84.7	6.2	9.1	11
2 ¹ Early wet season	4	3-4	5 Nov. 1986	34959	98.0	2.0	-	10
	5	3-4	5 Nov. 1986	24835	90.9	9.1	-	12
	6	3	5 Nov. 1986	85015	89.9	10.1	-	12
	7	8-9	19 Nov. 1986	188909	96.2	3.8	-	12
	8	8-9	19 Nov. 1986	94490	97.4	2.6	-	10
3 ¹ Average wet season	9	7-10	20 Jan. 1987	144930	98.9	1.1	-	11
	10	2.5	20 Jan. 1987	222767	97.7	2.3	-	12
	11	3.5	20 Jan. 1987	3900	91.8	8.2	-	10
4 Late wet season and the dry season beginning	12	3.5	27 Apr. 1987	69383	78.0	4.7	17.3	9
	13	3.5	27 Apr. 1987	9421	62.1	6.1	31.8	9
	14	2.5	27 Apr. 1987	40726	78.7	4.1	17.2	9

Table 1. M. Eysker y V.S. Pandey (1989) Donkey large intestine small Strongyles count.

SPECIES	GEOMETRIC MEAN	RANGE	NUMBER OF POSITIVE ASSES
<i>Cyathostomum montgomeryi</i>	14076	650-77541	14
<i>Cylicostephanus minutus</i>	9394	390-39080	14
<i>Cylicocyclus nassatus</i>	3501	10-38225	14
<i>Cylicocyclus auriculatus</i>	1506	0-17110	13
<i>Cyathostomum tetracanthum</i>	855	0-25187	12
<i>Cylicostephanus bidentatus</i>	739	2-56943	14
<i>Triodontophorus nipponicus</i>	169	0-8600	10
<i>Cyathostomum coronatum</i>	77	0-962	12
<i>Cylicocyclus adersi</i>	72	0-22620	10
<i>Cyathostomum alveatum</i>	69	0-804	13
<i>Triodontophorus serratus</i>	57	0-5590	11
<i>Cylicocyclus elongatus</i>	41	0-825	11
<i>Cylicodontophorus bicoronatus</i>	1.4	0-100	1

Table 2. M. Eysker y V.S. Pandey (1989) Geometric measures and number range of different species of small strongyles sorted by order of abundance and number of positive asses.

¹ No L3 search was carried out. At an altitude of 1260 m above sea level. The climate of the region in which the study took place (Highveld in Zimbabwe) is characterized by a dry season that runs from April to November and a wet period from November to April, with an average of 738 mm annual rainfall distributed over 66 days. The monthly maximum average temperature ranges between 22.8 and 30.8 °C and the monthly average minimum temperature is between 4.9 and 16.9 °C.

EQUINE PARASITES/WORMING CHART BY SEASONS AND TARGET PARASITES

Anthelmintics (chemical wormers) the diagnosis of parasitic diseases require the consultation of a veterinarian and the use of medications in foals younger than 4 months is not recommended	Adult roundworms	Larvae of nematodes	Cystic larvae	Respiratory nematodes	Oestrids larvae	Tapeworms	Seasonal goals
Ivermectin is widely accepted and used in donkeys. It is usually administered in the form of oral paste. Ivermectin is considered between 90 and 100% effective against most internal parasites, excluding cestodes and small cystic strongyles. Ivermectin works as a neuromuscular agent, blocking biological functions within the parasites; usually with no detrimental effect on the treated animal. However, popularity in the use of ivermectin also involves the potential risk of their resulting over-utilization in parasitic resistances, so a regimen of animal medicine rotation would be recommended.	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>), small strongyles (<i>Strongyles trichonema spp.</i>) threadworm (<i>Strongyloides westeri</i>)	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>), small strongyles (<i>Strongyles trichonema spp.</i>) threadworm (<i>Strongyloides westeri</i>)	Non-effective	Effective	Effective	Non-effective	Depending on the parasite against which we want to apply it, we will apply it during a certain season or another.
The Moxidectin , is another neuromuscular endectocide. It is generally applied in the form of oral paste. The moxidectin is considered as effective as ivermectin to control a wide range of parasites (not cestodes) and has the additional advantage of being effective against small cystic strongyles, being effective you have 45 more days than ivermectin.	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>), small strongyles (<i>Strongyles trichonema spp.</i>) threadworms (<i>Strongyloides westeri</i>)	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>), small strongyles (<i>Strongyles trichonema spp.</i>) threadworms (<i>Strongyloides westeri</i>)	Effective against cystic small strongyles larvae	Non-effective	Effective	Non-effective	Spring Strongyles and tapeworms
Benzimidazoles. Fenbendazole is part of the Benzimidazole family. The Fenbendazole is effective against the strongyles (large nematodes and less effective against the small nematodes) pinworms but not oestrids (Bot fly, <i>Gasterophilus spp.</i>).	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>). Moderately effective against	Ascarids (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus arnfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyles (<i>Strongylus vulgaris</i>). Moderately	Effective against cystic larvae of small strongyles at a 5 times higher rate than the standard dosage of Fenbendazole	Non-effective	Non-effective	Non-effective	Summer Strongyles and oestrids

<p>Fenbendazol acts by blocking the biological functions within the parasite causing starvation. There is evidence in increased resistance to this drug and a rotation of the application regime will always be recommended.</p>	<p>small strongyle (<i>Strongyles trichonema spp.</i>) threadworms (<i>Strongyloides westeri</i>)</p>	<p>effective against small strongyles (<i>Strongyles trichonema spp.</i>) threadworms (<i>Strongyloides westeri</i>)</p>	<p>(donkeys: 5-10 mg/Kg once a day for 5 consecutive days).</p>				
<p>(Pyrantel pamoate and pyrantel tartrate) Administration comes in two forms, the oral paste-like pyrantel pamoate and tartrate pyrantel as a daily nutritional supplement. Both forms of Pyrantel function as neuromuscular agents, blocking the biological functions within the parasites; with usually no detrimental effect on the animals that they are administered to. They have an environment effectiveness of 90% against tapeworms and are somehow less effective against the <i>Strongylus</i> genus (large and small nematodes), pinworms but not the oestrids. However the popularity of Pyrantel also poses a potential risk of development of resistance given their overuse. A rotation scheme to manage it is recommended for this.</p>	<p>Moderately effective against oxiures (<i>Parascaris equorum</i>), respiratory nematodes (<i>Dictyocaulus amfieldi</i>), pinworms (<i>Oxyuris equi</i>), large strongyle (<i>Strongylus vulgaris</i>), and threadworms (<i>Strongyloides westeri</i>)</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Effective against <i>Anplocephala spp.</i> (<i>Anoplocephala magna</i>, <i>Anoplocephala perfoliata</i>, <i>Paranoplocephala mamillana</i>), at twice the standard dose. Standard doses of pyrantel pamoate 6.6 mg/kg live weight. Equine tolerated it worse than the pyrantel tartrate. A dose of 75 mg/kg pyrantel tartrate was well tolerated, but at 100 mg/kg of tartrate 2 out of 3 animals succumbed. Tartrate is more soluble in water than the pamoate, so that it is more absorbed by blood and therefore more toxic. The margin of safety in donkeys is ~20.</p>	<p>Autumn strongyles, oestrids and tapeworms</p>
<p>Praziquantel is a member of the Group of pyrazines, Wormer effective against cestodes (family of worms). There are three species that infest horses and equine specifically: <i>Paranoplocephala mamillana</i>, <i>Anoplocephala magna</i>, and <i>Anoplocephala perfoliata</i>. At the same time that is researched we discover more aspects about tapeworms, especially its important involvement in cases of colic in equidae,</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Non-effective</p>	<p>Effective against <i>Anoplocephala (perfoliata, magna)</i>, <i>Paranoplocephala mamillana</i>.</p>	<p>Winter Strongyles</p>

both medical and surgical.							
The combination of ivermectin with praziquantel is one of the more effective anti-parasitic combinations against internal parasites, including most tapeworms, but it is not effective in the case of small cystic strongyles.	Effective against all nematodes	Effective against all nematodes	Non-effective	Effective against respiratory nematodes	Effective	Effective against three species of equine tapeworms (<i>Anoplocephala perfoliata</i> , <i>Anoplocephala magna</i> and <i>Anoplocephaloides mamillana</i> .)	Combined action of both wormers

Table 3. Imagery.cc (2014) Equine parasite treatment Chart [Table] Accessed from <http://equestrianoutreach.com>

Six Kenyan asses postmortem exams showed that *Dictyocaulus arnfieldi*, *Gastrophilus intestinalis*, *Strongylus vulgaris*, *S. edentatus* were isolated from the total number of animals. *Cylicocylus radiatus* and *Strongylus* were isolated from between 83% and 67% asses respectively, while *Cyathostomum coronatum* was isolated from around the 50% of the animals and *Paranoplocephala mamillana*, *Anoplocephala perfoliata* and *Cyathostomum coronatum* were each isolated in 33% of the cases. Other findings were *Habronema muscae*, *Trichostrongylus axei*, *Tridontophorus tenuicollis*, *Parascaris equorum*, *Trichonema tetracum* and *Cretorestom acuticulator* isolated from the 17% of the cases each.

Hygiene and management measures must accompany the use of anti-parasitic products. The main measure of management is to care for the hygiene of the stables daily.

If the animals are found in a pasture, the weekly collection of dung, considerably reduces the parasite load. Ideally, pasture load must not be exceeded, by hosting an animal per hectare if we want them to only eat grass, and we will not supplement with fodder or animal feed. If we have many animals we must group them in batches (pregnant females, foals up to 6 months, foals up to 2 years, more than 2 years old adults) and rotate the plots every 15 days, leaving them empty if it is possible for 1-3 months to decrease the parasite load.



Figure 48. Moonbeams Limited (2014) Group of donkeys grazing in a meadow in Casons, on the island of St. Helena, at approximately 1,200 miles west of the border with Angola/Namibia, in the South Atlantic [Photograph] Accessed from <http://sainthelenaisland.info>

If we want the worming of a group to be effective, we should also keep in mind that animals should be treated at the same time to avoid that some act as a reservoir to others. The dosage is extremely important, since a subdosing favours resistances.

All animal arriving at our group must be wormed at their arrival and be isolated in quarantine for at least one week.



Figure 49. Chris Radburn/PA (2018) Hapton, United Kingdom. Some donkeys in quarantine are driven to the equine sanctuary of Redwing, after having been rescued from a farm in Amersham along with other horses, ponies and donkeys, the RSPCA (Royal Society of prevention against the cruelty to animals) established that 5 people would face 12 charges for breaching the 2006 Animal Welfare Act [Photograph] Accessed from <http://www.theguardian.com>

As for proper deworming, there are different possibilities of parasite control programs. One of them is based on seasonal treatments, performed 4 times a year. Climatic factors will condition the cycles of parasites and thus we will control parasites in the critical moments of each season.

Spring

Weather conditions are excellent for the development of the phases of free life of all nematodes (gastrointestinal roundworms): in the wet grass with rising temperatures there are large numbers of larvae, developed from hibernating larvae or which have been developed from eggs disposed by animals that have not been properly treated during the winter. Tapeworm eggs are ingested by a developing population of soil mites. The pregnant mares can host some *Parascaris* adults which contaminate pasture with eggs when the foal is going to be born. In some areas it begins the period of flight of adult flies.

It is truly the period where it is necessary and essential to use a parasite adulticide and larvicide, which control nematodes, gasterophilus, and tapeworms.

<p>Summer</p>	<p>In wet areas, the high temperature facilitates the development of eggs of parasites, so quantities of larvae can be raised. However, in dry areas, larvae and mites protect themselves at the warmest weather time, locating in the deeper ground layers. Summer is the time of flight of adult flies so we have to take special care with wounds in the skin that can be complicated by a cutaneous myiasis (worms). Flies responsible for gasterophilus (stomach parasites) lay their eggs in the limbs of the animals at this time, this phenomenon can be better seen in dark coated and short haired animals. In addition it is also the time of greatest activity of mosquitoes, being the culicoid mosquito bites, the cause of allergic dermatitis on the back of the animal, causing itching, alopecia and "rat tail". During this period you must choose one or several wormers that control roundworms and gasterophilus, repellents can also be applied on the skin to ward off flies and mosquitoes and stable animals overnight if possible.</p>	<p>migratory larvae on the intestinal mucosa, as well as having the adult population increasing progressively. Treatment of worming at the beginning of this season keeps the animal free of parasites in the cold months, when grass is scarce and energy must be harnessed to fight the cold. The antiparasitic of choice for this period must have effect against nematodes and gasterophilus.</p>
<p>Autumn</p>	<p>This is the period when a lot of ideal conditions of humidity and temperature for parasites that live in the grass match. Eggs of nematodes develop somewhat more slowly than in the spring, but their survival is higher. In addition to the risk of infection in this period it must be taken into account that it is possible that the animal has been infected in summer after summer deworming so that we also eliminate the parasites that have infested our donkey at the end of summer and thus does not remain in our mascot throughout the winter. Treatment against roundworms, tapeworms and gasterophilus is recommended.</p>	
<p>Winter</p>	<p>Temperature affects the survival of the free-living stages and mites. Adult flies are usually not active at this time of the year. However, in the interior of our ass, a period of development of larvae takes place. In the post-mortem examinations which are carried out at this time of year, it is common to find cystic and</p>	

Table 4. Seasonal worming plan.

CURIOUS FACTS

FROM COMPANIONS TO THE AFTERLIFE TO POSSIBLE ROMAN MOURNERS SNACK

Donkey throughout history, has been curiously much related to burial rituals in various cultures. As an international team of researchers has just unveiled with the finding of 10 skeletons that show that its process of domestication was slower and less linear than it was thought at first. Archaeologists, led by Fiona Marshall, an anthropologist at the University of Washington (United States), have been able to go back to its first days thanks to the discovery of 10

donkey skeletons in a tomb of Pharaonic mortuary complex in Abydos, South of El Cairo. The name of the King who wanted to have them beside him in the afterlife is unknown, although it is known that he lived 3,000 years BC in the first dynasty, the time of the Pharaoh Narmer and Aha.

The graves to bury them were built with mud bricks and covered with wood, so that they were nearly complete. Only one of the skulls was missing possibly by the action of ancient grave looters.

Due to its exceptional conservation, archaeologists even found hair and tissue to analyze DNA and have been able to carry out a comparative analysis of their bones with the one from wild African asses (both Nubian and Somalian wild ass), previously found fossils and 53 specimens of modern donkeys from different continents.

This research establishes that its origin is African and that domestication was prior to changes in its skeleton and even in their genes.

The truth is that those primitive Egyptian donkeys, which apparently came from the Nubian donkey had lesions in the vertebrae caused by weight, as well as other pathologies derived from the confinement. However, they still resembled much their ancestors, somewhat higher.

It was also discovered that numerous individual differences among them existed, which bases the hypothesis that domestication was slow, although they already showed considerable phenotypic change during this early dynasty.

Some researchers maintain that African pastoralists began using them about 6,000 years ago, when the aridity of the Sahara desert increased. Their ability to carry heavy loads in lands without vegetation allowed them to move further and more often.

The fact that they were buried near the Pharaoh gives an idea of the great social value that they were granted because of this function that, indeed, they continue providing their services in much of North Africa and, in general, in the poorest world areas, difficult to be accessed by other types of vehicles.

Its prestige during the first dynasty is not surprising, when it was common that when the Pharaoh died for him to be buried with, in other nearby tombs, the remains of animals or objects that could be useful for him in the afterlife.

Later, as the archaeologist of the CSIC Andres Diego Espinel remembers, they fell into disfavour and became related to the Egyptian God of the evil Seth. "Later in time it is rare to find them in a necropolis because they had a negative value. In the ancient Egypt, the "mysteries of Osiris" (the Festival of Sokar-Wesir) called this way by the Greeks took place.

They were the repronouncement rituals and celebrations surrounding death, burial and establishment of Osiris in the throne of Amenti, the land of the West where the deceased dwell. This Festival was held towards the end of the season of Ajet (flood) in the fourth month or Kasher-ka, to restore the fertility of the earth as well as the people who were beginning to grow. This is still a time when fields are planted today in Egypt.

The feast of Sokar-Wesir was the most solemn of all antique Egyptian festivals, and surely one of the most picturesque, since in Osiris the Egyptians came to understand their own immortality, and the creative potential that existed in each person. On the 26th day of the fourth month of Ajet, they continued with the "lamentation" mysteries. On this day rituals were made to protect the double country of Kemet and everyone blessed by Osiris. This ritual was called "Destroying the donkey and the Snake", manifestations of the dangers of Apep, and which was performed by the King and priests behind closed doors. This conception of the ass, intimately associated with the snake (the sign of the evil par excellence), would lose its sense, as evidenced by the findings from later stages.

The Hyksos term (in Egyptian heqau jasut "foreign rulers", in Greek ἕκσως Hyksos) refers to a group of people from the Near East (in the Greek text of Manetho, pros anatolen) which took control of the Lower Egypt in the mid- 17th century BC. There are multiple theories about the origin of the Kycsos people. However, these theories, like others that have emerged, were based on the partial information which mainly came from the Pharaohs of the 18th dynasty. That is why until excavations were not resumed in *Tell el-Dab'a* in 1966 by the Austrian Archaeological Institute, directed by Manfred Bietak, that sources to interpret and reconstruct this period in the history of Egypt were partial and scarce. The successive campaigns in *Tell el-Dab'a* ended up confirming this identification with Avaris, the capital of the Hyksos in Egypt, at the time that they demonstrated that their penetration into Egypt in any way was violent.

These excavations also proved that during their stay in Egypt, the Hyksos adopted customs, rituals and Egyptian beliefs, but they also introduced their own. Excavations at Tell el-Dab'a have been supplemented with others conducted at different sites in the Eastern Delta and, especially, in Memphis, in charge of the *Egypt Exploration Society*, under the direction of David Jeffreys. Nowadays it can be stated that the penetration of Asians in Egypt began already in the XII Dynasty, increasing their number at the end of it. You may think that the arrival of such population was due to various circumstances and in spaced waves in time.

During the 12th dynasty, the establishment of the Asian population in Egypt was on the rise, with an important existing Asian community in Tell Dab'a, from the end of this dynasty that would include soldiers - judging from the weapons found in his funerary offerings-, merchants, sailors... and a population which retained cultural characteristics, like integrating their tombs in urban areas (adjacent to their palatial residences, with sacrificed donkeys at the entrance and weapons), the layout of houses or their pottery. This development of its own culture, eventually would lead to the formation of a new tradition, which retained elements from their country of origin.

CURIOUS FACTS

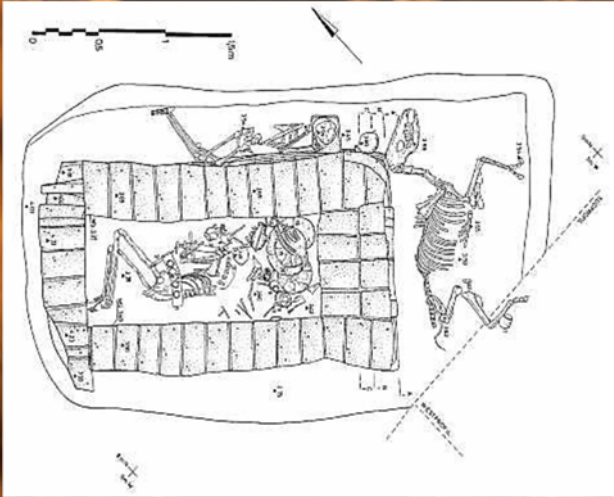


Figure 50. Diaz Bravo, J. (2014) Tomb of a Hykso warrior buried with a donkey (13th dynasty) in the necropolis of the city of Avaris [Scheme] Accessed from "The 17th Dynasty of Ancient Egypt: History and state of question" *Archaeological Research & Ethnographic Studies*, nº2: 77-115

The absence of large structures over graves is noteworthy. It is possible that the rituals and acts of worship occur in small buildings that were close to the graves and had a clear Egyptian architectural style.

The grave goods depended on the type and size of the burial and the items being buried. Weapons, for example, were always in the body; bowls and dishes near the left shoulder. Vessels were deposited at the entrance of worship places, possibly for some act of purification before entering.

The remains of donkeys have also been found in some tombs, buried along with the men. This fact of being buried next to donkeys can be considered a symbol of social status. This practice was a typical custom from Mesopotamia, so it was an acculturation in Egypt or rather a rescue of a tradition in diuse because of its association with Seth.

We should not be surprised by the appearance of asses in funeral processions depicted in the reliefs from Roman sarcophagi.

The ceremonies related to the funeral (funus) were very important in the Roman world, and varied depending on the economic and social rank of the person; this way we know about the funus translaticium or normal; the funus militare, dedicated to soldiers, the funus publicum, reserved for the characters of relevant public importance, and the funus imperatorum, devoted to the emperors; all of them had in common the celebration of a funeral procession (pompa) that should take place at night, with the deceased led on a pallet or feretrum, until the necropolis, which laws required to stand outside the city; only in exceptional cases - emperors, for example – they could be buried inside the urban area.

Once the procession arrived at the burial place three rituals were carried out: the ceremony of consecration of the resting place, the selection of the land on which the remains would rest and the purification of all stain of death. If the body was being burned a shallow hole was dug and was filled with dry wood, on which the corpse stood. After all these rites animals were sacrificed and were eaten by mourners (among the ones we can see goats, calves and even donkeys included). Then the family returned to the House, which was purified by means of an offering to the Lares, and thus ended the funeral rite.

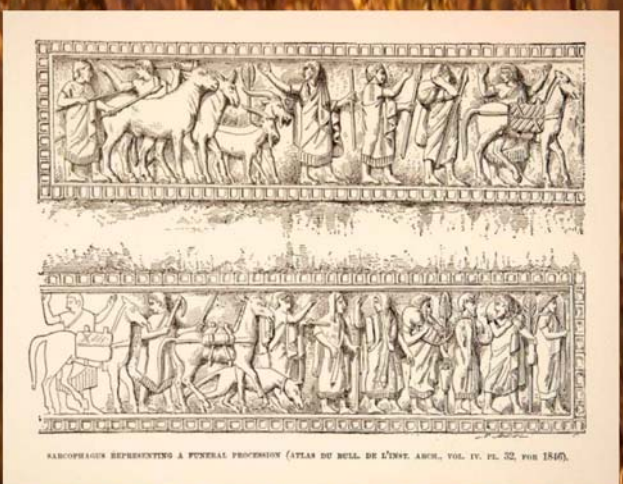


Figure 51. Period paper (1890) Tracing of the relief of a Roman sarcophagus representing a funeral procession among which we can observe the presence of donkeys [Tracing] Accessed from <http://www.amazon.com>

5.6. DENTAL CARE



Figure 52. Mike Marano (2010) Donkey teeth biting the gate that keeps it in [Photograph] Accessed from <https://www.flickr.com>

The dentition of the donkey is very similar to that of the horse, except for the fact that eruption tends to take place later.

Dental problems in the asinine species are very similar to the horse ones. A dental filing must be done by the vet specialist at least once a year.

Dental problems take longer to be detected in donkeys than the ones on the than in horses as they do not carry a mouthpiece, but that is no reason to deny them the health and comfort provided by a mouth without tips or hooks.

CURIOUS FACTS

HOW TO DETECT A DENTAL DISEASE?

The fact of not wearing a bit causes much of the dental or mouth problems of the ass apparently go unnoticed. This makes ass owners should be more attentive to perceive other signs that may show a problematic condition. These signs are:

- Difficulty when chewing. A donkey with dental problems can tilt or lean its head or scatter food while chewing. It can also drop balls of straw because of being unable to chew enough to be swallowed (this is known as quidding in English)
- Bad breath. In case of gum disease, food particles accumulate around the teeth and begin to rot, causing a strong odor. This can lead to an infection or abscess.
- Nasal discharge. Milky white, yellow or green occurs when there is an infection. When this concurs with swelling in the face, it could be a result of an infected tooth. The nasal discharge may also be a sign of respiratory infections.
- Undigested Food in manure, if we realize that there are whole grains or long strands of straw in the stool of our ass, this could indicate that the animal is unable to grab and chew its food properly and sufficiently.
- Colic. Dental disease can be a cause of colic in donkeys.
- Inability to eat, if your ass does not show willingness to eat or it is unable to do it so, or if it has lost weight it may be due to dental disease.

In many cases, donkeys may not show symptoms or even may appear healthy or fat. Thus regular dental care should always be a part of the routinely hygienic life of donkeys in captivity. In the same way that in horses, the teeth and mouth of the ass should be checked at least once per year. In young and elderly animals we should increase this frequency to twice a year.

5.7. HOOF CARE (SEE BOOK 1, CHAPTER 8)

The regular care of the hooves is extremely important. Without a proper review of the hooves, your pet can go lame and suffer unnecessarily from it. Wild asses keep their hooves in good condition walking more than 30 km a day in arid lands. A "pet" donkey may not wear its hooves far enough into the available space in an enclosure or box. Every 6 to 8 weeks the farrier should check our donkey hooves and provide the proper hoof care, it is very important that the farrier that we call is experienced in donkey hooves trimming, because the physiologically angle of the ground with the hoof-pastern wall is greater than in horses. It is also important that donkeys live on a dry ground since moist grounds favour hoof problems such as abscesses.

5.8. DETECTING WHETHER MY DONKEY IS SICK

The donkey and the horse are closely related, and many of the diseases that affect them are similar. However, detecting a disease in a donkey can be even more difficult than in a horse due to their stoic nature. Depression and sadness can be the only obvious symptoms. These subtle changes in behaviour can accompany anorexia. All this leads, in the majority of cases, to the fact that we will only realize that our animal is sick when it already is in an advanced state of discomfort. When in doubt we must notify the vet quickly since the problem may be much more serious

than what can actually be seen with the external symptoms. To meet our pet and watch it every day will help us to know it and understand it better and to thus detect these slight changes faster.

However, it also consists of not panicking and apply common sense to "diagnose" possible causes for depression in our donkey like for example the separation or death of a partner which can induce these signs.

The most common causes of disease are:

- Colic
- Hyperlipidemia
- Hoof problems: laminitis and abscesses
- Respiratory problems
- Miscellaneous: joint problems, dental, fractures, among others.

6. BASIC TRAINING

Generally, when we acquire a donkey, it has already been subjected to a training or basic dressage. What do we mean by basic dressage? We will define a basic dressage as the management measures needed to treat our pet safely and naturally. i.e. to get it used to knowing that kicks are completely intolerable, to trust in people, to string, to load into a truck, among others. Although this topic is treated in greater detail in the chapter on training, in rough outlines, we must not forget that donkeys are prey animals and, therefore, their first reaction is the flight one, but when they cannot flee, it will be an attack reaction. With this in mind, we must engage our reaction from trust but always without losing the firmness. Our pet should see us as the leader who they must follow and who they must rely on to make decisions, once this is achieved, everything will be a piece of cake.



Figure 53. Siena College (2014) Boy learning how to ride on a donkey next to his father [Photograph] Accessed from <http://www2.siena.edu>

7. DONKEYS AND CHILDREN

Due to its small size and its more stable character in comparison to horses, asses are animals which have traditionally been used so that the children from an early age could get accustomed to dealing with horses. The relationship with this type of animal will always be very beneficial for children, since, as discussed above, it will help them to apply the sense of responsibility on top of another living being and to be aware of how they should control their behaviour and their reactions. However, we must not forget that a donkey is a big animal that, in the worst case, can be lethal for a child, therefore all interaction between a donkey (or any animal) and a child should be supervised. In addition, both the animal and the child should receive some previous behaviour classes. In short, always without relying on excess, the friendship between a boy and his donkey will be a unique experience that will brand them for life.



Figures 54, 55, 56, 57, 58, 59, 60 & 61. (Figure 54) Arnell Farms, (Figures 55, 56, 57, 58, 60 & 61) David Caird/NewsPix/Rex Featur & (Figure 59) Unbound state (2012-2013) (Figure 54) A boy hugs an American Mammoth donkey foal, (Figures 55, 56, 57, 58, 60 & 61) 15 months old Jack Johnson plays with two donkeys at the donkey protection centre near his house in Yea, Australia & (Figure 59) A donkey smelling a girl [Photographs] Accessed from (Figure 54) <http://www.arnellfarms.com/>, (Figures 55, 56, 57, 58, 60 & 61) <http://www.dailymail.co.uk/> & (Figure 59) <http://unboundstate.blogspot.com.es/>

CURIOUS FACTS

TRAINING, CALMING AND PROTECTING LIVESTOCK

In countries like Australia with a vast livestock production, the donkey, continues playing a, sometimes unnoticed, but indispensable role in regards to the preparation of livestock for its driving, and even leading a flock, although today such large movements of livestock have resulted in exhibitions in which driving bulls show and compete with their skills in a show ring.

The intelligence, great strength and placid nature of trained asses has always been an invaluable tool for livestock cattle drivers when training to the bulls as the leaders of a flock. This utility has also reached the farms of goats and some Thoroughbred horse ones. The demand for donkeys, either entire males, or females asses and geldings, is booming, given the application of their particular characteristics to help to educate show and leadership bulls, to calm and reassure the Thoroughbred Race horses and to guard and protect the goat herds in reproduction.

New Zealand cattle breeders used solitary jackstocks to stand between aggressive bulls and prevent them from fighting, making it easy for the bulls to put on weight by keeping them quiet before being selected to go to sale and show fields. This is not a simple exercise, and asses must also carefully be selected, to work well with cattle, thoroughbred horses and goats, according to their gender and individual behaviour. A correct choice of the ass and more specifically their character is crucial.

In New Zealand practitioners regarding management of cattle in open field have employed these skills and intelligence in two geldings to prepare the herds of cattle (breeds such as Aberdeen Angus) for national exhibitions, and they value them in the same way as farmers and herders rate Shepherd dogs.

An ass intended for these purposes must always be trained prior to carry out its task, especially when we talk about training for driving cattle, so that we can enable them effectively in their work, in order for such driving to be quiet and successful.

The donkeys have a supreme intelligence within the animal world. They also have a huge strength in comparison to their size, they are capable of making decisions themselves (and they often will) and have a soothing and calming effect on cattle and horses. But this work is not just about buying a donkey and think that it will innately calm our cattle and teach a bull how to conduct a herd.

We must educate our ass so that it can perform its work properly in a paddock or a meadow.

If the donkeys are taught to calmly lead the bulls on the meadows in which they normally inhabit, they will be calm in the show ring, which is essential given the characteristics of these events. When a cattle driver has some donkeys who flawlessly develop its work, these animals are so precious that they become the family pet, they receive better food and the same hygienic care that would be provided to a horse, concerning to, for example worming, dental and hoof care. In the initial phase of the training, a donkey will wear a wide leather collar which will be tied to a leading rope attached to the head of a young bull (even in the stable), so that the ass is always at the bull side and close to it.

An educated ass will remain calm and safe while the young bull will display nervousness and insecurity when it comes to moving.

With the leader of cattle in command, ass will be compelled to lead the young bull around the pen before moving on to the meadow. From this point onwards the ass will command it, so if the ass moves, the young bull will walk, and if the donkey remains quiescent, both will do it so; If the ass grazes, both will do it. Normally about three days after being with the ass, young bull can be directed by the livestock driver or his/her assistant.

Many breeders of donkeys also report considerable support involving asses when they are used to calm Thoroughbred foals and to protect and take care of goat herds.

Sometimes, it is possible to observe donkeys appeasing fickle young racehorses before entering the paddock to be saddled, as well as some ranchers keep them next to the colts for one year so that they remain calm.

The use of donkeys in the protection and care of herds of goats, is today, one of the most increasing applications more that this species has.

Asses perform an immeasurable work, so much that they get to be highly prized as pets, as a dog would.

However, it is essential to choose the right ass. Although a jackstock does a good job in the case of young bulls, two geldings will maintain harmony when being together that will be very beneficial. Jennies are used to protect goats given their maternal instinct, and these and geldings seem to give good result with Thoroughbred horses.



Figures 62, 63, 64 & 65. (Figure 62) ¿Sabías que?, (Figure 63) Tom Meade , (Figure 64) Christine's Quackery & (Figure 65) mustbeme (2009-2013) (Figure 62) Andalusian donkey protecting a herd of goats in Fuentes de Andalucía, (Figure 63) Ass guiding a herd of sheep, (Figure 64) Ass educating a young leading bull [Photographs] Accessed from (Figure 62) <http://www.curiosidadsg.com/>, (Figure 63) <http://www.hobbyfarms.com/>, (Figure 64) <http://www.christinesquackery.com/> & (Figure 65) <http://forum.horsetopia.com>

8. THE DONKEY AS A “PET” OF OTHER ANIMALS

Donkeys are very social animals that like to live in the company of other living beings and develop strong bonds with other animals. This feature and the phylogenetic proximity that they share with horses is taken advantage of for their use as pets.

When we want to wean a horse foal, the donkey is left grazing with the mare and foal so they become accustomed to it, and when we place the foal apart from its mother, we will locate it in an enclosure apart with the donkey. Thus, the foal does not feel lonely, share the calmness of the donkey and look for it to relax. The trauma of maternal separation is reduced drastically.

In the case of nervous horses, donkeys are used so that its company and leisurely character is transmitted to these animals, calming them with their influence. The benefits that we get using a donkey rather than the ones we get by using another horse are its smaller size, occupying less space and eating less and their greater ability to easily adapt to new environments. If you want to use them as stable companions, small size donkeys like the miniature donkeys are recommended.

Another common use of donkeys is to have them as sheep and goat flock "protectors". A single donkey, preferably a female, but a gelding will also serve (a jackstock does not usually work because they become aggressive with lambs) is introduced into the herd and the link between animals is let be established. Once it considers the flock part of its family, it will protect the flock from potential predators (foxes, wild dogs, wolves...) as if it were one of their own relatives. This technique is extremely useful in areas in which herds have many hectares where to graze. The advantage of the donkeys respecting to dogs is that they eat the same food as sheep/goats and do not

have to be fed independently. The danger of a donkey braying alert shepherds from many kilometres away. For this task, we recommended large size donkeys like Andalusian or Catalanian ones.

Another possible task for our donkey is to teach foals or calves to string. The donkey wears a collar attached to the head of the foal or calf and is taught this way to follow it without hitches. It will go to where the donkey wants to go, and the foal will have no choice but to follow it. In this way, the foal will not associate this stressful situation with people, in fact, when we set the foal free from its bonds with the donkey it will tend to be very willing to follow us.





Figures 66, 67, 68, 69 & 70. (Figure 66) David Caird/Newspix/Rex Featur, (Figure 67) David Chapman/OrganicMan77, (Figure 68) Jessica Riederer/Caters, (Figure 69) Mark Singleton & (Figure 70) PA (2008-2010-2011-2013-2014) (Figure 66) Chihuaua riding on a donkey, (Figure 67) Dog resting on an Egyptian donkey, (Figure 68) Colin the kid plays on a Jenny of the Wildlife Park of Yorkshire in Branton, (Figure 69) Minnie, a bichon frise and Lily, an ass whose mother rejected have become great Friends and (Figure 70) Auguste, the Christmas goose rests on the back of Eddy in Marzahn (Berlin) [Photographs] Accessed from (Figure 66) <http://www.bbc.co.uk/>, (Figure 67) <http://emailfunnypictures.wordpress.com/>, (Figure 68) <http://www.telegraph.co.uk/>, (Figure 69) <http://www.dailypets.co.uk/> & (Figure 70) <http://travel.aol.co.uk/>

CURIOUS FACTS

ASSES AT HOME

Any home is not a home until it dwells in a pet. Times are changing and with fashion, pets do it too.

Frequently, the fact of an ass dwelling in a home in which it would not usually be, is usually related to situations of orphanhood, rejection by the mother of some foals which requires caregivers to pay special attention to affected animals dependent on them, among others. But what happens when an ass lives in a House with a family as if it were a dog or a cat.

Often they are accidental acts which make a donkey get to participate in this mode of "family life", as for example the case of Jackie Ferrier that accidentally allowed her ass, Polly, at home when her husband Tim was at work.

Asses are animals that require much company and which enjoy human contact, however when we drove them apart from their common field to one even more domestic if possible (home), we should be careful with the elements that it can found (fruit, bread, etc.) and to which it will be able to reach given its size. The Ferrier's had to suffer some modifications allowing that Polly could move inside the house safely. Among these changes, there is the amplitude of the corridors, the height of the stairs whose first step was made deeper so that Polly could not be damaged by attempting to climb them and chest of drawer whose height prevents Polly from reaching the objects inside of it.

In the case of Polly, its life is fully integrated with the one of the Ferrier. From shared breakfast, lunch and dinner (without hot food and with an own dish for meals) to watching out for the newspaper or television, perhaps in these cases asses get some confusion as not being able to identify themselves as members from their species, but the truth is that they enjoy the company provided to them by their owners.



Figures 71, 72, 73, 74, 75, 76, 77, 78 & 79. (Figures 71, 72, 73 & 74) Apex & (Figures 75, 76, 77, 78 & 79) Adam Smith (2008-2014) (Figures 71, 72, 73 & 74) Polly in their daily life the Ferrier family & (Figures 75, 76, 77, 78 & 79) Chris Wegener & Dawn from Missouri, their pet, during their daily activities [Photographs] Accessed from (Figure 71, 72, 73 & 74) <http://www.dailymail.co.uk/> & (Figure 75, 76, 77, 78 & 79) <http://www.bajiroo.com/>

The day little Hope was born, 49-year-old, Jane Nelson did not sleep all night concerned and offering her help to its mother to avoid any possible problems that could arise during birth.

After its birth its mother licked it and cleaned it up as it normally occurs after any birth. However, when its mother, Tuppance, reacted kicking its foal and biting it shortly afterwards, Jane did not think twice, led Hope home and began feeding it with bottles of goat milk every two hours, since its mother would have killed it if it had stayed the night with it (it was born at seven o'clock in the evening).

In later attempts for Hope to breastfeed, the aggressive tendency of the mother towards Hope did not stop, so it could not be corrected so that Hope could be returned to the same shelter where it lived with its mother.

Soon Hope by the process of learning known as imprint, (which is the learning process in young animals during the sensitive or critical period, as it could be the birth) began to follow Jane just as if it were its mother.

Hope enjoys walking and playing with other animals of the farm. Luckily one of the young pony females, Dixey, could partially take care of Hope and grooms it and treats it as if it were a little sister, so that both could live together.

One of the facts that allows that a donkey can be a pet is the size of some breeds like the miniature Mediterranean donkey, which do not reach a taller height than a Labrador retriever when they are young and which have the appeal of a Shetland pony when they reach maturity.

Genetic selection also makes increasingly possible to obtain lower height asses, even though everything is linked to a series of quite frequent pathologies in the breed, like for example, dwarfism.



Figures 82 & 83. North News and Pictures Ltd (2013) Hope and Jane at home [Photographs] Accessed from <http://www.dailymail.co.uk/>



Figures 80 & 81. (Figure 80) North News and Pictures Ltd & (Figure 81) Grawood Miniature Donkey Farm (2013) (Figure 80) Miniature donkey. The size of these animals makes it possible for them to be able to, in exceptional cases, coexist with people in their own homes and (Figure 81) Miniature Mule and ass in a dog carrier for large dogs [Photographs] Accessed from (Figure 80) <http://www.dailymail.co.uk/> & (Figure 81) www.grawoodminiaturefarm.com

The life of domestic asses should not be understood as an isolated entity that exclusively focuses on the area of the home of a family. People live in society and this makes our asses' behaviours may be annoying or undesirable for our neighbouring peers.

This is the case of Lola, the main donkey in the theatrical play "The Palestinians" in Brussels. It is not the first time that asses are part of the cast of a theatrical, musical or other kind of shows otherwise (see Book 3, Chapter 9). Lola used to relax on the balcony of a Belgian Arab cultural centre, during the breaks and when the play was not in the air, where it could enjoy fresh air, water and sufficient straw, until police forced its withdrawal due to the existing complaints in the neighborhood, with respect to the noise of the brays that Lola emitted.



Figures 84 & 85. Reuters (2013) Lola rests after a performance at the Cultural centre while the headmaster of the centre, Hawa Djabali, rebukes her neighbours because of their complaints due to the noises produced by the animal [Photographs] Accessed from <http://www.dailymail.co.uk/>

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Chapter 10

Donkey Therapy: Donkey Assisted Therapy. Human Illnesses Treatment

David Lema & Elsa Pérez

1. A LITTLE BIT OF HISTORY

Throughout the history of mankind, animals have occupied a central position in the treatment of diseases, and although the roots of deep relations between people and animals are lost in time, is at the end of the 18th century, when the theories about the socializing influence of animal company began to be applied in the treatment of the mentally ill. The scientific use of this type of relationship therapeutically dates back to the year 1792, at the York Retreat in England. It was William Tuke, pioneer in the treatment of mentally ill without coercive methods who sensed that relationships with animals could provide patients with mental disorders with human values. The Center provided rabbits, chickens and other farm animals and it represented a notable improvement in such an institution of this kind in its time since the patients could enjoy a more natural environment.

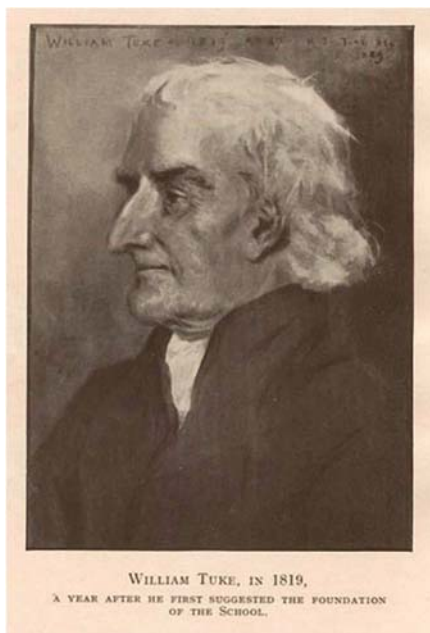


Figure 1. History Webside for Dibdin, Aglio, Rowntree, Guise, and other Families (1819) Portrait of William Tuke in 1819 [Portrait] Accessed from <http://www.guise.me.uk/>



Figure 2. Bot (Magnus Manske) (1796) A donkey going toward the original building of York Retreat around the 1796 [Etching] Accessed from <http://en.wikipedia.org/>

During the 19th century, pets became a growing part of mental institutions from countries such as England and Germany, among others. In 1867 the animals begin to intervene in the treatment of epileptics in the Bethel institution, Bielefeld in Germany. Today it is a sanatorium that serves 5,000 patients suffering from mental and physical disorders in which all kinds of animals (dogs, cats, horses, birds, farm animals and wildlife) are an active part of the treatment and caring for them is an important part of the programme.



Figure 3. Akpool.de (2014) Bethel Samaritan Hospital from Bielefeld-Gadderbaum [Postcard] Accessed from <http://www.akpool.de>

THE AMBLING GAIT, SELECTION STRATEGY

Francisco Javier Navas González from the PAIDI AGR-218 Research group from the University of Cordoba has implemented a programme of qualification of asses so that these are behaviourally evaluated as well as in terms of their physical qualities and movements, to determine their aptitude for riding therapy programmes. Genetics is the science that seeks to explain how individuals' biological heritage is transmitted from generation to generation. This information is saved in the genes, DNA sequences responsible for conferring certain common characteristics to one species and more specifically to a breed, making us stand out as individual beings.

There are features that are defined by a single gene, we call them monogenic traits. However, there are others which are affected directly and indirectly by hundreds of combinations of genes that establish relations among themselves. These are known as polygenic traits. Types of Polygenic inheritance in humans are the height, the color of the skin and eyes and weight. For example, the height of individuals is regulated by several genes so that there is a wide variety of heights within the same population. In the case of the movements the different breeds of donkeys describe, it also happens in the same way. This means that donkeys like the Egyptian, the Andalusian or Colombian Paso Fino donkeys, its particular way of walking is one of the features that will be affected by several different genes.

When we study the ways of locomotion in horses, we find that all breed show three natural gaits: walk, trot and gallop. However, there are some breeds that, besides these three, can perform special gaits. A team of geneticists has just published a study in the Nature journal where the gene that makes it possible for these alternate gaits to occur has been identified. Leif Andersson, one of the leaders of the study, was surprised by the discovery. According to her, the variation in the height of human beings depends on hundreds of different genes, each contributing with a small part; so she expected the horses' locomotion to be something as complex as that. What is surprising is that the mutation of the gene DMRT3 explains, by itself, a large part of the difference between horses that perform only the three natural gaits and those that adopt other special airs. Basically, this gene produces a protein used in the neurons of spinal cord in the area responsible for coordinating the movements of their legs. This has two effects:

- First, it allows to develop non-native movement patterns varying form coordinated movements between the left and the right, as well as the hands and feet ones, this facilitates ambling and the lateral gaits;
- Second, it inhibits the transition from trotting or ambling to galloping, helping to keep the intermediate gait for longer and at higher speeds.

During the initial phase of the study the genome from 30 Icelandic horses which, in addition to the natural gaits, could also display the Tölt (a kind of long walk); and 40 which could perform the Tölt and Skeid (a kind of ambling), was sequenced. But then the base was increased to 352 Icelandic horses, as well as samples from Tennessee Walkers, Peruvian Paso, Pure Puerto Rican Paso Fino (Dr. Gus Cothran) and other breeds performing lateral gaits. In addition, included Standardbreds and other breeds of "trotters" used in harness racing. It was found that the mutation of this gene was responsible for them being able to display the special gaits in all of them, or which could keep the trot (in the case of the Trotters) without making the transition to full Gallop when they increased the speed. The work also included studies in mice that corroborated the same results observed in horses.

Although this gene explains why some breeds, including the pure Puerto Rican Paso Fino, prefer to adopt a locomotion gait different from the one that naturally occurs in all breeds, it is yet to discover the specific genes affecting each of these special gait mechanics. For example, the Paso Fino is an isochronous four-timed (equally spaced) gait, while the ambling presents two times and the trail presents four times, but they are not spaced at equal intervals.

Although the DMRT3 gene and its mutations have not been studied yet in the ass, the fact of the presence of derivations and deviations from the three main gaits would make us think that this mutation is so old that it would go back up to the common ancestors of both species.



Figure 4. Crayon Candy! (2012) Ambling gait anatomical study [Illustration] Accessed from <http://crayoncandyleslie.tumblr.com>

Here there are the following hypothesis.

HYPOTHESIS 1: The DMRT3 gene only exists in horses (not in donkeys). As we may know there are fine mules, obligatorily DMRT3 gene comes from the mare. Therefore in the mule there does not exist a double copy from DMRT3 (they do not have the DMRT3 gene under a homozygous but heterozygous form). But as that single gene copy is expressed in the phenotype of the mule we can say that this is a dominant gene (a double copy is not required for it to be carried - what is known as homozygous - to express themselves). This is a very important clue, because from here we could infer many things, for example (to make it easier we will call the dominant DMRT3 gene for the Paso Fino as "F" from now on):

There are homozygous fino horses and mares: DMRT3 - DMRT3 (or FF) There are heterozygous fino horses and mares: DMRT3 - XXXXX (or Ff)

As the DMRT3 does not exist in donkeys, they would always be: ff.

If we crossbreed a homozygous fino Mare (FF) with a donkey: FF x ff: all descendants would be Ff (F from the mother and f from the father) and therefore all the offspring would be heterozygous fino mules. If we crossbreed a heterozygous fino Mare (Ff) with a donkey:

FF x ff: could be born both heterozygous fino mules (Ff) and not diagonally gaited fino mules (ff).

HYPOTHESIS 3: Gait DMRT3 gene is co-dominant with the other diagonal genes. Codominant means that when both genes are present in the heterozygous form both are expressed. For example human blood types, when types A and B are present, the individual gets the type AB. Then, if the DMRT3 gene is co-dominant, the following situations may occur:

The DMRT3 gene is in the homozygous form (DMRT3 - DMRT3): the horse would be a Paso Fino one.

The DMRT3 gene is not present (XXXXX - XXXXX): the horse would present diagonal steps.

The DMRT3 gene is in the heterozygous form, the horse could display both lateral and diagonal gaits.

HYPOTHESIS 2: the DMRT3 gene comes from a common ancestor and therefore exists in donkeys and horses. As this would confirm the existence of ambling donkeys which walk laterally. Then we could say that the DMRT3 gene is recessive and therefore it only manifests itself when it is in the homozygous form (double copy) and that it is possible to obtain fino mules with the DMRT3 coming from the father and the DMRT3 from the mother. If this is the case, then all our paso fino horses will have to be homozygous for this gene, or dmrt3-dmrt3 (recessive alleles).

From here on we could write many pages about the possible combinations and the possible genetics that Fino, Trocha and Trotting ones carry. Let's continue with the predictions.

HYPOTHESIS 4: considering the DMRT3 gene has an incomplete dominance with other genes. Incomplete dominance occurs when a dominant gene fails to completely hide the presence of the recessive gene and then gives an intermediate phenotype between both parents. In this case, when the DMRT3 gene is present in the heterozygous form, the horse would display an intermediate step. Would this be the explanation for Trocha?

These hypotheses are very simplified and maybe what happens in our equine surely includes the interaction of multiple genes, however, are a good starting point from which to consider investigations that deepen more in the area.

Despite the apparent success of these early and preliminary experiences of assisted therapy with animals in institutional care, the advent of scientific medicine eliminated animal hospital environments in the first decades of the 20th century.

Moving from continent, in the United States, the branch of veterinary medicine of the health services command of the U.S. Army employed animal therapy to improve the well-being of hospital staff and their families from the Second World War.

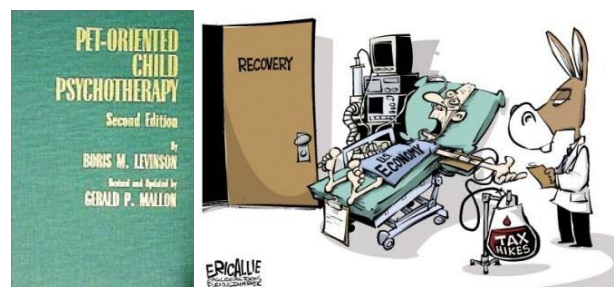
While in the State of New York, between 1944 and 1945, animals were earmarked for the rehabilitation of Airmen from the center of convalescence of the forces from the air force, in a programme sponsored by the American Red Cross.

In 1948, in the vicinity of New York, Dr. Samuel B. Ross founded the Green Chimneys Centre. A farm for the rehabilitation of children and young people with disorders of behaviour by working with animals.

And it was not until the end of the 1960s when these ideas returned to emerge in the articles and books of the American child psychiatrist Boris M. Levinson. In 1953, Jingles, the dog of Levinson, suggested its owner its potential as "cotherapist": a certain morning, a mother with her son, who had spent a long therapeutic process without success, arrived at the doctor's surgery. They had been prescribed to go to hospital and visited Dr. Levinson so that he could issue a diagnosis, and then decide whether he admitted the boy as a patient, since it showed increased subdued tone symptoms. As psychiatrist he greeted the mother, the dog ran towards the child and began to lick him.

The boy, without panic, hugged him and began to stroke it. He showed his interest in playing with him and after a few such

promising auspices, advanced in his treatment, reaching a great rapport with Jingles and the doctor, which allowed the work to solve their problems. From here, a milestone in the development of the therapy assisted by animals was marked as a specialized field, registering a large number of conferences on assisted therapy with animals, as well as a large number of publications in the United States.



Figures 5 & 6. (Figure 5) Boris M. Levinson y Gerald P. Mallon & (Figure 6) Erica Lie (1996-2011) (Figure 5) Cover of the child-oriented psychotherapy book and (Figure 6) and Doctor Donkey performs a transfusion (increase taxes) to the US economy [Photography and illustration] Accessed from (Figure 5) <http://www.amazon.ca> & (Figure 6) <https://texan2driver.wordpress.com>

In 1966, Erling Stordahl, a blind musician, founded the Beitostolen Center for rehabilitation of blind and disabled in Norway; a place where dogs and horses were involved in the programme by encouraging patients to exercise.

In the United States, in 1974, Dr. Samuel Corson and Elisabeth Corson, conducted a programme to assess the viability of the therapy assisted with animals in a hospital setting, in which they achieved excellent results. They used dogs to treat patients who did not respond to traditional treatment and who, with such therapy, obtained an increase in self-esteem, communication, independence and the ability to assume responsibilities in the care of the animals.

In 1981 a prison for women in Washington, began training rescued dogs from kennels (whose fate was the sacrifice) for performing therapies with persons with disabilities. In this way prisoner women had

the opportunity to take care of a living being, since many were mothers, increase their self-esteem and learn an occupation, feeling reintegrated to provide these dogs to the disabled people who needed them.

In 1991, Anderson *et al.* carried out a study in 6000 people which shows that people living with pets have fewer numbers of blood pressure, cholesterol, and triglycerides, especially in women over 40 years of age.



Figure 7. Youngs Funny Farm (2014) Henry waiting in the hallway of the Lakeside Medical Center, to visit inmates [Photograph] Accessed from <http://www.pinterest.com/>

During the last thirty years, and at least in part as a response to skepticism of the medical profession, the interest in the potential therapeutic value of companion animal has been directed towards studies

that might statistically significantly prove its apparent benefits.

This stage was initiated with an innovative study of 92 patients discharged by a unit of cardiac care that, from a statistical point of view, lived more years if they were owners of a pet, against non-homeowners (Friedman *et al.* 1980).

This report led to the appearance of a range of research related to health, most of which have demonstrated the relaxing effects for short-term contact with animals, or long-term health improvements that confirm the belief that animals are a source of social support.

In the case of Spain, animal assisted therapy began to spread much later, in the 1990s. Since our inception in 2005 in which we went to the authorities to introduce assisted therapy programmes with asses and were regarded with great disbelief, until our days, when things have changed a lot.

At present, in our country animal assisted therapy is a scientifically recognized therapy, although it continues to receive little recognition in most of the medical literature and the research hardly receives the support from the administration.

In spite of this, in almost 10 years we have passed from having a long list of donkeys to give in adoption to have a waiting list of people, families, cottages, organic production farms, etc., who want to adopt an abandoned and/or abused donkey.



Figure 8. SPANA (2014) Aware donkey foal [Photograph] Accessed from <https://www.facebook.com>

A great raising awareness labour has been done in which the figure of the donkey as an animal that continues to help people: pet, companion, therapeutic mediator, hiking partner or agricultural worker in a respectful way (ecological animal traction products are very appreciated by consumers, at least in other countries) are among others, new areas in which donkey can still contribute to the well-being of humans.



Figure 9. The Donkey Sanctuary (2014) A boy riding a donkey during a donkey therapy session in the animal-assisted therapy center from the Donkey Sanctuary [Photograph] Accessed from <http://www.thedonkeysanctuary.org.uk>

CURIOUS FACTS

WHAT BREEDS DO WE USE FOR DONKEY THERAPY AND ANOTHER THERAPY?

Various organizations and manufacturers of materials used during the Asinotherapy sessions and its leaders as Marko Suklje have reported the special adaptability to the Asinotherapy certain donkey breeds possess. While the most common current trend to devote a donkey to assisted therapy is to functionally reintegrate previously trained animal from shelters, and therefore seeks crossbred animals, the characteristics of one of the parental breeds is complemented by the other. There are some breeds that have shown, given their temperament, a special fitness for the purpose.

Among them Miranda Donkey (Portugal), Zamorano-Leonese asses, Encartaciones and Andalusian (Spain) and Mediterranean miniature donkey (United States) and the Egyptian donkey (Egypt), may show some skills that make them currently highly demanded for this purpose. This favours that companies which both apply such assisted therapies and are involved in the development and manufacture of appropriate equipment, are interested in the import of animals from their countries of origin, as it has happened in the case of the Andalusian donkey to Serbia and Germany. These breeds have several common factors; a docile character, a rather remarkable intelligence, nobleness and an affable attitude towards people more than obvious. In addition, the size of the miniature donkeys and of the ass of the Encartaciones (and their affable behaviour) promotes their use and work with children (although a donkey of a larger size but still not too large, allows children to stroke it without it being intimidating) and the typical horizontality of the thoracolumbar spine when moving from Andalusian or Egyptian donkeys as well as the kinetic equilibrium that characterizes them, and the presence of the ambling gait make them suitable for their application.

The Egyptian donkey has the added difficulty of importing animals from Africa to the rest of the world. The tall height of the above breeds makes their hybrids with other smaller sized donkeys, be preferable because of their adjustment to the disabilities of the people involved in the therapy sessions. Generally donkeys are patient, astute, attentive, endowed with an excellent memory and strong, resilient and stable, both physically and emotionally animals. They have also proven to be helpful, to have a remarkable solidary spirit at work and proven loyalty to whom treats them well.

On the other hand, in the case of breeds such as Mirandese donkey or Zamorano-Leonese one, we must not forget their ability to print their characters in their offspring given the dominance of its features over those from other breeds), something that not only made their jackstocks be in high demand for agricultural work but which do it too nowadays, in order to implement the new existing functional niches. Precisely because of the mutual cooperation between associations and the Zamorano-leonese ass Association (ASZAL) with facilities to take care of handicapped persons and the national association for the protection, recovery and therapeutic study of asinine species (ANDREA) these people is not only provided with the opportunity to progress in the treatment and to improve in their disease but to help this seemingly misplaced species are functionally relocated.

Nowadays it is generally accepted that animals are therapeutic and natural environments and contact with nature are good for people. But there is still a long way to go, as still, when building a center to serve persons with special needs, a space for animals is not designed, perhaps not even intended in, as an indispensable part in the process of creating a healthy environment to improve the quality of life of these people. Another discouraging fact is that today these therapies do not form part of the curriculum of psychologists or psychiatrists.

We hope that this chapter will help to transform stereotypes about the figure and the behaviour of the donkey and publicize assisted therapy donkeys as an effective therapeutic tool and to efficiently improve the quality of life of people, and especially from people with special needs.



Figures 10, 11, 12, 13, 14 & 15. (Figures 10, 11 & 12) A.A./Las Bellotas: Reserva del Asno Andaluz, (Figure 13) Mizunzu, (Figure 14) M.A.C./La Opinión de Zamora & (Figure 15) The Donkey Sanctuary (2009-2010-2011) (Figure 10) Child with physical disabilities caresses an Andalusian donkey (Figures 11 and 12) donkeytherapy-session riding programme with prisoners with mental illness and Andalusian donkeys in Granada (Spain) , (Figures 13 and 14) riding session with Zamorano-leoneses asses provided by the ANDREA Association in the facilities of Santa Croya de Tera (Zamora) and (Figure 15) The Donkey Sanctuary riding therapy centre from Manchester [Photographs] Accessed from (Figure 10) <http://www.ideal.es>, (Figures 13 y 14) <http://www.laopiniondezamora.es/> & (Figure 15) <http://www.thedonkeysanctuary.org.uk/>

2. A.N.D.R.E.A. ASSOCIATION'S DONKEY ASSISTED THERAPY PROGRAMMES

A.N.D.R.E.A. (National Association for the defense, recovery and therapeutic study of the asinine species) is a non-profit organization that has spent years working for the welfare of donkeys, welcoming, rehabilitating and finding new uses for these endearing "big-eared friends".

The Association employs abandoned donkeys and sometimes cruelly mistreated as "therapeutic mediators", once rehabilitated in our centre for abandoned and/or abused donkeys. In addition, it also has some examples of breeds under a critical state of conservation and under serious danger of extinction such as individuals from the asinine breed from las Encartaciones, one of the most threatened breeds of donkeys in the world according to a recent report by FAO. All of them make up the team of mediators which helps people in physical, mental and/or social disadvantage to enjoy a better quality of life, not only as a process of rehabilitation but also prevention, through the interaction mediated by a therapist, between the animal and the patient .

After having worked in different countries from the European Union with disadvantaged groups and accumulate more than sixteen years of experience in the private clinical office, the professional team of the A.N.D.R.E.A. Association made their biggest discovery: the importance and ability to restore the balance of people, in its broadest sense, through environments.

It has always been known, or sensed, that the separation of human beings from their natural environment and their languages, i.e. the compendium of its existing sensory stimuli, has been a different psychological and physical disorders predisposing factor.



Figures 16 & 17. (Figure 16) Perséfone & (Figure 17) Felix Ibargutxi (2011) (Figure 16) Therapy with a girl with Down syndrome making a drive circuit with the help of an Encartaciones ass and (Figure 17) Encartaciones asses [Photographs] Accessed from (Figure 16) <http://anima-bloq.blogspot.com.es> & (Figure 17) <http://www.diariovasco.com/>

This experience revealed in parallel with the clinical office we needed to move the clinic to natural spaces with natural stimuli, where animals would facilitate us this work undoubtedly and would enhance the benefits of the therapy more.

CURIOUS FACTS

INDICATIONS AND APPLICATIONS

According to the equine training center for sport and education, HÍPICA DOBLE A – LIZASO, the Asinotherapy, donkeytherapy or onotherapy is a very effective treatment assisted by animals in those patients who are affected by the following situations:

- Conditions affecting psychomotor development.
- Mental disorders.
- Autism.
- Emotional disorders (eating disorders, psychomanias, addictions, social pathologies, etc.)
- Difficulties in attention, learning, speech and communication.
- Muscular Dystrophy.
- Visual disturbances and/or visual damage.
- Epilepsy.
- Multiple Sclerosis.
- Spina bifida.
- Hyperactivity.
- Palsy, hemiplegia and amputation.
- Loss of mobility after a stroke attack.
- Problems of social adaptation.
- Accidents rehabilitation.
- Rehabilitation of the states of depression, anxiety, stress and pain.
- Down Syndrome.
- Head trauma.

Through the use Asinotherapy the best results have been obtained in cases of hyperactivity, nervousness, depression, lack of concentration, excessive shyness, communication difficulties and/or emotional expression, eating disorders, phobias and psychosomatic diseases.

Apart from these conditions. Donkeys have been very useful in their role as "social volunteers". Proving to have great beneficial effects on older people in nursing homes, children at schools involved within educational programmes) as well as part of rehabilitation programs after prison situations and other groups at risk of social exclusion, as multiple experiences worldwide have demonstrated.

The animal reaches points which we often cannot and its interaction with the patient is the key to the therapeutic process itself, as well as a huge source of information that we would never get in an office.



Figure 18. ANDREA (2013) Natural environments and therapeutic animals as facilitators are the key to a comprehensive intervention of persons with special needs [Photograph]

Young Down syndrome affected people, children diagnosed with ADHD, adults and elders with the Alzheimer's disease or other dementias, people with chronic psychiatric disorders or cerebral palsy and young children with autistic spectrum disorders, are, among others, some of the groups who benefit from the donkeys-assisted therapy. The results are excellent and invite us to be optimistic and to presage a more inclusive psychological approach of the person, where to work, therapeutically speaking, with sensory stimuli coming from environments where the natural environment, and animals as facilitators, can be the key.



Figure 19. *Asociación ANDREA (2008)* Asociación ANDREA (2008) A girl embraces a therapist donkey [Photograph] Accessed from <http://andreasociacion.org/>

Our donkey assisted therapy programmes with the animal mediation are defined as a therapeutic strategy based on the presence of brain neuroplasticity and based on cognitive neuropsychology and the psychomotor rehabilitation therapy and sensory integration, aimed at favouring the instrumental and basic functionality of persons with a disability (physical, mental and/or social) and longer conserve their autonomy.

These pioneering programmes in Spain, have been created, designed and improved by our interdisciplinary team after years of experience and research in animal-assisted therapy.



Figures 20 & 21. *The Donkey Sanctuary (2013)* Each year, approximately 46,000 children come to The Donkey Sanctuary riding asinotherapy centres in Belfast, Ivybridge, Leeds, Manchester and Sidmouth from their schools, hospices, orphanages or centres and homes. These centres are equipped with totally adapted play areas and gardens in which children can wait until those sessions begin, in the covered therapy Court. [Photographs] Accessed from <http://www.equitrekking.com/>

All riding sessions are carried out under the supervision of highly qualified people and vary according to the needs of each particular case. These needs vary from behavioural or learning problems, autism, Down syndrome, visual impairment or disabilities to severe conditions like cerebral palsy.

For some children a trip of about ten minutes is more than enough, while others need to spend more time brushing and stroking asses.

Children are encouraged to be independent and their self-confidence increases lesson after lesson. The lessons are structured around the correct riding postures, which includes sharing riding time shifts, as well as the following orders.

Guiding the ass up to reach certain images, letters, numbers and signs which are arranged in the field of therapy, increase motor skills of children, as well as encourage them and force them to communicate with them, congratulating them when they do it well, and recognise them and use their names to call them.

Riding increases balance and helps to strengthen muscles and stability. Through the interaction with donkeys and people the stimulation of vocabulary is fomented, as well as it also promotes self-esteem and safety, whatever their needs are.

The centers also provide access to wheelchairs adapted trucks, for those children who cannot mount on asses.

Furthermore, each of the six centres of donkey assisted therapy also make trips and visits to health centres, homes residence and orphanages.

Asses are very affectionate creatures that enjoy the interaction with humans and are comfortable entering a living room or a

bedroom to meet with patients in their beds or chairs.

Asses thank the caresses, being spoke to or even sung to, and their visits evoke such feelings that they even let participants recall those moments, time after the visit.

For our therapeutic work the concept of neuroplasticity is basic. It is the capacity that neurons have for functional adaptation, to broaden their synaptic connections to enrich their activity. All people, including those who have dementia maintain some neuroplasticity capacity, a cognitive plasticity potential, learning or reserve skills which can be developed and stimulated in order to modify and optimize their adaptation to the environment.

From the scientific field, research projects which show how, through exercise and the adequate sensory stimulation it is possible to functionally and structurally modify the brain. The *neural plasticity* is influenced by intrinsic factors (genetic) and environmental influences or extrinsic factors.

In this way through environmental factors, it is possible to influence by means of non-pharmacological treatments in people with deteriorated psychomotor, cognitive, psychological, communication or social development, or deteriorating in order to develop their residual abilities and maintain them for as long as possible.



Figures 22 & 23. (Figure 22) [Onlinepersonaltrainer.es](http://www.onlinepersonaltrainer.es) & (Figure 23) *ASSERTA Desarrollo Humano* (2014) (Figure 22) Brain exercise & (Figure 23) *Neurons and their connections* [3D Illustration] Accessed from (Figure 22) <http://www.onlinepersonaltrainer.es> & (Figure 23) <http://poderpersonalmexico.com/>

Another fundamental concept of our non-pharmacological therapeutic intervention work is the *stimulation*, understood as a set of stimuli generated by rehabilitation purposes interventionist Neuropsychology, aimed at maintaining and even improving people capabilities.

On this base, Neuropsychological rehabilitation or cognitive training which we carry out in our programs specifically affect the areas that present a more significant deterioration. It is about setting the most possibly individualized stimulation, and therefore the most suitable for the residual capacities of each patient.

Thus, through the presentation of adequate stimuli which our brain is used to, we get to elicit the physical, cognitive, emotional, social, and communication capabilities of the person in the therapeutic process.

CURIOUS FACTS

METHODS

According to the Epona Association (Barcelona), there exist the following types of equine assisted therapy. The term Equine therapy and its branch the donkey therapy, refer to the different treatment modalities in which horses or more specifically the ass, is its mediator instrument, so that, we find:

Hippotherapy/Donkeytherapy/Onotherapy/Asinotherapy: Consists of taking advantage of the ass therapeutic principles and its inherent characteristics to treat people with physical disabilities, either congenital or acquired. It is based on aspects such as the transmission of the body heat of the horse's body to the person, rhythmic impulses and the three-dimensional movement. The sessions are led by a physiotherapist, psychologists or trained personnel for this purpose.

Therapeutic Riding: Through the contact with the donkey and the motivation that this generates, it tries to find different solutions to the problems of learning and adaptation those affected by disabilities present, always starting with the possibility of educability. Increases motivation, stimulates affection, improves attention and concentration, stimulates tactile, visual, auditory and olfactory sensitivity, helps to schedule learning actions and increases the capacity for Independence.

Adapted Riding: Aimed at those who practice riding as a recreational or sporting option, but for their disability they require accommodation to access the ass.

Therapy Swing: equestrian discipline that involves making gymnastic exercise on the back of the donkey, is mounted only with a blanket and a surcingle with handles designed for it.

Social Equine therapy: Equestrian Discipline which takes advantage of the emotional relationship established with the donkey, to help people with social adaptation problems to overcome their conflicts, and to integrate in a standardized way in society.

From a medical point of view is defined as a therapeutic and educational method based on the theory of neuroplasticity, and neurorestoration, using the horse as a healing or stimulation agent, with in a multidisciplinary approach in the areas of health, education (psycho educational) and riding, with well-defined roles, programmes and sequentially made proposals; looking for the bio-psycho-social development of people living with disabilities or special needs.

From a psychological point of view, it is defined as an "Supraparadigmatic Integrative Psychotherapy, strictly systemic by integrating inter disciplinary teams, family, volunteers and the donkey as change agents, under a Humanist context, in which the main feature will be the therapeutic change framework and Humanism principles (Burgental) using cognitive behavioral techniques in its direct intervention in children and adults living in some physical or mental disability with special educational needs; Along with the active participation of a horse which will unconsciously intervene as the paradigmatic figure of transitional attachment (Winnicott) and archetypal itself."

Upon this base the various activities which are carried out both within the classroom and outdoors are designed, like for example the circuits of psychomotor skills and sensory stimulation especially designed by the multidisciplinary team of ANDREA, in which disabled people improve at a holistic level, in all its aspects: psychomotor, cognitive, emotional, social and communicative. This is one of the most innovative aspects of this therapy: to be able to encompass all the aspects of the person in a single therapy, thanks to the interaction with the animal, mediated by our therapists.

The therapeutic mediation with the ass allows us to perform a double work. On the one hand the psychomotor stimulation in which we hold a deep work of reeducation of the main psychomotor indicators developing so fundamental aspects such as muscle tone and balance. Moreover, psychomotricity acts, by stimulating cognitive, behavioral and emotional functions, with the aim of increasing the capacity of interaction of the person with their environment. In this regard the participation of the psychomotor skills and therapeutic mediation specialist of our professional team are essential. At the same time animal-mediated activities are designed to directly influence these little developed functions or in process of deterioration, such as spatial and temporal orientation, attention, memory, language, among others. On the other hand, we get, again thanks to the animal, a solid work of emotional stimulation through the stimulation of the limbic system and the creation of emotional bonds.

It is important to note that this programme does not seek a disorganized stimulation, but one that mean a proper stimulation and the most possibly individualized and therefore most

suitable one to the residual capacities of each person. And especially the stimulation provided by the animals is phylogenetically suitable for our brains, so we will never run the risk of an overstimulation, which would be harmful for the person.

3. THE DONKEY AS A THERAPEUTIC MEDIATOR



Figure 24. Reuters/Adnan Abidi (2012) An Afghan child embraces a donkey near the city of Kabul, in Afghanistan [Photograph] Accessed from <http://www.noticias24.com>

In this regard, we wish to express our admiration for the donkey, an abandoned animal in our modern societies and which owes very interesting therapeutic capabilities. Donkeys are suitable animals for therapeutic mediation work, since in addition to its docility, they are excellent partners and its large size allows us to carry out the work of sensory integration for the stimulation of the primitive areas of the brain, through rhythmic movements and swinging while therapeutically riding on them.

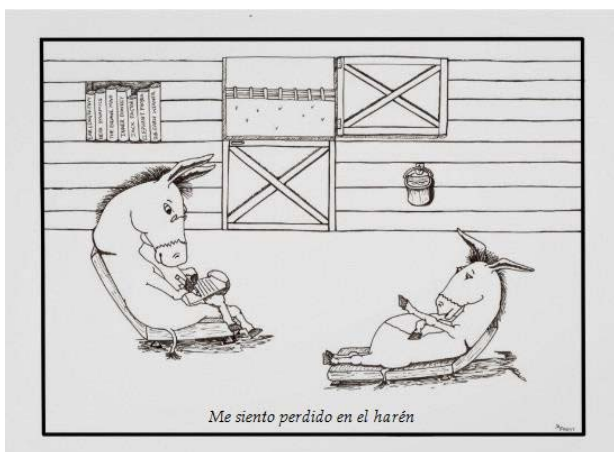


Figure 25. Zazzle Inc. (2014) Donkeytherapy, figuratively speaking [Illustration] Accessed from <http://www.zazzle.es/>

The donkey has some therapeutic characteristics intrinsic to its own ethology that facilitate the therapeutic process with the most disadvantaged. Through therapy sessions, it is possible to get a more efficient way for the rehabilitation of the person, since these animals generate a very high motivation and interest, which facilitates the realization of the activities through a special and warm bond that the donkeys are capable of providing.



Figure 26. Ananya Hixon (2012) Emotional therapy with young people in Llanelli [Photograph] Accessed from <http://www.pinterest.com/>

In our cultural baggage the donkey is an animal that evokes a feeling of love and affection. Their quiet character awakens the urge to get closer to pet them in people and we feel comfortable when we are near it. This allows us to count on the motivation of the users for the implementation of the activities required so that the therapeutic processes are produced. It is impressive to see how people that seem unrelated to any stimulation from their environment (for example, some people with autism spectrum disorders) interact with such docile animals, so friendly and delicate towards the participants.



Figures 27 & 28. Bryndafydd Animal Assisted Therapy (2012) Trained donkeys like Polo the donkey, from Newcastle, can adapt to the needs of different types of patients, adapting to the restrictions of the situations of each case [Photographs] Accessed from <http://www.animalassistedtherapywales.co.uk>

The donkey is a source of deep multi-sensory attention, allowing us to communicate with it further than in the cognitive aspect of the reasoning: a communication through the emotional channel. This stimulation produced at the level of the limbic system (emotional brain system) is the gateway to directly influence on such basic and complex aspects as attention, memory and learning, among others, directly related to the emotional aspects.

We still remember when after a few therapy sessions, the professionals who accompanied a group of patients with Alzheimer's disease told us how different was the stimulation when one of their users could experience making a puzzle on a table in a indoors classroom, from the brain

stimulation received through contact, always mediated by professionals, with a donkey, childhood and youth mate in the work of the field.

CURIOUS FACTS

ANTICRISIS THERAPY

Donkey therapy is not only indicated in the case of diseases that have an obvious clinical basis as we have been seeing throughout this chapter. In 2009 the following piece of news appeared; "A donkey shelter is offering therapeutic services to bankers evicted from their home who have lost family and friends because of the economic crisis.

This center from Chesire is assisted by 50 donkeys and an elderly couple of Shetland ponies, which share their stables with brokers, banking executives and fund managers.

The idea came up when Miss Mildred Criag from Southport visited one of their sponsored donkeys and discovered that a bank employee named Fred lived with him there, buried under a pile of financial newspapers and quite depressed about the situation. Fred was hiding from the media who pursued him because of his participation in the credit crisis.

A spokesman said the shelter will soon introduce a bankers adoption plan soon so that disabled children could ride them, always following the implementation of a programme of pre dressage and so that when the situation is overcome those asses could be resettled in their jobs "... sorry, I mean, bankers," headed.



Figure 29. NewsBiscuit (2009) Banker and his stable mate [Photograph] Accessed from <http://www.newsbiscuit.com/>

The donkey has a curious character and it is very sociable. Its bad reputation as a stubborn and headstrong sometimes comes from human egocentrism, wanting all beings to see the world with their own eyes. The latest research carried out on the brain of the donkey has discovered that almost three-fourths of their brain capacity are intended for visual analysis.

So that it takes more time for the donkey than for the human being, to process the information in order to assess the possibility of a hazard. This means that it takes longer for it to cross a small river or wetland, for example, simply because it may be analyzing the information surrounding it more slowly. And we strive to have it walking at our pace, so that it goes faster... If we stopped just a few moments more, it would end quietly, crossing when it were sure not to put its life at risk.



Figure 30. FEPAMIC Lucena (2010) the Zoo from Córdoba (Spain) organises sessions of riding for the disabled in which the Andalusian donkey boast their ideal qualities for this functional application [Photograph] Accessed from <http://fepamiclucena.blogspot.com.es>

In this sense the donkey invites us to respect the times, different rhythms and the differences in general and this is a basic aspect to develop in all of us, and especially in the most disadvantaged.

CURIOUS FACTS

WHAT CHARACTERISTICS SHOULD DONKEY THERAPY USED DONKEYS PRESENT?

According to veterinarians from the University of Cordoba with experience in implementing Asinotherapy sessions, as well as in the education of donkeys to perform it, a fundamental requirement is that the donkeys chosen to perform animal assisted therapy should usually be young and healthy (it is unethical and therefore not recommended working with senior or sick animals), unless the animal rehabilitation is part of the therapeutic process. More specifically, the donkeys involved in educational and therapeutic processes are characterized by:

- High sociability with people.
- Balanced behaviour.
- The lack of behaviors that may mean a risk for patients (tendency to bite, kick, conflict with other donkeys, etc.)
- And above all, trust in humans.

It is also possible to incorporate therapeutic programmes in the context protection in which cases its purposes doubles, contributing to the rehabilitation of people during the rehabilitation of donkeys rescued from abuse and neglect. And this is because, even if they have had a difficult life, this animal is so noble, that is, despite the experienced adversities a great ally, giving us one of the most beautiful lessons we can learn: it is possible to start over from zero. In fact, many little donkeys working in therapy do it from sanctuaries in which they now live happily and free, after being rescued from miserable lives and environments. We have many examples in the US, UK, Italy ... A fine example of this without going any further, is El Refugio del Burrito in Spain, which makes rescue work and care of donkeys from deplorable situations of indifference and abuse, and which strives to give them a new life, which they had always deserved and which was denied to them. Like other shelters they combine their work with animal-assisted therapy, in this case as we have mentioned, donkeys. And the ass because of its quiet, docile, friendly, curious and intelligent behaviour, is a perfect co-therapist. From the animal we seek, above all, for it to have a docile character, so in most cases geldings or castrated males, females of a certain age, preferably older than ten years and once they have passed adolescence are selected.



fields, with hectares where grazing, playing, resting, and above all with space to live in herd. In this sense we feel very fortunate to have the appropriate conditions to be offered to both users as well as to the animals, and also therapists, an environment where the rhythms and peculiarities of each of them is respected, healthy spaces so that the therapeutic process can take place.

Our donkeys are free and go into or come out of mediation when they want to, they are not forced to interact, which guarantees a relaxing and safe environment for everyone. In that environment, and to allow a real therapeutic interaction, the three parties involved in the therapy, user, animal and therapist, must end the session relaxed... all three, including the donkey.



Figure 34. As Salgueiras (2012) Free donkey on the place where the circuit of psychomotor skills of As Salgueiras (La Coruña) Spain [Photograph] Accessed from <http://salgueiras.blogspot.com.es>

Figures 31, 32 & 33. (Figures 31 & 32) Donkey Sanctuary (Cyprus) & (Figure 33) T.I.F Fotos (2014) Donkeytherapy is being applied around the world, and although the studies carried out to prove its effectiveness are still in very early stages they potentially allow us to glimpse a different therapeutic perspective that eventually greatly enhances the prognosis of certain disorders [Photographs] Accessed from (Figures 31 & 32) <http://www.donkeysanctuarycyprus.org/> & (Figure 33) <http://tiffotos.com/>

When we refer to the docile and collaborative behaviour of the donkey, we speak about animals that have their needs met, animals which spend the day in the

CURIOUS FACTS

PSYCHOMOTRICITY CIRCUITS

The As Salgueiras Foundation implemented an Asinotherapy sessions programme during 2012. To develop the sessions of the programme entitled "animal-assisted therapy for people with dementia and cognitive Impairment" an adapted covered circuit was available for the therapy.

Being the main objective of the programme, to improve the physical and mental health of the users in all their aspects (cognitive, behavioral, emotional and psychomotor), the work on the circuit was started right from the very second session, with the help of our asinine cotherapists, a geriatrics assistant and an occupational therapist from the Red Cross.

In the circuit we work and appreciate different aspects such as: discrimination of colors, sizes and shapes, coordination, spatial and temporal consciousness, handedness, immediate and short-term memory, among others, emphasizing in reinforcing the skills that are conserved and trying to help its deterioration get slower.

The degree of dependence of the users of these sessions is varied. They range from more dependent users at an equilibrium and muscle tone level (who use wheelchair or need a walker to get around) to less affected people in whom it can be seen that its limitation in mobility does not stop them from doing it correctly. Donkeys contributed by adapting their way to patients, waiting patiently and serving as a support at one of the sides.



In each session, simple and accessible goals are scored in order to motivate and boost the self-esteem of patients.

To achieve this type of circuit donkeys are also intensively trained so that they are used to having them mount up & down a trailer, noise, shocks, unexpected events, etc. Thus their behavior is totally safe for the people with whom they interact.

Figure 35, 36, 37 & 38. As Salgueiras (2012) (Figure 35) Psychomotricity circuit view, (Figure 36) the asses, cotherapists of the experience, wandering free in the therapeutic area, (Figure 37) A patient performs the psychomotricity circuit & (Figure 38) Another patient is assisted by the qualified staff who develops the experience [Photographs] Accessed from <http://salgueiras.blogspot.com.es>

The donkey is an animal that is already in the rural environment, there is no need to change it from its habitat and which has also lost its place after the mechanization of agriculture. After so much work, now the donkey seems hopeless, like the rural world, towards its demise. However the donkey can still help much to the human being, as it did years ago and like it still continues today helping us to improve our mental health. The donkey makes us reduce the speed at which we live, makes us live in the present moment, reminding us that we must respect rhythms, theirs, ours and the nature's one.



Figures 39, 40 & 41. Hudson Valley Walk with Donkeys (2014) Little Brays of Sunshine Donkeytherapy Programme [Photographs] Accessed from <http://www.meetup.com/>

This is also part of the therapeutic process: wait a few minutes until the donkey slowly approaches mediation... it can make us reflect on our pace of life, and it is also a way of working the tolerance to frustration and impulsivity as a therapeutic target.

CURIOUS FACTS

THERAPISTS AND QUALIFIED STAFF WANTED

As the staff of the donkey therapy Programme of Little Brays of Sunshine expressed. The almost non-existent institutional support makes not only that no means to facilitate the implementation of such therapies be provided, but makes no expert therapists to specialize or to be formed in the subject.

Currently voluntary services can contribute to the realization of such therapeutic programmes, but training them is provided by associations and centers such as ANDREA, putting programs into practice.

Within this particular program, a normal session has a variable duration that depends on the characteristics of the user and objectives, and how advanced the state of patients is, among others. Session range from 30 to 45 minutes to last about four hours from the time the material is prepared until it returns to the starting point. Some sessions can last a little bit longer and take place both during the week and on the weekends..

Volunteer therapists should know how to physically control the donkeys and know their personality and understand the signs of body language that donkeys are showing us, so that they can communicate with them. This requires spending time with the asinine cotherapists.

Figure 42. Bridell Nursing Home (2014) health personnel in charge of the Bridell Health Care centre, which participated in the donkeytherapy experiences [Photography] Accessed from <http://www.carehome.co.uk/>



4. DIFFERENCES BETWEEN THERAPY AND DONKEY ASSISTED ACTIVITIES

Donkey assisted therapy is a therapeutic process, like any other type of therapy process, but which uses donkey as a mediator to achieve the proposed objectives. You must not confuse these therapies with mediated animal activities. Therapy is directed and taught by officially accredited professionals to do therapy, psychologists or psychiatrists, or by physical therapists for hippotherapy, though of course it requires the collaboration of other professionals who are part of the team, such as: professional from the field of disability, special education, welfare and animal ethology, psychomotor skills, etc. We should not forget that animal- assisted therapy includes different disciplines: psychology, ethology, among others, veterinary medicine, disability... Both therapy and activities are very beneficial for people with special needs, but they are clearly different and we must not call therapy when we are referring to activities, as occurs a great confusion in the population in general and we contribute to discredit this beneficial therapy.

The therapeutic process begins with the demand of a user, relatives or professionals who are in charge. After one or some interviews in order to collect information (diagnostic reports, tests, clinical history, among others) the therapeutic objectives are set. The intervention is designed according to them: the prognosis, estimated programme duration, periodicity and duration of sessions, periodic evaluations, report issuing and possible discharge. An individualized therapeutic route, even though working in a group, is carried out taking into account the objectives and personal characteristics.





Figures 43, 44 & 45. Pablo Araújo/EFE (2010) Margari, Carmela, Candela and Rosalía are the protagonists of the therapeutic Center of the A.N.D.R.E.A. Association of the Ourense town of Allariz which provides support to groups in disadvantage and social exclusion. Asses have achieved what traditional methods have failed to achieve yet: a remarkable and effective improvement of their patients at all the therapeutic levels. People suffering from Alzheimer's disease, physically and mentally disabled are just some of the groups where results that invite to the optimism have been noted. In the case of Alzheimer's patients they have been able to observe spectacular results, since the donkey awakens parts that are starting to deteriorate as the memory in them. From being virtually in a state of complete abandonment, the donkeys have become excellent therapeutic mediators, like dogs, horses and even dolphins. Feeding them, brushing them and carrying a circuit of psychomotor skills and sensory stimulation with the animal out are part of the therapy that develops in O Rexo two days a week, under the supervision of David Lema and the clinical psychologist Elsa Pérez. Although little known in Spain, animal therapies have achieved great success in many European countries like Holland and England. In fact, due to the lack of specialties in this matter, experts have had to go abroad to be able to delve into this field. Right away you notice the benefits, the donkey is an animal that has many therapeutic properties. It is a very docile animal that you can embrace, that you can caress and with which they interact. Families immediately noticed that patients have more mobility, they talk more at home and have fewer relationship problems, because the donkey is an animal that accepts them the way they are. The next step is to get a prior therapeutic bond. Only from there, therapy starts to operate, although it takes a period of time to see a little deeper results. The Association inaugurated a riding center with the support of the administrations and the European Social Fund. In addition to the work done with animals, the Association aims to collaborate in this way with the development of the farm, through the recovery of a village that was uninhabited. Donkey therapy and the recovery of the countryside, through organic farming, grazing controlled by donkeys and the maintenance of the area make up a hopeful future for Requeixo de Valverde, where the Center is located [Photographs] Accessed from <http://www.lavozdeg Galicia.es/>

During sessions professionals collect written information about the performance of each user and at the end they fill an individual record with the collected clinical observations, user performance, developed skills, difficulties that have arisen. This information enables a continuous assessment of the operational objectives for the following sessions. It is necessary to also stress the importance of the training of professionals so that more people can benefit from the mediation with the donkeys. Know the methodological bases of this therapy, having knowledge of the asinine ethology and a good management or handling of the animal will allow to succeed, therapeutically speaking, in these programs.

CURIOUS FACTS

SCHEMATIC APPROACH AND PREPARING EXPERIENCES

In 2006, the Norwegian University of Life Sciences (Norges miljø- og biovitenskapelige universitet) proposed the implementation of an Asinotherapy programme with a University grant. During this approach, it was studied that the initiative should be structured so that treatment programmes be successfully and safely adapted to the needs for which they were implemented.

This preparation could be divided into the following phases:

1) A theoretical phase, about 5 months long.

2 months: propaedeutic evaluation of both patients and coaches.

2 months: Meetings and interviews with patients, family & mental health departments to find out what they really are the needs of a specific area.

1 month: Readiness and training of trainers.

2) A practical phase, about 7 months.

A theoretical and practical course takes about 4 months to teach the coaches as for them to be in charge of their asinine cotherapists and their patients.

Three months in which each patient is separately and individually assigned to a donkey for the whole experience (to take care of it, to ride it) firstly the activities will be guided by an instructor for, once a sufficient progress has been shown, pass to individual sessions.

3) 1 week for the evaluation of results.

For this, the clinical methods carried out a neuropsychological evaluation to assess: visual global cognitive functioning, working memory, learning and care functions and verbal fluency.

Verbal and numerical amplitude (Wechsler, 1987).

Auditorium verbal learning test (Rey, 1964; Taylor, 1959).

Rey-Osterrieth Complex Figures (Rey, 1959).

Verbal fluency test (Novelli et al., 1986).

Word-color association Test (Golden, 1978)

Circuit conducting test (Retain, 1958)

Family questionnaires (QCF)

Each association and programme will put appropriate specific tests into practice according to each individual operation and clinical situation.



Figure 46. M.A.C. (2010) Practical sessions within the training programme for instructors run by ASZAL and ANDREA [Photographs] Accessed from <http://www.laopiniondezamora.es>



Figures 47, 48 & 49. (Figures 47 & 48) ANDREA & (Figure 49) M.A.C. (2010) Donkey therapy sessions put into practice by the ANDREA Association [Photographs] Accessed from <http://asociacionandrea.wordpress.com/> & (Figure 49) <http://www.laopiniondezamora.es>



Figures 50, 51, 52, 53 & 54. (Figures 50 & 51) The Donkey Sanctuary (Cyprus), (Figures 52 & 53) Hardscrabble Times & (Figure 54) Jochanson (2006) (figures 50 and 51) donkeytherapy has proved to have a high effectiveness against disorders like autism, (figures 52 and 53) in the case of Harrison, he was diagnosed with autism at the age of 4 and he had been riding on an ass from the age of 3 (even made a three-day trip to the Sangre de Cristo mountains. His parents always try that Harrison go riding fairly regularly when the weather is good, always having rides of about 45 minutes, in the presence of an adult who can keep the ride safe and deal with the possible setback that could appear, like other animals, livestock or a dog trying to bite the tail of the ass. Although virtually (not anatomically) the movement of asses is equivalent to the one of horses', their warm nature make them less prone to a sudden and uncontrolled flight for fear. Something very valuable in this type of therapy. As we have seen there is a difference between recreational therapy and donkeytherapy, which takes place under the supervision of credited therapists (whether speech therapists, occupational therapists, physical therapists or psychologists). Even so, both disciplines can combine making children memorize and sing songs while riding on the ass. This type of activity is therapeutic for all individuals who are involved in it, both patients and their parents, who find such experience with their children very satisfactory. Autistic children, depending on their level, are prone to tantrums and screams, a kind of behaviors that improve after the sessions of training and (Figure 54) Onotherapy in Poland, a therapist ass training session [Photographs] Accessed from <http://www.donkeysanctuarycyprus.org/>, (Figures 52 & 53) <http://hardscrabbletimes.com/> & (Figure 54) <http://www.bochnia-parlamen..com/>

5. BENEFITS FROM THE THERAPIES

The positive impact of animals on human health is evident. The documentation of this impact on health (both front conditions in the area of psychology, psychiatry and pedagogy as at a cardiovascular, respiratory, digestive level, among others) comes from epidemiological studies that defend the long-term effects of possession of animals (*Friedmann et al., 1980; Anderson et al., 1992; Serpell, 1991; Friedmann and Thomas, 1995*), and almost experimental and experimental studies that defend the short-term impact of the human-animal interaction.

We do not want to get involved in making a description of the research studies that the reader can easily find through the different collections that exist in manuals or through internet in this chapter. What we will share here is the accumulated experience after years dedicated to ass assisted therapy for people with physical, mental and/or social disabilities professional team of the ANDREA Association.

After almost ten years of dedication to animal-assisted therapy we have been able to witness the clinical benefit of this therapy. It has not always been possible to verify these improvements with statistical significance, however the observation itself, the collected clinical data, questionnaires and interviews with users themselves, family members and professionals, among other resources, show us daily how donkey assisted therapy is obtaining therapeutic objectives at all levels: physical, cognitive, emotional, communicative and social. Perhaps this comprehensive intervention is one of the keys to therapy: through mediation with the animals managed to reach all the aspects of the person. And this, the therapists know, it is not easy.

Below we show the overall benefits that we have seen after the participation of users in

our animal assisted therapy programmes. It is important to note that these benefits are obviously conditioned by a number of variables, which include, the characteristics of the users, the therapeutic objectives or the duration of the therapy, without including a range of variables that affect people such as the process of maturity, course of various diseases or the reappearance of unused capacity.

CURIOUS FACTS

THERAPEUTIC RIDING ALONG THE HISTORY

The use of horses as a means of rehabilitation for people with disabilities of various diseases is not a new activity as it is currently believed.

HIPPOCRATES (458 - 377 BC). In his book *The Hippocratic Corpus* in the volume on the diet; on its affecting conditions; and the Appendix "About the diet in acute diseases"; on the use of liquids; and on the food, he advised riding to "regenerate health and preserve the human body in many diseases and especially in the treatment of insomnia." In addition to that it stated that "riding practiced outdoors causes muscles to improve their tone".

ASCLEPIADES OF PRUSA (124-40 BC). He also recommended the horse's movement to gouty, epileptics, paralytics, apoplectic, lethargic and frantic patients.

GALEN (130 - 199 AD). Consolidator and disseminator of knowledge of Western medicine, personal physician of the Emperor Marcus Aurelius (which was a bit slow in his decisions). He recommended the practice of riding as a way for Marcus to act faster.

HYERONIMUS MERCURIAIS (1569). In his book "*Artis gymnasticae*" says an observation made by Galen: "The riding not only exercises the body, but also the senses" - The personal physician of Empress Maria Theresa of Austria, who belonged to the first Medical school from Vienna, said that the muscle fibers became less excitable, practicing this sport, which is why decreased episodes of hypochondria and hysteria.

SAMUEL T. QUELMALZ (1697 - 1758). Doctor from Leipzig, Germany, invented in 1747, an equestrian machine showing how the problem of movement and physical exercises were faced by the doctors of the time. This machine was a kind of crane that mimicked equestrian movement induced effects the best possible. In his book "*Health through horseriding*", we find a reference to the three-dimensional movement of the horse's back for the first time.

GUSTAVO ZANDER (Swedish). Physiatrist in Mechanotherapy, was the first to claim that the vibrations transmitted to the brain from 180 oscillations per minute, stimulate the sympathetic nervous system. Zander found this, but without associating it to the horse. Almost a hundred years later the doctor and Professor Dr. Rieder (Swiss) Head of the neurological unit of the Martin Luther University in Germany, measured these vibrations on a horse's back at a walk gait and they incredibly correspond exactly to the values recommended by Zander.

OXFORD UNIVERSITY HOSPITAL (1917). There the first group of Equine was founded, to serve the large number of wounded in the First World War, also with the fundamental idea of breaking the monotony of treatment.

LIZ HARTEL (Denmark from 1952 to 1956). At 16, she suffered from a severe form of polio to the point of being unable to move for a long time unless it was by means of using a wheelchair and then with crutches. She practiced riding before and contrary to all, continued practicing and eight years later, at the Olympics in 1952 was awarded the silver medal in dressage, competing with the best riders in the world, the public only saw its state when under the horse podium she had to use two Canadian sticks. This feat was repeated at the Olympics in Melbourne in 1956. From this fact, this example of self - therapy raised the interest in the equestrian activities programme of the empirical medical class as a therapeutic means, while in 1954 the first interdisciplinary team appeared in Norway, formed by a physiotherapist and her boyfriend who was a psychologist and riding instructor. In 1956, the first associative structure was created in England.

FRANCE. Equestrian Rehabilitation was born in 1965 as Lubersac and The Llieri cited in the introduction to its manual entitled "*Re-education through Riding*" (1973), while in 1963 this had already been used empirically by Killilea in his book "*To Karen with love*". In 1965 hippotherapy turns into a didactic material. In 1969, the first scientific work was published.

HIPPOTHERAPY in the Hospital of the University of Salpentire, in 1972 the defense of the first doctorate thesis in medicine on Equestrian Rehabilitation takes place and was made in turns at the University of Paris in Val-de-Marne, by the Doctor Collette Trintelin Picart.

In Latin America

The pioneers in this activity have been Argentina, which started its action in 1978, not only with equine activities, but also with experiences working with doves and dogs.

Argentina was joined by Brazil, and both pioneers in equine therapy, are renowned for their actions by the different authorities, either at the level of Ministry of Health, by the CONADIS (National Advisory Committee for Persons with Disabilities, which depends on the Executive) etc.

In the last decade, this activity has expanded and nowadays, centers have already been opening, with great success in Mexico, Venezuela, Chile, Peru, Uruguay, Ecuador, Colombia and Cuba.

5.1. AT A PHYSICAL LEVEL

At a physical level improved muscle tone, posture and balance are observed. Improves fine and coarse coordination, reflexes, right/left discrimination, motor planning (understood as the ability of the brain to conceive, organize and carry out a sequence of actions) and in general to improve the mobility of the person. We have seen the strengthening of musculature and, something especially important, a notable improvement in the ability to relax it.

The decrease in abnormal movement patterns, ritual or stereotypic movements is very noteworthy. In this sense, we have had very good experiences with young people with autistic spectrum disorders, which, after the programmes, have reduced their stereotypical behavior and disruptive behaviors. Below we show a fragment of the psychological report of a young man diagnosed with Down syndrome, associated with an autism spectrum disorder, developed by the clinical psychologist of the A.N.D.R.E.A. Association, after six months of the intervention with assisted therapy with donkeys: *"rage attacks decrease and impulsive as rituals and stereotype symptoms become less pronounced: during sessions the stereotyped movements as thumb sucking or hitting decrease. After the exercises of stimulation on the donkey clear signs of relaxation and well-being appear, that continues after the session". November, 2011.*

After donkey assisted therapy people have a greater degree of psychomotor development in general.

As it appears reflected in various investigations we have found decreased blood pressure and heart rate. These studies range from the first observations in people, they experienced a drop in blood

pressure when interacting with animals (Katcher *et al.* 1983) to more open behaviours that indicate a more relaxed state (Katcher and Beck, 1986;) Wilson, 1991). There are even more recent evidences indicating that contact with animals not only helps in the recovery of cardiovascular disease, but it can even help to prevent them (Anderson *et al.*, 1992).

This aspect seems particularly important for us to report, especially when it comes to the public health and economic implications that it can have. In other countries this therapeutic potential of the animals has already been used for several decades in referral hospitals worldwide such as the Mount Sinai in New York or at the UCLA (University of California, Los Angeles), in which the intervention with animals has become an important and growing component of modern health care.



CURIOUS FACTS

MOTOR LEVEL ACHIEVEMENTS

According to associations like *Humanymal* - Animal Assisted Therapy Alicante (Spain), we can improve motricity and coordination through the motivation that comes from working with an animal. Through activities adapted by a professional physiotherapist, and even without riding (walking dismounted, caring for and handling animals) a patient with a problem of reduced mobility can improve his/her motor level, showing more free and independent movements, and even in cases of patients with stereotypes, reducing the abnormal movement patterns.



Figure 55. *Parlament dla Wszystkich Polaków* (2014)
Donkeytherapy session in a Polish cottage [Photograph]
Accessed from <http://www.bochnia-parlament.com>

5.2. AT A COGNITIVE AND PSYCHOLOGICAL LEVEL

Increasing the capacity of observation, care and concentration of users after the programmes, is remarkable as these aspects are the ones in which we especially focus during sessions. These capabilities are the gateway to cognitive basic processes, such as learning or memory that need to be deeply stimulated in people that either have not developed them properly, or in which they are deteriorating. These capabilities also will work directly, through different activities designed specifically for this purpose, obtaining a considerable improvement on the memory and learning ability of the participants. Especially noteworthy is this improvement of attention in children with Attention Deficit Disorders and hyperactivity working with our herd of animals, thus intensifying their attention span. The increase in the time that children with ASD (autism spectrum disorders) lend to animals during the sessions is also quite remarkable.

Thanks to our psychomotor therapist's specific work within our interdisciplinary team we get an increase in users' body consciousness, a generally deteriorated aspect in people with special needs.

We confirmed an increase in the response of relaxation during and after sessions, effects that are even kept for several days. Our experience is that this calming effect of animals is essentially valuable with children showing inattentiveness, hyperactivity and conduct disorders.

In terms of states of anxiety and depression, we see a significant reduction during the programme and then in a short term. This aspect is widely documented by the research that has tried to describe the relationships between the possession of animals and the health status of a population in relation to minor anxiety and minor depression levels, especially in older people. Loneliness, lack of company and the lack of social support are serious risk factors that can damage the well-being of a person, one of the initial causes of suppression of the immune system. The companion of animals, as a social support which absorbs and reduces the impact of stress and anxiety, has been recognized in several studies as a factor that helps people to feel less depressed and lonely.

CURIOUS FACTS

PHYSIOLOGICAL REACTION TO THE ASS QUALITIES

Several studies (Wilson, C. C., 1991; Friedmann, E., Thomas, S.A., 1985) report that we will see an overall improvement in the management of emotions, optimizing their expression, as in the presence of the animal, patients expressed more at both a gestural and a verbal level. It allows the development of feelings of trust, and therefore increases self-esteem, so the bond can be developed with the donkey (the creation of bonding between patient and animal, mediated by a therapist is essential for therapeutic processes to occur), for the tasks associated with handling and care. It can also help us to work on the impulse control, since when an animal perceives an excessively high or violent energy, and even more one so intelligent as the donkey is, can evade the contact, so that the patients will have to regulate themselves and learn to control their impulsiveness if they intend to work with them. Another aspect that we can work is the relaxation and stress reduction and anxiety; because once the patient is accustomed to the contact with the donkey, it offers moments of great relaxation, in which we come to perceive even a decrease in blood pressure and heart rate, muscle relaxation (which is fantastic to work spasticity, in case the patient present it.)



Figures 56, 57 & 58. As Salgueiras (2012) animal-assisted therapy for people with dementia and cognitive impairment [Photographs] Accessed from <http://salgueiras.blogspot.com.es/>

After the therapy programmes, the self-confidence and self-esteem of the users' increases. This improvement is logical if we fall into the account that the donkey is an inexhaustible source of love and unconditional acceptance. They accepted us as we are, handsome or ugly, young or old, demented or not, with more or less capacity. Its mere presence, responsiveness to human contact, and the clarity of their behaviour provides a sense of emotional security, which is scarce in our personal interactions.



Figures 59, 60 & 61. T.I.F Fotos (2014) The team of Dancing with donkeys, composed of specialists with extensive experience in psychology, physiotherapy, occupational therapy and pedagogy, keeps in Hoyo de Manzanares, in the outskirts of Madrid, the team of donkey therapists which helps them to treat patients of very different conditions, especially to the elderly and children with problems of integration, motor dysfunctions and both physical and psychological disabilities [Photographs] Accessed from <http://tiffotos.com/>

In general we can say that they treat us as capable and worthy people. Their attention and company is a gift for many people who feel like "a burden" in this society. We can work from curricular contents adapted to the level of the patient, to the learning of new tasks/jobs and ass and farm-related terms. Also aspects such as attention and memory, which directly affect learning.



Figure 62. Asociación ANDREA (2014) Theory and practice course of training in the knowledge, management and communication with asses, in an inclusive manner within donkey therapy programmes [Photograph] Accessed from <http://escueladeformacion.wordpress.com/>

CURIOUS FACTS

KNOWLEDGE, MANAGEMENT & ANIMAL COMMUNICATION COURSES

Based on our professional experience within Asses Assisted Therapies and Asinomediation activities, the ANDREA Association designed a very practical course where participants have the opportunity to acquire the knowledge and experience required for the proper management of donkeys. Learning from the basic care needs of these animals, knowing how to interpret and creating an effective communication code is a key factor for the success of assisted activities with donkeys.

The course objectives are: to introduce students to the application of donkeys as a tool for mediation and experience a proper animal handling for different activities: therapeutic, recreational, educational or environmental.

This Specialized Workshop is designed so that participants experience themselves their interaction with the animals.

CONTENT SUMMARY:

- Introduction to ethology.
- The healthy donkey (and basic care needs).
- The ass' internal systems and mental faculties.
- The communication:
 - From donkey to donkey.
 - From donkey to man.
- The personal attitude to establish fluid communication based on understanding and respect.
- Fundamentals of communication with the donkey.
- How to effectively communicate with donkeys.
- Approach the donkey: verbal and nonverbal communication.
- Guidelines to the donkey behavior based on mutual trust.
- Education and Behavior Therapy ass mediation activities.
- Specific work:
 - The donkey with problems.
 - The donkey foal and its education.
- Leadership concept.
- Establishment of leadership.
- Basics on natural horsemanship.
- Work in the round pen.
- Features of the ass as a mediator.
- Relaxation techniques with the donkey: "Portage"
- Assisted interventions with donkeys with different disadvantaged groups: *Pervasive Developmental Disorder & autism spectrum disorders, attention deficit disorder and hyperactivity disorder (ADHD), mental retardation, physical disability, schizophrenia, people affected by Alzheimer's disease, among others.*
- Diploma Issuance.

THE COURSE IS AIMED AT:

- Professionals and general population regardless their academic qualifications who are interested in working with donkeys in their therapeutic, educational, recreational or environmental field.
- Donkey owners, and to all people who love animals and nature.
- Who want to make and innovative activity.

DURATION & COST:

13 hours/275 € (305.799 \$)

5.3. AT A COMMUNICATIVE AND LANGUAGE LEVEL

This is a level at which there are easily observable benefits, as it has been manifested, not only by therapists, but also by relatives. An increase in verbal interaction occurs at the same time that sessions ensue, both with animals, and with therapists but also with their fellows. Family members' reviews on the increase of communication by the user during the return journey, at home or in their reference centres are common at the end of each session.



Figure 63. *Save the Dogs (2012) Asinotherapy program for orphans with disabilities in Bucharest [Photograph] Accessed from <http://www.savethedogs.eu>*

This increase in verbal interaction occurs both in the quality of the interaction (which becomes more adequate, more emotional) and the amount of verbal interactions. We also note an increase and improvement of non-verbal communication, communication including smiles, laughs, looks, gestures and contact with the hands. The facilitator for this process to occur is the non-verbal language of donkeys itself which is very clear and direct, which makes the interaction with it easy. The feedback that you receive after their actions in the presence of the donkey is immediate and simple. If the donkey is not comfortable it will leave. And the arising consequences

from his/her actions are experimented by the person himself/herself, not a professional which warns about what will happen. Also with their non-verbal language show us that they are attentive, fully present. They are not thinking about other things from the past or for the future. This is a great contribution to the creation of a healthy and therapeutic environment. This appreciable improvement in the communication begins with the animals and then extrapolates to professionals, family members, among others. The vocabulary is enriched and there is an improvement in the articulation of words.

5.4. AT A SOCIAL OR EMOTIONAL LEVEL

After our programmes we can confirm an increase in the interest in the world around, which translates into an increase of the interaction with the environment and also in an increase in the emotional responses in relation to animals and that is extrapolated to their personal relationships. Animals are social facilitators, stimulate people so that they socialize with each other and the topic of conversation is often the animal, even among strangers. In this sense, we remember the experience with a patient suffering from a chronic mental disorder from the psychiatric unit of a hospital in the area, with great difficulties in setting social contact, and how, after several months of intervention, he accompanied professionals during the visits from individuals to the Association and told them anecdotes about donkey behaviour rules, with all sorts of explanations.

An increase in social contact and the ability to interact with other living beings, relationships of friendship and respect with both animals and others, therapists, companions, family... is produced. It is important to point out how they develop feelings of respect for animals once the ethology of donkeys is known, the reason for their behavior. For people affected by

Alzheimer's disease, for example, after programmes donkeys change from draft and work animals which accompanied them during their life, to become partners which collaborate to improve their health, both physically and mentally. Specifically this collective produces a deep emotional interaction with the donkey: both have lost their place in a world that goes too fast for both of them.

In the case of young people and children with autism spectrum disorders we have found that they increased their social behavior and detected a parallel self-absorption and autistic behaviors decrease (murmurs and clicks, the position of the hands, spinning objects, repeated jumps, vagrancy...) and a higher degree of sociability as for example, helping the therapist in simple tasks, initiating autonomous activities such as leading donkeys and frequently imitating the actions of therapists. The problem that arises is the difficulty for the maintenance of these benefits after the programmes, which currently have a limited duration and are not yet a part of the continued treatment of these people, despite all the existing empirical evidence.

The recognition of the states of mind and the ability to understand the behaviour of others, animals, people and themselves. The increase of emotional experiences that occur during the program also improves the mood of participants and therefore the desire to engage in group activities.



Figure 64. AFAOR (2014) This project consists in the realization of an asses assisted therapy for people affected by a mild or moderate stage of Alzheimer's disease, with the purpose of promoting their independence, autonomy and social integration. This pioneering experience of collaboration between AFAOR and professionals who taught ANDREA Association programs, was developing successfully for years both at a regional and provincial level, and despite being very interesting and striking and having obtained a special mention at the second Congress of quality and safety, at present, does not have any kind of sponsorship, whether public or private, which is the cause for the temporary suspension of its operations [Photographs] Accessed from <http://www.afaor.com>

We would like to refer to a study conducted in collaboration with the Alzheimer SDRC (State Disease referral Centre for the Alzheimer's disease and other dementias), the National Association of breeders of the Zamorano-Leonese donkey breed (ASZAL) and family and Alzheimer's disease affected patients from Benavente and County Association (AFA Benavente and region).

The aim of this study was to confirm the clinical benefits specifically observed in people affected by Alzheimer's disease after an assisted multifunctional stimulation program taught by the professionals of A.N.D.R.E.A. to children with special needs. One of the psychoneurologists of the SDRC Alzheimer's took the methodological and statistical analysis management of the data.

While it was a short duration study, data collected three months after the program by a wide battery of tests before and after the intervention, showed a statistically significant improvement at a psychomotor level in three aspects: locomotion, balance, and coordination of arms.

It also should be noted that in the case of the Test of ADAS-COG (test that allows a complete examination of the cognitive impairment from Alzheimer's) although significant results are not found they are about to be. We need further research to collect scientific evidence indicating the clinical data observed about the benefits of these therapies.



Figures 65, 66, 67, 68 & 69. (Figure 65) E. R. B., (Figure 66) The Donkey Sanctuary (Cyprus), (Figure 67 & 68) Gabriela Dumba & (Figure 69) Young's Funny Farm (2009- 2011-2012) (Figure 65) Donkey therapy session at a nursing retirement from Alhaurin de la Torre, Málaga & (Figure 66, 67, 68 and 69) The so satisfactory benefits and experiences that the visits of asses to centers in which senior residents, whether they are disabled or not, it is perhaps one of the most powerful boost that can be put into practice , as evidenced by the results [Photographs] Accessed from (Figure 65) <http://www.elcorreo.com/>, (Figure 66) <http://www.donkeysanctuarycyprus.org/>, (Figure 67 & 68) <http://www.puterea.ro> & (Figure 69) <http://www.youngsfunnyfarm.org/>



CURIOUS FACTS

Table 1. How much does it cost to launch an initiative like this?

ACTIVITY/SUBJECTS	EUR €
Stable and facilities	6,000
Specialized operator (7EUR/h Net)	4,700
Animal caretaker (4.2 EUR/h Net)	2,280
Therapeutic equipment	1,000
Donkey care (food, health, etc.)	1,700
Veterinary assistance	1,560
Operators education and training	2,000
TOTAL EXPENSES, 1ST YEAR	19,240

As it was established by the Organisation *Friends of Homeless Dogs*, in 2012. *It's Donkey Time!*

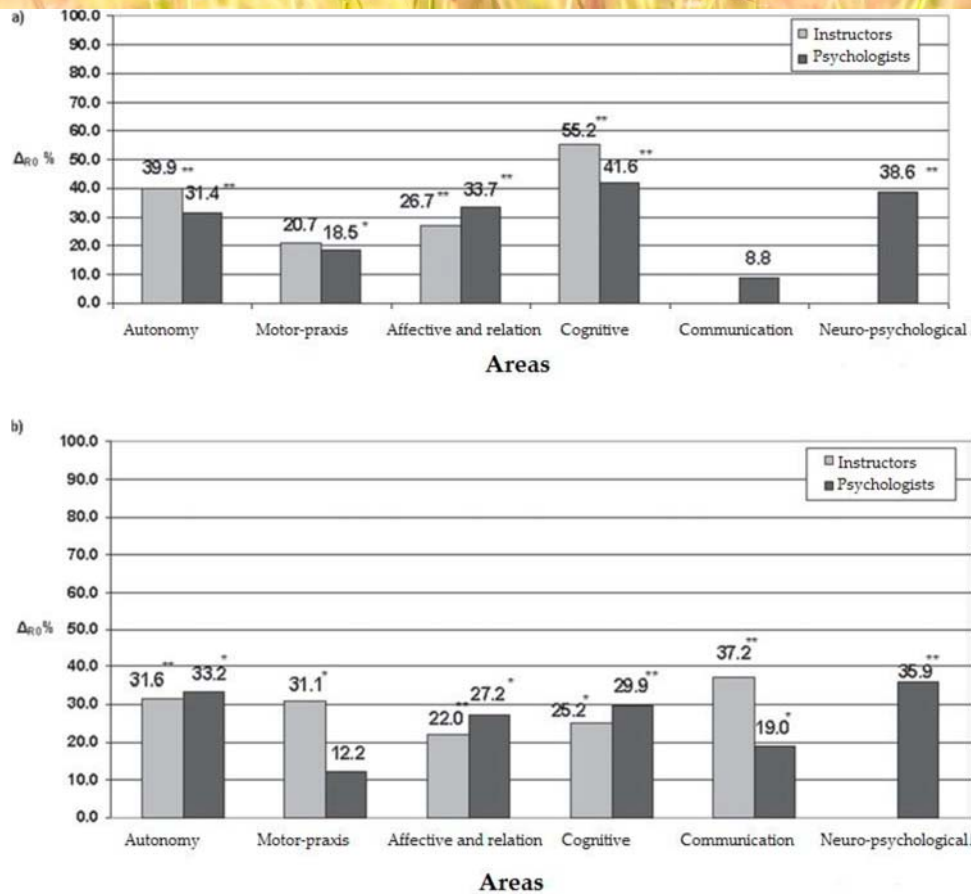


Figure 70. Nicoletta Borioni et al. (2011) Relative improvement on the base (ΔRO %) by group of evaluators and area (* $p < 0.05$; * $p < 0.01$). (a) improvement relative to hippotherapy, or equestrian rehabilitation and (b) improvement relative to Onotherapy.

Assessors Group	Areas	Number of elements	% accumulated			% accumulated			% accumulated
			%	%	%	%	%	%	
Instructors	Autonomy	2	40.0	40.0	80.0	3.3	83.3	16.7	100.0
	Motor-praxis	1	46.7	33.3	80.0	13.3	93.3	6.7	100.0
	Affective and relationship	5	50.7	18.7	69.3	9.3	78.7	21.3	100.0
	Cognitive	3	51.1	26.7	77.8	8.9	86.7	13.3	100.0
	Communication	2	46.7	10.0	56.7	3.3	60.0	40.0	100.0
Psychologists	Autonomy	10	34.7	28.0	62.7	27.3	90.0	10.0	100.0
	Motor-praxis	10	68.5	12.1	80.6	6.1	86.7	4.2	90.9
	Neuropsychological	6	45.6	24.4	70.0	21.1	91.1	8.9	100.0
	Affective and relationship	18	59.6	17.0	76.7	13.7	90.4	8.1	98.5
	Cognitive	4	38.3	11.7	50.0	30.0	80.0	20.0	100.0
	Communication	10	67.3	14.7	82.0	6.7	88.7	11.3	100.0

Table 2. Nicoletta Borioni et al. (2011) Frequency distribution of 15 subjects performing donkeytherapy sessions, according to the time when these patients achieved the highest score in the tests that were performed, according to the group of evaluators, namely instructors and psychologists.

5.5 LAST CONSIDERATIONS

To finish we would like to point out that the way in which animals affect human health is complex, as people's nature of health, both physically and mentally also is.

From our experience, we can only apply to Spanish universities and administrations for support for the creation of research groups scientifically documenting the multiple benefits of animal-assisted therapy.

Nowadays there are more institutions committed to this type of therapy every day, complementary to other more classical ones, and perhaps seeing a therapy animal in the cardiology and oncology patients rooms of the Spanish hospitals very soon, as it has already happened in the United States since some decades ago, will not leave us perplexed. It may be a matter of time.

CURIOUS FACTS

DONKEY THERAPISTS SCHOOLS

The Donkey Sanctuary opened a school to train mules and donkeys in 2014 to educate them in their application for donkeytherapy, given the high demand to what such initiatives are exposed. The donkeys that were selected all come from shelters and after months of basic training sessions they will continue to riding and care of disabled children or when being pet by the residents from hospitals, medical centers and nursing homes. For the election of the donkeys, attention was paid to their characteristic curiosity and stability, two qualities that make them particularly useful for their use as therapy animals. They have to be sociable, calm and easily get accustomed to being around people.

Larger donkeys are used for riding sessions while the smaller ones are used for the visits to homes, hospitals & health centers of various kinds. Basic training includes from driving, leading and human handling to their exposure to colorful objects, noise and sounds that are normally unfamiliar. The character of donkeys and their thorough training is essential, given the support that these animals will lend in the future. Thus it favors applying a donkey deserved retirement programme so that they can be replaced by younger individuals, in order to continue the work.

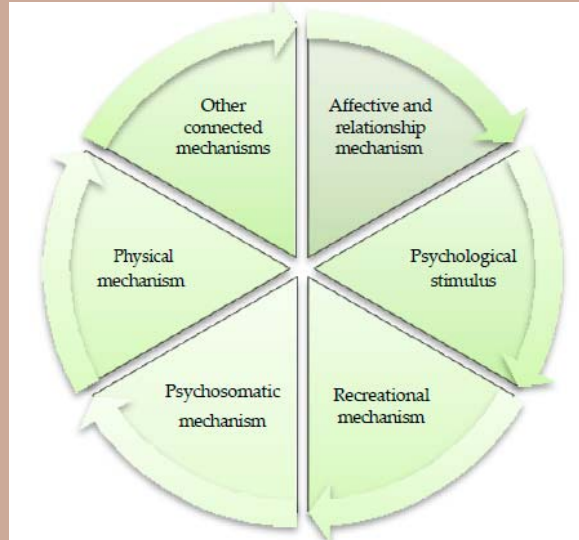


Figures 71 & 72. The Donkey Sanctuary (2014) Donkey therapists training school from Sidmouth (England) [Photographs] Accessed from <http://www.thedonkeysanctuary.org.uk/>

CURIOUS FACTS

INTERSPECIFIC ADAPTATIVE MECHANISMS

According to the investigations of Paola De Rose (2011). The mechanisms of action involved in any animal-assisted therapy could be broadly grouped into the following features:



The affective mechanism is the most important and beneficial of all the mechanisms involved in the animal bond, since it has a more or less emotional basis. The stronger the bonds provided are, the greater the benefits obtained are as well. As it is well known, the emotions play a decisive role in the treatment and recovery from various diseases.

A current intense bond is set, as for example a powerful psychological stimulus on different parts of the human psyche, like social behavior and relationship mechanisms, the components of the character and other cognitive aspects.

Game and recreation are extremely beneficial for people who suffer from isolation or low esteem and, above all, cause positive changes in mood, something that has a substantial beneficial impact on health and welfare.

In addition game favours movement and is one of the best forms of exercise, with the implications and psychosomatic improvements that may arise both from this exercise and the good feelings that it produces. Trying to adapt such physical mechanisms to the physical needs of each patient is in our hands.

The relationship between patients and animals, often includes a series of mental processes that unconsciously help the natural psychological development of patients.

For example, the projection is one of these subconscious processes through which moods, feelings and emotions are transferred to the external environment.

Patients partially identify themselves with animals through which they are able to express their feelings, something that facilitates their adaptation and best response to the situations that produce anxiety and fear, and that will inevitably be present in the lives of people with intellectual disabilities. Asses act as social catalysts facilitating and fostering intercommunication not only through the game, but also greatly developing verbal communication skills, as well as leading to the development and understanding of non-verbal signals and understanding of body language.

Chapter 10

Likewise, affective emotional behavioural components are developed through stimuli which, through positive reinforcement, improve confidence, self-esteem and lead to a better view of oneself, as well as they develop an incredible sense of responsibility and incentive motivation not only to learn about the concepts that surround the donkeys themselves, but those that concern the environment that surrounds them.

Each session lasts 45 minutes and they are repeated every week during the six months that a full programme lasts. Each session focuses on the different aspects that depend on the emotional state of the patient and his/her behavior. During the sessions we passed from a superficial and physical component to a greater emotional progressive involvement, always in a fully reversible way at any point in the therapy, in order to avoid any complications that may arise, according to the affective disposition that patients present in each case.

The protocols must always be characterized by an apparent flexibility given that not all patients require the same therapeutic approach, so that a detailed study of each patient should be implemented.

Achieving a complex level of communication is gradually achieved passing through the phases that individually require a less complex or at least one greater feasibility.

We pass sequentially from the creation of a shared workspace, evolving from the mere physical contact to the emotions. This always induces both affective and emotional rehabilitation processes, and as we have already mentioned in a reciprocal and reversible way. In time, we will observe that communicative codes learned during therapy from the teachings of instructors. New communication codes specific to each patient and their assigned ass will appear as well, something which will deepen and achieve a further development in advanced stages of the therapeutic programme of more complex decision-making by the patient and with the supervision of instructors, with a greater autonomy. We must evaluate the learning process and the effects of therapies at three points; at the start, halfway through the programme and at the end, so that we can study the evolution of each case.

One of the facts that draws our attention the most is the modulation of behaviour. Overreactions and hyperactivity or on the other hand, the absence or weakness of response to external stimuli are regulated to acceptable levels as a result of the interaction between patients and animals. The perception of the environment is also increased, as it has been evidenced by graphic records of the experiences such as drawings of patients in which the use of colors and detail of the forms show a greater sensory perception of the environment, after donkeytherapy sessions.



Figures 73 & 74. Paola De Rose (2011) Drawings of a patient affected of obsessive compulsive disorder (OCD), before the experience and at the end of the therapeutic cycle, 6 months later. Note the increase in detail and the use of color.

6. ABOUT A.N.D.R.E.A. ASSOCIATION

The A.N.D.R.E.A. Association is part of a comprehensive project to support the rural development based mainly on starting up services of social welfare and exploitation of natural resources. Currently, fruit of the collaboration between the A.N.D.R.E.A. Association and the municipality of Allariz (Ourense), an experience of recovery and revitalization of surfaces and rural populations of the "Area of Allariz" biosphere reserve has been launched. This pioneering experience affects an uninhabited core of population and its environment, in an area of special protection within the reserve.

recovery and dinamization of surfaces and rural populations. This pioneering experience, affected an uninhabited core of population and its environment, within a special protection area within the reserve of the biosphere "Area of Allariz". Thus they had the opportunity to visit the comprehensive project that develops the A.N.D.R.E.A Association to support the rural development based mainly on starting up services of social welfare and use of natural resources through its three lines of action (the reception centre of abandoned and/or abused donkeys, the assisted therapy centre with donkeys for people with physical disabilities (mental and/or social and the revitalization of the rural programme) and of course get to know the herd of donkeys, therapeutic mediators for groups at a disadvantage closely [Photograph & Logo] Accessed from <http://asociacionandrea.wordpress.com/>



Figures 75 & 76. Asociación A.N.D.R.E.A. (2014) (Figure 75) Logo of the A.N.D.R.E.A. Association and (Figure 76) The students of the professional training cycle in agriculture and ecological animal husbandry from the integrated Professional Training Centre from Pontearreas A Granxa visit the headquarters of the A.N.D.R.E.A Association, to learn about the rural project collaboration between the A.N.D.R.E.A. Association and the Concello de Allariz. In the year 2008 a novel experience in San Salvador dos Penedos was launched, framed within a project of

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Chapter 11

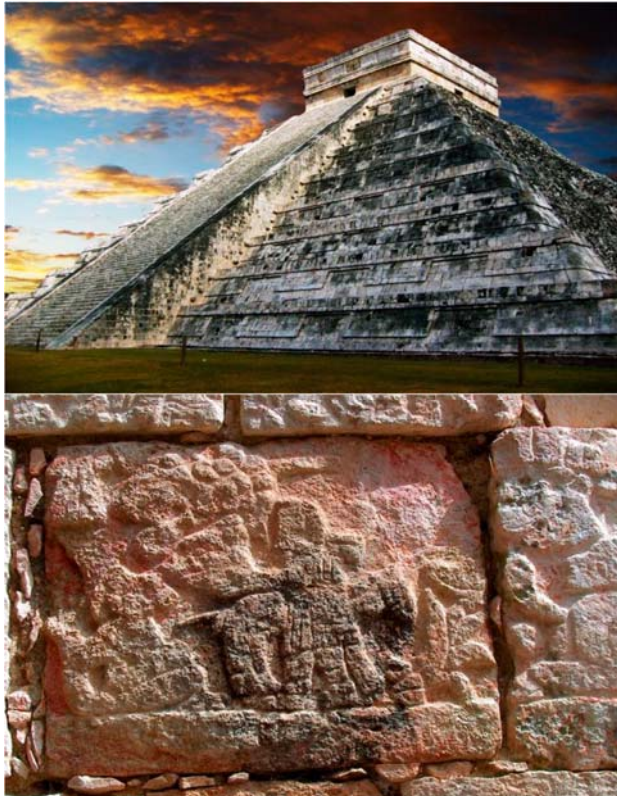
Breeders, Farms and Farming: Comparing & Contrasting

Deb Collins Kidwell & Connie Bonczek

1. INTRODUCTION

Donkeys in the USA have only been present since the development of European colonization, which limits their history to the past few hundred years. In addition, most of the USA is located in temperate climates, and as a result for many areas horses have long been preferred to donkeys. The development of specific breeds of donkeys has not been all that common in the USA.

The exceptions to this general rule include the American Mammoth Jackstock, specifically developed as a breed to produce large jacks for mule production, and more recently the development of miniature donkeys as pets. The many donkeys that fall in between these size classes in the USA tend not to be standardized into breeds.





Figures 1, 2 & 3. (Figure 1) Ccojorgefalcon, (Figure 2) FreeTiiuPix - Tiiu Roiser & (Figure 3) Alamy (2007-2012). (Figure 1) Chichén Itzá at sunset & (Figure 2) A Stone depicts the “White God” that came to visit the Mayans riding a donkey at Chichén Itzá, in Yucatán (Mexico) & (Figure 3) Map showing the four voyages of Christopher Columbus and fellow explorer John Cabot [Photographs & Map] Accessed from (Figure 1) <http://en.wikipedia.org>, (Figure 2) <http://teacher-resource.cwahi.net> & (Figure 3) <http://mapas.owje.com/>





Figures 4, 5 & 6. (Figure 4) *The Cactus Files*, (Figure 5) UTEP & (Figure 6) University of Washington Libraries. Special Collections Division (2011-2012-2014) (Figure 4) Miner and his donkey, (Figure 5) One of the State School of Mines' earliest symbols was the donkey seal. The image was adopted by the School of Mines to highlight the school's mining roots and can be found in early school publications, such as this advertisement for candy in the 1924 Flowsheet. The donkey also served as a school mascot for many years & (Figure 6) Prospector standing in front of building with donkey loaded with gold mining pan, shovel and other supplies, vicinity of Nome, Alaska, ca. 1900 [Photographs] Accessed from (Figure 4) <http://thecactusfiles.com/>, (Figure 5) <http://transformations.utep.edu/> & (Figure 6) <http://www.pinterest.com/>

CURIOUS FACTS

EARLY NORTH AMERICAN DONKEYS' HISTORY. HOW DID THEY TRAVEL OVERSEAS?

Donkeys in North America constitute approximately 0.1% of the worldwide donkey population. They were first brought to the New World by Christopher Columbus in the 15th century, and once arriving in Mexico in the 16th century, spread northward into what today is the United States. Some donkeys were bred in the eastern part of the continent from imported European stock. In the gold rush era of 19th century, additional numbers came to the western United States for use as pack animals and working animals in the mining industry. Some sources suggest that there are no true North American donkey breeds as such, and it is true that donkeys in Canada and the United States are classified according to their size as miniature, standard or mammoth donkeys. However, there are US-based purebred registries for the spotted ass (a color breed), the American mammoth jackstock, and the miniature donkey. The three size classifications have been reported as breeds to the Domestic Animal Diversity database of the UN Food and Agriculture Organization by the National Animal Germplasm Program of the Agricultural Research Service of the US Department of Agriculture, along with the burro (a small standard donkey that includes a feral population), and the spotted ass.

The first asses came to the Americas on ships of the second voyage of Christopher Columbus, and were landed at Hispaniola in 1495. In the early days of the Conquest, jackasses were highly valued as sires for mules, which were esteemed as riding animals by the Spanish, and reserved for the nobility. Mules were bred for expeditions to mainland America, with males preferred for pack animals and the females for riding. The first shipment of mules, along with three jacks and twelve jennies, arrived in Mexico from Cuba ten years after the conquest of the Aztecs in 1521. Mules were used in silver mines, and each Spanish outpost in the empire bred its own mules from its own jack. Donkeys arrived in large numbers in the western United States during the nineteenth century gold rushes, as pack animals and for use in mines and ore-grinding mills. The major use of donkeys came to an end with the end of the mining boom and the introduction of railroads in the West. With little value, many animals were turned loose to become the populations of free-roaming burros that inhabit the West today.

2. FROM THE BIGGEST: AMERICAN MAMMOTH JACKSTOCK...

2.1. INVESTIGATING ITS PAST – WASHINGTON’S “ROYAL GIFT”

The history of the American Mammoth Jackstock breed is shrouded in mystery, misinformation and myth. As a result, information regarding early mule production in the British (American) colonies prior to the American Revolution is just as flawed. There are many reasons for this: old records being lost or destroyed; the smuggling of animals – thus no Commons House records or listings on bills of lading; and misinformation being published in America as fact in the early 19th century and being repeated ever after. Upon my decision to breed these animals for the preservation of the breed and to maintain quality mule production in the United States, I started researching the breed by reading everything I could obtain. It became apparent, very early on that there were inconsistencies in information, which was confusing to me and caused me to have to delve further into history, in America and abroad to try and learn the truth about the breed’s beginnings in the United States colonies. This focus was on the original thirteen colonies and I did not address the movement of the Spanish, with mules and donkeys into the American west, which is an entirely different topic.

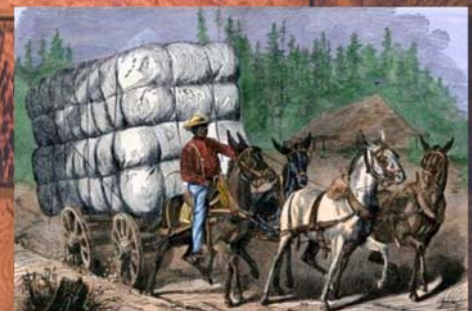
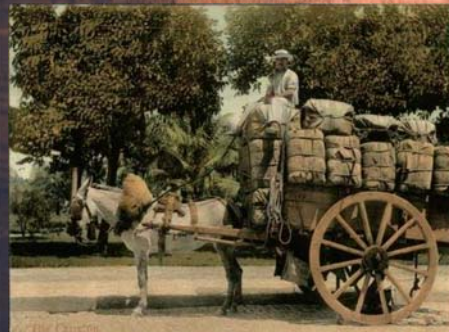
Anyone wanting to research mule and American Mammoth Jackstock history in the US will eventually read that George Washington is referred to as “The Father of the American Mule”. In 1878, *Wallace’s Monthly, Volume 4*, said about Washington, “He was the first breeder of the mule in America.” From an address at Washington’s estate, Mount Vernon delivered on April 10th, 1891, Joseph Meredith Toner, M.D. (Medical Doctor) stated, “To him is awarded the credit of the introducing into the United

States the best breeds of that very useful animal, the mule.”

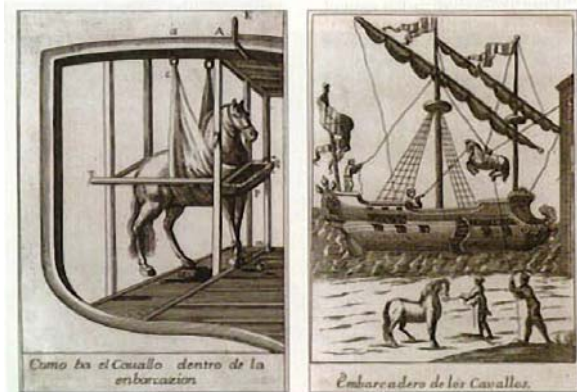
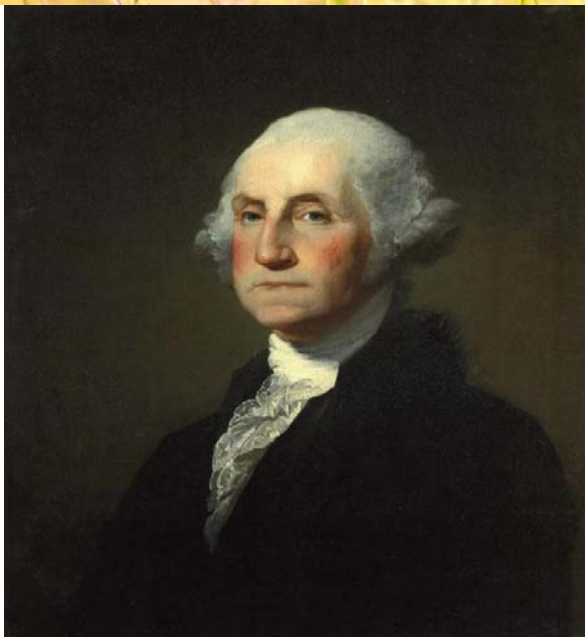
CURIOUS FACTS

TOBACCO AND COTTON COLLECTION IN THE SOUTH

The American Mammoth has a history that only goes back 250 years or so. Plantation agriculture was developed in the South, and usually involved cotton and tobacco production with slave labor. The climate of this region is humid and subtropical, so that mules were preferred to horses as work animals. Mules have other advantages over horses, especially in this region, because they are easier to feed and manage in large groups. Mule production was seen as a highly desired agricultural endeavor in the South, and tended to be the focus of the elite large landowners. The involvement of the political leaders of the day assured that the breeding of large jacks was a highly respected endeavor. Breeders of high-quality donkeys were highly respected members of society.



Figures 7 & 8. (Figure 7) CardCow.com & (Figure 8) All Posters (1800-2011) (Figure 7) Donkey Cart With Bales of Tobacco in Guanajay around 1900 (Cuba) & (Figure 8) African-American Hauling Baled Cotton to Market with a Team of Mules, c.1800 [Photograph] Accessed from (Figure 7) <https://www.cardcow.com> & (Figure 8) <http://www.allposters.com/>



Figures 9, 10 & 11. (Figure 9) Gilbert Stuart Williamstown, (Figure 10) Deb Collins Kidwell & (Figure 11) Thomas Prichard Rossiter & Louis Rémy Mignot (1769-1797-1859) (Figure 9) Portrait of George Washington (1732–99), (Figure 10) This is the way George Washington's presents arrived in USA. 1769 Vega painting of horses being taken aboard at San Lucar de Barrameda & (Figure 11) Washington and Lafayette at Mount Vernon, 1784 (The Home of Washington after the war), The Metropolitan Museum of Art. New York, NY [Oils on Canvas & Photographs] Accessed from (Figures 9 & 11) <http://es.wikipedia.org> & (Figure 10) <http://horseandma.com>

In the book, *George Washington: Farmer* published in 1915, author Paul Leland Haworth wrote, "Washington, according to

his own account, was the first American to attempt the raising of mules." Haworth goes on to say that the King of Spain sent "two jacks and two jennets" (no jennets were sent to Washington from Spain). US Congressman Sol Bloom wrote in 1932 that George Washington was "the first American to breed mules" (see Book 2, Chapter 7).

Let us move into the twenty-first century where this information continues to be published: In the book, *What They Didn't Teach You About the American Revolution*, 2001, Mike Wright, "(Washington) introduced mules to America." Storey's *illustrated guide to 96 horse breeds of North America*, 2005, Judith Dutton, Bob Langrish, "The first person to breed and promote the breeding of mules in the colonies was George Washington..."

ROYAL GIFT, AND THE KNIGHT OF MALTA, two valuable JACK ASSES, WILL cover Mares and Jennies at MOUNT-VERNON, this Spring, for Five Guineas the Season. The first, is of the most valuable Race in the Kingdom of Spain.—The other, lately imported from Malta, by the Way of Paris, is not inferior.—ROYAL GIFT, (now 5 Years old) has increased remarkably in Size since he covered last Year—and not a Jenny, and scarcely a Mare to which he went, mis'd.—THE KNIGHT OF MALTA will be 3 Years old this Spring—is near 14 Hands high—most beautifully formed for an Ass—and extremely light, active and sprightly.—Comparatively speaking, he resembles a fine Courser. These two JACKS seem as if designed for different Purposes equally valuable.—The first, by his Weight and great Strength, to get Mules for the slow and heavy Draught.—The other, by his Activity and Sprightliness, for quicker Movements on the Road.—The Value of Mules, on account of their Longevity, Strength, Hardiness and cheap keeping, is too well known to need Description. MAGNOLIO Stands at the same Place, for FOUR POUNDS the Season.—The Money, in every Case, is to be paid at the Stable, before the Mares or Jennies are taken away.—No Accounts will be kept.—Good Pasture, well enclosed, will be provided, at Half a Dollar per Week, for the Convenience of those who incline to leave their Mares, and every reasonable Care will be taken of them; but they will not be insured against Theft or Accidents. JOHN FAIRFAX, OVERSEER. Mount-Vernon, March 12. 1787.



Figures 12 & 13. (Figure 12) The Library of the Congress & (Figure 13) AA.VV. (1944- 1787) (Figure 12) Mule covering advertisement, John Fairfax, Mount Vernon, March 12th 1787 & (Figure 13) "Mule, from the Vallardi Album" by Antonio Pisano (Pisanello). XV Century, Louvre Museum (Paris) [Text and oil on canvas] Accessed from (Figure 12) <http://www.loc.gov> & (Figure 13) <http://commons.wikimedia.org>

And, from 2011, *Epigenetics: how the environment shapes our genes*, by Dr. Richard C. Francis, “There were no jackasses in the United States when it was founded, yet soon they were everywhere” and credits Washington with bringing the first jackass to America.

In the chapter “Horses Asses” Dr. Francis goes on to write about George Washington being the first mule breeder in America and has a footnote 1: (citation given): “The Mule Page – [www._____ dot com.](http://www._____dot.com)” No wonder a neophyte, want-to-be breeder of these animals, like me, was confused. And, who uses Wikipedia or a website with the address of “pudpuker” as a citation for a scientific book?

While donkeys and mules were most certainly along with Spanish priests in Florida and Virginia in the 16th century, they were there for transportation and draught purposes, not breeding. So, I concentrated on British colonial activities. In a resolution adopted by the directors of the Virginia Company on July 7th, 1620, it was proposed to ship 200 head of cattle, 400 goats, 80 asses and 20 mares (the cattle from England and the asses from France).

In 1740, when George Washington was eight years old, there was a toll placed by King George II for the crossing of the bridge over the Pawmunky River in Virginia, “For every man, three pence, and for every horse, mule, or ass, three pence.” Advertisements in newspapers even earlier than that show, not only the presence of mules, but also the presence of imported jacks standing at stud for mule production:

The South Carolina Gazette, October 14, 1732: “RUN away a *Bossue* Negro Man named *Aaron*, who used to go about the Town with a Cart & Mule.”

The South Carolina Gazette, September 21, 1748: “I have to dispose of, at *Pribans* Sales

a Plantation containing 587 Acres or thereabouts, situate on the North Side of *Ashley-Ri*, about eight *Mules* from *Charles-Town* ...”



Figure 14. Diego Rivera (1929-1951) Diego Rivera's Murals in National Palace Of Mexico federal District. In this picture, Rivera recreates Hernan Cortes landing in Veracruz City. In it, we can observe the inclusion of the foreign element into the daily life and the first subjugations which subdued the natives. In the centre of the picture, in perspective, different groups of natives can be seen performing tasks for the ones they were not used to such as, excavating looking for metals, ploughing or housing construction for the conquerors [Photograph] Accessed from <https://portail.college-josephsuacot.re>

CURIOUS FACTS

THE PRIEST AND HIS ASS

A priest, who wanted to raise money for his church, was told there was a fortune in horse racing, and so he decided to buy a horse and enter it in some races. However, at the local auction, the going price for horses was so steep that he decided to buy a donkey instead. Although he had some doubts, the priest figured that he might as well enter the animal in a race just to see how it would do. To his surprise the donkey came in second.

The next day the headlines read: **PRIEST'S ASS SHOWS**

The priest was so pleased that he entered the animal in another race, and this time it won.

The headline read: **PRIEST'S ASS OUT IN FRONT**

The bishop was so upset with this kind of publicity that he ordered the priest not to enter the donkey in another race.

The new headline read: **BISHOP SCRATCHES PRIEST'S ASS**

This was too much for the bishop, and he ordered the priest to get rid of the animal. The priest gave the donkey to a nun in a nearby convent.

The next day the headline read: **NUN HAS BEST ASS IN TOWN**

The bishop fainted. He told the nun that she would have to dispose of the donkey. After several days, the nun finally sold the beast to a local farmer for \$10.

The headline read: **NUN PEDDLES ASS FOR TEN BUCKS**

They buried the bishop the next day.

The South Carolina Gazette, July 2 1750: "STREAYED from Charles- Town, a *light bay mule*: Any person who can give any intelligence of the same, so as may be had again, shall have 20th reward."

The South Carolina Gazette, September 29, 1759: "(For sale) He also has 16 fine mules from 13 to 14 hands high."

The South Carolina Gazette and Country Journal, May 20, 1766: THIS JACK was brought here last fall at 12 months, and has now proved himself to be very good for getting of mules, there is one colt already, and several more are expected. He covers at Mr. John Waring's plantation, at two pistols each mare, and the money sent with them; to oblige those that will send him employment, he shall continue covering to the first of July, or longer: if any mares do not prove with foal this season, another chance will be given the next, *for free*. Mr. Waring will not be answerable for any mares that may be lost, but there will be all possible care taken to prevent any such accident."

The Virginia Gazette, April 2, 1767: "TAKEN up, in the island of *Jamestown*, a large mare mule, without any brand. She will be delivered to the owner, on paying the charge of this advertisement. John Buck."

The Virginia Gazette, November 26, 1767: ANY person inclinable to purchase five very good *MULES* may be supplied with them at the court of *Oyer* ensuing by applying to the subscriber. FRANCIS WILLIS."

The South Carolina Gazette and American General Gazette, January 6, 1772: "(For sale) Upwards of forty breeding mares, two *Jack Asses*, Twenty Mules or more..."

The South Carolina Gazette and Country Journal, July 2, 1771: "A Few good *JACK ASSES*, just imported, and to be sold reasonable by WILLIAM SOMARSALL."



Figure 15. Lefman Lavrate (1894) 'Back to the Presbytery after lunch at their neighbour colleague'. It shows a female swineherd looking at a group of priests. One of the priests clings dearly to a donkey's neck, while the donkey seems to refuse to carry his heavy load. Two of the fellow priests try to get the animal to move forward [Illustration] Accessed from <http://www.amazon.com/>

The Virginia Gazette, May 24, 1776: "MIDAS, a remarkable large jack ass, imported last fall from Malta, by *Philip Mazzei*, esq; stands at my plantation in *Prince George* county, and covers at two dollars the leap, 40\$. the season, and 31\$ to ensure. – It may not be amiss to inform the public, that, from the difficulty of obtaining and the expense attending the importation of an ass of this kind, his price for covering is necessarily much higher than any one of the common breed, but it will be amply compensated by the size and the strength of the mules he gets. THEODORICK BLAND, Jun."

The Virginia Gazette, April 18, 1777: "I HAVE at *Green Spring* five JACK ASSES, which will cover mares at 3\$, 9\$ the leap, 20\$ the season, or 25\$ to ensure. Good pasturage *gratis*, but I will not be answerable for escapes. I will give 6l. for mules got by either of my *jack asses*, or for any got by a *jack ass* lately advertised by *Mr. Nathan Northington* of *Sussex*, at six months old, clear of any expense of putting to the *jack*; the mules to suck their dams six months, and to be delivered to me in good order. JOHN ELLIS."

The Virginia Gazette, April 18, 1777: "SANCHO, the famous *jack ass*, now in high perfection, stands at my house in *Sussex* county, near *Col. Mason's*, to cover mares at 7\$. 61\$ the leap, 20\$ the season, or 50s. to ensure. Good pasturage *gratis*, but I will not be answerable for escapes, --I will give 6l. for mules got by my *jack ass* at six months old, clear of expenses of putting to the *jack*; the mules to suck their dams six months, and to be delivered to me in good order. NATHAN NORTHINGTON."

In 1770, three hundred and forty-five horses and thirty mules were exported from Savannah, Georgia. While the above examples are from the southern colonies, mule breeding was alive and well prior to the

Revolution in New Jersey, Connecticut, Rhode Island, Massachusetts and New York. As a matter of fact, in 1764 the new Society for the Promotion of Arts, Agriculture and Economy was to offer prizes to spur increases in the quantity, quality and variety of New York products. One of those products eligible for prizes was "mule foals".



Figures 16 & 17. (Figure 16) Teaching American History in South Carolina Project & (Figure 17) Library of Virginia (2009-2014) (Figure 16) A copy The South Carolina Gazette and Country Journal & (Figure 17) A copy of The Virginia Gazette [Photographs] Accessed from (Figure 16) <http://www.teachingushistory.org> & (Figure 17) <http://www.virginiamemory.com>

So, where does George Washington fit into this history? Washington, being a voracious reader and agriculturist, was certainly aware of the presence of the jacks standing at stud in his own backyard and elsewhere in the colonies. His friend Thomas Jefferson had purchased a team of mules, Captain Molly and Doctor Slop, for three thousand pounds of tobacco in 1781 from a John Cocke. Washington had been reading about fine Spanish jacks being used for the production of exceptional mules for over two decades as Thomas Hale's book on husbandry, which expounded on Spanish jacks and mule production was in his library. I believe that he may have been bitten by the Spanish "mule bug" even earlier, during his trip to Barbados in 1751.

Regardless, he was aware of the large Spanish jacks of varying breeds. It does not appear that he was aware that exportation

of said jacks, without royal permission from the King, was punishable by death. During the Revolutionary War he was visited by a Spanish diplomat from Cuba. This diplomat wrote back home that he was astounded that this tall, quiet General only wanted to talk about jackasses. In 1778 Washington began in earnest putting out queries to ship captains and friends who were world travelers as to how to acquire a large Spanish jack. By 1784, word had reached the royal court and permission was granted to send the esteemed American General two jacks, on two separate ships (in case of disaster and the loss of a ship). This action was based on diplomacy and the hope of a bit of future favoritism over the use and control of the Mississippi River, but that is another story (it did not work).

Eighteenth century documents from the Archivo Historico Nacional in Madrid reveal the story about the acquisition of the jacks sent to Washington. They did not come from the royal stud. Instead they were acquired in small towns outside of Zamora, Spain. The jack who became known as “Royal Gift” in America was purchased for 4,000 vellon¹ reales from Baltasar Moralejo (a second jack was also bought for 5,800 vellon reales). Also purchased were the accoutrements needed for the jack; bridle, halter, hobbles, a “decorated blanket with its lettering” and horseshoes.

Pedro Tellez, a mule driver, was given the task of walking the jack the 250 miles from Zamora to the port of Bilbao. On August 8, 1785, he and the jack boarded the American brig Ranger captained by Job Knight and they left for Gloucester, Massachusetts. On September 26, 1785 a letter from Cape Ann, MA stated the following, which was then published in The Philadelphia Gazette: “A ship this day arrived from Bilbao, and has brought a large Jack-Ass, a present from his Catholic Majesty to General Washington, attended by a Spaniard to take care of him

& c. It is esteemed a great favour, as none of these animals (particularly of this great breed) are ever allowed to be exported from Spain.”

¹Given name to the copper and silver alloy which some Ancient coins were made of. For instance, *doblas*, *doblers* or *doblangas* from the Castilian Spanish Middle Age, or the *vellón reales*, that was created during the Reign of Carlos II in 1686 with an equivalent monetary value to 34 copper *maravedies*.

CURIOUS FACTS



Figure 18. Francisco Javier Navas González (2012) Hand-leading jackstock exhibition: From right to left, Guanche (Andalusian), Burlón (Catalonian), Fuerte (Zamorano- Leonés) at the Horse Breeding Military Centre in Écija, Seville (Spain) in 2012 [Photograph] Accessed from <http://www.youtube.com/>

MAMMOTH JACKSTOCK'S ANCESTRY

Most of the stock that went into the American Mammoth breed was imported from Europe. These imported donkeys tended to be high-value animals that were carefully documented as to origin, size, and color. The result is a breed that has fairly well defined origins, even if these came before the European sources had themselves been organized into formal breeds.

The current American Mammoth is about 80% Spanish in origin. The Spanish roots of the breed go back to the late 1700s when the king of Spain gave large jacks and jennets to President George Washington. These jacks were reputed to be Andalusian, but the Spanish records indicate that at least some of these were Leonesa-Zamorano. Other Spanish jacks soon followed, from Andalusia, León, Zamora, and Catalonia. These were imported, along with jennies, during the 1800s. Between 1830 and 1890 several thousand large donkeys were brought into the USA. Not only Iberian Spanish stock was brought. Other sources included Malta (including a gift to Washington from LaFayette), France (Poitou donkeys and others), Mallorca in the Balearic Islands, and Italy. In none of these other cases, though, were the numbers equal to what was brought from Iberian Spain.

The various imported threads that were incorporated into the breed were valued for different traits. These were each used to help generate a composite breed that was uniquely fit to produce high quality mules.

"Imported Mammoth" was an early Spanish import into the USA. He was reputed to be a Catalonian jack, although most Catalonians are somewhat shorter and finer than Imported Mammoth. He contributed great height and size to his offspring. Catalonian stock tended to grow larger in the USA than in Spain, and also had the short coat and black color desired by American breeders. Catalonian animals were valued for their attractive conformation.

They were superseded later by animals from Spain, but contributed an active and fiery character that was valued in mule production. They also tended to be black or brown, which met the color preferences in the USA.

Majorcan stock, from the Balearic Islands, was the largest type imported. They were reputed to be more sluggish than the Maltese and Catalonian animals. Few of this type were imported, largely due to low availability in the small island population from which they hail.

Andalusian animals were common among early imports. These have strikingly good conformation and a long history of being used in mule production. Their grey color was considered a negative by most breeders, which somewhat limited their use.

Italian jacks tended to be smaller than those from Spain, and few were used in the production of jennets for purebred breeding. Most seem to have been destined to be mated to mares for mule production, which left no lasting contribution to the donkey breed.

Poitou animals were valued for their heavy conformation, even if on a somewhat shorter animal than some of the Spanish breeds. The breed's long hair was not considered too much of a negative, especially in light of the dark color and overall conformation. The main limitation to use of Poitou animals was their rarity and high price.

Finally, local jennets from Mexico and Texas figured into the early breed formation. They were usually small, and had light conformation that was not considered ideal. Among these were grey and dun animals. These colors were shunned due to the longstanding preference for black and brown, but have persisted to this day and are now more common in the breed than once they were.



Figuras 19 & 20. (Figure 19) Nate D. Sanders, Inc. & (Figure 20) Numismática Medieval (2012) (Figure 19) Copy of "The Philadelphia Gazette and Daily Advertiser" & (Figure 20) Vellón Real from Enrique II (1369-1379). Circa: Córdoba unknown date. Inscription: A/ DOMINVS MICH I ADIVTOR ET EGO DISCIPIAM INIMICOS MEOS R/ENRICVS DEI GRATIA REX CASTELLE [Photographs] Accessed from (Figure 19) <http://natedsanders.com> & (Figure 20) <http://numismaticamedieval.wordpress.com>

Once on American soil, Pedro walked the jack to Boston (35 miles) and arrived there on October 7, 1785. Thomas Cushing, Lieutenant Governor in Boston wrote to Washington of the jack's arrival. Cushing informed Washington that the "fine Jack Ass" was "the largest that I believe ever came into this Country." He further stated that "he has been something Bruised upon the Passage by the frequent tossing of the Vessell, although no way essentially hurt." He then advised that he would await further instructions as to whether to send the jack on to Mount Vernon via land or sea, adding that going by sea would "be attended with a greater Risque." Two hurricanes struck the east coast of America in the week prior to the jack's arrival in Gloucester and it is during those storms that the second jack sent from Spain perished at sea.

Washington wasted no time in responding to Cushing's letter and sat down to write out page after page of instructions for his overseer, John Fairfax prior to sending him

on the journey to collect the jack and the Spanish groom, Pedro Tellez. Fairfax was instructed to purchase riding mares for himself and the groom upon his arrival in Boston so that they could pony the jack back to Mount Vernon and then have additional young, vigorous mares to breed to the jack for mules (along with the twenty carriage mares he already had designated for breeding with the jack). However, once Fairfax got to Boston, he was informed by Tellez that he needed to walk the jack to Mount Vernon as the jack could not travel at the pace of the horses safely. So, Pedro, once again walking his prize jack, set off on the 451 mile journey to Mount Vernon. The trio arrived at Mount Vernon on December 5, 1785, where Washington measured him at 15hh and named him "Royal Gift").

In 1786 Washington received from Malta a jack and two jennets as a gift from the Marquis de Lafayette. He bred one of the Maltese jennets to Royal Gift and had a jack foal he named "Compound", who was a personal favorite. He also acquired a jennet from Suriname – and although her breed is unknown, she certainly would have been a large jennet (as he wanted no others) of Spanish lineage.

The breed of Royal Gift had been a mystery. Some Americans have written that he was Catalan, others Andalusian. But, if you look at where the jacks were purchased, it would have been most likely that they were of the Zamorano- Leones breed as has been stated by Spanish and Cuban historians and veterinarians.

After a decade of research to uncover the true history of George Washington and Royal Gift; and with the acquisition of 18th century documents from the Archivo Historico Nacional in Madrid, Spain, I can now prove definitively that the "burros garañones" sent to George Washington

from King Charles III were indeed Zamorano-Leonés jacks.

He was improving on other donkey breeds that had been imported over the centuries. Whether Italian, Egyptian, British, Irish or Maltese. Thus, the foundation of the breeding of large donkeys had its Genesis.

CURIOUS FACTS

COAT COLOR EVOLUTION

The historic goal of the breeders was to produce large, sound jacks that would produce large dark-colored mules from either saddle or draft type mares. The mule market was highly stratified by height and weight, and mules within different classes met with brisk demand. For most of the history of the breed the goal was dark mules that were easy to match into teams. Dark jacks, ideally black, were used to produce these. Black was so much a desired color that other colors became very rare in the American Mammoth.

As the breed grew in popularity the breeders organized and developed a standard for their animals. This was generally a height standard, although circumference of lower legs (indicating massiveness), length of ears, and other measures were also used from time to time. Originally the breed registry was “The Standard Jack and Jennet Registry of America,” a reference to the fact that the animals did indeed need to satisfy certain standardized criteria for admission into the registry. A similar philosophy was used for trotting horses, resulting in the American Standardbred horse breed.

Fashions have changed in the breed over time. While massive black jacks were highly desired for most of the history of the breed, this preference changed in the mid 1900s as the Belgian Draft Horse breed became more numerous than the Percheron. American Belgian horses tend to be sorrel or light chestnut colored, in contrast to the black and grey of Percherons. Breeders began to want red-colored mules similar to the color of the draft mares, so that red jacks became increasingly common in the breed.

The difference between red and black Mammoth Jacks is astonishing, because the two colors have different conformational styles even within single families of animals. The red animals tend to be more massive, thicker, but also lack the smooth conformation of the black animals. However, red jacks mated to sorrel mares produce only red mules, and so this color and style of animal became increasingly common in the late 1900s.

The saddle mule market also has much less interest in matched teams than does the draft mule market, because saddle mules are used individually. This has resulted in a relaxation of the preference for red or black jacks. Odd and unusual colors have now come to receive a price advantage, with the consequence that grey, spotted, and other colors of Mammoth Jacks are now seen, where a century ago these would not have been acknowledged within the breed.

HEIGHT IMPORTANCE & FUNCTIONALITY

Unfortunately for donkeys, the American Donkey and Mule Society chose “Standard” as one of the height classes for its donkey registry, and this height was well below that for the desired standard for large mule-breeding jacks. In recognition of the confusion, the name of the Standard Jack and Jennet Registry of America was changed to the American Mammoth Jackstock Registry in 1988. This recognizes the importance of Imported Mammoth, a large jack brought to the USA from Catalonia in 1819.

The height limits for the breed have varied over time, but males were generally at least 146 cm tall at the withers, females at least 141 cm. This was lowered to 141 cm (136 cm females) in the 1950s, but the original taller measurement is currently once again in force. The herdbook is open to donkeys that meet this height requirement, and registration does not depend on the previous registration of an animal’s ancestors. At first this might not seem consistent with a specific breed, but in the USA large donkeys are rare, and any that meet the height requirement are therefore sure to be of the genetic pool of this breed.

The original animals were specifically designed to produce mules for agricultural draft. The jacks were expected to be tall, heavy, and to have good draft conformation and soundness. The best jacks were quite valuable. These were designated as “jennet jacks” and were destined to be mated to jennets to produce the next generation of jacks. In contrast, “mare jacks” were used for mating to mares for the production of mules, and tended to be of somewhat lower quality. Rarely would jacks cover both jennets and mares, and it was long the practice to never use a jack destined for mule production on jennies for fear that he would thereafter refuse to mate with mares.

At the end of the 1900s the mule market witnessed yet another change in direction. Draft mules held their small market share, but saddle mules became increasingly popular. Good saddle mules have become more valuable than similar quality horses, so breeders began selecting jacks for their potential to produce good saddle mules. This includes tall but refined conformation, in contrast to the blockier conformation of the draft animals. In addition, gaits have become important, and jacks have been produced that lack the ability to trot.

Another change within the breed is the increasing use of the Mammoth donkeys as saddle animals for riding. Many people have come to prefer the temperament and safety of donkeys as compared to horses. This change in use has seen more selection for tall animals that have easy gaits, willing attitudes, and less of the massive conformation desired for draft animals that were the target of early selection and breed development. The breed retains lines that have the original draft animal conformation and attitude, but these are now rarer than the saddle type animal.

After Washington acquired his jacks, the interest in large jacks and mules grew in America. Large jacks and jennets were bought up in huge numbers abroad, but the Spanish stock was still hard to come by until 1813. As early as 1828, Henry Clay was advertising his jacks standing at stud at his plantation, Ashland in Lexington, Kentucky. Clay imported Andalusian, Catalan, Maltese, French (unknown whether Poitou, du Berry or Pyrenees) and “two Spanish” from Lisbon through his son who was visiting there.

What Washington did that was different than others standing jacks in the colonies is that he stood his jacks to jennets as well as mares. He was breeding Jackstock that was the “best of the best” and others not only took note, but pursued the interest in not only outstanding Jackstock breeding, but quality mule production. The appreciation of the mule as a superior draft and riding animal had begun. Some 300 plus years after Spanish royalty had recognized this.

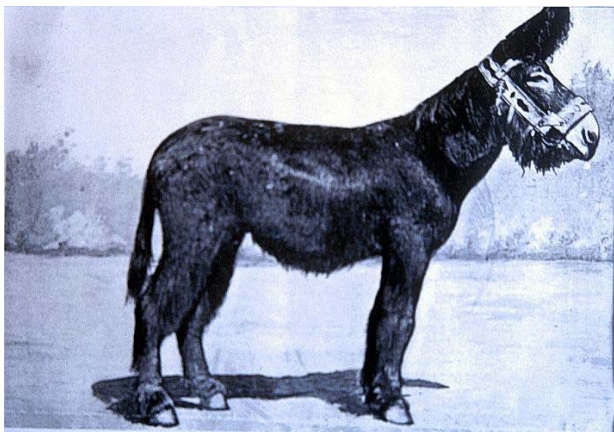


Figure 21. J. E. Yanes García (1933) Zamorano leones jackstock
[Photograph]

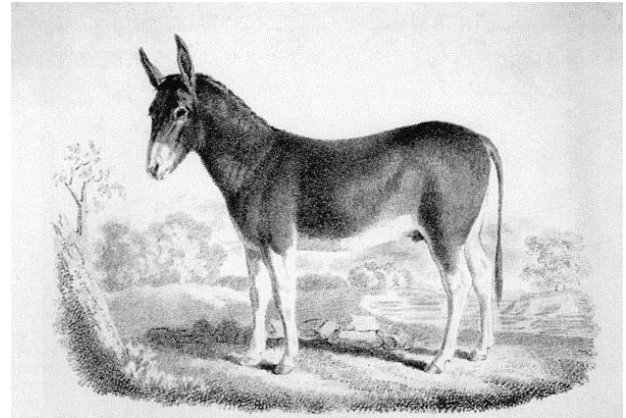


Figure 22. Wendy Bright (1852) Henry Clay's most prized jack, *Magnum Bonum*. Clay's most lucrative livestock were mules and he became one of the most successful providers of mules to the South. He imported donkeys –jacks and jennies –from all over the world and bred them with his horses to create mules, which were ideally suited for the hard, hot work on southern plantations, kept in Henry Clay's estate, Ashland, in Lexington, Kentucky [Illustration] Accessed from <http://historyofahousemuseum.com>

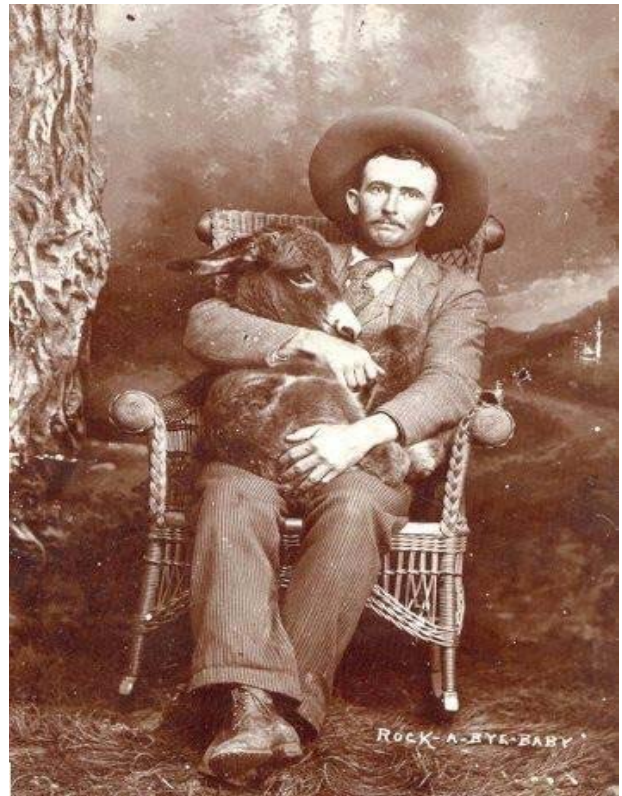
In 1888 the Standard Jack and Jennet Registry was founded. The “standard” was in reference to standards, as in requirements for conformation, not the Standard donkey as we know him now. The registry eventually became the American Mammoth Jackstock Registry and it is still in operation today. Producing quality jacks and jennets was something to aspire toward. They were needed to produce the mules that built America – whether in fields, on canals, logging, driving or any other kind of work required for the intelligent, sedate, willing equine. In the mid-1800's the mule began his military career for America and her allies and it continues to this day on battlefields in the Middle East where vehicles cannot gain access.

2.2. FACING THE PRESENT – MANAGING OUR HERD

We breed American Mammoth Jackstock and mules at Lake Nowhere Mule and Donkey Farm in the US. Our herdsire, AMJR PCF Genesis is 15.3hh, black with white points and has a four beat lateral gait. He has old heritage American bloodlines in his pedigree and is 14 years old. Our

management for him includes his own paddock with a run-in shed and when he does not have an outside mare in with him for breeding (pasture breeding of mares), we keep a molly mule in his paddock with him for company. When we breed him to American Mammoth Jackstock jennets, he is bred in-hand. He prefers his longeared girlfriends over his mare girlfriends, but will not hesitate to breed a mare in heat. He is handled for breeding by women and has never acted aggressively toward any human or animal. We keep our jennets in a pasture where he cannot see them, but since he has company with him, he hardly ever even brays seeking company. He is fed free-feed hay and an 11 percent grain mix. His hooves are trimmed every 5 to 6 weeks and he is on a regular deworming and vaccination schedule. In addition to his regular vaccines he is given a Strangles vaccine to protect him from outside mares that may have been exposed to this disease. Outside mares that come to be bred must present a negative Coggins test, a health certificate and also proof of a Strangles vaccines.

American Mammoth Jackstock Registry Logo [Logos] Accessed from (Figure 23) <http://www.lovelongears.com/> & (Figure 24) <http://www.amjr.us/>



Figures 25 & 26. Deb Collins Kidwell (2012) (Figure 25) A man looking after his donkey colt, caption reads "Rock-a-Bye-Baby." & (Figure 26) Deb Collins Kidwell and Lake Nowhere Rhesa at 7 days of age [Photograph] Accessed from <https://www.facebook.com>



Figures 23 & 24. (Figure 23) The American Donkey and Mule Society & (Figure 24) American Mammoth Jackstock Registry (1888-1997) (Figure 23) The American Donkey and Mule Society, Inc. Logo, Thirtieth Anniversary (1967-1997) & (Figure 24)

Mare jack training for young jacks, thankfully, has changed over the centuries. The Moors, when wanting to produce a jack that would willingly breed mares, would kill and skin a horse foal. The skin would then be put on a jack foal and the jack foal would be put on the mare to raise as her own with the intention that the jack would think that he was a horse and accept mares as his own kind. Our method is much easier and less bloody!



Figure 27. Tour Egypt (2013) Donkeys Flock pottery by Said El-sadr 50x20x26 cm. Signature of the artist on the engraved base, in Mohamed Mahmoud Khalil Museum [Photograph] Accessed from <http://www.toureygypt.net>

When our jack colts are weaned at approximately 4 months old, we put them alone with a kind, experienced, sweet quality mare. The jack colt will stay with this mare through weaning and through his second or third year, if he has not been sold.



Figures 28, 29, 30 & 31. Deb Collins Kidwell (2011-2012-1013-2014) Lake Nowhere Mule and Donkey Farm's Mammoth Jackstocks and jennets. Showing Andalusian, Catalanian and Zamorano-Leonese characteristics [Photographs] Accessed from <https://www.facebook.com>

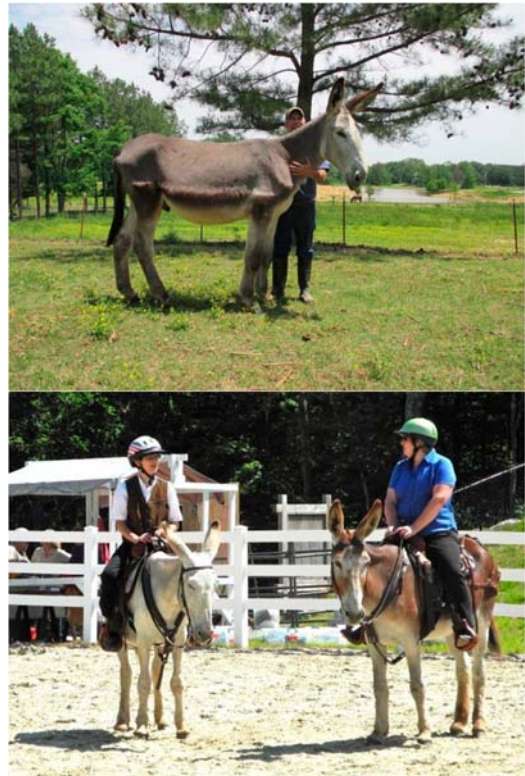
This mare will tolerate his colt foolishness and teach him the ways of romance without hurting him physically or mentally. I have heard many stories of young jack colts being put into a pasture with many mares who then act aggressively when he is trying to learn to breed. These jacks not only can get kicked (teeth knocked out, permanent damage to the scrotum or penis) and killed, but some will just be afraid of mares and stand in a corner of the pasture and will never be able to breed a mare. All of our jack foals are imprinted at birth, haltered within hours of birth and worked with every day. By the time they (and our jennet foals) are weaned, they will lead, self-load into the trailer and stand for the farrier. Early training, kindness and discipline make these jacks, who will exceed 15hh, a safe jack to work with in the future. Our jacks are taken out into public – to schools, libraries, nursing homes and are in parades. They are wonderful ambassadors for the breed and for intact jacks. If they are not sold and stay with us long enough, they are also started under saddle. Sons of our jack in Israel and Puerto Rico are ridden frequently with groups of mares and gelding horses with no issues. The number of the heritage American Mammoth Jackstock is currently estimated at about 2,000 individuals globally. This is a critical mass which must be addressed.

2.3. LOOKING TO THE FUTURE

At issue with the American Mammoth Jackstock breed is misidentification of the breed to begin with, a decline in registrations and most unfortunately, the loss of the older generations who knew how to breed these animals for the best results, diversity of bloodlines and perpetuation of the breed as it was meant to be. Like dogs, horses, cats and any other animal humans breed, someone always desires to change the breed – color, conformation or whatever

else *they* decide would be better for humans and not the animals.

The American Mammoth Jackstock breed was meant to be a tall, big boned, substantial, kind and quiet animal. These animals were not meant to be the fastest equine in the world - that is why there are thoroughbreds. There is a disturbing “trend” in the US to create a “style” of American Mammoth Jackstock with height, but less bone. These are being referred to as “performance donkeys”. What some do not understand is that the animals need that bone to support the height that they must have in the 15+hh range when they weigh 1,200 – 1,500 pounds.



Figures 32 & 33. Deb Collins Kidwell (2013) (Figure 32) Lake Nowhere Asher at 15 months of age & (Figure 33) Kim Brockett and her AMJ jennets [Photographs]

Advertisements abound for “Mammoth” donkeys that are 12hh. Pinto spots have been introduced into the colors by breeding “up” with Standard donkey blood. I do not know if the American Mammoth Jackstock breed is the victim of this attitude because breeders here are not aware of other breeds

that would meet their “needs” such as the Pega jack from Brazil, or whether they do not want to spend the money to import those animals. All of this, along with the few breeders in the US not knowing what heritage bloodlines other breeders have is going to eventually lead us down the path of the Poitou, if action is not taken. I would hope that in the future, breeders and registries will open discussion regarding these dangerous “trends” and “styles” (off of a registry webpage about the AMJ) and put effort into breeding the best to the best. Diversity, while we still have it, is going to be the key to survival of this breed.



Figures 34, 35 & 36. Howtohavegaysubtext (2014) The Pêga donkey (*Equus asinus*) the most popular Brazilian donkey breed is a big asinine that has Iberian origin, being also popular in some other countries in South America as Bolivia, Paraguay and Colombia. Its breeding started in Minas Gerais State and, since then, the Pêga breed has been selected for more than two centuries, mainly to produce outstanding saddle type mules. Nowadays, the Brazilian Association of Pêga Donkey Breeders (ABCJ Pêga) has approximately 2,000 members and about

20,000 mules and donkeys registered (Canisso and McDonnell 2010) [Photographs] Accessed from <https://www.tumblr.com>

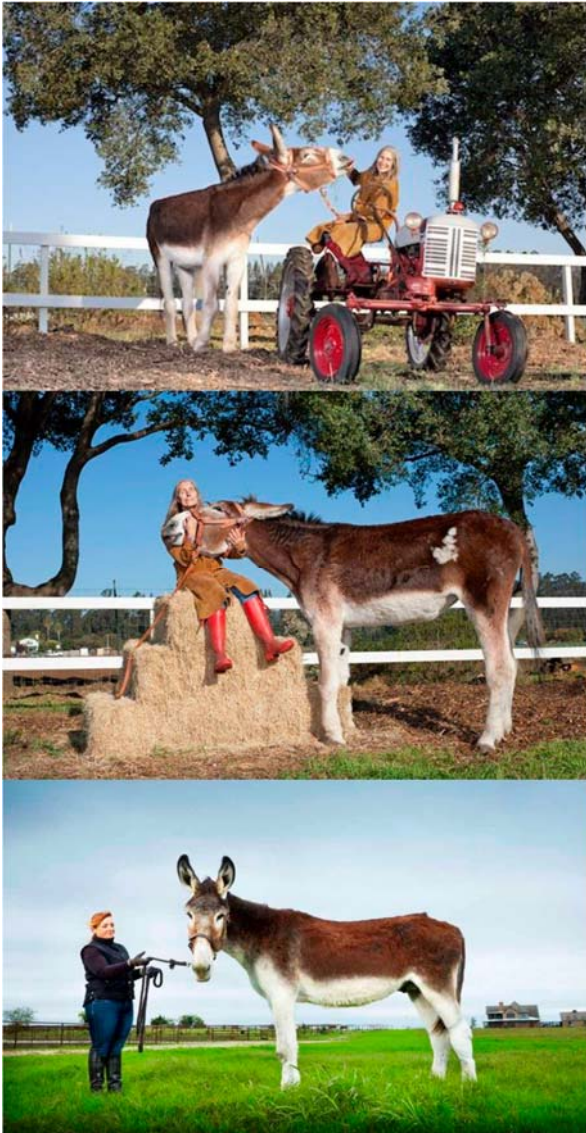
Promoting this breed as a wonderful riding and driving animal for children as well as adults will also help to give those jacks not suitable for breeding (conformation or genetic issues) an opportunity to provide someone with a calm, quiet, safe ride that will last them many years and provide them with loving companionship as well. Having correct information readily available to the public about the breed is another issue that needs to be addressed. With the advent of the World Wide Web, misinformation can be obtained while one sits in their pajamas on their couch. Outreach by breeders, registries and other livestock organizations and making sure that what is published in books, articles and on the web is accurate would be a good start.



Figure 37. Deb Collins kidwell (2014) 8 week old Lake Nowhere Zane trailer loading [Photograph]

Education of veterinarians about the breed would also help. In the US, veterinarian students will usually not see a mule or a donkey during the course of their advanced education, and this is a shame, for both the students and the animals. We hope that the American Mammoth Jackstock continues to grow in numbers (and quality) and maintains its very important place in

American history as a most American original!



Figures 38, 39 & 40. James Ellerker/Guinness World Records (2013-2014) (Figuras 38 & 39) The tallest donkey living is Oklahoma Sam, a 4-year-old American Mammoth Jackstock, who measured 15.3 hands -- or 5-feet, 1 inch tall on 10 December 2011. He is owned by Linda Davis of Watsonville, California & (Figure 40) Romulus is the world's tallest living donkey, as certified by the Guinness World Records. He is owned by Phil and Cara Barker Yellott of Red Oak, Texas. Romulus is an American Mammoth Jackstock gelding. Romulus has a brother Remus, who is just 2 inches (51 mm) shorter. Romulus is 9 years old and has been measured at 17 hands or 68 inches (1,700 mm) from hoof to withers, five inches taller than the former tallest donkey, Oklahoma Sam. Romulus weighs about 1,300 pounds (590 kg). Romulus and Remus are American Mammoth Jackstock donkeys, the world's largest donkey breed. American mammoths were developed and utilized for their potential to produce large mules when cross-bred with horses. Currently the donkeys are used as guard animals that protect the Yellott's other livestock from predators. On February 8, 2013, Romulus was measured for the Guinness Book of World Records. His paperwork was received in London and certified by Guinness World Records on May 13, 2013 [Photographs] Accessed from <http://www.guinnessworldrecords.es/>

CURIOUS FACTS

AUSTRALIAN IMPORTED MAMMOTH JACKSTOCKS FROM USA (HOW ON EARTH WOULD IT BE POSSIBLE FOR THEM TO COME FROM ANOTHER PLACE?)

The history of the donkey in Australia began almost as early as colonisation, the first arriving from Calcutta, India in 1793. Some died en route. The months at sea and the conditions on the sailing ships were arduous for man and beast. Only the strongest survived the journey. Many such ships brought to these shores donkeys sourced from amongst the world's finest stock, from places such as Rawapindi, Chile and the Canary Islands. Maltese donkeys were imported in the mid-1800s. Californian gold miners, following the lure of riches on the Australian newly discovered gold fields brought donkeys with them. The home of the donkey was to be the remote arid inland of Australia and the monsoon country of the Kimberley's in Western Australia and Northern Territories.

The donkey teamsters along with the camel teams supplied the remote outstations, settlements, beyond the reach of bullock and horse teams, being hardier for the harsh conditions, as well as being able to forage on the available herbage. The donkeys' staunchness in harness, and his propensity to stay close to the wagon, not straying far, were qualities the teamsters valued. Another reason donkeys, and mules were indispensable was the 'immunity' they had to "Kimberly Walk-About disease" a fatal condition caused by ingestion of a poison weed. The ass either avoided or was immune to its effects. The donkey teams were large, up to 4 abreast and commonly 20-40 or more per team. They were driven by voice alone, the teamster walking alongside his charges. The teams hauled loads as diverse as aromatic sandalwood, missionaries' provisions, iron tanks and boilers for mines, wool bales and food supplies. To the people of the outback, until the coming of the motor, they and the camels were their one vital transport link to the "inside country" of the large towns and cities.

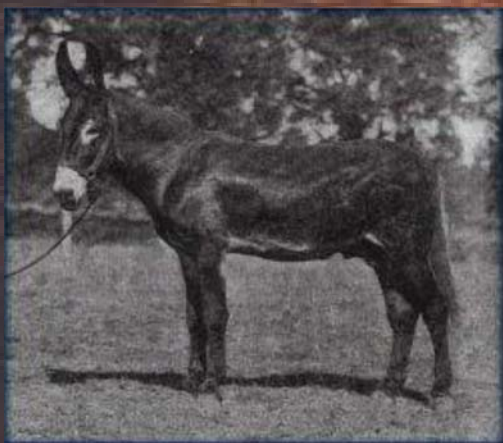
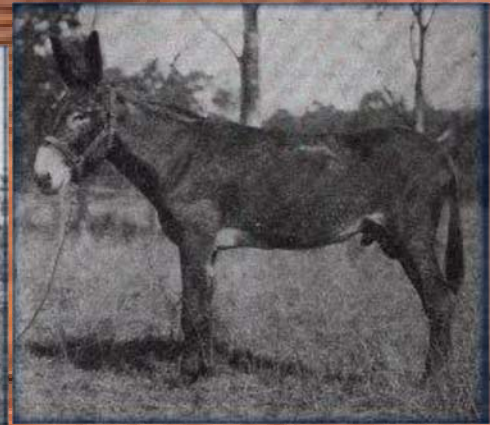
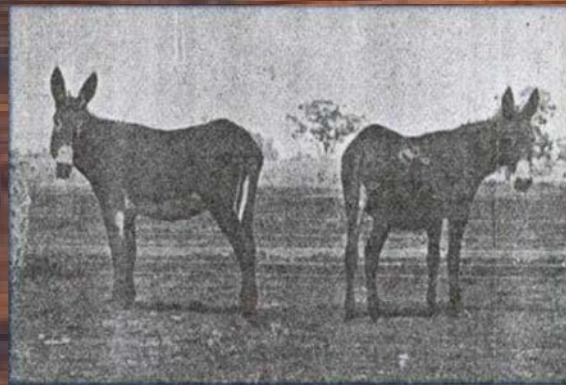
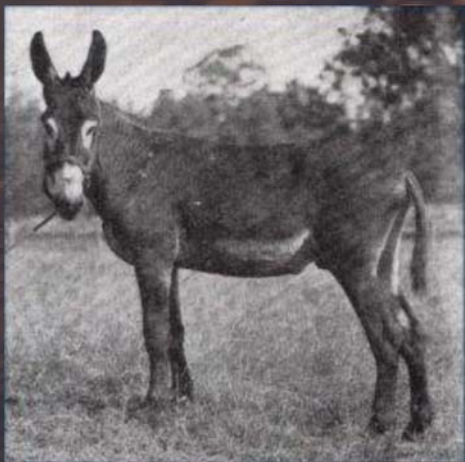
The coming of the motor promoted the demise of the teams. By the 1940's donkeys had been replaced. Many were turned loose into the uninhabited areas to breed up to hundreds of thousands, becoming an environmental problem still being dealt with today. During the 1970's there was something of a revival of interest in the donkey as a recreational animal, and many bush donkeys found themselves becoming the basis of hobby studs. The smaller jennies were used as foundation stock for the newly imported small standard English/Irish donkey. Some larger stock were also among the bush donkeys, a few up to 14 hands, more commonly 12-13 hands. These were said to have the blood of "Spanish" donkeys. It was known that 3 American Jacks were imported prior to WWII. The 'common wisdom' though was that these had only been imported for the purpose of breeding mules for the sugar cane fields. Beyond that, nothing was known of any imports.

It always bothered me, the thought that the importers would go to the considerable expense and risk of bringing the jacks to Australia to breed only a terminal line of mules did not jell. With what I knew of the pioneers of the livestock industries of Australia, such short-sightedness was not typical. Probably what finally spurred me on to further research was a meeting with a rickety, ancient scarecrow of a donkey here in the south of the state of NSW. Looking beyond his age, his frame size, bone, colour and markings was exactly the stamp of the American Mammoth Jackstock I had seen in magazines.

Several patient years of research later, (probably only for my own historic satisfaction) a clearer picture has emerged. From at least the early 1900's Jackstock from America (and Spanish stock) were being quoted in local journals as the finest asses in the world, and standing at stud in at least two states. One stud, cited as the largest donkey stud in Australia, in 1909 'standing out from the many Spanish and American imported jacks' which were also involved in the development of the Australian Merino, founding a famous mother line after which one of the American jacks were named. The station still operates today. The grandson thinks some of the jackstock came from Texas. I am hopeful of more details, as he has 95 years of family memorabilia, and believes the records are therein! The stock (registration and photos passed to AMJR) at the New South Wales Government farm were mentioned in a 1914 report thus- 'half of the farm is given over to the purpose of breeding donkeys and mules'. The next record found was of the 3 jacks brought to Queensland by the Government on behalf of the sugar cane industry, indeed to breed mules, but 'Business' at least did breed donkeys. As late as the 1970's stock descended from him were on at least one station. It is also possible the jack that went to Fairymead (a very large sugar company) also bred, as in the 1970's large donkeys were sent down to southern states from Fairymead. Another report a few years later speaks of Fairymead as having several imported jacks.

These few records that I have found so far are probably by no means the only imports that were made prior to 1935. After that, no further Jackstock was imported until the last 3 years when the jack Major Leo, bred by Cy and Major Cokely, was imported by P&H Streef Kirk to Victoria, followed by Carousel Farms Bear Track Chuck and TJC Ginger who were brought to NSW by K&B Hoole. Unfortunately TJC Ginger was lost due to foaling complications, but left a strapping young jenny sired by Carousel Farms Houston to carry on in her place. Many fine youngsters are now on the ground from these fine Jacks, and new interest and excitement is growing in the donkey community in Australia. The availability of larger stock will allow the development of the donkey as a fine recreational animal suitable for adults to ride and drive. Until now the chance of an adult getting a mount suitable were almost nil. Now the wheel has turned full circle and we have regained that we had lost! We have many good smaller animals in Australia, from the diminutive miniature, either Mediterranean or Irish, small standards of English/Irish bloodlines imported in the 1970's, and mixtures of the type, and the Australian ass descended from the teamster donkeys, now an average size of 11-1/2 to 12 hands.

(Full Circle, Pat Emmett, 2003)



Figures 41, 42, 43, 44 & 45. American Mammoth Jackstock Registry (2014) (Figure 41) "Ajacks", SJJR registered jack purchased from Colonel L.M. Monsees and Sons, Limestone Valley Jack Farm, Smithton, Missouri. This jack was foaled July 24, 1933, 15-1/2 hands standard measure, (Figure 42) "Big Belle" and "Jane H.", SJJR registered jennets imported from the US. Big Belle was foaled in 1906, 14-1/2 hands standard measure. Jane H. was 14 hands standard measure. A third jennet, Lucy K., SJJR registered and imported from the US is not pictured. She was foaled August 10, 1908, 14-1/2 hands standard measure, (Figure 43) "Business", SJJR registered jack purchased from Colonel L.M. Monsees and Sons, Limestone Valley Jack Farm, Smithton, Missouri. This jack was 15-3/8 hands, standard measure, foaled 1929, (Figure 44) "Collay", SJJR registered jack purchased from H.T. Hineman and Son of Dighton, Kansas. This jack was 15-1/4 hands standard measure, foaled 1928. Purchased by Fairmead Sugar Coy., Bundaberg, Australia & (Figure 45) "John Marshall, Jr.", SJJR registered jack imported from the US. John Marshall, Jr. stood 15 hands standard measure. [Photographs] Accessed from <http://www.amjr.us/>

* The registry was established in 1888 as the American Breeders Association of Jacks and Jennets. A second registry for jackstocks was later created, the Standard Jack and Jennet Registry of America (SJJR). In 1923 the two entities merged, and the registry was known as the Standard Jack and Jennet Registry of America (SJJR) until 1988.

3. GEORGE WASHINGTON CORRESPONDENCE

Few animals in history have been bestowed the name "Royal Gift". But for the superb Spanish jackass sent to George Washington from King Charles III of Spain, no other name would have sufficed.

Animal husbandry was a significant part of Washington's life at Mount Vernon, and one of his most highlighted, noteworthy farm animals was Royal Gift, the Spanish jackass. This prized creature, sent to Washington by the Spanish king in 1785, played an integral part in breeding mules.

George Washington had for long wished to have a Spanish jackass, thought to be the best in the world, to begin breeding mules in Virginia. He was convinced that mules would prove superior as draft animals to horses and oxen. It was at his behest that Robert Townsend Hooe wrote to his business partner Richard Harrison in Cadiz asking him to try to obtain one or more jacks for George Washington.

This episode from George Washington's life starts with a letter written by **George Washington** to **Robert Townsend Hooe** from Mount Vernon, on **18th July 1784**.

"Sir:

Hearing that you have a Vessel bound to some port in Spain, I am induced to ask if it is safe & practicable to bring from thence a good Jack Ass, to breed from—The late Don Juan de Miralles, resident from the Court of Spain at Philadelphia, promised to procure one for me; but in his death I met a disappointment. Another Gentleman of his nation, not long since, has also given me a promise—but it is not yet fulfilled—& as I am convinced that a good Jack would be a public benefit to this part of the country, as well as private convenience to myself, I am desirous of having more strings than one to my bow. I do not mean however to involve any person, or thing, in difficulty, to accomplish this end.

*Under this express declaration if you or your Partner Mr Harrison, could openly, fairly & upon easy terms, serve me, I should acknowledge the favor. **An ordinary Jack I do not desire; I will describe therefore such an one as I must have, if I get any—***

*He must be at least fifteen hands high; well formed; in his prime; & one whose abilities for getting Colts can be ensured; for I have been informed, that except those which are designed to breed from; & more especially such as are suffered to be exported; they very frequently have their generative parts so injured by squeezing, as to render them as unfit for the purpose of begetting Colts, as castration would—when from a superficial view no imperfection appears. Whether the latter is founded in truth, or mere report, I do not vouch for; but as I would **have a good Jack or none**, I am induced to mention the circumstance. I am Sir &c."*

G.Washington"

To what **Robert Townsend Hooe** replied from Alexandria, Va., **18th July 1784**

"Sir —

*I am to acknowledge the honor of your letter of this day, and let me assure you that I will do everything in my power to procure such a **Spanish Jack** as you describe—Mr Harrison will with pleasure receive and execute the order and all will be done in that fair open and honorable manner you direct.*

I could wish you had communicated your desire a few days sooner that I might have given directions by one of our own Vessels—but we have a Ship lading flour at Balto. That I hope will sail in a few days, and by her I will give the necessary orders. I have the honor to be sir your most Aff. Humble servant

Hooe Td R."

Richard Harrison, was a partner in the commercial firm of Harrison & Hooe in Alexandria. From 1780 to 1786 he acted as consul for the United States in Cadiz. Harrison asked for the help of the chargé d'affaires for the United States in Madrid, William Carmichael, who wrote George Washington on **3rd December 1784** about acquiring Spanish jacks for him. George Washington also spoke to his beloved friend, Gilbert du Motier who was known as the Marquis de Lafayette, during Lafayette's visit to Mount Vernon in November about his wish to have a jack.

William Carmichael, wrote this letter from Madrid on 3rd December 1784;

"Sir:

*In the course of the last month I read a letter from Mr Richard Harrison established at Cadiz requesting me to use my endeavours to procure the permission to **extract a Jack Ass of the best breed**, which you wished to import into America. In consequence of this application, I mentioned in a Conversation with his Excy the Ct de Florida Blanca the Minister of State, my desire to render you this Little Service. The Abovementioned Minister seemed pleased to have this occasion of proving his esteem for a character which is not less dear to his Countrymen, than it is revered by Foreigners. Actuated by this Sentiment he wrote me the note of which I have now the honor to transmit you the Copy & the Translation. I must confess sincerely that I shall be uneasy until I have your Approbation. The glory that you have acquired needs not the attention of a Monarch to augment it. But you are now a Citizen of the United States and as such will interest yourself in the smallest circumstance that can contribute to its prosperity. This Mark of Attention to the Late Chief of the Union, considered in this point of view, will while it adds another proof to the Many you have read of General approbation, evince the desire of the head of a Nation, of which we are the Neighbour, to cultivate their good will, by paying that attention, (which his own fellow Citizens accord) to the Person whose services rendered their Country Independent. I enclose this Letter to the Marquis de la Fayette. The Share that I had in making him known to you is a much better claim to interest a heart like yours in my favor, than any assurances that I can make you of the high respect & affection with which I have the honor to be Sir Your Most Obedient & Most Humble Servant*

WM Carmichael"

After George Washington learned how much a Spanish jack might cost, and also learning that it would require permission of the king of Spain, George Washington told both Hooe and Lafayette to discontinue their efforts on his behalf.

George Washington wrote to General Lafayette from Mount Vernon el 15th February 1785. Here we show the extract relating to the jackstock inquiry;

*"My Dr Marqs,
"...If I recollect right, I told you when here, that I had made one or two attempts to procure a good Jack Ass from Spain, to breed from. Colo. Hooe, or rather Mr Harrison, was one of the Channels thro' which I expected to be supplied; but a day or two ago the former furnished me with the enclosed extract from the latter. As it is not convenient for me to pay such a price, I have desired Colo. Hooe to countermand the order—& the same causes induce me to pray, that **if these are the prices of a good Jack (& no other I would have)**—that you would decline executing the commission I gave you of a similar kind..."*

This letter was written as a postscript to a copy of the letter above (written by William Carmichael on 3rd December 1784), which George Washington did not receive. The postscript, written nearly three months after the letter to which it was attached, is shown here as a separate document written from Madrid on 25th March 1785.

"...I take the Liberty of sending you a Triplicate of a Letter which I had the honor to write you under cover to the Marquis the 3rd of Dec 1784. His return to Europe may otherwise occasion surmises which would hurt me as a delay of this communication might appear Singular on my part. I shall have the honor to send you with the Jack Asses an act of the mode of treating them & of rendering them useful to the propagation of Mules..."

WM Carmichael"

Correspondence continued with a flurry of letters, both domestically and abroad. On 29th March 1785, Robert Townsend Hooe responded from Alexandria [Va] to a letter from George Washington (which has never been found) with this reply: *"I had the honor of receiving Your Excellency's favor of this date."* And its reply.

*"Sir,
It is with pleasure I sit down to do myself the Honor of giving Your Excellency an extract of a Letter I received Yesterday from Cadiz. It is as follows—"We have the pleasure to inform you that on License being asked of the King to Ship a Jack Ass for Genl Washington, his Majesty not only granted it, but at the same time most Graciously insisted on making a present of **two of them** to the Genl—adding he was happy in an oppty of Testifying his esteem and regard for so great a Character—Orders are given for the Purchase of **two of the best in the Kingdom** to be put under the direction of*

Mr Carmichael, who will send them down here or to Bilboa to be shipped by different vessels. Mr Carmichael & ourselves are equally pleased with the exit of this little Negotiation, & of which you will be pleased to advise his Excellency."

I hope both these valuable Animals will before long arrive safe—And I beg Your Excellency to believe me to be sir, Your most Affe hble servt"

When acknowledging on 10th June 1785 Carmichael's "favour of the 25th of March covering a triplicate of your letter of 3d December", George Washington expressed in elaborate terms his appreciation for the king's intended gift of two jackasses. For the remainder of the summer and early fall he anxiously awaited the arrival of the animals, which is apparent from several fragments of letters sent from Mount Vernon, between 21st May 1785 and 1st September 1785.

From George Washington to William Fitzhugh, 21st May 1785:

"P.S. 'Ere this, I was in hopes of having had it in my power to have offered the service of a Jack, or two, of the first race in Spain, to some of your mares, if you should be inclined to breed mules—but they are not yet arrived—another year, & I shall be happy to do this.

G. Washington"

From George Washington to Marquis de Lafayette, 25th July 1785:

"...Soon after I had written to you in Feb, Mr Jefferson, & after him Mr Carmichael informed me that in consequence of an application from Mr Harrison for permission to export a Jack for me from Spain, his Catholic Majesty had ordered two of the first race in his Kingdom (lest an accident might happen to one) to be purchased and presented to me as a mark of his esteem. Such an instance of condescension & attention from a crowned head is very flattering, and lays me under great obligation to the King; but neither of them is yet arrived: these I presume are the two mentioned in your favor of the 16th of April; one as having been shipped from Cadiz—the other as expected from the Isle of Malta, which you would forward. As they have been purchased since December last, I began to be apprehensive of accidents; which I wish may not be the case with

respect to the one from Cadiz, if he was actually shipped at the time of your account: should the other pass thro' your hands you cannot oblige me more, than by requiring the greatest care, & most particular attention to be paid to him. I have long endeavoured to procure one of a good size & breed, but had little expectation of receiving two as a royal gift..."

From George Washington to Marquis de Lafayette, 1st September 1785:

"...Having heard nothing further of the Jacks which were to be sent to me from Spain, & which by Mr Carmichael's letter (enclosing one from the Count de Florida Blanca) of the 3d Dec were actually purchased for me at that date, I am at a loss to account for the delay, & am apprehensive of some accident. Be this as it may, if you could my Dr Marquis, thro' the medium of Admiral Suffrein, or by any other means that would not be troublesome, procure me a Male & female, or one of the former & two of the latter, upon the terms mentioned in your letter of the 3d of May, I should think it a very fortunate event & shou'd feel myself greatly indebted to your friendship. The Mules which proceed from the mixture of these Animals with the horse, are so much more valuable under the care which is usually bestowed on draught cattle by our Negroes, that I am daily more anxious to obtain the means for propagating them..."

Unknown to George Washington, Lafayette also acquired in 1785 two jacks for George Washington, which also were shipped to America in two different ships. One of them again was lost at sea (the arrival of Lafayette's present, the Knight of Malta, took place in 1786).

Lafayette had written George Washington on 16th April that he was sending George Washington a jack from Cadiz and would send another from Malta, but Washington misunderstood and assumed that Lafayette was referring to the jacks that the king of Spain had promised.

George Washington finally heard from Thomas Cushing, the lieutenant governor of Massachusetts that one of the jacks was safely ashore in Boston. (The other one was lost at sea.) George Washington promptly sent John Fairfax, one of his overseers, to Boston

to conduct the jack and his Spanish caretaker back to Mount Vernon.

To **George Washington** from **Thomas Cushing**, from Boston on **7th October 1785**;

“Dear Sir

*I have the pleasure to **Acquaint you of the safe arrival of a very fine Jack Ass**, which I have just received from Gloucester, a Town in this State, It was Sent to me by Mr David Pearce a Merchant there, who writes me, it came in a Ship of his from Bilboa & that he was directed to send it to me in order to be forwarded to your Excellency, It was accompanied by a Spaniard, to whose special Care he was Committed until delivered; All the Intelligence I have directly from Spain relative to this matter is contained in a Letter I have received from Wm Carmichael Esqr. dated Madrid, July 22nd 1785, Wherein he writes me, that “By the Vessel that conveys this Messrs Gardoqui mean to Send **one of the Jack Asses** presented by the King of Spain to our late Commander in Chief and in Consequence I take the Liberty of repeating my request to you to forward this Animal by the mode you shall judge most expedient to the Southward. Messrs Gardoqui’s Correspondent at Beverly will have the Honor of sending you advice of the Arrival of the Vessel and at the same time enclose you this Letter.” Thus far Mr. Carmichael—as I received this Letter of Mr. Carmichael, not from Messrs. Gardoqui’s correspondent at Beverly, but by a Vessel that arrived at Gloucester, I conclude another of these animals has been shipped by a Vessel bound directly to Beverly & whose arrival may be hourly expected. I have taken care that the Spaniard **and The Jack Ass** should be well provided for, he is a fine Creature, **just fifty Eight Inches high**, & the largest that I believe ever came into this Country, **As he has been something Bruised upon the Passage by the frequent tossing of the Vessel, although no ways essentially hurt, I shall suspend sending him forward until he is recruited or perhaps until the arrival of the other** and in the mean Time I should be glad to be favoured with your directions whether to Send them by Land or water, The sooner I have them the better, as it is said Cold Weather does not agree with these animals; It will naturally occur to you, Sir, that it will be very expensive to Send them by Land as I understand the Spaniards (who have the Care of them) are to Accompany them until delivered to Your Excellency, and as they cannot Speak English must be furnished with an Interpreter and Guide, on the other hand it must be Considered that sending them by water, although it will be less expensive, yet it be attended with a greater Risque; Whichever way*

you please to have them sent I shall comply with your directions and you may depend, Sir, I shall in this Instance, as well at all other times, with great pleasure execute your Commands and cheerfully contribute all in my Power either to your Pleasure or Emolument. Mrs Cushing my Son & Daughter join with me in tendering their best regards to yourself & your Lady. I remain with great Esteem and respect Your Most Obedt humble servt

Thomas Cushing”

George Washington replied to **Thomas Cushing** from Mount Vernon on **26th October 1785**;

“Dear Sir,

The last Post gave me the honor of your favor of the 7th inst²: for which & your care of the Jack and his Keeper, I pray you to accept my grateful thanks.

As the Jack is now safely landed, & as I am unwilling to hazard him again at Sea, I have sent a man in whom I can confide to conduct him & the Spaniard to this place by Land. The person I send has not the smallest knowledge of the Spanish language, consequently there can be little communication between him & the Spaniard on the road; but if there is a convention established by means of an Interpreter at Boston, & essentials well understood by the parties before they commence their journey; there will not be such an occasion for an Interpreter on the road, as to be a counterpoise for the expense, as Mr. Fairfax whom I send will be both guide & paymaster, leaving nothing for the Spaniard to do but to be attentive to the animal. The hour for starting in the morning & putting up in the evening, and feeding in the meantime being fixed: the halting days, & kind of food for the Jack & manner of treating the Spaniard settled & clearly understood; will remove all difficulties of consequence on the road—at least ‘till they get to New York, where by means of the Spanish Minister’s attendants an explanation of them, if any there be, may enable the parties to pursue the rest of their journey with more ease.

As I expect two Jacks it would give me great pleasure if the second should have arrived; that one trouble & expense might serve both. Mr Fairfax, the bearer of this, goes from hence to Boston in the Stage, & will have to buy a horse to return home upon. I preferred this method on account of the dispatch with which he would reach Boston; & because the whole journey might be too much for one horse taken from hence, to perform in a short time. If the Jack is led, two horses will be wanted—

& if two Jacks are arrived—three may be necessary. These uncertainties, and the danger of trusting a large sum in specie to a man who has not been much accustomed to the care of it, though' perfectly honest, have induced me to request the favor of you to obtain from any of the Merchants in Boston who have dealings in, & who may want to make remittances to Alexandria, as much money as will make these purchases, & defray the expenses of the Men & Horses back to me; the Bill, for the amount of which, shall be paid at sight; as also the charges which Mr Pearce may have against me—the cost of getting him from Gloucester to you, & such other expenses as may have arisen during their stay in Boston—in short the whole. Mr Fairfax has directions with respect to the kind of horses I want, & will take your advice how to procure them on the best terms, as well as in all other matters—for the favor of which I shall be much obliged to you. Mrs Washington joins me in respectful compliments to Mrs Cushing, your son & daughter; & with great esteem & regard, I have the honor to be &c.

G. Washington"

And

That very same day, George Washington sat at his desk, with John Fairfax at his elbow so there would be absolutely no chance of misunderstanding, and wrote explicit instructions for the man to follow during his journey to retrieve the jackass and his groom from Boston.

"You will proceed in the Stage from Alexandria to Boston, without losing a day that can possibly be avoided; & when arrived at the latter place, deliver the Letter herewith given you to the Hone Thos Cushing, Lieut: Governor of the State of Massachusetts, who resides in the town of Boston, & whose directions you are to follow.

The intention of your going thither is, to bring one—perhaps two Jack asses, which have been imported for me from Spain: a Spaniard is arrived with, & attends the first; & probably if the second is arrived, there will be one with him also: one, or both of these men, according to the instructions they may have received in Spain, or agreeably to the directions you may receive from the Lieut: Governor, are to come on with you & the Jacks.

As you will have to ride back, & as this will be the case also with the Spaniards, (if there are more than one) Horses, if it is thought improper to ride on the Jacks, will be to be bought—& as females will answer my purposes best, I desire you to buy

Mares: let them be young, sound & of good size, as I propose to put them to the Jacks in the season for covering: Lieut: Govr Cushing will furnish you with money, and aid you with his advice in this purchase; as also to defray your expenses in returning.

You know too well the high value I set upon these Jacks, to neglect them on the road in any instance whatsoever; but if the one which is now at Boston, & the other if it arrives in time, should come on under their proper keepers, your business will then be to see that everything necessary is provided—leaving the management of them to the Spaniard or Spaniards who will attend them, & who best know how to travel & feed them. See however (if their keepers are drunken & neglectful) that due attention & care are bestowed on these animals.

As I do not mean to be at the expense of hiring & bringing on an Interpreter (although' neither of the Spaniards should speak English) you would do well before you leave Boston, where by means of one you can communicate your sentiments to each other, to settle all the necessary points for your journey: that is, your hour for setting out in the morning, which let be early; taking up in the evening—number of feeds in the day, & of what kind of food—also the kind & quantity of Liquor that is to be given to the Spaniards in a day. In this govern yourself by the advice of the Lieut: Governor—I would not debar them of what is proper; any more than I would indulge them in what is not so. Be attentive to the conduct of these men, as from their good or bad dispositions I shall be enabled to judge whether to keep one of them or not; if either shou'd incline to stay in the Country with the Jacks. Having settled the principal points with them before you leave Boston, you will easily understand each other in smaller matters by signs, 'till you return to New York; where, by means of the Spanish minister's attendants, you may if necessary, settle a fresh plan.

Not expecting that you will travel back faster than the Jacks can walk, it is possible you may reach New York before you take a halting day, which, if not too far, would be best, as here probably the Spaniards will require it, on account of meeting their Countrymen in the family of Mr Gardoqui, the Spanish Minister: however, if they think a halt sooner is necessary, you must be governed by their opinions—as the Jacks must not be hurt by travelling them too fast, or improperly.

Let the Jacks be put separate & with no other Creatures, lest they should get kicked, & hurt themselves or hurt others; & if it is necessary they should be clothed, (which you must know before you leave Boston) provide Blankets or such other clothing as their keepers think best, at that place.

Keep an exact account of your expenses from the time you leave home until you return to it again; remembering that Dollars in the States of Maryland, Delaware, Pennsylvania & part of New Jersey, pass at 7/6; bordering on New York, & in that State for 8/—and in all the New England Governments at 6/ as in Virginia—all other silver, & gold, in that proportion.

Altho' I do not think there is any probability of the Jack, or Jacks having left Boston before you will arrive there; yet at, & after you leave the City of New York, it may be well to enquire now & then along the road whether this may not have taken place; the circumstance of which will be very notorious if it has happened. For this reason, if there is a Stage which passes thro' Hartford in Connecticut, & so along the post road to Boston; it will be better to pursue this rout than to go by the Stage-boat from New York to Providence.

As soon as the Stage gets to its Quarters at night, immediately engage your passage for the next day—lest you may be too late & thereby detained a day or two for its return. Make use of the Stage Waggon—the Stage Coaches are too expensive.

As soon as you get to Boston, write to me, or get somebody to do it, by the Post— informing me whether there are one, or two Jacks; in what condition they are, with other particulars—& when you expect to commence your journey back.

G. Washington”

The details of the shipment of the surviving jackass from Bilbao, Spain, to Gloucester, were shown in the letter by **David Pearce** to George Washington, from Gloucester, Massachusetts on **6th November 1785**.

“Exclent Sur

have it once more to hand your owner my Respects ass it has So happened I had a Ship at Bilbao onboard Sd Ship Mnsur Gardequa Pleased to Ship a jackass for your owner & Sd animal Safe has arrived & from my Regards have got him on there & Nursed him Strong & by Gardequa Dereckton have Sent him on to Boston to Letent governr how after he had him was Desears to have me Carey him by water ass I had a weasel bound to your Place I also acquainted him that I would carry him but after waiting a most a week heard nothing from him the wind f[a]jir was obliged to Send Sd weasel on I have Presented by the hands off Mr. Harts horn the bill of Land & charge of Paseg & wilst at cap any wish if

free from error Please to Pay per gentleman. Remind your Very Humble St”

And **George Washington** did not hesitate to share this event with Le Marquis de Lafayette in a letter from Mount Vernon on **8th November, 1785**;

“...One of my Jacks is, by advices, arrived at Boston; but I still adhere to the request contained in my last, if you can have it complied with without much difficulty...”

This event was also tracked in two more letters; the one sent from **Thomas Cushing** to **George Washington** from Boston on **9th November, 1785**;

“Sir

This will be handed you by Mr Fairfax, to whom I have delivered the Jack, & sincerely wish you may receive him in safety, & in good order—I have directed Mr Fairfax in general to observe the directions received from Spain, with respect to managing & feeding this animal. I have delivered him also a good Mare which I have purchased on your account, for one hundred Spanish dollars. I did not purchase another as it was unnecessary—the Spaniard declined to ride, he said it was necessary for him to walk in order to lead the Jack—I understood upon his first arrival that he was to accompany this animal in order to take the care of him until he was delivered to you, but now he says, it was left with him to do as he pleased, either to go forward to Virginia, or to return to Spain from this State—I suppose his being something out of health & a little home sick, discourages him from proceeding on so long a journey—however I have prevailed upon him to proceed as far as New York, where I hope the Spanish Minister will either persuade him to proceed on to Virginia or permit one of his servants, who may understand the management of these creatures, to proceed with & take the care of the Jack—I have furnished Mr Fairfax with thirty dollars to defray their charges upon the road, I offered him as much more as he should judge necessary to carry him through the Journey, but he said, as he had some money left that you gave him, he did not choose to take any more, for fear of being robbed on the road, more especially as he could readily procure more at New York, Philadelphia, or Baltimore, if he found he had occasion for it—he has bought a saddle & bridle to return with for which he gave three pounds, Nine shillings Lawful Money. I remain with great respect Your Most obedient, humble Servt

Thomas Cushing"

And the one sent on **16th November 1785** by the same writer;

"Sir

The foregoing is a copy of mine of the 9th instant by Mr Fairfax, who set out on his journey together with the Spaniard & the Jack on the 10th instant—I have not as yet been able to procure from Mr Peirce of Gloucester, nor from Mr Cabot of Beverly their respective Accounts for the passages of the Jack Asses, & therefore cannot as yet send your account of expenditures relative to the Jacks, but have at present taken the liberty to draw a Set of bills of exchange dates November 16th 1785 for the sum of three hundred dollars in favour of Messrs Isaac & William Smith merchants of this Town on their order, payable at <mutilated> sight, which I doubt not you will honour, <as soon> as I can procure the accts above referred to, I shall send forward your account. In the meantime, I remain with great respect & esteem Your most humble Servant

Thomas Cushing"

Cushing paid on GW's behalf the charges for the passage of the jackass that died at sea.

The Gloucester merchant was named David Pearce, not Peace, and the Spaniard was Pedro Tellez. As Cushing suspected, Carmichael's letter to him referred to the second jack, the one, as Cushing was soon to learn, that had died at sea. This notice appeared in the *Salem Gazette* (Massachusetts) on 25th October: "Capt. Ashton, who arrived at Beverly, a few days ago, from Bilbao, brought out one of the four [two] Jack-Asses sent as a present from the King of Spain to General Washington; but the animal, notwithstanding the extraordinary precautions which were taken for insuring his health & safety, died on the passage."

The bill of lading, dated **8th August 1785**, referred to in a letter and its attachment by **William Hartshorne & Co.** sent to George

Washington, from Alexandria on **26th November 1785**, describes the animal being sent to David Pearce as "a he Jack ass forty four Spanish Inches high." On the back of the manifest, or bill of lading, Lund Washington wrote: "Captn Sullivan informs me 12 of our Inches make 13 Spanish—at same time says in some parts of the Country 12 of our Inches are equal to 14 Spanish—L. Washington."

"Sir

The Enclosed Letter and Account we read under cover from our Friend Mr David Pearce of Gloucester New-England with an order on you for the Amount say £63.5.6—as the account is not very plain & you may not be acquainted with the hand writing I have sent a Copy of it—I am Respectfully Yours

WM Hartshorne & Co."

In his letter of **6th November** enclosing his account with George Washington, David Pearce indicated that he was also enclosing a bill of lading, but Hartshorne's letter of 10th February 1786 seems to indicate that the document was received later. A filled-out printed form, dated 8th August 1785, records that John Gardoqui was shipping a "a he Jack ass forty four Spanish Inches high", on the Ranger, Job Knight master, from the river of Bilbao to be delivered to David Pearce in Gloucester, Massachusetts. The bill of lading was signed by Knight. On the back side of the form, someone listed items supplied for the jack such as feed and horseshoes. Hartshorne sent George Washington the original bill of lading along with a copy of Pearce's charges at the end of the present letter:



*Dr His Excellency Genl Washington,
To Freight of an Animal called a Jack Ass from Bilbao to
Boston £35. 0.0
Building a House for Him agreement 7. 10.0
Boarding the Spaniard who attended him 1. 10.0
Cash pd for Brandy to Bathe the animals joints . 10.0
Wine & Bran for said Animal 1. 4.0
Oates for ditto . 6.0
Your Stable while at Do hired 1. 0.0
Cash paid Spaniards washing . 6.0
Cash Expenses to Boston and a Man to go with him 3 days
1. 16.0
the hire of a Boat to Land said Animal . 3.3
Keepers passage omitted 14. 0.0
£63. 5.6
"Sir Please to pay the above a/c to Mr Wm Hartshorne and
you will oblige Your obedt Humble Servt David Pearce
(Copy)."*

Thomas Cushing, wrote to George Washington from Boston on 6th November 1785, telling him about the cautions that were taken in order to help the jackass recover from the journey;

"Sir

I had the Honor this day of receiving your Favor of the 26th of Oct last, by Mr Fairfax, in Answer to a Letter I wrote you the 7th of the same month relative to the Jack I received from Spain on Your Account, he has gained flesh since he came on shore and is in much better order than when I received him, I shall send him on, as soon as I can purchase a good mare, with Mr Fairfax & the Spaniard—who will proceed to Virginia to take care of this animal. Only one mare will be wanted as the Spaniard says he must walk & lead the Jack. Mr Fairfax desires me to inform you that he was detained at New York three days as there was neither a Stage nor Packet to convey him or he should have arrived at this place sooner; I am sorry to be obliged to Inform you that the other Jack Ass that was shipped on your Account from Bilbao by a Vessel bound to Beverly in this state, was lost at sea in a great Storm. I have the Honor to be dear Sir Your Most Obedient humble Sert

Thomas Cushing

P.S. I have taken such measures that there may be an understanding between Mr Fairfax & the Spaniard on the Road, as will render it needless to be at the Expense of an Interpreter, Mr Fairfax will be near 50 days on his Journey as the Spaniard says the Jack must not travel more than 15 miles day & there must be here & there a resting day."

To George Washington's satisfaction, Fairfax arrived safely with his charges on 5th December 1785. Washington wrote to

William Carmichael from Mount Vernon on 19th December 1785.

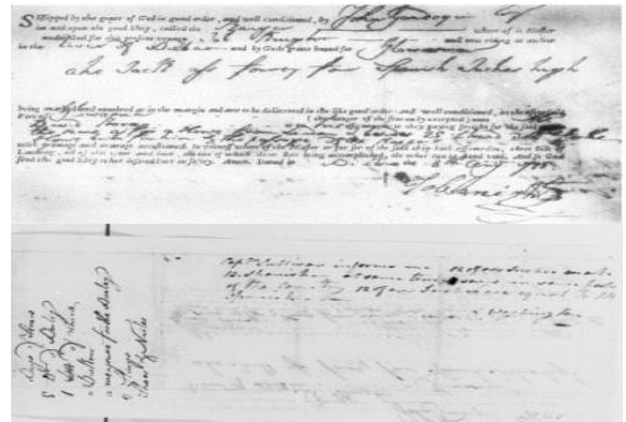


Figure 46. The Library of the Congress (2014) Front and Back of the landing bill for Royal Gift, the Zamorano-leones jackstock from Spain [Photograph]

George Washington's description of Royal Gift, appeared in a newspaper advertisement placed by Washington's farm overseer John Fairfax offering to cover mares and jennets at Mount Vernon in the spring of 1786. Published in the Pennsylvania Packet (Philadelphia) newspaper on 7th March 1786, Royal Gift was said to be:

"A JACK ASS of the first race in the kingdom of Spain ... four years old, is between 14 1½ and 15 hands high, and will grow, it is said, till he is 20 or 25 years of age. He is very bony and stout made, of a dark colour, with light belly and legs." The advertisement went on to discuss the advantages to be derived from the propagation of "this mongrel race"- namely their "great strength, longevity, hardiness and cheap support."

"Sir,

One of the Jacks with which his Catholic Majesty was pleased to present me, has arrived safe; & the enclos'd to his Minister is a testimony of my gratitude for this singular mark of his royal notice—I pray you Sir, to do me the honor of presenting it. I hesitated a while, whether to express my sense of this obligation at first, or second hand; but considering the value of it, I determined on the former—and at the same time that I would enclose you a copy of what I had written.

The Spaniard, Seignior Pedro Tellez who accompanied the Jack which arrived safe, has expressed a wish to obtain a line of approbation from me; by means of which he thinks he could obtain some low office in the King's Customs: but it was a liberty I could not take, further than to express in the Certificate I have given him, my sense of his care of the animal which was entrusted to him. But if a word my good Sir, could occasionally drop from you to this effect, it might do an essential service to the poor fellow, (who it seems has a wife & children) & would be considered as an additional favor conferred on, Sir Yrs &c.

G. Washington"

George Washington also wrote to Francisco Rendon, was secretary in 1785 and 1786 to Diego de Gardoqui from Mount Vernon on 19th December de 1785,

"Sir,

This letter will be handed to you by Mr Peter Tellez, who attended the Jack Ass, which arrived safe, to this place:1 for want of an Interpreter I have not been able to understand him perfectly; but as far as his wishes have been explained to me, they are, that he may be permitted to return to Spain as soon as possible; that it is proper he should go by the way of New York to see his Excellency Don Gardoqui; that as he was employed by his Catholic Majesty, & in the Kings pay until he return'd (his wife receiving part of it from Mr Gardoqui at Bilbao) he would take none from me.

Under these circumstances I have forwarded him to New York, after prevailing on him to take a trifle as an acknowledgment of the obligation I am under to him, for his care of the animal on which I set the highest value. He has some expectation <in>deed, that at his return his Majesty may bestow some humble appointment on him, in the Collection of his Customs; & therein he has my wishes, but I could not ask it for him, or even hint it to the Minister.

Not having the honor of an acquaintance with his Excely Mr Gardoqui, I have taken the liberty of making these communications to you; & to pray, if there is anything improper in my sending Mr Tellez to New York, or in my conduct towards him, that it may be ascribed to misconception, & misunderstanding his wants by bad interpretation. Altho' unknown, I pray you to make a tender of my respectful compliments to Mr Gardoqui, & to accompany them with the strongest assurances of the pleasure I should feel in seeing him at this Seat of my retirement, if inclination should ever induce him to

visit the States to the southward of New York. It is unnecessary to offer you the same assurances, because I have repeatedly done it before, & you must have been convinced of my sincerity. With very great esteem & regard, I have the honor to be &c.

G. Washington

P.S. Sr. Tellez is charged with a Letter from me to Mr Carmichael, enclosing one to His Exy the Count de Florida Blanca, praying that my homage & gratitude may be presented to his Catholic Majesty for the favor he has conferred on me & for the honor of his royal notice. G. W——n"

When Washington introduced his finest carriage mares to Royal Gift for his first breeding season, he "met a great disappointment". The jackass wanted nothing to do with mares. At four years of age, it became apparent that he had not been used for mule production in his native Spain. Thus, Washington had to use subterfuge to fool the young jack. He borrowed a comely jennet from another farm to entice the Gift. When the jack was ready for breeding, Washington replaced the jennet with a mare. The bait and switch was successful and by 1799 there were fifty-seven mules in residence at Mount Vernon. The jack had been in residence at Mount Vernon for only four months, but Washington had already advertised his services for the 1786 breeding season, which resulted in some back-peddling as evidenced by this letter written from Mount Vernon to Bushrod Washington on 13th April 1786:

"Dear Bushrod,

If royal gift will administer, he shall be at the Service of your Mares, but at present he seems too full of royalty, to have anything to do with a plebeian race. Perhaps his stomach may come to him—if not, I shall wish he had never come from his most Catholic Majesty's Stables.

Your Papa has not been here, yet. I am just come in from a ride—the Dinner bell rings—and your Man says he must go off after it—so offer me affectionately to all—and believe me to be sincerely Yrs.

Go: Washington"

George Washington described the jackass' attitude to mares to Marquis Lafayette on 10th May 1786 on a letter Mount Vernon;

"Your assurances my dear Marquis, respecting the male & female asses, are highly pleasing to me; I shall look for them with much expectation & great satisfaction, as a valuable acquisition, & important service. The Jack which I have already received from Spain, in appearance is fine; but his late royal master, tho' past his grand climacteric, cannot be less moved by female allurements than he is, or when prompted, can proceed with more deliberation & majestic solemnity to the work of procreation. The other Jack perished at Sea."

Once the animal was ready, George Washington described the jackass's reproductive behaviour to William Fitzhugh, Jr. on 15th May 1786 on a letter written from Mount Vernon;

"Dear Sir,

Your favor of the 13th came to me this day. Particular attention shall be paid to the Mares which your Servant brought; and when my Jack is in the humour they shall derive all the benefits of his labours—for labour it appears to be. At present, tho' young, he follows what one may suppose to be the example of his late royal Master, who cannot, tho' past his grand climacteric, perform seldomer, or with more Majestic solemnity, than he does. However, I am not without hope, that when he becomes a little better acquainted with republican enjoyments, he will amend his manners, and fall into a better & more expeditious mode of doing business. If the case should be otherwise, I should have no disinclination to present his Catholic Majesty with as good a thing, as he gave me.

*I am very sorry to hear of the accident which befell Colo. Fitzhugh in his late trip to Virginia; but, from the effect of it, I hope he will soon be perfectly recovered. I am happy in having it in my power to furnish the Colo. with a Bushel of the Barley, requested in your letter. A propos, are there any persons in your neighborhood who raise Lambs for sale? My stock of sheep were so much neglected during my absence, that I would gladly buy one, or two hundred ewe lambs, and allow a good price for them, in order to get it up again. A line from you, when convenient, in answer to <this query,> would be obliging—Mrs Washington & the rest of the family join me in every good wish to the Colo. his Lady & yourself. I am—Dr Sir Yr Most Obedt Servt
Go: Washington*

P.S. Please to present me to Colo. & Mrs Plater when you see them."

Royal Gift eventually became equally at ease with breeding mares as well as jennets. In 1791 he was sent to stand at Sandy Hill, the South Carolina plantation owned by William Washington. His jack's sons, "Compound" and "Young Royal Gift" out of the Maltese jennets brought Washington much pleasure and influenced the husbandry practices of all those who have followed him. There are five main breeds that were incorporated into the development of the Mammoth jack of today: the Andalusian, Catalonian, Majorcan, Maltese, and Poitou. The gray-dun and spotted influence most likely came from Standard breeding, since the original breeds did not include these colors.

The Andalusian was the drafty, heavy-boned, dappled animal. Most of the original animals imported into the U.S. (even up into the 1900's) were dappled gray-roan (sometimes called blue roan) or red roan. The average height of the Andalusian was 14.2-15hh. Many of the heavy sorrel jacks used in draft mule breeding resemble the purebred Andalusian quite closely. The head should be in proportion, but this is the breed most likely to have a thick jaw, and Roman-type nose. The bone was heavy especially through the leg, and breeders wishing for a heavier type of jack should look to this type to add substance in both jackstock and mules. Most jacks today that exhibit the Andalusian characteristics are sorrel or dappled red roan, with little or no visible cross being preferred.

The Catalonian donkey was one of the most popular breeds for use in creating American jackstock. The purebred Catalonian was always black, no grays or roans were ever allowed. The hair coat was fine, short and glossy. The Catalonian was finer-boned and used exclusively in Spain for the production of mules. This breed became the one of choice

when creating the Mammoth, even though the average height was only 15 hands and the bone was finer and lighter than that of other jackstock breeds. Today a very tiny population of Spanish Catalonians still exists in Spain, and another small Mexican Catalonian population as well.

The Majorcan jack, also of Spain, was often crossed with the smaller Catalonian to produce a superb breeding jack. Black in color, although not quite with the fine-textured haircoat of the Catalonian, these jacks contributed size and bone to the Mammoth. They were often described as “sluggish” in disposition, but there is also the possibility that they were some of the largest jackstock in existence. The demand for these huge animals quickly depleted the supply so that, the population of Majorcan donkeys decreased and conservation programmes had to be put in practice for this breed until today.

Maltese donkeys were imported from the Island of Malta, early jackstock breeders purchased every animal with any hope of breeding quality, including those whom it was hoped would grow taller. Most did not, and the animals as a breed were less than 14 hands tall. They were often a clean black, and their manner described as having extreme vigor and vitality.

Probably the most striking of the jackstock breeds, the Poitou survives today as an endangered breed. It is felt by some jackstock historians that the Poitou was used far less in the production of today’s Mammoth than it should have been. The Poitou is found in France (although evidence supports they were bred from Spanish stock many centuries ago), and was used almost exclusively for the production of mules. Bred to an incredibly heavy draft horse breed called the Mulassier, mules which were believed to be some of the

finest work and draft animals in the world were produced. The Poitou is noted for the heavy bone, and memorably, for the long tangled coat, forming dreadlocks to the ground. The coat color is exclusively black or dark brown (termed bai-brun by the French) and should never bear a cross or stripe. This horrific coat, matted with filth and years’ worth of shed hair caught year after year, was prized and said to be a symbol of purity in the breed. A few Poitou donkeys were exported for breeding, and early engravings of these noted animals show them with shaggy, yet neat, coats. It is suggested that these jacks lacked the matted coat and were penalized in France. Those that were used in jackstock production contributed bone to the Mammoth, not only in leg, but in the length of the back and distinctive shape to the face.

There are less than 200 purebred Poitoux left in the world, and the Poitou Mule has become almost extinct.

4. ... TO THE SMALLEST: MINIATURE MEDITERRANEAN DONKEY

4.1. HISTORY

Miniature Mediterranean Donkeys originated from the islands of Sardinia and Sicily. Over time the distinction between the two island populations blurred and they became known as Miniature Mediterranean Donkeys. They had been used to carry water from village wells and supplies into the mountains for shepherds. Because of their small size, they had also been used to turn grinding stones for grain inside the peasants' homes! These hard-working little creatures were often underfed and over worked.



Figures 48 & 49. Miniature Mediterranean Donkey carrying water and statue of a Miniature Mediterranean donkey turning the wheel [Photographs]



Figure 47. NormanEinstein (2009) Map showing the location of the Strait of Sicily, between Sicily, Italy in Europe and Tunisia in Africa [Map] Accessed from <http://es.wikipedia.org>



Figure 50. Miniature Mediterranean Donkeys in Ireland (2014) Christopher Columbus, the first Miniature Donkey born in North America on Columbus day 1929. Robert Green and his grandson are pictured in the cart. Mr Green imported the first Miniature Donkeys into the United States in 1929 from Sicily and Sardinia [Photograph] Accessed from <http://www.little-donkeys.com>



In 1929 the first imports from Sardinia arrived in the USA, imported by Robert Green, a

New York stockbroker with a farm in New Jersey. He bought seven Sardinian donkeys, sight unseen, while on a trip to Europe. Dogs killed three of the imported jennies only a few months after their arrival, but the three surviving jennies, 'Miranda, Palermo and Suzanne', and jack 'Impheus', became the foundation stock for the Green herd. One of the jennies was pregnant and on Columbus Day 1929, she gave birth to a little jack who was named 'Christopher Columbus', the first miniature donkey born in the USA.

A favorite quote, by Robert Green: "Miniature Donkeys possess the affectionate nature of a Newfoundland, the resignation of a cow, the durability of a mule, the courage of a tiger, and the intellectual capability only slightly inferior to man's." This is a most accurate statement!

In 1935 el Mr. Green had a herd of 52 donkeys. He only sold a few of his cherished little donkeys when his herd became too large. Among his buyers was August Busch, Jr. (Whose donkey's one can find in pedigrees with the 'Belleau' prefix).

In the early 1950's, Daniel & Bea Langfeld bought their first miniature donkey, Pepi, from August Busch, Jr. of St. Louis, MO. The Langfelds established the Danby Farm in Omaha, Nebraska where they raised show quality Shetland ponies and Miniature donkeys. They were the first professional breeders of miniature donkeys in the United States, eventually having as many as 60 to 225 miniature donkeys in their herd. Bea Langfeld established the original registry, The Miniature Donkey Registry of the United States in 1958. She turned the registry over to the stewardship of the American Donkey and Mule Society in Denton, Texas in 1987 (<http://www.lovelongears.com/>)

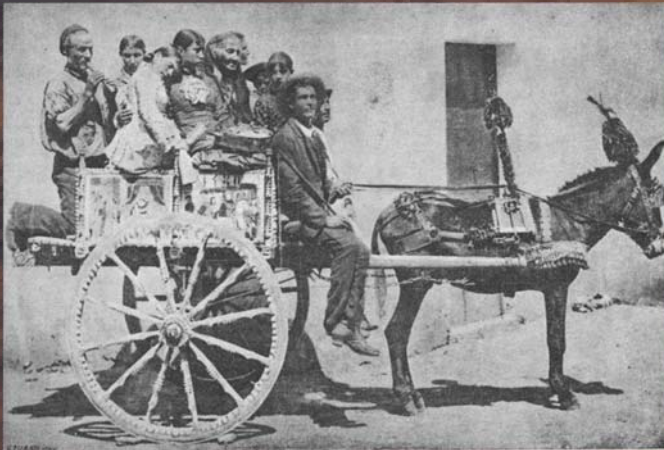


Figures 51, 52 & 53. (Figure 51 & 53) HAA Miniature Donkeys & (Figure 52) National Miniature Donkey Association (2010) (Figure 51) Very Dark Brown Jennet w/NLP, Date Of Birth 4/06/10 at 12:12am, Birth Height: 22" ~ Birth Weight: 27 lbs., MDR #59253, Sire: Wit's End Badlands Marauder, 30 ½" Burgandy Black, Grand Sire: Sunset Acres Speedway Racer, 32" Very Dk Brown w/NLP, Grand Dam: Sunset Acres Meggie Mae, 32 ½" Black w/Cross</Dam: Big Woods Best Kept Secret, 32 ½" Dark Spotted, Grand Sire: Circle C Motown's Secret, 33" Black w/NLP, Grand Dam: Fisher's Justine, 32 ½" Gray & White Spotted, (Figure 52) National Miniature Donkey Association Logo & (Figure 53) Miniature Donkey registry [Photograph & Logos] Accessed from <http://www.minidonks.com>

CURIOUS FACTS

MINIATURE DONKEY DRAWN CARTS

The Sicilian cart (or *carretto siciliano* in Italian and *carrettu sicilianu* in Sicilian or *carretti* (plural)) is an ornate, colorful style of horse or donkey-drawn cart native to the island of Sicily, in Italy.



Figures 54 & 55. (Figure 54) Carreto & (Figure 55) Mary Nissen Corwith Iowa (2014) (Figure 54) A Sicilian working cart in a picture from 1890 & (Figure 55) Original Miniature Donkey Cart [Photographs] Accessed from (Figure 54) <http://www.mondellolido.it/> & (Figure 55) <http://miniaturedonkeys.eu>

The carts were introduced to the island by the ancient Greeks. Carts reached the height of their popularity in the 1920s, when many thousand were on the island. Miniature carts, or *Carrettino Siciliano*, are often sold in Sicily (or in Italian shops and restaurants in other countries) as souvenirs. The Museo del *Carretto Siciliano*, in Terrasini, in the province of Palermo, is a museum dedicated to the carts.

Sicilian wood carver, George Petralia states, that horses were mostly used in the city and flat plains, while donkeys or mules were more often used in rough terrain for hauling heavy loads. The cart has two wheels and is primarily handmade out of wood with iron metal components. Carts are used for hauling miscellaneous light loads, such as products, wood, wine, and people, called "*Carretto del Lavoro*" (cart for work) and also carts for festive occasions such as weddings and parades called "*Carretto de Gara*". The Carretto is like the 'taxi' or 'truck' of today.

4.2. FACTS

Miniature Mediterranean Donkeys (herein referred to as minis), have a life span of 25 – 35+ years. Average weight at maturity is 250 – 400lbs. Average height at maturity (3 years) is 32"-34", maximum of 36" tall at the withers. Males (intact) are referred to as "jacks", males that have been gelded as "geldings", females as "jennets" and babies as "foals". Gestation period is 11 ½– 13 months, 12 being the average. Foals are 20-25lbs at birth, up and nursing within 30 minutes and weaned at approximately 5 months of age. A jennet is considered mature at 3 years of age, many are bred after 2 yrs. Jacks can start very early, so do be careful who is housed together. Every jack that is not used for breeding should be gelded.

Many are predominantly gray-dun with the "cross." However, they also come in darker shades of gray, brown, black, red, white, ivory and spotted. Usually they have light tan markings around their muzzle and eyes, known as points. However, some have dark points. This is referred to as NLP (no light points). Almost all donkeys have a "cross". The cross is a darker brown or black dorsal stripe running from the top of the donkey's back from the withers and extending to the rear and down the tail. There is also a shoulder stripe that intersects the dorsal stripe at the withers running down each shoulder. There is a legend called the "Legend of the Donkey's Cross", which states that Jesus rewarded the donkey for his loyalty to Him when he carried Jesus into Jerusalem and staying with Him at the crucifixion by placing the shadow of the cross across the donkeys back for all to remember the importance of God's humblest of creatures. However, not all donkeys have this marking.

CURIOUS FACTS

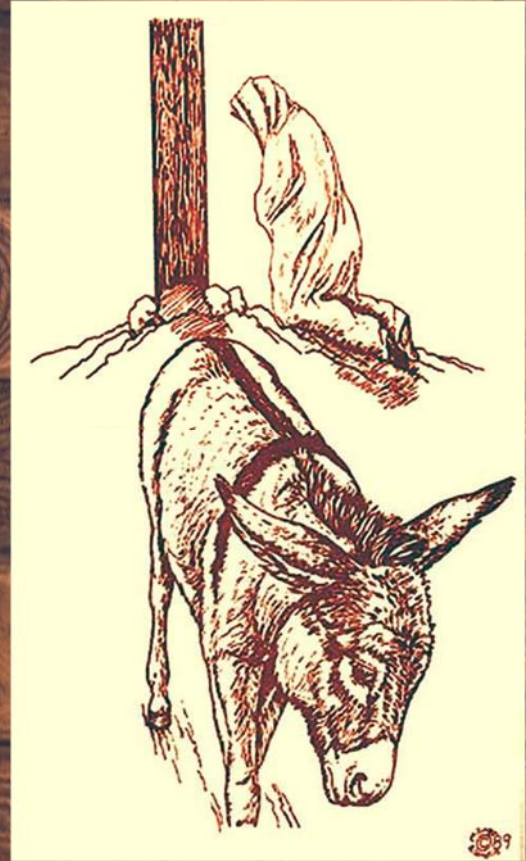


Figure 56. Mary Singer (2011) Legend of the Donkey's Cross [Illustration] Accessed from <http://fineartamerica.com>

LEGEND OF DONKEY'S CROSS

"Bring me the colt of a donkey," was the Master's request. A young donkey was brought to Jesus to carry Him into Jerusalem. A week later, Jesus was ordered to be crucified. The little donkey so loved the Lord that he wanted to help Him carry the cross. But, alas!, he was pushed away. The sad little donkey waited to say goodbye until nearly all had left. As he turned to leave, the shadow of the cross fell upon the back and shoulders of the little donkey. And there it has remained a tribute to the loyalty and love of the humblest of God's creatures"

Donkeys communicate with their human owners and with other donkeys by 'braying', also more commonly known as a hee-haw. Each has their own style of braying with some sounding quite comical. They range from barely being audible to a loud thunderous bray. Donkeys develop schedules and if you are late in feeding, you will hear about it! Jacks pastured apart from their jennets, will call to them several times a day. On the whole, donkeys are very quiet animals.



Figures 57 & 58. (Figure 57) Connie Bonczek & (Figure 58) Klein-Hubert/KimballStock (2014) (Figure 57) Visible cross/stripe & (Figure 58) Miniature Donkey Foal Standing In Pasture Exhibiting Flehmen Response [Photographs] Accessed from (Figure 58) <http://www.kimballstock.com/>

4.3 PERSONALITY

Minis are loving, gentle, comical creatures, underestimated by many. They are highly intelligent. They develop a bond with their owners and will enrich your life in so many ways, if given the opportunity. In today's fast paced stressful life, Minis are one of the best stress relievers found! Although they adore their human family, donkeys are herd animals; they crave the companionship of another donkey. A single donkey will be a very sad, lonely soul.

They are highly intelligent and often stop to think or ponder over a situation, which has been misinterpreted as stubborn. Donkeys are quite the opposite; they are easy to train and will happily oblige what you ask of them, after they understand. Training Minis' is fun

and easy, since they want to please you.

Give them time to think things through and always end your lesson on a positive note. You cannot push or bully a Mini into things, but once you earn their trust and love, they will do nearly anything for you. Donkeys are very cautious animals and do not generally get themselves into the trouble that a horse would.

A horse's instinct is to flight, whereas the donkey's instinct is to look the situation over and determine the best approach. A few basic things to teach your donkey- leading, stopping and standing quietly, coming when called, loading, picking up his/her feet, standing when tied, standing while being groomed.





Figures 59, 60 & 61. (Figure 59) eboone, (Figure 60) Legendary Farms & (Figure 61) Peter van Dijk (2008-20112013) (Figure 59) Miniature Donkey playing with his mum, (Figure 60) Miniature Donkey Colt pulling his owner pants & (Figure 61) Marion van Dijk with some of their miniature donkeys [Photographs] Accessed from (Figure 59) <http://ureport.foxnews.com>, (Figure 60) <http://www.donkey-mule.org.nz/>

Donkeys very much enjoy human interaction. They learn to look forward to brushing, feet trims, visitors etc.; anything that allows them to spend time with people. They are often sought after to take part in live nativity scenes at Christmas time. Small town schools may request minis to visit their children for a day, as hands on learning tend to stick with children for years to come!



Figures 62, 63 & 65. (Figure 62) Suzi & (Figures 63 & 64) Connie Bonczek (2014) (Figure 62) Woman holding her baby miniature colt in her arms, (Figure 63) Visiting school & (Figure 64) Easter ears [Photographs] Accessed from (Figure 62) <http://suzi-pratt.com/>

4.4. HEALTH & FEEDING

Mini donkeys are hardy animals with low energy need. Originating from desert regions, they are able to maintain themselves on much less than a pony/horse would require. During the summer months, a donkey's nutritional requirements can be met mostly by pasture. Donkeys can graze harsher pastures than horses and lush pasture is not recommended as they can easily get fat or founder.

If pasture is sparse, feed hay also. In winter, *twice a day* feed good quality horse hay: Bermuda, timothy or orchard is a good choice. Do not feed alfalfa, which is too high in protein. They do need access to clean water 24 hours a day. Free access to mineral salt blocks (or loose mineral/salt) should be provided. If your area is low in Selenium, be sure to provide a salt/mineral block with Selenium. This cannot be stressed enough. From my own personal experiences, I can assure you that a jenny with low selenium can in fact produce offspring with a severe off-bite.

CURIOUS FACTS

REPRODUCTIVE STRATEGIES

Most are Sardinian or Sicilian, but the details of how present animals go back to the original foundation have long been lost. It is certain, though, that due to the extreme phenotype, the animals are a preponderance of breeding from the original imports.

Breeding of miniature donkeys is increasingly common, and to some extent the breeders adopt the strategy that “smaller is always better.” This has created problems in some genetic lines because of the production of non-proportional dwarf donkeys that have various skeletal and conformational abnormalities. As a result some breeders have begun to have less emphasis on the truly tiny animals and more on animals with good conformation and soundness.

Color variation has always been sought by breeders of miniature donkeys. The majority of them are grey dun, the ancestral color of wild donkeys. From this basic genetic package an array of mutations have arisen. In most cases these are single-gene differences from grey dun, but there is an increasing trend for individual donkeys to have multiple of these changes.

Among the common color changes are black, which resembles the common color in Mammoth Jackstock that has a black body with light belly, upper legs, muzzle, and eye patches. “No light points” takes these light areas away, usually resulting in a uniformly grey dun animal, but when combined with black it results in entirely black animals. Sorrel animals replace black areas with red, and this is usually a bright clear coppery red color. Some animals are intermediate to these, with brown bodies but black manes and tails. A few are ivory, which is off-white with blue eyes and shadows of the backstripe and cross so common in grey duns.

White spotting is also common in miniature donkeys, usually on a grey dun background but increasingly on other colors as well. Roan animals also occur.

Miniature Donkey breeding is increasingly popular in the USA, and the animals see wide use as companions and also as show animals. Many of them are taught to drive, and see use by hauling small carts or other vehicles.



Figure 65. Jon, Mary and Jay Nissen's Lazy 'N' Ranch (2014)
The Hitching of 24 Miniature Donkeys for the Milwaukee
Circus Parade [Photograph] Accessed from
<http://www.inminidonk.com/>

Supplemental feeding dependent upon needs (10% crimped oats is common or 10% sweet feed). For ex: Pregnant, lactating, working donkeys and foals will need supplemental feeding. Donkeys can founder on rich food and lush spring grass. A fat donkey will develop a “roll” on the neck and is quite unsightly, not to mention unhealthy. Obesity can lead to laminitis, metabolic disorders and hyperlipidemia.

Hyperlipidemia is a serious, often fatal condition that can affect miniature donkeys, miniature horses and ponies. Hyperlipidemia (or hyperlipemia) is a disorder of lipid metabolism that may lead to fatty infiltration of the liver, loss of appetite and, ultimately, death. The disease often occurs in obese individuals that are stressed, off-feed, pregnant or lactating. It frequently develops following a primary illness of several days duration such as diarrhea, endotoxemia, parasitism, pituitary tumor or neonatal septicemia, but can occur any time a donkey is unable to satisfy its own metabolic energy needs (late gestation, early lactation, hormonal imbalance, etc.). Affected donkeys usually will begin with anorexia and lethargy, progressing to incoordination, abdominal pain, circling, diarrhea, convulsions and death. It is important for owners and veterinarians alike to always suspect hyperlipidemia in any obese mini with severe depression, anorexia, neurological signs, and jaundice. Owners may prevent this condition by providing appropriate nutrition while avoiding obesity, stress and engaging in good routine health care.

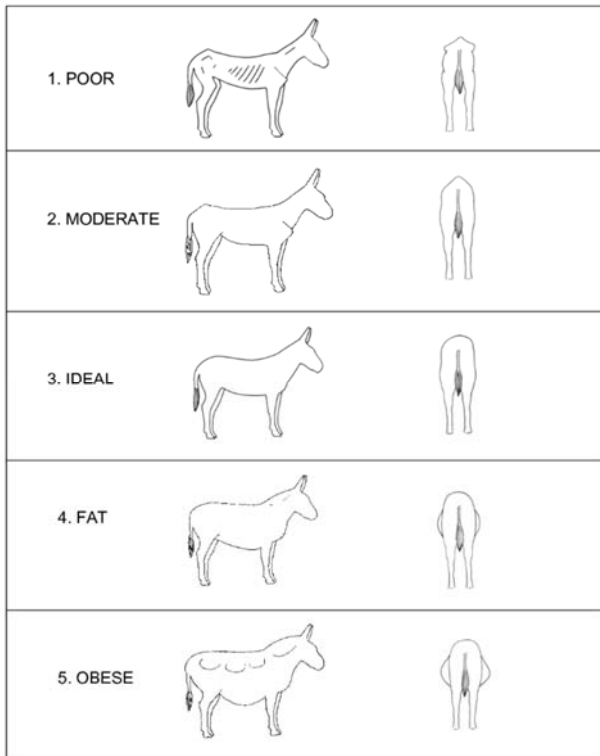


Figure 66. *The Donkey Sanctuary* (2014) Fat deposits may be unevenly distributed especially over the neck and hindquarters. Some resistant fat deposits may be retained in the event of weight loss and/or may calcify (harden). Careful assessment of all areas should be made and combined to give an overall score [Illustration] Accessed from <http://www.thedonkeysanctuary.org.uk>

They do require yearly vaccinations, which may include VEWT (venezuelan, eastern, western encephalitis and tetanus), West Nile, influenza, Rhinopneumonitis and rabies, depending upon your location. They receive the same vaccination dose as a full size horse.

Their hooves are more upright and rounded when compared to horses, needing regular trims every 8-10 weeks or so. Their feet are subject to thrush and or other bacterial infections during very wet seasons. Hooves need to be cleaned out on a regular basis. Keeping the feet dry does help to avoid infections.



Figures 67, 68 & 69. (Figure 67) *Legendary Farms*, (Figure 68) *Disqus* & (Figure 69) *Tanya Morphew* (2012-2013-2014) (Figure 67) Red Miniature Donkey. *Legendary's Southern Belle* at one month of age, (Figure 68) Albine Miniature Donkey grazing with a sheep & (Figure 69) Three Miniature Donkeys [Photographs] Accessed from (Figure 67) <http://www.legendaryfarms.com>, (Figure 68) <http://galleryhip.com> & (Figure 69) <http://www.pinterest.com>

4.5. WORMING

Worming is so important, it is a MUST DO part of your donkey care! Donkeys need a year round equine wormer rotation program. Dosing is done by weight of each donkey. Keeping your donkey free of internal parasites is one the most important things

you can do for them. A little about worms:

There are many different species of small strongyles, they can become encysted into the wall of the small intestine and then emerge in mass in the late winter or the early spring, causing severe illness, diarrhea, colic and even death due to toxic shock. They can also cause, weight loss and chronic diarrhea. This encysted type of worm is treated with a five day course of fenbendazole.

Large strongyles have a migration cycle that progresses through the donkey's intestine, peritoneum, blood vessels and liver. Signs of infection include weight loss, diarrhea, anemia and colic. They are usually treated with wormers including, ivermectin, pyrantel and fenbendazole.



Figure 70. Allison Preiss (2010) Worming a Miniature Donkey
[Photograph] Accessed from <http://novicelife.blogspot.com.es>

Ascarid is a large, white round worm that looks a bit like spaghetti. Signs of infection include colic, intestinal obstruction due to large worm size and numbers and weight loss. These worms are normally treated with ivermectin, pyrantel or fenbendazole.

Pinworm causes irritation around the tail and rubbing, sometimes leading to self-trauma (baldness around rump and tail base are signs). Threadworm infects foals via the milk, but does not seem to cause problems in the adult. Both these worm types are usually

responsive to the wormer products listed above.

Tapeworms can cause intestinal damage and abnormal intestinal motility resulting in colic. They are treated with a double dose Pyrantel at the recommended dose rate, usually given in spring and autumn. Pyrantel should not be used in donkeys with liver problems so consult with your own veterinarian before using this product. Liver fluke is a parasite that can affect donkeys. As the name suggests, it infects the liver and while some donkeys will show no signs of illness, heavier infections will cause liver damage and death. There is no treatment for liver fluke that is licensed for use in donkeys therefore treatments for sheep and cattle are usually used. Ask your vet if your donkey is at risk of liver fluke and if so a special type of worm egg count can be performed to test for infection.

Lungworm is another worm that can affect donkeys. Donkeys will often show little sign of infection; if they do it may include harsh lung sounds and coughing. Treatment is achieved with routine worming with an ivermectin based product.



Figure 71. SPANA (2014) Ian gives the foal an anti-parasitic injection to kill the blood parasite, treats her for ticks, and gives her a vitamin injection. The team's prompt action has prevented the anemia from worsening and improved the foal's health [Photograph] recovered from <https://spana.org/>

4.6. HOUSING AND PASTURE

Shelter, yes a mini does require shelter! Would you like to live outdoors with no shelter from rain, wind, sun and snow? Well neither do the donkeys. In fact, when it begins to rain, they usually all together, form a line, and walk slowly to their shelter. My preference was a large open area barn with an entrance approx. 12' wide, so they could come and go at will.



Figure 72. Connie Bonczek (2013) Barn with attached lean to roof [Photograph]

The wide open door may not be acceptable, depending upon your climate. They are very smart creatures and will stay in and out of the elements if offered the choice. The flooring should be appropriate to drain or absorb urine and be easy to clean. Stall mats or bedding (straw or sawdust) work well.

A three-sided shelter with opening away from blowing wind, is the minimum they need. In winter they grow a thick shaggy coat to keep warm, Works great, but come spring and early summer, when they have not shed out, the moistness under the coat can attribute to rain rot (infection on the skin). Therefore brushing to help rid the winter hair is needed.



Figures 73 & 74. (Figure 73) Scott and Theresa Ellinger & (Figure 74) rusholme_moz (2008-2014) (Figure 73) Two Miniature Donkeys in a Barn & (Figure 74) 3 miniature donkeys in a line, sheltering from the rain [Photographs] Accessed from (Figure 73) <http://www.theredqateminiauredonkeys.com> & (Figure 74) <http://www.flickr.com/>

What to do with all those droppings? During the summer months, you can spread the manure. During the heat it dries out quickly killing the parasites. If you live in a cold climate, spread in winter also, parasites will be frozen and killed.

CURIOUS FACTS

MINIATURE DONKEY HOOF TRIMMING ADVENTURE

Donkeys do not require a whole lot more than love, fresh water, good hay, and the occasional hoof trimming adventure.

Here it is a hoof that needs trimming:



You start by cleaning out the mud with a pick:



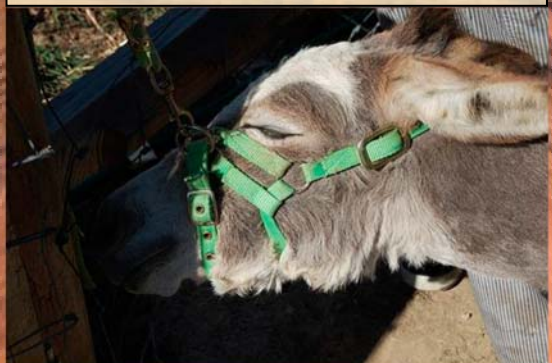
Then cutting back the soft part:



Then filing the hoof down.



Do not tie so that the animal is in an uncomfortable position, if nervous, someone grooming can help occupy their mind:



We have to make sure we "keep the shape" of the hoof when filing.



Miniature donkeys are intelligent creatures that learn and cooperate wonderfully, given the opportunity to do so. The hardest thing is your sore back afterwards, because you have bend over so far!

My suggestion about hoof trimming with an uncooperative donkey is, take your time, let them learn what you are asking and they will happily comply.

Learning new things takes time, practice and patience. Begin simply by cleaning each hoof out, even while in the field, on a daily basis.



Figures 75, 76, 77, 78, 79, 80, 81, 82, & 83. DIYdiva (2010) Miniature Donkey Hoof trimming procedure, at Black Feather Farm [Photographs] Accessed from <http://diydiva.net/>

Many are happy to haul off manure for free and use it in their garden. Along with manure and heat, flies seem to come. Fly Predators are absolutely the most wonderful natural bugs for controlling fly population. I would never be without these every spring/summer.



Figure 84. Connie Bonczek (2013) Large pasture with shade trees [Photograph]

Basically you need enough pasture for the mini's to run and play. Pasture grass is good for donkeys, providing it is not too rich in protein.

Fencing is meant to keep your donkeys safely enclosed. Also to keep out unwanted predators, this often can be a dog. A four foot fence is adequate for a miniature donkey. However for jacks, I preferred the non-climb 5' horse fence. Keep all gates secured with clips, remember donkeys are very intelligent.

Mini's also love toys! Orange road cones, jolly balls, hose with end removed, beach balls, empty feed pans, etc. all are enjoyed by donkeys. It is quite enjoyable to watch them play.

A pile of shavings or sawdust is also a favorite; they will push it around with their nose, and then happily roll in it many times over. A pile of dirt in the pasture will often start the game of 'king of the hill'!



Figure 85. Ugly Dogs Farm (2011) Miniature spotted donkey playing "King of the hill" [Photograph] Accessed from <http://uglydogsfarm.blogspot.com.es>

4.7. CONFORMATION

The overall appearance of a miniature donkey is of a small, compact, well-proportioned animal. Proportion means that each body part is proportionate to every other body part, i.e. Head is not too large for body, neck is not too long for head, and length of body is not too long. They should be well balanced when viewed in thirds. There are two body types- refined and drafty/stocky. Drafty appears as heavier boned, wide rump, thicker neck and legs. Refined appears as lighter boned and not as thick as the drafty type.

A shorter head is preferred to a longer one. The Donkey should have a broad forehead and width between the eyes. The muzzle should taper with firm, even lips and large, open nostrils. The profile should be straight or slightly dished. Ears are preferred long, but in proportion to the head, parallel, set upright and carried alertly.

Teeth should meet right on. A slight underbite or overbite is often acceptable to some breeders, providing it does not exceed 1/8". Any bite that over 1/4" is considered severe. Severe overbite is called 'parrot mouth' while severe underbite is called 'monkey mouth'. Bad bites are inherited so

animals with these defects should not be bred.

Mini's are naturally slightly cow-hocked because they are a draft animal and descendants of draft animals. Cow-hocks are common in draft animals used for work. It helps pull a load because they can more easily get their feet under them to aid in pulling. A miniature donkey's legs should be straight to only slightly cow-hocked. Severe cow-hocks are a conformation fault. When viewed from the front, legs should not be knock-kneed or bowed. Hooves should not be facing away from the donkey or underneath him or her. All 4 hooves should face directly forward and legs should be straight.

They should have good width between their front legs as well as their back legs. Lack of width is referred to as "close" in front and/or back, and is viewed as a conformation fault. Rump should appear full and round when viewed from the top.

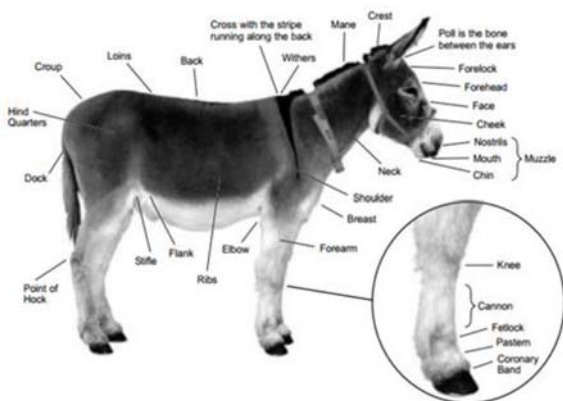


Figure 86. *The Donkey Sanctuary* (2012) *Miniature Donkey Body Parts* [Photograph] Accessed from <http://thedonkeyarchives.blogspot.com.es>

4.8. BREEDING AND REPRODUCTIVE BEHAVIOR

A jack is half of every foal produced at your farm. Therefore, the jack should be exceptional in all ways. Conformation should be excellent, bite should be right on and

temperament should be stellar. He should be smaller than the jennies, to help eliminate birthing problems. A jack pursues a jennet in estrus, sometimes very aggressively, and especially when first introduced. He may bite the neck, back, and hind legs and even draw blood. As a consequence, some jacks have to wear a breeding muzzle to avoid injury to the jennet. It is easy to teach most jacks to mount without biting the jennet. It is beneficial to take the time and train your jack while growing up. Living with adult jennets can be a great life lesson for an upcoming future herd sire.

The estrus cycle length in jennets is 21-28 days, with the jennet sexually receptive for 5-10 days of this period. They should not be bred until 3 years of age when they are physically mature. Heat cycles start at approximately 8-12 months of age, so they should be housed separately from jacks. Female receptivity to a jack is evidenced by the jennet backing up to the jack and making jawing motions with the mouth.

Some jennets in estrus will kick a jack in the chest for several minutes when receptive. This behavior is required for some jacks to achieve full erection. Receptive jennets also squat, wink the vulva, and urinate in the presence of the jack. A receptive jennet may also raise her tail when approached by a jack. Jennets mount each other on occasion, with the estrus jennet on the bottom. Some jennets do not show receptivity when there is no jack present, when nursing a foal, or when another female interferes with the advances of the jack.

There is nothing more precious than a miniature donkey foal. Some farms prefer their jennets to be stalled and have a camera set up so they are able to watch for signs of foaling and be there to assist should the need arrive. Other farms allow them to foal out in the pasture (certainly would not be my choice). They normally have a foal within 20

minutes of contractions starting, providing it is positioned correctly with front feet and head first. There are times when a vet must reposition a foal in order for it to be delivered naturally.

Foals are up fairly quick and normally nursing within 30-60 minutes of birth. Once in a while a few first time moms want no one near their foals and will do everything they can to keep you away. They may resort to kicking at you. Provided the mom does not mind your presence, be sure to spend time with baby, imprinting him/her on a daily basis. A foal will soon run to greet you when you enter the pasture/barn area. They love to be pet and hugged and are absolutely so amusing to watch speed racing around the fields, bucking and kicking in the air. Once again I say, there is nothing more precious than a miniature donkey foal!



Figures 87 & 88. Connie Bonczek (2013) (Figure 87) Jennie and her foal & (Figure 88) Ivory foal sleeping watchful mom [Photographs].

CURIOUS FACTS

“A book is a mirror: If an ass peers into it, you can’t expect an apostle to look out.”

*Georg Christoph Lichtenberg, eighteenth-century
German scientist.*

5. OTHER BREEDS

The American Donkey and Mule Society does have a registry that classifies animals by size. Aside from the miniature and Mammoth categories are small standard or standard, for animals 91 to 122 cm high, and large standard from 122 to 137 cm. These categories are strictly a size descriptor, with no implication of an isolated genetic pool.

Many of the donkeys that are registered in the Standard and Large Standard classes have roots in local or feral donkeys from western states. These originated in donkeys brought early in the Spanish conquest of the area, but have become free-ranging with little management or selection. To some extent this is changing, with more breeders selecting donkeys for conformation, temperament, and ability.

The isolation of several of the feral populations of donkeys would imply that changes consistent with breed formation might have occurred, but these have never been documented. In the USA most donkeys are basically just considered donkeys, with little or no attempt to sort through these by specific location of origin.

A final attempt at breed development is the American Council of Spotted Asses. This is a registry for donkeys with white spotting. It seems, at this point, that only a single genetic pattern of white spotting occurs in donkeys. The pattern is quite variable, and appears to be due to a dominant gene that is lethal to homozygotes. As a result it is impossible to generate an entirely pure-breeding population of spotted animals. Spot to spot matings will always produce some solid colored animals, and spot to solid matings will always produce some spots.

The spotting is not limited to any specific size class or subpopulation of donkeys. Some few Mammoths are spotted, and many Miniatures. The Standard and Large

Standard donkeys also occasionally have spotting.

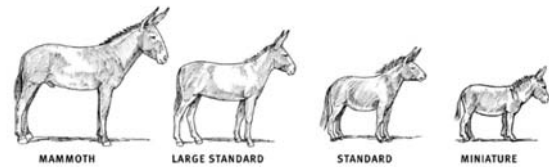


Figure 89. Sue Weaver (2008) American former Donkeys Breeds [Illustration]

CURIOUS FACTS

STANDARD DONKEY

Small standard donkeys stand 9 to 12 hands (36 to 48 inches, 91 to 122 cm) at the withers, large standard donkeys stand from over 12 to 13.2 hands (48 to 54 inches, 122 to 137 cm) for jennies, and over 12 to 14 hands (48 to 56 inches, 122 to 142 cm) for jacks and geldings. They are commonly measured in inches alone, rather than in hands.



Figure 90. Creciendo con un Negocio (2014) Standard Donkey [Photograph] Accessed from <http://www.creciendocontunegocio.celeris.cl>

SPOTTED ASS

A spotted ass is any kind of donkey that has a spotted coat. To be registered with the American Council of Spotted Asses, the animal must have at least two spots behind the throatlatch and above the legs.



Figure 91. *TodaysPhoto.org* (2006) *Spotted Donkey*
[Photograph] Accessed from <http://www.todaysphoto.org>

6. CONCLUSIONS & FUTURE DIRECTIONS

The future of donkey breeding in the US is difficult to predict. The miniature donkey is likely to increase in popularity as more Americans seek a rural, as opposed to urban, lifestyle. The American Mammoth Jackstock numbers are likely to increase, after a steep decline with the mechanization of farming in the early 1900's made the Mammoth jack's role as a mule sire unnecessary. However, with renewed appreciation for the versatile mule in the US, and the increased use of Mammoths as riding and driving animals, the breed numbers may increase slightly, but it will never be considered a "common" breed due to lack of individuals to begin with.

CURIOUS FACTS

MINIATURE DONKEY DWARFISM

Treatment and Health Concerns for Dwarf Equines

Facial:

Dental abnormalities are common in Chondroplasia-like dwarfism (ACAN) dwarfs. Undershot jaws and crowded teeth often occur in ACAN dwarves.

Facial surgery could be performed to allow an affected donkey to breath better.

Dental abnormalities are rarer in Skeletal Atavism Dwarfism (SA) and Friesian dwarfs due to their heads mainly being unaffected by their form of the disorder.

Legs and Farriery: Premature and severe arthritis are common in all forms. Dwarfs of any type with severe leg issues may require corrective surgery or special shoes/braces to walk comfortably. Some dwarfs' legs will continue worsening over time, and leg joints may fuse.

Internal Organs:

Colic is a constant risk for dwarfs due to certain types having restricted body cavities and normal sized internal organs. Colic is more common in ACAN and Friesian dwarfs.

Skeletal Atavism equids are likely at less risk of internal issues due to their main body cavities being normal sized. But there are no statistics on this.

Mental Health:

Some dwarf equids have mental retardation due to their disorder. The malformation of the cranium can affect mental development. Some dwarfs may also suffer from depression due to their condition and constant pain.

Life Expectancies:

Viable dwarfs can survive anywhere from a few hours to a few years. Much of this depends on severity of dwarfism and care. Severe dwarfs appear to average a few years or less. Mildly expressed dwarfs could live into double digits.

Dwarfs, in general, have shorter life expectancies than non-dwarf equids. Due to multiple physical abnormalities, these alone greatly increase risk of premature mortality. For many dwarfs euthanasia is often performed once quality of life is affected, or quality of long term care cannot be provided.

Dwarfs possessing D1/D() or D4/D4 are naturally aborted early. These equids never survive outside the womb. Other dwarfs can be aborted early even if their gene combination is viable. Others are stillborn for either unknown reasons, or complications during birth. They are at higher risk for these problems.

Dwarf Friesians often live much shorter lives than non-dwarves or even miniature equids dwarves. Many dwarf Friesians only survive a few years. For perspective, the longest-lived dwarf Friesian, Silhouette, survived to be 14 years old. The second longest-lived dwarf Friesian was less than half that age and died at 6. Many others are humanely euthanized due to their condition right after birth.

Identifying Dwarf Donkey Foals

-Dwarf donkeys will generally be smaller.

-As they mature their proportions will not even out. Head-to-leg ratio should be taken to determine disproportion status.

Dwarfism is a genetic disorder that causes abnormally smaller stature in an individual of a species. This can refer to overall reduced stature, or reduced stature in specific body parts. Equine dwarfism is most prevalent in American Miniature Horses. It more rarely occurs in Friesians, Welsh, and donkeys.

Miniaturization vs Dwarfism

•Miniaturization

- Naturally small size.
- Gradually bred for over many generations from normal sized donkeys.
- Attempts to keep miniatures in proportion.
- Not a genetic defect.

•Dwarfism

- Genetic defect that causes reduced growth of body parts and disproportionate bodies in equines.
- Causes health disorders.
- Inheritable recessive trait.
- Multiple mutations can cause various forms.

Miniature Donkey Dwarfism

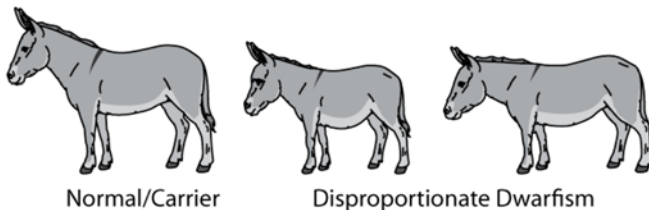


Figure 92. Threnody (2010) Miniature Donkey Dwarfism [Illustration] Accessed from <http://www.horsegroomingsupplies.com/>

Dwarfism Inheritance

-Breeding and research has shown that all known forms of dwarfism in equines are recessive. Some are lethal.

-It takes 2 dwarf alleles, one from the jackstock and one from the jenny, to have a dwarf foal.

-Parents can be normal or be dwarves themselves.

-It was once thought to be only inherited through the sire, this is not the case as both a mare and stallion can pass on the genes for dwarfism.

-Donkey dwarfism is not as common as the other types. There is limited information available on the subject because of this.

-Dwarf donkeys are identified through their disproportionate bodies. Donkey registries look at the head to leg length ratio to help determine if a donkey is disproportionate. If they have a more extreme head to leg length ratio, they are considered more than likely to be dwarfs.

-Dwarf donkeys have shown up in two types. One that resembles Chondroplasia-like dwarfism (ACAN) with short compacted bodies, leg anomalies, and domed heads with underbites and facial deformities. And another resembles skeletal atavism with shortened upper limbs.

Given these physical expressions, it is likely that they occur on the same gene locations as dwarfism found in miniature horses. The short leg dwarfism is the most common with the one resembling ACAN dwarfism appearing much more rarely.

Dwarf donkeys often have short necks, high croups, short legs, large misaligned jaws, and pot bellies.

Affected Breeds: Only Sicilian (miniature) donkeys are known to have dwarfism occurring. Grade donkeys of mixed backgrounds are also at risk.

Breeding and Dwarfism

When breeding for smaller size, dwarfism will inevitably be selected. Dwarf breeds of dog, cattle, and others have shown that when breeding smaller size, mutations for dwarfism are more likely to occur. As hormones and genes combine to create smaller animals, these are more likely to allow mutation. This is similar to how selecting for more docile personalities in animals increase the chance of white patterns mutating. Careful genetic research and responsible breeding reduce the spread of dwarfism disorders within a population.

Gelding stallions and retiring mares from breeding if they produce a dwarf offspring is considered a good practice.

- Since dwarfism is recessive both parents are carriers.
- Dwarf equines should not be bred-because they will only create more carriers or more dwarf offspring.
 - Dwarf stallions should be gelded.
 - Dwarf jennies should be spayed and/or kept away from stallions.
- Dwarf pregnancies not only carry on the dwarf gene, but can physically be dangerous for a dwarf dam and her possible offspring. Constricted body cavities prevent proper room for both internal organs and a foal.
 - Even non-dwarf jennies can potentially sustain trauma from birthing a dwarf foal, resulting in injury and/or death. This is due to some dwarf foals having odd proportions that can cause complications during birth.

Irresponsible breeding can result in high mortality rates, foals needing expensive surgery or needing to be humanely put down.

Dwarf x Non Dwarf: Dwarfs bred to Non-carriers will always produce phenotypically normal offspring. However, all of these offspring are guaranteed carriers who can further spread dwarfism.

Carrier x Carrier: The problem with carriers is that when they are bred to other carriers, they have a 25% chance of producing a dwarf, and a 50% chance of creating more carriers like themselves. There is only a 1 in 4 chance of having a normal non-carrier foal, so the dwarfism allele is spread within their offspring 75% of the time.

- Although there is no surefire way to visually determine dwarfism carriers from non-carriers, some have noticed that miniature horses who are Skeletal Atavism carriers tend to have more "horse-like" heads. Others have noticed smaller ears are also present in their carrier stock. Although a correlation, horses with these head and ear types are not guaranteed carriers. Nor are those lacking these traits guaranteed to be non-carriers. *Correlation does not equal causation. *More information on the structure of carriers must be obtained to draw any clear conclusions, though determining possibilities is a first step.
- Skeletal Atavism horses have been found carrying the ACAN mutation D2 (D2/N Sa/Sa) They could likely carry other heterozygous ACAN mutations and still be viable.
- Horses who carry one copy of ACAN and one copy of Skeletal Atavism have been found by breeders and appear normal.
- Horses homozygous for both ACAN Dwarfism and Skeletal Atavism (D/D Sa/Sa) are unknown. It is possible that this combination is non-viable.

Miniature Horse and Donkey Dwarfism (Dwarf Mules)

If the genes for miniature horse dwarfism and donkey dwarfism are on the same gene locus, they can interact together to create mini mules with dwarfism. It is a rare occurrence since mini mules aren't often bred for, and dwarfism occurs more rarely in the donkey parents of mini mule combinations. If donkeys also possess a dwarfism mutation on ACAN, it may also create ACAN dwarf mini mules.

Several years ago, The American Donkey & Mule Society put out this form in the registration booklets, it also appeared in THE BRAYER magazine.

We are trying to gather some data that will help us determine the average proportions of bone length and height in the Miniature Donkey. We hope that this research will give us a way to devise a way to determine Dwarfism in the Miniature with the use of measurements.

As we have published in past issues of the BRAYER magazine, the most commonly seen traits of dwarfism are extremely short forelegs, long backs, and large heads. However, these traits may not be clearly defined in all animals. If we have an average curve, with an inside and outside limit, we might be able to better label animals suspected of having dwarf characteristics.

Please send this completed form to:

The American Donkey and Mule Society: Dwarf Research

Animal's name: _____
Registration # _____
Sex _____ Age _____
Color _____

Measurements:

1. Height _____
2. Ground to fetlock _____
3. Fetlock to knee _____
4. Knee to elbow _____
5. Elbow to wither _____
6. Back _____
7. Neck _____
8. Head _____

Any other notes (such as average height of offspring)



Figure 93. Threnody (2010) A mini mule expressing skeletal atavism. This means that skeletal atavism in minis and at least one form of dwarfism in donkeys are on the same locus and can interact [Photograph] Accessed from <http://www.horsegroomingsupplie.com/>

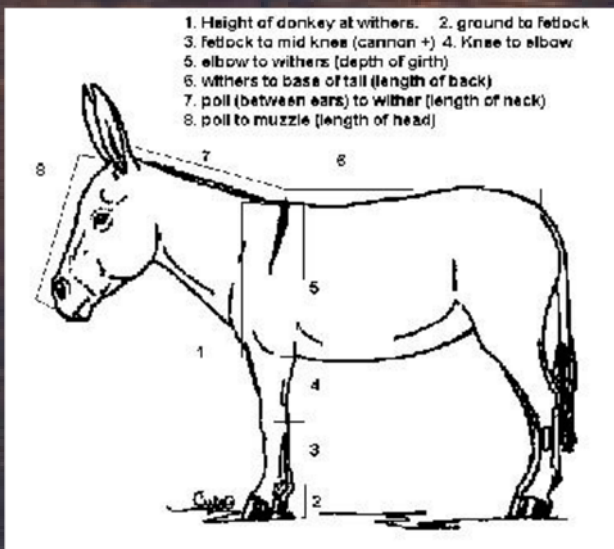
The information was used to gather a set of statistics on the average measurements of the head, body length, leg length of miniature donkeys, and how these measurements corresponded to one another.

The goal of gathering this information was to compare the head-to leg, leg-to-height, and back-to-height ratios of miniature donkeys. Working with numbers gathered in the 1970's by Willoughby for his "Empire of Equus" book, it was possible to formulate the average numbers for horse types (he measured numerous horses of several breeds, and came out with averages for proportion) as compared to what we were seeing for Miniature Donkeys. If we could find an average (matched visually by photos and measurements) then we would also be able to see which animals (again, by photo ID and then verified by measurements) fell outside the average. If the animals outside the average in measurements also visually showed large heads and short legs, we would have some data to go on in isolating dwarfism. Owners sent quite a bit of material to work from.

The ADMS worked from the numbers gathered, and found the measurement we felt indicated immediate dwarf tendencies, the head to leg ratio, was between 0.75 (head to leg length of 1.0) and 8.5 to be in the "normal" range. The average ratio was 0.799, the head being 80% of a unit of 100, as compared to the length of the leg. at unit 100. Animals with a leg length of 0.95 or greater (up to 1.15) indicated dwarfism in visual reference.

Willoughby indicated in his research that given a standard height unit of "100.0", the legs were 59.8, head 39.1 % of 100 in the Arabian horse, all the way to 57.2 leg length, 42.4 (head length) (from the base 100) in the Draft Horse. Converting these numbers into the same formula we used for donkeys, Arabian horses head-leg ratio was 0.653, Thoroughbred horses were 0.692, Shetland (British) ponies 0.755, Draft horses (European/Heavy) 0.741, Przewalski horse 0.791, Onager/Kulan 0.722, Standard Domestic Donkey 0.764, Grevy's zebra 0.798.

Therefore we are seeing Miniature donkeys with larger heads than even a zebra or draft horse, when compared to their leg-length ratios.



Figures 94 & 95. American Donkey & Mule Society (2014) (Figure 94) Miniature Donkey Dwarfism Measure Scheme & (Figure 95) Romeo, Dwarf Donkey [Photograph & Illustration] Accessed from <http://www.lovelongears.com>

The last USDA census of donkeys and mules conducted in 2007 put donkey and mule numbers in the US at 280,000. A new census has been conducted, but the numbers have not been compiled as of this writing.

Donkeys of all sizes and breeds in the US are becoming more popular as American equine aficionados are learning of the outstanding attributes the donkey calls his own: intelligence; kindness; compliancy and heart.



Figures 96, 97 & 98. (Figure 96) NM Pinto Horse Club, (Figure 97) Marion van Dijk & (Figure 98) Javier Carrillo (2012) (Figure 96) Mammoth Jackstock smelling Miniature Mediterranean Donkey, (Figure 97) Coyote Lane Miz Berta with Bryan Clausen and Peter van Dijk with Clovercrest Sorrento & (Figure 98) American Spotted Mammoth Jackstock at Bar Z Ranch in Texas (USA) [Photographs] Accessed from (Figure 96) www.youtube.com/, (Figure 97) <http://www.mammoth-donkey.co.nz/> & (Figure 98) <http://www.criaderolasislas.com/>

7. SPECIAL MENTION

All letter transcriptions are from Papers of George Washington, University of Virginia, accessed at [<http://www.virginia.edu>].

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Chapter 12

Donkey Husbandry and Production Systems

Félix Meutchieye, Nfor Napoleon Kwalar y Rose Armelle
Florence Nyock

This chapter shall discuss elements of donkey production systems including, husbandry and management systems, breeding, veterinary care and welfare concerns as well as a global perspective on some existing parameters and monitoring variables in domestication/conservation and genetic resources of the donkey. We will also look at constraints in production and how this can be improved and sustained.

1. INTRODUCTION

Donkeys or asses belong to the equine family and today's number is over 44 million, mostly in developing countries (Bougler *et al.*, 2005). Mules being crosses between a male donkey (jack) and a female horse (mare) are around 15 million. Donkeys have been domesticated for over 4000 years essentially for packing, carting or tillage. They have a life expectancy of 9-13 years (depending on the area they live); they display various coat colors and body sizes. A very sturdy and tolerant animal, morphological deviation in body size and coat color patterns in varying ecologies may be related to functional adaptation of a given population to prevailing ecological variables and biophysical resources (Starkey *et al.*, 1997). Donkeys are found in various ecologic zones around the world but not much attention has been focused on them despite their important role in the socio-economic life of many small holder agricultural systems and their families. The draughtability of donkeys is better than other draught animals. Donkeys are an undervalued power source in a large part of the world (Oudman, 2002).



Figure 1. itan14 (2014) A donkey in a pasture [Photograph] Accessed from <http://1x.com/>

2. WHY DONKEY PRODUCTION?

Although the donkey have been given a derogatory and low profile role in modern society usually associated with the poor and disadvantaged communities, it has played a long standing role as a means of transport and draft by its load carrying abilities, obedience, low cost input and functional adaptation to various ecological zones and resistant to many diseases plaguing livestock in the world (Oudman, 2002; Bougler et al., 2005). There has been a steady increase in donkey populations despite very minimal investment in its production, research and management. As traction animals, donkeys demonstrate a high level of resilience compared to oxens. They are easily trained and have shown amenability with the women folk in farm work and the movements of farm produce in many countries in Asia, Latin America and Africa. In many African countries, poorer women believe that donkey-traction and transport would suit their needs, and they are anxious for related credit and training (IFAD/FAO/Government of Japan, 1998). Donkey distribution or rather higher concentration is overlapping with “undeveloped” areas of the world as showed in the table 1 below.

CONTINENTS	DONKEY POPULATION
Asia	14,885,000
Africa	9,639,000
South America and The Caribbean	8,164,000
Middle East	9,220,000
Europe	1,512,000
North America	52,000
TOTAL	43,552,000

Table 1. Bougler et al., (2005) World distribution of donkey population [Table]

CURIOUS FACTS

ANCIENT EGYPT HIGH DONKEY PRODUCTION SYSTEMS

The domestication of donkeys served to increase the mobility of pastoral cultures, having the advantage over ruminants of not needing time to chew their cud, and was vital in the development of long-distance trade across Egypt. In the Dynasty IV era of Egypt, between 2675 and 2565 BC, wealthy members of society were known to own over 1,000 donkeys, employed in agriculture, as dairy and meat animals and as pack animals. By the end of the fourth millennium BC, the donkey had spread to Southwest Asia, and the main breeding center had shifted to Mesopotamia by 1800 BC. The breeding of large, white riding asses made Damascus famous; while Syrian breeders developed at least three other breeds, including one preferred by women for its easy gait. The Muscat or Yemen ass was developed in Arabia. By the second millennium BC, the donkey was brought to Europe, possibly at the same time as viticulture was introduced, as the donkey is associated with the Syrian god of wine, Dionysus. Greeks spread both of these to many of their colonies, including those in what are now Italy, France and Spain; Romans dispersed them throughout their empire.



Figure 2. Frank M. Rafik (2008) Wall fragment from a Tomb Depicting Egyptian Donkeys. Old Kingdom 5th Dynasty. 2524-2400 BCE Limestone [Photograph] <http://www.flickr.com/>

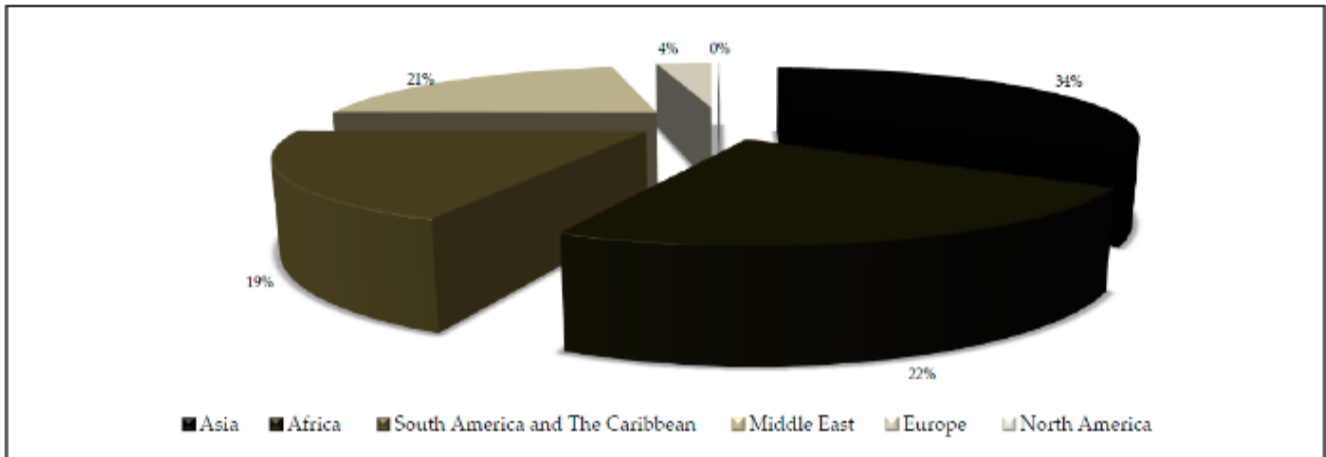


Figure 4. Bougler et al., (2005) World distribution of donkey population [Graphic]



Figure 3. The American Colony in Quds (Jerusalem) (1898) Arab Peasant plowing a Rocky Field with an ox and donkey yoked together. Curiously in the Bible, in the book of Deuteronomy 22:10, it can be read "You shall not plow with an ox and a donkey together." [Photograph] Accessed from <http://www.azerbaijanrugs.com>

In pastoral communities donkeys are a vital agent in transport and the delivery of goods and services providing daily water and fuel wood for family consumption. During transhumance donkeys help in transporting family goods from the hills to the valleys.

Donkeys are important for many farm families across Africa in the movement of farm producers to homes and markets (Oudman, 2002). This way, donkeys reduce the burden of heading load transport and make women save the time they spend in search of food and water. They assist small traders in the transportation of their wares to nearby markets for sale especially in landlocked areas or during periods when roads are bad for vehicular transport.

The high cost of transportation and limited number of load charge vehicles makes donkey transport the only available means for these small traders. On the Hydra Saronic Island, because cars are outlawed, donkeys and mules form virtually the sole method of heavy goods transport. Donkeys bring supplies through the jungle to camp outpost in Tayrona National Natural Park in northern Colombia. Donkeys have also played historical roles in warfare providing means of personnel, food and water transporting to soldiers at the war front and also evacuating wounded or sick soldiers for medical attention. More than 85 citations implicating donkeys are found in the Bible and rock art depicts thousands of them reflecting the very ancient use of donkeys.

Despite the fact that there may only exist oral sources, donkeys played a crucial role in commerce and communication in people from very different backgrounds. For instance, it is well known and accepted that in the Nso clan of Cameroon western highlands, donkeys or *Jaiki* (*lamnso*, native tongue) were the main agents of kola nut¹ trade between Southern Cameroon and Nigeria. On their return the owners bought dresses for sale back in Cameroon.

A lot of landrace populations of donkeys have survived and some even turned wild in

¹The kola nut is the fruit of the kola tree, a genus (*Cola*) of trees that is native to the tropical rainforests of Africa. The caffeine-containing fruit of the tree is used as a flavouring ingredient in beverages, and is the origin of the term "cola".

small herds in this mountainous and moist region.



Figure 5. Jason Florio (2013) Kola nut vendor, Labé market. Fouta Djallon Highlands, Guinea-Conakry [Photograph] Accessed from www.rivergambiaexpedition.com

Marshall & Weissbrod (2011) identified the main reasons behind donkey domestication. Donkeys were not regarded as food. They were considered women's animals, important for transport but without the symbolic status of cattle till very recent in some southern countries (Oudman, 2002).

The consumption of donkey meat and milk is increasing in both developing and less developed countries although the donkey is not considered in many countries of the world as a food animal.

In Nigeria because of taboos and traditional mythologies associated with donkeys and its products, illegal trades still continue between Northern and Southern Nigeria with increasing demands for donkey meat. Italy is the highest consumer of Donkey meat in Europe.

In the native land of donkeys (Kenya, Somalia and Ethiopia), donkey meat consumption is more or less tolerated, depending on the cultural background (see Book 2, Chapters 1 to 6).



Figuras 6, 7 & 8. (Figure 6) Didier Ruef & (Figuras 7 & 8) Félix Meutchieye (2004- 2014) (Figure 6) Mauritania women ride donkeys to travel through the Sahel desert in the southern part of the country. Donkeys have been used for centuries as working animals to transport goods and people and pull carts, (Figure 7) Donkeys carrying building materials in Ethiopia & (Figure 8) Donkey (hairy type) carrying fuel wood in Ethiopia [Photograph] Accessed from (Figure 6) <http://didieruef.photoshelter.com>.

Donkey milk is also gaining prominence and has been shown to have some bio-nutritional and extra-nutritional beneficial factors compared to cow and human milk. This could explain the high cost of donkey milk nearly five times more than the cost of cow milk in some European cities.

The therapeutic and nutritional value of donkey milk could be an important landmark development for improving donkey husbandry, production and valorization in the near future (see table 2, and figures 9 & 10).



Figures 9 & 10. (Figure 9) David Smith & (Figure 10) Amy McLean (2013) (Figure 9) Milking a donkey in Asia & (Figure 10) Donkey Milk bottles in a refrigerator [Photograph] Accessed from <http://www.tsln.com/>

SPECIES	FAT %	PROTEIN %	LACTOSE %	ASH %	TOTAL SOLIDS %
Antelope	1.3	6.9	4	1.3	25.2
Ass (donkey)	1.2	1.7	6.9	0.45	10.2
Bear, polar	31	10.2	0.5	1.2	42.9
Bison	1.7	4.8	5.7	0.96	13.2
Buffalo, Philippine	10.4	5.9	4.3	0.8	21.5
Camel	4.9	3.7	5.1	0.7	14.4
Cat	10.9	11.1	3.4	—	25.4
Cow:					
Ayrshire	4.1	3.6	4.7	0.7	13.1
Brown Swiss	4.0	3.6	5.0	0.7	13.3
Guernsey	5.0	3.8	4.9	0.7	14.4
Holstein	3.5	3.1	4.9	0.7	12.2
Jersey	5.5	3.9	4.9	0.7	15.0
Zebu	4.9	3.9	5.1	0.8	14.7
Deer	19.7	10.4	2.6	1.4	34.1
Dog	8.3	9.5	3.7	1.2	20.7
Dolphin	14.1	10.4	5.9	—	30.4
Elephant	15.1	4.9	3.4	0.76	26.9
Goat	3.5	3.1	4.6	0.79	12
Guinea Pig	3.9	8.1	3	0.82	15.8
Horse	1.6	2.7	6.1	0.51	11
Human	4.5	1.1	6.8	0.2	12.6
Kangaroo	2.1	6.2	Trace	1.2	9.5
Mink	8	7	6.9	0.7	22.6
Monkey	3.9	2.1	5.9	2.6	14.5
Opossum	6.1	9.2	3.2	1.6	24.5
Pig	8.2	5.8	4.8	0.63	19.9
Rabbit	12.2	10.4	1.8	2	26.4
Rat	14.8	11.3	2.9	1.5	31.7
Reindeer	22.5	10.3	2.5	1.4	36.7
Seal, gray	53.2	11.2	2.6	0.7	67.7
Sheep	5.3	5.5	4.6	0.9	16.3
Whale	34.8	13.6	1.8	1.6	51.2

Table 2. This table is adapted from course notes by Robert D. Bremel, University of Wisconsin and from Handbook of Milk Composition, by R. G. Jensen, Academic Press, (1995). Range of variation of chemical composition and pH values of different species milk [Table]

CURIOUS FACTS

DONKEY MILK PRODUCTION SYSTEM

Donkey milk is such a treasured commodity mainly due to the great care and effort that goes into its production. Milk begins to formulate in the jenny after it has given birth and for two months the little foals are fed with milk directly from their mothers' udders without any disruption from farm workers. Then, the mothers are temporarily separated from their foals and milked by hand every three hours. However, to be willing to give their milk, the mother donkeys must always have visual contact with their foals.

The storage volume of milk in a jenny's body is very small, so it must be milked regularly to collect a significant amount of milk, usually amounting to 1.5 litres per donkey per day. After the last milking of the day, the foals, which are fed by bottle throughout the day, return to their mothers for natural feeding. This process is repeated until the foal is 11 months old. All milking on the farm is done by hand, primarily because the use of electric milking machines would be traumatic to the donkeys. And in any case, the small amount of milk collected from these animals would make electric milking machines obsolete.

After each milking, the pure donkey milk is filtered without the use of chemical processing. Analyses carried out in collaboration with the «Centre d'Expertise de la qualite des Facultes de Gembloux» (The Quality Control Centre of Gembloux Academic Faculties) has certified the bacteriological stability of milk. This means that the donkey milk that is produced on the farm can be drunk without pasteurisation. The milk is then poured into 200 ml containers and frozen immediately in a minimum temperature of -18 ° C.

It is thereby preserved for consumption as a sweet and pleasant drink or for the manufacture of high-quality cosmetics. Farm units work according to European Union hygiene regulations and recommendations and is licensed by the Belgian Ministry of Health.



Figures 11, 12, 13 & 14. L'Anesse Cosmetics (2014) Donkey Milk Process & L'Anesse Logo [Photographs] Accessed from <http://lanesse.gr>

Increasing reports of mixing donkey meat with beef for commercial purposes have been reported in some countries. The work of Yman *et al.*, (1995) in differentiating horse meat from donkeys and their hybrids by electrophoretic separation of albumin can be a useful indicator in detecting tainted meat and meat products from the horses, donkeys, mules and hinnies.. Staining of th starch gel for carboxylesterase activity permits differentiation of most horses from donkeys while mules and hinnies cannot be distinguished from horses by their esterase activity alone.



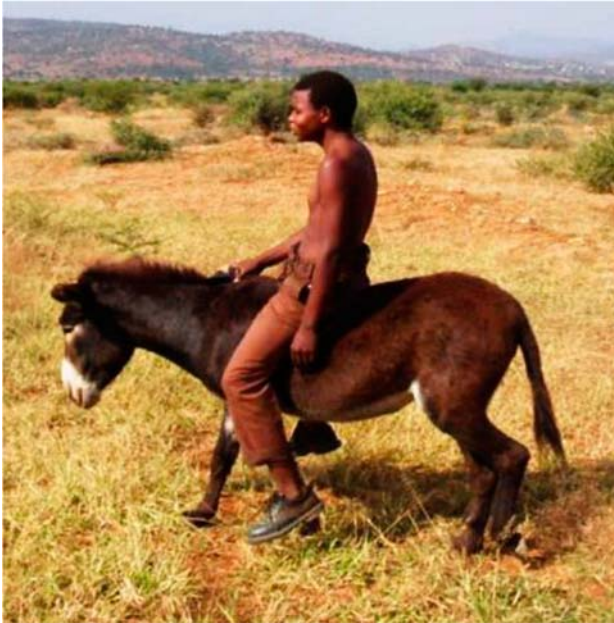
Figure 15. Coinsa SAC (2014) Donkey skin [Photograph]
Accessed from <http://johnmiami.e.tradeee.com/>

Donkey skin has been used in the production of parchment (see Book 2, Chapter 3). Donkey riding and donkey keeping for fun is a new trend in donkey husbandry, particularly in developed contexts (Oudman, 2002; Orhan *et al.*, 2012). Donkey riding and racing is becoming much popularized, both in developed and developing contexts in the world (see Chapter 28).



Figure 16. A&N Hides Trade Inn Co. Ltd (2014) At some Chinese buying and selling websites, it is possible to buy hand fleshed wet salted donkey skins from wholesalers. <<WET SALTED DONKEY HIDES. Hand flayed, many cuts, Hand fleshed and well-trimmed. Average weight: 4 to 8 kgs (average 5.5 kgs) (8.81-17.63lbs, average 12,12 lbs) size approx. 12 to 15 square feet (1.11m2-1.39m2) hair length min. 20 mm, selection/quality levels: 80% I(A), 20% II (B). Availability: 1 or 2 containers per month (1 x container = approx. 2000 to 2700 donkey hides) Price: Between US18.50 and US22 per hide Cost and Freight international port. Payment terms: 30% deposit and balance against copy of docs or by irrevocable letter of credit at sight>> [Photograph] Accessed from <http://kitairu.net/>





Figures 17, 18, 19, 20, 21, 22, 23, 24 and 25. (Figure 17 & 18) Orhan et al., (Figure 19) Ben Woods, (Figures 20 & 21) Alianthos Crete Horse Riding, (Figure 22) Digital Panoramics, (Figure 23) French Photographer & (Figures 24 & 25) Argonaftis Tours (2006-2009-2012-2013-2014) (Figures 17 & 18) Riding donkey in western and sub-Saharan regions, (Figure 19) Donkey beach rides training lessons, (Figures 20 & 21) Donkey Riding Farm. Alianthos Donkey Riding in Plakias, Crete, (Figure 22) Donkey rides panoramic, (Figure 23) Donkey Rides on the Beach at Les Sables-d'Olonne in Western France. Postcard Sent in 1913 & (Figures 24 & 25) Donkey Farm Kelokedara Paphos' donkey rides: In 1998 a donkey farm near the village of Kelokedara was created, where shelter and veterinary care would be provided for the Cyprus Donkey, which was on the verge of becoming an

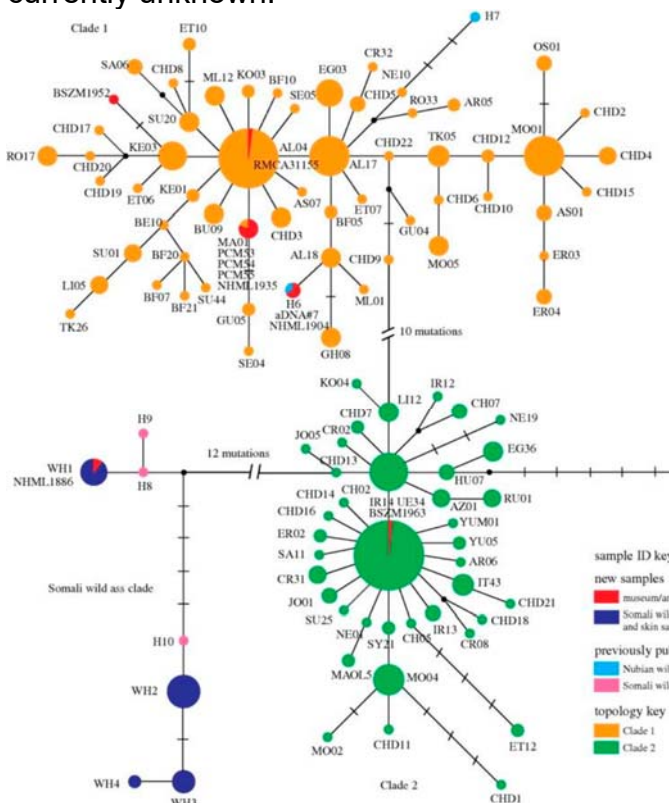
endangered breed. The aim of this farm was to create an exclusive and out of the ordinary excursion product, a way to bring this project into the public eye and make it available for adventurous tourists to enjoy. That enabled clients to see the donkeys in their own environment and to combine a meeting with real Cyprus countryside, original hospitality, extreme experience, fun, adventure, good food and unexpected entertainment [Photographs] Accessed from (Figure 19) www.edp24.co.uk/, (Figure 20 & 21) www.cretehorseriding.com/, (Figure 22) www.photo-digital.co.uk, (Figure 23) www.allposters.es & (Figures 24 & 25) www.argonafis.com/.

3. DONKEY BREEDING AND GENETIC VARIABILITY (SEE BOOK 1, CHAPTERS 1 & 11)

3.1. WHY DONKEY PRODUCTION?

Domestication of donkey has been extensively studied during the last decades (Rossel et al., 2008). It has long been suggested that ancient Egyptians domesticated the donkey (*Equus asinus*), although the Near East has also been considered a possible area of origin (Marshall and Weissbrod, 2011). Even in putative original domestication sites, many factors affect donkey spatial distribution (Kefen et al., 2011). Their genetic-diversity data in modern donkeys suggest two domestication events, both in northeastern Africa. Kimura et al.'s (2010) recent analysis of ancient DNA from the Nubian donkey (*Equus africanus africanus*) and the Somali wild ass (*Equus africanus somaliensis*) demonstrates that the Nubian wild ass was the ancestor of modern donkey Clade I but that the ancestor of donkeys of Clade II is currently unknown.

Figure 26. Kimura et al. (2010) Reduced median-joining network of 108 mtDNA haplotype sequences from domestic and wild asses. Coloured circles represent sampled haplotypes, while black dots represent hypothesized, unsampled haplotypes. Size of the circle is proportional to haplotype frequency and branch length is proportional to number of mutations. The 33 modern Somali wild ass specimens fell in the same clade as previous Somali wild ass specimens (WH1-4). This clade is well separated from the domestic donkey Clades 1 and 2 and is clearly not ancestral to either clade. Only four new haplotypes were found in the 33 specimens analysed and haplotype diversity of the Somali wild ass clade is only 0.7417 ± 0.0444 (compared with 0.9309 ± 0.0102 and 0.8212 ± 0.0268 for Clades 1 and 2, respectively), suggesting that the genetic variability in present-day Somali wild ass is low. The new haplotypes are found in both Eritrea and Ethiopia, and show no geographical structure. The single historic Somali specimen that was successfully amplified came from Berbera, Somalia. Collected around 1886, it showed a sequence identical to that of one of the new Somali wild ass haplogroups (WH1) from Eritrea and Ethiopia (figure 2 and electronic supplementary material, figure S2 and table S4). This result demonstrates a degree of historical continuity in the mitochondrial variability of Somali wild ass within the region over the last 120 years. The coalescence time of each clade was also calculated, i.e. the time to the most recent common ancestor (TMRCA), as follows: Clade 1: 406 000 years ago (95% confidence interval 105 400–811 300 years), Clade 2: 334 600 years ago (95% confidence interval 86 100–661 300 years), Somali wild ass clade: 359 500 years ago (95% confidence interval 57 600–770 800 years). Although there may be some uncertainty in the dates owing to time dependency, these dates clearly predate the domestication time for donkey of approximately 5000 years ago [Graphic].



The African Wild Ass, *Equus africanus* is adapted to marginal desert lands. Wild donkeys in dry areas are solitary and do not form harems. Each adult donkey establishes a home range; breeding over a large area may be dominated by one jack. Orlando et al., (2009) suggest current evolution in donkeys is still ongoing.

Donkeys generally prefer less dense bushes or sparse vegetation interspersed with shrubs. Donkeys are ungulates with efficient browsing and grazing abilities. They can trot, gallop, jump, canter, stampede and swim. Their slender bodies make them good trotters and carriers of load. Feral domestic donkeys studied in Arizona had a mean annual home range of 19.2 km². The African wild Ass has a territorial coverage of about 23 km² (Kingel, 1990).

The typical grazing pattern starts from the dawn till late morning and again in late afternoon, resting during the heat of the day (Nowak, 1999). Donkeys are very tolerant to high temperatures and can quickly adjust to extreme temperatures by raising its body temperature by as much as 6.5 degrees centigrade (Moehlman, 1988) to achieve a thermo-cooling effect. Donkeys at rest can use panting as a thermoregulatory mechanism to maintain heat balance. Respiratory rates can increase from 24 (cool environment) to 72 (hot environment) breaths per minute (Mueller et al, 1996).

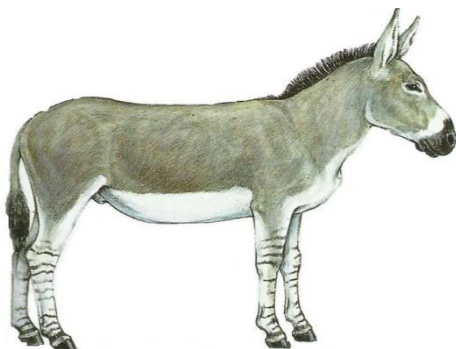


Figure 27. Kingdon (1997) Typical wild donkey in eastern Kenya savannah [Illustration].



Figures 28, 29 & 30. (Figures 28 & 29) Oona Räisänen & IUCN (International Union for Conservation of Nature) based on Moehlman, P.D., Yohannes, H., Teclai, R. & Kebede, F. (2008) & (Figure 30) iLyke (2010) (Figures 28 & 29) Geographic distribution of the African Wild Ass (*Equus africanus*). Legend (red - extant, maroon - possibly extinct) & African Wild Ass Conservation Status: Critically Endangered (according to IUCN 3.1) (Figure 30) African wild ass [Map, Graphic & Photographs] Accessed from (Figures 28 & 29) <http://en.wikipedia.org> & (Figure 30) <http://www.ilyke.net>

Many donkey breeds may be associated with different ecologic and environmental conditions. Donkeys have shown a wide range of adaptations under different environmental and climatic conditions. Two main types of donkey are worldwide recognized: the common African donkey (with a variety of coat colors and a typical

stripe on the shoulder), less heavier than the Poitou donkey, generally dark brown, long haired and stouter animal, dedicated to temperate environment and used for centuries to produce mules.



Figures 31, 32 & 33. (Figure 31) Webmaster FEI & (Figures 32 & 33) A.J. Haverkamp (2010) (Figure 31) Baudet de Poitou's Eye at the Mulhouse Zoological and Botanical Park, in Alsace, France, (Figure 32) Baudet de Poitou jenny and foal eating from a trough & (Figure 33) Baudet de Poitou Jackstock [Photographs] Accessed from (Figure 31) <http://www.fond-ecran-image.com/> & (Figures 32 & 33) <http://www.flickrriver.com/>

3.2. BREEDS/BREEDING AND GENE FLOW IN DONKEYS



Figures 34, 35 & 36. (Figure 34) Roger Brown, (Figure 35) Robin Alasdair Frederick Hutton & (Figure 36) Charles Roffey (2005-2011) (Figure 34) Cousin Thabo visiting the country, Botswana (Africa), (Figure 35) Woman looking after the cattle and donkey herds in Eastern Kenya & (Figure 36) Himbas taking the donkeys home [Photographs] Accessed from (Figure 34) <http://artofthewildrogerbrown.blogspot.com.es> & (Figures 35 & 36) <http://www.flickr.com/>

There are over 189 donkey breeds in the world as listed by The Domestic Animal Diversity Information System (DAD-IS) of the FAO in June 2011. These breeds vary in body weights and sizes ranging from 80

to 480 kg and heights at withers measuring from 75 cm to 160 cm. Some of the breeds worth mentioning include the *Abkhazskaya* or Abyssinian donkey (Ethiopia), American mammoth Jack (derived from selective crossings of the Malteses, Poitou, Majorcan, Andalusian and Catalonian breeds), the Poitou ass (bred for the production of Mules) and Âne de Provence (France), Âne du Miankala (Mali), Asino dell'Asinara (Italy), Criollo (Cuba), Asno Americano (Chile), Asno Andaluz or Andalusian donkey (Spain), Barockesel referred to as the Austrian-Hungarian White Donkey, Biyang (China), Black (Jordan), Dongolawl (Sudan), Tswana (Botswana), Hassawi (Egypt), Bourik (Haiti), Burro Kentucky (Honduras, El Salvador, Brazil). Many of these breeds have witnessed cross-cutting ecological adaptations over time. Figure 4 and table 3 display the common facts about donkey breeds and features.



Figure 37. Sambraus HH (1992) Standard "African type" Donkey [Photograph] Accessed from <http://medical-dictionary.thefreedictionary.com>

REGION	POPULATION (%)	BREEDS
Africa	26.9	26
Asia Pacific	37.6	32
Europe and The Caucasus	3.7	51
Latin America & The Caribbean	19.9	24
Near and Middle East	11.8	47
North America	0.1	5
World	41 million head	185

Table 3. Kugler et al., (2008) Population sizes and breeds number per región in the world in 2006.

According Marshall & Weissbrod (2011), the dynamics of wild ass mating systems, based on short life associations that occur when females move through male territories, influence donkey breeding in the domesticated environment. Maasai women stressed their concern with the aggressive behavior of jacks during mating. Even when they wanted to keep a female from breeding with an especially aggressive jack, women said that they found it impossible to keep the male away. They also noted that estrus Jennies might go astray without warning in search of males. They are often lost this way, and a number of cases in which wandering females has been documented, as well as males, were cared over a long term by women in distant settlements.



Figures 38 y 39. (Figure 38) Nigel Pavitt & (Figure 39) Tom Stoddart/Getty Images (2004) (Figure 38) Namibia, Kaokoland. An old Himba woman, upright despite her years, rides her donkey through harsh land where mid-day temperatures rise to 40°C (104°F). Her body gleams from a mixture of red ochre, butterfat and herbs. Her hair is styled in the traditional Himba way & (Figure 39) A Maasai woman with her young children in the Malambo district of Ngorongoro. The region of Ngorongoro in Tanzania is one of Africa's most popular tourist destinations. It is famous for its ancient crater and dense population of big game. It is also home to the Maasai, Africa's most recognised and photographed tribe. The current extreme drought affecting Africa has impacted heavily on the traditional Maasai pastoral existence. The wealth of the Maasai of Ngorongoro has dropped dramatically as their cattle have died from thirst and hunger. Women have to walk up to 30 miles (48.28 Km) each day to fetch water and firewood back to their villages. The parched plains are covered with rotting carcasses of donkeys, goats and cows [Photographs] Accessed from <http://www.gettyimages.es/>

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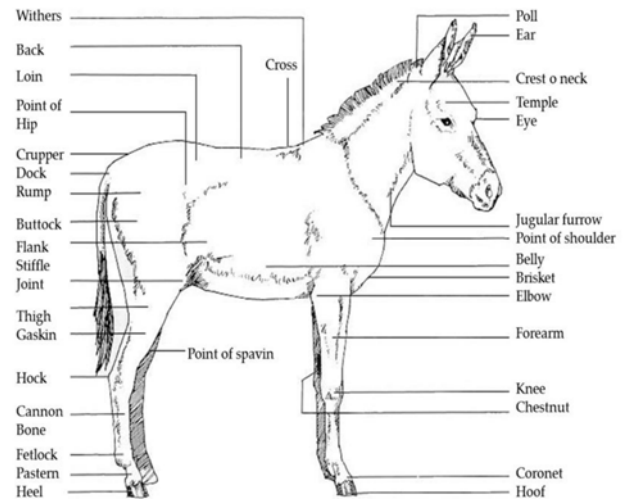


Figure 40. Government of Alberta (2013) Parts of the body of the donkey [Illustration] Accessed from <http://www.agriculture.alberta.ca/>

3.3. MAIN DESIRED TRAITS FOR BREEDING

Lack of selection because of the difficulty of controlling donkey breeding is, therefore likely wherever a premium is placed on “wild” characteristics of the donkey, such as strength, rather than on docility and productivity for food. The relatively high proportion of males in herds (one male: two females) is another factor that makes control over breeding logistically difficult. The greatest factor contributing to the adaptation of the ass may be related to its functional anatomy, biology and behavior. Donkeys are miniature creatures with slender bodies and anatomical built that permit them to support load over 60% of its live weight.

They have shown remarkable stamina and resilience to move long hours without food and water. The hooves are the narrowest and smallest of any equid, useful to effect long distant journeys. In equids, the pectinate ligament is more prominent than in ruminants and characterized by sturdy interconnected strands and relatively small intertrabecular spaces (Simoens et al, 1996). Each aspect of donkey is interesting in breeding programme (even behaviour or body weight=power).

4. HUSBANDRY SYSTEMS IN THE WORLD

In general, donkeys have been very crucial to pastoral people in arid regions. Nevertheless, donkeys have been always managed less than other livestock (*Marshall & Weissbrod, 2011*). Inadequate care remains an issue in donkey husbandry as shown by a case study in developing world (*Mutua, 2004*).

Donkey husbandry, ownership and usage can be useful indicators on the wellbeing and living conditions of many agrarian or peasant economies. A traditional donkey husbandry consists of a lawn or grazing field, a stable with a drinking point and feeder trough. However most donkeys are usually tethered on the back yard where it may be fed some left over household remnants.

Traditionally donkeys may be given limestone or salt as mineral licks, however care under these conditions remains much to be desired. A typical donkey husbandry should provide facilities for grazing/exercise, shelter, watering *ad libitum*, feeding and restraint with back up nutritional supplements to improve performance and output. Where donkeys are kept as a pack lot or for draught purposes such nutritional support is recommended for vitality, repair and energy needs of the animal. Although donkeys tend to express instinctive stubborn behavior, they can be well tamed and take to organized activities.

CURIOUS FACTS

DONKEY MEAT FARMS

China and some countries in Africa are known for their traditional donkey meat based cuisine. However, their production systems are quite different. If we thought about any other kind of meat producing farms, such as the ones that we have to produce chicken meat or beef, we could easily change the species bred there by donkeys and we would realize what a donkey meat farm is like. These farms are commonly placed in South American & Eastern European countries (like Ukraine, Peru or Mexico) where, though there it is not legal to eat donkey meat, or better said, to slaughter donkeys with alimentary purposes, it is possible to produce donkeys and export them to countries such as Canada or China, where they can be slaughtered and transformed into traditional dishes. Animal number per pen ranges from 50 to 100 animals and depending on the country, they are likely to produce only jennies, jackstocks or both sexes.

Africa would be better adjusted to the example of a backyard production farm, in which a family or a whole tribe keeps their donkey herd among other animals such as cattle or goats. Animals are kept in groups which range from 30 to more than 300 animals, generally looked after by women or young men. These kinds of farm are also the main producers of donkey hides.





Figures 41, 42, 43 & 44. (Figure 41) ITG Donkey Meat, (Figure 42) Eric Lafforgue, (Figure 43) Dana Hoag & (Figure 44) David Tilson, Q.C. MP (2010-2014) (Figure 41) Donkey Meat Farm in Peru, (Figure 42) Herd Of Donkeys On The Road, Weito, Omo Valley, Ethiopia, (Figure 43) Donkey herd on its way home, Ethiopia & (Figure 44) Two Mexican donkey farm employees charging a donkey onto a transport truck to be carried to a Canadian slaughterhouse [Photographies] Accessed from (Figure 41) <http://www.donkeymeat.net/>, (Figures 42 & 43) <http://www.flickr.com/> y (Figure 44) <http://www.hesteinternatet.dk>

5. DONKEY FEEDS AND FEEDING (SEE APPENDIX AT THE END OF THIS CHAPTER)

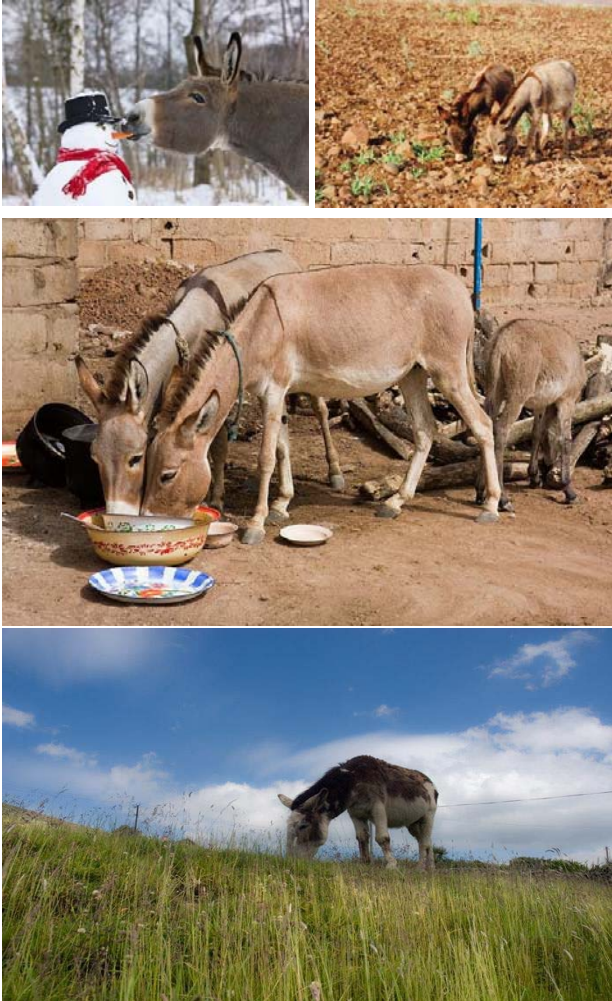
Donkeys can survive on very poor diet and nutritional conditions. The nutritional requirements have not been properly elaborated. Some documentation provides rations for donkeys similar to that of horses. Nevertheless, a good daily ration for donkeys should depend on a greater extent on the breed, age, purpose and reproductive status of the ass, as well as, the required daily food intake necessary for it to meet both physiologic and physical needs. Ebangi et al., (2004), investigated the nutritional intake of the N'dama and Crossbred donkeys in the Sudano-sahel region of North Cameroon and found significant differences in feed consumption and weight gain; work force and response to seasonal changes between the N'dama and the cross bred donkey.

Their work showed that the male donkeys had a better body condition score throughout the dry season period compared to their female counterparts and that seasonal changes in weight gain in both sexes experienced were good indicators for supplemental feeding (and watering, emphasis mine) necessary to improve body condition of the donkey. The main nutritional feed of the donkey is grass. The donkey is a non-ruminant herbivore with a single stomach chamber and like the horse is referred to as a hind gut fermenter. Donkeys can eat grasses, bark, leaves, and stalks among others. Generally a donkey prefers the grassy part of habitat over shrubs or woodland part (*Lamoot et al, 2004*). Thus a donkey may consume 80% grasses, sedges, rushes, 10% other flowering and herbaceous plants and 10% woody plants. A donkey can survive with little water and has more endurance and tolerance to feed and water scarcity than a horse (*Kingel, 1990*). The donkey has a

tougher digestive system compared to that of the horse in which microbial fermentation takes place in the caecum and the large intestine.

Generally the donkey eats in small amounts over a longer period and can handle 1.5 percent of its body weight per day in dry matter because of its efficient and structurally designed digestive tract. The efficiency of the donkey's digestive abilities over the donkey may also be associated with the functional levels and interplay of its gut enzymes and microbial flora. Although a donkey can obtain much of its energy needs from structural carbohydrates there is great controversy on the type of feed sources a donkey may be fed. A typical feed ration for a donkey should consist of forage as the main source and other sources of proteins, fat, vitamins and minerals with regular access to fresh drinking water. It is important that the ratio of legumes to grass may not exceed 1 in 4 parts. It is generally advisable to avoid feeding potatoes or anything from Brassicaceae (cabbage) family, rhubarb leaves, cereals, onions, leeks, garlic or fermented foods.

Silage has a high moisture content, low pH and high protein content and is not suitable for donkeys. Hay and other supplemental rations are important during dry season and winter periods. It is risky to allow donkeys for long hours on lush pastures or leguminous forage and heavy concentrate feeding as this can predispose them to obesity, laminitis and hyperlipemia or gastric ulcers. Feeds high in fiber given in small quantities are good to minimize the risk of obesity and hyperlipemia.



Figures 45, 46, 47 & 48. (Figure 45) Klein-Hubert/KimballStock, (Figure 46) Félix Meutchieye, (Figure 47) Ikiwaner & (Figure 48) Jackie Weisberg (2010-2011) (Figure 45) Head shot of a Cotentin donkey eating snowman's carrot nose, (Figure 46) Donkeys scavenging in Ethiopia, (Figure 47) Donkeys eating leftover food in Damfa Kunda/The Gambia & (Figure 48) Donkey grazing in the countryside of Ireland, Europe. This donkey shows its leg and muzzle hair shaved because of the harness of the terrain it lives in [Photographs] Accessed from (Figure 45) <http://www.kimballstock.com>, (Figure 47) <http://en.wikipedia.org> & (Figure 48) <http://www.flickr.com/>.

6. HOUSING AND SHELTERING

Modern donkey farms consist of sheltered stables with nutritional feed supplements, grazing fields and unrestricted access to water. These farms provide facilities and management conditions for improving welfare of donkeys such as proper ventilation, lighting and bedding materials and emergency precautions against hazards such as fire extinguishers and precautions from injurious objects. With proper adjustments, standards boxes for horses can be adopted: The recommended box sizes are 3.66m x 3.66m for very large breeds and 3.05m x3.05m for large breeds and 4mx4m for expectant jennies.



Figures 49, 50 & 51. (Figure 49) Matt Cardy/Getty Images & (Figures 50 & 51) Alessio Mesiano (2009-2010) (Figure 49) Donkeys stand in the yard at a farm where they are being cared for near the Donkey Sanctuary near Sidmouth, England & (Figures 50 & 51) New stables and pen of the Donkey Sanctuary shelter for abused or abandoned donkeys in Romania [Photographs] Accessed from (Figure 49) <http://www.nbcnews.com/> & (Figures 50 & 51) <http://www.savethedogs.eu>

7. HERDING AND IDENTIFICATION

In developed countries where their use as beasts of burden has considerably receded, donkeys are used to sire mules, to guard sheep and can be ridden or used as pets. Donkeys may be pastured or stabled with horses and ponies, and are thought to have a calming effect on nervous horses including providing companion and protection to weaned horse colts. In pastoral communities like in eastern Africa, children herd household donkeys with the calves, but during the wet season, donkeys are free ranging. Many families pen donkeys within the settlement thorn fence or in calf enclosures at night for protection against predators.



Figure 54. The Donkey Sanctuary (2013) Identification band on a donkey [Photographs] Accessed from www.thedonkeysanctuary.org.uk

Different methods are used to identify donkeys including branding (tattooing), ear tags and the use of coat color or body identification marks. Many families also identify their donkeys by names which the donkeys recognize. It is very important to properly identify and age donkeys especially those moving from one country to another in their passport and other traveling documents.

CURIOUS FACTS

REFLECTIVE EAR TAGGING PROGRAM

SPANA (the Society for the Protection of Animals Abroad) is the charity for the working animals of the world and has launched a program funding partner charity the Maun Animal Welfare Society (MAWS) to attach reflectors to donkeys' ears on 500 donkeys in four northern areas of Botswana. The people that own working donkeys are some of the very poorest in Botswana's society and often have no choice other than to let their animals roam freely in search of food in the sparse desert environment and that includes its roads. However, when on the road at night drivers are often unable to see the domestic animals like livestock and donkeys in time to brake, causing around ten per cent of road traffic accidents in the country. The aim of the project is to reduce the number of road traffic accidents involving the animals at night every year. In northern Botswana, there is one donkey for every two people and until now, welfare efforts for donkeys has been limited to humanely euthanizing those that have been injured in traffic accidents to prevent further suffering. This tagging project will prevent these accidents happening altogether, saving not only donkeys' lives but also those of the occupants in vehicles that hit them. Hopefully the project will be adopted in other parts of the country and will be the first step towards making reflective tags a legal requirement for freely roaming donkeys and livestock in Botswana.



Figures 52 & 53. (Figure 52) SPANA & (Figure 53) Maun Animal Welfare Society (2014) Donkey ear tags during the day and illuminated by headlights [Photographs] Accessed from (Figure 52) <https://spana.org/> & (Figure 53) <http://www.maunanimalwelfare.com>

8. REPRODUCTION MANAGEMENT (SEE BOOK 1, CHAPTER 7)

In arid conditions the male or the wild ass stallion literally control access to resources like water from females and thus gain access to the female donkey in estrus. In wetter conditions, the donkey stallion controls a harem of bonded females which he defends from other invading males (Moehlman, 1998). A young foal weighing about 25 kg at birth begins nibbling on plants at 5 days when incisor teeth erupt (Moehlman, 1988), keeping closely with the mother until weaning at 12-14 months of age (Grinder et al., 2006). The age at puberty in the female is 1.5 years, but females may not usually breed until 2-3 years. Sexual maturity in males is attained at 2 years (Grinder et al., 2006). Donkeys have very little sexual dimorphism compared to other members of the *equidae* family.



Figure 55. Félix Meutchieye (2014) Donkey castration with Burdizzo in Ethiopia [Photograph]



Figures 56, 57, 58, 59 & 60. Framepool (2003) Two Andalusian donkeys showing typical mating behaviour [Photographs] Accessed from <http://footage.framepool.com>

There is very little documentation on courtship in donkeys. Typical courtship behavior is manifested by biting, sniffing, kicking, running and rolling on the ground. Klingel (1998) describes a mating behavior pattern as follows: the receptive female stands with hind legs pulled apart and tail

swung to one side exposing the vulva; Jack sniffs the vulva, may huddle the female and make a number of jest movements; Female kicks towards him in a ritualized fashion and steps forward; Jack follows and both run for an average distance of about 20 m; When female halts, Jack mounts and copulates. Most donkeys are bred under natural conditions. The female donkey or Jennet may come on heat within 14 days post foaling. The gestation period is 11-12 months. Donkeys having a rather low fertility rate compared to horses and it is common to allow 2 estrous cycles to pass for a first time jenny to be bred. The mean average length of estrus described by Felding (1990) is about 6 days and estrous cycle length of about 24 days under temperate conditions. Under tropical conditions the jenny is in cyclical activity almost throughout the year. These repeated cycles may be associated with diurnal rhythms that affect day length and hormonal interplay concerned with estrus or estrous cycle. Male donkeys are very active and may mount several times a day. Where couples are desired, the female must be separated from the male as soon as has taken in to reduce risk of abortion from repeated mounts from the male. The age at first foaling in the tropics is about 57 months (Blench *et al.*, 2004). Donkeys are seasonal breeders though they may not be expected to foal every year like horses because of a long gestation period and foaling interval. It is acceptable for donkey breeders to expect three foals in four years under natural breeding. In captive breeding, most African pastoralists breed their donkeys to wild asses (Clutton-Brock, 1999). In some communities of North Cameroon stud males may be borrowed by other female donkey owners for breeding. Breeding under natural conditions is limited by a number of factors such as the availability of a male donkey, nutrition, working conditions to which the

donkey is subjected as well as environmental conditions. Twins are rare and occur in about 1.7% of deliveries.

Genetically, the donkey has 62 chromosomes as against 64 in the horses. Crosses or hybrids have been registered between a donkey and a mare to produce a mule. Many mules constitute the bulk of the draught power of the equidae family as they have been found to be more resistant to diseases, can carry more loads, trot better and work better than the parents that gave birth to them. A cross between a jennet (a female donkey) and a Stallion (male horse) is called a hinny. Head and front end of the crosses resemble the male (sire) and the hindquarters look more like the female (dam). Generally speaking, a hybrid mule's head resembles the sire's large donkey head (Clutton-Brock 1981). The mule and hinny are usually sterile offspring (of either sex). The offspring between a male donkey and a female zebra is referred to as a zedonkey, zebroid or zebrass (American Donkey and Mule Society website, 2009). Artificial Insemination (AI) is not very popular in donkeys. However, with increasing demand for donkey milk and meat, AI and Embryo Transfer applications can become vital tools for genetic selection for increased donkey meat and milk.

9. HEALTH CARE (SEE APPENDIX AT THE END OF THIS CHAPTER AND BOOK 1, CHAPTER 5)

Donkeys suffer from a number of metabolic disorders, infectious diseases; cancer related pathologies as well as physical injuries. Health is more or less considered as important in donkey keeping (*Fahmy, 2004; Wambui et al., 2004; Wells et al., 2004; Wold et al., 2004*). The predominant condition may depend on environment, living and working conditions of the donkey. Blench et al (1998) have listed a number of diseases described in Hausa by donkey owners in Northern Nigeria and local treatment methods that they apply.

Elsewhere, Wells et al., (1996) featured a number of disease conditions affecting donkeys of local farmers of the North West and Eastern Cape Provinces of South Africa, in which the study showed that the majority of respondents indicated that parasitic diseases and injuries associated with harness were more common. Despite subjected to very perilous living conditions, the donkey appears less susceptible to a number of pathological conditions and diseases affecting horses and cattle.

The basic health requirements of a donkey includes among others: A clean and safe environment. It is important that your donkey lives within a clean environment with free access to clean fresh water and mineral licks. Grazing field should be managed properly and all noxious plants such as ragwort removed. It is also necessary that your donkey lives in an environment that is free from pests such as insects or control measures are taken to minimize their nuisance. The environment should promote good husbandry practice and minimize all forms of injury and abuse. Donkeys should be fed properly taking great precaution to minimize the risk of laminitis, obesity and hyperlipemia that are all life threatening. Regular vaccination and strategic de-

worming are essential. It is important to ask your local veterinarian for a vaccination, deworming and a calendar of other prophylaxis necessary to keep your donkey healthy. Bathing and grooming your donkey regularly can contribute to body hygiene by removing body odor, reduce pestilence such as mange(sweet itch), ticks infestation and improve body tone and well-being. Hoof and dental care is an important aspect of donkey care.

Hooves must be checked routinely for debris, wear and tear, injury and infection such as laminitis. Teeth must be inspected every 2-8 weeks for general oral hygiene including wear and tear, debris and eruption. A Veterinarian's advice should be sought for any abnormality. Donkeys with affected hoof resulting in poor gait or lameness should be given stable rest. Hooves should be trimmed or shod when necessary. A happy donkey should also be provided with dignity in handling, care and companionship. Young and newly introduced donkeys should be tethered or kept adjacent to old ones so as to minimize shyness. Aggressive donkeys should be removed from the lot. Transport and Working donkeys should be given sufficient time to rest, training and proper attention, ensuring proper use and care for equipment. Donkey users need to learn new technologies before applying them.

Housing facilities should provide adequate space, lighting, ventilation and facilities for restraint, separation of males from females, young ones, sick and nursing animals and space for breeding and delivery with unrestricted Access to water. Fences should be made of suitable materials to minimize harm and promote comfort. Pregnant jennies should be given sufficient "maternity rest" including exercise, proper maternal care such as housing, beddings, clean fresh

water and medical attention as required. Young donkeys should have sufficient time and environment to play and express themselves. An animal may be sacrificed under the following conditions – old age, infirmity, severe casualty, pain and suffering from a condition that is debilitating or life threatening. A veterinarian should be consulted on the appropriate timing, method of euthanasia and disposal of cadaver.

CURIOUS FACTS

DONKEY'S FALSE PREGNANCY

When jennets bray more frequently and stay away from owners, when they would be supposed to approach them friendly, we should start wondering what is happening.

When a normally friendly jenny stands about 15 feet away with her legs apart while urinating, staring at her owner with her mouth wide open and making a weird breathing out sound, and also begin pointing to her belly with her face and breathing out seeming distressed.

Once we have ruled out most of the symptoms of colic, we should start thinking about reproductive issues.

If we see that she keeps stopping to pee (frequent urination), whether pee comes out or not, sometimes a dribble, sometimes cloudy white/yellow, sometimes normal – even more when every time she stops to pee she seems distressed again, turns to point to her belly and breathes out. Her tail is also staying out and stiff and her vagina is opening and closing a lot (also known as "winking").

Either our jenny is pregnant or in heat. These symptoms mentioned above are the ones which would likely be shown in case of pregnancy. The indentation in front the hips becoming deepened when the baby drops, the urinating, the abdominal distress, pointing to her belly, her recent mood swings & discontent with other animal in their environment, she is pacing a lot, and has become more aggressive with kicking are the most common symptoms.

One of the clinchers is when we can see some clear liquid shot out from the udders. If we are unable to perform an echography and a baby does not show up at the time it should, we ought to start thinking about false pregnancies.

Jennies show this kind of symptoms when they go into heat (open mouth, urinating, among other). They will show their signs of heat not only to male donkeys (Jacks) but also to other female donkeys (Jennies) and to humans.

Not only donkeys present more false pregnancies than horses but also they even have a menstrual cycle that, even though does not produce blood as in humans, can actually cause equine menstrual cramps.



Figure 61. Miss Voodoo (2010) Jenny showing estrus symptoms during a false pregnancy [Photograph] Accessed from <http://oko-organic-clothing.blogspot.com.es/>.

CURIOUS FACTS

DONKEY MILK FARMS' WORLDWIDE MARKET NICHE

Donkey milk farms have proliferated all over the world. Italy, Bosnia and Herzegovina, Serbia, Switzerland, Turkey and France in Europe, and Chile or Mexico in South America, are just examples of countries in which donkey milk is reaching limits which were at first unthinkable.

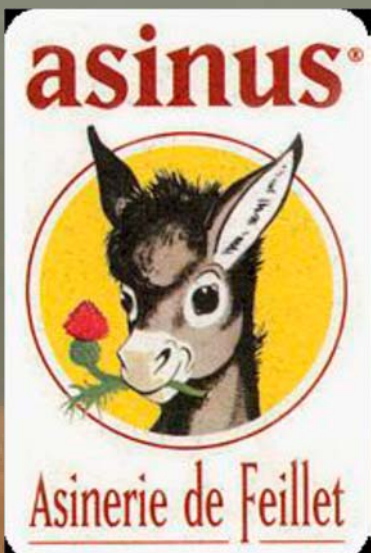
In the middle of the beautiful Pyrenees lies one of the first Donkey Dairy Farms in Europe. Olivier Campardou, the founder, was the first farmer to produce donkey milk on a regular basis. In summer, all of his donkeys live in the mountains at an altitude of about 1000 metres. This is also the place where, each year, the donkeys are milked for a period of 5 months. The milk is dried in a laboratory enabling to keep the milk longer and to produce derived products all year round. Donkey milk is very rich in vitamins and the drying process we use is designed to preserve these vitamins as well as possible. Donkey milk is very similar in composition to breast milk and is widely used as a treatment for allergies such as lactose intolerance and eczema in babies and young children. Donkey milk is similar to mare milk and human breast milk in that it is relatively poor in protein and fat but rich in lactose. The casein to whey protein ratio is intermediate between human breast milk and cow milk. Gross composition of milk differs by the mother's lactation stage, with ash and protein content showing a declining trend, but pH, percentage of whey protein, and amino acid content remaining the same.

Donkey milk keeps the skin hydrated, smooth and youthful and products contain between 5% (soap) and 50% (facecream) donkey milk. The combination with other natural ingredients and essential oils perfectly complements the properties of the milk. All these cosmetics are biologically and ecologically friendly and are made by professional hands. Soaps are made using the method of hot saponification by a soap-maker who learnt his craft from an old traditional master in Marseille. Every soap is formed and put into its boxes by hand. The laboratory for the cosmetic products is near Dijon and donkey milk sweets are made in Vichy by the same company that produce the famous «bonbons de Vichy». If you are travelling around the south of France during the summer you should not hesitate to go and visit the farm and their donkeys in the mountains (Commune de Couflens - chemin des Cascades de Leziou).

A female ass gives between 0.2 to 0.3 litres of milk a day. The milk of a donkey was disapproved by the U.S.D.A (The United States Department of Agriculture) until 2001. It is frowned upon in the average American society. A donkey dairy farm may range from a few to over 600 animals. It seems that we are getting back to ass milk to raise children in the earliest infancy, notably when the child is of delicate health (as it happens in India). Ass milk has not been quite totally abandoned, but if 25 or 30 years ago, a few well looked-after asses were easily found in the city to provide milk nourishing young babies, it is no longer the case today. Although the market potential is huge donkey farms normally start selling only pure milk with ordinary people who have bronchial problems as the main consumers—and then it soon moves on to cosmetic production which normally starts with homemade soap production. One liter of donkey milk sells between 35 and 55 euros in European countries due to its rarity and limited supply. Soap sells for 7 euros per bar.

Donkey milk production is still a stranger for some countries, not everybody likes the idea of having a donkey farm in the neighborhood or drinking this special beverage. A Student Entrepreneurship project, running from September 2011 to September 2014, provided Bosnia and Herzegovina students with training, technical assistance, access to affordable financing, and advice throughout the start-up period of their businesses. Alen Jusupović, a 23-year-old student of agricultural engineering in Sarajevo, was intrigued by the idea of starting a donkey farm after learning that a similar business was thriving in neighboring countries. In 2012, he set out to have the first in Bosnia and Herzegovina.

Turkey's first donkey farm in the northwestern province of Kırklareli is the first also aiming at producing donkey milk for consumption. The project started in 2009, and the farm is now in use with a stock of nearly 180 donkeys, but the farm is always on the lookout for more of them, as the owner complains of not being able to find donkeys due to an insufficient number of them in the country. The production of milk is yet to start in the farm due to formalities between the owner of the farm, Ufuk Usta, who is also an instructor at Trakya University's Faculty of Medicine and the relevant authorities. Usta said he had completed the necessary paperwork and was now waiting for a response.



Figures 62, 63 & 64. (Figure 62) Asinus, (Figure 63) AA & (Figure 64) Alen Jusupovic (2009-2014) (Figure 62) Asinus Donkey Milk Farm Logo, (Figure 63) First Turkish donkey milk farm & (Figure 64) Alen Jusupovic with two donkeys, Ceca y Cica, on his farm in Zavidovici [Photographs] Accessed from (Figure 62) <http://www.asinus.fr/>, (Figure 63) <http://www.hurriyetdailynews.com/> & (Figure 64) <http://www.usaid.gov/>.

An injured/ill ass may be transported only if it is being taken for veterinary treatment/diagnosis and then only provided it is transported in a way which is not going to cause it further suffering, under veterinary supervision. Pastures and equipment should be inspected and regularly maintained. Saddles, harness, yokes and traction equipment should be regularly reviewed to minimize injury. Generally it is good to avoid all forms of abuses such as starvation, beating, neglect, over tasking including all forms of environmental, physical, social and psychological constraints that will inflict stress and thus reduce their performance, productivity and peaceful co- existence with man and other livestock.

Donkeys engaged in traction, cart carrying or transport may suffer from a wide range of musculo-skeletal injuries sometimes resulting in lameness or immobilizing fractures from the equipment they are pulling from or from automobile accidents on the highway. It is very important that donkey users ensure a safe working environment for donkeys avoiding overloading or over tasking a willing donkey. Appropriate procedures and precautions should be taken when applying equipment on donkeys. Only adult and well trained donkeys should be used for a particular task with enough time given to rest, drinking water and balanced diet, as well as veterinary care. An injured donkey should be given immediate veterinary attention. In poor farm conditions some common diseases to both horses and donkeys may go unnoticed (*Sarr et al., 1988*).

10. EVALUATION OF PERFORMANCES

According to Marshall & Weissbro (2011), donkey ownership developed by herders in the horn of Africa still encompasses present practices like in Massai. Families in the study area who did not own donkeys could not move as a whole away from permanent sources of water and were unable to make optimum use of available grazing. Biophysical resources play crucial roles since centuries in donkey selection (Johnstone, 2004).

11. DONKEY PRODUCTION SYSTEM

A donkey husbandry may be related to its purpose, herd size, usage and environment. Efficient use of donkeys, as already mentioned would depend on many conditions (Kumwenda, 2004). Socio economic and cultural factors play an important role in donkey keeping (Marshall et al., 2004; Mofya, 2004; Mrema, 2004).

11.1. EXTENSIVE SYSTEMS

Under these systems, the donkey though limited by space is allowed to graze freely throughout the day on the field, drinking and resting when and where ever it wants. This is synonymous with grazing in the wild, whereby feral donkeys may have extensive range coverage depending on season and availability of needed resources and threats from predators and hunters.

Donkeys can survive on very poor diet without clinical signs of anemia or metabolic disorders and are tolerant to a number of infectious pathogens and pests that cause clinical diseases in ruminants such as tick and fly borne and mycotic infections that are prevalent in the tropics. Although the donkey belongs to the equine family, it is not frequently prone to colic and azoturia as in horses. The difference between the donkey and the horse in this regard may be due to physiological adaptation in evolutionary biology but more importantly to functional levels of enzymatic activity and colonic flora that play vital roles in bacteria fermentation in both animals. The extensive systems are very common in tropics, particularly in harsh conditions. During transhumance, when large herds of cattle move from North Cameroon southwards in search of water and pastures, donkeys serve as a valuable means of transport for children, women and family luggage.



Figure 65. Rekindle (2014) A herd of donkeys in a Texas walking away. Grazing on grass and leaves on edge of forest. Tails swishing flies and insects [Photograph] Accessed from <http://www.shutterstock.com/>

11.2. MIXED AND SMALL SCALE SYSTEMS

Donkeys are still more or less an add-on livestock for smallholder rural dwellers where they are used as pack animals (Wod et al., 2004; Yilmaz et al., 2013). Draught and transport are then the main purpose of keeping donkeys, in a free range system, periodic rest and specialized tasking. These systems are popular throughout sub-Saharan Africa (Starkey, 1994).

11.3. SEMI INTENSIVE SYSTEMS

Here the donkey or pack of donkeys are subjected to periodic grazing and some limited supplemental feeding as well as spending part of the day on the field and whole night in the stable, fence or barn. This can be seen in farms where donkeys have been integrated with other livestock, like dairy production in Kenya (Starkey, 1994). Dead and life (electric) fences constructed to form paddocks may be used to control grazing as a pasture management strategy.



Figure 66. ABC News (2014) Some of the wild donkeys yarded during a recent muster at Elkedra Station in central Australia [Photograph] Accessed from <http://www.abc.net.au/>

11. 4. INTENSIVE SYSTEMS

Also called zero grazing, Intensive system deals with single or a small number of donkeys in which they may be tethered or stabled and fed on the spot with sufficient quantities of hay, straw, vitamins and concentrate rations. This could be seen in dairy herds, feedlots or with the young (Polidori et al., 2009). Nevertheless under traditional management, tethering is more or less a way of restraint or confinement rather than having a specific production purpose. In the Donkey Sanctuary in the United Kingdom of Great Britain, during winter donkeys are housed in large airy barns and are fed controlled amounts of hay or haylage according to body condition.



Figure 69. Emma Wallis (2011) Donkeys roam the stables at Montebaducco, in Italy [Photograph] Accessed from <http://www.cbc.ca/>

CURIOUS FACTS

MOONLIGHTERS AT A FARM IN WUM

Donkeys can be used to guard sheep farms. In Fru Ndi Ranch in Wum, North West Cameroon, donkeys are an important part of the ranch husbandry management system where they are used for riding and lifting water, ecotourism and mixed grazing with sheep and horses. The increasing demand is associated with the fact that donkeys are cheaper to maintain and can carry 4 to 5 times the load carried by man on head load and can make 5 times more trips than man. They can also move far into the hinterlands to areas where vehicles cannot reach.



Figures 67 & 68. (Figure 67) Moz B & (Figure 68) Virág Győri (2014) (Figure 67) Donkey and sheep & (Figure 68) A donkey protecting a sheep flock and carrying four lambs in its saddlebags [Photographs] Accessed from <http://www.pinterest.com>

11.5. SOME TERRITORIAL ACTIVITIES AND MAIN DONKEY BEHAVIORS

Donkeys exhibit certain habits in their habitats including aggression, play or displays, territorial dominance, communication, vocalization, olfaction or scent marking, social adherence, pairing or associations within member groups.

Territorial jackstocks tend to send away intruding males away from the females. Levels of aggressive behavior are lower in and mutual grooming more common in feral donkeys that occupied resource rich habitats than in desert habitats (Moehlman, 1998). The jack demonstrates its supremacy by a number of postures (McDonnell, 2003) such as: An upright stance; forward facing ears; ritual chasing of other intruding males; keeping guard or surveillance of his boundaries and examination of other individuals' scents.

Play behaviors are common in foals and during courtship. Usually foals will toy with field objects, carrying, sniffing, chewing or pulling. They will also jump and mount other members of the group and manifest a number gesticulations including frolic, run, chase, buck and leap movements. Foals may also engage in King of the Mountain competition and play fighting. Moehlman (1998), observed more play in foals living in a resource rich environment on a Georgia barrier Island than those found in Death Valley California.

Unique brays are made when breathing in ("hee") and breathing out like "haw" (Browning & Scheifele, 2001). These calls travel long distances and can serve as an

invitation to the males by females in estrus. Whuffles communicate position to others, while snorts serve as an alert or alarm of an intruder or predator. Other sounds include a grunt and growl.

Jackstocks routinely examine nasal, anal and genital areas of other asses for scent information. Dung heaps is important landmarks for the stallion to recognize his own territory. They do not however deter other intruding males (Klingel, 1998).

CURIOUS FACTS

HOW DONKEY CAN HARNESS PALM OIL PRODUCTION?

Palm oil is a becoming a ready cash activity for many farmers in Cameroon coastal lowland region. In remote farms, fresh nuts carrying and processing have been regarded as very limiting factors till an innovative farmer decided to start use of pack donkey imported from a similar region, boarding Nigeria, in the wet Cross River zone. After few months of training and adaptation, the animals are able now to carry fresh harvested nuts, collect them to stores, and pull the press machine. These biological components are now being alternative power source and even income opportunity for their owner. The first parturition happened one year after their settlement, in this very hot and moist lowland area. Increasing numbers of Donkeys are moving to wards the forest zone of Cameroon to work in plantations carrying bananas, palm kernel and other items to strategic locations where vehicular transport is possible. Donkeys serving in these plantations are increasingly facing new challenges in terms of food and health, environmental, welfare and working conditions.



Figures 70 & 71. (Figure 70) Donkeys & Co & (Figure 71) Fabian Romero Dávila (2014) (Figure 70) Palm plantation & (Figure 71) Palm fruit collection and donkey charging [Photographs] Accessed from (Figure 70) <http://donkeysandco.com> & (Figure 71) <http://fineartamerica.com>

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13. APPENDIX

CLASS	SOURCES OF NUTRIENT	RECOMMENDATIONS
Protein	Forages, hay, haylage, Protein pellets or cubes	Ideal during winter. Must be properly stored and guarded against moulds, ragworts and pests.
Carbohydrate	Freshly cut hay, haylage	Highly palatable but must be fed in very small amounts.
Fibre	Barley Straw, Short chopped up chaff (SCUC), Diet sugar beet pulp (DSBP)	SCUC is useful in donkeys with poor dentition and being useful as a total hay/Straw replacer declared as "laminitic safe". DSBP should not be molassed base to avoid risk of laminitis (follow manufacturer's instructions)
Minerals/Vitamins	Straw, grass and hay. Salt granules or blocks	Free Access to Salt blocks or granules meant for donkeys such as equine mineralized blocks are recommended.
Water	Clean fresh water	Free Access to fresh clean water. Avoid serving frozen water or very cold water. Provide several sources of drinking points on a grazing field to encourage feeding and grazing ad lib.
Succulents And Treats	Fruits and vegetables. Carrots, bananas, pears, apples, turnips and Swedes. Mixture of oats, oat bran and corn	1 or 2 a day properly chopped to avoid choke. Not more than a hand full a day.

Table 3. Main sources of donkey food.

DONKEY CATEGORY	GRAZING FIELD DAY	CONCENTRATE RATION	HAY	SALT/MINERALS/VITAMINS	FRESH WATER	FRUITS AND VEGETABLES
Pregnant	7 hours on fresh grass	Once a month	Once a week	2 x a month	Ad libitum	Fruits: apples, bananas, pears, turnips. Vegetables: carrots.
Nursing	7-8 hours on fresh grass	2 x a month	2 x a week	Once a week	Ad libitum	Fruits: apples, bananas, pears, turnips. Vegetables: carrots.
Working	7-9 hours on fresh grass	Once a month	3 x a week	Once a week	Ad libitum	Fruits: apples, bananas, pears, turnips. Vegetables: carrots.
Foal 5-12 weeks	Below 3 hours on fresh grass	Once a week	Once a week	Once a month	Ad libitum	Fruits: apples, bananas, pears, turnips. Vegetables: carrots.
Foal below 5 weeks	1 hour + Dam milk	Nil	Nil	Nil	Ad libitum	

Table 4. M.A.K. Farms (2012) Simple feeding regime for donkeys of different status.

Carrying a load over level ground on dirty tracks	
Live weight of donkey	120 Kg
Distance travelled	15 Km
Load carried	40 kg
Energy costs of walking (1,40 J/m/kg) ¹	2520 KJ
Energy costs of carrying (2,30 J/m/kg) ¹	1380 KJ
Total net energy of work	3900 KJ
Proportion of total cost of work used in walking	65 %
Total net energy cost as a proportion of maintenance requirement	0,31
Plowing a field for 2,6 hours at an average draft force of 730 N with a beam of four ²	
Live weight of donkey	120 Kg
Distance travelled	5,5 Km
Work dose per donkey	1004 KJ
Efficiency of pulling	0,25
Energy costs of walking (2,0 J/m/Kg) ¹	1380 KJ
Energy costs of doing work pulling (1,40 J/m/Kg) ¹	4016 KJ
Total net energy of work	5336 KJ
Proportion of total cost of work used in walking	25 %
Total net energy cost as a proportion of maintenance requirement	0,42
Carting a load over level ground at an average draft force of 140 N on laterite roads ³	
Live weight of donkey	120 Kg
Distance travelled	15 Km
Work dose	2100 KJ
Efficiency of pulling	0,35
Energy costs of walking	2520 KJ
Energy costs of doing work pulling	6000 KJ
Total net energy of work	8520 KJ
Proportion of total cost of work used in walking	30 %
Total net energy cost as a proportion of maintenance requirement	0,67

Table 5. Paul Starkey & Pascal Kaumbotho (1999) Three examples of energy requirements for work for a donkey.

¹Data from Dijkman, (personal communication), ²Data from Hagmann and Prasal (1994), ³Data from Slingerland (1989)

DISEASE/PATHOLOGY	SIGNS	PREVENTIVE MEASURE	POSSIBLE TREATMENT	OUTCOME
INJURIES- Resulting in fractures/lameness/wounds	Pain, bleeding wound or sore. Lameness, Recumbent Weakness, Inability to move Broken bone, swelling or inflamed skin or muscle.	Proper training, Obtain right equipment Inspect and care for tools-greasing, etc. Apply equipment correctly Ensure safe working environment Avoid using young inexperienced donkeys	Rest and provide first aid-wash wound, minimize bleeding, relief pain and seek veterinary attention For septic wounds debride, clean and seek professional advice from a Vet. If fracture-support with a bandage and seek help from a local veterinarian.	Depends on early intervention and first aid given
SADDLE SORES- Ulcerating wounds on the back associated with friction an improper padding caused by harness	Ulcerating wounds or abscesses on the back	Clean saddle and sundry regularly	Rest, clean and apply penicillin powder or ointment until healing Seek veterinary advice	Treatment usually rewarding if started early and the animal is stabled rest during treatment period.
LAMINITIS OR FOUNDER- Affecting the lamina of the hoof. A fatal condition caused by starch overload or grass high in fructan or feeding excessive grain diet	Painful and swollen hoof May discharge fluid Cannot bear weight on the affected limb	Avoid feeding heavy grain diet or sugary foods Recommended commercial high fibre cubes	Rest, clean hoof and seek veterinary intervention	Early intervention is desired Dressing and or padding of affected hoof
OSTEOCHONDROSIS- Growth disorder associated with imbalanced ratio of Calcium and phosphorous in bones. In case of contracted tendons damage can be permanent if not properly handled	Fragile bone tissue that can break easily Retarded growth	Proper feeding regime	Proper feeding regime Surgical correction	Early intervention is crucial
OBESITY- A metabolic condition associated with overfeeding and over weight	Overweight, gets lazy	Avoid lush pastures and concentrate feeds Daily exercise Monitor weight regularly Increase straw intake and lower diet calories.	Correct feeding regime desired	Early intervention is good
BLOAT OR COLIC	See obesity			Can be life threatening requiring trocarisation to de-gas the stomach
HYPERLIPEMIA- A fatal condition characterized by depletion of fatty acids to the liver and kidney that can cause irreversible liver, kidney and heart damage	Lactating jennies at higher risk than males, Signs are nonspecific including—off feed, fever, dullness, lethargy, rapid weight loss, head pressing, circling and ataxia, seizures and death Predisposing factors include heavy worm egg burden, dental problems, colic, choke, obesity	Vigilance and precaution on feeding Measure of circulating fat (triglycerides)	Hospitalization, nursing care and urgent veterinary intervention may include glucose IV therapy in combination with other support treatment.	Successful outcome depends on early intervention and extent of organ damage
PARASITID DISEASES- Lice, worms, midges, mites, flies and ticks infestations. A donkey can serve as an intermediate host for tapeworms, <i>Echinococcus granulosum</i> from cats and dogs defecating in donkey pastures	Weight loss, ruffled hair coat, skin biting/nibbling. Dull, anorexia, restlessness, itching, irritation, anemia if chronic	Clean, fly proof stable. Avoid wet and dusty stable Regular grooming, Routine dipping	Specific acaricide applications and worming schedules Fly and tick repellents Integrated Pest control	Early intervention usually rewarding

<p>LUNG DISEASE caused by Equine Herpesvirus 1 (EHV 1 and 4), Equine Influenza, Strangles, Asine Herpesvirus (AHV), <i>Dictyocaulus arnfieldi</i>, a nematode that infests the lung and tapeworm cysts found in lung and liver tissues. Allergies causing Recurrent Airway Obstruction (RAO)</p> <p>PHYTOTOXICOSIS- Examples include ragwort, horse tail, bracken fern, rhododendron, privet, hemlock, ivy, yew and oak poisoning</p> <p>SARCOIDS- A type of skin tumor varying in appearance and extent described as nodular, fibroblastic, verrucose, and occult. Mixed or malevolent. Flies complicate sarcoids by inflicting trauma and skin damage. Sarcoids occur predominantly around head and ears and to a lesser extent on the limbs, shoulders, neck, trunk and genitalia</p>	<p>Coughing and pneumonia symptoms may be apparent-labored breathing, nasal discharges,</p>	<p>Vaccination against EHV Proper ventilation Isolate sick donkey Avoid dusty feeds and environment</p>	<p>Specific diagnosis including isolation of the causative agent, X-ray and fiber optic endoscopy and treatment regimes</p>	<p>Early detection of clinical signs and early intervention is critical</p>
	<p>lymphadenopathy, increased respiration rate, respiratory noises (wheezing, honking, snorting) Weight loss</p>	<p>Treat carnivores and follow a regular/strategid worming plan</p>	<p>Veterinary advice Range management desired to control parasites</p>	
	<p>Depends on plant and toxic symptoms manifested which may include-frothy salivation, labored breathing or respiratory distress, dullness, weakness, bloody stool or urination, ataxia, seizures and death</p>	<p>Pasture care and husbandry management Inspect stored hay Weed pastures Detection of symptoms</p>	<p>Requires urgent veterinary intervention. Identification of plant, antidote if available alongside a wide range of support treatment depending on clinical manifestation</p>	<p>Success depends on early intervention. Extent of organ damage or toxemia and use of specific antidote</p>
	<p>Lumps or small growths on the skin should be differentiated from other forms of swellings such as an hematoma or abscess.</p>	<p>Control flies and biting insects Early monitoring of lumps or skin lesions Consult your Vet immediately</p>	<p>Several approaches including Cryosurgery, (Bacillus Calmette-Guérin) BCG Injection, chemical cytotoxic therapy, radiation therapy alongside with chemotherapy</p>	<p>Success depends on a number of factors including timing, technique and type of sarcoid. Failure of treatment may result in the re-appearance of more aggressive tumor!</p>

Table 6. Diseases and pathologies of the ass.

WORLDWIDE			AFRICA		
Country	Donkey (Thousands)	90s Trend	Country	Donkey (Thousands)	90s Trend
China	10983	-	Ethiopia	5200	n
Ethiopia	5200	n	Egypt	1550	n
Pakistan	3775	+	Nigeria	1000	+
Mexico	3190	+	Morocco	946	n
Iran	1900	+	Sudan	670	-
India	1550	n	Mali	610	+
Egypt	1550	n	Niger	462	+
Brazil	1364	+	Burkina Faso	436	+
Afghanistan	1180	n	Senegal	364	+
Nigeria	1000	+	Somalia	356	n
Morocco	946	n	Algeria	340	n
Turkey	895	-	Chad	271	n

Table 7. FAO (1994) Countries with the greatest number of donkeys in 1993, Global and Africa trends. Leyenda: + Increasing, - Decreasing, n No change.