

A black and white photograph of a person, likely a farrier or veterinarian, working on a horse's hoof. The person is bent over, focused on the task, and is using a tool. The horse is standing in a stable or barn setting. The background is bright, possibly from a window or doorway.

Hoof Care and Management

Dr Julie Bell

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HOOF CARE AND MANAGEMENT

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FOREWORD

The New Zealand Equine Research Foundation is most grateful to Dr Julie Bell for compiling this very important booklet on care and management of horses' feet. As all horsemen and horsewomen know good feet are critical to the horse's wellbeing and ultimately performance.

There has been a real need to fill the space of knowledge for horse people and although this booklet is very simple it serves as a very good starting point for people to understand the anatomy and functional aspects of the equine hoof. This booklet should be read in conjunction with our previous publication "Equine Laminitis"

Both of these booklets are available free through your Veterinarian or by contacting the NZERF Secretary

Tim Pearce
Chairman, NZERF

September, 2023

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NEW ZEALAND EQUINE VETERINARY ASSOCIATION and RODMOR No 2 CHARITABLE TRUST



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CONTENTS

INTRODUCTION	6
CHAPTER 1: ANATOMY OF THE FOOT	7
External Anatomy	7
Internal Anatomy	9
Importance of Healthy Hooves	10
CHAPTER 2: HOOF BALANCE	11
Static Hoof Balance	11
Dynamic Hoof Balance	13
Importance of Trimming	14
CHAPTER 3: SHOEING: WHY AND HOW	15
Does My Horse Need Shoes?	15
Do My Horse's Shoes Fit Properly?	17
Hot Shoeing Versus Cold Shoeing	18
CHAPTER 4: BROODMARE AND FOALS	19
General Hoof Care	19
Angular Limb Deformities	20
Flexural Limb Deformities	22
CHAPTER 5: COMMON DISORDERS OF THE EQUINE HOOF	23
Solar Bruise	23
Corns	24
Abscesses	25
Thrush	26
White Line Disease (Seedy Toe)	27
Laminitis	28
Cracks	29
Trauma	30
CONCLUSION	32

HOOF CARE MANAGEMENT

Throughout history horse owners have struggled to keep hooves strong and healthy enough for optimal performance. The New Zealand equine culture, where many horses tend to spend the majority of their time outdoors, in all weather conditions, poses its own unique set of advantages and disadvantages to hoof care. There are many elements that play a part in the health of a horse's hoof - genetics, nutrition, daily care and environment, trimming and shoeing, as well as the amount and type of work required by the individual - which all interact to determine the hoof strength and quality. In this booklet we will look at some of the ways we can help keep horses' feet at their optimum and discuss some of the common hoof issues encountered in NZ horses.



Photo Credit

Robert McIntosh

CHAPTER 1: ANATOMY OF THE FOOT

In true terms the word “hoof” refers to the external capsule of the foot. The word “foot” refers to the hoof capsule as well as all the structures, bones, tendons, joint structures, nerves and vessels, contained within it.

External Anatomy

The hoof is a dynamic structure. Keratinised hoof capsules encase the more sensitive elements of the horse's foot providing them protection and allowing them to perform on a variety of surfaces.

Outer Wall

The outer wall is composed of tubular structures that grow from the coronary band downwards to the ground. They can be pigmented (black) or unpigmented (white). The job of this keratinised structure is to protect the sensitive structures that it encloses, as well as store and release energy with each stride that the horse makes.

Inner Wall

On the underside of a freshly trimmed hoof the inner wall can be seen as a white layer inside the outer wall of the foot. It is also made up of tubules but has a greater component of horn binding the tubules together. This makes the inner wall more pliable and shock absorbent.

White Line

The white line joins the sole to the inner wall. It also forms a border of protection for the pedal bone from the outside environment.

Sole

The sole is the area inside the white line. It provides support to the hoof and protects the sensitive structures inside the hoof.

Frog

The frog can be seen as the spongy V shaped structure in the centre of the hoof. A healthy frog helps provide traction, absorbs shock (reducing concussion), and aids in circulation.

Bars

The bars are extensions of the hoof wall that run alongside the frog. The bars support the heels and help reduce excessive distortion under pressure.

Coronary Band

The coronary band is a highly vascular ring of tissue located at the hoof/hairline junction. The coronary band produces tubules for new hoof growth. It is also incredibly strong and helps reduce distortion of the hoof wall and underlying structures as the hoof impacts the ground.

Periople

The periople is a protective covering of the newly formed hoof wall just below the coronary band.

Bulb of the Heel

The bulb of the heel is located at the back of the hoof. Healthy heel bulbs are made of soft, slightly flexible horn and aid in shock absorption.

1

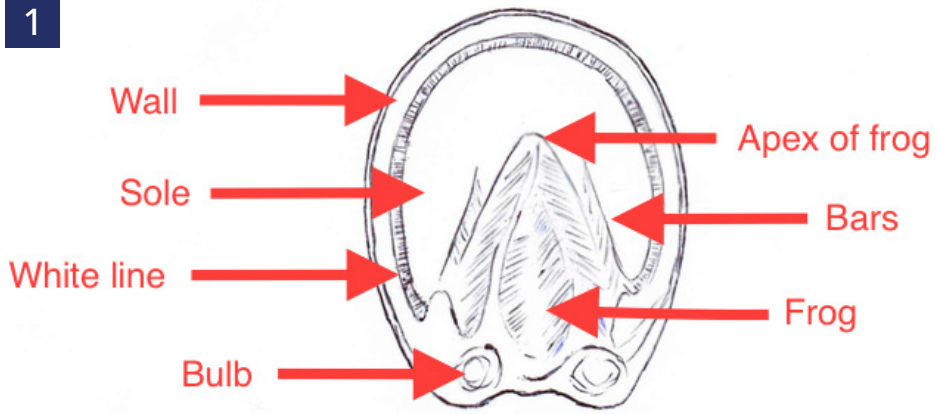


Figure 1
Parts of the external hoof.
Diagram Credit
Margaret Evans

Internal Anatomy

Bones

The hoof contains the pedal bone (P3), also known as the coffin bone, the navicular bone, and the lower half of the short pastern bone (P2). These bones form attachment points for a variety of tendons and ligaments.

Digital Cushion

The digital cushion sits behind the pedal bone. Due to its springy nature it is a vital component in concussion reduction. Its large groups of blood vessels also aid in hoof circulation with each stride.

Laminae

There are two layers of laminae. The laminae attached to the wall are termed the horny or insensitive laminae, while the laminae attached to P3 are termed the sensitive laminae. These laminar tissues interdigitate, much like velcro, to attach the pedal bone (P3) to the hoof capsule.

Lateral Cartilages

The lateral cartilages are located within the hoof but also extend above the coronary band. They attach to the pedal bone and help suspend it within the hoof, storing and releasing energy with each stride. They also act to absorb shock during the weight-bearing phase of the stride. The condition termed sidebone occurs when these cartilages ossify into bone.



Figure 2

Internal anatomy of the hoof and distal limb.

Diagram Credit

Margaret Evans

Importance of Healthy Hooves

As you can see there are many different components that make up what looks to be a simple hoof. Adequate balanced nutrition is vital for the body to be able to produce and maintain the structures defined above. Different environments pose their own set of challenges on your horse's hooves. Dry, hard ground may cause the unshod horse to wear away hoof wall faster than they are able to replace it, while constant wet ground may cause the wall and sole to soften. This softening will make the hoof more susceptible to bruising and abscessing.

Genetics also play a large role in the quality of hooves. Some foals are born blessed with strong, healthy, well shaped feet while others, under the same management, will be plagued with hoof issues their whole lives. Wild ancestors of our domestic horse underwent natural selection for strong, functional hooves as horses lame due to chips, cracks and abscesses would not have kept up with the herd. The modern horse however may pass on genetics for weak or deformed feet when other traits are highly desired and selected for.



CHAPTER 2: HOOF BALANCE

Static Hoof Balance

In order to assess hoof balance the horse must be standing with even weight on all 4 feet and on a clean, level surface. An overview of the general shape of the hoof and its proportion to the horse, as well as symmetry to the other hoof, should first be considered. From the front, a vertical line from the knee straight through the middle of the cannon bone should divide the hoof into two equal parts. The wall should be at the same angle to the ground on both the inside and outside of the leg, not flaring or under-run. The coronary band should be parallel to the ground.

From the side view the hoof pastern axis (HPA) must form a good alignment. This means that a line drawn through the pastern should continue on the same angle through the hoof. The angle at the front of the hoof wall should also match the angle made at the heels. The ideal angles for a grown horse are approximately 54 degrees for the forelimbs and 58 degrees for the hind limbs. This will vary slightly in individual horses but it is most important that the HPA remains aligned. It is important to note that foals have a more upright HPA often at an angle of 60-65 degrees.

3



Normal hoof



Long-toe (broken forward)



Short-toe (broken back)

Figure 3

Line dropped from the centre of the coffin joint bisects the hoof in the normal foot but not in those that are unbalanced

Hoof pastern angle is straight in the normal foot but not in those that are unbalanced

Diagram Credit

Paul Fraser

A broken back HPA causes excess strain on the suspensory apparatus, the flexor tendons and the laminae. These very important structures are vital to maintaining a functioning, athletic horse.



Figure 4

Example of a broken back HPA with a low heel and long toe.

Photo Credit

Ryen Carlson

A broken forward HPA is not seen as commonly as a broken back HPA. However it can lead to stumbling and bruising of the sole. A broken forward HPA with a steep, sometimes concave, dorsal wall is referred to as a club foot. Horses often have only one hoof affected with this condition. In this condition the farrier should be careful not to over trim the heels and place excessive strain on the deep digital flexor tendon. However careful trimming to keep the foot in a moderate shape and maintain a normal HPA should be attempted. The owner should be advised that the club foot will never match the shape of the other hoof.



Figure 5

Example of a broken forward HPA, also known as a club foot.

Photo Credit

Ryen Carlson

When the foot is raised a line down the back of the tendons should be perpendicular to the surface of the sole.

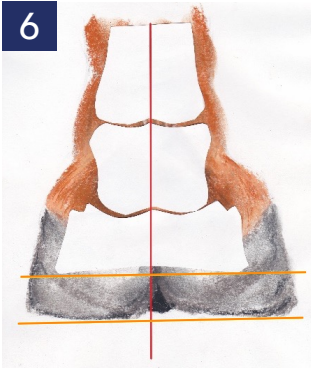


Figure 6

Lateral Medial balanced foot, red line bisects foot

Balanced, Pedal bone and bottom of hoof are parallel

Diagram Credit: Paul Fraser



Figure 7

Lateral Medial unbalanced foot, red line does not bisect foot

Unbalanced, Pedal bone and bottom of hoof are not parallel

Diagram Credit: Paul Fraser

When looking at the underside of the hoof the frog should be symmetrical between the heels with the apex ending approximately 2/3 of the way from heel to toe. The hoof wall should be trimmed and/or shod to the widest point of the frog. There should be an even amount of sole and wall on both sides of the frog.

Dynamic Hoof Balance

Of most importance is the balance of the hoof when the horse is moving, specifically as the hoof hits the ground. It is important to watch the horse as it walks toward you. From in front the hoof should hit the ground level; this is a good assessment of the mediolateral (inside to outside) balance. If this balance is not correct then the hoof will contact the ground on one side prior to the other, placing uneven pressure throughout the leg. This is often the case with horses with poor limb conformation.

When observing the gait from the side, it can be determined if the horse is landing level from back to front. Ideally a horse will land level or very slightly heel first.

If you are having trouble assessing the balance at a walk it can help to video the horse from a few angles, focusing on the hooves. Being able to play the video back in slow motion is a great tool to assess dynamic hoof balance.

Importance of Trimming

Daily care and regular trimming or shoeing, every 6-8 weeks, is a vital part of keeping your horse's hooves healthy. Most domesticated horses do not subject their hooves to the same daily wear as their wild ancestors did. The average mature horse grows approximately 6-9mm of new hoof wall per

month. Long, overgrown hoof wall is subject to breaking off in chunks, cracking, and/or splaying. These conditions cause imbalances, as well as compromising the protective aspect of the hoof wall. This compromise leaves the horse more susceptible to a variety of hoof issues, for example abscesses. Regular trimming also ensures the hooves remain at a length and angle that result in a balanced lower limb. This will enable your horse to move and perform at his optimum and reduce the amount of stress and strain on vital lower limb structures.



Figure 8

This horse is overdue for a trim.

CHAPTER 3: SHOETING - WHY AND HOW

Does My Horse Need Shoes?

More and more horse owners are asking the question “does my horse really need shoes?” In order to answer this question you need to look at the individual situation and assess accordingly.

One of the major factors involved in this decision is the quality of the hooves you are starting with. A good quality hoof will appear solid, with a uniform shape and no cracks or chips. The frog will be full and spongy. The white line will be of equal thickness around the entire sole and the heels will be solid. Both front feet, and both hind feet, will be an even pair. The feet will also appear to be proportionate to the size of the horse. Hooves that need help maintaining a good size or shape will benefit from the application of shoes. Soft or slow growing hooves that cannot keep up with the rate of wear require shoes so that the hoof does not end up too short and sensitive.



Figure 9
Riding on hard ground or stones can cause the hoof to wear away faster than it grows.

Another major factor to consider is the amount and type of work that your horse will be asked to perform. A pleasure horse that spends most of its life in the pasture will not pose the same wear on its hooves as the horse that schools in an arena, for an hour each day, landing off large jumps or performing lots of tight turns. Shoes may be required on these horses, even if the quality of hoof is good, as the amount and type of work causes an increased rate of wear. The horse that treks over rocky terrain or on firm surfaces will also require more protection than the horse hacking over lush dairy country. Some performance horses also require shoes to aid with traction. Shoes can be altered to allow for the addition of studs or caulks on the corners of the shoe, acting like spikes used in sports shoes.

Some diseases or injuries require a shoe to maximise healing and/or comfort. For these horses a specialised shoe may be advised to relieve strain or add support to specific areas.



Figure 10

This shoe has been modified to move the weight bearing surface away from the injured area of the hoof wall to make the horse more comfortable and allow the area to heal.

For many people the more natural, barefoot, state is preferable. Some of the benefits of keeping a horse barefoot include encouraging the growth of a stronger, harder hoof wall that is naturally tougher. The sole and frog may also become stronger and more durable. A barefoot horse will have more traction on grass or slippery ground than a horse with plain steel or aluminum shoes. However, as discussed above, caulks or studs are often added to shoes to create additional traction. A barefoot horse will not have its hoof wall subjected to repeated nail holes that compromise its integrity. Barefoot trimming is of course also cheaper than shoeing provided the hoof remains healthy and the horse sound.

In conclusion the decision to shoe or keep your horse barefoot should be made on an individual basis. Obviously for some horses circumstances may change throughout the year, or throughout their life, that require reassessment of that decision. In the end every owner should aim to keep a sound horse with solid, well-shaped hooves.

Do My Horse's Shoes Fit Properly?

Before the shoe is applied the hoof should be correctly trimmed and balanced. It is important for the farrier to fit the shoe to the horse and not try to trim the horse just to fit the shoe that is available. A good fitting shoe will then follow the circumference of the hoof from the toe around to the quarters. In the weight-bearing phase of the horse's stride the heel will expand, this expansion is maximised at high speeds. The shoe should allow room at the heel for this expansion so that the heel maintains contact with the shoe during weight bearing even at maximum loads. This means that at rest the shoe will be slightly wider than the hoof at the heels.

Most shoes are attached to the wall with steel nails. A minimum of 6 nails are usually used to attach a shoe. There are a variety of nail sizes available but as a general rule the smallest size of nail that will adequately hold the shoe on for the required period should be used. This will minimise the size of the hole placed in the hoof wall. A variety of nail heads are also available. Choice of nail head will depend on the style of shoe being used and individual farrier preference.

Nails should exit the wall at approximately 1/3 the height of the hoof from the ground. Nail clinches should be smooth against the hoof wall. Fore or side clips, if present, should also be flush to the wall. Fore clips should be placed in the middle of the toe and sideclips should be evenly placed around the hoof.

When shoes are removed the wear on the underside of the shoe should follow the centre of the shoe all the way around to the heel. Hooves that have been allowed to grow over the shoe and shoes that are too small for the hooves will not have even wear at the heels.



Figure 11

An example of a shoe that has been correctly fitted to the horse's hoof. This shoe also has holes drilled so that caulks or studs can be used as needed.

12

**Figure 12**

This shoe has very even wear in the centre of the shoe. It is obvious that the heel has been in the centre of the shoe allowing for full support even when the heel expands under weight.

The average horse needs to be reshod every 4-6 weeks. However this is best judged on an individual basis. Signs that your horse needs to be reshod include a loss of shape to the foot, hoof that is starting to grow over the circumference of the shoe, raised clinches (clinches that are sticking out away from the wall) and loose shoes. Depending on the rate of hoof growth and the type of performance required this time period may vary anywhere from 3 to 8 weeks.

Hot Shoeing Versus Cold Shoeing

The most important aspect of shoeing is not whether it is hot or cold but the skill of the farrier performing the job. Hot shoeing allows the farrier to make greater alterations to the shape of the shoe, drill holes for caulks or even change the nature of the shoe for therapeutic reasons. However it also takes extra time, requires more equipment and can be difficult on horses that are nervous of the smoke. On most horses with relatively normal feet a well-fitted cold shoe on a correctly trimmed hoof will hold no disadvantage compared to hot shoeing.



Photo Credit

Patrick Schimanski

CHAPTER 4: BROODMARES AND FOALS

13



Figure 13

This broodmare is in need of a trim. The long toe increases the chances of laminitis as it places extra mechanical stress on the laminae.

General Hoof Care

All too often broodmares are seen with hooves that have gone many months without trimming or care. The extra weight carried during pregnancy puts even more pressure onto the hoof wall and without regular care the hooves quickly spread and crack. This, along with the extra weight and lack of regular hoof picking, will increase the risk of abscesses and bruises. As the hooves lose their shape and balance the risk of laminitis due to mechanical pull and stress on the laminae also increases. Regular care and trimming of broodmares, throughout the year will not only increase their comfort, but often increase the longevity of their life as a successful healthy broodmare.

Assessment of hoof and limb conformation should be made on foals

approximately a week after birth to determine if any interventions are required. Foals' hooves grow rapidly in both length and width. Ideally foals should have routine farrier visits approximately every four weeks starting at a month of age. Not only does this ensure correct balance and shape of the foot but it has the added benefit of educating the foal to farrier care.

The foal is born with a perioplic membrane enveloping the hoof. This membrane protects the mare's reproductive tract during the birthing process. Once the foal begins to walk the membrane on the sole of the foot is worn away. The rest of the membrane then retracts to just below the coronet. At this point it creates a groove.

New hoof, after the foal has been born, is grown under the effect of weight bearing which creates horn of differing composition to hoof developed in utero. Due to the change in horn composition and differing angle of new growth there comes a time when the initial foal foot needs to be trimmed off as it cracks and breaks unevenly.



Figure 14

This foal has a prominent line showing the difference between his foal foot and the new hoof growth since birth.

Photo Credit:

Christine Bambray

Angular Limb Deformities

Correct limb conformation is important for the soundness, athletic and sales potential of any horse. The first few months of a horse's life are vital in this regard as they give you a chance to influence the future conformation of the horse. Having a veterinarian and farrier who work in conjunction is a great asset to any breeder. Minor deviations in limb conformation produce uneven hoof wear and growth, which in turn create a greater imbalance in the limb. Regular monitoring, both standing and at a walk, as described in the previous hoof balance chapter, ensure that developmental problems are noted in the early stages. Prompt, early treatment provides the best chance of success by conservative methods. Due to the narrow chest and long limbs of most foals a slightly base wide, mildly toed out conformation is normal. The foal's HPA is also naturally steeper having a normal angle of closer to 60-65 degrees.

For foals that are identified with limb deformities corrective trimming and stall rest can be used solely, or in combination with surgery for more severe cases. Extensions can be made out of acrylic materials or special shoes can be made/bought and applied. Cuffed shoes should be removed after 7 days as they can restrict the outward growth of the hoof.

15

**Figure 15**

This foal has lateral extensions applied to aid in the correction of an angular limb deformity.

Photo Credit

Timothy Pearce

Flexural Limb Deformities

Flexural limb deformities are deviations in the form of contraction or over extension at any joint.

Foals born with contracted limbs benefit from treatment by your veterinarian alongside support bandages. Some foals with flexural contractions may also need corrective farrier treatment in an aim to gradually restore the HPA.

Many foals, especially those that are born premature, are born with laxity in their tendons causing their fetlocks to drop close to the ground. This is most common in the hind legs but often occurs in the front legs as well. For most foals controlled exercise to strengthen the muscles and tendons resolves the issue. If the laxity is severe shoes with heel extensions can reduce the amount the toe lifts off the ground and protects the bulbs of the heels from excessive wear. In moderate to severe cases it may be necessary to protect the fetlocks from abrasion by applying very light bandages. Heavy or supportive bandages should be avoided as they can worsen the condition.



Figure 16 - Multiple tendon joint laxity in a premature foal.

Figure 17 - Carpal contraction (contracted knees)

Figure 18 - Fetlock contracture in both front legs. This occurred as a result of the foal having an infected pedal bone in both front feet.

Photo Credit: Dr Jane Axon

CHAPTER 5: COMMON DISORDERS OF THE EQUINE HOOF

The most common site of lameness in the horse, of any discipline, is the foot. Of this, the front feet are more commonly affected than the hind feet. This incidence is not surprising as the front end bears more weight especially at high speeds and over fences. Numerous disorders can affect the hoof and some of the more common are discussed in this chapter.

Solar Bruise

A solar bruise is a contusion of the soft tissues between the sole of the foot and coffin bone. This most often occurs due to trauma such as stepping on a sharp rock or object while being ridden. Leaving a horse too long between shoeings greatly increases the risk of bruising as it delays breakover and causes the pedal bone to be driven into the sole. Bruising can also occur from repeated concussion on hard ground. Small blood vessels in the area of trauma rupture, causing a haematoma (pocket of blood). The associated pressure and inflammation results in pain ranging from mild to severe.

Clinical Signs and Diagnosis

A solar bruise may sometimes be visible on a freshly trimmed foot. More often it is diagnosed from a range of clinical signs. The hoof may be warmer than its counterpart. Palpation of the vessels running down behind the fetlock to the hoof often reveals an increased pulse. The application of hoof testers reveals increased sensitivity in the area of trauma. Your veterinarian may also decide to perform a perineural block to the foot to confirm that the hoof is the source of the lameness.

Treatment

Anti-inflammatories and rest are the first steps of treatment and, in uncomplicated cases, may be sufficient remedies. Poulticing the foot or bathing with epsom salts can reduce inflammation, relieve pain and help draw out an abscess if it develops. Most uncomplicated solar bruises carry an excellent prognosis and tend to resolve with proper treatment in 5-7 days.

Once the bruise has resolved some veterinarians/farriers may advise the use of a pad under the shoe to protect the sole. It should be remembered that an ill fitted pad can actually increase the likelihood of bruising by applying more pressure to the sole of the foot.

Horses that have been subjected to prolonged periods in a wet environment are predisposed to solar bruising as the constant moisture softens the protective nature of the sole. Horses that have previously had laminitic episodes are also at a higher risk of solar bruising as the rotated tip of the pedal bone (P3) applies pressure to the blood vessels below.

Corns

Corns are bruises located between the wall of the hoof and the bar of the foot (alongside the frog).

Corns are diagnosed and treated in the same manner as subsolar bruises. In order to remove the initiating cause the shoe should be removed and then refitted once the horse is sound.



Figure 19

A corn was found during a lameness exam on this sport horse.

Abscesses

Hoof abscesses are probably the most common cause of severe acute lameness in NZ horses. A hoof abscess occurs when pus builds up in a localised area between the hoof wall (submural) or the sole (subsolar) and the inner components of the foot. Pus is formed when bacteria gain entry through a compromise in the external structures of the hoof. Gravel, dirt or manure commonly carry bacteria through cracks in the hoof walls, breaks in the white line or, more rarely, misplaced nail holes. The bacteria invade the tissue inside the hoof and cause inflammation. The body reacts to the foreign substance by sending specialised cells to fight off the bacteria and by walling off the area of infection. As the infected tissue and cells die they form an exudate (pus) that builds up within this walled off area. The associated pressure on the surrounding tissues within the hoof capsule causes the severe pain seen with an abscess.

Clinical Signs and Diagnosis

The clinical signs of a foot abscess are similar to a subsolar bruise. However as the days progress the horse gets increasingly lame on the affected foot, often to the point where they are reluctant to bear any weight on it. Most commonly an increased digital pulse is noted to the affected foot, which may be accompanied by increased heat in the hoof. Sometimes there is swelling in the pastern, fetlock and tendon areas. Hoof testers can be used to localise the area of the hoof affected and often a small track can be seen along the white line in this area.

Treatment

The best way to treat a hoof abscess is to establish drainage. If shod the shoe should be removed and the abscess localised by hoof testers if possible. The hoof should be cleaned by trimming a fine layer off the white line and bars. If a tract can be seen then it can usually be followed carefully with a hoof knife to the source of the pain. Once the abscess has been ruptured a grey/black exudate will begin to drain from the opening. In order to maintain drainage and keep the area clean a foot poultice can be applied at this time. Antibiotics are not indicated for a uncomplicated foot abscess. However it is imperative to check the horse is up to date on tetanus immunisation and cover with a tetanus anti-toxin if necessary.

Although this common condition may strike even the best-managed hooves, regular trimming to help avoid unnecessary cracks and chips in the hoof wall as well as some reprieve from wet, muddy ground is the best form of prevention.

Thrush

Thrush is caused by fungus or anaerobic bacteria infecting the frog, most commonly in the grooves that run down the sides and centre of the frog. An overgrown frog with deep crevices makes the horse more prone to developing thrush as dirt and debris get embedded.

Clinical Signs

Until the thrush has reached an advanced stage most horses will show no degree of lameness. The most common sign is a potent smell when picking the feet and an unhealthy frog.

Treatment

The best treatment is removal of necrotic frog tissue and exposing the area to air. The opened lesion can then be treated with hydrogen peroxide or a topical antibiotic. Treatment should be repeated as necessary and the sulci kept as clean and dry as possible.



Figure 20

This horse was diagnosed with thrush. The frog has been debrided and a topical antibiotic and antifungal spray applied. More debriding will be necessary.

Photo Credit

Bruce MacDonald

White Line Disease (Seedy Toe)

White line disease, commonly referred to as seedy toe, occurs when opportunistic bacteria or fungi cause a progressive separation between the outer wall of the hoof and the middle layer of tissue. Horses can vary from sound to severely lame depending on the amount of separation that has occurred. When left untreated white line disease can result in disruption of the laminae and pedal bone rotation.

Diagnosis

White line disease may be diagnosed first by your farrier on a routine trimming. Removal of a small area of crumbly, gray material near the white line will reveal separation of the hoof layers. The disease always begins at the sole surface and progressively moves up toward the coronet. In advanced cases horses will be lame on the affected hoof. Radiographs of the foot should be taken to check if the pedal bone has rotated within the foot.

Treatment

The most important aspect of treatment is removal of the dead and infected areas. In some cases this may require a large area of hoof wall to be resected. Farriers may need to return every 7-10 days initially to ensure all infected areas are removed. Once the affected wall has been removed anti bacterial and/or anti fungal agents such as dilute iodine, or copper sulfate is used. The horse should be kept in a clean, dry environment to avoid reinfection. A supportive shoe should be placed if possible to protect the toe until the hoof wall has regrown. Depending on the size of the resection, additional clips, heartbar shoes, pour in pads or glue on shoes may be required to support the pedal bone. Diligence on the part of the owner and the farrier is necessary to both eliminate the infection and avoid recurrence.



Figure 21

These photos show a foot that has been treated for white line disease. Although this appears drastic it is necessary to remove all the diseased foot in order for healing to take place.

Laminitis

Laminitis begins with inflammation of the sensitive laminae of the foot. These sensitive laminae interdigitate with non-sensitive laminae from the hoof wall to suspend the pedal bone within the hoof capsule. Inflammation progresses and leads to death of the cells within the laminae. This causes painful separation of the laminae, disrupting the attachment of hoof capsule to pedal bone and resulting in rotation or sinking of the bone within the hoof capsule.

The full range of laminitis causes are not fully understood and it is beyond the scope of this booklet to discuss the many theories involved. Some of the more common factors that place a horse/pony at high risk of laminitis are noted below.

- **Obesity and Over-eating**
- **Toxaemia/Illness**
- **Concussive/Mechanical**
- **Corticosteroid**
- **Hormonal Imbalances**

Clinical Signs

Laminitis usually presents as an early onset of lameness, often but not always, affecting both forelimbs. Many horses are reluctant to move and stand with increased weight on their hind limbs. When asked to move they land notably heel first. Lameness is worse on hard or stoney ground and on turns. The hooves may be hot and will have an increased digital pulse. In advanced cases there will

be extreme resistance to picking up the foot as the horse is reluctant to bear more weight on its counterpart. The sole is sensitive to hoof testers especially in the toe area. If the pedal bone has dropped a depression may be felt around the coronary band area and there may be noticeable bruising or bulging on the sole.



Figure 22

This radiograph of a horse with early laminitis shows rotation of the pedal bone (P3) within the hoof capsule.

Diagnosis

Diagnosis of laminitis is usually first made on clinical signs and history. Radiographs should be taken to determine if rotation or sinking is present and, if so, to what degree. Many cases of laminitis will not show rotation on initial presentation and it is a good idea to take repeat radiographs 5-10 days later.

Treatment

In the early stages the horse should be removed from any factors that may have precipitated the laminitis. Placing the horse in a stable with deep sand or shavings helps provide comfort. Movement should be avoided as much as possible. An anti-inflammatory such as phenylbutazone should be administered to provide pain relief. Mechanical aid in the way of a soft heel wedge can help support the frog and relieve pressure from the digital flexor tendon. This wedge can be made with any conforming material and duct tape and replaced as necessary.

In chronic cases the farrier should work with the veterinarian and radiographs with an aim to realign the pedal bone (P3) in its proper position relative to the ground. This should be attempted while maintaining a proper HPA. By moving the point of breakover back the laminae will suffer less force during weightbearing and breakover points of the stride. This will help decrease further laminae separation. Heel support in the form of a heartbar or reverse shoe may help relieve tension on the deep digital flexor tendon. It is also imperative that the farrier and vet work to unload any areas of pressure that have been caused by the altered stance and growth during the laminitic episode.

Cracks

Hoof cracks can affect horses of all breeds, types and disciplines. Most commonly the crack is in a vertical direction starting at ground level. This type of crack is commonly referred to as a grass crack. Other types of cracks include sand cracks, that begin at the coronary band and progress downward and horizontal cracks that run parallel to the coronary band. Any of the above types may affect the hoof wall at the toe, quarter or heel. Most cracks are superficial and affect only the insensitive horn of the hoof wall. However if left untreated these cracks can progress to deep cracks that penetrate the sensitive tissue. These cracks may bleed, cause lameness and/or become infected.

Horses with poor quality hoof wall are most susceptible to cracks. Lack of regular trimming resulting in overgrown and unbalanced hooves puts increased pressures and added leverage on the wall. Constant wet, or alternately, extremely dry ground conditions weaken the hoof wall and leave it more vulnerable to cracking. Imbalances in the hoof, as well as poor conformation in foot or limb, is another contributor to hoof cracks due to uneven weight loading and stresses.

Less commonly seen are cracks to the bars and sole of the foot. Solar and bar cracks are most often seen in horses with chronic low grade laminitis as they place excess weight onto their heels. Internal pressure associated with the rotation of the pedal bone also contributes to sole cracks. Long toes with low heels increase the risk of cracks at the bar of the hooves from the excessive weight placed on the heels.

Treatment

The hoof should be trimmed back to a balanced state and round shape. For superficial toe cracks a shoe with side clips at the widest point of the hoof may help protect the wall and support and stabilise the hoof. For deeper cracks stronger forms of stabilisation may be required to avoid movement of the hoof wall. After a thorough cleaning and debriding of dead tissue by your veterinarian or farrier, screws can be placed either side of the crack and wire tightened across them. The screw and wire can then be reinforced by the application of an acrylic hoof patch over top. It is important to have no elements of infection in the crack when the acrylic is applied.

Quarter cracks and heel cracks are most commonly caused by a lateromedial imbalance. It is vital to correct this imbalance for treatment to be successful. Floating the quarter to reduce the stress and remove the weight from the affected area of hoof wall can be effective when done correctly. A bar shoe will add support to the area. As with toe cracks patches will add stability and support in severe cases.

The only treatment for bar or solar cracks is to eliminate the initiating cause. In the case of chronic laminitis this will usually involve radiographing the feet and trimming them to restore the pedal bone (P3) to its proper position relative to the ground. For horses with bar cracks due to excessively long toes and under-run heels, trimming to restore a proper HPA is needed.

Trauma

As with all other parts of the body the hoof is susceptible to trauma from foreign objects or the horse itself. It may be necessary to trim the hoof in a way that ensures the traumatised area does not weight bear. Remedial shoes may also help to redirect weight away from the area as well as provide necessary support. Disruption to the coronary band may result in permanently altered hoof growth and a distorted hoof capsule. A shoe may also be used to change the weight distribution to make horses with injuries more comfortable and aid in healing.



Figure 23

A severe crack in this horse was causing instability of the hoof capsule and lameness. The crack was debrided and cleaned. Screws and wires were used to stabilise the crack and the defect was patched with an acrylic hoof repair. The horse returned to work within a week.

Figure 24

Wire was used to stabilise this crack and allow the hoof to grow down intact.

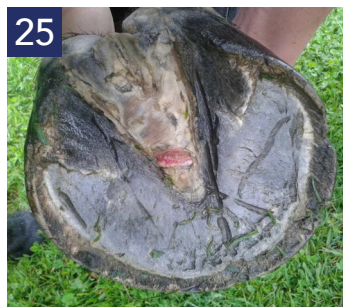


Figure 25

Trauma to the frog or the sole can be very painful. It may be necessary to use a shoe to ease the pressure on the affected area.

Figure 26

This shoe dramatically raises the heel to take weight off the flexor tendon.

Figure 27

This shoe has been designed to take the weight away from the damaged heel.

CONCLUSION

The hoof of the horse is vital to the well being, welfare and performance level of every equine. What appears on the outside to be a straightforward capsule actually encloses many complex structures and processes. Hopefully this booklet has given you a little insight into the anatomy and workings of the equine hoof. This understanding should help you prevent some of the common problems associated with hooves and help you decide how and when to treat the problems that do occur. Good communication with your farrier and vet is vital to helping maintain your horse's hooves in optimal condition; keeping them at their most comfortable and helping them to perform to their maximum level.



Photo Credit

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Photo Credit

Alexandra Pearce

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