Education and Culture
Leonardo da Vinci

EFFA

EUROPEAN FARRIER HANDBOOK FOR THE 21ST CENTURY

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EUROPEAN STANDARD CONTENT HANDBOOK

Contents

A. The Equids:

General Points:

1. Breeds

There are certain groups Pamong different animal species that are capable of reproducing among themselves, thus procreating others of their kind. They differ from other groups due to their common morphological and/or functional characteristics and are capable of passing them on to their descendants. These groups of animals are known as BREEDS.

We could say that horses belonging to a race share more similiarities. They have more genetic characteristics than the rest of the animals of the species.

For administrative purposes, a horse is of a certain race when it is registered in the stud book for that race.

In nature, the various horse breeds come about by natural selection which means only the animals that best adapt to their environment survive. Beyond this initial natural selection, human-assisted breeding has made it so that they are artificially selected according to certain animal characteristics that seem useful for human activities, which has generated the appearance of several breeds that are suitable for different functions such as: work, speed, endurance, jumping, meat production, etc.

The classical and modern breeds can be distinguished.

The classical breeds are the result of centuries-long evolution and selection which are, for the most part, due to natural selection.

The modern breeds came about recently and are the result of functional characteristics that humans demand from the horse.

A classification and brief description of the most well-known breeds is provided below. In general, horse breeds can be divided into three groups:

Workhorses
Saddle horses
Ponies

Workhorses.

These horses are also called “cold-blood” horses, not because of their body temperature- which is the same as that of other horses- but rather due to their calm and peaceful temperament.

Some specialists believe that all of these animals originated from the common ancient prehistoric horse (Equus Stenonis).

These equids, the general lines of which are characterised by great physical development, sometimes reach considerable weights and are able to produce great power suitable for traction work. Their skeleton is very solid and this

makes them rural and resistant animals. These breeds are more frequent in Nordic countries and central Europe than in Mediterranean countries.

Workhorses are traditionally used and selected for traction and were widely used by man to transport heavy loads and for agricultural work until the appearance of the internal combustion engine, which caused them to become obsolete and led to a major reduction in numbers.

Currently, they are primarily used for the production of meat, the consumption of which is quite valued due to its nutritional and health benefits.

The two main countries in the world that produce these breeds are no doubt France and Poland.

In France, five breeds stand out due to their importance: the Percheron, the Ardennes, the Breton, the Comtois and the Boulonnais.

In England, three breeds are amongst the most important: the Shire, the Suffolk and the Clydesdale; currently used mainly for leisure activities.

Belgium also produces a remarkable breed of workhorse due to its weight and size.

Saddlehorses.

These include the horses referred to as “hot blood”, due to their dynamic and impetuous temperament. They are more than 1.48 m at their withers. Smaller animals are zoologically considered to be horses even though sport regulations classify them as ponies.

In general, saddlehorses have a svelte appearance and develop ample and agile movements thanks to their strong, yet elastic muscle structure and their relatively light skeleton, which makes them quite suitable for speed. They are used for leisure or competitive riding and harnessed.

The following can be distinguished from among the classic saddlehorse breeds.

Purebred Arabians

Originally from North Africa, this breed has been widely spread throughout the world.

It is characterised by its moderate size, strong temperament, which makes it ideal for crossing with breeds of great physical size, and by its extraordinary proportion of shapes and aesthetic beauty. Many authors believe it has the best temperament, which most likely had a decisive influence on the majority of modern breeds. It is currently used for shows, racing, light traction and endurance, which provides an idea of its enormous possibilities.

English Thoroughbreds

This is the race that shows the greatest capacity for speed. They are animals that were originally selected from the Arabian race by crossing with English mares using speed competition as the primary selection value. They are very svelte and agile, but often have a difficult temperament and quite a bit of riding knowledge is needed in order to get them to perform adequately. The selection degree attained by these animals makes them extremely delicate and thus they

require great care. This breed is currently used for racing and to improve other sport breeds, especially for show jumping and events.

Anglo-Arabians

This is a breed that resulted from crossing the two aforementioned races in order to obtain an animal with a good capacity for sport, a better temperament, that was easier to ride and that required less care. These horses have been used a lot in all sport disciplines, but today have perhaps been surpassed at the highest levels of competition by functionally selected modern breeds.

Andalusians

Originally from Andalusia in the south of Spain, it is one of the working horses par excellence thanks to its good nature and easy handling, making it easy to ride. Its physical characteristics and elegant shape, as well as its movements, make it more suitable for *haute école* (high school) dressage than speed. This horse is also ideal for crossing with more sporty breeds in order to obtain a highly athletic breed with a better temperament.

French Trotters and American Trotters

This race was selected in France and the USA for trotting races which are highly regarded by the public in these countries.

Quarter Horse or the 'Quarter Mile' Horse

This is a breed which was selected in the USA and initially used for cattle herding and was later used for races and Western riding activities. It is a horse of short stature, very compact and highly resistant. Its speed is particularly noteworthy.

The following stand out among the modern saddle horses:

Hanoverians

This breed was selected in the province of Basse-Saxe in Germany. It is the breed that provides the best results, especially in classical dressage, an Olympic discipline where it shows its absolute supremacy. Germany stands out as a producer of modern equid breeds with other breeds that are similar to the Hanoverians, which also see great success in sport: Holsteiner, Oldenburg, Trakehner, etc. …

Selle Français

Produced in France, this breed has spread throughout the world thanks to the great success it has obtained in riding competitions.

KWPN

This breed was created in the Netherlands in accordance with the German selection model which produces sport horses and has recently achieved significant results.

All of these modern saddle horse breeds can be found in all developed countries. English Thoroughbreds are very highly regarded among them from a genealogical point of view as they transmit a good capacity for sport.

Other saddle horse breeds for leisure riding or show exist; however, only the most important and influential for the development of other breeds were briefly described in this summary.

Ponies

Ponies are horses that do not exceed 1.48 m at their withers.

Great Britain stands out as a producer of a great variety of ponies including Shetlands (which originally came from the island of the same name), but also New Forests, Connemara, etc.

The Nordic countries are also home to important breeds such as the Icelandic horse, the Fjord horse and the Gotland.

And finally, the Camargue horse (grey, almost white) and the Mérens Pony (black and typically from the Pyrenees) are the breeds of ponies that are found in France.

Internationally, ponies are used to teach children how to ride. There are races reserved only for ponies, and they are often used for tourism purposes.

2. *Coats and Markings*

Coats

The horse's exterior colour is its coat, which is the combination of the colour of its skin and the hair that covers it. Knowledge of coats is very useful in identifying horses as it is the easiest characteristic to notice at first sight. Normally, a great variety of terms are used in all languages to name the different coats, and knowledge of them is an important indicator of equestrian culture.

The multitude of coat categories proves that there is no fixed criterion for establishing them. The classification that we are offering in this handbook covers the most common and well-known coats.

Coat colour is the result of each animal's genetic heritage. Based on this point of view, there are two types:

- **base colours:** the result of the combined action of base coat genes
- **modified colours:** due to the action of modifier genes that alter the action of base genes.

The base colours are:

- **Solid:** all of the hair is the same colour. There are two coat colours
  - **Black:** only black hair
  - **Chestnut:** only brown or reddish hair;
- **Mixed:**

They have two-toned hair and one coat colour

  - **Bay:** the head and the body are a reddish brown colour, in different hues, but the mane, tail and lower legs are always black.

For all of these base colour coats, terms such as “light” or “dark” can be used to express the hue nuances.

The mixed colours come from coats or base colours and have different causes

- **Lightening of the base colour.** The results vary. The most noticeable coats include:
  - **Isabella**: the chestnut base coat is very light. All the hair is the same colour, thus obtaining almost yellow hues.
  - **Light Bay:** the base chestnut coat is light. The head, neck and trunk will take on a similar hue as the Isabella, but the mane and the tail remain black. This coat often has black strips on the back and legs.
  - **Cream:** the lightening of the chestnut colour is so intense that the difference between the base colour and the coat cannot be distinguished and the general appearance is creamy, nearly white.
- **Homogenous mix with white hair.**

  The white hair mixes with the base coat colour. The homogenous mix can be permanent; in other words, the quantity of hair of this colour remains constant, or progressive, with more white hair appearing with age. The following coats are recognised in this group:
  - **Roan:** A permanent mix of white hair on horses that were originally chestnut coloured. The mane, tail and the lower half of the legs always remain black. It is due to this that these horses have white, black and red hair.
  - **Grey:** A non-permanent mix of white hair with any base colour. The coat progressively lightens with age as the percentage of white hair increases. This coat is the most common after the non-modified base colours.
- **Incorporation of white hair forming homogenous spots**

  In this case, the pigmentation disappears in certain cutaneous areas. The skin in the area affected is rosaceous and all the hair is white. The coats include:
  - **Pinto:** White spots appear all over the body among areas with the base coat colour. We can also find black, red or chestnut pintos and even grey pintos or any other modified coat.
  - **Appaloosa:** There are many variations. The most common case is of a large white spot on the hindquarters that includes small spots in the base coat colour. When the effect generalizes, the horses end up with a colour similar to that of Dalmatian dogs.
  - **White:** When the white spot is so large that it covers the entire cutaneous surface, the base coat colour can no longer be seen and the animal looks absolutely white with pink skin. However, the eyes and mucous membranes have normal pigmentation.

3. General Signs of a Healthy Horse

There are a number of signs that lets us know if a horse is healthy. We should:

Observe its general attitude; a healthy horse should be lively, upbeat, active and interested in its environment without showing any symptoms of nervousness or tension. Every horse has its own normal temperament. Some are very restless and others extremely calm.

Any change in its normal temperament or behaviour is reason to suspect an illness.

The normal rectal temperature of a horse at rest is between 37 and 38 °C. However, after transport or exercise, this can be higher. The mercury column of a thermometer must be first lowered and the horse's temperature must be taken for two to four minutes. Any temperature over 38.5ºC suggests the presence of an infection.

A horse's respiratory frequency is 10 to 25 movements per minute at rest, based on the animal's weight. Breathing is regular. The respiratory movements are not very marked. Breathing rhythm should be regular and the horse's costal arches must not be excessively marked as this could indicate a difficulty in obtaining air. In order to assess the breathing rhythm, you can look at its flank or even place your open hand on the nostrils to feel the outflow of hot exhaled air. In the event of pain or an illness, the frequency increases and breathing is more marked.

A horse's cardiac rhythm at rest is almost constant and is around 36 to 42 beats per minute. To assess this, you can use a stethoscope to directly listen to the heart beats at the rib cage or even by palpation at the arteries. This second technique is easy to do and consists of lightly holding your fingers on the facial artery where it passes the lower edge of the mandible. The cardiac rhythm increases with work as well as with pain and some illnesses.

The mucous membranes are pink when normal. They can be observed at the eyes, mouth and vulva. When you press the mucous membranes of the gums with your finger, they regain their colour in less than two seconds after removing your finger (capillary replenishment time). If the mucous membranes are white, bright red or yellow, or the capillary replenishment time increased, a veterinarian must be called.

A healthy horse's hair must be shiny and quite smooth. Hair that stands on end indicates a problem. The skin must be supple without rough patches or enlargements, and must move freely on the subjacent tissue.

The eyes should be shiny with a clear and serene gaze. The eye membranes must be transparent. If they are very red, this indicates an inflammation or irritation, whereas a very pale colour can indicate anaemia. If the colour is bluish, this can indicate a lack of oxygen in the blood which may suggest severity in many illnesses like digestive colic.

Healthy horses have between eight and ten bowel movements a day. The dung must be shaped like balls and not be too hard or too dry. If it is so loose that it isn't

round, this may indicate a digestive illness. The colour depends on the diet, being greenish in pasture-fed animals and yellowish in those nourished with feed mixes.

Urine must be released regularly without discomfort or pain. It should be clear and free of any strong odour, which could indicate different illnesses. Dark urine is caused by muscular injuries and dehydration.

Any change in the way horses normally eat should be reason to suspect the presence of an illness. A horse that does not eagerly eat its food ration, without a doubt suffers from a problem (which is not necessarily an illness) but for example, it could mean that it doesn't have enough water available.

A horse's nostrils must be clean of any discharge except for a light dampness which is the result of the condensation of the water vapour suspended in the air it breathes. Very dry nostrils may indicate dehydration or fever.

A healthy horse does not cough. Any kind of cough should be considered a sign of illness.

A horse should evenly distribute its weight on all of its legs. If it refuses to support itself on any of them, this could indicate a painful area. This is particularly evident for the fore legs. However, it may support its weight on its hind legs when it is healthy. Another indicator of pain with regards to its support is the attitude of the tail, which, in a healthy horse, is relaxed and not in the middle of the rump.

4. Defects and Non-Pathological Qualities.

The farrier can see if there are any defects or injuries in the physical structure of the animal's limbs or legs by observing the horse.

Such as: angular deviations, rotations, lack of balance, etc.

The farrier can best compensate for these defects through adapted foot trimming and accurately turning the horsehoes, all while always keeping in mind the horse's balance and locomotive system: rolling, fitting, extensions, etc.

It is advisable that the farrier make note in each horse's records of any comments and interventions regarding his work on the animal so that he, himself or a colleague can immediately see the work to be done.

The farrier should inform and explain his work to all of the people involved with the horse: owner, trainer, etc.

5. Ethology (Animal Behaviour).

Social Structure:

Horses are gregarious animals that live in groups or in herds with a solid hierarchical structure that dominates all of the group's activity. The most common social unit is the harem which includes a group of mares with its foals and the stallion. Other groups are formed by the bachelor males which tend to constitute their own harem by stealing mares from another stallion.

Foals leave the herd with the support of the stallion which acts as the leader of the group and join other bachelor groups that are usually led by older animals with stronger temperaments.

In domestic populations, the social structure is less clear. It is modified by the presence of geldings. The groups of animals are artificially formed without the individual horses being able to freely choose their companions. In any case, domestic groups also show a solid hierarchical tendency.

Relationships of Dominance:

In any contact between horses, a dominant-subordinate relationship always develops. This holds great importance because it prevents or reduces the frequency of aggressions and contributes to the stability of the herd.

In general, the adults dominate the young but, contrary to other animals, this domination seems to have nothing to do with physical characteristics such as height or weight. Character and temperament are the two primary factors that determine the hierarchical position of the animals.

The manifestation of dominance follows a successive rule of actions which begin by simple displacement where the dominant animal tries to occupy the dominated animal's space. If the dominated animal does not move, the dominant animal threatens to bite by extending its head and neck and pulling its ears back. The lack of a response leads to the following stage, the actual bite after showing its teeth and opening its mouth. Kicking is not common in this kind of behaviour as it is more of a defensive reaction to an attack, but sometimes this is also preceded by intense up and down movements of the tail.

When a horse submits to the pressure of a dominant animal, it does so by initially moving to concede its space or by taking off running. Young animals show a specific submission behaviour that protects them from the aggression of adults which consists of lowering their head and making a chewing gesture.

Dominance relationships between the different groups have also been described when a scarce resource like water must be shared. The use of troughs in dry regions gives rise to dominance relationships between the different herds that use them; if the dominant group wants to drink, it chases away the group already there.

Communication:

Horses use acoustic, olfactory, tactile and visual signs to communicate information about their identity, emotional state, social status, reproductive state, the activity they carry out and the environmental circumstances to their counterparts.

We can differentiate two types of acoustic marks: vocal and non-vocal sounds. There are three basic vocal sounds, which are:

- Squeaking that may be associated with kicking and agitation may mean a threat of aggression on the part of a male or a rejection to mating by the female.
- A gentle neigh (also called "nicker", which means broken) is produced by the male when it courts a female, when the mother wants to wash the foal, or even

when the foal finds its mother after a short separation, as well as when the animals receive food. Thus, this is a manifestation of pleasure.

- Long, intense neighs which can be heard from great distances and occur when the mare and the foal call out to each other when they lose visual contact with each other, when a horse arrives in a new or foreign environment, or in response to another neigh.

The non-vocal sounds include blowing where the animal strongly expels air through its nostrils which is interpreted as an alarm or warning sound for the herd.

Olfactory communication is less well-known, but is probably more vitally important. It is difficult for man to understand as our sense of smell is much less developed and it is difficult for us to imagine the quantity of information on the environment that can be received through this sense. But for horses, this sense is extraordinarily developed. In this regard, we must only remember that the points of maximum smelling interest on animals when they enter into contact are around their mouths, flanks and the perineal region.

But horses also pay attention to the smell to all of the secretions produced by their congeners, such as bowel movements (especially for stallions), urine and birthing liquids (very important for the mother to learn how to recognize her foal's odour).

Tactile communication is also important, but difficult to interpret. It is very close between the mother and the foal. We know that pressure from the foal on the mother's flanks expresses its desire to nurse, and that the pressure exercised by the mother with her head on the foal's hindquarters indicates her desire to nurse. Another typical expression of tactile communication is the phenomena of mutual cleanliness where the animals, and especially the young foals, scratch each other with their teeth to mutually free themselves of any foreign substance stuck to their skin or hair.

Visual communication is also very important and subtle; therefore it seems difficult to interpret. It is determined by the position of the ears, lips, tail, hooves and head.

Ears back indicates a threat or an aggressive state. If they are lifted, they show that the animal is paying attention to the object it is looking at. And if they are horizontal towards the outside, they indicate relaxation or submission.

An erect tail shows excitement and trust, whereas it is held close to the body between the rump in times of fear, submission or relaxation. The position of the head is similar; when held high, this indicates excitement and sureness and when held low, submission or relaxation.

Marking

Stallions identify themselves by the odour of their stools. They use their bowel movements to mark their territory and that of the mares that occupy it. This is why they often make a habit of releasing their excrements over those of other males as well as on the dung and urine of mares in their harem during the reproductive cycle.

After sniffing the bowel movements, they react by adopting the Flehmen response: a curled lip (curling the upper lip and showing the incisors and gums) so they can identify the smell in a more subtle way.

Certain horses do not mark their territory, probably due to their nomadic lifestyle in search of better pastures.

6. *Activities:*

EQUESTRIAN DISCIPLINES.

It can be said that the current importance of the horse comes mainly from equestrian sports. The following are the most common and most practiced sports disciplines:

This information was obtained mainly from the French Equestrian Federation (www.ffe.com).

Dressage:

Dressage is an essential discipline as it proves the quality of communication between the horse and its rider. This is the first discipline that is practiced by beginners who must refine their gestures and attitudes throughout their lives as riders in order obtain optimal attention from their horses. Dressage competitions are evaluations of this progression and give riders of all levels the chance to demonstrate this understanding.

A dressage test puts a rider and horse on stage. The two advance on a 60 by 20 m rectangular field and execute a series of movements pertaining to a required or free programme and music: the reprise.

These movements are done at a specific place and at the pace required. In order to help the rider mark the locations and perform the movements, letters are posted all around the arena.

The judges assess the ease and fluidity in carrying out the programme as well as the rider's discretion as it communicates its orders to its horse. The precision in the execution, the submission of the horse, the quality of the paces, the impulsion and the position of the rider on the saddle are also judged and a score between 1 and 10 is given for each movement.

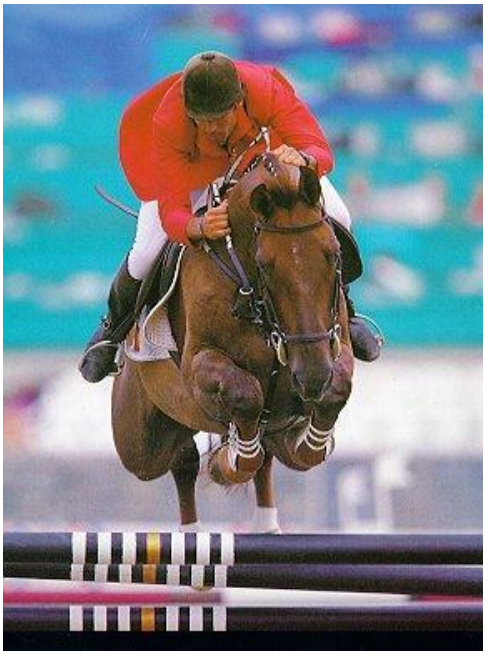
Show Jumping:

Show jumping puts a rider and horse on stage in a fenced area with an obstacle course. The bars and elements that make it up are mobile and fall on impact. The idea is that the horse and rider pair must clear these obstacles in a precise order and a given time. Point or time penalties are allocated for refusals, falls or if one or several bars fall down.

This discipline requires perfect harmony between horse and rider, as several parameters such as impulsion, speed, course, number and length of strides must be combined in order to guarantee a faultless run. The rider's estimations and proper communication with the horse are the keys to this success.

The horses used are of all breeds and all sizes. It is important to find a balance between the horse's level and the course difficulty. Likewise, there is a wide range of events available to riders allowing them to progress and see how they measure up to riders at the same or higher level in open events.

Young riders who train on ponies benefit from events that are adapted to their age, level and the size of their pony.



Eventing (Complete equestrian competition):

As its name indicates, eventing brings together a number of endeavours, putting into play a wide range of skills, both physical and moral. Tested on three events, the preparation of horse and rider pair must be impeccable in order to best avail in a discipline where speed, endurance and balance are highly necessary.

Eventing always begins with a dressage test. Advancing on a rectangular arena, the contestants execute a sequence of required movements using the three paces. During this event, the judges assess the suppleness, elegance and precision of the horse and rider pairs.

The cross-country event follows. A test of magistry, this is by far the most selective of cross-country tests. The contestants follow an itinerary that reflects the landscape: alternating between underbrush, hilly prairies and flat lands. Fixed obstacles must be cleared in a limited amount of time. Some of them are **combinations** that require more effort from the horse. For the obstacles that seem dangerous, the rider may choose to take other options that are technically less difficult alternatives, but that require covering more ground and therefore bring about time penalties.

Show jumping concludes the trials and reveals the final classification. Contestants must clear approximately a dozen obstacles. This event primarily tests the horse's capacity to recover, technical nature and respect for the bars.

Originally a military event, horse trials have their roots in cavalry competitions that took place in the 19th century to prove the endurance, speed, courage and submission of the army's horses. Audacity, speed, balance... The horse's spontaneity and generosity are also very much tested in this exceptional discipline.

Races (Turf):

The idea behind the flat race is, at first glance, quite simple: start at a gallop, and reach the finish line first.

The race distances vary from 900 (some races for 2 year olds) to 4000 metres (for example, the Gold Cup in England), but most often range from 1600 to 2400 metres, with the English mile being the historical reference at 1609 metres.

The horses take off from the stalls, which are boxes they enter that automatically open as soon as the start of the race is called.

However, in order for it to be a competitive race, all the contestants must be able to compete, even if they have less potential. This is the principle of the handicap:

before the race, the handicapper allocates a certain weight to each horse which it must carry throughout the race.

The weights are distributed based on the horses' results and vary between 50 and 62 kg in France (the numbers and weight units change by country). Thus, the horse that wins a race will receive an additional load for the following race. On the contrary, a horse that runs poorly in a race will have weight taken off for the following one. The objective is to have the closest race possible.

During the race, the importance of the rope must also be taken into consideration. Through a random draw, the horses obtain a number that designates their starting stall. Number 1 is placed at the starting rope and number 18 completely to the outside, which means it will have to run a greater distance at the bends. It is an important factor that can sometimes cost the win.

A very famous flat race is the Prix de l'Arc de Triomphe. There are other highly prestigious races, especially in England, Ireland, Germany, Italy, the United States, Japan, Hong Kong and Dubai.

Vaulting:

Vaulting is an equestrian discipline that allows for an original approach to the horse or pony. Open to all, it serves all interests: animal discovery, saddling up, leisure or competition.

In competition, vaulting is a spectacular discipline that is practiced in a circle. Vaulting in a circle places one or several riders on stage who advance on a horse at a gallop controlled by a lunger. The animal is equipped with a surcingle and a thick blanket which allows the athletes to execute a series of movements where balance and physical ability are fully tested.

Without the saddle and the reins, a sensation of freedom is often evoked by those who practice it. Thus, it would not do justice to classify it as just an equestrian discipline.

Vaulting is not about the exchange of information between horse and rider in order to move; it makes it so the animal is an essential element of body expression, bringing to mind gymnastics, dancing or sports like skiing, skating and surfing due to the grace, strength and constant search for balance it requires.

When practicing this sport, a vaulter has to be able to execute a sequence of extremely spectacular movements such as balancing acts on one's arms or perilous jumps, all while maintaining the connection with the horse in order to preserve its locomotion and back.

So that the vaulter(s) can express themselves, they must be able to count on a perfectly trained horse. The horse must maintain a regular pace and a tight course in a circle with a 13 metre minimum diameter for several minutes: this is why a calm, attentive and perfectly prepared horse is necessary. Once these conditions are met, vaulters can carry out their programme and do a series of free or required movements.

Polo:

Polo is an equestrian sport that was born in Babylon around 2500 B.C. The kings and queens of Asia and Asia Minor and their courts devoted themselves to it. The word *polo* comes from the Tibetan *spo-lo*, as the British founded the first polo club in Silchar, in the Himalayas, in 1859. This sport was introduced in America by British colonists in the 19th century.

Polo is played on a 275 x 144/180 m grass field. It consists of hitting a ball with a long club. The players ride on horseback and must successfully hit the ball between two

posts that are 7.5 m apart. The game is played in 4, 6 or 8 periods lasting 7.5 minutes each, with 3 minute breaks between them.

The players and horses are protected in order to prevent accidents. Likewise, there are specific rules on behaviours and actions that must be avoided.

Created to give each team an equal opportunity, handicaps are allocated to players on a scale from -2 to +10. A handicap of 4 allows one to compete in international matches. A team's handicap is the sum of all of its members' handicaps. A team with a handicap of 30 against a team with a handicap of 40 begins the match with 10 goals up.

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Horseball:

Horseball is a team sport opposing two teams of six riders (four players and two substitutions) on a rectangular pitch ideally measuring 65 m by 25 m. Through a game of passes, the players on each team attempt to score points by shooting a ball through opposing baskets.

The ball has six leather handles making it possible for riders to pick it up without having to dismount. In order to facilitate this movement, a strap below the horse's belly connects the two stirrups (a pickup strap).

A horseball match is played in two 10-minute periods with a 3-minute halftime. Given the small size of the pitch, all riders are both attackers and defenders for their team. They are allowed to steal the ball and can push other riders outside the pitch borders with the help of the weight of their horses.

Two essential rules make horseball very original. The rules require that each team make three passes between three different players before shooting. If this rule is not respected, the goal can not be valid. The "ten second" rule limits the time a single player can hold the ball to 10 seconds.

TREC:

In English, "trekking" is a sport similar to hiking, with the word in Arabic meaning "trail". The origin of the acronym TREC - Techniques de Randonnée Équestre de Compétition – however, is decidedly French. This sport discipline emerged at the end of the 1980s among groups of trail riders who wanted to compare their horses and their riding skills by means of events assessing the qualities necessary for trail riding.

An equestrian discipline par excellence for amateurs in the countryside, TREC is comprised of four events designed to evaluate the horse/rider pair.

Two of the events were inspired by the difficulties found in trail riding:

1. POR - Orienting Course (*Parcours d'Orientation et de Regularité*),
2. PTV - Obstacle Course (*Parcours en Terrain Varie*), and two tests of equestrian knowledge and technique:
3. Presentation of the Horse and Rider
4. Pace Control

Endurance Riding

No other competitive equestrian sport keeps the horse and rider together for so long.

Endurance riding is a discipline of complicity between the rider and the horse, the horse and the rider. Observe the two during veterinary check stops, or after arrival, and you will see this bond betrayed by a gaze, a stroke of the hand, a quick movement of the head, the gesture of an ear, a furtive exchange of signs that does not deceive… it is clear that the shared effort brings them together.

It is a sport for those who travel far. These are the most common conditions:

- Competitions of 120 or 160 kilometres in a day, or even 200 in two days.
- Maintaining a rhythm of 15, 17, 19 km/h... on average, while respecting the horse on these distances.
- Supporting each other for hours and toughing it out.
- Managing the effort of your horse and using strategy in the competition.
- Being in a group or sometimes alone for hours on a marked trail out in nature.
- Not getting carried away when things are going well, as nothing is ever won until you pass the finish line.
- Not getting down when the time seems to drag on and things are not going well, but knowing when to stop before your horse does.
- Allowing yourself to become overcome by the landscapes which are often beautiful, and at the same time, always being on the lookout for repeated course difficulties.
- Listening carefully to your horse, kilometre after kilometre, without stopping.
- Not asking the horse to do more than it can.
- Not letting the horse go beyond its abilities for you.
- Knowing how to recognise the horse's limits and knowing how to sense them.
- Arriving with your horse in good condition, although tired, but always spirited enough to be capable of galloping full out in a final sprint.
- …and finishing with panache, or just finishing, but without the weakness or shame of having gone too far.

Western:

This kind of horseback riding was born on the ranches in the United States. It made it possible to escort, watch over and select cattle logically and quickly. From there, a kind of dressage which emphasises qualities of availability, ease and manageability of the western horse was born. A competition circuit was established in France, Europe and internationally. The horse and rider must have a relationship of complete trust.

The specialties in this discipline are called: Reining, Cutting, Pole Bending, Barrel Racing, Trail and Trainers.

Driving.

A harnessed horse is an image that is familiar to us as it has been recorded in our recent history. Engines may have replaced animal traction, but all you have to do is watch driving to feel pure delight. As, according to some, horses are better able to pull loads than to carry them on their backs. This is surely what the many amateurs who practice this discipline for pleasure or for competition feel. Almost all horses and ponies can be harnessed and thus offer new proof of their generosity.

Harnessing competitions are similar to eventing due to the great variety of effort the horses must make as they are judged on dressage, endurance and in manageability tests.

The **driver** leads the driving and can be assisted by **grooms** who are authorised to dismount in order to help out in certain phases of the course. Driving competitions are open to teams of one, two or four horses and are divided up into three different events:

The dressage event takes place in an arena, the sizes of which vary in accordance to the importance of the event. Contestants must execute a reprise during which the judges assess the impulsion, style, pace regularity and also the cleanliness and general condition of the harness. The driver is judged on technique and mastery. The Manageability event consists of overcoming obstacles on a competition track.

The marathon follows which includes three to five sections at a required speed. This event tests the endurance, resistance, speed and manageability of the horses and the drivers' skills on an obstacle course.

Care:

7. Hygiene

Hygiene is an important factor in keeping a horse healthy. Hygiene includes the cleanliness and the care given to the different parts of the body, diet, the cleanliness and disinfection of the stables, physical exercise, and overall equilibrium of the horse.

The principal areas in caring for a horse's hygiene are:

Skin and hair cleaning and care.
Hoof cleaning and care.
Exercise hygiene.
Facility conditions.

Skin and Hair Cleaning and Care:

The cleanliness of an animal's skin and hair has a clear aesthetic interest which also affects its health. The best way to clean a horse's skin and hair is through mechanical friction with the use of common grooming tools found in stables; in other words, a currycomb, a soft brush (or with fine bristles), a wisp (with thick bristles), cloth and a sponge.

Mechanical friction has some advantages over other cleaning systems. The massage it produces on the animal's skin stimulates blood circulation in this area of the body which accelerates the arrival of the blood that best nourishes the skin tissue and makes the coat healthier and shinier.

Wild horses that roam freely use other mechanisms to keep their skin and hair clean and in good condition. These natural hygiene mechanisms include rolling in the grass or sand and scratching themselves with natural objects such as tree trunks or rocks.

Another natural mechanism is self-grooming. Horses often use their mouths to clean their legs by licking them, or to scratch different parts of their bodies. Foals use this mechanism most efficiently due to their great suppleness and small size.

Due to the restrictions for self-cleaning, horses, more than other animals, use what could be called reciprocal cleaning, which consists of scratching each other. Mares

clean foals with their mouths after birth in order to quickly dry them and prevent an excessive loss of heat, which in nature could kill them.

When man alters a horse's natural environment and encloses the animal up in a stable, the horse no longer has natural elements available to be cleaned or companions that can help it. This is why we must take care of its hygiene.

However be careful, cleaning accessories are one of the main sources of contagious skin diseases. This is why it is best to have individual cleaning equipment for each animal and clean this equipment regularly, and even disinfect it.

Showers are a good cleaning system, but they shouldn't be abused. In principle, horses should only be showered when the outside temperature is high in order to prevent a sudden loss of heat if there are no effective drying systems available. Preferably, showers should be given after exercise and the animal should be allowed to completely dry before entering the stable. In cold weather, showers should be restricted to the legs in order to prevent respiratory complications.

As an important precaution, soaps and shampoos should be used as little as possible even though there are special types for horses. The reason for this is that these animals produce a type of fat in the sebaceous glands of their skin which forms a water-proof film preventing moisture from penetrating into the deepest part of the coat. Due to this, they can easily withstand rain and cold. But soap dissolves this fat and reduces the horse's natural protection.

Shearing is a technique that is practiced as part of horse hygiene in order to prevent long and tight winter hair from complicating thermoregulation during exercise. Hairy horses often sweat in the winter when they work, which can cause a cold because it takes them a long time to dry. In order to prevent this, they are sheared, but certain precautions must be taken. First, the animals must be protected from the cold after being sheared by putting blankets on them or by controlling the temperature of the stables. Moreover, the areas where the skin is in contact with riders (for example the saddle) must not be sheared in order to prevent lesions.

It is also common, for aesthetic reasons, to shear a part of the tail hair. There are a few ways to fully or partially shear different parts of the horse's body depending on the objective.

Hoof Cleaning and Care:

The hooves are essential to a horse's functional activities. For this reason, their care is one of the most important hygiene factors.

The hooves must be cleaned daily, before and after the animal works, in order to prevent excrement, sand or rocks from getting stuck in them, which could harm the horse. Manure that sticks to hooves ferments and this damages the coronet, which loses its hardness, thus harming the animal's support. Rocks can push on the sole and cause injuries and limping. Sand that compacts under the sole makes it difficult for the elastic mechanisms to function.

Hoof cleaning is done with the help of specially designed instruments called "hoof picks" that are generally hook-shaped with a blunt tip in order to prevent the risk of hurting the animal. The surface of the sole and the sulcuses of the frog are scratched with the hoof pick in order to remove all the dirt. A wisp can be used to finish the cleaning.

The external part of the hoof is called the "coronet band". This secretes a fat or varnish that protects the outside of a horse's hoof from loss of moisture. It must be cleaned with a wisp or a gentle scraper, so as to not remove this protection.

Daily hoof cleaning contributes to the animal's dressage and improves its docility. It allows us to observe the lesions that might otherwise go unnoticed and worsen over time. During cleaning, one must check for the presence of notches, cracks, peeling and the location and wear of the horseshoes. We should also compare the temperature of all the hooves, which should be identical. An increase in temperature in one of the legs may indicate the presence of an injury.

Dressing:

Dressing the hooves is very important. The moisture of the hoof is the main factor in its elasticity. Hooves that are too dry are very hard and not very elastic, and if they are too damp, they grow excessively and can be subject to putrefactions. The best way to control hoof moisture is to apply oily products to the surface, making them waterproof.

To do so, fats that have an oily appearance are used. The fat applied properly stops evaporation from the hoof in dry climates and limits the absorption of moisture from the environment in wet climates. Incorrect use of the fat can cause excessive softening which weakens the hoof and makes it susceptible to different diseases.

When in dry climates, the best thing to do is apply the fat after showering the horse, after having finished working so that the moisture is maintained and the elasticity of the hoof improves, as it tends to be very dry and hard.

On the contrary, in wet climates the fat must be applied before leaving the stable, especially if the animals are going to be left in muddy or wet ground like fields. This way, the hoof is impervious to any excess moisture.

Another important factor in hoof care is a balanced diet. In order to form the coronet substance, the hooves need a large quantity of sulphurous amino acids and thus, sometimes the horse's diet must be supplemented with products such as methionine or biotin.

Physical exercise hygiene:

Horses need to do exercise in order to correctly maintain their health and of course, the appropriate level of fitness to face athletic exercises. Doing moderate exercise stimulates the circulatory system and thus improves the circulation to all the horse's organs and physiological systems.

For equids, this activity is even more important because these animals have hooves, which are elastic mechanisms that contribute in a very important way to blood flow. It is due to this that certain authors say that horses are animals with five hearts; the one that is found in their chests and those that are in their four hooves.

Hygiene for horses undertaking physical exercise involves meeting the following requirements:

Determining a progressive work programme.
Not demanding inappropriate effort in relation to the horse's physical capacity or its training and dressage level.
Adapting the horse's diet to the intensity of its work.
Adequately warming up and progressively cooling down.

Using leg protection based on the risks involved in the work.
Avoiding fatigue by doing short sequences of intense work and longer periods of moderate work.
Getting advice from a specialist and asking for a veterinarian's opinion when determining work programmes.
Stopping the exercise and calling a veterinarian if the animal becomes lethargic.

Facility conditions:

Of all the horse hygiene tasks, cleaning and maintaining the facilities is what takes the longest time. The following aspects must be taken into consideration:

Cleanliness of the litter, extracting the dung and the portion of the litter that is wet from urine in order to prevent these products from affecting the hooves.
Providing water if possible with automatic individual troughs.
Controlling the air flow so that the air is properly renewed without creating draughts.
Paying attention to the build-up of manure so that these odours and the proliferation of insects do not cause problems for the animals or environmental contamination.
Avoid using construction materials that could cause harm to the animals such as glass, iron wire, wood splinters, etc.
Paying special attention to paddock fencing as far as its safety in closing off the area, but not causing the animals any injury.

8. Food

The horse's diet. Digestive characteristics of a horse:

Horses are herbivores, which means that they only eat plants. In the wild, field grass is the horse's main food source. The human use of horses made it necessary to modify their diets in order to cover the energy needs of the work that is demanded of them and to make it compatible to life in the stable.

Despite their condition as herbivores, horses are not ruminant, in other words, they do not regurgitate food in order to re-chew them as a cow does for example. Horses have small stomachs (with a capacity of 12 to 15 l). Because of this, they must eat continuously. When a horse is artificially fed, it is best to distribute the daily ration in several doses - at least three - to avoid digestive problems.

Another characteristic of the horse that makes it sensitive to digestive illnesses is its inability to vomit, due to the structure of its palate and the disposition of its stomach muscles that prevents regurgitation.

Horses need a varied, balanced diet that is adapted to their activity, age and size and which is capable of covering their nutritional needs. In order for their digestive tract to work properly, they need a sufficient volume of food, which is provided by fodder such as grass, hay and straw.

Spacing feeding time apart from physical work is recommended. It is best to always feed horses at the same time so they can prepare their intestines to make good use of the food. Food should be administered to all the animals in the stable at the same time to prevent stress and dissatisfaction of those that do not receive it.

Horses are very demanding animals as far as the quality of the food and the water they consume. Food must be clean and free of fungi and dust in order to prevent illnesses and the food from being rejected.

Nutrients:

By nutrients, we mean each of the basic components of the food animals need. We shall highlight the following:

a) **Water:** It is essential for all vital functions because it is the solvent par excellence that transports all other nutrients.

b) **Fibre:** It is made up of plant carbohydrates and its main mission is to provide volume to the ration and regulate the intestinal tract by preventing the formation of a build-up of food. It also proves energy.

c) **Energy elements:** They provide the fuel needed for metabolism and the vital functions of cells and are made up of:

- soluble carbohydrates such as starches and sugars.
- fats.

d) **Structural elements:** They provide the materials to develop functional organs and tissue. They also help with the operation of vital functions. These essentially include amino acids and proteins.

- Minerals: Necessary for the development of the skeleton and the maintenance of vital functions. The most important are: calcium, phosphorus and sodium, which are needed in large quantities. And others, such as iron, copper, zinc and selenium, which are needed in small quantities.
- Vitamins: They contribute to the regulation of many organic reactions.

The main foods used for horses:

To feed horses, the products offered by nature are traditionally used. This depends on the land and the customs.

The most common foods can be divided into three large groups:

a) Fodder.
b) Cereal grains.
c) Supplements.

a. <u>Fodder:</u> These foods are usually stem grass or the leaves, flowers or fruit from herbaceous plants (aerial part). Fodder can be consumed raw or preserved.

Raw fodder constitutes the majority of the diet of wild horses. It is the best food for horses. Green grass is very appetizing for horses because they digest it easily as it is rich in water and low in fibre. It can not be preserved.

Preserved fodder is subjected to a process to stock and preserve it. Two techniques are used:

- "Haying" which consists of drying the plants after mowing. This is done by the sun or in artificial dehydration tunnels.
- The fermentation of plants without oxygen once mowed, silaging.

Whatever the preservation process may be, it decreases the nutritional value of fodder. But these foods provide energy and are rich in proteins and calcium.

Straw. This is the stems of cereal grains (wheat, barley, oats, etc.) after their harvest. It has little nutritional value, but is used to give volume to highly-concentrated food rations and to divert the animals while they are in the stable. If consumed in excess, it can cause the development of abdominal volume; for very gluttonous horses, this can cause colic.

The best straw is from oats, as it is the lowest in fibre. However, wheat is the most commonly used. It is frequently used for horse litter, so they can freely consume it.

Pellet fodder and granulated fodder. Fodder can also be processed in a more complex manner in order to improve its digestibility. This is the case of cut fodder which is conditions to favour its ingestion, or granulated fodder, the most commonly used of which is granulated alfalfa.

Hydroponic fodder. This option consists of germinating cereal grains in water and maintaining a constant temperature and moisture level. The result is that grain husk is formed and a germ is produced. Horses consume this very well, it is refreshing and helps improve the digestion of cereal grains.

b. Cereal grains:

Cereal grains are used for energy supplements based on the horse's work. They are foods that are very rich in carbohydrates (starch) and easily digestible due to their low fibre content. Moreover, they are products that cost very little and are easy to obtain.

The use of one cereal or another depends on the region. But the most common are oats, corn and barley. Wheat can also be used, but it is more expensive and can cause founder. Sorghum, sesame and rice are used less frequently.

c. Dietary supplements:

These are used in horse nutrition in small quantities in order to keep the animal's metabolism and digestion in balance. The following are the most commonly used:

Bran is made up of cereal husk. The fibre it contains gives it the capacity to absorb water. It can cause accidents if it is consumed dry because the volume increases as the water is absorbed. In order to prevent this, it must first be moistened and never make up more than 10% of the total ration.

Dehydrated beet pulp. A waste product of the sugar industry, it is used in the equine diet as it is rich in fibre and sugars.

Molasses, which is also a waste product of the sugar industry that is very rich in soluble sugars, is good for muscular work and very appetizing for horses. It is administered in small quantities. An excess can cause diarrhoea and/or kidney injuries.

Foods that are high in water content. These are used as refreshments with vitamins. They are rewards for the animals, who consume them with pleasure. The main ones are apples and carrots and they must be administered in rather large pieces which force the horse to chew because if the animal swallows them whole, they can cause obstructions in the oesophagus. Some tubers like turnips or potatoes must be administered cooked so they are digestible.

Feed mixes:

There are different types of feed mixes on the market that are excellent for horses and adapted to the different activities they undertake. The positive features of these products are:

The compositions are balanced, appropriate and cover all the animal's needs.
They have a precise, uniform composition. A kilo of the same mixed feed always has the same analytical composition (equal supply of energy, mineral proteins, etc.).
The raw materials are subjected to prior treatments in order to improve their benefits.
Feed mixes come in different forms: granulated, flakes, flour, etc.
They are not dusty or dirty. This is removed by an industrial treatment, thus preventing a negative effect on the respiratory tract.
They taste good to horses. And thus, are better consumed.
They include vitamin supplements. This prevents accidents due to doses that are too high in vitamins.
They are preserved and distributed easily. Distribution and dosing is easy. They are prepared to be stored without any alteration.
They offer legal protection against possible errors. In the event of a formulation error, the law provides for compensation for damages that could affect the animal.

The main disadvantage is the price, which is often higher than the traditional diet, but the advantages it offers compensate for this. In general, feed mixes should be administered with good quality fodder in order to supplement the supply of fibre and to obtain the psychological effect of prolonged chewing for horses that remain in stables without access to prairies.

Principles for a proper horse diet:

In order for the horse to be healthy, its diet must follow the following principles:

Variety: The foods must be complementary so as to cover the animal's various needs.
Adjusted to the horse's needs. Too much food can cause excessive weight gain and not enough food will lead to weight loss and illnesses such as rickets.
A balanced mineral composition. Special attention must be paid to the calcium/phosphorus ratio which must be around 2 to 1. An excess of one mineral can influence the absorption of the others. A balanced diet is fundamental to the animal's good health.
High rate of digestibility. Food that is prepared through the use of appropriate techniques such as transformation into granules or crushing, in order to facilitate digestion and prevent them from being ejected without being beneficial.
Adapted to the horse's taste. They can incorporate products such as molasses, or those that are rich in water like carrots.
A fibre content of between 15 and 18% of the total ration. Considering that cereals provide between 2 and 10% fibre, hay between 20 and 30% and straw 40%.

In general, horses consume approximately 2.5% of their total body weight daily; in other words, 2.5 kg of food for every 100 kg of live weight.

As far as dry matter, without counting the water content, horses are capable of consuming about 2% of their body weight per day; that is, 2 kg of dry matter per 100 kg of live weight.

9. Habitat

Natural habitat:

Horses are animals with great ecological tolerance and can be found in very diverse climates. They show a clear preference for open spaces and especially for prairies, although they have a great capacity for adaptating to dry climates and desert regions.

The facilities:

Horse facilities differ according to the livestock farming system used. Special attention must be paid to the confined areas, all the corners of which must be rounded; and to the doors, which must be long and high enough to prevent the animal from getting hurt. The walls and floors must be built with solid materials that can be easily cleaned. There must not be any salient objects which could cause tears such as: locks, nails, hooks, etc. The floors must be built with anti-slip materials.

A horse's holding area must be equipped to allow for the distribution of fodder, fresh water and food. Horses that stay in a stable also need facilities where they can get physical exercise.

The following are the three most common equestrian farming types:

a) **Extensive farming.** The animals are always in open air and only feed on the land.

b) **Semi-extensive farming.** The animals stay outside with small refugee areas and feed on the land and on food man provides.

c) **Intensive farming.** The animals spend most of their time in stables and are almost exclusively fed on products distributed by their caregivers.

The following are the three most common horse facilities:

Stables. They should be comfortable and safe for the animal. The size depends on the size of the horse; it must be able to lay flat and get up without difficulty. The litter must be soft and dry, with a drain that removes urine and other liquids. As for individual boxes, it is best if the horses can see each other. When planning the facilities, special attention must be paid to airing and above all, air draughts, which are very harmful to these animals.

Fences. They should be solid and well-fixed to the ground and high enough that the horses cannot jump over them.

Storage for feed. It must be clean and ventilated as well as closed so that the horses cannot get into it. It must be protected from access by other animals (rodents, cats, dogs, etc.).

Feeders and waterers. Regardless of whether horses roam free or in the stable, the provision of water and food must be ensured in the best way possible so as to avoid any wasting or danger to the animal.

Horseshoeing area. It should be spacious with an anti-slip floor and no obstacles; it must have running water, good lighting and a system to tie up the horses. It must also be supplied with electricity. It must always be clean and disinfected.

Health and isolation facilities. Any horse farm must have a facility where sick or injured animals can be kept and isolated so they can receive the care needed to for

their recovery. This facility must be separate from the other animals to isolate animals with contagious diseases.

Runs. They are essential for intensive farms where the animals remain in the stable most of the time. For their well-being, horses need to move around, which is why they must be able to use an adapted area where they can do enough physical exercise, run freely or work appropriately.

The ground for these exercise areas must be supple; very hard or very soft grounds must be avoided as they can both cause injury. The walls for this space must be solid and secure in order to prevent the horse from getting hurt if it runs into them, and they must also have wide enough doors.

Waste storage facilities:

Taking care of horses produces different types of waste that can become pollutants and create unpleasantness such as foul odours for surrounding houses. This kind of operation is subject to laws that regulate unsanitary and dangerous activities. Removing manure or urine is one of the major problems that must be resolved.

Thus, the manure storage facility must be built with walls and a floor made of cement or another resistant and water-proof material in order to prevent any infiltration of liquids which could lead to fermentation. It must be located far away from any animal or human housing and in such a way that does not allow dominant winds to transport foul odours towards residential areas.

Once manure has fermented, it can be used as fertilizer on the property or even sold. If the establishment does not have a designated manure pile, it is also possible to store manure in containers that can be transported to authorised locations or it can be incinerated.

General services:

These include staff quarters, sheds to house farming materials, areas set aside for the work teams and horses and any other additional facilities that may be necessary.

10. Approach and Restraint

Firstly this has to do with quickly figuring out the character of the horse that is going to be shoed. A scared horse stiffens up, holds its neck up high and its ears move a lot. A mean horse holds its ears back.

A lack of trust is always the order of the day even if the horse knows you well and is the nicest horse in the world. You should not walk very close behind the horse's hindquarters. In order to take hold of a limb, first always begin by placing your hand high up on the limb, then let your hand slide along it until it reaches the fetlock, which you must pull in order to make the horse lift its foot. For some horses, it is necessary to lightly pinch the tendon region so they lift their foot.

Never make any sudden movements, especially with Thoroughbreds. Shouting must be avoided, especially when near a scared horse. Even so, sometimes it is necessary to raise your voice so that the horse remains attentive.

In order to have proper contact with a horse, a farrier must take precautions but never be scared.

Horse immobilisation techniques

There are many circumstances when a horse must be immobilised, such as: when providing treatment, shoeing or conducting medical exams. Thus, farriers must know how to control and immobilise a horse.

The least aggressive technique, or one that will have the least psychological impact on the animal, must always be used. You must never use scare tactics to get the animal to obey, because in this situation it will most likely react by trying to run away. This is why hitting and screaming are not good methods for obtaining the calmness needed to safely handle the horse.

Controlling the head:

When its head is being controlled, the horse is practically under control. If you have control of its head, you can move the rest of the horse's body as you wish. If you move the head to the right, its body will turn to the left. If you push it back, you will make the horse move backwards; and if you pull it forward, you can make the horse move forwards. This is why controlling this part of the body is very important. The most common technique consists of putting a cavesson or a net on it.

Using a cavesson or a snaffle is a gentle method of restraint and can be enough for certain handling. In this case, the noseband exerts pressure in order to control the horse. You must be sure that this part is well-adjusted and that it is not uncomfortable for the horse. There are various cavesson or snaffle models, which when used with some accessories, best insure control of the horse.

Tethering the horse:

Another way to immobilise a horse is to tether it. All you have to do is put a halter on it and tie it up with the help of a headrope to a fixed point which limits the animal's mobility and in general, prevents it from running away. However, the animals can still move in a way that is dangerous to themselves as well as to the people who are handling them. The horse must be tethered in an area that is spacious enough so it cannot trap you against a wall.

The main defence against tethering is to pull back in a panic, especially horses that are not used to being tied up. The knot used to tether the rope to the wall ring must be easy to untie simply by pulling in order to prevent injury. Another system consists of using a special ring, which breaks if the horse pulls back harshly and frees the animal without any harm.

Pain-induced immobilisation systems:

Another way to restrain a horse well is to periodically apply pain to specific areas, which generally leads to immobility. There are a few different methods which are used for this purpose:

Pinching the skin: this is an easy method to apply that provides good results for short-term restraint. It involves squeezing a fold of skin with your hand as hard as you can in an area that is free of subcutaneous tissue. This way, you cause slight pain, which immobilises the animal. This technique can be applied to the following places:

- the skin of the neck where the neck joins the back.
- the area of the hock fold.

the skin of the abdomen, but this requires a lot of pressure in order to be effective enough, especially with mares.

Securing by the tail: This system is very useful with foals that are still with their mothers. It involves taking hold of the tail and folding it up high and forward. This position causes pain that, in general, makes it possible to handle the animal without the need for any additional tying. However, using the tail is not a good method for restraint with adult horses. The tail must never be tethered to a fixed point as a sudden movement could cause vertebral injury.

Securing with a twitch: This is one of the most commonly used techniques and provides the best results. A twitch is a loop of rope or chain that is attached to one end of a rigid stick. To put it on, you put your hand through the loop of rope and grasp a portion of the horse's upper lip (very sensitive for horses). Once the lip is trapped, slip the rope under your hand without releasing the lip, then quickly turn the stick in order to pinch its lip with the rope. This causes pain and immobilises the animal.

The animal stays calm and in many cases, as if it were sleeping, which gives you the opportunity to handle the horse safely. A twitch should be used only when necessary.

Immobilizing by securing its legs: Securing a horse by its legs is another way to effectively immobilise it in order to shoe or treat it. This is because even though a horse rests on four points of support, it can also remain balanced on only three. However, if you lift a limb, you force the animal to support itself on the other three in order to keep its balance and it cannot try to kick or it will fall. Therefore, it can be shod more safely.

But be careful, as certain horses develop a special skill where they can kick even if they have a limb lifted in the air. This is why you must always be very careful with this type of immobilisation.

If you need to immobilise a rear limb, you can tie it to the tail in order to lift it. This system is very useful when shoeing difficult animals, but it requires two helpers besides the person who is holding the foot. To do so, a long rope needs to be tied to the horse's tail so that the two ends are more or less the same length. Put on a hobble (a padded, leather loop with an adjustable diameter that includes an iron ring), secure it to the pastern in such a way that the iron loop is towards the back of the foot.

Each end of the rope should go through one of the iron loops in opposite directions. The two helpers then pull the ends of the rope sideways in opposite directions.

When the two helpers pull the ends of the rope that is also attached to the tail, they make it safer for the person to shoe the horse.

Chemical immobilisation:

This consists of using medication to block the capacity of the nerves to create violent responses or that increase reaction time. You can successfully decrease the horse's reaction capacity with the most common tranquillisers.

But tranquilizers can only be used as directed by a vet, as the dosages are very precise and can have many side effects.

In summary, we could say that the best immobilisation technique is the one that gets the desired effect with minimal intervention on the animal.

Very violent immobilisation techniques or the use of scare tactics, shouting or hitting are not effective ways to control a horse and can lead to strange reactions from the animal which will then be difficult to manage.

Every horse reacts differently to immobilisation techniques. It is therefore very important to know the animals you are working with in order to apply these techniques most effectively.

11. Sedatives

A farrier is not authorised to purchase or administer intravenous or intramuscular sedatives; these must only be administered by veterinarians.

In certain European countries, farriers or owners are authorised to handle and administer oral sedatives.

12. Illnesses to declare

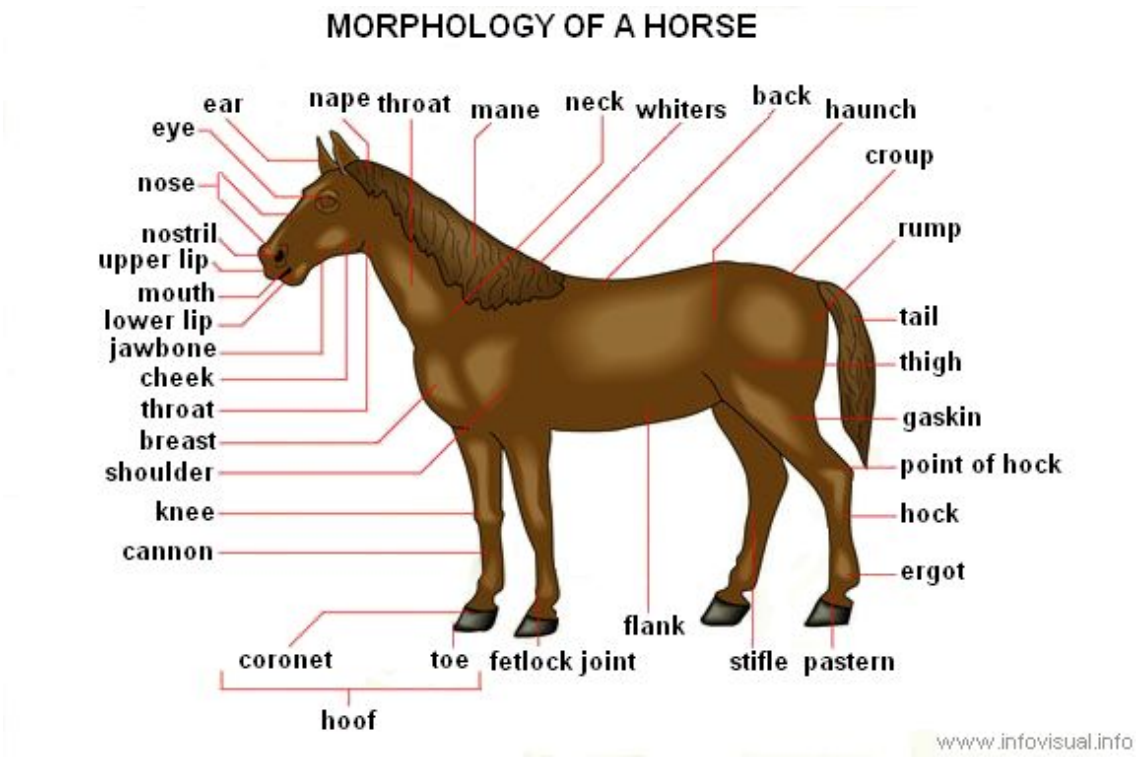
A farrier must have the knowledge necessary to be able to evaluate the health of the equines he is going to shoe. He must know how to recognise if a horse suffers from any condition or anomalies before it is shod. When faced with a complicated or questionable situation, he must immediately inform the owner, caregiver or another person who is responsible for the animal.

Anomalies that are detected must also be reported to the veterinarian so that he/she can properly diagnose the condition in order to allow the farrier to effectively and safely do his work.

There is a catalogue of equine illnesses in each European country that must be reported to the authorities if the symptoms are detected. Farriers must fulfil this obligation in order to avoid possible epidemics.

Functional anatomy:

It seems necessary to get an accurate idea of a horse's anatomy and how its body works before jumping into horseshoeing and treating foot problems.



Terminology.

The terms used in farrying and hippology differ from anatomical terminology. It seems necessary to present the two terminologies in order to correctly understand this entire document.

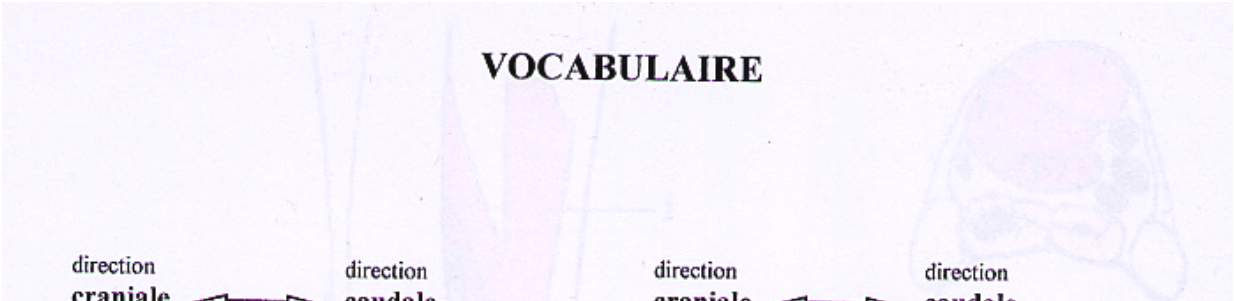
Directional terms differ for farriers and anatomists in the following way:

- **anterior** corresponds to **dorsal,**
- **posterior corresponds to palmar or plantar,**
- **superior** corresponds to **proximal,**
- **inferior** corresponds to **distal,**
- **internal** corresponds to **medial collateral,**
- **external** corresponds to **lateral collateral.**

Likewise, the anterior limbs correspond to the thoracic limbs and the posterior limbs to the pelvic limbs.

Again for better understanding, certain old terms that are still used in farrying are used in this study in parentheses.

Fig. 1 <u>Exterior: the regions.</u>



A first approach to anatomy involves studying the regions. The vocabulary used in the figure is the basis used to discuss the limbs and their sturdiness.

Two important things to keep in mind.

First - for horses, the knee area, the anatomical base of which is the carpus, corresponds to the human wrist. The stifle and hock, the anatomical bases of which are the femoral-tibial-patellar joint and the tarsus, respectively, correspond to the human knee and ankle.

Secondly, you will note the similarity between the names given to the regions of the distal extremities of the thoracic limb and the pelvic limb, the cannon bone and the hoof.

13. The Skeleton (basic knowledge).

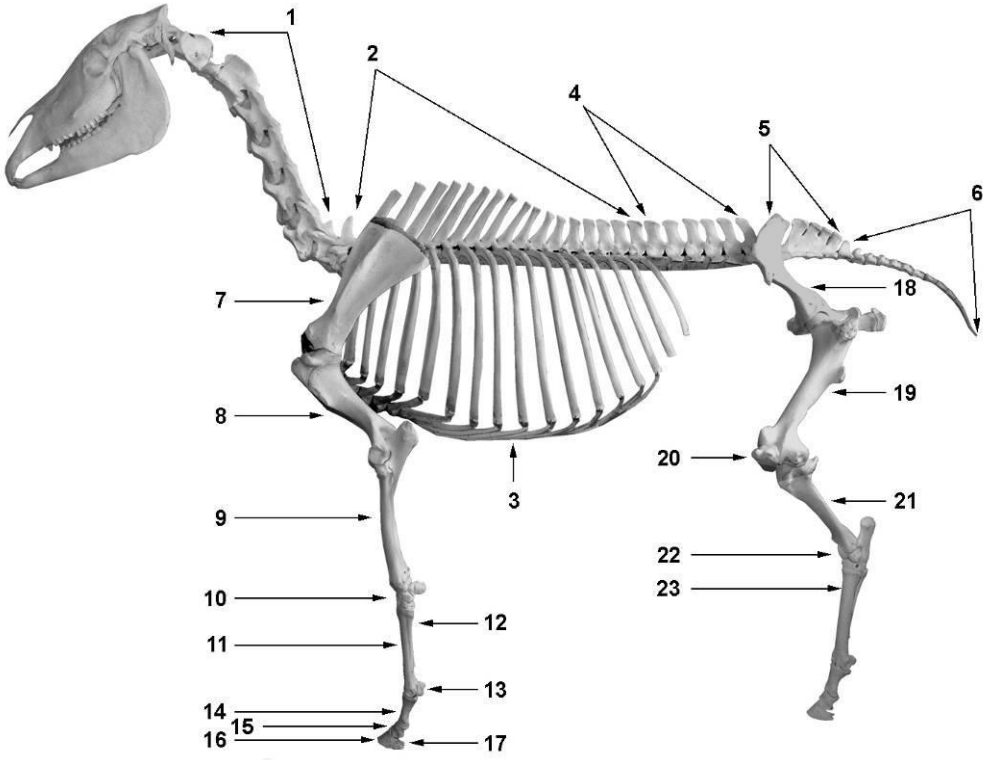


Fig. 2 Skeleton

1) 7 cervical vertebrae
2) 18 dorsal vertebrae
3) 18 pairs of ribs
4) 6 lumbar vertebrae
5) 5 sacral vertebrae
6) 15 to 18 caudal vertebrae
7) scapula
8) humerus
9) radius ulna
10) carpal bone
11) first metacarpal bone
12) rudimentary lateral metacarpal

	bone
13)	large sesamoid bones
14)	proximal phalanx
15)	middle phalanx
16)	distal phalanx
17)	small sesamoid bone
18)	ilium
19)	femur
20)	limpet
21)	tibia-fibula
22)	tarsal bone
23)	metarsal bones

The Skeleton: Osteology.

The skeleton is the framework for the body. The bones are connected to each other by joints, and the muscles that are attached contribute to their mobility. Animal bone nomenclature is similar to that of humans.

The skeleton stops growing between three and half and six years, depending on the race. When faced with bone deviations, especially at the limbs, the horseshoeing choice must take into account the horse's age and what it is used for.

The skeleton is divided into several parts: the head, the rachis, the thorax and the limbs.

The head is made up of cranial bones that are not very mobile and inferior maxillary bones.

The spinal column, also known as the vertebral column, is made of vertebrae. It is the axis that holds the entire body and enables the transmission of momentum.

Each vertebra is made up of:

a vertebral body, which is pierced in the middle by a vertebral canal through which the spinal chord passes.
a spiny apophasis, a more or less developed dorsal extension.
two transverse apophasis, located on each side of the vertebral body.

The spinal column can be broken down into:

7 cervical vertebrae,
18 thoracic vertebrae,
6 lumbar vertebrae,
5 sacral vertebrae,
15 to 18 caudal vertebrae.

The cervical vertebrae correspond to the neck region. They are passively supported by the nuchal ligament, which extends from the nape region to the withers and attaches to each one of them. The first cervical vertebra, known as the atlas, and second cervical vertebra, or axis, enable all head bending, extension and rotation movements.

The first thoracic vertebrae have very developed spiny apophasis, which form the withers. Each thoracic vertebra is joined to a pair of ribs.

The lumbar vertebrae correspond to the kidney region. Their transverse apophasis, which are very developed, act as a support for the rachidian muscles.

The sacrum is made up of the five sacral vertebrae, which are linked together. It is a powerful point of support for the hipbone, the anatomical base of the pelvic region and proximal extremity of the posterior limbs.

The caudal vertebrae have small apophasis, and are therefore very mobile. They correspond to the tail region.

The thorax is bordered by the thoracic vertebrae on its dorsal part. It is made up of 36 ribs (18 pairs). The first 8 pairs of ribs are said to be true or sternal ribs because they

are attached to the sternum at their distal extremity. On the contrary, the others are called false ribs or floating ribs.

The **limbs** can be considered as broken columns that mainly serve to support and transport the trunk. All of them are built on the same fundamental model and are made up of an equal number of segments. The functional differences between the limbs have to do with the direction of their radius bones, and therefore the size of the articular angles.

The **thoracic limbs**, located at the cranial end of the trunk, are the closest to the body's centre of gravity. They are mostly used for support and shock absorption. The rays that form them are thus appreciably straight and vertical, from the elbow joint to the fetlock joint.

Fig. 3 Thoracic limb:
1. scapula
2. humerus
3. olecranon-ulna
4. radius
5. carpal bones
6. metacarpal bones
7. toe bones

The **thoracic limbs**- the agents that touch the ground- execute movements that are mainly on a sagittal plane. The thoracic girdle, represented by the scapula, is only attached to the trunk by muscle mass, as the horse has no collarbone. This allows for a wide range of movements.

Located at the caudal extremity of the trunk, the **pelvic limbs** are further away from the body's centre of gravity than the thoracic limbs. Therefore, they are used for propulsion.

None of the radius bones extend from one another, except for the phalanxes. The articular angles, which open forward and back alternatively, create powerful springs out of these limbs that buttress under the caudal part of the body. The pelvic girdle, unlike the thoracic girdle, is directly connected to the axis vertebra at the sacrum, and is a real point of support. The relaxation of the pelvic limbs, transmitted by the pelvic girdle and then the lumbar dorsal root, are the main agents of momentum.

14. Joints (basic knowledge)

a. **General Points.**

A joint is an anatomical structure that connects two or several bones.

Joints are classified according to their structure and their degree of mobility. Thus, there are:

a) **Fibrous joints, which are immobile, like the sutures between the bones of the skull.**
b) **Cartilaginous joints, which are slightly mobile, such as the junctions between the ribs and the sternum.**
c) **Synovial joints, which are very mobile- in the limbs, for example.**

b. **Description of a synovial joint.**

The synovial joints correspond to what was once called diarthroses. Characteristically, they are articular spaces surrounded by a capsule that is filled with synovial liquid. A synovial joint can be broken down into several parts:

The bones: articular surfaces
The bone surfaces that enter a joint are called articular surfaces. Their shape and length can vary greatly. They make up the subchondral bone, or in other words, the bony part located under the articular cartilage.
The means for concordance.
Intermediate formations that allow the articular surfaces to better coapt.

Articular cartilage smoothes and covers the bone surface. It allows the articular surfaces to glide against one another as the joint moves and also has a shock absorption role. Cartilage is a dynamic structure that results from a constant balance between the deterioration and formation of the matrix.

Additional fibrocartilage (meniscuses) is sometimes present in order to ensure better concordance of the articular surfaces between them.

The means for joining. Joints are held in place by an articular capsule: a kind of fibrous muff that fills slight gaps in the articular surface. It insulates the articular cavity. Ligaments keep the joint in place and limit its movement.

Finally, tendons and muscles also play a secondary role in keeping the joint in place.

Synovial membrane and synovial fluid. The synovial fluid, or synovial membrane, covers the inner side of the articular capsule. It secretes the synovial fluid, a liquid that is located in the articular cavity, thus lubricating the joint and contributing to the nutrition of the cartilage.

At certain well-defined areas, the fibrous capsule is not as thick and the synovial fluid creates extra-articular diverticulums. These are recesses, or synovial folds. At times vast, they facilitate the movement of tendons over the joint or nearby bones. In the case of an articular condition, the synovial recesses are stretched by the excess synovial fluid. They are then called soft blemishes.

c. The different types of synovial joints.

The shape of the articular surfaces and the movements make it possible to distinguish six types of synovial joints.

Plane or arthrodial joint. The articular surfaces are flat or slightly curved. The only movement possible is a glide between articular surfaces. This is the case of the articular facets of vertebrae.

Spheroid or cotyloid joint, or enarthrosis. A sphere-shaped articular head fits into a glenoidal or cotyloid cavity. The movements are varied and very extensive. This involves the scapulohumeral joint and the coxofemoral joint.

Condylar joint or imperfect hinge. An elongated head fits into a glenoidal cavity. The main movements are bending and extending. Secondary glide and lateral movements are also involved. The femorotibial joint is an example of an imperfect hinge.

Simple joint or ginglymus, or perfect hinge. The articular surfaces are cylinder-like and fit together very closely. Bending and extending movements are therefore the only movements possible. This is the case of the elbow joint.

Pivot or trochoid joint. An articular surface that is shaped like a pivot or full cylinder fits into another surface, which acts as a sheath. The only movement possible is rotation. It involves the atlanto-axial joint (between the first two cervical vertebrae).

Saddle joint or articulation by reciprocal reception. One articular surface is convex in one direction and concave in the other. The second articular surface is the opposite. These joints allow opposing movements on perpendicular planes. They are very rarely found in mammals. These are the joints that give birds such great mobility in their cervical vertebrae.

15. The Large Muscle Groups (basic knowledge)

Muscles: Myology

Muscles can be divided into three categories:

a) **Striated muscles, which are more or less dark red with voluntary contraction.**
b) **Smooth muscles, which are whitish and have a reflex function.**
c) **Cardiac muscles, which are comprised of striated fibres, but have a reflex function.**

Striated muscles can be divided into two more categories:

a) **Cutaneous muscles lie directly under the skin and enable its motivity.**
b) **Skeletal muscles are found near the bones.** They are arranged in superimposed layers and make up the largest part of the muscle mass. They enable the mobilisation of the different bony segments between them. Some of them are attached to an extremity by a tendon- a white, resistant fibrous band of tissue- that is inserted into bone that is further away from the fleshy body.

For a given muscle, it is always said that one of its insertions is stationary, and the other mobile. Thus, depending on the insertion that is considered to be stationary, a muscle can have two effects. For example, the brachiocephalic muscle, which extends across the lower side of the neck from the head to the leg, is a head flexor if the stationary point is considered to be its insertion into the leg (stationary horse), and motor control for the leg if the stationary point is the cranial insertion (horse in movement).

Muscles have three fundamental properties: **tonicity, contractility and elasticity.**

The tonicity of a muscle ensures a slight, permanent contraction. **Without tonicity, a horse could not stand.**
Contractility is the possibility the muscle has to reduce its length.
The elasticity allows it to stretch even more when extended. This property limits muscle tears and tendon ruptures.

Muscles have different functions depending on their location and insertions. A muscle is:

Flexor: if it folds the bone segments one on top of the others, in other words it "closes" a joint.
Extensor: if it extends the radius bones and "opens" a joint.
Abductor: if it pulls a limb away from the saggital plane of the body.
Adductor: if it draws a limb closer to the saggital plane of the body.
Rotator: if it makes a bone segment rotate on its axis.

16. Functional and locomotive anatomy of the distal limbs below the knee and hock (skeleton, ligaments, tendons, circulatory system, nervous system, cartilage, synovial bursa, fleshy portion of the foot, horny box).

Anatomy of the distal extremity of the limbs.

Fig. 4 Toe bone structure (profile)

1) third metacarpal (metatarsal in the posterior)
2) proximal phalanx
3) middle phalanx
4) distal phalanx
5) proximal sesamoid
6) distal sesamoid

Osteology.

The bone pieces of the distal extremities of the thoracic and pelvic limbs are similar. We shall first present the thoracic limb extremity, then some differences with regards to the pelvic limb.

Thoracic limb or forelimb.

The metacarpus, which is the bone basis of the cannon region, extends vertically between the carpus and the digital region. It is made up of three metacarpal bones that are fused together in a parallel way and very unequal in development.

The metacarpal shaft is the major one. It is known as the main or middle metacarpal, or MC III, or even as the cannon bone. It is long, cylindrical and flattened in the back.

The other two do not have a digital connection. They are the rudimentary or secondary metacarpal bones, MC II and MC IV.

Phalanxes.

The phalanxes make up the bone base for the digital region. Horses only have one toe, which extends from the main metacarpal. This toe is comprised of three phalanxes extending from it which are called from top to bottom: proximal, middle and distal phalanx (first, second and third phalanx). These line up when the animal is standing still, under physiological conditions.

Proximal phalanx (first phalanx, pastern bone, PI).

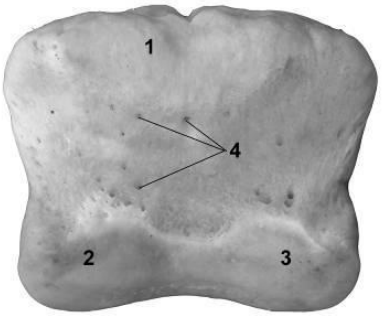
Fig. 5 Proximal phalanx (dorsal view)

It is located between the main metacarpal and the middle phalanx, and slants from top to bottom and back to front.

Middle phalanx (intermediate phalanx, second phalanx, coronet bone, PII).

Fig 6 Middle phalanx (palmarview)

Overall, this bone is shaped like a compressed cube in the dorsal-palmar direction. Only the distal part penetrates the horny box in order to form the distal interphalangeal joint with the distal phalanx and the small sesamoid bone.



Distal phalanx (third phalanx, foot bone, PIII).

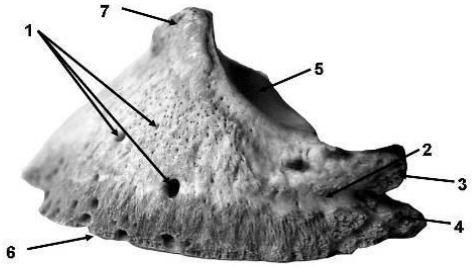


Fig. 7 Distal phalanx or foot bone

1) vascular foramina
2) parietal groove
3) proximal palmar (plantar in the posterior) process
4) distal palmar (plantar in the posterior) process
5) articular surface
6) distal edge
7) extensor process

It is shaped like a cone with a deep groove in the back. It is completely within the hoof, and gives it its shape.

The dorsal or parietal side is usually convex, slants from top to bottom and from back to front, and corresponds to the hoof wall. It is porous and riddled with **vascular foramina** which vary in size and form the **semi lunar sinus** on the inside. On each side, there is a sulks called a **parietal groove** (formerly **pre-palmar fissure**), located in the middle of each side and behind the bone. It separates the palmar extremity into two parts: the **proximal palmar process** and the **distal palmar process**.

The solar side forms a concave arch. It is divided into two very unequal portions by the **semi lunar line**, a salient line that extends from one angle to the other in a palmar concavity curve. Distal to this line, in other words before the convexity, there is a region with very fine pores. These pores are in the shape of a crescent which corresponds to the hoof sole. This is the **solar surface**. In the concavity, there is a vascular nervous groove called a **solar groove** (formerly **plantar fissure**), which leads to the solar foramina (formerly **plantar hole** or **semi lunar sinus**).

On the articular side, there are two **glenoidal cavities** which are separated by a light relief sagittal, that opposes the condyles of the middle phalange.

The distal edge, called the **solar edge** is parabolic-shaped. It is thin and razor-sharp, and has about ten large vascular foramina.

The coronary edge is proximal-dorsal. It separates the parietal side from the articular side. In the middle, there is a flattened triangular apophasis that is called an **extensor process** (formerly **pyramidal eminence**), which receives the tendon insertion of the dorsal extensor muscle of the toe. On both sides of this process, you can see a recess at the ligament insertion.

The palmar edge is short and concave. It has a very narrow facet which lies transversally and is opposite the dorsal side of the small sesamoid bone.

Sesamoid bones

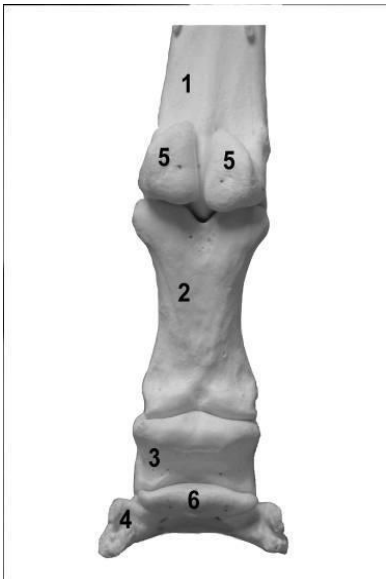


Fig. 8 Toe bone structure (palmar view)

1) third metacarpal (metarsal in the posterior)
2) proximal phalanx
3) middle phalanx
4) distal phalanx
5) proximal sesamoid bones
6) distal sesamoid bones

Large sesamoid bones (**proximal sesamoid bones)**.

They are located on the proximal extremity of the proximal phalanx. One is medial, the other lateral. They make up the skeletal base of the proximal scutum.

Small sesamoid bone (**navicular bone)**.

It mustn't be confused with the tarsus bone of the same name. It lies transversally, compressed from top to bottom and shrunken at the ends. It is solidly joined to the distal phalanx by the distal sesamoid ligament, continuing the articular surface of the phalanx.

Pelvic or rear limb.

Metatarsus

It is longer than the metacarpus. The main metatarsal or MT III has a cylindrical-shaped section that is more significant than that of the metacarpals. Finally, the lateral rudimentary metatarsal (or MT IV) is larger than the medial one (or MT II), unlike the metacarpals.

Phalanxes.

Proximal phalanx (first phalanx, pastern bone, PI).

It is narrower in the middle and thicker at the ends than its thoracic counterpart.

Middle phalanx (intermediate phalanx, second phalanx, coronet bone, PII).

It is thicker, taller and smaller than its thoracic counterpart.

Distal phalanx (third phalanx, foot bone, PIII).

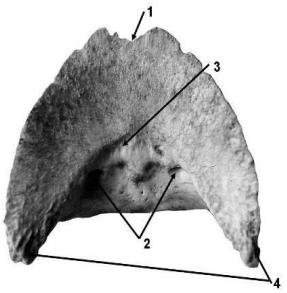


Fig. 9 Distal phalanx (solar side)

1) crena marginis 2) solar foramina
3) semi lunar line 4) distal plantar process (palmar in the anterior)

It has a V-shaped solar contour, whereas the thoracic distal phalanx is U-shaped. Moreover, the solar surface is more hollow.

Arthrology.

The metatarsal-phalangeal joint and the interphalangeal joints of the pelvic limb are organised like their thoracic limb counterparts. The only differences are the shape of the bone pieces, which were described in the osteology study. Therefore, only the joints of the thoracic limb extremity are discussed here. As far as the pelvic limb, the term "metacarpal" can be replaced with the term "metatarsal" and "palmar" with "plantar".

Metacarpal-phalangeal or fetlock joint.

Bone pieces.

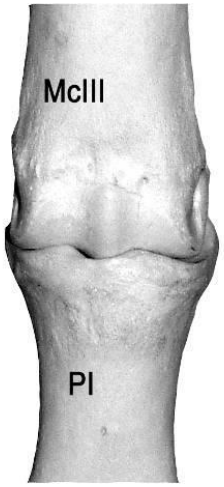


Fig. 10 Metacarpal-phalangeal joint

MC III: third metacarpal (metatarsal in the posterior)

PI: proximal phalanx

This joint is a perfect hinge formed by the distal extremity of the main metacarpal and the proximal side of the proximal phalanx and completed by the two large sesamoid bones. The axial sagittal ridge that separates the two condyles prevents horizontal slipping as well as rotations, except when hyperextended.

Ligaments.

The fetlock ligaments can be divided into three categories according to their functions:

- the one that joins the two large sesamoid bones: the palmar or intersesamoid ligament.
- those that join the large sesamoids to the phalanges: the sesamoid-phalangeal ligaments.
- those that join the two articular surfaces together: the metacarpal-phalangeal ligaments.

Intersesamoid ligament.

The intersesamoid ligament is a vast fibrocartilaginous formation that surrounds and joins the two large sesamoid bones. It receives the insertion of the sesamoid-phalangeal ligaments. Moreover, it helps form a large groove, the proximal scutum, which acts as a return pulley for the toe flexor tendons.

Sesamoid-phalangeal ligaments.

There are several types of ligaments:

- three groups of distal sesamoid-phalangeal ligaments.
- two collateral sesamoid-phalangeal ligaments.

Fig. 11 Palmar ligaments

1) branch of the fetlock suspensory ligament
2) proximal scutum
3) right ligament
4) oblique ligaments
5) middle scutum

The distal sesamoid-phalangeal ligaments join the distal edge of the proximal sesamoid bones to the proximal and middle phalanges. They are part of the fetlock suspensory apparatus because their role is counteractive to that of the fetlock suspensory ligament.

Fig 12 Palmar ligaments

1) branch of the fetlock suspensory ligament
2) proximal scutum
4) oblique ligament

Fig 13 Palmar ligaments

1) branch of the fetlock suspensory ligament
2) intersesamoid ligament (proximal scutum)
6) crossed ligaments

The superficial or right ligament lies within the axis of the limb between the large sesamoid bones and the proximal extremity of the middle phalanx. It lies proximal to the intersesamoid ligament and distal to the middle scutum.

The middle, or oblique, ligaments, which are deeper, extend from the intersesamoid ligament to the palmar side of the proximal phalanx. The deep plane is made up of the crossed ligaments, each of them extending from a large sesamoid bone, crossing each other in an X, then inserting on the proximal side of the palmar face of the proximal phalanx, and of the short ligaments.

Fig. 14 Collateral ligaments

Each collateral sesamoid-phalangeal ligament lies horizontally to the abaxial side of a large sesamoid bone to the side of the proximal phalanx.

The collateral ligaments follow a quasi-vertical path between the side of the main metacarpal and the proximal phalanx.

Metacarpal-phalangeal ligaments.

The two articular surfaces are joined by four ligaments:

- Two collateral ligaments.
- The dorsal ligament.
- The inner bone group III muscle, or fetlock suspensory ligament.

The dorsal ligament is a fibrous capsule expansion which encloses the joint forward.

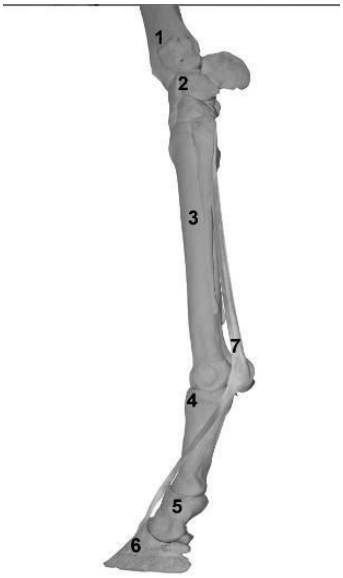


Fig. 15 Fetlock suspensory ligament (MIO3)

1) radius
2) carpus
3) metacarpus
4) proximal phalanx
5) middle phalanx
6) distal phalanx
7) fetlock suspensory ligament

The inner bone group III muscle, the fleshy part of which has disappeared in equines, is also called the fetlock suspensory ligament and is a long ligament that extends from the carpus to the proximal phalanx. It inserts proximal, on the palmar side, into the carpus and the proximal extremity of the metacarpus. It lies vertically and distal, before it is divided in the middle of the cannon region into two collateral branches that are not very far from each other. Each branch attaches to the top of the large sesamoid bone located on the same side, and is followed by a loop. This goes forward and down to join the tendon on the dorsal extensor muscle of the toe.

Movements.

The fetlock joint mostly produces flexion and extension movements.

Proximal interphalangeal joint.

Bone pieces.

This joint is a condylarthrosis, which means an imperfect hinge between the proximal phalanx and the middle phalanx.

Ligaments.

The palmar ligaments, previously called glenoid padding attachment bridles, support the middle scutum.

Two collateral ligaments keep the joint in place: the lateral collateral ligament and the medial collateral ligament. From the distal extremity of the proximal phalanx, they run lengthwise on the sides of the middle phalanx.

Movements.

Movements are small and limited. Mostly flexion and extension movements are observed. But, since the joint is an imperfect hinge, it can produce lateral and pivoting movements.

Distal interphalangeal joint.

Fig. 16 Sagittal cut

1) Wall
2) Sole
3) Frog
4) Digital pad
5) White line
6) Deep flexor tendon
7) Right sesamoid-phalangeal ligament
8) Distal (navicular) sesamoid bones
9) Seat of corn
10) Dorsal extensor tendon

Articular surfaces.

The distal side of the middle phalanx is made up of two condyloid surfaces that are separated by a sagittal ridge. The distal phalanx and the small sesamoid bone lie opposite two cavities that are not very hollow, called glenoid cavities, which are separated by a sagittal break that is not very prominent.

Ligaments.

Three bone pieces are joined by a vast articular capsule as well as two types of ligaments:

- Five palmar or sesamoid ligaments.
- Two interphalangeal ligaments.

The sesamoid ligaments keep the small sesamoid bone in place and form a support system.

- The distal sesamoid ligament intimately joins the small sesamoid bone to the distal phalanx. It was once called the innerbone foot ligament or right ligament or odd ligament.
- The collateral sesamoid ligaments fit proximal on the dorsal edge of the proximal interphalangeal joint collateral ligament as well as on the edge of the middle phalanx. Each of them rupture after running a bit on the proximal edge of the small sesamoid bone. The bundles run to meet the ones on the opposite ligament, along the proximal edge of the small sesamoid bone.
- The chondral sesamoid ligaments fit in the extremities of the small sesamoid bone and at the inside of the ungular cartilage.

The collateral ligaments are symmetric; one on the lateral side, the other on the medial side of the joint. Each of them is triangular, flat, thick and short. It begins on the side of the distal extremity of the middle phalanx and ends after running a bit distal palmar along the crease incision at the base of the extensor process of the distal phalanx.

Articular synovial membrane.

The distal interphalangeal joint synovial membrane is relatively large. This membrane covers:

- the palmar side of the dorsal extensor tendon of the toe.
- the deep sides of the collateral ligaments.
- the proximal side of the distal sesamoid ligament.

This synovial membrane also has several recesses.

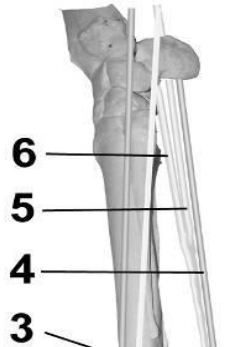
The dorsal recess is the most superficial. It is located under the dorsal extensor tendon of the toe and goes back all along the dorsal side of the middle phalanx.

The proximal palmar recess is the largest. It goes back over the small sesamoid bone, against the palmar side of the middle phalanx.

The distal palmar recess is the smallest. It gets between the distal phalanx and the small sesamoid bone and covers the proximal side of the distal sesamoid ligament.

The collateral recesses are small diverticulums that are located on each side of the foot, immediately under the ungular cartilage.

Myology.



We shall voluntarily move our study towards the tendons of the extensor and flexor muscles of the toe, which are inserted into the distal part of the limb. We shall study the thoracic limb. Then, we shall describe the pelvic limb and the differences of this limb in comparison with the thoracic limb.

Fig. 17 Tendons in the foot

1) Dorsal extensor muscle tendon of the toe
2) Lateral extensor muscle tendon of the toe
3) Manica flexoria
4) Superficial flexor muscle tendon of the toe
5) Deep flexor muscle tendon of the toe
6) Carpal flange or perforating accessory ligament

These tendons can be divided into two groups:

- The extensor tendons of the toe, located on the dorsal side of the limb.
- The flexor tendons of the toe, located on the palmar side.

Extensor muscle tendons of the toe.

There are two: the dorsal extensor muscle tendon of the toe (formerly anterior extensor muscle of the phalanges) and the lateral extensor muscles tendon of the toe.

The dorsal extensor muscle tendon of the toe.

Path.

The dorsal extensor muscle tendon of the toe is located in the dorso-lateral region in the proximal part of the metacarpus. It descends along this bone following an oblique direction which brings it closer and closer to the sagittal line. It then glides over the dorsal reinforcing band of the metacarpal phalangeal joint. It attaches to the proximal phalanx, then continues.

At the third distal proximal phalanx, it receives the lateral reinforcing flanges of the inner bone group III muscle. It then enlarges considerably, attaches to the middle phalanx and opens up again in order to end on the entire surface of the extensor process of the distal phalanx.

Synovial membrane.

This is a vesicular sac that is found between the tendon and the proximal part of the dorsal reinforcing band of the metacarpal-phalangeal joint.

Function.

The dorsal extensor muscle tendon of the toe extends the distal phalanx over the middle one, the middle phalanx over the proximal one and the proximal phalanx over the metacarpus. It is therefore at the same time an extensor of the toe and the foot, especially the second time it supports the limb.

When supporting, during the shock absorption phase of reactions, it maintains and contains the three phalanges thanks to the lateral flanges sent by the inner bone group III muscle.

Lateral extensor muscle tendon of the toe.

Path.

The lateral extensor muscle tendon of the toe is located on the lateral side of the limb. It is palmar to the dorsal extensor muscle tendon of the toe. It follows an oblique direction from back to front and then laterally meets the dorsal extensor tendon of the toe at the main metacarpal. It is reinforced at the distal part by a flange from the carpus. It continues all the way to the metacarpal-phalangeal joint, opens up onto the distal reinforcing band of this joint and ends at the proximal extremity of the proximal phalanx.

Synovial membrane.

A small vesicular synovial membrane is found between the deep plane of the tendon and the dorsal reinforcing band of the metacarpal-phalangeal joint.

Function.

The lateral extensor muscle of the toe extends the proximal phalanx over the metacarpus. It helps extend the entire foot.

Flexor muscle tendons of the toe.

There are two: the superficial flexor muscle tendon of the toe or the perforated tendon, and the deep flexor muscle tendon of the toe, or perforating tendon.

Superficial flexor muscle tendon of the toe (perforated).

Path.

The superficial flexor muscle tendon of the toe is very long. It appears at the distal quarter of the forearm, and extends vertically on the palmar side of the limb to the middle phalanx.

Very quickly, it receives an enormous fibrous production: the radial flange. Reinforced in this way, the cylindrical tendon crosses the carpal tunnel.

Then it flattens from front to back to form a crescent shape at the transversal section and juts out over each side of the penetrating tendon. The two tendons descend in this manner along the metacarpus, with the perforated tendon being palmar to the perforating tendon.

The perforated tendon forms a ring called *Manica flexoria* over the large sesamoid bones which it passes into and glides the perforating tendon. Joined in this way, the two tendons bend together over the proximal scutum and move toward the front, in the axis of the phalanges.

In the distal part of the proximal phalanx, the perforated tendon enlarges considerably then separates in two collateral branches, between which the perforating tendon emerges.

Each of the branches of the perforated tendon ends at the middle phalanx, on the middle scutum.

Function.

The superficial flexor muscle tendon of the toe flexes the middle phalanx over the proximal one, the proximal phalanx over the metacarpus and the foot over the forearm.

Reinforced by the radial flange, this tendon also plays an extremely important role supporting the fetlock.

Deep flexor muscle tendon of the toe (perforating).

Path.

The deep flexor muscle of the toe crosses the carpal tunnel in the palmar part of the limb, following a vertical path. It then runs along the palmar side of the metacarpus, in front of the perforated tendon and behind the fetlock suspensory ligament.

At the middle part of the metacarpus, it receives a strong fibrous strap: the carpal flange.

It inserts into the annular device that forms the perforated tendon over the large sesamoid bones.

The two tendons bend over the proximal scutum and run all along the metacarpal-phalangeal sheath. At the end of the sheath, the perforating tendon emerges from between the end insertion branches of the perforated tendon. It enlarges as it flattens and is subjected to a double inflection toward the front, first on the middle scutum, then on the distal scutum.

It finally opens up into a vast expansion called palmar aponeurosis which attaches to the entire length of the semi lunar line of the distal phalanx. The end portion of the tendon is reinforced by a fibrous formation: the reinforcing fascia of the palmar aponeurosis or the distal digital annular ligament.

Synovial membrane.

A vesicular synovial membrane known as a podotrochlear bursa, formerly called a small sesamoid synovial membrane, is attached to the last portion of the tendon. It facilitates the gliding on the palmar side of the small sesamoid bone, which is still called *Facies flexoria*.

Function.

The perforating tendon makes it possible for the phalanges to flex one over the other, the toe over the metacarpus and the metacarpus over the forearm. Moreover, as it supports the limb, it straightens the digital ray, thus contributing to propulsion.

Reinforced on the distal part by the carpal flange, then by the palmar digital fascias and reinforcing the palmar aponeurosis, the perforating tendon becomes more or less

independent of the fleshy body and thus, with the inner bone group III muscle and the perforated tendon, helps support the fetlock and digital ray.

Distinctive features of the pelvic limb.

The organisation of the distal part of the pelvic limb is rather similar to that of the thoracic limb. However, there are some differences.

The lateral extensor muscle tendon of the toe joins the dorsal extensor muscle tendon of the toe towards the proximal of the metatarsus and merges with it.

The superficial flexor muscle is fibrous and inert; it functions like a ligament.

The flexor muscle tendon of the thoracic toes becomes the "middle and lateral flexor muscle tendon".

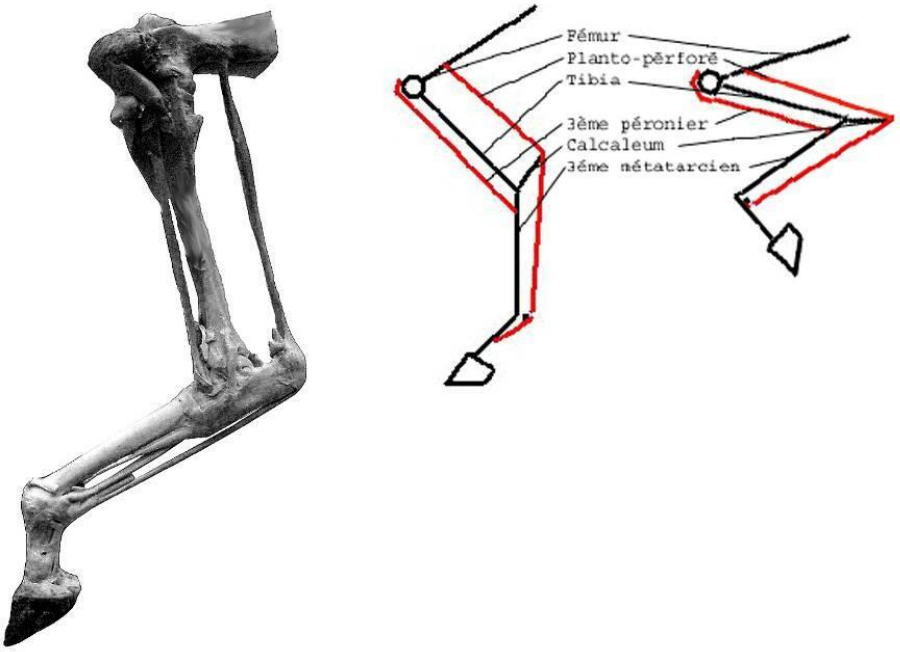


Fig. 18 Reciprocal apparatus

The pelvic limbs of the horse are equipped with a ligament system known as the "reciprocal apparatus".

The two main ligament elements of this apparatus are:

- The femoral-metatarsal ligament (third peroneal) on the dorsal side of the tibia.
- The plantar perforated ligament (superficial flexor of the toe) which functions like a ligament even though it contains a fleshy body.

With this system, the movements of the pelvic limb joints are intimately bound. When the stifle joint opens up, the hock extends and vice versa. The fetlock joint can then extend. Reversely, when one of the two joints- the stifle or the hock joint- flexes, the other follows all while leading to a flexion of the fetlock joint.

This apparatus makes it possible to lock the limb in a tense position, thus allowing the animal to remain standing without muscular effort when the kneecap is loose. It also effectively contributes to its locomotion.

Complementary fibrous skeletal apparatus.

The complementary apparatus has three parts. There are two fibrous cartilaginous plates that are fixed to the distal phalanx called ungular cartilage which encloses the digital torus (pad).

Constitution.

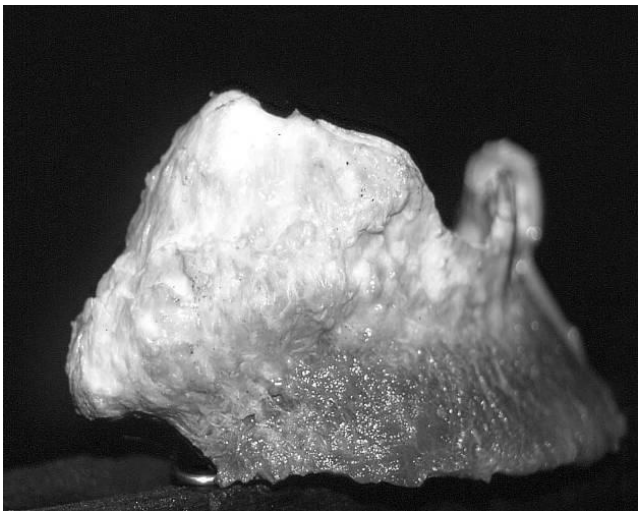


Fig. 19 Ungular cartilage

The ungular cartilage (formerly complementary fibrocartilage) is made up by two plates located on both sides of the distal phalanx, which are diamond-shaped and contain fibrocartilage. The distal part is found in the hoof, while the proximal part sticks out slightly when pressure is placed on the coronary edge of the hoof.

The ungular cartilage covers the tendinous structures and the synovial membranes of the foot, and merges its palmar part with the digital torus. With a hyaline cartilage structure in the front and on the outside, they progressively become fibrocartilaginous in the back and on the inside. All of the ungular cartilage is kept in place by:

- a chondrocompedal ligament that connects to the proximal phalanx,
- a chondrocoronal ligament that connects to the middle phalanx,
- a chondral sesamoid ligament that connects to the small sesamoid bone,
- crossed and collateral chondroungular ligaments that connect to the distal phalanx.

The digital torus (formerly **plantar pad**) is a fibroelastic corner interposed between the plantar aponeurosis and the distal and palmar portions of the hoof (heels, sole and frog). Its role is to distribute pressure.

This distal part is found between the distal phalanx and the frog corium. There is a triangular protrusion in the middle, the point of which is directed forwards. It is composed of two branches separated by a median sulcus, and corresponds to the external crack in the frog. The branches end in the back on the **digital torus bulbs** which correspond externally to the bulbs of the heels.

The digital torus continues on the palmar side of the toe and adheres to the ungular cartilage located on each side.

Role.

When providing support, the digital torus, thanks to its springiness, distributes the pressure from the small sesamoid bone and the middle phalanx. Moreover, the squashing of the digital torus reverberates on the cartilaginous plexuses, thus participating in the irrigation of the palmar parts of the foot and the hoof gap.

Corium or dermal layer (keratogenous membrane).

Constitution.

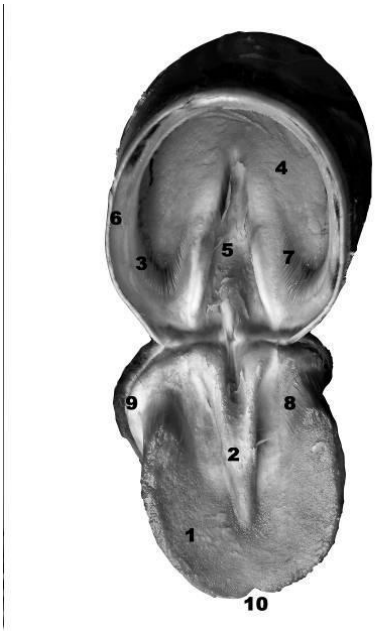


Fig. 20 Podophyl and keraphyl

1) solar corium
2) furcal corium
3) horn lamellae (keraphyl)
4) inner side of the sole
5) inner side of the frog
6) coronary groove
7) inner side of the bar
8) sensitive lamellae (parietal corium return on the bars, podophyl)
9) coronary corium
10) crena marginis

The corium is a modified vascular tissue that completely surrounds the end part of the limb. It makes up the skin of the foot. It can be broken down into five parts.

The coronary corium (formerly **main seat**) is a membrane that covers the coronary pad, the demi-cylindrical break located over the proximal edge of the wall. It runs circularly along the coronet and ends on the bulbs of the digital torus. The external side is filled with many long and conical papillae that go downwards to penetrate the horny tubes of the wall. Its role is to secrete the main horn, and consequently, to keep the foot flat.

The perioplic corium (formerly **perioplic ring**) bridges over the corium of the coronet. It secretes the periople, a protective cuticle for the main horn.

The parietal corium or **podophyl** (formerly **flaky tissue**) covers the dorsal side of the distal phalanx and continues toward the rear, on each side, on the solar corium. The parietal corium is covered from top to bottom by parallel and juxtaposed primary lamellae; there are about six hundred. Each primary lamina has some one hundred secondary lamellae on the sides. All of these lamellae embed themselves in the keraphyl lamina of the internal side of the wall in order to suspend the distal phalanx to the hoof wall.

The solar corium (formerly **velvety tissue)** spreads over the solar side of the distal phalanx and the digital torus. Its size is in proportion to the palmar part of the hoof, made up by the sole and the frog. It has many papillae that give it a velvety appearance.

The furcal corium (of the frog) has the same structure as the solar corium. The deep side co-mingles with the digital torus.

Roles.

The coronet, solar and frog coriums are the matrixes for the formation of the hoof. The parietal corium is a support and connection organ for the wall.

Under the influence of the keratogenous organs, new layers of horn are added to the previously formed layers, and the hoof constantly grows. This growth, known as hoof growth, takes place in the direction of the forming organs. The wall expands in height, whereas the sole and the frog get thicker. Hoof growth is slow and it takes approximately eight months for the wall to fully regenerate. This explains the difficulty in repairing losses to the horned substance and shows the importance of regular foot care so as to avoid these losses. The horn is permanently growing. It is compensated either by natural wear, or by the farrier's trimming.

Foot vessels and nerves.

The foot is filled with digital artery endings which descend along the palmar side of the proximal phalanx, where they are easily palpable. Each of them run along the edge of the perforating tendon all the way to the distal phalanx.

Every digital artery ends with an ungular dorsal artery that irrigates the periphery of the distal phalanx, and with an ungular palmar artery that dives into the semi lunar sinus where it meets its counterpart coming from the other side. Thus, they irrigate the corium because of the many small arteries they originate which cross the phalanx on the parietal side.

The digital veins descend from a very branched-out, dense network coming at the same time from the inside and the contour of the distal phalanx, and the corium. These venules, which are abundant, are constantly filled with a significant volume of blood and constitute a sort of "sponge" that helps absorb the pressure of the body on the hoof when the foot hits the ground. The digital veins then go back up bordering the digital arteries.

The digital nerves follow the same path as the arteries. Each digital nerve divides into three branches (dorsal, middle, palmar) which help make all the living parts of the foot highly sensitive.

External foot organs: the hoof.

The hoof is a horned box that is closely connected to the corium. The horn that forms it is assimilated into the horned layer of the dermis. Without vessels and nerves, there is no feeling in it. The hoof can be broken down into three parts: the wall, the sole and the frog, which we shall study separately.

The hoof wall.

The wall is the dorsal part of the hoof, which can be seen when the foot rests on the ground. It is formed at the coronary corium which serves as a matrix for the formation of the wall.

The dorsal or parietal side is smooth, straight from top to bottom and convex from side to side. It is covered by the periople, a horn layer that comes from the perioplic corium which forms a protective cuticle for the main horn, thus preventing it from drying up and deforming.

The wall is divided into several portions. Beginning at the dorsal sagittal line, there is the **toe**, from each side and from front to back, the **udders**, the **quarters** and the **heels**.

The inner side is filled with several parallel, vertical lamellae. They form the **keraphyl** which constitutes the lamellar epidermis of the hoof. Their lamellae are interdigitated with the lamellae from the parietal corium (formerly flaky tissue).

The proximal edge receives the **coronary corium** in a tapered semi-circular cavity on the inside of the wall called the **coronary groove**.

The distal edge, or palmar edge, is in contact with the ground or the horseshoe.

The two extremities bend at sharp angles forming the **seats of corn** and get between the sole and the frog to form the **bars.**

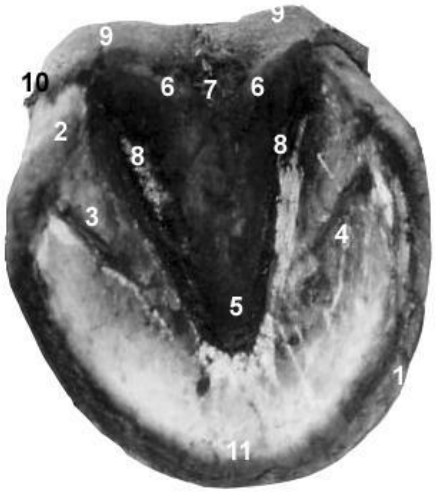


Fig. 21 Sole side of the hoof

1) Wall
2) Seats of corn
3) Bar
4) Sole
5) Apex of the frog
6) Branches of the frog
7) Central sulcus
8) Lateral sulci
9) Bulbs of the heels
10) Periople
11) White line

The wall is approximately one centimetre thick (for saddle horses) and decreases a half centimetre from the toe to the heels. Pigmented and hard on the surface, the horn on the wall is no longer pigmented and the deeper, the softer.

The sole.

The sole is the palmar part of the hoof and is only visible when raised. It forms a crescent-shaped arch.

The proximal side is convex. It adheres to the solar corium (formerly velvety tissue).

The distal side is concave and sits slightly above the ground when the foot is down.

The outer edge is meshed solid to the wall following a line that is called the **white line**.

The inner edge is V-shaped, open in the back and comes into contact with the fork and the bars. The sole is as thick as the wall, but it is not as hard and is generally darker.

The frog.

Overall, the frog is V-shaped and the front-oriented apex is embedded in the sole.

The inner side moulds to the crack in the corium of the frog.

The outer side protrudes on the palmar side of the foot and touches the ground when at rest. There is a **central sulcus** in the centre towards the sides, bordered by the **branches of the frog** and two **lateral sulci.**

The base of the frog is separated into two parts by the extension of the central sulcus. These are called the **bulbs** of the frog; they are located over the heels.

The horny substance of the frog is always dark. It is more or less soft and can be pressed depending on the hygrometry. It is one centimetre thick at the salient parts, and thinner at the sulci.

17. Gaits

General Points.

The gaits are the different ways a horse moves. There are natural gaits that horses know instinctively (walk, trot, gallop, jump, back up) and the gaits acquired through work (dressage airs, pace).

When describing gaits, the limbs are often associated in twos. Thus, there are:

- the two front and hind pairs of legs which correspond, respectively, to the two thoracic limbs and the two pelvic limbs.
- The right and left lateral pairs of legs, for which the two limbs on a single side are associated.
- The right and left diagonal pairs of legs, with the right of these corresponding to the association of the right thoracic limb and the left pelvic limb.

Some are walking gaits, which means that there is at least one foot on the ground at all times (walk). The opposite are the jumping gaits (trot, gallop).

The gaits are symmetrical, as the movement made by a foot or a pair of legs is then repeated by its counterpart (walk, trot). Otherwise, they are asymmetrical (gallop).

The gait times correspond to the beats of the limbs on the ground which can be heard with each stride. A horse has "beautiful" gaits when they are energetic and harmonious. When they are very spread out and the feet significantly touch the ground, the gaits are lengthened. Otherwise the gaits are shortened. Finally, the gaits are raised when the limbs bend a lot and low when the opposite is true.

Description of the gaits.

Natural gaits.

Fig. 22 Walk

The walk is a walking, symmetrical, four-beat gait. The limbs are successively raised, cover the same distance and go down in the following order: right front leg, left hind leg, left front leg and right hind leg. With every stride, there is a balancing movement in the neck.

Fig. 23 Trot

The trot is a leaping, symmetrical, two-beat gait using diagonal pairs of legs. Every beat is followed by a suspension period (no limb touches the ground), also called the projection period. No neck movement is associated with this gait.

Fig. 24 Gallop

The gallop is a leaping, asymmetrical three-beat gait.

The straight gallop stride can be broken down in the following way:

- left hind leg on the ground,
- left diagonal pair of legs on the ground,
- right front leg on the ground,
- projection period.

Artificial gaits.

- Ambling is a walking, symmetrical, two-beat gait using the lateral pairs of legs.
- Racking is a trot where the beats of the diagonal pairs of legs are disunited.
- The canter is a pace in which the horse gallops on its fore legs and trots on the hind legs.
- The gallop is called disunited when the horse gallops on the right of the fore legs and on the left of the hind legs, or vice versa. In this case, the second beat, which normally corresponds to putting one pair of legs on the ground, is replaced by putting a lateral pair of legs on the ground.

Jumping.

When an obstacle is not very high, the horse "steps over" it, in other words, it uses its momentum to clear it without modifying its demeanour. Clearing the obstacle then corresponds to a gallop stride. However, if the obstacle is a little higher, several phases in the jump can be distinguished.

The stride preceding the obstacle is shortened. The horse straightens itself. It raises its neck and its hind legs go under the body, coming closer to the fore legs. It is the stride of approach.

The fore legs rise, while the hind legs are bent. Then the horse takes off with its hind legs, extends its neck towards the front and bends its fore limbs under it. This is the release.

The hind limbs leave the ground and fold in progressively. The rear foot goes up to the level of the front foot. This is the soar.

Then, the horse's body upstarts. The neck stretches up and the fore limbs stretch out to prepare for the arrival to the ground. This phase is called the descent.

The horse puts its fore legs on ground, then its hind legs. This is the landing.

A new gallop stride then begins.

Mechanics of the stride.

In locomotion, two periods can be distinguished for every limb and at every step. The stance period corresponds to the period of time when the foot is in contact with the ground. The suspension period is the whole portion of the stride when the foot is off the ground.

We will describe these two periods in more detail.

Suspension period.

This period is composed of a **bending phase** and an **extension phase**.

Fig. 25 Bending phase

The **bending phase**, which comes just after raising the foot, is marked by a shortening of the entire limb under the action of the flexor muscles.

Fig 26 Extension phase (front left)

The extension phase **corresponds to contact with the ground, when the limb is carried forward under the action of the extensor muscles.**
At the end of the extension period, the limb gets ready for the stance. The deep flexor muscle of the toe contracts slightly in order to bring the sole of the hoof horizontal. The dorsal extensor muscle tendon of the toe and the superficial flexor muscle tendon of the toe tense to maintain the joints in position during the stance.

Support period.

Fig. 27 Shock absorption phase

The first phase of the support period is **shock absorption**. The fetlock descends under the action of the weight of the horse. The metacarpal-phalangeal joint hyperextends while causing tension in the two flexor tendons of the toe and the fetlock suspensory apparatus tension. Then, the bend of the interphalangeal joint increases the tension of the flanges of the fetlock suspensory ligament, whereas the deep flexor muscle contracts to resist the landing

of the fetlock. The radial flange of the superficial flexor muscle tendon of the toe is placed under tension, thus disassociating the tendon from the fleshy body for one beat.

Thus, the fetlock is suspended by the fetlock suspensory apparatus (proximal part of the ligament associated to the proximal sesamoid distal ligaments), by the superficial flexor muscle tendon of the toe and its radial flange, and the active support of the deep flexor muscle of the toe through its tendon.

Fig. 28 Intermediate support phase

At the end the shock absorption phase when the limb becomes vertical, which is called the **intermediate support phase**, the tension exercised on the fetlock suspensory apparatus is maximum, notably on the suspensory flanges and the distal extremity of the dorsal extensor muscle tendon of the toe. This is also the phase where the support loads on the limb are maximum. At this moment, the accessory ligament of the deep flexor muscle tendon of the toe (the carpal flange) is used very little because of the contraction of the muscle itself.

Fig. 29 Impulse phase

What follows is the **impulse phase** which is characterised by the ascent of the fetlock and bending of the limb. For the first beat, the limb tilting forwards, the bend in the interphalangeal joints decreases while progressively placing tension on the deep flexor muscle tendon of the toe and its carpal flange. Right then, all the ligaments that sustain the fetlock are very stretched, especially: the suspensory ligament, the distal ligaments, the radial flange and the carpal flange. The ascent of the fetlock is connected to the spring phenomenon of this apparatus. Then, the flexor muscles of the limb contract and prolong this movement.

The metacarpal-phalangeal joint straightens. The tension of the deep flexor muscle of the toe is intense. As the foot is again on ground, it causes the distal interphalangeal joint to extend and push the toe forwards. The carpal flange of deep flexor muscle tendon of the toe is then very tense for a brief moment before all the flexors cause the limb to rise. The foot leaves the ground starting with the heels. Bending ends during the suspension period.

Pathologies of the distal limb (description, ethiology, treatment, main horseshoes used):

18. Pathologies of the osteoarticular system

Distal interphalangeal arthropathy.

Aseptic arthritis.

Distal interphalangeal aseptic arthritis is the result of a trauma. Lesions in the cartilage, the capsule, and the articular ligaments are observed.

Ethiology.

Only violent trauma can cause aseptic inflammation with lameness. These include bruises and compressions following a slip, sliding, violent joint torsions, and finally articular fractures of the distal phalange or sesamoid bone.

Symptoms.

Lameness can appear right after the trauma or after a few hours. At rest, the limb pushes on the toe. Abnormal heat over the coronet can be perceived. The synovial recesses are stretched. Passive joint mobilisation is painful. Lameness increases on hard ground.

Diagnosis.

An ultrasound makes it possible to see the tendon lesions.

Arthroscopy makes it possible to assess the extent of the intra-articular lesions and thus refine the prognosis.

Magnetic resonance imaging can also be useful in assessing the tendon and cartilaginous lesions, but its accessibility is limited and the cost is high.

Treatment.

The horse is placed in a stall with thick litter for complete rest. An intra-articular corticoid injection may be prescribed to limit the inflammation and its destructive consequences to the joint. Cold, damp packs with aluminium acetate can be used for 3 to 5 days to decrease the pain associated with the trauma. After a few days, if the impairment is not too severe, the horse can begin to be walked some ten minutes with assistance.

It cannot being working again until two to three weeks after the clinical signs disappear. It must be progressive. A follow-up ultrasound can help detect the evolution of the lesions in order to determine the proper time to resume working.

A horseshoe shall be used which enables "rolling", that is, flexible movements of the foot in all directions. A very bevelled horseshoe can be placed on all its external edges and least sheeted possible.

The prognosis is favourable as long as osteocartilaginous lesions have not set in. It darkens as the arthritis evolves towards festering or towards chronicity (arthrosis).

Infectious arthritis.

Ethiology.

Infectious or septic arthritis occurs following an open trauma with deep penetration (impairment, puncture wound in the foot), or as an extension of a neighbouring infection (abscess, quittor). It can also follow a poorly managed intra-articular injection. Finally, it is sometimes the result of a general illness associated with a septicaemia.

Symptoms.

It provokes very intense lameness at rest. Topically, heat and swelling of the coronet is observed. The articular synovial recesses are easily palpable and in particular, the dorsal recesses on both sides of the extensor process. The digit pulse is marked. The passive mobilisation of the joint causes acute pain.

Its general state is often altered.

Diagnosis.

The incisor exploration test is negative, which makes it possible to differentiate septic arthritis from a foot abscess in the coronet.

The radiographic signs of infectious arthritis only appear three weeks after the infection begins. An x-ray makes it possible to rule out the hypothesis of a fracture, but also to judge the age of the lesion and its consequences. Indeed, an infectious arthritis can spread and can cause osteomyelitis lesions.

The ultrasound makes it possible to see the tendon lesions.

Synovial draining is the only way to get a definitive diagnosis. Normal synovial liquid is limpid, yellow and viscous. If affected by septic arthritis, sometimes a significant modification to the macroscopic appearance is observed. The bacteriology is visible on the sample. A follow-up bacterial sensitivity test to antibiotics makes it possible to set up an adapted anti-infectious treatment.

Arthroscopy makes it possible to collect the synovial fluid for analysis, but also to assess the extent of the intra-articular lesions and thus refine the diagnosis.

Treatment.

Treatment is rapid and effective. Because, in certain cases, the joint can be destroyed in a few hours.

From the initial inflammation phase, a broad spectrum antibiotic must be injected into the joint, after having drained the synovial fluid and rinsed the joint extensively with a physiological liquid. If possible, the articular cavity should be rinsed every day with physiological, antibiotic and enzymatic solutions.

For this, place a large-diameter needle in the most declivitous position possible and inject the solutions with the help of a finer needle, in a more proximal position. This eliminates tissue remnants and limits the propagation of the infection. This treatment is to be done for at least ten days, and five days after the complete disappearance of the signs of infection. If an articular fistula is present, setting up a drain is essential.

Arthroscopy is strongly recommended. It makes it possible to assess the extent of the intra-articular lesions and thus refine the diagnosis. But it especially enables the joint to be very meticulously washed.

A systemic antibiotherapy is associated with this topical treatment.

Strict rest in a stall for about fifteen days should allow the joint to heal. Then, when the infection has healed, exercising and warming-up the joint allows maintenance of the articular physiology as well as its mobility.

When it comes to infectious arthritis, the prognosis is always reserved. Indeed, if the infection is not treated early enough, it can lead to the complete destruction of the articular cartilage, or even lead to osteomyelitis. Moreover, arthrosis is a common complication of infectious arthritis.

Arthrosis.

Arthrosis is a degenerative chronic affection that progressively appears and affects the articular cartilage and/or the bony structures of the joint.

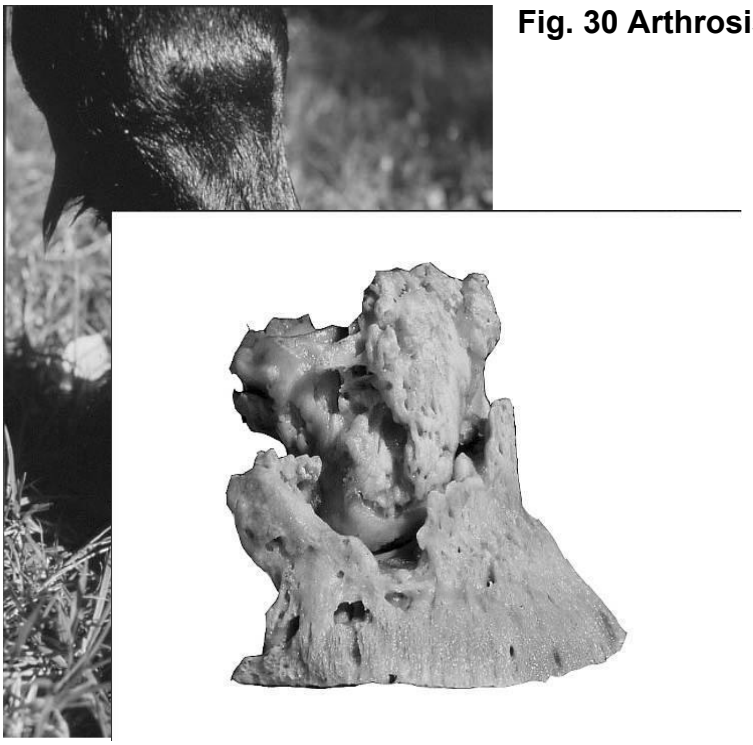


Fig. 30 Arthrosis (coronary form)

Fig. 31 Arthrosis

Ethiology.

The appearance of arthrosis is favoured by articular and peri-articular fractures of the intermediate and distal phalanxes or of the distal sesamoid bone. It can also be the result of an infectious arthritis.

Beyond any pathology, it is favoured by balance shortfalls, poor trimming and poor shoeing, as well as work in circles that are too tight or on hard and unequal ground.

Symptoms.

If the two fore legs are impaired, the horse walks with short steps. It shows pain when it bends. A very marked stance in the heel is characteristic. Sometimes, lameness becomes more pronounced when hot. In advanced cases, the bony protrusions over the coronet are palpated. Passive bending of the joint is painful and the range is not as large.

Radiographic signs are often discreet. A thinning of the articular space and an opacification of the under-chondral bone are observed. Sometimes the presence of osteophytes or enthesophytes is noted.

Arthroscopy makes it possible to assess the extent of the intra-articular lesions and thus refine the prognosis.

Treatment.

Orthopaedic treatment is first aimed at keeping watch over the trimming so as to limit the articular constraints of the toe as much as possible. A horseshoe with a rocker toe and an elastic sole is applied to facilitate foot movement and to limit the shock when putting it down. A horseshoe that enables "rolling" can also be used.

The horses must only undergo moderate exercise. Corticoid injections in the joint often have a temporary effect in the treatment of the arthrosis because they limit the inflammation and pain that come with it. The same can be said for systemic anti-inflammatory therapies. Finally, some dietary supplements limit the development of arthrosis.

The prognosis is almost always reserved to unfavourable. Indeed, articular surface lesions often lead to irreparable chronic lameness. Indeed, arthrosis is an irreversible chronic affection.

19. Desmitis

Desmitis is an inflammatory affection of the ligaments.

The most common desmitis are:

- Desmitis of the fetlock suspensory ligament,
- Desmitis of the carpal flange (accessory ligament of the deep flexor tendon of the toe)

Desmitis is found in most ligaments of the limb.

Ethiology

Desmitis often originates from a trauma. They can be due to a shock but most often it has to do with a traction effort on the ligament beyond its natural elastic faculties.

The collateral ligaments are more vulnerable when the horse changes direction or on uneven land. The axial ligaments are more exposed during fast gaits (races) or during violent efforts, such as an approach to an obstacle or landing.

Symptoms.

Depending on the ligament affected, the lameness will be more pronounced either on the circle or in a straight line, on the corresponding side or the opposite side and the horse will tend to shorten either the fore phase or the hind phase of its stride.

Treatment.

Always associated with rest, the treatment will generally be topical (blister, burn in skates or at the apex…).

It will be necessary to adapt adequate shoeing in order to save the affected ligament.

20. Tendonitis

Tendonitis is an inflammatory affection of the tendons. As tendons are not very vascular but have a lot of nerves, they are very sensitive and therefore the seat of a number of causes for lameness.

Ethiology.

Tendonitis essentially affects the flexors of the fore limbs when due to effort. Excessive constraints leading to tendonitis can be caused by too much work or normal work on a weakened tendon, for example following a period of prolonged rest (tendonitis brought on by resuming activity). Some external circumstances can also be at the origin of tendonitis, such as a poorly adapted shoe or inadequate land.

It can also be caused by trauma; it is then found on the fore limbs as well as the hind limbs.

Symptoms.

The tendon will generally be hot and thickened. The lameness will often be intense and more pronounced on the corresponding foot circle.

When it comes to tendonitis of the superficial flexor, the deformation will most likely be palmar (plantar for the hind legs); the horse will shorten the fore phase of the support for the affected limb.

For tendonitis of the deep digital flexor, the deformation will be collateral and it is the hind phase of the support of the limb affected that will be shortened.

Treatment.

Always associated with rest, the treatment will generally be topical (blister, burn in skates or at the apex).

It will be necessary to adapt an adequate shoeing:

When it comes to tendonitis of the superficial flexor, first, the heels must be lowered and a horseshoe with a covered toe should be applied to the short and free points.

For tendonitis of the deep flexor, the heels will have to be raised (with a heel lift) and a straight bar shoe will have to be applied.

21. Podotrochlear syndrome

Podotrochlear syndrome: Navicular disease.

Navicular disease is a degenerative chronic illness that affects the navicular bone, the podotrochlear bursa and the deep flexor tendon of the toe. It basically affects the fore limbs and is one of the main reasons for intermittent lameness.

Ethiology.

- There is a hereditary component to navicular disease through defects in the physical structure. A right jointed horse is more susceptible to developing this disease. Defective trimming as well as work on uneven land are aggravating.
- The lesions seem to be linked to tension in the deep flexor muscle of the toe that comes too early in the support phase.

Symptoms.

- The horse limps intermittently. When it moves, the horse tends to land on its toe in order to decrease the shock to its heels. A reduction in the caudal phase of the stride is observed and is particularly visible when walking. The lameness is aggravated when cold, on hard ground and on the foot on the same side.
- The impairment is often bilateral, with one side more affected.
- At rest, the horse "toes", which means that it rests its painful foot far ahead of the balance line, to only support it on the toe. When the two feet are affected, the horse alternatively toes one or the other of its fore limbs, or it takes on a tight gait by putting most of its weight on its hindquarters. In the stall, the horse raises its heels and builds a small heap of straw behind its forelimbs, in order to relieve itself. The most affected foot atrophies.
- During an incisor exploring test, certain pain can be found in the middle third of the frog, where the distal sesamoid bone is located. The board test, however, is the most meaningful. A forelimb is placed on the end of a board. The other forelimb is raised, then the board is gradually raised until it reaches an angle of 30 to 45° from the horizontal. Thus, the toe is hyper extended. A horse affected with podotrochleitis suffers when this test is conducted. It places all its weight toward the rear and may even jump from the board.
- Distal digital anaesthesia is positive.
- X-rays and ultrasounds allow you to see the lesions and their severity. However, there are numerous physiological variations in the shape of the distal sesamoid bone.

Lesions.

Based on the anatomical elements concerned, seven types of podotrochlear syndrome can be distinguished:

a. The articular form.
b. The tendon form.
c. The ligament form.
d. The scleroses form.
e. The cystic or osteolytic form.
f. The composite form.

g. Fractures.

We will study these different forms successively.

c. **The articular form.**

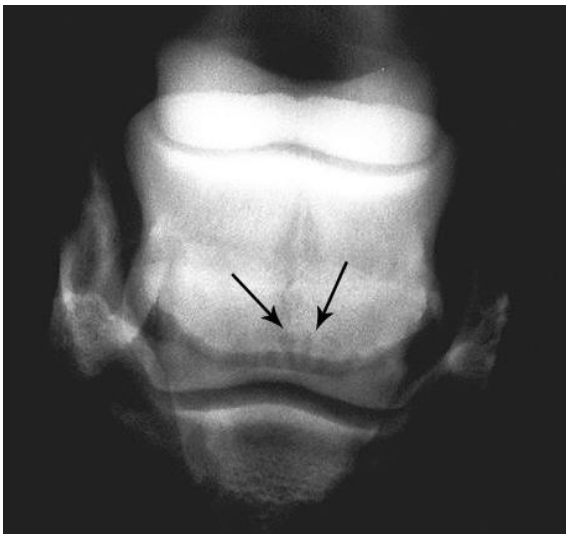


Fig. 32 Articular form

X-ray.

▪ The articular form is very visible on a dorsal-palmar position. There is distension in the distal synovial fossa of the distal sesamoid bone, which look like air sacs on the image. It is the result of a distal interphalangeal arthropathy.

▪ On the lateral-medial position, a thickening of the soft tissues can be seen, followed by a distension of the dorsal recesses of the joint.

Ultrasound.

- A proximal-palmar approach of the pastern hallow can be done. This makes it possible to see a distension of the proximal palmar recesses of the distal interphalangeal joint.
- A dorsal approach at the coronet allows for a study of the dorsal recesses of this joint, and also sometimes shows the existence of a proliferative chronic synovitis with many synovial folds, or even a separation of the synovial cavity.

b. The tendon form.

X-ray.

Radiographic images on the lateral-medial and proximal-distal tangent positions can show the osteolytic or osteoproliferative lesions on the palmar side of the distal sesamoid bone. Mineralisation lesions of the deep flexor tendon of the toe can also sometimes be observed.

Ultrasound.

- A proximal-palmar approach of the pastern hallow can be done. It allows for observation of the perforating tendon, the distal digital annular ligament, as well as the proximal recesses of the podotrochlear bursa.
- In a para-sagittale cut, a normal perforating tendon becomes distally hypoechoic. The two sides are parallel. In a transversal cut, it is slightly less echoic than the digital pad, and presents two symmetrical lobes.
- Lesions of the perforating tendon are often lateromedially asymmetric. In a recent lesion, a hypoechoic thickening is observed, whereas one observes some hypoechoic focal spots corresponding to areas of mineralisation when there is a chronic tendinopathy.

c. **The ligament form.**

X-ray.

- The negative on the lateral-medial and dorsal-palmar positions are enough to observe the collateral ligament insertions on the proximal-palmar edge of the distal sesamoid bone. The most common lesion shows the presence of enthesophytes on the proximal-palmar side of the bone. It may or may not be associated with osteolitic zones. The presence of enthesophytes on the proximal collateral angles of the distal sesamoid bone means there is a ligament form of podotrochlear syndrome.
- As far as the distal sesamoid ligament, the presence of a radiodense nodule on the distal edge of the distal sesamoid bone can be observed on a lateral-medial position. However, this formation can be observed in healthy horses.
- Sometimes to see the lesions better, it seems necessary to make an oblique dorsal-lateral radiographic negative (or dorsal-medial) at 45° and proximal-distal at 60°, when the foot is placed on a block that protects the cassette.

Ultrasound.

- The proximal-distal approach through the pastern hollow enables obtaining sagital, parasagittal and transversal cuts. The collateral sesamoid ligaments appear to have an even echogenicity. Their section is triangular in a parasagittal cut. The lesions are of various sized sections as well as of various echogenicities.
- The odd distal sesamoid ligament is visible by a distal approach through the frog. When normal, it appears thin and echogenic, occupying the space between the deep flexor tendon of the toe, the distal phalange and the distal sesamoid bone. The lesions that are visible are a reduction of echogenicity, which becomes inferior to the one of the deep flexor tendon of the toe, a thickening of the distal sesamoid ligament. Bone changes at the insertions of the distal sesamoid ligament can also be observed.

d. **The sclerosis form.**

X-ray.

The three proximal-distal, lateral-medial and tangent positions make it possible to see the sclerosis form. Osteo-condensation in the spongy part of the distal sesamoid bone is observed. Trabeculations are no longer visible. The palmar cortical can also be affected. Underexposed negatives are doubtful as they produce the same effect on the distal sesamoid bone and can lead to a false diagnosis.

Ultrasound.

Ultrasound doesn't provide any information on the sclerosis form. Yet, it is necessary to note that podotrochlear bursititis is often associated with it.

e. **The cystic or lytic form.**

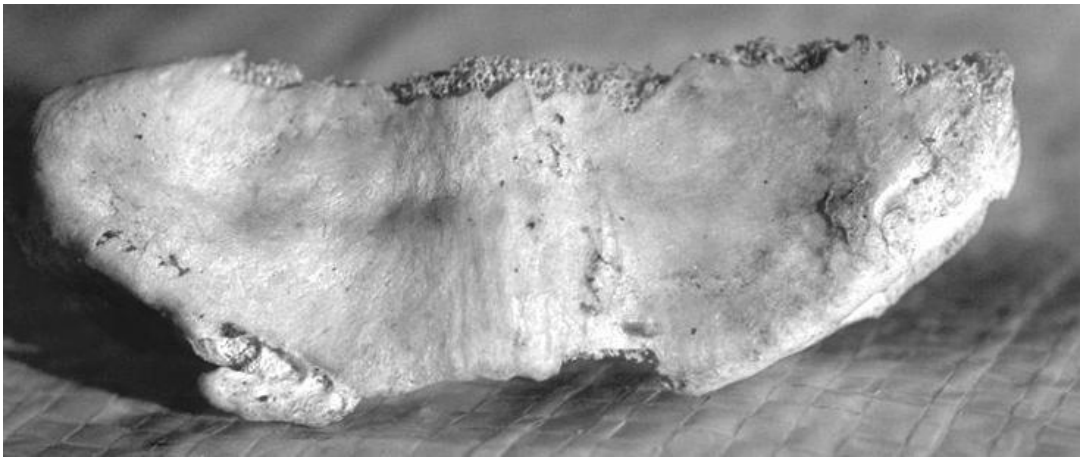


Fig. 33 Osteolytic form

Fig 34 Osteolytic form

X-ray.

- The lesion is visible on the three base negatives. The presence of a radiotransparent osteolytic zone is noted which is more or less extended throughout the thickness of the spongy bone. This zone is often rounded, hence the name cystic form. It is generally found in the sagittal region. It sometimes affects the palmar cortical of the bone.
- This type sometimes follows a tendon or joint form that has evolved, or an unstabilised fracture of the distal sesamoid bone.

Ultrasound.

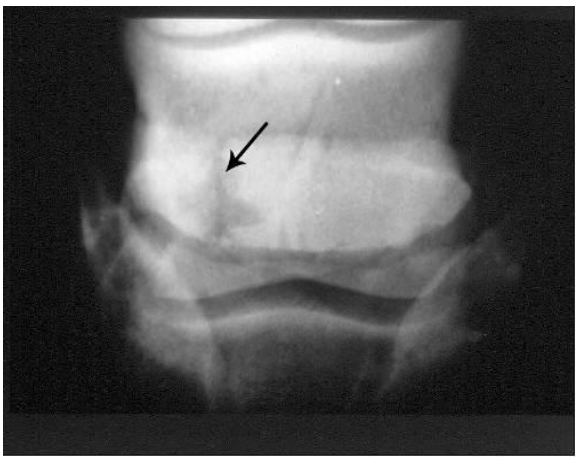
- It is only useful when the osteolytic zone affects the surface of the cortical bone.
- With a proximal-palmar approach at the pastern hollow, the surface of a normal distal sesamoid bone appears in the shape of a regular hyperechogenic line.
- The osteolytic zone causes the appearance of a hypoechoic zone that extends more or less deeply below the bone surface.

f. The composite forms.

Several elementary forms can be associated with podotrochlear syndrome. A sclerosis form is often found with a lytic form, or with a tendon form. Other associations are possible.

g. Fractures.

Fig 34 Navicular fracture



Fractures of the distal sesamoid bone can be the cause or the result of podotrochlear syndrome. When such a fracture is discovered radiographically, the absence of other lesions must be verified.

Treatment.

- The treatment for podotrochlear syndrome consists of decreasing the pain felt by the horse, while playing with the biomechanics of the foot. To do so, adapted trimming and shoeing are fundamental.
- The toe must be shortened in order to minimize the lever arm effect when lifting the foot. In some cases, the height of the foot at the toe can be reduced so that the distal phalange is slightly dorsal-distally oblique in relation to the horizontal plane, thus relieving the podotrochlear apparatus.
- A rocker toe is made to facilitate the rolling of the foot during propulsion. Heel support, with the help of a crossbar horseshoe or an "egg bar shoe" makes it possible to limit the recess of the posterior part of the foot during the shock absorption and suspension phase. To limit placing the frog on the ground, and thus avoid the compression of the podotrochlear apparatus, a shock absorption system can be implemented by adding a plate and filling the space between the foot and the plate with silicone.
- Resuming work cannot be expected until after an adapted shoe is used. Work on hard ground is prohibited. The shoes used are more adapted to flexible ground, and this limits the shocks to the foot when putting it down. Finally, a long period of warming-up to walking, without tight curves, is recommended.
- When the pain is significant, systemic anti-inflammatory treatments can be given. Intra-articular or intra-synovial injections can also be given depending on the form of the podotrochlear syndrome involved, with anti-inflammatory steroids or with hyaluronic acid.
- Surgery may be considered when there is no response to the medical treatments.
- A nervectomy of the palmar digital nerves suppresses the sensitivity of the foot, and therefore the pain. It must be followed by very regular foot care. Indeed, the lesion at the origin of the lameness will tend to worsen because the mechanical constraints will no longer be protected by pain sensitivity. A progressive dilaceration of the perforating tendon may occur as a result of its rupture. A nervectomy is therefore contraindicated for an evolving tendinopathy of the deep flexor tendon of the toe.
- Because of the absence of pain sensitivity, stings, abscesses and other foot pathologies will go unnoticed and can lead to loss of the hoof.

- Often, sensitivity and pain return after the operation, either with the appearance of a painful neuroma on the proximal end of a sectioned nerve, or through the regeneration of the sectioned nerves within two to three years following the intervention.

22. Founder.

Fig. 35 Typical posture of a horse in founder

Pododermatitis aseptica diffusa: founder.

Founder is an inflammation of the podophyllum associated with significant passive congestion.

It leads to a separation of the two dermal and epidermal layers through disimpaction, which can cause the distal phalange to tilt under the effect of the mechanical constraints to which the foot is subjected. In serious cases, the distal phalange completely separates and it ends up crossing the sole.

Ethiology.

Although the vascular phenomena involved in founder are better-known today, overall, this multi-factor disease is far from being fully understood.

Several "classical" origins of founder can be distinguished and separated into two groups:

a. "Metabolic" founders.

Of a dietary origin.

It generally follows massive and brutal ingestion, often accidental, of cereal grains (barley, oats, etc.). It can also occur in the spring when taken out to pasture on young, "fatty" grass. Finally, it can appear following rapid ingestion of a significant amount of cold water, at times hot, when suffering from water colic.

In any case, an endotoxemia is what causes founder.

After an illness.

Any serious infectious illness can lead to founder. Classically, gastro-intestinal problems (colitis, enteritis, peritonitis…) that cause severe colic can cause founder. The same is true for postpartum metritis. As in the previous case, founder is caused following an endotoxemia.

b. "Mechanical" founders.

By being overweight.

When an animal gets so fat that it becomes obese, the excess weight the feet must bear becomes too much and founder sets in.

The horse may also injure a limb. Then, it transfers all of its weight onto the healthy limb, which may then suffer from founder.

By a severe blow to a limb.

In the event of significant trauma to a limb, leading to a prolonged suppression of support (fracture, septic synovitis), the weight supported by the contralateral limb is such that it can cause the appearance of founder.

Pathogenesis.

The organisation of the foot arterial network predisposes the dorsal podophyllum to ischemia. The blood circulates from the sole to the coronet, against the weight. It is the terminal arterial network that irrigates the wall. Yet, there are few collateral branches in the arterial arcades on the solar side.

The signs of acute founder are linked to the opposition between a marked oedema of the podophyllum and the impossibility of the horny box to expand. This phenomenon is called compartment syndrome.

First, a digital venous vasoconstriction that causes passive congestion of the dorsal podophyllum, a capillary blood stasis and a parietal oedema are observed. This leads to an increase in vascular resistance, and consequently the opening of the arteriovenous shunts in the coronet. This leads to a paradoxical situation: the parietal perfusion is stopped in spite of the increase in digital blood flow.

Secondly, the formation of microthrombosis following a massive release of mediators of inflammation aggravates the ischemia and tissue degradation. The dermal cells detach themselves from the basal membrane which disintegrates. This causes dermal-epidermal disimpaction. The tension exercised by the deep flexor muscle tendon of the toe is no longer counterbalanced by the resistance of the parietal lamellar system and causes the distal phalange to tilt which aggravates the phenomenon, creating an empty space between the dorsal side and the rest of the tissues.

During the chronic phase, this space is filled by the fibrous tissue which definitively prevents a return to a normal balance.

Symptoms.

In the beginning, the horse trudges along. Then it begins to move with difficulty, cautiously. Finally, it stops and refuses to move. It then becomes difficult to lift its foot. The horse reaches a founder crisis in the fore limbs and adopts a characteristic position. It places its hindquarters far forward, under it, in order to transfer as much weight as possible onto its rear foot, and thus relieve its forelimbs.

When the horse is foundered in the four limbs, it stands up and categorically refuses to move or completely lies down. The affected feet are hot. Its digital pulse leaps. Sensitivity in the toe is very important.

The passage to chronicity is marked by a tilt in the distal phalange. This can be observed on a x-ray of the foot profile, while taking care to place a radio-opaque marker on the hoof wall at the toe. Normally, the dorsal side of the distal phalanx is parallel to the wall. When afflicted with founder, the distal phalanx is no longer

retained by the dorsal side. It descends and tilts downwards. Its solar side can become affected or even pierce the sole.

The degree of rotation of the distal phalanx makes it possible to provide a prognosis. Thus, if the angle of rotation is lower than 5.5°, athletic function can be regained. Up to 11.5° rotation, the prognosis is reserved as far as sports activities. Beyond 11.5°, only life in the meadow and reproductive use is foreseeable.

The shoot of the horn alters from the tilt of the distal phalanx. If the hoof is not trimmed, it will quickly take on an "Aladdin-slipper" appearance.

Treatment.

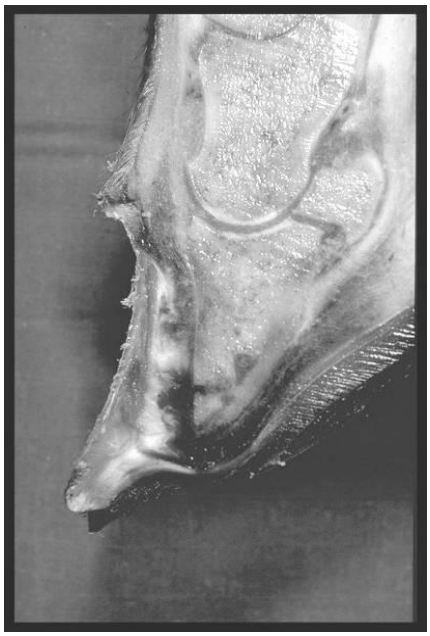
Acute phase.

The different phases of acute founder sometimes follow one another very quickly. The prognosis worsens considerably when the distal phalanx tilts. Therefore, an acute founder crisis must be treated like an emergency. First, an attempt is made to minimise the cause of the founder. Then, the vicious circle that is established between pain and vasoconstriction is interrupted. Finally, an attempt is made to prevent the tilt of the distal phalanx as much as possible, or to limit it if it has already begun.

Preventing or limiting the distal phalanx from tilting.

To limit the effects of the tilt, support in the frog on the foundered foot is provided. This enables sustaining the phalanx, which is no longer maintained at the necrosis layers, and limiting the tension exercised by the perforating tendon on the phalanx and on the injured tissue.

Ideally, a material is used that is moldable enough to adapt to the shape of the frog without leading to damaging compression; firm and thick so as not to be completely crushed during support; waterproof, light, easy to cut and inexpensive. An isolation sheath corresponds well to these criteria, but it is not always available in the veterinarian's vehicle. In this case, two rolls of crepe strip can be used or a large packet of compresses.



The material is placed on the back half of the frog and is kept in place with adhesive tape, and crossed several times without passing over the coronet or the bulbs of the heels. Considering the weak mobility of horses in crisis, the bandage stays in place. Several options for furcal support are available on the market.

The pads made of rubber moulded in the shape of the frog and bulbs of the heels do not adapt well to the different foot formats and can cause scabs. Styrofoam polystyrene blocks, if they are cut to the exact size of the sole, mould well by collapsing on the frog and the bulbs of the heels. Finally, some resins can be directly moulded on the sole.

The furcal support is supervised and left in place until a suitable orthopaedic shoe is fit.

Chronic phase.

Fig. 36 Cut from a foundered foot

The initial trimming must minimise the tissue destruction linked to the tilt of the distal phalanx. Indeed, the absence of care can lead to the spontaneous loss of the hoof.

When the distal phalanx is tilted without collapsing, the wall can be dorsally thinned. The wall is thinned at the toe, the lower side of the seat of corn up to the sole, without exceeding the two thirds of the toe in width, so as not to increase the instability of the phalanx. It is thinned with the help of a rasp or an electric reamer until the wall depresses when pressed. This treatment limits the compressions caused by the distal phalanx on the wall and encourages hoof growth that is parallel to the dorsal side of the phalanx.

In serious cases of founder, when the horse often remains lying down, it is best to make it a stall with sand instead of litter in order to limit the appearance of scabs. Moreover, exungulation, the immediate effect of which is to relieve the horse, can be foreseen.

The horse must also be fitted with orthopaedic horseshoes that provide support to the posterior part of the frog.

23. Other foot pathologies

Foot illnesses and accidents.

Impairments of the horny box.

Impairments of the wall and the coronary and parietal coriums.

Sand crack.

Definition:

Any crack in the hoof is called a sand crack.

There are different types of sand cracks based on the direction of the extension or based on their location:

a. **Rising sand cracks**

Description.

Rising sand cracks are sand cracks that start on the solar side of the hoof wall and progress towards the coronet.

Fig. 37 Accidental rising sand crack

Treatment.

The wall is trimmed. Then, the wall is sutured transversally to the crack and above it in order to prevent it from spreading. The crack can also be cauterised on the upper end with a red hot punch. In certain serious cases, it is best to insert a staple or glue to prevent the sides of the gap from

moving. Shoeing the horse so that the hoof maintains its shape is always recommended.

The crack disappears by itself with horn growth. The feet should be regularly greased in order to facilitate this.

b. **Field- or pasture-induced sand cracks.**

Description.

Field-induced sand cracks are rising cracks.

They most often occur in unshod horses on grass as the foot, which is too long, tends to get wider. It can occur in shod horses after a very long time, or when there are too many nails or they are poorly positioned, in other words when they bother wall expansion.

Fig. 38 Field-induced sand crack

Treatment.

The treatment is the same for rising sand cracks.

To prevent this kind of accident, it is best to regularly trim the feet of field horses.

c. **Descending sand cracks**

Description.

A descending sand crack is a crack in the wall in the direction of the tubules. Beginning at the coronet, it extends downwards. It is caused by the wall's incapacity to bear the effort imposed on it, either the effort is too much or the horn of the wall is too weak. *It most often appears in one quarter and thus is called "quarter-crack".*

Fig. 39 Descending quarter-cracks

Treatment

Eliminate the cause as much as possible:

If the horse is not balanced, it will often be associated with riding heels. It will then be necessary to trim the foot on the riding heels side until the angle formed by the hoof support surface and the longitudinal axis of the cannon bone (observed when raised) is the same as the angle formed by the longitudinal axis of the cannon bone and the ground (when put down). (i.e.: E: balance trimming on the frontal plane).

If the sand-crack has been caused by shock to the heels during locomotion, it will be necessary to monitor that these are not too high or the horseshoe is not too long in sponge.

The sand-crack may be due to a defect in horizontal physical structure, in which case it will be necessary to make sure the corresponding sponge is not too long.

Decreased support in the damaged area.

Removing support is often recommended. In other words, subtracting the distal part of the wall from its support on the horseshoe. This removal of support generally begins a little forward in relation to the direction of the sand-crack and extends to the heel. An attempt should be made to increase the hoof support by non-involved parts as much as possible.

Immobilisation of the sides of the crack.

When the sand-crack is significant, it is sometimes necessary to immobilise the edges of the crack. This can be done by stapling all along the height of the sand-crack, while making sure not to press the soft tissues, or by gluing with reconstructive material such as polymethylmethacrylate or a polyurethane resin. This solution increases the stability of the horny box, but risks closing in the germs that could develop and cause an infection.

Preventing infections.

If the gap must be filled, this shall only be done after having cleaned it thoroughly.

Activating horn growth.

The removal of support in the damaged area facilitates growth. In the event of a severe sand-crack, the damaged zone may be cauterised or irritating substances (iodine dye) may be used to encourage the inflammation and therefore the multiplication of the germ cells.

Sometimes, the trauma caused to the germ cells of the coronary corium is significant and the lack of growth in the horn becomes permanent. In this case, successive trimming limits the distortion, but does not suppress it.

d. **Horizontal sand cracks**

Horizontal sand-cracks are generally the result of detachments from the wall that occurred at the coronet and descend under the effect of the hoof growth. They can be invisible at first and can appear some months later at the midwall. These detachments may be due to abscesses having pierced the coronet, to striking (see below) or still yet to warming-ups of overworking such as is found in endurance horses.

They are not generally incapacitating and disappear with hoof growth.

e. **Cicatricial sand cracks**

Cicatricial sand cracks

Fig. 40 Cicatricial sand-cracks are actually defects in the growth of the horn from its birth at the coronet. They are found when the coronary corium has been damaged (striking, lunging…) and the scar tissue cannot produce the horn correctly. They are almost always chronic and rarely incapacitating.

f. **Quarter-cracks**

Quarter-cracks are descending sand cracks located in the lower quarter or the heel (see above).

g. **Sand-cracks of the sole**

Sand-cracks of the sole are very rare. They are generally found at the end of winter. They are the crevasses that generally start at the apex of the frog and move towards the front. Very painful, they make the horse limp very low, and are very favourable to infections and thus, abscesses. When they are bilateral (on the two feet), the animal adopts the position of a foundered horse which can lead to a false diagnosis.

Treatment.

They must be fitted with a character horseshoe and a treatment plate after having properly treated the abscess if there was one.

h. **Sand-cracks of the bar**

Fig. 41 Sand-cracks of the bar

Sand-cracks of the bar are cracks that can spread over the entire height of the bar in the direction of the tubules. Just like sand-cracks on the sole, they can be very favourable to infections and thus, abscesses, and in this case the horse limps very low.

Treatment

The heels are trimmed to reduce the loads and the edges of the crack are thinned. It is sometimes useful to cauterise them at the end of the sulci.

i. **Mounting sand cracks**

Striking

Fig. 42 Regular striking

The horse is injured as it scalps one of its heels or fore bulbs of the heels with the horseshoe on one of its other feet. Downwards, the mark on the hoof will look like a parallel crack at the coronet which is sometimes called a "horizontal sand-crack". More generally, striking sometimes refers to all accidental wounds on the distal part of the limb.

Fig. 43 Accidental striking

Treatment.

On a recent injury, the horn detaches slightly and the wound oozes. The damaged bulb of the heel tends to be oedematous. In general, the horse limps. This wound, located very close to the ground, tends to be quickly soiled by sand and dust. It will then be necessary to finish cutting the shred of horn that has detached and disinfect it carefully. If this is neglected, germs will settle in. Suppuration leads to rapid extension of the lesion and may cause significant damage.

a

Ulcer on the coronet

Fig. 44 Ulcer on the coronet

Ulcer on the coronet is an eczema-based horny hyperplasia that begins at the coronary corium, leading to its deformation and giving rise to a crackled horn. It is rare and does not lead to lameness.

Ethiology.

Ulcer on the coronet can be the result of an irritation of the corium following trauma at the coronet. It can come from chronic selenium poisoning.

Treatment.

The irregularities of the horn are equalled with a rasp. Then the wound is cauterised with iodine dye or 5% picric acid. A bandage moistened with astringent can be used. Regular feet greasing is necessary to improve the condition of the frog.

Keratoma, or keraphyllocele.

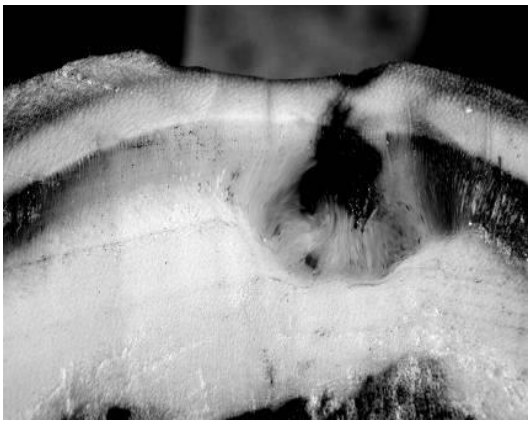


Fig. 45 Keratoma

Keratoma is a rare benign tumour that develops in the deep layers of the wall. It is made up of a set of thickenings that are more or less isolated, in the shape of a crest, cone, column or sphere. Located on the inner side of the wall, they can stick out toward the outside. These thickenings are most often observed in the toe, sometimes in the breasts and quarters.

Ethiology.

These thickenings are the result of an abnormal production of horn following septic or non-septic inflammation of the pododerm of the coronet or the wall. Thus, it can follow a sand-crack, gravel, a relapsing abscess or repeated shocks (a horse who taps on the door of its stall with a forelimb). However, the reason for the appearance of the keratoma is sometimes unknown.

Symptoms.

Keratoma is generally located in the toe, rarely at the sole.

Lameness may be absent or of a variable intensity, depending on the location of the keratoma and its size.

If it is massive, the keratoma in the toe can lead to a deformation of the wall. It can also cause a compression of the distal phalanx and amending it may lead to fracture.

A keratoma can become infected and cause strong sensitivity, lameness and an increase in the digital pulse. It must be differentiated from a foot abscess.

Diagnosis.

The keratoma is often discovered by the farrier, who notes a deviation of the white line in a semi-circle toward the sole.

When it is present, lameness can be suppressed by a digital distal anaesthesia for a solar keratoma, and by a digital proximal anaesthesia when the keratoma is located in the toe.

For a massive keratoma located on the toe, a dorsal-palmar 65° view radiological negative shows a circular or semi-lunar distortion of the third phalanx, as well as a possible fracture.

In there is no radiological distortion of the distal phalanx, an ultrasound can sometimes show the keratoma, which looks like a well-delimited hypoechoic mass.

Treatment.

It is essential to eliminate the cause of the keratoma, when it is known. To decrease the inflammation of the pododerm, a reversed U funnel can be made with a paring knife or a rasp on the distal side of the wall. This limits the damaged area from making contact with the ground. The wall can also be thinned with the rasp.

If orthopaedic care is not enough to eliminate the lameness, the keratoma must be surgically removed.

Corn.

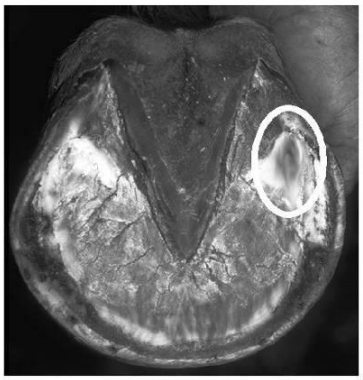


Fig. 46 Corn

A corn is a haematoma located on the sole, generally on the heels.

It occurs more frequently on the forelimbs and inner heel. Horses that have flat feet or whose heels are low are more exposed to this than others.

Ethiology

The corn can be caused by external bruises or compressions, such as a stone that gets lodged in a lateral sulcus of the frog or a horseshoe with points that are too short and push on the sole. It can also be caused by pododerm bruises on the heels following the mineralisation of ungular cartilage or their lack of flexibility.

Symptoms.

The horse is lame. When the sole is compressed at the bruised area with exploratory tool, a quick reaction from the horse is observed.

Sometimes, the bruise is visible after having washed and brushed the sole. But most often, the shoe must be removed and the sole slightly trimmed to observe the bruised area.

The corn is **dry** when the horn is merely coloured yellow and spotted with blood. The corn then has a good prognosis.

The corn is **wet**, then haemorrhages when the horn is pinkish and slightly detached by infiltration of blood. It can lead to lameness, but recovery is fast and easy.

Finally, the corn can become **festered** if left too long without treatment. The formation of pus more or less detaches the sole and the infection can spread inside the foot. The horse limps strongly.

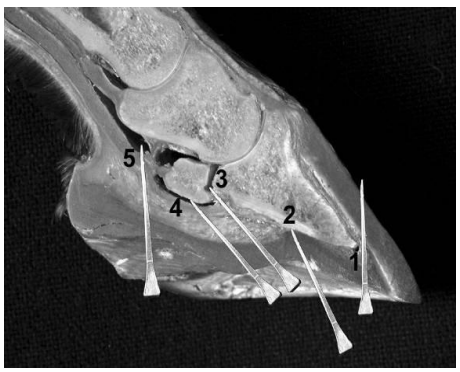
Treatments:

a. Dry corn.
In the event of lameness, it is enough to thin the horn of the sole which is abnormally coloured and its surroundings with the paring knife. After this trimming, the horn must be easily pressed when someone pushes on it with their thumb. Fit the foot with a plate to protect the bruised area.

b. Damp or haemorrhaging corn.
The horse is left to rest. The horn is heavily thinned with a paring knife so that the secretions drain themselves easily. Daily foot baths are given. When the lesion is more extensive and the sole is sensitive throughout, a horseshoe along with a protective plate is fitted.

c. Festered corn.
In addition to the previous treatments, the foot is wrapped in a bandage until the wound heals.

Puncture wound in the foot.



This includes all wounds that perforate the plantar surface of the hoof, regardless of the cause (tips of metal or wood, pieces of glass…).

Fig. 47 Puncture wound in the foot
1) Flaky flesh
2) Phalanx.
3) Articular synovial bursa
4) Podotrochlear synovial bursa
5) Tendon synovial bursa

Ethiology.

Nails and tips are to be placed on the extremity of the frog, as the nail is raised by the toe of the horseshoe and slips along the sole until it clings to the frog that it penetrates.

Symptoms.

If the pointed object seriously impairs the sensitive tissue, lameness is immediate and pronounced. Otherwise, an abscess forms and lameness appears 5 to 8 days later.

The seriousness of the accident varies depending on the site of the prick. The most dangerous area is the area between the apex of the frog and the tip of the central sulcus because the object can reach the distal sesamoid-phalangeal joint.

Treatment.

The foreign object must be completely removed as soon as possible and the location of the prick must be accurately noted, or even have an x-ray done of the foot profile before withdrawing the object.

It is then necessary to thin the horn very extensively around the point of penetration in order to facilitate drainage. The cavity must be disinfected with a syringe containing an antiseptic or antibiotic solution.

If the lesion is recent, daily foot baths in a tepid antiseptic solution are enough. It heals within 8 to 10 days. The foot is then shod with a protective plate. Considering the topicalisation and the reason for the lesion, it is best to administer an antitetanus serum injection that same day.

When lameness persists after treatment, an x-ray of the foot must be taken to see the extent of the damaged area. If the lesion is neglected, it will become an abscess.

Foot abscess.

Ethiology.

A pointed object penetrates the sole, or small stones penetrate through the white line. Germs increase and an abscess forms.

Symptoms.

The collection of pus ends up putting pressure on the sensitive regions: lameness appears. It is very intense and the horse poses its foot on the toe. When taken, the digital pulse is very pronounced. Exploring the sole with a hammer or exploring pliers causes the horse to quickly withdraw the limb. Thus, in general the abscess can be located.

Treatment.

If the abscess is mature, the horn can be pressed down with a thumb in the place where the abscess is going to pierce. The most essential in the treatment is to uncover the damaged area to assure it drains. If left to evolve on its own, the pus causes inflammation of the limb, gets under the horn until it completely invades the foot and ends up oozing at the coronet.

It is then necessary to thin the horn very extensively around the point of penetration with a paring knife in order to facilitate drainage. The cavity must then be disinfected with a syringe containing an antiseptic solution. If the abscess is recent, foot baths twice a day in a tepid antiseptic solution are enough.

The foot can be protected with a bandage to stop the spots from refilling and reinfecting the wound. The bandage must be redone after every bath. The cotton used should be moistened with an antiseptic solution.

Even when the horse is vaccinated, an anti-tetanus injection is given because this type of injury provides the ideal conditions for the penetration and development of *bacillus tetani*.

The pus no longer oozes after 5 to 6 days. The wound is smeared with Norway tar. If the abscess were very developed and the sensitive tissues were not yet protected by the regrowth of the horn, cotton is stuffed in it and a horseshoe fitted, adjusting a protective plate on the sole. This protective device is left in place for 8 to 10 days. Then, if there are no more signs of lameness, the plate is removed.

If the abscess is not mature, it is impossible to locate and therefore impossible to control. In this case, the abscess is matured while wrapped in linseed. One part linseed to three parts water is boiled for 10 minutes. When the preparation has cooled but is still tepid, it is placed in a plastic bag (supermarket-type bag) and the bag is wrapped around the foot. A bandage is placed over the foot with a strip of thick cotton and a piece of jute canvas or a piece of large and resistant adhesive tape. The wrap is changed every day until a soft horn area appears: the abscess is advanced.

Impairments of the frog.

Thrush.

Fig. 48 Thrush

Rotting of the frog is a process where the central and lateral sulci degenerate and then release a blackish and necrotic ooze.

Ethiology.

It appears most often in badly kept stables, when the litter is dirty and the feet are cared for just as poorly. It is more frequent in winter when the horses work on wet, muddy ground. The posterior limbs are most often affected first.

Symptoms.

The frog is excessively soft. Shreds of horn detach from it, and the sulci release an excessive quantity of blackish, nauseating secretions. Once the foot is cured, the sulci seem deep. When the corium is affected, curing the feet causes a sensitivity

reaction in the horse. Rotting of the frog does not cause limping unless the impairment is severe.

Treatment.

The frog must be trimmed in order to remove the pieces of degenerate horn. Every day, after having cleaned the feet, the sulci are stuffed with cotton moistened in an antiseptic solution.

When the frog is dry, the antiseptic solution is replaced with Norway tar. Applying Norway tar on the frog and the sole regularly will prevent recurrences. Obviously, proper hygiene of the foot and the litter must be practiced.

Canker of the hoof.

Canker of the hoof is a lesion of the keratogenous tissue of the frog, and sometimes of the sole. The superficial epidermis is subjected to a proliferative hyperplasia with degeneration of the external layers.

Ethiology.

It is a rare affection that generally affects the hind limbs and is due to poor hygiene (dirty litter, no foot care). You must know how to differentiate it from frog rot. There are many germs that cause it.

Symptoms.

Lameness only appears when the infection takes over the sensitive parts of the foot. The clinical signs are therefore rough in the beginning. When the foot is raised, there is a strong, nauseating odour. The frog is intact but has a very irregular shape. Trimming the frog reveals a whitish hypertrophic underlying tissue. An ooze flows out.

If left untreated, a canker of the hoof will not spontaneously heal. It will spread to the sole, or even to the wall.

Treatment.

The treatment consists of cleaning the feet, leaving the wounds bare and cauterising them with iodine dye or 5% picric acid. The feet are then shod with plates, interposing a very compressive bandage moistened with antiseptic and astringent between the sole and the plate. The patient must continue to work. Of course, drastic improvement in the care conditions are necessary.

Necrosis of the white line.

Ethiology.

Necrosis of the white line is a common phenomena. The white line, the area that joins the wall and the sole, is a very fragile region of the hoof. Moreover, it is covered by the horseshoe and, therefore, cannot be cleaned. Anaerobic germs develop superficially in it, which leads to necrosis and blackening.

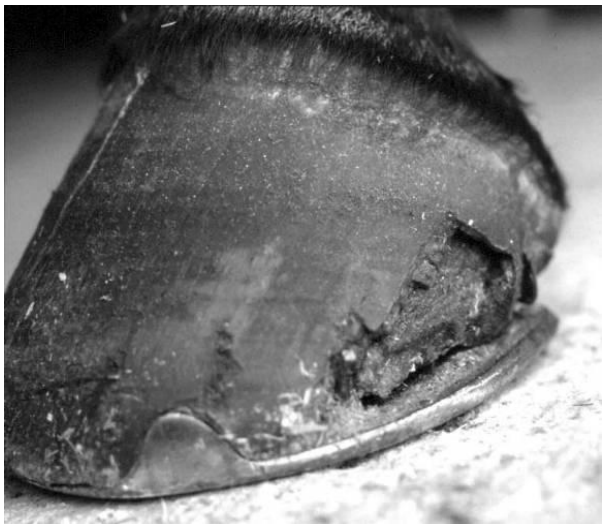
Symptoms.

Necrosis of the white line does not cause lameness. But it can be complicated due to white line disease or gravel. Furthermore, it favours the penetration of foreign bodies (stones, etc.), which can cause foot abscesses.

Treatment.

When trimming, the farrier cleans the entire blackened area well in order to verify that the phenomena has not spread much and that there is neither white line disease nor gravel present.

<u>While line disease.</u>



White line disease is a keratinolytic process characterised by the separation of the wall and the sole along this line, then between the podophyl and the keraphyl. It develops most often in the toe and quarters.

Fig. 49 White line disease

Ethiology.

This disease essentially affects the forelimbs. Asymmetrical hooves are predisposed to it. At the most oblique parts, the white line is especially put to the test when in contact with the ground, particularly on hard ground which facilitates its disunion.

No ethiology has been scientifically proven, but its appearance is encouraged by a soft and crumbly horn. Poor foot care, as well as diseases that chip away at the hoof, such as the canker of the hoof, necrosis of the white line, or a trauma contribute to its development.

Symptoms.

The horn of the white line can be destroyed on one part or throughout the entire contact edge. The development of anaerobic bacteria leads to the formation of a blackish, foul-smelling mass at the white line. If the phenomena spreads, the horse limps.

Treatment.

After having trimmed the foot, the whole blackened and crumbly horn of the white line is removed as well as the wall in this area. If the hollow formed is significant, it can be filled with a plastic substance or cotton moistened with an antibacterial and/or anti-fungal product. A covered horseshoe protects the lesion. Toe clips placed on both sides of the lesion stabilise the wall. Horn production will fix the problem itself.

The farrier should carefully monitor the horse's feet because it is not rare that this disease reappears a year or two later then throughout the life of the horse.

To prevent the appearance of white line disease, the farrier should verify the integrity of the white line and dig the least blackened zones at every trimming.

Gravel.

Fig. 50 Gravel

A gravel is a detachment of the middle layer of the wall from its deep layer, generally caused by the development of anaerobic bacteria and fungi in symbiosis within the horn.

Ethiology.

Gravel generally begins through an opening or a weakness of the white line. A small sand-crack, a trauma linked to a violent shock on the wall, or a necrosis of the white line can be at the origin of such openings. It also appears in horses left in the meadow without foot care. The horn that has not been trimmed detaches because of the weight of the horse. Soil and debris further the detachment. Bacteria and anaerobic fungi can develop in it, leading to a necrosis of the tissues.

Symptoms.

The horse limps. Percussion of the wall sounds clear in the affected area. Sometimes, the distal extremity of the wall detaches. There is certain sensitivity. When raising the foot to examine it, a dead space filled with debris inside the wall can be seen.

Treatment.

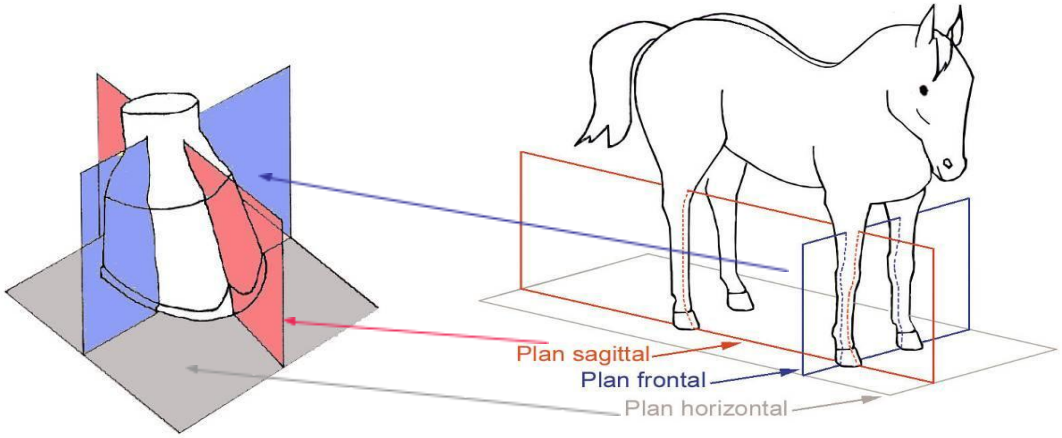
The foot must be trimmed and the cavity must be cleaned of all debris. Then the whole horn is detached while taking care not to leave any trace of the necrosis-infected horn.

If the gravel has not spread much, the horse is then fitted with a covered horseshoe to protect the sensitive area. If it is significant, a heart bar shoe is used in order to support the distal phalanx that is deprived of a part of its support. In this case, the zone discovered can be filled with surrogate horn, as described for false quarters and hoof substance losses. But, knowing that the gravel originated from anaerobic germs, this repair should be avoided at first.

When the gravel is treated quickly, with regular care, the growth of the horn brings the hoof back to normal. On the other hand, if the gravel is left untreated, it can lead to a lowering of the third phalanx. The foot then becomes flat or heaped and the prognosis is worse.

Physical structure of the limbs:

24. General Points



"Stance" means the natural physical structure and the directions presented by the different bone rays of the limbs. The physical structure of the stances can, when used, influence the longevity of the horse's career. Some irregular or imperfect stances can predispose a horse to premature wear of the limbs, as well as lesions.

The stance of the limbs is inherent to every horse and is difficult to modify on the adult horse without the risk of creating constraints leading to lesions or hindrances.

Terminology: observation of the stance.

In order objectively mark the stances in space, we shall organise our study around three planes:

- The **sagittal plane of the limb**, which is its vertical plane of symmetry. The observation of the stance in the parasagittal plane is a **profile view**.
- The **frontal plane** is the vertical plane that is perpendicular to the sagittal plane. The stance is observed in this plane with a **side view of the limb**, **rear view of the limb**, and **a view from above of the dorsal side of the limb**. Certain frontal deviations can also be observed while observing the cannon bone and the phalangeal alignment of the forelimbs when the foot is raised.

- The **horizontal plane**, the plane that is parallel to the ground. The stance is observed in this plane with a **side view**, **rear view** and **view from above of the dorsal side of the limb**.

The direction of the various bone rays, the virtual axes of the joints as well as the bulbs of the heels is observed.

Fig. 51 View of the shoulder

25. Stances

The limb stances are studied when the horse is at a stop on horizontal ground with the two limbs of each pair of legs- fore and hind- on the same lines.

Irregularities in the stance of the limbs of an adult horse can be congenital or acquired. They must be well understood because most often you do not need to try to correct them, but rather you need to help the animal best support them.

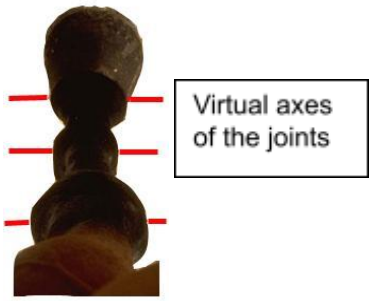
Ideal stances: The ideal stances are references for the description of imperfect, irregular or simply different stances. Under no circumstance should they be considered a result to be obtained through trimming and shoeing in the mature horse.

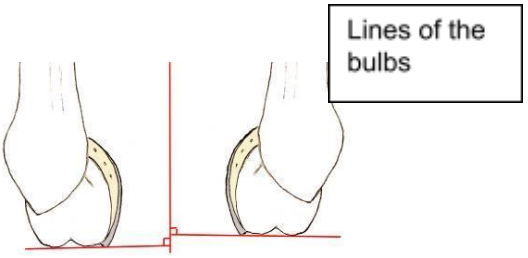
Forelimbs

- **Sagittal plane**
  - The lower vertical of the elbow joint separates the forearm and the cannon bone into two appreciably equal halves and touches the ground a little behind the hoof.
  - The lower vertical of the elbow tip borders the posterior part of the forearm and the cannon bone and touches the ground behind the foot. The distance separating the heels from the lower right is the same as the length of the support surface of the hoof.

The pastern is inclined at 50 to 55° in relation to the horizontal. The line formed by the phalangeal rays is not broken.

- **Frontal plane.** From a side view, the lower vertical of the tip of the shoulder splits the entire limb into two equal halves and touches the ground at the middle of the foot. The distance on the ground between the two hooves is equal to the width of a hoof. The alignment of the bone rays is not broken medially or laterally.
- **Horizontal plane.** The virtual axes of the joints as well as the lines of the bulbs of the heels (tangent line to the two bulbs of the heels on the palmar side of the hoof) are perpendicular to the sagittal plane of the horse.





Hindlimbs

- **Sagittal plane**

The lower vertical of the tip of the rump meets the hock point, followed by the plantar side of the metatarsus and touches the ground a little behind the foot.

The lower vertical of the hip joint touches the ground in the middle of the hoof. The pastern is inclined at 55° to 60° in relation to the horizontal.

- **Frontal plane**

The lower vertical of the tip of the rump splits the bottom of the limb into two equal halves and touches the ground in the middle of the foot. The distance between the hooves is equal to the width of a fetlock. The feet are turned slightly outwards. Physiologically, the hind feet are therefore slightly toe-out and a bit closer than the fore feet.

- **Horizontal plane**

The virtual axes of the joints as well as the lines of the bulbs of the heels form an angle that is slightly closed towards the rear with the sagittal plane of the horse.

In motion

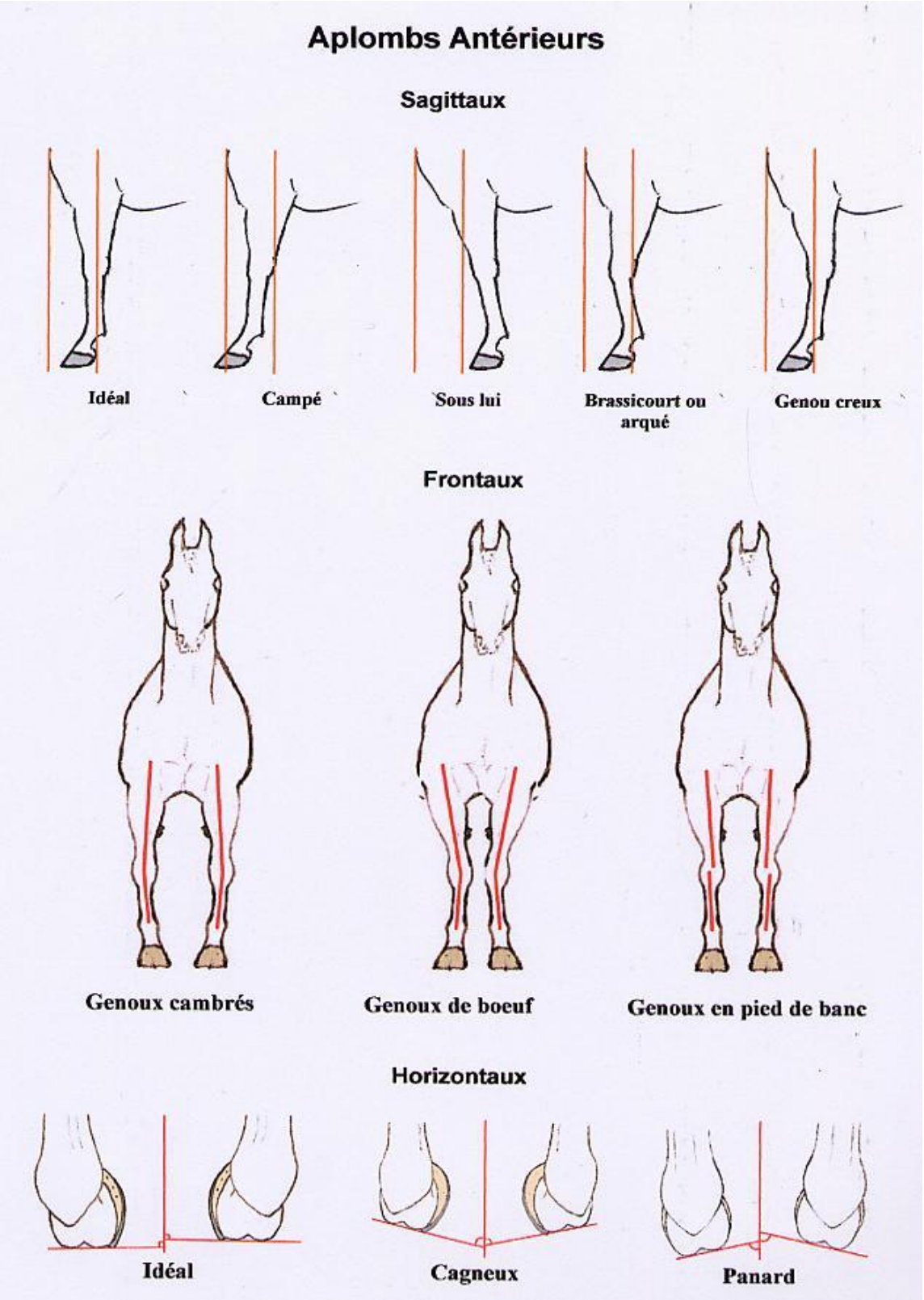
The stances condition the horse's walk and gaits, which is why it is necessary to also examine them when moving, at a walk and at a trot.

A horse with the ideal physical structure theoretically has ideal locomotion, which serves as a reference for describing the other types of motion.

A horse with ideal stances walks straight, the two limbs of a side move in the same plane and on the same track. If you look at a horse from the front when it is walking, the forelimbs conceal the hind limbs located on the same side. Seen from the rear, the hind limbs conceal the forelimbs.

The feet seem to go down flat. In reality, a saddle horse with a normal physical structure starts by putting down its feet on the outside, in 65% of the cases for the fore feet, and in 85% of the cases for the hind feet. However, this detail is not visible to the naked eye.

26. Front leg stances (deviations)



Different stances

"Different" stances can be irregular, imperfect or defective. They can also be part of the criteria sought in a race. These stances are listed by plane, although the variations are often located on several planes at one time.

These variations may involve the entire limb or only part of it. In the latter case, the deviations and the rotations are visible at the joints, but their seat is generally at the bones themselves.

Forelimbs

- **Sagittal plane**

These positions are generally due to retractions or ligament or muscle tendon laxities. They can result from the search for an analgesic position, in other words, more comfortable, to limit pain.

The horse is said to be:

Camped out,

When the limb is oblique and the foot too forward. The limb is in protraction. On hard ground, the phalanxes generally meet in a bend.

This feature can be congenital or acquired. When it is acquired, it may correspond to a search for an analgesic position. It can be observed during founder or navicular disease. Indeed, the camped position makes it possible to relax the deep flexor apparatus of the toe and tends to limit the weight carried by the forelimbs, to the detriment of the hind limbs.

In locomotion, a camped out horse tends to shorten the later phase of the stride. It shortens the propulsion phase in anticipation of raising the foot.

Camped under,

When the limb is oblique and the foot too far behind. On hard ground, the phalanxes meet when extended.

This feature can be associated with a search for an analgesic position. Indeed, this position has the tendency to loosen the suspensory apparatus of the fetlock and the superficial flexor apparatus of the toe. It also makes it possible to unload the weight of the hind legs. Thus, it can be observed with a pathology of the suspensory ligament of the fetlock, of the superficial flexor tendon of the toe, or when there is pain in the hind limbs (in the latter case,the hind legs will be under it).

A camped under horse seems to have reduced amplitude. The fore phase of the stride is decreased. It is predisposed to striking as it hits its forelimbs with its hind limbs, and can even remove a shoe.

Over at the knee (congenital) or arched (acquired),

When the knee is too far forward.

This posture can be observed in the event of fatigue in the superficial flexor tendon of the toe or the suspensory tendon of the fetlock.

Calf kneed, or back kneed,

When the knee is too far behind. This defect is predisposed to straining. It is generally congenital.

Short jointed,

When the pastern is shorter than normal.

A short jointed horse is generally also straight jointed.

Straight jointed,

When the pastern is too straight and forms an angle of more than 55° in relation to the horizontal.

The short and straight jointed horse strongly raises its knees and strikes heavily on the ground, which gives it some short, dry gaits.

Long jointed,

When the pastern is longer than normal.

A long jointed horse is generally also low jointed.

Low jointed,

When the pastern is inclined at less than 50° in relation to the horizontal.

A long and low jointed horse has flexible paces, as well as a large stride. Its tendons are vulnerable because the descent of the fetlock is important.

Fetlocked,

When the fetlock is too far forward. The angle formed by the cannon bone and the pastern is not dorsally closed. This defect is often associated with an interphalangeal extension.

On the forelimbs, the horse can get fetlock by reflex or voluntarily while stretching its perforated with the help of the superficial flexor muscle of the toe. This position decreases tension on the perforating and the suspensory of the fetlock.

In locomotion, the fetlocked horse cannot absorb its contact with the ground by descent of the fetlock, and therefore cannot complete its gaits normally.

Interphalangeal extension:

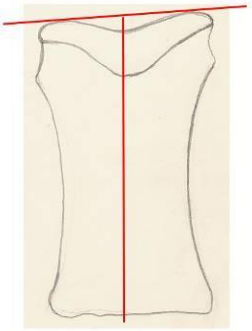
When the line of the interphalangeal rays is broken towards the rear. The angle of the toe is sharper than the angle of the pastern.

As the angle of the toe is sharper, the toe is generally long, which slows down the starting point of the lifting. The deep flexor apparatus of the toe requires more. On profile x-rays, the distal sesamoid seems denser.

Interphalangeal bending:

When the line of the interphalangeal rays is broken towards the front. The angle of the toe is less sharp than the angle of the pastern. In shock absorption, a descent (extension) of the more important fetlock can be observed, which requires more from the suspensory apparatus of the fetlock as well as the superficial flexor apparatus of the toe. On profile x-rays, the distal sesamoid seems less dense.

- **Frontal plane.**



On this plane, we hear of "angular deviation" when it doesn't involve the entire limb. In this case, the longitudinal axis of the bone ray, which is where the seat is, is not perpendicular to the transverse axis of its articular surface.

The horse is said to be:

Base wide,

When the feet are separated from each other too far. The fore limbs distally diverge (go downwards).

In movement, the limbs seem to be in adduction (or medial-motion), in other words, the limb that rises comes closer to the one that is on the ground. Thus, the horse risks striking and cutting itself. Moreover, the soft tissues of the medial part of the limbs work excessively.

Base narrow,

When the feet are too close to each other. The fore limbs converge distally (come closer together towards the bottom).

In movement, the limbs seem to be in abduction (or lateral-motion), in other words, the limb that is rising separates from the one that is on the ground. The horse seems to be walking on a thread. Moreover, the soft tissues of the lateral part of the limbs work excessively.

Joint valgus,

When the line of the bone rays forming the joint is broken inside (medially).

Each joint of a limb can be in valgus. The seat of a valgus corresponds to the bone ray, of which the transverse axis of the articular surface is not perpendicular to the longitudinal axis. The two axes form a sharp angle on the outside (laterally).

Joint varus,

When the line of the bone rays forming the joint is broken outside (laterally).

Each joint of a limb can be in varus. The seat of a varus corresponds to the bone ray, the longitudinal axis of which is not perpendicular to the transverse axis of its articular surface. The two axes form a sharp angle inside (medially).

Bowlegged or carpal varus,

When the line formed by the bone rays of the forearm and the cannon bone is broken outside (laterally). The knees are too far separated from each other.

The horse in movement is clumsy. The lateral ligaments of the knee are heavily strained when on the ground and therefore more vulnerable, while the joint is compressed medially.

Pigeon-toed or carpal valgus,

When the line formed by the bone rays of the forearm and the cannon bone is broken inside (medially). The knees are too close together.

In this case, the medial ligaments of the knee are strained and vulnerable when in contact with the ground and the joint is compressed laterally. The horse has defective gaits.

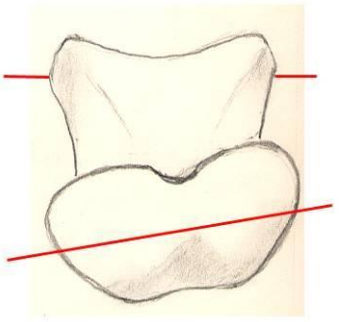
Bench knee,

When the carpus is deviated in relation to the forearm and the cannon bone, which are generally parallel but staggered. In fact, it involves the association of a valgus of the antebrachiocarpal joint and a varus of the carpometacarpal joint.

The horse that has this defect in its physical structure is often victim of premature wear of the carpus, with a development of vessigons and osteo-arthritic lesions.

- **Horizontal plane.**

On this plane, you hear about "rotation". When it doesn't concern the whole limb, the joints proximal and distal of the bony ray that are the seat of it possess the transverse axes that are not in the same plan.



The horse is said to be:

Knock-kneed in a limb (end rotation),

When a limb is turned inside, elbow outside. The sagittal plane of the limb converges forward towards that of the horse.

The knock-kneed limb often ends in a varus of the fetlock and/or of the pastern. The foot is then amiss inwards.

The horse puts its foot flat or starts with the medial side. At the end of the support phase, at the time of the impulse, the horse exercises a stronger thrust on the external part of its limb. The foot tilts on the lateral wall and is "thrown" outwards when lifting.

Then, during the bending phase, the foot deviates laterally because of the end rotation of the limb. The horse is said to cannon. The limb comes back in place during the extension preceding the support.

The deviation observed is often amplified because of the knock-kneeing of the foot.

Toe-out limb,

When the limb is turned outwards, elbow inwards.

The sagittal plane of the limb diverges forward of that of the horse.

The toe-out limb often ends in a valgus of the fetlock and/or the pastern. The foot is then amiss outwards.

The toe-out horse puts its foot down naturally while starting with the quarter or the lateral heel. The foot tilts on the toe or the medial wall and is "thrown" inwards when lifting. Then, during the bending phase, the foot deviates medially because of the end rotation of the limb. Thus, the horse tends to knock itself, strike itself and cut itself.

The biomechanics phenomena observed are practically the opposite of those described for a horse that is knock-kneed in the limb. The deviation observed is often amplified because of the toe-out feature of the foot.

Knock-kneed in a joint,

When the part of the limb located under the joint is turned inwards. The rotation is at a bone ray. The transverse axis of its distal articular surface forms a sharp angle forward with the sagittal axis of the horse.

If only one joint is involved in the rotation, the joints located distally have transverse axes located on the same plane. The bone rays that are distal to the rotation bend according to a plane converging towards the sagittal axis of the horse.

The knock-kneed horse in a joint is so from this joint. Thus, the deviation of the limb in motion is identical to the one described for a knock-kneed limb, but only involves the part of the limb located distally to the seat of the rotation.

Toe-out in a joint,

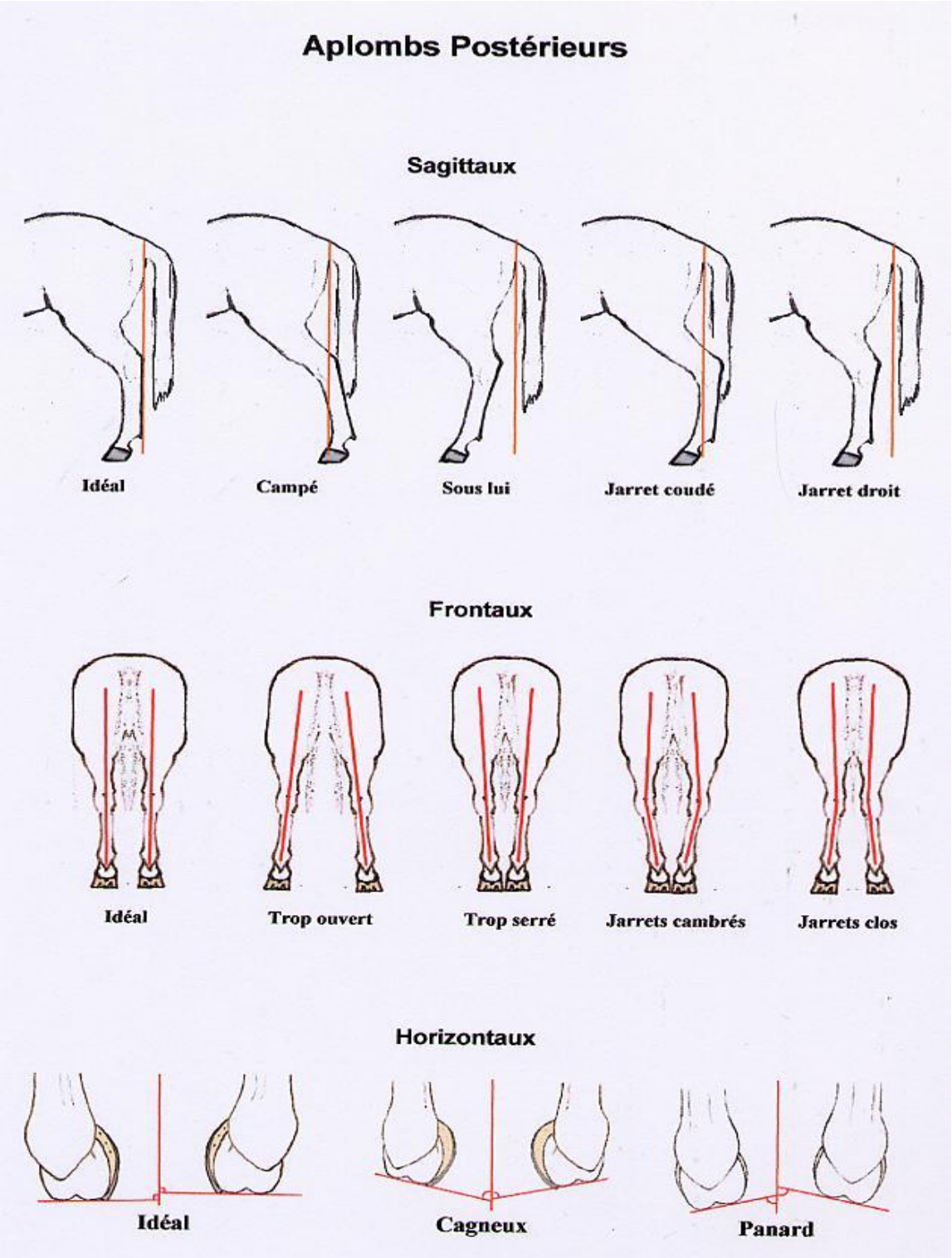
When the part of the limb located under the joint is turned outwards. The rotation is at a bone ray. The transverse axis of its distal articular surface forms a sharp angle backwards with the sagittal axis of the horse.

If only one joint is involved in the rotation, the joints located distally have transverse axes located on the same plane. The bone rays that are distal to the rotation bend according to a plane that diverges from the sagittal axis of the horse.

The toe-out horse in a joint is so from this joint. Thus, the deviation of the limb in motion is identical to the one described for a toe-out limb, but only involves the part of the limb located distally to the seat of the rotation.

Ideal stance | Toe-out | Knock-kneed

27. Hind leg stances (deviations)



Hindlimbs

- **Sagittal plane**

As for the rear limbs, these postures are often the result of retractions or ligament or muscle tendon laxities. They can also result from the search for an analgesic position. The horse is said to be:

Camped behind,

When the limb is inclined and the foot too far behind when at rest.

This feature can be congenital or acquired. When it is acquired, it may correspond to a search for an analgesic position. This position increases the extension of the joints, including the lumbar-sacral joint. It can be sign of suffering in the hocks or of lumbar pain.

Camped under,

When the limb is oblique and the foot too forward.

This feature can be congenital or acquired. When it is acquired, it may correspond to a search for an analgesic position.

When the horse is camped under and camped out in the rear, it is attempting to relieve its fore limbs, such as in the case of forelimb founder.

When it is camped under in the rear and camped out in front, it unloads its hindquarters. This position will be adopted in the event of pain such as desmitis of the hind fetlock suspensors. This position also relieves lumbar pain by bending the spine.

Bent hocks or too closed,

When the joints of the stifle and the hocks have angles that are too closed.

The tip of the hock is behind the lower vertical of the tip of the rump. In motion, the horse tends to sway the hocks.

Straight hocks or too open,

When the joints of the stifle and the hocks have angles that are too open.

The tarsus and the metatarsus set is in front of the lower vertical of the tip of the rump. The fetlock is generally low and the phalanxes bent.

The horse has some difficulties engaging its hindquarters.

As for the forelimbs, the horse can be:

Short jointed,

When the pastern is shorter than normal. A short jointed horse is generally also straight jointed.

Straight jointed,

When the pastern is too straight and forms an angle of more than 60° in relation to the horizontal. The short and straight jointed horse has dry gaits.

Long jointed,

When the pastern is longer than normal. A long jointed horse is generally also low jointed.

Low jointed,

When the pastern is inclined at least 55° in relation to the horizontal. A long and low jointed horse has flexible gaits, as well as a large stride. Its tendons are vulnerable because the descent of the fetlock is important.

Fetlocked,

When the fetlock is too far forward. The angle formed by the cannon bone and the pastern is no longer dorsally closed. Contrary to the forelimbs, the fetlocking of the hindquarters cannot be caused by muscular contraction. Indeed, in the hind limb, the plantar-perforated muscle, that goes along the superficial flexor tendon of the toe is not very developed.

Interphalangeal extension:

When the line of the interphalangeal rays is broken towards the rear. The angle of the toe is sharper than the angle of the pastern. As the angle of the toe is sharper, the toe is generally long, which slows down the starting point of the lift. The deep flexor apparatus of the toe must work more. On profile x-rays, the distal sesamoid seems denser.

Interphalangeal bending:

When the line of the interphalangeal rays is broken towards the front. The angle of the toe is less sharp than the angle of the pastern.

In shock absorption, a descent (extension) of the more significant fetlock can be observed, which requires more from the suspensory apparatus of the fetlock, as well as the superficial flexor apparatus of the toe. On profile x-rays, the distal sesamoid seems less dense.

- **Frontal plane.** The horse is said to be:

Too open in the back (and often toe-out),

When the feet are separated too much. The soft tissues of the medial part of the limbs work excessively. The horse has rocked gaits.

Too close in the back (and often knock-kneed),

When its feet are too close together. The soft tissues on the lateral part of the limb work excessively. Both limbs risk getting injured if the farrier attempts to correct this defect while leaving the hoof laterally higher.

Bowlegged hocks or too open or even tarsal varus ,

When the hocks are too far separated. This defect predisposes the horse to premature wear of the hock joint. In motion, the hocks will tend to sway during propulsion.

Closed or hooked hocks or even tarsal valgus,

When the hocks converge at their tip. This defect predisposes the horse to premature wear of the hock joint.

- **Horizontal plane.**

The hindquarters can also present sectoral rotations of the limb, but this particularity is less common in the forelimbs, and above all involves the foot.

Knock-kneed behind

When one or both feet are exaggeratedly turned inwards and the hocks are turned outwards. The hocks often sway when the horse walks.

Toe-out in the rear,

When one or the two feet are exaggeratedly turned outwards, hocks inwards. The hindquarters are naturally slightly toe-out.

In motion

The defects observed when the horse is stopped result in gait irregularities. Besides the gait variations already described, the horse can:

- sway on the hocks.

The hocks are carried outwards when in contact with the ground, and the entire limb revolves around the toe of the foot.

- cross.

The forelimbs or hindquarters move one in front of the other. The horse risks stumbling or even to falling.

- touch.

When it lifts, the limb knocks the limb on the ground, and with time, wears down the hair.

- cut.

The horse violently strikes itself to the point where it creates a wound.

- forged.

The toe of the hindquarters hits against the front horseshoe.

- strike itself.

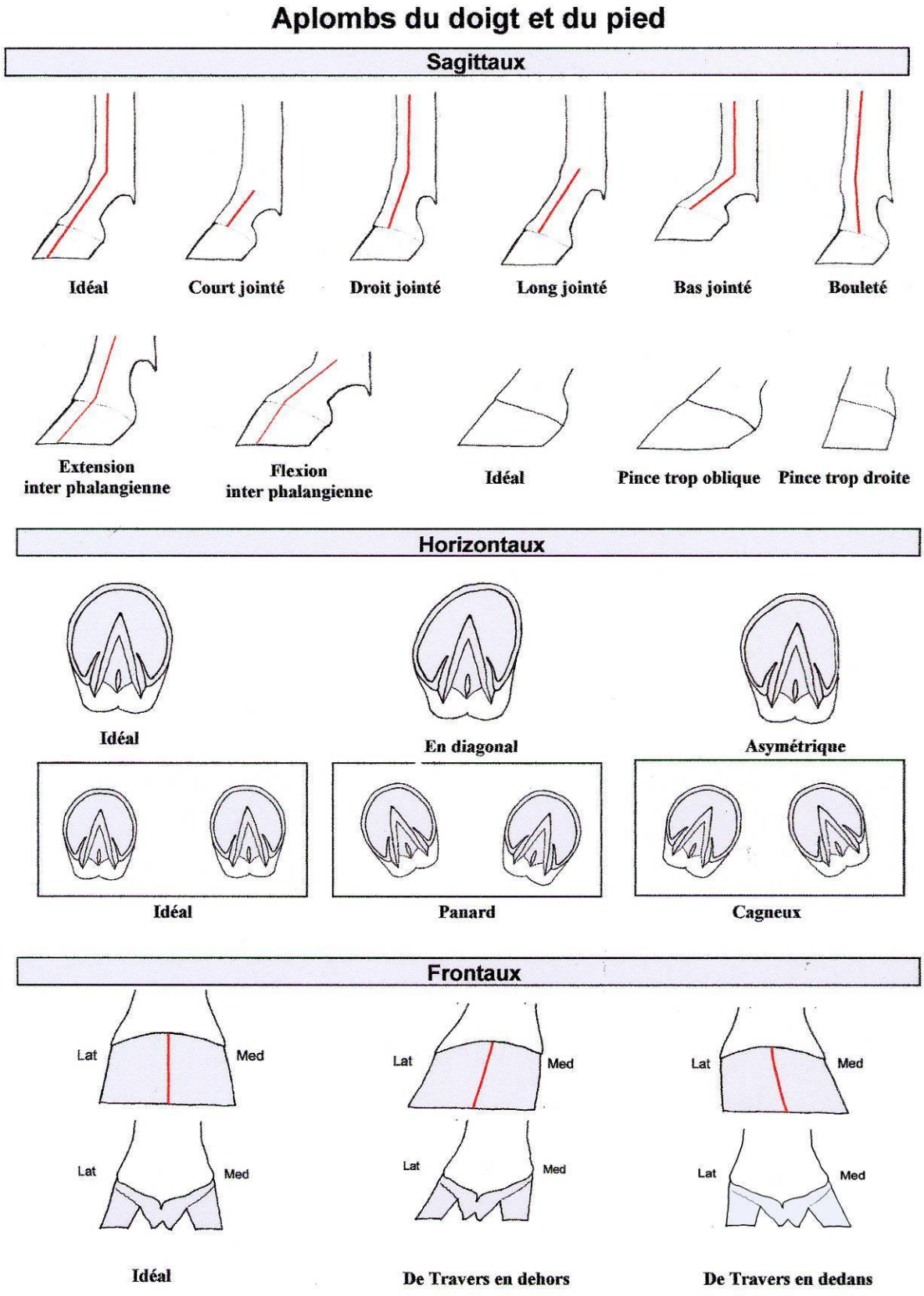
The hindquarters hit against the forelimbs.

- bump (or budge).

The horse "mows the grass" and bumps against the ground with the toe of the hoof.

All these stance defects, when at rest or in motion, predispose the limbs to early wear.

28. Stances of the toe and foot (deviations)



Stances of the feet.

We use the term "foot" in its farrier science meaning, which is: "the horny box and all of its content".

The stance of the feet, as with the stance of the limbs, is inherent to every horse and even to each of its limbs. For adult horses, except for an orthopaedic or therapeutic reason, this stance should be respected and should be kept when trimmed. In this case, the horse will be said to be "stanced", in other words, the foot has been trimmed in order to impose a minimum of constraints upon the joints and the soft tissues of the distal limb, while allowing the animal to perform as expected of it. The centre of pressure is static on the axis of the frog at about 1 centimetre behind the apex; the loads supported by the foot are then, mediolaterally, distributed evenly.

Irregular or imperfect feet stances can predispose a horse to early wear of the limbs as well as to lesions.

According to the plane method, a relaxed foot flat on the ground has an ideal stance if:

- **Frontal plane (front or rear view):**

The virtual axis of the middle of the toe is perpendicular to the ground and the coronet at the same time. The quarters are the same height and the angles that they form with the ground have similar values (the medial quarter is physiologically a little more vertical than the lateral quarter). The coronet is parallel to the ground.

Seen from the rear, the bulbs of the heels are at the same height.

If all these conditions are met, the lower side of the distal phalanx is parallel to the support surface on the ground, and this is perpendicular to the longitudinal axial plane of the limb (the entries of the semi-lunar sinus can be used as a radiographic reference mark).

- **Sagittal plane (side view):**

The toe profile continues without breaking the pastern profile; it forms an angle with the horizontal of between 50° and 55° for the forelimbs and 55° and 60° for the hind limbs.

The direction of the heels is identical to that of the toe line.

If all these conditions are met, the lower side of the distal phalanx, tilted towards the front, forms an angle of about 3º with the horizontal.

- **Horizontal plane (horizontal shape of the support surface and direction of the foot) (view from above or raised foot):**

The support surface is relatively round for the fore limbs, and on the other hand, relatively more pointed in the toe for the hind limbs.

The axis of the frog splits the foot in two equal parts. It is practically the axis of symmetry of the support surface. The line of the heels cuts the axis of the frog perpendicularly. The line of the bulbs of the heels is perpendicular to the sagittal plane of the horse.

The lateral wall is slightly more removed than the medial wall. The largest part of the lateral quarter is located at half the total length of the foot and the largest part

of the medial quarter is slightly behind. The shape of the outside edge of the support surface is a projection of coronet shape.

Different stances:

"Different" stances can be irregular, imperfect or defective. In this chapter, we will only look at the natural stances, otherwise known as the physical structure. The influence of trimming on the stances of the foot will be studied later on.

- **Frontal plane**

When the axis of the toe is not perpendicular to the ground it is said that the foot is amiss. The inclination angle is very different from the medial quarter to the lateral quarter, the most oblique quarter will tend to widen. The feet can be amiss without being either knock-kneed or toe-out.

The foot will be amiss outwards when the axis of the toe forms a medially sharp angle with the horizontal. This physical structure is often due to a valgus or to a physical structure that is too open on the bottom.

The foot will be amiss inwards when the axis of the toe forms a laterally sharp angle with the horizontal. This physical structure is often due to a varus or to a physical structure that is too closed on the bottom.

- **Sagittal plane**

Excessively oblique toe,

When the angle of the toe as seen from the profile is less than 50° for the fore limbs and 55° for the hind limbs. A foot with an excessively oblique toe is often associated with an interphalangeal extension.

The toe is generally long. The lift is therefore slow, and the deep flexor apparatus of the toe is strained. A horse presenting this physical structure generally has large, skimming gaits.

Excessively straight toe

When the angle of the toe seen from the profile is more than 50° for the fore limbs and 55° for the hind limbs. A foot with an excessively straight toe is often associated with an interphalangeal bend.

During the shock absorption phase, the descent of the fetlock- in other words, the bending of the interphalangeal joints- is more significant. Thus, there is great strain on the suspensory apparatus of the fetlock and the superficial flexor apparatus of the toe. Overall, the horse has raised but short gaits.

- **Horizontal plane**

Diagonal foot

When one of the walls of the foot is strongly rubbed out to the benefit of the other, the quarter and the heel corresponding to the first are, on the contrary, developed, whereas on the side of the latter, the quarter is more vertical and the heels rubbed out.

Toe-out foot

When it diverges from the sagittal axis of the horse. The line of the bulbs of the heels forms a sharp angle towards the rear with the sagittal axis of the horse.

Knock-kneed foot

When it converges towards the sagittal axis of the horse. The line of the bulbs of the heels forms a sharp angle towards the front with the sagittal axis of the horse.

Asymmetric foot

When the frog doesn't split the support surface into two equal parts. The side with less surface will have a tendency to penetrate more on penetrable ground.

B. Determining the horse's foot needs:

29. Care for the limbs

To prevent accidents in the limbs, first, the difficulty and the length of work must be adapted to each horse (physical condition, age, weight, etc.).

Ground that is too hard increases joint shock and heavily bears on the shock absorption system. Ground that is too deep, soft or greasy leads to more significant use of the tendons. Therefore, the work must be adapted based on the ground.

After long or difficult work, the limbs can be relieved by showering them with cold water. A cataplasm of green clay can also be done or they can be put under strips during the night.

As far as shoeing, care must be taken to adapt it to the type of work and to the type of land. As much as possible, difficult work (races, jumping sessions, etc.) should be avoided when the horse has worn out the shoe or when it has just be reshod.

30. Foot care

The feet must be cured every day, before and after work. Care should be taken to really clear out the sulci of the frog.

The feet must be greased once per week. In summer, gold or green ointment should be used which softens the horn. In winter, the use of black ointment is preferred as it contains Norway tar so as to prevent the horn from softening. Finally, the horse must be trimmed and/or shod every six to eight weeks.

31. Communication with the people concerned.

Communication with the owner is of utmost importance. First of all, you must explain to him that his horse needs to be reshod regularly in order to prevent the horn from being destroyed and having motion problems.

Moreover, any modification to the type of shoe must be explained so the owner understands the importance. When fitting an orthopaedic shoe, he must also indicate the types of ground, work, etc. to be done or that is to be avoided.

Finally, the farrier must also warn the owner if he notices any health problems in the horse.

C. Material, equipment and work methods:

Tools and maintenance:

32. Tools corresponding to the task

Tools and maintenance.

Basic forge equipment mainly includes the following tools:

- **Hammer:** It may come in different sizes, shapes (cross-peen, ball-peen, square, etc..), and weights (from 0.5 kg up to 1.5 kg).
- **Tongs:** several pairs of tongs are normally needed: one for each horseshoe thickness used.
- **Fuller:** it is a good idea to have several to be able to properly fuller the various horseshoe thicknesses.
- **Stamp:** several are needed as per the size of the nail that is to be inserted into the nail hole.
- **Pritchel:** in a shape and size that matches the swage used.
- **Back pritchel:** a punch that is finer than the others used to open and calibrate upper nail holes.
- **Centre punch:** tool used to mark the horseshoe.
- **Steel rule:** for measuring both cold and hot horseshoes.
- **Farrier rasp:** a metal tool with two sides: a rasp side and a file side. It is used to level and polish the hoof.

Tool maintenance.

Hammer:

Before beginning to work, it is a good idea to verify that the hammer head doesn't move on the handle. If there is any movement, it must be repaired by moving the handle up or by replacing it.

Verify that there are no cracks on the hammer head. If there are, you will need to grind them or file them in order to avoid the risk of having it split.

Pliers:

When the pliers are too big for the horseshoe thickness you are working with, they should be heat modified to adjust them until they are perfectly adapted to the desired size. Then, the rivet should be retightened so as to always have a little clearance when cold because once heated, they dilate a little.

Fuller:

A good fuller must be sharp enough to be able to mark the fullering without too much effort. The thinner the horseshoe to be fullered, the larger the fuller. To sharpen the fuller, use very fine sand paper or a very fine file on a slightly hot fuller.

Stamp:

They are normally manufactured in self-tempered steel. After having hit on the swage, the tip that is in contact with a hot horseshoe may bend back or even break. When warm, use a hammer to correct the loss of matter that occurs in a

fuller if it is corrected with a strip sander. The shape should coincide with the shape of the nail collar that will be used.

Pritchel:

The tip of the pritchel must be the same size as the tip of the swage. When the pritchel is damaged, it should always be rebuilt with a hammer under heat. You must also be sure that there are no cracks on the ends.

Back pritchel:

The tip must be finer than the pritchel in order to be able to calibrate the upper nail holes once the horseshoe is forged.

33. Materials corresponding to the work

Normal horseshoeing must respect the horse's foot and foot movement as closely as possible to its natural locomotion.

However when a horse is subjected to effort or work that have nothing to do with its natural locomotion, some deviations in its movement can be emphasised that may lead to slips or falls, which may cause injuries.

To avoid this, various holes can be adapted when shoeing that will reduce or eliminate these excessive movements.

In show jumping competitions

Depending on the ground on which the horses move, landings or starts can be dangerous, mainly on grass; many participants have their farriers make stud holes on the horseshoes.

Making stud holes consists of punching holes in the horseshoes and tapping them in order to be able to screw in studs of different sizes or thicknesses, depending on the ground.

In driving

In driving, the horses are forced to carry varying heavy loads on diverse ground, whether in competition or for leisure.

Depending on the weight and work, horseshoe backing ranges from nails with a tungsten carbide tip to fixed studs, tungsten carbide cones or screwed studs.

In general, it is the owner who decides what to insert upon the advice from the farrier.

In trekking or any outside riding

Trekking horses, those used in fox hunting or skijoring in some regions are forced to move on very difficult or dangerous ground; in this case, tungsten carbine tips or carbide cones fixed to the horseshoe or even nails with different, more pronounced heads are generally used.

Other techniques and materials.

To reinforce horseshoes, other techniques can be used such as reinforcing them through welding.

The system is the same as arc welding and this practice, using filler rods which deposit a steel seal on the horseshoe when melted, creates a sub-thickness which will increase the bond of the horseshoe.

Or if the horse is shoed with horseshoes that are fulled all along the length of the points and the toe, cones can be brazed in the fullings; this technique can be done either with a blowtorch or in a gas forge by placing a copper roll on the fulling placing the cone on this drop and as it melts.

These techniques must not be used long-term, as with the passing of the time if they reduce the slip of the foot, they also reduce the general movement of the limbs and can cause tendon or ligament injuries.

It is very important to quickly bring the horse back to a locomotion that is as close as possible to its natural movements.

On the other hand, they can also be used, in some cases, to relieve the lesions that would cause excessive wear on the foot if the horse was without shoes, which would make the animal comfortable again.

34. Properties of the materials

Horse shoe, steel and aluminium.

Horse shoe.

Industrially pure iron has few applications because of its weak mechanical properties. This is why it is used in alloys with coal, to improve its properties. This iron-coal alloy is called steel.

Steel.

This is horseshoe material with a coal content which ranges from 0.03% to 1.67%.

The higher the coal content in steel, the longer it will last and the better resistance to traction it will have, but its flexibility and malleability will be considerably

reduced. It will become more fragile. The melting point for steel is between 1300 and 1400 ºC

The following are the general properties of steel:

- It is flexible and malleable.
- Its resistance decreases when the percentage of coal increases.
  Its mechanical resistance, durability and fragility increase with the coal content.
- Based on this, steels can be classified as extra soft, very soft, soft, semi-soft, semi-hard, hard, very hard and extra hard.
- The welding capacity of steel decreases with the percentage of coal.
  It rusts easily.

Aluminium:

Aluminium is one of the main components of the earth's crust, in a proportion of 8% in weight. Nevertheless, in nature it does not occur freely, but rather is found in the form of oxide (aluminized AL2O3), which includes an array of minerals such as cyanite, silimanite, bauxite, diaspora and corundum.

The metal mineral source of aluminium is bauxite.

Aluminium is a white-coloured metal that when polished looks like silver. Its density is 2.7 g / cm^3, or in other words, a third of the density of the horseshoe. The only metal that is lighter than aluminium in industrial use is magnesium.

The melting point for aluminium is very low: 660 ºC.

Mechanical properties of aluminium:

- High flexibility and malleability at low temperatures. It becomes fragile and breaks at high temperatures.
- Its mechanical resistance is weak when pure, and increases when alloyed with other metals.
- When alloyed, its flexibility, resistance to corrosion and thermal and electrical conductivity decreases.

35. Properties of work equipment.

Work equipment must have the following properties:

Safety: To avoid accidents involving people or animals.

Efficiency. It should always be in perfect conditions for use. Tools and equipment must allow for detailed work and save time.

Profitability. The equipment must be versatile and resistant so that it lasts the longest possible time.

Replaceable. It is very important that the tools and machines can be repaired and purchasing spare parts is easy.

Ergonomics. It must be possible to work comfortably, avoiding excessive fatigue and postural lesions.

Appropriate for the task. Each tool or machine must be appropriate for the task to be done. For each task, use the best tool possible.

36. Maintenance of tools and equipment.

To maintain the properties of the tools and equipment, it is very important to establish a good maintenance system.

The most important aspects to keep in mind are:

Check the tools and machines daily that are most often used.

Immediately repair any wear or damage that occurs.

Clean the equipment used daily. Tools and equipment machines must not be stored dirty or wet.

Organised and easy-access storage.

Separate the tools and products that may be incompatible.

Store the equipment in a place with adequate temperature and humidity conditions.

Have basic spare parts available for common repairs.

Save and follow the instructions in the operating manuals for machines, ovens, welding tools, cutting tools, etc.

Specific techniques:

37. Forge techniques.

Upset forging:

A technique that consists of increasing the width and/or thickness depending on the length of a given part of the piece by upsetting the metal through tucking. This operation is done by heating the part to be upset, then hitting the end of the piece.

Stretching:

This technique is opposite to upsetting. It consists of reducing the thickness and/or size by increasing the length. The piece must be heated and alternatively pounded flat and on the edge with a hammer on the anvil.

Calibrating:

Adjusting the measurements of the section of the piece with precision. This is done on hot metal with a hammer and anvil.

Beginning of form

Stamping: Modifying the profile of the metal by placing another tool between the hammer and its surface. It can be done when the metal is hot or cold, depending on the type of stamping.

Bending:

Applying the desired bend to the metal piece. The metal piece is pounded between the clamp and the anvil (inside) or at the front of the anvil support, the canch being opposite, on the blacksmith side (outside).

Angling:

Creating an angle on the metal piece on the flat side or on the edge. The hammer and the anvil angles are used. If you want the piece to keep its section, it will have to be upset at the angle.

Straightening:

Reducing the curve on the metal piece.

Punching:

Making a hole on the metal piece with a hammer and a punch.

Cutting:

The metal can be cut in different ways: when cold by using a tool between the hammer and the piece to be cut; by using a tool between the piece and the anvil or by directly pounding the piece on an side of the anvil.

38. Dipping techniques

Definition:

Thermal treatment is any operation done under heat to modify the structure of a metal so as to give it new qualities. These treatments include:

For steel: **tempering, ageing, annealing and cementation.**

For melting: **malleabilisation**

Constituents of tool steel:

Pure iron (Fe) tool steel contains 99.5 to 98.5%.

Carbon (C) tool steel contains 0.5 to 1.5%.

Steel does not temper well unless it has a carbon content of at least 0.5% (**semi-hard** steels). Between 0.1 and .04% C is **soft** steel.

Simple forge tempering (combined tempering)

Simple and common tools, normally made of tool steel, are heated in a gas oven or over a forge. For the latter, the sulphur and phosphorus contained in the forge coal must be burnt, therefore it is not necessary to put fresh coal in the furnace before tempering (if these substances contact the steel, it makes it brittle).

The steel (a punch for example) is slowly heated at the core at a temperature of about 600 °C, or red-brown, and then more quickly brought to the tempering temperature which is about 800 °C, or cherry red. Then, the tip of the punch is dipped between 1 and 3 cm into water at a temperature of 20 °C for 3 to 4 seconds, depending on the thickness of the tool.

The punch is slowly moved about in the water to prevent water from boiling at the surface of the tool. As the punch is not entirely dipped in the water, there is enough heat stored behind the dipped area for ageing.

The tip of the tool should be quickly cleaned with an old file or an abrasive stone as this makes it possible to observe the different colours of the ageing that appear thanks to the increase in temperature at the end of the tool through oxidisation. As

soon as the desired colour appears, and thus the proper tempering temperature for our steel, the tip of the tool must be quickly dipped into 1 cm of water and allowed to cool completely.

Comments

The temperature to be reached depends on the quality of the steel and its carbon content. Therefore, you must know this data before beginning to work. Refer to the steel supplier's prospectuses or catalogues. To really see the ageing colours, the tool must be forged clean.

Tempering varieties

High heat tempering is done in a cold bath with high heat conductivity (fresh or salt water)

Gentle tempering, which is slower, is done in oil or in the air.

Ageing

The purpose of ageing is to decrease the fragility of tempered steels. It eliminates the internal tension caused by tempering and restores part of the resistance and the elasticity adapted to the conditions of use for the tools.

39. Annealing techniques.

Annealing

The purpose of annealing is to destroy the effects of tempering and ageing or to regenerate a metal drawn through cold swaging.

It consists of reheating steel to the core up to the desired annealing temperature, then letting it cool down very slowly away from the air, for example in a sawdust and ash mix.

Gentle annealing is done according to the carbon content between 680 and 750 °C.

Standardisation annealing is done according to the carbon content between 750 and 950 °C.

Release annealing is done between 550 and 650 ºC in order to eliminate internal tension caused by forging or welding.

40. Sharpening techniques.

Sharpening is an important operation.

Optimal cutting power must be returned to a cutting tool so that it assures its essential function (to cut).

This work should be done regularly and with a frequency that varies according to how often the tool is used; every time the blade doesn't have any more cutting power.

Sharpening involves a set of five different operations:

- Hollowing the blade when it is too thick

- Grinding, which involves removing a fine layer of metal all along the tool until a burr appears in order to eliminate the old edge.
- Honing: removing the burr
- Buffing the cutting edge.
- Aligning the edge

To be ready for use, a tool must be cleaned.

Hollowing

Hollowing is an operation where the lateral sides of the blade are thinned when they are too thick.

This operation gives the blade a profile, thus assuring less friction in the product while maintaining the mechanical resistance characteristics of the tool.

The state of the blade surface and function of the material used.

Good blade thinning must be done without heating the steel so as not to alter its physical characteristics. Depending on the work, the blade profile to be used may be different.

This operation is very often completed by sliding the tool over a rotating abrasive strip in order to get the desired hollowing. Or manually with a file.

Grinding

This operation consists of obtaining a constant angle in the direction of the blade and throughout its length.

The important thing is to adapt the carving angle to the nature of the task. It can be done with the help of a traditional wet millstone.

Honing

The purpose of this operation is to remove the metal burrs that appear when grinding.

The burr is a small metal strip on the edge. Eliminating it makes the edge appear.

For proper honing, heavily grooved sharpening steel must be used.

Buffing

Buffing consists of removing the streaks and scuffs caused when thinning the blade and grinding it. This makes it slide better.

For this operation, you can use a millstone with a felt or rubber wheel.

Aligning the edge

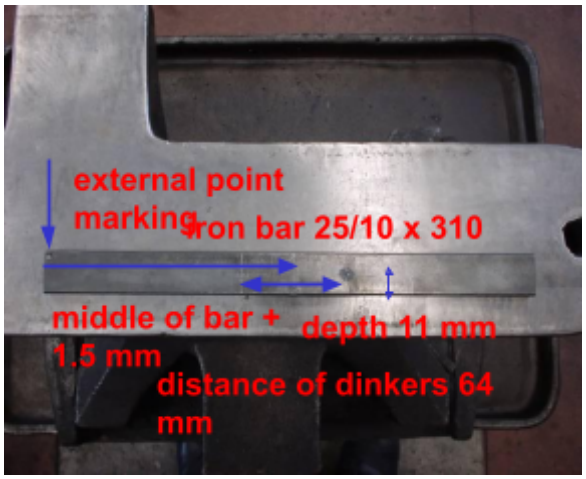
Aligning the edge is the last stage in the sharpening operation.

It is done with edging materials. Using a slightly damp leather strip is best.

D. Making and modifying horseshoes:

Horseshoe forge (from the Instruction model of the Centre de Compétence du Service Vétérinaire et Animaux de l'Armée 57 Caserne Sand, 3000 Berne 22. Author: Bernhard Häberli)

Basic horseshoes (standard)



Horseshoe bars

The marking in the middle of the bar remains the same as the other bar dimensions.
The distance and the depth of the nail holes in the toe can vary according to the hoof. (c. to d. toe walls ± thick, poor walls, concealed walls)

1st firing

Heat one-third of the middle of the bar to white. Seize the outside point with the pliers, clean the bar, slightly hold back the arc and bend the bar symmetrically with the rounded side of the hammer into a V.

Forge a fitting on the upper side of the toe. Forge fields marking the beginning of the slightly bevelled fulling where the toe nail hole dinkers are on the beak of the anvil. Forge the horseshoe bar where the arc is, mark the fuller on the two sides at the dinkers with the fuller hammer. Forge flat.

2nd firing

Heat the outside point beyond the arch to white. Seize the bar at the height of the beginning of the inner fuller, clean the bar, shape the heels. Shape the outside point on the beak of the anvil

and forge the upper side of the shoe flat from the middle of the arch to the end. Forge the outside point from the arch to 5/8 slightly bevelled. Mark, then drop-forge the fulling.

When drop-forging the fullering, make sure to hold the swage parallel to the outside border, but angled towards the inner border.

The depth of the fullering represents 2/3 of the shoe thickness. The outside point shall be slightly marked with the fuller hammer. Forge flat and pound out the irregularities. Stamp the toe nail hole, the last nail hole shall be placed on the 5/8. Distribute the remaining nail holes between them and stamp. Forge flat and pound out the irregularities. Clear the nail holes, forge the outer point on the anvil from the arch to the end. Forge flat.

3rd firing

Heat the inner point beyond the arch to white. Seize the bar at the height of the beginning of the outside fuller, clean the bar and slightly forge the field after the middle of the length. Form the field sponge. Shape the inner point on the beak of the anvil and forge the upper side of the shoe flat from the middle of the arch to the end. Forge the inner point from the arch to the middle of the length slightly bevelled. Mark the fulling in the middle of the length thinner, then stamp.

The length of the fulling is identical on the two sides.

Forge flat and pound out the irregularities. Stamp the nail holes in the toe, the last stamp should be on the 5/8, the last stamp of the inner point ½ more forward than that of the outside point. Distribute the remaining nail holes between them and drop-forge. Forge flat and pound out the irregularities. Clear the nail holes, forge the inner point on the anvil from the arch to the end. Forge flat.

4th firing

Heat the shoe completely, seize the shoe at the top of the last nail hole, clean and pull the toe clip. Fold the material back to the left and right of the clip, clean and forge the upper side flat in an arch. Bang out the base of the clip and adjust it to the square. Form the shoe on the beak of the anvil (adjust the shoe on the arch), square the fulling and the nail holes. Check the position of the nails. Forge flat and apply the toe clip to the square.

Clear the nail holes from the lower side, then from the upper side (towards the wall), and once again slightly from the lower side.

Method and equipment for the different types of welding:

Welding consists of joining two pieces of steel so they become one through very strong heat.

The heat melts the ends of the two pieces that are in contact until the two parts combine.

41. Gas (oxyacetylene)

For the welding type that is called brazing, you must have a container of oxygen and a container of acetylene, and mix the two gases using a kind of gun that is equipped with a nozzle, then light them on fire so that the flame looks like a small pointed torchlight.

Heat the two parts to be welded that will be put in contact; when a drop of metal appears, melt a copper filling metal and slowly move it forward all while respecting the molten filling metal.

For this kind of welding you must protect your eyes with a special shield.

The final weld is immediately cleaned.

This technique does not require any electricity and can be easily transported.

42. Electric

In arc welding, the heat needed to weld is produced by electric tension.

Unlike fire welding, the two pieces do not overlap, but are placed end to end either straight or forming an angle.

One side of the electric source is provided with a first "filler rod" electrode and the other electrode is secured with a clip to the pieces to be welded.

The weld involves putting the filler rod and the two pieces to be welded into contact and the electric arc that results melts the three parts, which mix together. It is enough to then move the electrode (filler rod) forwards in the desired direction all while maintaining a 70° to 80° angle and keeping enough space between the rod and the pieces to be welded which forces the rod to continue melting while advancing and properly verifying the formation of a regular seal that is not too thick.

When melting, the rod deposits "slag", a thin, protective layer which makes it so that the weld does not store oxygen, which would cause oxidisation and weaken it.

Pieces of different thickness can be welded using this technique, modifying the voltage of the electrical source and the thickness of the rods if necessary.

To do this kind of weld, you must protect your eyes with a special mask.

When the weld is finished and cooled slightly, all you have to do is gently hit it on the top with a hammer to get rid of the slag.

If the weld is not even, it is possible to redo it on top to make a second seal.

Other more modern welding techniques exist which some think resemble the arc welding technique, but they require special equipment and are used mainly in shops where large quantities of work is needed.

43. Fire

Fire welding can be done either in a coal forge or in a gas forge.

Welding in a coal forge may be considered better because the fire-chamber is deeper, but it is more delicate as there is a risk of burning and melting the metals to be welded or of a break if the metals in question are not smudge-free.

In gas forge welding, the metals stay cleaner but the fire-chamber is sometimes not enough to do a perfect weld.

To do fire welding, the technique is the same regardless of the forge.

The two metal pieces are heated to white and crushed one onto the other until a single piece is formed that is just like the original two.

First of all, the two metal pieces must be clean and free of any particles: to do so, they are heavily brushed when taking them out of the fire.

Then they are overlapped after having previously prepared the ends creating a bevel. Welding powder is added as it is an antioxidant so that nothing can penetrate between the two parts.

Then the two pieces are put back in the fire, until they become nearly white and they are then gently hit where the previously-prepared bevels are.

This primes the weld.

The primer is well prepared when the two metal parts can no longer be differentiated over a surface of about two to three millimetres.

Then it is placed back in the fire and heated to the burn limit.

After having brushed the parts to be welded well, these two pre-welded pieces are crushed until they have the same thickness and length as the original ones.

A successful weld is one where you cannot see any trace of the welding.

E. Shoeing equine feet:

Horseshoe removal and observations

44. Horseshoe removal

Fig. 52 Removing the clenches

Before removing the shoe from the foot, it is important to clean it, then cut the clenches making sure not to damage the horn of the wall. The worker then inserts the pincers below one of the shoe points at the heel.
Using the bar for leverage, he removes the horseshoe. He repeats the operation on the opposite point.

Fig. 53 Removing the horseshoe

If it is too difficult to remove the shoe, it will be tapped back to the foot using pincers or a driving hammer, which will make the nail heads come out of the shoe. The worker will pull out some nails while being careful not to leave them on the ground and risking injury to the horse if it walks over them.

45. Observation of horseshoe wear and the state of the hoof

Traces of wear will then be observed on all the surfaces of the horseshoe.

Fig. 54 Observation of horseshoe wear on the lower side

On the bottom side (ground side), they help understand how the equine puts its foot down and also how it balances it for support, if it brushes, etc.

Fig. 55 Observation of horseshoe wear on the upper side

On the top side, they make it possible to see the expansion movements of the horny box especially at the heels, but they also reveal the distribution of pressure.

On the borders or the heel, they help discover the habits or behaviours of the box.

The state of the hoof should also be carefully observed because foot care and shoeing largely depend on it. The quality of the horn in particular, the state of the frog, the shape of the crown, as well as all marking capable of revealing stress or a lesion should be observed.

46. Foot and horseshoe care programme.

The foot care programme shall be agreed upon with the person in charge of the equine, mainly based on the state of the horn. The type of products that should be applied and how often they should be applied will be determined depending on whether it is dry and brittle or if it is too soft and humid.

If there is thrush, the application of treatment products as well as regular and comprehensive hygiene will have to be programmed.

The horseshoe programme shall also be agreed upon with the person in charge of the equine. It will consist of determining the time between two horseshoeings and their type.

When planning the periods between horseshoe renewal, the individual animal's needs based on possible deadlines, physical structure, the health of the limbs, the activity, the land on which it moves about, the growth speed of the horn, the speed at which the horse uses its shoes, etc. must be taken into account.

The type of shoe will be decided so as to meet the requirements listed above, but the trimming, the type of shoe used, its position under the foot as well as the position of the nails may be modified in comparison to the previous shoe based on what may be observed.

Trimming (assessing and performing) (standards)

47. To the desired degree (consequences of errors)

Trimming to the desired degree is done in order to keep the sole thick enough so as not to risk causing discomfort when putting the horseshoe down, or worse, burning the animal if the horseshoe is heat adjusted. It is difficult to establish universal repairs, but it is believed that the rule "white line on the toe and good horn on heels" can be applied in most cases. It involves trimming the foot at the toe until the white line seems clean and trimming at the heel until the quality of the horn is good enough to bear the load that is required of it. Nevertheless, the sole should remain concave and set back in comparison to the support surface.

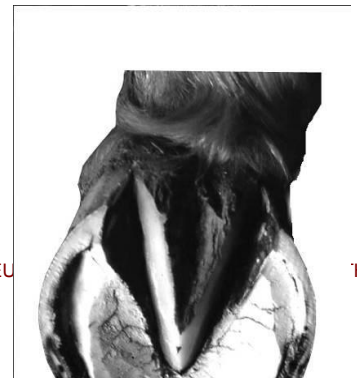


Fig. 56 Trimming to the desired degree

Insufficient trimming will lead to the deterioration of the distal part of the wall and then the horseshoe fit will be

weakened and will not last as long. It won't fulfil its role of putting the support surface back in place.

Excessive trimming will lead to exposing the fleshy portion of the foot or burns and the animal's discomfort. If the sole is constricted by the horseshoe, it won't be able to regenerate as it should and therefore risks losing thickness over time. The worker won't be able to have the horseshoe worn as comfortably as possible unless he knows how to prevent risks.

48. Balance (influence on anatomic elements, consequences of errors)

Fig. 57 Balance trimming

Balance trimming means carving the hoof horn and in particular the wall horn in order to give or maintain an optimal impact angle in relation to the ground at the distal phalange, through the intermediary of the hoof to which it is bound.

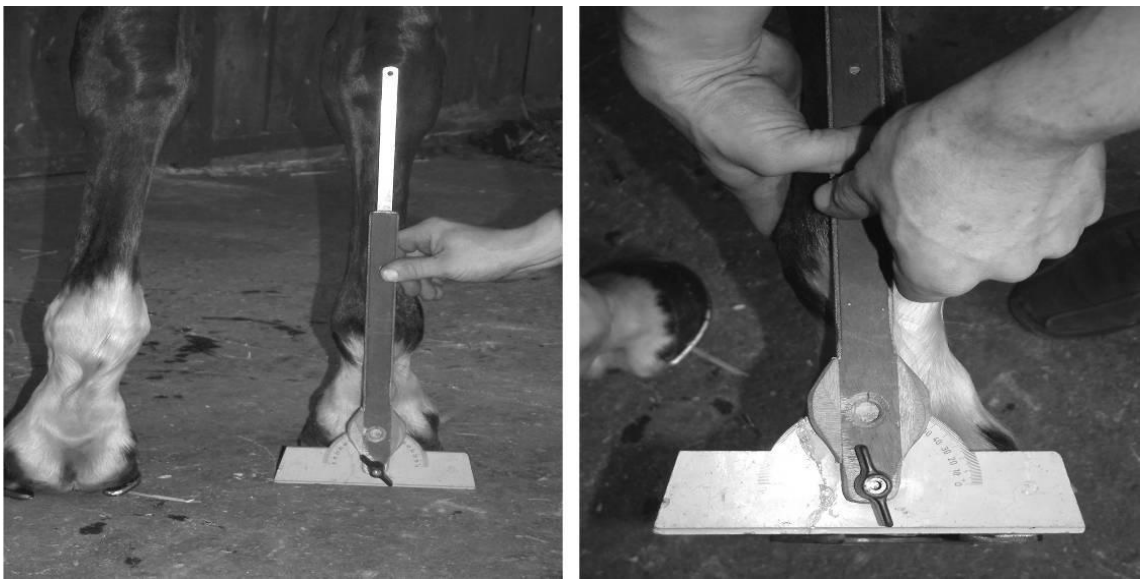


Fig. 58 Assessing the balance

This optimal angle will make it so the joints and the soft tissue of the distal limb only have to bear minimal constraints while allowing the animal to achieve the performance that is expected of it. The angle of impact shall be considered according to two planes: frontal (front or rear view) and sagittal (profile view).

The balance in the frontal plane, in other words the medio-lateral balance, shall respect the animal's physical structure and that of its limbs so as not to lead to any additional constraints on the joints. To do so, the alignment of the toe bones that can be observed when the foot is held in the air should remain the same when the foot is on the ground. The angle formed by the hoof support surface and the longitudinal axis of the cannon bone (observed when lifted up) will be the same as the angle formed by the longitudinal axis of the cannon bone and the ground (when down).

The balance in the sagittal plane shall be kept as is. All angular modification modifies the distribution of the loads between the toe and the heels. An increase in the load leading to slower hoof growth and a decrease leading to acceleration of the modifications that the farrier would attempt to give the angle of the toe will become useless over the time the horseshoe lasts, and the angle of impact of the distal phalange will have the tendency to come back to its initial state.

When the front foot is balanced, its centre of pressure is on the frog axis at about one centimetre behind the apex.

49. Trimming plane

Fig. 59 Trimming plane

The trimming plane is important for hot shoeing as well as cold shoeing. When hot shoeing, it allows the worker to make the shoe worn less time so as to achieve optimal adherence between the shoe and the foot. When cold shoeing, it is essential because the irregularities of the plane won't be burnt and if the hoof does not fit the shoe all over, the wall will become distorted leading to crown deformations.

50. Parietal rasping (role of the levers)

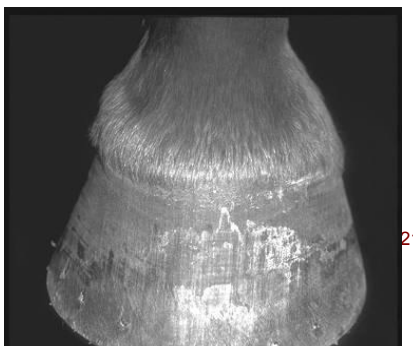


Fig. 60 Parietal rasping

Rasping the wall shall be done only on the distal part (about 1/3 its height) and where necessary.

Parietal rasping will make the flares that are often the source of problems with the white line and horn quality disappear. It must be done while taking into account the shape of the coronet and that of the support surface of the foot. The horse needs to perform as expected without putting the health of its limbs in danger.

51. Sole and frog grooming (advantages and disadvantages)

Sole care makes it possible:

- to control its state of health
- to intervene early on minor pathologies such as the beginnings of gravel or white line diseases
- to reveal certain pain or minor accidents such as burns, bruises, inflammations, minor abscesses, sand-cracks in bars, keraphylloceles…

Sole care must be done with restraint and in principle should only eliminate the dead horn that is ready to fall off; under no circumstance shall it weaken the underside of the foot at the risk of causing discomfort. The worker should leave a harmonious concavity on the sole without depressions or prominence; the bars should be trimmed to a minimum so that they are at the level of the sole forming a solid stop along the lateral sulci.

Frog care makes it possible:

- to control its state of health
- to clear the places where rot would begin to develop and to facilitate its care
- to release the sulci so that they retain less impurities at the source of the rot and warm spots all while making cleaning and care easier

Sole care must be done with restraint, it should preserve a maximum volume while eliminating as best as possible the irregularities and bits of non-healthy horn.

Preparation of the horseshoe

52. Turning the horseshoe

Fig. 61 Turning the horseshoe

The shoe will be shaped in accordance to the shape of the hoof and while taking into account the equine's activity, its locomotion and its possible weaknesses or pathologies.

The horseshoe toe will be turned in order to optimise the foot balance while taking into account both the performance sought and the health of the equine.

The points will be turned so that

- the upper nail holes are on the white line
- the pitch of the nail holes becomes more upright moving from the front part of the foot towards the heels
- the arches are applied to (?)the middle of the cover.
- the largest part of each branch corresponds to the largest part of each of the sides of the hoof.

The worker will try to always turn the horseshoe a little more harmonious than that of the hoof in order to make the hoof move towards improving its shape.

53. Horseshoe plane

Fig. 62 Adjusted horseshoe and plane

Once the horseshoe is turned, it will be placed flat on the upper side (foot side).

Special attention will be paid so that the inside border of the horseshoe doesn't pass the plane and there is no risk of causing pressure on the sole.

The horseshoe seat (surface on foot side) in certain cases will be slightly concave on the front part, the outer border will remain flat except for the toe which will may be raised slightly.

54. Particular modifications and accessories.

Fig. 63 Straight bar shoe with stud sockets (note the wear on the upper side caused by the movements of the wall and the frog)

Depending on the needs of the horse, the judges' demands, traditions or local customs, the worker may embellish the horseshoe:

with a rocker toe that will shorten the arms of the levers of the front part of the horseshoe, thus facilitating foot balance at the support end. This rocker toe should not alter the plane of the seat below the line defined by the two toe nail holes;

with stud sockets, the number and distribution of which will be such that they will limit the maximum the risks of interferences and stress on the limbs;

with additional nail holes outside the fulling that will be hot pierced with a drop-forge and punch. They will be adapted as far as position, size, direction and number to the needs of the shoe;

with a square toe that will shorten the arms of previous horseshoe levers and will make it possible to leave, if necessary, a part of the wall at the toe beyond the horseshoe. This square toe should not place the outside edge of the horseshoe below the white line.

A simple straight bar is the part of a horseshoe that joins the heels and provides the horseshoe with a more significant wear surface on the rear parts. It decreases the recess at the rear of the foot on penetrating the ground and therefore the inter-phalangeal extension. Its role can also be to offer support to the frog, the participation of which in supporting the rear parts of the foot will be relieving the heels.

The straight bar may be forged in the same patch as the shoe and finally welded in the middle, by fire or other means; it may also be prepared separately then welded to the two heels of the shoe.

55. Toe clips

Fig. 64 Toe clip and rocker toe

The main role of toe clips is to help the horseshoe nails stay firmly in place under the hoof. When it is located in the toe, the toe clip stops the horseshoe from moving back but keeps it a little in the medio-lateral direction. It doesn't interfere with the expansion or retraction movements of the distal part of the wall.

When the horseshoe is equipped with multiple toe clips, these are more efficient as far as the cohesion with the horseshoe but they limit the hoof movements. They are quite well tolerated in the front mobile parts, but should be used wisely in the rear parts where the movements of the horny box complete part of the shock absorption process.

Toe clips should be thick enough (especially at the base) to fulfil their role without opening up, but in a measured way so they can be encrusted in the thickness of the wall, which makes them effective and offers a quality finish.

56. Balance

The shape and position of the horseshoe under the foot will determine the length of the lever arms and the distribution of the structural surface.

So that the balance of the foot is not modified by asymmetric penetration on moving ground, the horseshoe points must have similar covers and be at an equal distance from the foot symmetry axis. Therefore, ordinary horseshoes should have some points of the same length on the front feet, the lateral point of the rear horseshoe may be a little longer than the medial point, and not much more covered.

The distribution between the front and rear of the structural surface of the horseshoe as well as the position of the foot balance line at the toe will play a role in the effort to be provided by the tendons and the ligaments during a stride. The

more forwards the balance line is, the more the effort to be provided by the deep flexor apparatus of the toe during the propulsion phase will be. The longer the points in the back, the less penetration there will be of this region in the ground, therefore the bigger the interphalangeal bending will be in the shock absorption phase and the smaller the extension at contact will be.

57. Rasping and finishing

It is important that the worker finish the horseshoe while being careful to remove all sharp projections so the horseshoe represents minimal danger in the event of interference with the other limbs. They must be rounded with the hammer, the rasp or with any other abrasive tool.

The worker must also verify the size, the calibration and the quality of the nail holes so as not to find any additional when nailing.

Horseshoeing

58. Dressing (hot, cold)

Fig. 65 Fitting it

The horseshoe must obviously be fitted to the hoof in order to adjust it the best way possible. This is the time to verify that:

- the size of the horseshoe corresponds well to the foot
- the turn of the horseshoe offers sheeting where necessary
- the largest part of the horseshoe corresponds to the largest part of the hoof
- the upper side of the horseshoe and the structural surface of the hoof are flat and adhere to each other
- the seat offers a good surface of support to the hoof especially at the heels and in the toe
- the sole doesn't risk being constrained by the horseshoe
- the horseshoe may be nailed with the nails starting from the white line without risking discomfort or sting.

It's also the time when the toe clips are embedded in the wall. The worker will dig an adapted slot there if the dressing is done cold; if the dressing is done hot, the heat of the toe clip should be enough to burn enough horn to be able to do the insertion, adapting it to the toe clip.

Fig. 66 Verification of the turning, the size and the toe clip fit.

59. Nailing

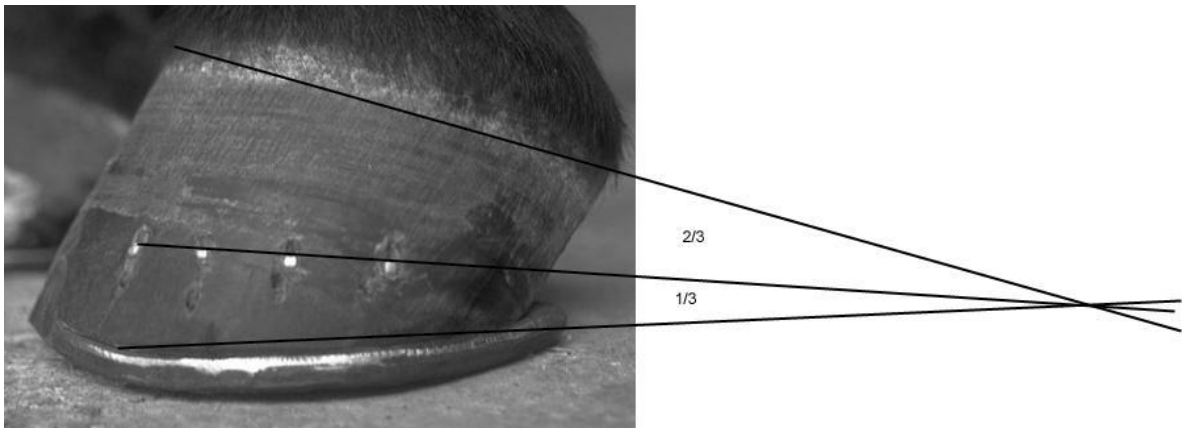


Fig. 67 Nailing in a line 1/3 of the height of the wall.

The horseshoe should be secured to the hoof with enough nails to last throughout the expected life of the shoe. The number and the size of the nails shoe should be moderate so as not to weaken the wall. The nails must be distributed as regularly as possible in the front part of the hoof, in other words in front of the largest parts of the foot. They will stick out of the wall forming a straight line at about 1/3 the height.

60. Clenching up and finishing.

The nails will be cut and folded to form solid clenches. The clenches will be encrusted in the thickness of the horn; they should be long enough to present a squared surface beyond the fold of the lamina.

Finishing is the time for the worker to verify his/her work. It will generally consist of a light stroke of the file on the distal third of the wall in order to eliminate the small irregularities and burrs on the clenches and the wall. This stroke of the file should not weaken said clenches when making them thinner, but should refine the shoeing by slightly rounding the edge of the horn.

61. Modern materials.

Studies on the techniques used in farrier work other than shoeing with classic horseshoes and nails.

Besides soft steel horseshoes secured with nails, there is a whole variety of materials used to replace or reinforce the shoeing.

These products can be classified as follows:

a) Shoeing with other materials.
b) Different techniques for securing the horseshoes to the hooves.
c) Filling materials for between the horseshoe and the hoof.
d) Materials to fill defects or accidents to the horny box.
e) Shoeing with other materials.

Horseshoes made with different metals.

After the discovery of light metals such as aluminium, farriers began using it instead of the traditional horseshoe; the lightness of this material is used mainly with trotters and gallopers because the decreased weight is very important for races.

Through alloys with other metals, aluminium becomes more resistant to wear.

For saddle horses, the variation in weight is not as significant, and it is for this reason that aluminium is not used very often, but there are also other reasons.

Aluminium wears out relatively quickly on hard ground.

Aluminium increases vibrations on hard ground.

Aluminium oxide affects the horn at the white line.

Studies on horseshoes made of titanium or magnesium have been conducted. Besides their high prices, they are too rigid and hard for horse feet; for these reasons they are not used very often.

Copper was used to shoe workhorses that worked in coal mines in order to avoid the risks of explosion due to the gases that could be at the depths from causing sparks as the steel horseshoes rubbed against the rock.

Plastic horseshoes.

Horseshoes have existed for some 2500 years and for a very long time, other materials have been sought for shoeing.

In the past, research on them mainly involved the quality of the steel.

For racehorses, the horseshoes must be very light and it is basically for this reason that aluminium makes very fine, hard steel horseshoes; even papier-mâché has been used to shoe.

In the cities, the horses that were used to transport goods or people had shoes that were often filled with a moistened tar seal to stop the horses from slipping.

Currently, other materials are being tested to eliminate the disadvantages of steel shoes such as the weight and the large number of vibrations on hard ground.

For this purpose, several kinds of horseshoes have been developed in the last hundred years.

All sorts of horseshoes made of rubber or plastic with or without steel structures have been tried.

A large number of these products have a lot of advantages when compared to steel but also have some disadvantages.

Besides the fact that they are a lot more expensive than a steel horseshoe, they are relatively difficult to work and put down, so shoeing is a lot more expensive.

The problem of the excessive wear of these horseshoes has now been resolved as the modern plastics can now be worn as long as steel horseshoes.

Advantages and disadvantages of plastic horseshoes:

- Advantages

a. The weight. The biggest advantage to these horseshoes is their weight.

Horse feet at the end of the leg can be compared to the weight or tip of a pendulum. A heavy horseshoe put on a foot, like a heavy weight at the end of a pendulum, increases the force and pressure that pull on the tendons and the ligaments and accentuates the deviation of the movements.

b. Shock absorption.

A steel horseshoe increases the vibrations that can arise when the foot touches the ground.

A plastic horseshoe partially absorbs these vibrations.

The absorption of the vibrations can also be achieved by placing a plate or leather pad between the horseshoe and the foot. Special plates with absorbing materials can also be put on the foot in order to reduce additional shocks.

- Disadvantages

In their locomotion, horses need to be able to make their feet turn and slide a little when making contact with the ground, and plastic horseshoes are too adherent to permit these movements.

This causes stress on the joints of the lower part of the feet which causes very strong traction on the feet.

Plastic horseshoes are more flexible than horseshoes made of steel which could seem to be an advantage, but most of the time, it isn't.

When the frog is too high in relation to the heels, the heels and the sole push the foot inside and the distortion of the heels causes deterioration of the foot.

Plastic horseshoes are also much more voluminous.

Other ways to secure a horseshoe to a horse's foot

For the last 2500 years, securing horseshoes by nails has been improved yet not changed; the biggest disadvantage is that they damage the walls of the feet and bother the natural mechanism of the feet.

The steel used to make the nails must be resistant, but as flexible as possible. The nails must be thin and only a few nails in the front half of the feet are necessary to secure the horseshoe.

But, there are some situations where securing the horseshoe with nails is undesirable or impossible, which is why other solutions for securing it have been invented it.

Belts or straps.

The hooves can be protected by leather or plastic secured to the feet by straps or belts surrounding the hoof.

If these straps or belts are secured more than one cm under the seat of corn, they are not dangerous to the feet.

But because these attachments are secured around the hoof, the foot will have tendency to enlarge and the horse will modify its locomotion while increasing the depth of its strides.

This solution is very good when the horse has lost a shoe during endurance competitions, for example.

Glues.

Currently, the glues that are on the market can be used to secure plastic or steel horseshoes.

In the past, fat-based glues stuck very poorly because the horn contains water. But the new polyurethane product adapts and secures well, provided the foot is as clean and dry as possible and as the horse does not remain in humid places.

When the horn is porous or of bad quality, it must be removed with precaution, otherwise the glues risk not holding correctly; the hooves must be dried, the hair dry and must be cleaned and the fat removed with alcohol.

When extension horseshoes must be glued on young colts, the glue should be spread very finely because it heats as it hardens and could burn the colt's foot.

Filling materials for use between the horseshoe and the feet.

Filling with hemp and tar to prevent dirt from getting between the horseshoe and foot.

It may be necessary to fill the emptiness between the horseshoe and the foot when the sole or frog must be protected following an injury or the sole is too fine or weak.

For horses, you can also work with a plastic or leather plate.

Horses with a chronic founder often have a down slope in the sole due to the pressure of the foot bone (third phalange); this also has to be protected.

The space between the feet and the horseshoe cannot be done without knowing the proper technique as some anaerobic bacteria could develop and cause lesions.

Filling with tar and hemp protects the sole and the frog efficiently; tar dries the feet and prevents the proliferation of bacteria and hemp stops dirt from penetrating.

Filling to help the sole and frog bear the weight of the horse; the wall of the horse can also have some defects, the sole and the frog need help to be able to support the weight of the horse.

This can happen when the horse suffers from a sharp founder and the veterinarian wants the weight of the horse to support itself on the rear part of the hoof. In this case, hemp and tar can also be used.

Hemp must be firmly inserted between the foot and the leather plate.

The space can also be filled with polyurethanes (EquiBuild by Vettec). All of these products release heat while drying, so you must pay close attention, especially on altered soles. Apply them in fine, successive layers.

As these products are firm and flexible, they do not have any negative effects on the horn of the feet.

Filling for shock absorption

When the joints or the ligaments of a horse are damaged, the horse will feel better in its movements with flexible protection under the feet to absorb the shocks.

Quick-drying flexible rubbery silicone can be used for this.

Flexible rubbery silicone can only be used on firm horny boxes because the hardeners affect the horn and make it more fragile.

Silicones used in construction must not be used on horse feet because it heats much more and their hardener would affect the horny box a lot more.

How to apply these products

Hemp and tar

As hemp is a naturally grown product, it is easily available.

The sole, the frog and the leather plate must be smeared with tar. The horseshoe with the plate is secured to the foot with nails and the finishes are done.

Then all you have to do is gently insert the hemp at the beginning with a toeing knife between the plate and the foot. When the resistance begins to be felt, apply more pressure until completely filling.

Rubbery silicone with two components.

Trimming must be done in order to remove the most horn on the sole and the frog as possible; the horseshoe must be adjusted to the feet and a leather plate secured to the horseshoe.

The inside surface of the leather plate must have rough spots that can be made with the paring knife or the toeing knife so the silicone doesn't slip towards the outside.

The horseshoe, the nails and the driving hammer must be ready and on hand.

The two silicone components must be mixed in order to get a consistent and firm paste.

Then, apply this paste to the foot, a bit more than necessary. The horseshoes and the plate must be secured with the two toe nails and the feet at rest. The extra silicone is pressure evacuated and can be removed with the toeing knife.

Finally, the horseshoe can be completely secured.

Filling materials for defects in the walls

The wall may be damaged in different ways. The horse can tear a horseshoe off, along with a piece of the wall. In this case, the wall can be repaired with a synthetic horn; various products are on the market.

All the parts of the damaged horn must be removed, the feet must be cleaned, dried and the grease removed with alcohol or acetone, depending on the reconstitution materials used.

A piece of paper should be put on the horseshoe in order to prevent the materials used from sticking to the horseshoe.

Once the product is prepared and put down, it may be rasped as soon as it is dry and hard.

When the problem is due to a deterioration of the white line, after having removed the damaged horn, filling this space with substitute materials is discouraged for several reasons.

Because this problem is often due to anaerobic bacteria and fungi and when the space is closed up, they are able to proliferate. In this case, eliminate all the parts reached and leave it open to air.

Substitution products heat while drying and when in direct contact with the flexible parts of the feet (flaky flesh) it could cause serious and deep burns.

The horn is very hard on the outside, but very flexible on the inside. This is to absorb the pressure in the feet with every step the horse takes. The product is evenly hard throughout and cannot absorb the pressure and therefore, the flesh of the feet would have to do this which runs the risk of causing internal haematomas.

Filling wall problems is only recommended when these problems are superficial and in the medial part of the foot to prevent the horseshoes from being torn off.

Technique and designs

62. To add a toe clip

It is sometimes necessary to add a toe clip to the horseshoe. This can be done in several ways. If the horseshoe is forged, an additional feeder can be placed at the precise area where the toe clip is to be pulled.

The feeder is an excrescence in the shape of a triangle on the outer edge of one of the two horseshoe points. It is made by stretching the point before and after the place where the toe clip is to be added, mainly on the round beak of the anvil.

There are basically two ways to add a toe clip on a mechanical horseshoe.

The first consists of heating the part of the point where the toe clip is to be added to white, then on the side of the anvil separating a piece of metal with a hammer regularly pounding it to flatten it, inclining the horseshoe more and more towards the base of the anvil until the toe clip is perpendicular to the horseshoe and the size and thickness are enough so that it fulfils the desired purpose. Be careful not to take too much metal, as this may harm the cover of the horseshoe, or not enough, which would make the toe clips useless.

Then, lay out the toe clip and turn it again to the point on the round beak of the anvil.

The second consists of using a tool called a "bob punch", the round tip of which you use to hit the hot horseshoe at the exact place where you want the toe clip, the point flat on the anvil, the part you wish to deform over the "eye" of the flat beak of the anvil.A piece of metal is moved away to be worked on with the hammer as above.

Once the toe clip is raised, there will be a small crater on the underside of the horseshoe.

63. To give it shape

To turn a horseshoe, either by forging it or using a mechanical horseshoe, give it the size and the shape of the foot, you need to use the round beak of the anvil and using a hammer on the hot horseshoe, make it so that the horseshoe respects the outside form of the trimmed foot once put on the ground by lightly and regularly moving from the end or the middle of the udders in order to give it sheeting (horseshoe that is moved from the foot) so as to facilitate the movements of the foot.

But also once the toe clip is incrusted correctly in the axis of the wall, the horseshoe, at the toe, does not pass or is hidden by the foot.

64. To chamfer

Chamfering a horseshoe involves using an abraser or a rasp to break the angles of the upper outer and inner edges in order to reduce the foot from brushing on the other or a rear one on a front one.

The lower inner and outer edges can also be chamfered if you want to reduce the brush with the ground.

65. To clench

Clenching is a technique that allows you to make a discreet hook (rivet) with the part of the nail that sticks out of the wall once the horseshoe has been broached (nailed).

First, you need to cut the whole nail that is level with the wall, then with the help of a clenching tool or with a toeing knife, remove the part of horn that is separated, when the nail is taken out create a small recess right under the nail (it can also be done with a rasp, but is less attractive).

This recess must be significant enough to house the returned nail without it exceeding or creating too large a hole in the wall.

Once this recess is made, return the nail on it so that it is incrusted in the recess.

A clench must be squared and must not cause puffiness on the wall, a small stroke of the rasp on these finishes the job.

66. The tools

The tools used to shoe alone or with a foo holder:

Shoeing tools differ according to the method, shoeing process, country and traditions. Nowadays, all shoeing tools are sold by farrie suppliers, but the modern farrier must be able to keep them maintained or prepare them as per his/her shoeing customs. Certain tools ca be used for several methods of shoeing. Whe shoeing, farriers are responsible for their own security (apron, protective goggles, shoes, etc.)

Tools for removing shoes:

The *nylon hammer* is used to undo the clenches and to trim

The *buffer* is used to raise the clenches when removing the horseshoe

Pincers or pull offs are used to remove the old shoes

Tools for trimming:

The *rasp* is used to prepare the hoof on the trimming plane and parietal rasping

Hoof trimmers are used to shorten the wall

The *searcher* is used to clean the angles of th seats of corn, the frog, the sole and to cut the toe clip

The *nylon hammer (driving hammer)* is used t trim the hoof with the toeing knife. The *toeing knife* is used to clean the sole and to shorten the wall

Tools for adjusting:

The *rasp* is used to correct the trimming plane when dressing

The *hammer* is used to form the horseshoe according to the hoof to be shod

The *shoemaking tongs* are used to hold the hot horseshoe on the anvil and to apply it to the hoof when dressing

Different *gauges or punches* are used when dressing hot horseshoes

The *trimming knife* is used to cut the toe clip i the wall

Tools for nailing the shoe:

The *clincher* is used to bend the nail blade back and to make a rivet

The *chisel* is used to cut the broached nails, respectively to lodge the clenches

The *hoof tester* is used to bend the nail to remove it from the wall and to cut them to the proper length. It is used to bend the shoeing clenches in two

The *driving hammer* is used to broach, remove, cut and clinch the nails

The *rasp* is used to do the finishes (finish) of the shoeing

67. Use of the hard facing, tungsten tips, route studs

To reinforce or reduce the wear on the horseshoe when used intensively or in delicate riding conditions, holes can be used which make for better adherence.

But you must know that anything that blocks the foot's natural movement reverberate these movements on the limb, which is not very good, so these processes should therefore only be used from time to time for very precise uses that will make the horse safer.

The horseshoe can be reinforced through arc welding with special hard facing rods and create thick points or the strength lines under horseshoe.

Always reinforce the horseshoe before shoeing and consider checking its turn next, under the heat of the weld, as the horseshoe can become deformed and then it would not fit the horse's foot.

You can also use cones of tungsten carbide or nails with tungsten carbide.

For the cones, you must pierce the horseshoe in the desired places and embed tungsten carbide cones in the holes. This material is very hard and it will slow down the wear on the horseshoe, but will increase the brushing of the foot, so pay close attention when inserting them so as to not create shocks or torsions in the limbs that brush too violently against the shoe.

For the tungsten carbide nails, small cones are inserted on the nail head.

The nails normally enter and this process respects the foot balance a little better and has an interesting brushing effect.

Calkins can also be created by returning the horseshoe sponges so that they hang better on the pavement; this method is also used for horses walking on ice or snow in order to prevent slips. These studs can be replaced by special nails for ice and snow.

Nails that don't have a flat head but one that is prominent which exceeds the horseshoe by about 5 mm.

Another method consists of piercing the horseshoe and tapping this hole in order to adapt the calkins you want to use by sight.

This is an interesting process because, except for when it is caulked, it enables the horse to regain a much more natural foot movement (a process that is often used in show jumping).

68. Pads and wedges

To protect or to relieve the horse's foot, devices on the outside of the horseshoe can be used, such as plates or heel lifts.

a. Pads mainly protect the underside of the foot, either because the foot is flat or because it is sensitive.

Pads can be made of leather, rubber or PVC or even an amalgam of two leathers, PVC, felt PVC; they can be used to absorb or merely protect and are located between the foot and the horseshoe.

If desired, silicones or a composite product can be injected between the pad and the foot to continue to reduce the pressure on the sole.

b. Wedges. You may also want to straighten a horse's foot by raising its heels. Heel lifts are then used which can be made out of PVC and are placed between the horseshoe and the foot at the heels. As they are thicker toward the rear and very fine on the front, they will raise the heel. The advantage of these heel lifts is that they are joined together by a PVC rod which helps support the frog.

Wedges, known as adjustable points, are welded under the heels of the horseshoe to keep the horseshoe in proper contact with the foot, as opposed to the one in PVC which separates the horseshoe from the foot.

But as "adjustable point" wedges are not joined together, they raise the frog from the ground and decrease or even completely eliminate contact with the ground.

F. Professional ethics, health, protection, safety:

Morals and philosophy:

69. Professional integrity

Farrier integrity refers to the fact that the farrier must be an honest and balanced professional in all aspects related to carrying out the profession. Working as a farrier implies knowing the animals and being respectful of them in order to prevent them from suffering and assure their health and well-being by caring for their feet and shoeing.

Cordiality and honesty shall be the rule in relations with people in the work environment.

The work should always be carried out responsibly and with the guarantee of work done well. Farriers must know how to give priority to their professional tasks based on the urgency and order of the commitments acquired.

70. Ethics

Ethics has to do with behaviour and attitude and contributes to maturing as people and as professionals. Ethics is structured around the most socially accepted and practiced customs. Personal maturity, professional growth and social integration require knowledge of the ethical and moral principles of the society we live in.

Ethical principles have to do with the relationship the farrier has with people, animals, the environment, and all combinations of the three factors. These principles are: solidarity, justice and impartiality, efficiency, respect for others, responsibility for the social role that corresponds to each of us, acceptance of the effects generated by acts of service and cooperation with improving the well-being of those close to us, of both the animals and society in general.

The preservation and improvement of the professional environment is the main foundation of ethics.

71. Rules of conduct.

The ethical values that a person assumes as a set of criteria that will guide his/her personal and professional life make it possible to establish the rules of conduct that will define his/her behaviour. For farriers, these rules of conduct will guide both their treatment of the people as well as the animals that they will have to professionally govern and with the set of factors that comprise their professional environment.

Below are some of the rules of conduct that can be considered important in the farrier profession.

Farriers have an enormous responsibility towards animals and human beings. As far as the protection of animals, of horses in particular, they should lead by example through their actions and behaviour.

Farriers should be aware of all the rules and laws that govern a simple structured business, and the tools and management procedures: taxes, organisation and administration, tax system, commercial processing, etc.

Farriers should respect the professional agreements made with their customers and if a problem arises, they should contact the customer as quickly as possible.

Farriers must not speak ill of another farrier or a customer. Farriers are colleagues and not competitors.

Farriers should follow up, in writing if possible, on customers' horses, especially if it concerns an animal with foot problems.

Farriers should stay informed of all new developments in the profession; even though they may not agree with them, it is very important to stay informed of these new developments. Farriers should continuously educate themselves throughout their professional life in an attempt to be consistent.

If a problem were to occur that the farrier cannot solve, he/she should consult with competent professionals, especially if the horse runs the risk of physical injury.

Farriers must treat their customers and their horses equally. They all have the right to a professional job, whatever the circumstances may be.

Farriers must not be unpleasant with horses or customers; if the horse proves to be difficult, the problem can be solved by working together with the owner.

CONCLUSION: Farriers must lead by example in their work and their behaviour towards the horses and people in their professional environment.

72. Laws

Just like any citizen, farriers have rights and obligations that must be known, respected and protected. Just like other workers, as it is the same thing. It is necessary to be well aware of the laws related to professional responsibilities, liabilities towards people, the animals, facilities and the environment in which the professional activity will be conducted.

Respecting the law when carrying out professional activities makes it possible to live rest assured, to avoid problems and to make sure that your professional tasks are covered by the laws in effect.

In the event a farrier causes any kind of injury or damage during the course of his/her work, he/she must try to correct it, compensate or indemnify for it. Respecting the laws in effect makes it so that solving problems is always easier and possible.

When facing any liability due to an accident or an error, insurance will help if the farrier has always acted in accordance with the laws. Farriers must always be responsible for their professional acts and must assume the effects of their work.

73. Insurance

Farriers must always be insured so that the damages that may be caused while they are working can be solved, compensated or indemnified.

Nowadays, the insurance market in every country offers various types of coverage and farriers should choose the most suitable type for their activity and improve the quality of his/her employment situation and services.

It is also very important that the owners or people responsible for the animals be informed of any possible risks so that they also take out the most appropriate type of insurance in each case.

74. Environment

There are four main factors in the farrier's professional environment:

the animals the farrier handles.
the customers, suppliers and people responsible for the animals and equestrian establishments.
the organisations that represent the trade such as associations, unions or professional bodies.
the legal, administrative and organisational system that is connected to the farrier profession.

For each of these domains, it is very important to be sure of the aspects that have been discussed above that are related to professional integrity, a sense of ethics, the rules of conduct and the law, always under the guidelines of the legality and morality of one's own personal and professional acts.

Every farrier and the result of his/her work represents the profession and his/her professional body before society. It is precisely for this reason that it is essential that farriers enrich their professional sector and themselves through continuous learning and by using all the resources available, both to improve their knowledge and techniques as well as to fully integrate themselves and be positive representatives who favour the progress and consolidation of the professional farrier business environment.

Health

75. Ergonomics.

Ergonomics is the science that studies behaviour, positions, mobility and the effort that people in any circumstance make so as to improve efficiency, safety, comfort and productivity.

Ergonomics can bring about standards and guidelines of great interest and importance on how to avoid injuries, accidents and problems in all areas of human activity: professional work, daily housework, sports or any other activity.

The three essential principals of ergonomics are:

That people do many different activities and in all of them there are health risks which can be avoided.
That in any activity that people undertake, the idea is to achieve efficiency, productivity and quality results.
That one main objective of human activities is safety and avoiding accidents, injuries, time off work and interruptions in one's normal, healthy life.

Working conditions.

Much attention must be paid to farriers' standard working conditions, as it is a job that is subject to many physical risks. Some of the factors that generate risks which can be palliated through ergonomics are:

Remaining in uncomfortable and forced positions for long periods of time and those that must be constantly repeated.
Loads that must be supported with strength and resistance: restraining the extremities of a horse, etc.
Sustained bending of the back, legs, arms, etc.
Significant static and dynamic loads that must be supported in forced and constant situations: horseshoes, tools, etc.
Responding to the quick movements of horses.
Excessive pressure and constant repetitions (pounding, closed and tense hands, shoulders against the horse, bent neck and pressing against the horse, etc.)
High noise level, above all, due to the use of the hammer.
Exposure to constant changes in temperature.
Sustained and repetitive pounding and intense vibrations.

The objectives of ergonomics in farrier work are:

Improving the physical work environment (prevention, safety, comfort and hygiene on the job).
Adopting appropriate positions for each potentially dangerous job.
Using adequate tools, machinery and facilities that are in good condition and adapted to each farrier, if necessary.
Organising the work and processes which safety standards and excellent conditions prescribe in order to avoid risks.
Respecting rest times.
Promoting the practice of sports and physical activities that compensate for the risk factors of the profession.

In order to take advantage of the benefit of ergonomics, all these aspects must be considered together.

Below are some tips that can be quite useful to improving the working conditions of farriers and avoiding the risk of injury:

Do not over-use any forced positions.
Keep your backbone straight as long as possible.
Take intermittent breaks and stretch and do exercises to compensate for the positions maintained.
Remain in normal positions as much as you can.
Limit the number of repetitions by varying your tasks whenever possible.
Avoid using excessive physical strength by using machines and mechanical aids.
Develop a powerful and balanced muscle structure.
Check with your doctor if you have problems and injuries. There are two types of injuries: those that are sharp and periodic and those that are chronic and long-lasting. If you do not recover correctly from a sharp injury, it can become chronic.
Properly recover from injuries before working again.
Use all recommended protective devices and precautions.

Practice sports that involve activities that are very different from those that are part of the profession: walking, swimming, football, basketball, rowing, riding, etc.

Balance work time with rest, leisure activities and entertainment, culture, etc.

Living a healthy lifestyle: rest, diet, hygiene, physical exercise, avoiding tobacco and other products that are harmful to your body.

Massages, relaxation, yoga, stretching are strongly recommended as compensatory activities

76. Toxic products

Farriers must know the materials that are used for the different horseshoeing tasks very well and dominate them. It is a necessary aspect of the profession. It is always necessary to take into account and assess the degree of danger and toxicity of the products and materials used in the profession.

The products that are used by farriers for horseshoeing, welding, repairing helmets, for preparing or cleaning the tools, etc. Materials such as steel, aluminium, silicones, resins, helmet repair, tungsten, oxygen, etc. can be in the form of a gas, solid, liquid or semi-liquid. A system of application is needed based on the characteristics of the components, the weather and environmental conditions, depending on the brand, the risk of contact, etc.

Chemical products used for decontamination, repelling insects, cleaning tools or the ground, etc., can be aggressive and dangerous.

It is very important to store the products under adequate temperature and humidity conditions and keep them well-identified and protected. This is to avoid accidents and obtain maximum performance and durability of the products and materials.

When handling and using toxic and dangerous products, it is necessary to apply the most appropriate safety and protective measures for oneself, the people close to the farrier and the animals.

All materials and products, especially those that may be toxic, must be used, stored and kept according to the manufacturer's indications, safety regulations and the laws in effect.

77. Zoonosis (bacterial, microbial or fungal infection capable of being transmitted from the animal to humans)

The word zoonosis comes from the Greek *zoon* (animal) and *nosos* (disease). In 1959, the WHO defined zoonoses as the *"diseases and infections that are naturally transmitted between vertebrate animals and humans"*. This definition is still in effect, but it has been expanded to include invertebrate animals (ticks, fleas, etc.).

We shall discuss the main zoonoses that can be transmitted from equines to humans. Among the different types, we can find bacterial, viral, parasitic and fungal zoonoses. Many others exist that will not be discussed herein. It is necessary to highlight the significance of emerging zoonoses because of animal and human growth and today's mobility about the world.

Zoonoses can be transmitted through direct contact with an infected animal, animal-based products (meat, skin, hair, etc.), contaminated water and by other means, from known carriers such as other animals (rats, male foxes, squirrels, etc.), from parasites (flies, fleas, ticks, etc.), and from the tools used in horseshoeing.

These diseases can be prevented in many different ways according to the type of transmission and the infection.

The application of effective veterinary health programmes and animal vaccines. Some zoonoses can be prevented by regularly vaccinating the animals that are susceptible to being transmitters. Ex. Rabies.

Correctly handling and appropriately cooking foods: Zoonoses that are transmitted through the consumption of undercooked meat or eggs that are stored incorrectly. Ex. Salmonella.

Eliminating waste (from offal, excrements, etc.) from areas close to where you work in order to avoid the proliferation of carriers. Direct elimination (plague control with insecticides, rodenticides, etc.) of hosts or carriers. If we eliminate one phase of the transmission cycle, we cut it off. Ex. Rats with rabies.

Other means of prevention consist of simple treatments, for example, using anti-mosquito products, avoiding the evening hours when the presence of mosquitoes is greatest, washing and disinfecting your hands and work clothes, not eating, drinking or smoking in the work area, ensuring proper ventilation in the work area, using adequate protective elements and gloves to touch sick animals.

Finally, it is important to emphasise that it is necessary to have a portable first-aid kit available and to have received adequate first-aid training.

BACTERIAL ZOONOSES

ANTHRAX or COAL

Anthrax, from the Greek for "coal", is an acute infectious disease caused by *Bacillus anthracis*, which is found throughout the world, but most often in developing countries.

The infection can occur in three ways: cutaneous, inhaled or gastro-intestinal. Humans can become infected with anthrax by handling products from infected animals (wool, leather, hair, etc.) or by inhaling spores with the bacterium that come from contaminated animal products. The infection can also occur by consuming undercooked meat. Transmission between infected humans is very rare.

THE SYMPTOMS OF ANTHRAX.

The symptoms vary depending on the means of transmission.

For the cutaneous form, which is the most common, the bacteria enters through a cut or an abrasion in the skin. The infection begins like a simple insect sting but within a few hours (24/48) a vesicle and a fester develop with a characteristic black necrosis in the centre. Death can occur in 5 to 20% of all cases if the person is not treated with the appropriate antimicrobial therapy.

For the inhaled form, the symptoms are similar to hypothermia and quickly lead to severe respiratory problems and a state of shock. Mortality is high.
For the gastro-intestinal form, the signs that are observed include nausea, loss of appetite, vomiting, fever, abdominal pain and diarrhoea. Death results in 25-75% of all cases.

PREVENTION

Prevention is based on:

Controlling the infection in animals
Preventing contact with infected animals and contaminated derivative products
Environmental and personal hygiene in the places where products of animal origin are treated (adequate ventilation, work clothes)
Medical attention for cutaneous lesions
Disinfecting hair and wool with hot formaldehyde

TREATMENT

The treatment for Anthrax is the administration of systematic antibiotics that are sensitive to this bacterium, such as penicillin.

Vaccinating highly-exposed groups can be advantageous even though the success of the vaccine has still not been completely proven and is not available in all countries.

BOTULISM

The disease that affects the nervous system is caused by the bacterium *Clostridium botulinum*. It is characterised by muscle paralysis and affects animals and humans. Botulism is not transmitted from one person to another. Food-borne botulism can affect people of any age. It is found world-wide.

Three types exist:

The first is food poisoning caused by the consumption of infected food.
Infant botulism affects breastfed babies who ingest the bacterium.
And in a smaller percentage, a wound that is infected with the bacterium.

The incubation period for the food form can last 18 to 36 hours, sometimes even days or weeks.

Without treatment mortality reaches 60%.

SYMPTOMS

Gastro-intestinal symptoms include nausea, vomiting, abdominal pain and precede the neurological manifestations such as weakness, paralysis, double vision, difficulty speaking or swallowing. Death often occurs because of the paralysis of the respiratory muscles (diaphragm, intercostal and abdominal muscles).

PREVENTION

Clostridium botulinum is usually found in soil and in non-treated water. These bacteria produce a kind of resistance, spores, that survive in food that is stored

improperly or placed in a container. The most frequent foods are plant-based food that is home-canned, pork and dried ham, raw or smoked fish. To prevent contagion, food must be correctly stored and prepared; for example, sterilising home-canned food in a pressure cooker at 120 º for 30 min. Bulky aluminium foil or foul-smelling food must be thrown out. Honey should not be given to children under 1. Seeking medical assistance for infected wounds is also recommended.

TREATMENT

An effective antitoxin can be administered to reduce the seriousness of the symptoms. Other measures such as mechanical ventilation (machine-assisted breathing) are essential. After proper treatment, patients usually recover completely.

For wound botulism, in addition to the above, the wound must be undressed and drained and an antibiotic (penicillin) administered.

In the case of infant botulism, antibiotics cannot be administered.

DERMATOPHILOSIS

Caused by the bacterium *Dermatophilus congolensis*, it is found throughout the world. Transmission occurs in humans through direct contact with an infected animal or through instruments or carriers like arthropods (ticks, flies and mosquitoes).

Humidity and the lack of hygiene favour transmission of the disease.

SYMPTOMS

The lesions we can observe consist of very irritated areas with scabs and hair loss.

PREVENTION

A wet, muddy environment as well as a lack of hygiene facilitates the development and transmission of the disease. Stable materials must be controlled (brushes, rags, hoof picks, etc.). Materials used on more than one horse must be disinfected.

TREATMENT

Cleaning the lesion with iodised antiseptic soaps or with chlorhexidine and checking with a dermatologist is recommended.

LYME DISEASE

This is a disease caused by the bacterium *Borrelia burgdorferi*. It affects domestic animals and people. The disease is transmitted through a bite from a tick infected with Borrelia. In Europe, the carrier- the tick- is the *ixodes ricinus*. European sources of the disease are located in the Scandinavian area and Central Europe. If it is diagnosed and treated in the initial stage with antibiotics, lyme disease is almost always curable; however, recovery will depend on the way in which a given organism reacts to the treatment.

SYMPTOMS

Typical lesions from the disease are cutaneous, red and circular rashes that appear between 3 to 20 days after the bite. Some other symptoms also appear

such as malaise, fever, headache, neck rigidity, muscle pain, joint pain, and swollen lymph nodes. As the disease progresses symptoms include facial muscle paralysis, concentration problems, loss of memory and even cardiac problems.

PREVENTION

Prevention measures consist of avoiding bites. Closed shoes and socks and adequate, light-coloured clothing, as well as pants and long-sleeved shirts should be used in endemic zones. It is a good idea to inspect the entire body, and to be on the safe side, the navel, ears and neck as well. Do not forget to check domestic animals; this is essential to avoiding the disease. Bug sprays, DDT and permetrines can be used.

TREATMENT

Early treatment of lyme disease is important and the disease is almost always completely curable. Antibiotics (tetracyclines, doxycyclines, cephalosporines and penicillins) administered between 4 to 6 weeks and anti-inflammatory medicines such as ibuprofen.

SALMONELLA

A very common disease in humans throughout the entire world. The infection is caused by the *Salmonella* bacterium.

The majority of infection cases come from the consumption of contaminated food and not from direct contact with infected people or animals (from undercooked foods, eggs and meats or from food contaminated by urine).

SYMPTOMS

The incubation period is between 12 to 36 hours and the symptoms include fever, headache, diarrhoea, abdominal pain, nausea and dehydration, which can quickly degenerate into a generalised infection.

PREVENTION

Preventive measures include the adequate control and disinfection of food, properly cooking food and good personal hygiene.

TREATMENT

The treatment depends on the seriousness of the disease; fluids and antibiotics can be prescribed by a doctor. Self-medication must be avoided so as not to generate resistance to antibiotics.

78. Tetanus and general infections.

TETANUS

Acute and often fatal, it is caused by the Clostridium tetani bacterium which produces neurotoxins causing generalized rigidity as well as convulsive spasms of the skeletal muscles. The bacterium is heat-sensitive and cannot survive in the presence of oxygen. On the other hand, the spores (resistant forms of the bacterium) are resistant to heat and most common antiseptics.

This disease is present everywhere in the world but it is more frequent in hot and very populated regions with humid climates and soil that is rich in organic matter. The spores are widely distributed in faeces from horses, bovine livestock, dogs, cats, rats, guinea pigs and chicks. The spores can remain in the atmosphere (the weather) and in animal and human faeces for a long time.

It is always transmitted to humans through sores or scratches on the skin that come into contact with stools or contaminated materials. In conditions where there is a lack of oxygen, the spores germinate and produce the toxins that are absorbed and spread by the blood.

The outcome is generally fatal due to a cardiac collapse or respiratory insufficiency. When a patient survives a reliable form of the disease, neurological consequences are frequent.

SYMPTOMS

The first manifestations appear after an incubation period of 3 to 21 days. There are different forms of the disease but the most common (80% of all cases) is generalised tetanus. The first signs are muscle blockage in the face which prevents the mouth from opening and swallowing, then rigidity in the neck, backbone, abdominal muscles and joints quickly follows.

Other general symptoms include a fever, heavy breathing, a high pulse and high blood pressure, sweating and signs of asphyxia. Spasms or muscular contractions frequently appear and can last 3 or 4 weeks. Complete recovery can last months.

PREVENTION

The prophylaxis or prevention consists of receiving the vaccine with regular boosters. The use of gloves, boots and suitable clothes which prevent direct contact with stools or contaminated matter and attentive care for all wounds are necessary for preventing contagion.

TREATMENT

The most suitable is a quiet and dark room to prevent the patient from having spasmodic crises. Appropriate medicines (analgesics, serums, antibiotics, tranquilizers, etc.) are administered; it is important to make sure the wound stays clean and anti-tetanus serum is administered when it is not known if the patient has been vaccinated.

VIRAL ZOONOSES

WEST NILE FEVER

The West Nile Virus is one of the Japanese encephalitises of the Flaviviridaes family. It was isolated for the first time in Uganda in 1937. It quickly spread throughout Africa and Eurasia.

In Europe, the sources are currently concentrated in Portugal, France, Slovakia, Moldavia, Ukraine, Hungary, Romania, the Czech Republic, Italy and Poland.

Mosquitos, mainly of the culex genus, are the main carriers of this disease through their bite. Some isolated cases originating from bloodsucking arthropods (ticks) have been recorded.

The main carriers of the virus are non-domestic birds. It has rarely been isolated among mammals, which are therefore considered as less important in the virus transmission cycles, with the exception of horses and lemurs, which are moderate carriers of the virus.

SYMPTOMS

The symptoms of the disease are similar to the flu. The incubation period is between 3 to 6 days. Symptoms include fever, headaches, muscular and articular pain, fatigue, conjunctivitises, sores all over the body, the legs and the head, swollen lymph nodes, a lack of appetite, nausea, abdominal pains and diarrhoea. Occasionally (<15%), a patient develops an acute septic meningitis or encephalitis which includes vomiting, disorientation, drowsiness, shivering, convulsions and coma. A patient can also develop hepatitis, pancreatitis and myocarditis.

PREVENTION

In endemic zones, vaccinating horses, avoiding exposure to mosquitoes in infested areas, avoiding the outdoors at night and using bug sprays on your skin and clothes is recommended.

TREATMENT

Complete recovery is possible and is often accompanied by muscular pain and weakness. There is no vaccine for this disease.

RABIES

Rabies is an acute viral disease, the prognosis of which is almost always deadly. It is caused by the lyssa virus and is normally transmitted through bites from animals that are infected with the virus or through the exposure of a wound to saliva from a rabid animal.

The spread of rabies in Europe is quite extensive but there are countries that are rabies-free such as Spain, Great Britain and Sweden. The most effected countries are those in Eastern Europe.

After the bite, the virus penetrates a nearby nerve and travels in this way to the brain where it multiplies. It then continues to the salivary glands where it again begins to reproduce.

The incubation period varies greatly and depends on the location of the bite; anywhere from 2 weeks to 6 months.

SYMPTOMS

The symptoms caused by the disease are fever, headache, irritability, restlessness, anxiety, muscular pains, salivation and vomiting. Difficulties swallowing and hydrophobia (an aversion to water). A state of excitement precedes the fall into coma, then the patient's death.

PREVENTION

It is important to take preventative measures such as:

Vaccinating horses where rabies has not been eradicated.

Avoiding contact with unknown dogs or other animals.

Vaccinating people who work with animals in rabies endemic zones.

Placing animals imported into countries where the disease does not exist in quarantine.

TREATMENT

Washing wounds well with soap and water in the event of an animal bite is recommended. Administering anti-rabies serum and vaccinating people in rabies endemic zones is recommended.

PARASITIC ZOONOSES

SCABIES

A skin disease that is caused by the acarid *Sarcoptes scabiei*, it is found throughout the world.

It is transmitted through direct contact with affected animals or people, clothes, napkins, animal litter, covers and other objects, as the parasite can only survive a few days outside of the infected body.

SYMPTOMS

The lesions that are produced are a result of the parasites migrating under the skin which causes major itching. Thin lines can be observed under the skin which are similar to a line made by a crayon. The most affected areas are the palms of the hands and the soles of the feet, interdigital spaces, elbows, armpits, the torso, the inguinal region and the abdomen.

PREVENTION

It is important to avoid contact with affected people; clean and disinfected sheets, napkins and clothing.

TREATMENT

A doctor must be consulted for specific treatment. Normally, ointments with permethrin and lindane are used, as well as a symptomatic treatment for the itch which may still be present a few weeks after the initial treatment.

FUNGAL ZOONOSES

DERMATOPHYTOSIS

This is a skin disease that is caused by the *Trichophyton equinum* fungus. It can be linked to other types of fungi.

Contagion occurs through direct contact with an infected animal or stable materials.

The lesions that they produce are circular shaped and are accompanied by a loss of hair and peeling. Itchiness can be more or less intense. It is a highly contagious disease.

The lesions must be treated with specific medications; disinfecting and controlling the materials which could be infected is essential. The treatment can last 45 days.

OTHER ZOONOSES

CAMPYLOBACTERIOSIS

Caused by a bacterium called *Campylobacter*, it is transmitted through direct contact or consuming infected animal food.

This causes gastroenteritis with vomiting and diarrhoea.

LEPTOSPIROSES

It is caused by the *leptospire* bacterium genus. Spread throughout the world, it affects most mammals. Humans can be contaminated in the case of direct contact with an infected animal's urine, with milk or milk-derivative products, or in indirect ways through areas contaminated by urine and other agents.

The clinical signs vary and include conjunctivitises, fever, headache, muscular pains, nausea, vomiting and diarrhoea, renal or hepatic troubles, bleeding and myocarditis.

Mortality in humans is anywhere from 5 to 40%.

Preventive measures include rodent control, wearing protective clothing, good hygiene and limited exposure (task mechanisation, drainage, etc.)

The treatment is based on the use of specific antiseptics.

LISTERIOSIS

Caused by the *Listeria monocytogenes* bacterium, it affects many mammals. It produces miscarriages and foetal infections as well as diseases of the ocular and nervous systems.

RHODOCOCCUS

It is caused by the *rhodococcus equinus* bacterium and is serious for foals. Infection is caused by exposure to the working environment.

The illness is very serious among immuno-deficient individuals such as those with AIDS as well as for individuals undergoing treatment for cancer. It is essentially a respiratory disease.

STREPTOCOCCOSIS

Caused by the *Streptococcus equi zooepidermicus* bacterium, it leads to choking in horses. People can be infected through direct contact with other infected people or animals or contaminated after eating. In humans, the clinical signs are: arthritis, fever, meningitis and weight loss.

BORNA DISEASE

Caused by a virus of the *Bornaviridaes* family, it originated in Borna, Saxony.

The clinical signs are fever, apathy, urinary and neurological disorders, among others. It is thought that this disease could be linked to psychiatric disorders in humans.

Necessary protection.

79. Personal protective equipment

Safety protection for the use of machines in horseshoeing workshops.

All the machines used in the workshop must meet safety regulations; they must have the EC certificate indicating that they fulfil the basic safety requirements.

Specific safety protective measures correspond to each machine as defined in the instructions manual, in addition to the standards of use that guarantee proper performance. It is important that the operating manuals be available and easy to locate in the shop so that the people who work there can check them.

Use of Individual Protective Equipment.

For each machine, it is necessary to use individual protective equipment specific to the risks involved in its use.

Machine	Individual Protective Equipment
Column drill	Goggles Leather safety gloves Safety footwear
Portable drill	Goggles Leather safety gloves Safety footwear
SHEARS	Leather safety gloves Safety footwear
Arc welding machine	Leather safety gloves Safety footwear Protective facial screen. UV ray protective shields Leather welding apron.
Hammers (portable, fixed)	Goggles Leather safety gloves Safety footwear
Beveller	Goggles Leather safety gloves Safety footwear

Storing flammable products:

The use of propane gas cylinders in shop work requires following the regulations for the use of flammable gases in accordance with the laws in force in every country regarding storing and using containers and large containers of gas that is compressed, liquefied and dissolved under pressure.

80. Horseshoeing equipment, workshop, vehicle, material and air

Machine area:

enough distance between machines to be able to do team work
layout of the machinery based on the order of work
respect all security components on the machinery
the most common machines are: drill, beveller, radial machine, millstone, shears, etc.

Work area:

Either a gas or coal oven is installed here in accordance with the regulation in effect.
Anvil and anvil table; secured manually or with automatic devices.
Snail and/or swan neck, set at a suitable height.

These three parts of the work area must be laid out so that it is ergonomic and facilitates work movement.

Materials area:

Good lighting.
Easy access to the materials.
Easy to see the material.
Orderly and organised.
Safe and practical restraining systems (vehicle workshop).
Drawers with safety locks (vehicle workshop).

Vehicle workshop:

Inside space. Comfortable and ergonomic.
Economic consumption and maintenance.
Enough load capacity.
Power.

Horseshoeing area:

Flat, semi-hard or anti-slip ground (rubber).
Covered and spacious location, around 15 to 20 m^2 per animal.
(this depends on the work equipment and the size of the animals).
Good restraining systems (linked to 1 or 2 winds).
Ventilated and bright area.
Easy access with the vehicle workshop.
Availability of water and electricity.
Organic and non-organic waste containers.

81. Stock

Stock is all the materials and tools that are stored away until needed.

For convenience, it should be preferably located in the same place where the vehicle workshop will be left or kept.

The quantity of components available must be enough so as not to have to stop working due to a lack of materials.

The amount of materials in stock must not be excessive. It is a good idea to continuously monitor the stock.

Conditions for the area:

Good lighting
Systematically organised
Easy replacement
Appropriate temperature and humidity (silicon, reagents, etc.)

The quantity of material will depend on:

Distributor service. Speed, price…
Supply.
Type of work, more or less specific…

82. First aid.

Farriers are frequently exposed situations where there is risk of an accident. Thus, they need to know how act if necessary.

It is as important to know how to act in the event of an accident as to prevent and implement measures so that accidents don't occur.

Farriers must know and must apply the following aspects of first aid and accident prevention at work.

The laws and regulations regarding labour safety conditions of the country in which the profession is practiced.

The safety measures that regulations and common sense dictate in order to avoid accidents.

Accident and civil liability insurance related to the profession.

Taking first aid courses and periodically updating one's theoretical knowledge and practices is strongly recommended.

First aid concepts and techniques farriers should know and dominate so as to be able to take care of themselves or help other people:

Basic first aid principles. How to behave in the event of an accident.

Artificial respiration techniques.

Techniques on how to act in the event of cardiac arrest. Cardiac massage.

Alteration of consciousness.

Asphyxia and drownings.

Trauma from different origins: blows, cuts, bruises, chemical aggressions, burns, etc.

Haemorrhages.

Fractures, strains, dislocations, etc.

Sunstroke, heat stroke.

It is very important to know how to apply the appropriate resources in any kind of accident or circumstance. For this reason, farriers must be sure to always carry a complete, properly equipped first aid kit in their vehicle and one should be available in the shop.

Risk evaluation

83. Risk and exposure factors

When practicing their profession, farriers come into contact with animals (poorly- or un-trained) or places (workshops, horseshoeing areas) that are not in optimal condition for doing correct work. Farriers must be able to quickly assess whether work can be done in good conditions.

Where does the risk come from? : The horse, the owner or the farrier.

The Horse:

Assessing a risk involving the horse primarily has to do with the place where horseshoeing is going to take place and the horse's level of dressage.

A horse that doesn't move and is not apprehensive when its foot is held already allows one to think that the work will be done in good conditions; then, if it stays tied up for enough time, one can suppose that it has been worked and has experience. If the horse allows its 4 feet to be worked on without effort or moving much, the farrier may conclude that there is little risk for the work.

The working conditions will be even better if the places where the work should take place are safe for the horse, the horse knows the place, or it doesn't have any stressful memories, the farrier will be able to restrain the animal as long as there is no traffic that could surprise it and the workspace is flat.

All of these assessments make it possible to know if the horse will be at risk, so if any of these parameters were to be lacking, the farrier would have to make decisions so as not to put the horse at any potential risk.

The Owner:

The owner is the only judge of the risks he/she runs with his/her animals, but the farrier as a professional can advise the owner on some ways to avoid a potential danger.

If an owner modifies his/her daily habits for the day of the shoeing or picks up his/her horses when they are used to eating may be causes for risk.

Also trying to separate them too quickly and at the last minute.

Tying them to a place where the horse does not feel confident or simply not correctly educating in all phases of dressage.

The Farrier:

Farriers as professionals must to know how to evaluate the risks for all places where they are brought to work and for all people and animals that they may come into contact with during their intervention.

The farrier's own stationary workshop, his/her truck workshop, a workplace at the customer's site, the owners or people taking care of the horses as well as his/her apprentices or workers, and of course the farrier him/herself.

Everything that concerns the farrier's stationary or mobile workshop, any possible employees and the farrier him/herself in this evaluation must take into account the laws in effect in the country where the farrier works. Nevertheless, the farrier will have to make sure that the use of the tools and work on the horse are done in good conditions.

For owners or horses, refer to the above paragraphs.

84. Seriousness of the risk

For a horse, risk can range from a simple wound to the death of the animal.

The animal can be injured while coming out of the box or while moving during the shoeing or by the farrier; these injuries can be benign, small wounds caused by

movements or sudden shocks or injuries on the feet made by the farrier, but muscular or bone contusions may occur due to a lack of patience caused by a prolonged work period or the absence of dressage or simply by a cluttered and poorly adapted worksite.

But all of these parameters can bring a horse to panic so much that it can kill itself by movements or shocks that are too violent.

The farrier must continually make sure that the animal is always in optimal conditions for horseshoeing.

For the owners, the risks are as important as for the horse and can vary in the same proportions.

It can range from a simple kick or bites to fractures and sometimes death.

This is why the farrier is advised to inform the owners that the work done before horseshoeing is also very important.

He/she should avoid going to fetch his/her animal in the middle of a herd at the last minute while running and allow the farrier to work in good conditions while providing him a place that is adapted to shoeing.

For the farrier and his/her employees, the risks are often bruises or fractures, as well as significant wounds due to the use of cutting tools and the forge, but rarely death.

Farriers must constantly be sure that all actions that they do as well as those done by their employees are covered by maximum safety.

The shop must meet the standards in effect in the country of operation with effective and safe tools; the vehicle must also meet these standards and the farrier must require that his/her customers provide proper working conditions.

Shoeing a badly trained horse in the middle of a meadow held by its owner and asking his/her employee to do part of the work on a rainy day next to a heap of rusty sheet metal is obviously an incorrect assessment of the seriousness of the risks incurred.

85. Risk probability and prevention

Risk is present everywhere in the farrier business: in the morning while taking his/her vehicle to the work site, during the shoeing and while in proximity to the horse.

But, this probability can be considerably reduced if the farrier correctly evaluates the working conditions and knows how to refuse work that is considered to be too dangerous.

Estimating danger is subjective, but is also based on the farrier's professional experience.

Other risk factors may also intervene that would not be due to the direct environment but to the exterior environment.

Farriers must try to discover them because these risks are random and potentially very dangerous.

For example: A new horse that arrives in a club close to an airfield won't necessarily know the noise a plane makes when it takes off; under these conditions, the farrier must ask about the horse's experiences and verify risks at any given moment by stopping work, untying the horse and checking its reactions to know whether it is possible to work and both the farrier and the animal will be safe.

Other random factors can intervene such as horns, thunder, yard noises, etc.

Farriers must therefore always be conscious of the random environmental factor which can put their lives in danger, as well as that of the horse, because a horse's reaction of fear or surprise can be very violent.

It is completely realistic to say that a young farrier who starts his/her activity without taking the advice of older farriers has a greater chance of getting him/herself into danger, but it is also true that there are professionals who believe that all work must be accepted and they have even greater probability of getting themselves into danger.

Demanding proper working conditions, trained horses, clean, protected and flat worksites a work vehicle, and a functional workshop decreases the probabilities of risk considerably.

Do not forget that ***farriers are not horse trainers.***

Making our customers understand this short sentence is already an enormous step toward the reduction of the probabilities of putting the professional in danger.

86. Insurance (personal and professional)

Insurance depends on the laws of the country where the farrier practices; whether they are obligatory or optional it is very important that the farrier think about his future.

There are several types of insurance.

1) Civil liability: This insurance covers the farrier when an accident is caused by the farrier, employees or the horse being taken care of. This insurance is very important to have because it prevents the farrier from having to pay (often for a very long period) for the damages that may be caused.
2) Sick and accident insurance: This insurance covers the farrier if he/she has to stop working for a long period of time due to an illness or an accident: it is very useful if one doesn't want to quit the activity during this period as they take over the financial charges that cannot be paid when not working. These policies sometimes give right to non-negligible capital.
3) Complementary policies: This is insurance that allows the people who pay into them to be repaid for the difference between the state reimbursements when this exists and the real price of the medication or medical or surgical operations.
4) Retirement insurance makes it possible to receive a monthly stipend when one stops working after having made payments throughout the years of work.

In most European countries, some kind of insurance is required for artisans, tradesmen, and the liberal and salaried professions, retirement insurance, social insurances, as well as the civil liability for self-employed workers. However, the other kinds of insurance are optional.

A whole range of insurance policies can be proposed to a salaried employee or self-employed worker as the goal is to find the way to protect him/herself as best as possible from the risks of their daily and professional life.

The objectives of this European Farrier's Handbook are:

To develop common standards of competence in the farrier business

To provide European farriers with training and preparation to pass the EFFA professional accreditation exam.

Encourage the different European countries, whether or not they are members of the European Union, to adopt basic standards such as a minimum level of training and to have this training accredited.

We hope this has been very helpful to readers in achieving these goals.

European Federation of Farriers Associations EFFA
Programme Leonardo da Vinci "Unity in Farriery"

Barcelona, 10 November 2008