

# An overview of Common Hoof Problems from an Equine Podiotherapist's perspective:

By Mike Ware, Equine Podiotherapist



Mike Ware, Manager Easycare Down Under and Hoof Boots Australia, an Equine Podiotherapist and Director of the **Australian College of Equine Podiotherapy** offers insights for dealing with common hoof problems using natural hoof care methods.

Mike says "if you are reading this article and looking to help a horse overcome hoof problems, don't just do the same old thing and use a "band aid" approach there are new and powerful alternatives available now.

Natural hoof care has the ability to turn around even long term hoof serious problems. You have nothing to lose and everything to gain by it!" It is based on the latest scientific research and if done correctly is a powerful healing tool being used by many veterinarians now and, I believe soon it will be standard practice for all equine vets.

## Firstly a "cook's tour" of the hoof and some new insights into the most common problems that occur in traditionally shod horses.

Long toes, under run heels, contracted heels, flares, hoof cracks, quarter cracks, thin soles, weak walls.....they are all caused by the process of Hoof Deformation!



## What is hoof deformation?

It is a slow and gradual distortion and finally the collapse of the hoof capsule. There is a biomechanically correct shape that evolved for the equine hoof. If you lift a hoof up and support it peripherally by traditional shoeing, or poor trimming practices the hoof will slowly distort. Vary too far from the physiologically correct shape and the capsule and its contents are put under abnormal stresses.

The distortion can vary from a minor imbalance to serious deformation where the hoof capsule loses its structural integrity and begins to squash and compromise the internal soft tissues of the hoof as with the long toe – under run heel hoof form.

The hoof is not a hard unyielding lump on the end of the leg. It's a living dynamic structure always reforming itself in response to the stresses put upon it. If abnormal stresses are constantly applied (i.e. if you shoe to suit the shape of an ever more distorted capsule) then the hoof reforms into an incorrect form.

**With years of incorrect loading and stressing it will reform into a shape that is at war with the horse's own biomechanics.**

Inappropriate stresses on the pedal bone (P3) eventually cause regional bone loss and as the pedal bone strives to balance an unbalanced hoof the palmar processes elongate, begin to ossify (turn to bone) & these can be seen on radiographs.

The further the hoof form verges away from physiologically correct the more obvious are the outward visible signs. The rate this condition advances depends on the type and quality of hoof care the horse has received during its life.

Diet and ongoing bouts of sub clinical laminitis due to stress, diet or insulin resistance will also play a huge role in speeding up this process.

Major deformations can be usually reversed with correct hoof care and a suitable diet but it takes time. Left unchecked they can continue to progress to the stage where the horse develops serious hoof issues such as navicular syndrome.

## How do you know if your horse has hoof deformation?

If your horse's hoof form displays the following characteristics then he most certainly has hoof deformation. These are not stand alone conditions as we formerly thought, they are the outward signs of stress from hoof deformation and mirror the internal changes.

Some of the most common outward visible signs of hoof deformation shown on the photo below are:



1. A raised upward sloop in the coronary band.
2. Overlong and under run heels (although they are very low you will see they are also very long)!
3. Cracks in the hoof wall. These appear because the horse's weight in motion flexes the unnatural hoof form constantly at that point so it weakens and cracks. Restore normal form and they grow out. Yes they do!!!!
4. Horizontal lines appear in the hoof wall from sub clinical laminitis episodes. These are not "growth rings" as we used to think. They are a warning sign of sub clinical laminitis. The white lines on the photo indicate what the physiologically correct hoof form should be for this horse.

The photo below looks to be a neatly shod hoof but beware the neatness of the shoeing job has nothing to do with structural integrity which is being compromised by the way the hoof has been set up prior to applying the shoe.

Observe the "living" indicators of hoof deformation:



1. The heels are slowly moving closer together with every shoeing as the horse's hoof form deteriorates.
2. The biomechanical fulcrum point of the hoof is so far forward that there is no support base at the back end of the hoof. The suspensory apparatus is now compromised when working at speed due to extreme flexion of the hock.
3. Heel bulbs are hanging out behind the shoes like 2nd story verandahs! Huge leverage forces are now crushing the caudal hoof area (heel area).
4. Horizontal lines are indicative of sub clinical laminitis episodes. In performance horses this can be due to mechanical laminitis from hard work on hooves suffering the stresses of hoof deformation.
5. The pink line shows how out of shape the dorsal wall really is. The toe has been dubbed off to make it appear cosmetically better but the hoof is still hugely out of balance. Appearing better does not reverse the imbalance nor deal with the compression of the internal soft tissue structures in the caudal (heel) areas of the hoof. There would be pain and discomfort for this horse on stride landings on both front feet.

## What does hoof deformation do to the internal structures of the hoof?

The internal hoof is chock full of wonderful evolutionary adaptations that make the horse the fast and agile animal it is today. Provide it with access to varying terrain and varying stimulus and the hoof is totally self sustaining for life. Sadly domestic horses will never have access to this type of lifestyle.

Hoof deformation has great impacts on these internal structures. We all know that the hoof was once the middle toe of a tiny browsing animal and that when it left the forests to graze on the plains for a few million years it evolved to be larger and faster.

To be larger and faster, required that it develop a hard hoof and it slowly lost the use of its outer toes and now stands on the nail of its middle toe! What most horse owners are not aware is that the structures at the back of the hoof (the caudal heel area) also adapted and took on the new and important role of dissipating the huge amounts of concussion that are generated with every stride.

Wonderful and unique are the adaptations that appeared in the soft tissues of the caudal hoof. Now they protect the animal from shock waves and concussion, they supply sensory information about the ground surface and play a huge role in the equine biomechanics. Without these structures, the shock waves from a 600 kilo animal hitting the ground at speed would shatter their bones!



Concussion is arrested in the tissues at the back of the hoof by unique circulatory adaptations called haemodynamics and by a robust fibrous digital cushion. In unhealthy distorted hooves these systems are operating in a less than optimal state.

### Why it is so important to develop and maintain a healthy, robust caudal hoof.

When hoof deformation occurs and the hoof capsule shape distorts the capsule it loses its integrity. The digital cushion becomes fatty and soft and the hoof capsule deforms and folds down on itself at the heels. In some cases heels under run (often seen in Thoroughbreds) in others they become steep and contract and the heel bulbs move closer and closer together also squashing the internal structures.

Either way the tissues in the caudal heel are now very compromised.

This caudal heel area is rich in sensory nerves that detect pain and pressure, they allow the horse to feel the ground and damage there causes ongoing pain. These horses don't limp because tenderness develops in both front feet at the same time.

But the horses do try to protect their sore heels by changing their strides and postures. As the soreness progresses they begin to move like "stick insects" and their bodies begin to stiffen from guarding sore hooves with every stride.

Inside the hoof as deformation continues the lateral cartilages, digital cushion and frog begin to suffer from the affects of atrophy. Soon these tissues are unable to perform their functions as shock absorbers and protectors of the bottom of P3 (the pedal bone) and the bones above in the bony column. So shock waves pass up the bony column and affect the joints, ligaments and bone above.

As the problems progress inflammation sets in due to the constant stresses. Inflammation is a good thing and plays a vital role in healing but when it progresses for a long time the cascade of chemicals that it creates is very damaging to tissue and bone. This can be witnessed in the progression of human arthritis. In the equine often this progression leads to the destruction of bone and the end result can be navicular syndrome.

## Research: The Science behind the Myths.

Horse shoeing has a long and colourful history and one might say it even has a "romantic" history. Horse shoes are said to be "lucky" and farriers are revered in stories and prose. But.....it is time that traditional hoof care with steel shoes is revisited in the light of 21<sup>st</sup> century scientific research. Romance is not a good reason to condemn future generations of horses to a poor quality of life.

Professor Robert Bowker of the Equine Hoof Laboratory at Michigan State University in the US found in his research into the functions of the hoof at cellular level, that the hoof wall construction shows no signs in evolution of developing tissue that is meant to bear the total weight of the horse.

**What he found in his work at cellular level was that its tissue is meant to bond the internal bone to the hoof capsule wall. Weight bearing in the hoof is therefore meant to be shared by parts of the sole, the inner walls, frogs and the heel platforms of the hoof.**

In hooves with advanced hoof deformation these structures are very dysfunctional.

Professor Bowker states "It's a testament to its amazing engineering that the hoof can still function somewhat when it is totally peripherally loaded by a shoe. But in time this suspension of the weight almost totally by the hoof walls brings the laws of physics into play, and the hoof capsule begins to distort under the unnatural pressures".

## Common Questions from horse owners:

### **I have been told my horse just has bad feet!**

***No horse just "has" bad feet. They acquire them slowly over time. Genetics has very little to do with hoof quality. Even though man has tampered with breeds to produce varying characteristics, if a horse has access to a healthy diet and good hoof care throughout its life, hoof problems do not go hand in hand with just being a particular type of horse.***

*Although different breeds have slightly differently shaped hooves the variance from normal is very slight indeed. Bad hooves are acquired from years of bad hoof care & incorrect diet.*

*For too many years we have used very subjective methods when balancing up the hoof. It's no longer acceptable to use these subjective methods when the hoof actually shows us living landmarks that allow trimmers to know exactly the state of the internal tissues and how far from normal they have diverged.*

***Diet:*** *Nor is it acceptable to just feed our horses diets and pasture species designed years ago for fattening cattle. There is a consequence for this and it is the horse that pays the price!*

*Horses require a diet that suits equines not bovines, and a hoofcare regime based on a paradigm governed by the principles of orthopaedics so they will remain sound for life. The principles that govern healthy hoof form have only tiny variations between breeds.*

*The basic hoof that evolved has changed little in millions of years and a few thousand years of domestication is not enough time for any evolutionary changes to happen. The biomechanical parameters for healthy hooves are the same throughout all breeds when you use "living landmarks" as your guide.*

***No horse breed has cracks and splits and under run heels naturally. These are "acquired" issues and in some equine disciplines they have become so common now that we now actually blame the horse's breed for his hoof problems!***

*This assumption stops us looking for solutions to many horse's hoof problems and causes us to fail to recognise what members of certain breeds share in common apart from their genetics. We need to ask were they shod early in life before their hoof bones matured? Were they given an unnatural upbringing without access to varying terrain and lots of movement? Were they fed diets that were not suitable? This is especially true in the Thoroughbred industry.*

*When a hoof is correctly balanced using biomechanical landmarks, hoof cracks, quarter cracks, under run heels and forward feet can usually be returned to normal.*

*Cracks are merely a sign that there is too much leverage from the hoof distortion being focused at that particular point. Remove the leverage and the crack will close and grow out. How do you spot hoof deformation issues just from the horse's gaits?*

## **Secondary Postural and Gait issues from hoof deformation:**

Researchers are only now discovering the huge amount of secondary postural and gait issues that stem from living constantly on hooves with caudal heel pain. These postures lead to muscle pain and fatigue. Often what has been thought to be arthritis pain in the upper joints can now be related to long term poor hoof form. Address the abnormal changes in the hooves and many horses again become pain free.

Many horses with hoof deformation carry vague and ongoing body problems that we call body therapists to attend to. This pain limits their performance and causes time off from training so we try to solve them with chiropractic or muscle therapies but unless the source of the problem is also addressed, i.e. the hoof deformation, then the problems just return again and again.

In the past we would head for traditional fixes and ask our farrier to apply corrective shoeing to our performance horses. This came from our misunderstanding of how and why the hoof capsule deforms. Corrective shoeing does not alter the slow hoof deformation or the associated problems.

Hoof deformation cannot be seen on radiographs until it is very advanced and has caused bony changes. These serious changes to the bones of the hoof happen long after caudal heel pain has developed.

As owners we can be observant and look for the postural and gait indicators of developing caudal heel pain.

**Beware the early warning signs!      Toe first stride landings.**



Toe first stride landings at the walk – clearly evident in this young race horse already exhibiting the signs of hoof capsule deformation.

To get relief from those sore heels horses change their gaits and resting postures. They will also try to do toe first stride landings whenever they can as shown in this picture above.

Performance horses working at fast paces are biomechanically unable to do toe first stride landings, (their biomechanics over-ride their ability to do this) so if they have pre-existing heel pain it is aggravated by fast work.

These adaptations can be seen by the naked eye if you watch the horse walk on flat ground. Often if they are walking on dusty tracks you can see a tiny spray of sand spurt out ahead of the hoof as the place the toe down first.

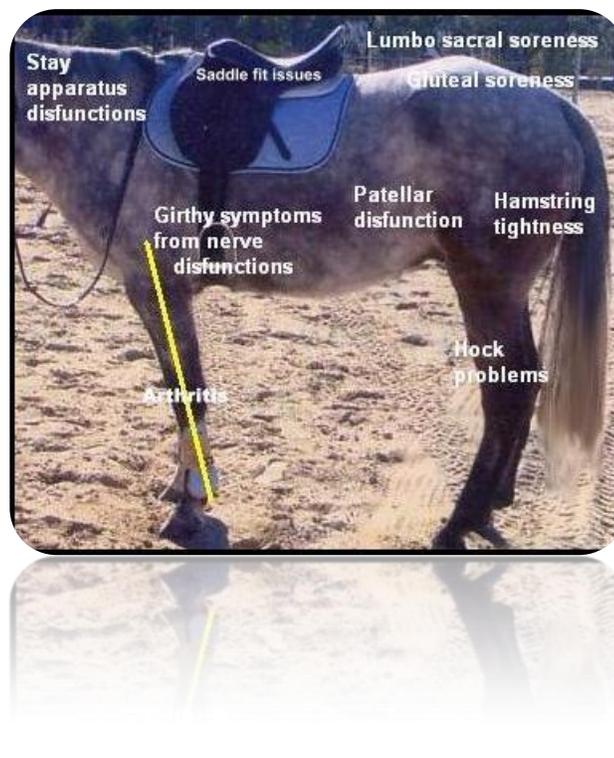
These sore horses often stumble when they accidentally stab their toes into something solid on the ground surface. Normal stride landings at the walk should be heel first.

Toe first landings change the normal biomechanics of the distal limb. They cause the tendons to bear weight in an abnormal way. This causes cumulative trauma to the centre of the tendons. Horse with healthy hoof form should do a heel first stride landing which allows for a controlled slow descent of the fetlock . A toe first landing causes a sudden uncontrolled drop of the weight done the bony column of the leg with a subsequent snapping of the major tendons. This creates a whip lash effect to the centre of the tendon causing cumulative damage there leading to tendon weakness.

Horses who stumble, trip, over reach and collapse at the knees usually have advanced hoof issues.

How can you spot horses that have secondary body problems from sore hooves?

*Even if you don't know a single thing about recognizing deformed hooves you can still clearly see the obvious "postures of pain" that accompany years of hoof deformation and soreness.*



Because of the biomechanics of the equine, the front hooves are usually the ones that suffer hoof deformation first. So the horses begin to adopt a leaning forwards stance to get some weight off those heels. We have all seen this stance but perhaps not recognized if for what it is. The horse looks like an elephant standing on a box or a goat on a rock.

Note: Often the conformation issue known as "over at the knees" is an adaptation not a fault! What you are seeing is the horse leaning forwards for some heel relief.

If your horse is standing like a circus elephant on a box as this one in the photo is, he already has "reversed" hoof angles due to deformation of the hoof capsules. He has caudal heel pain and will also certainly have secondary musculo-skeletal issues from this. This posture is the greatest indicator of "reversed angles" when the hoof form has verged so far from physiologically correct that the forefeet and hind feet angles are reversed.

This causes a lot of secondary issues in the hock and stifle and pain in the lumbo sacral area.

## **Can corrective shoes fix hoof deformation?**

Its not really necessary for me to answer that one. If they could the world wouldn't be full of horses in corrective shoes!!!! No it's not possible to help restore a physiologically correct hoof form by applying more of the same thing that created the problem.

A large part of the hoof deformation process stems from the hoof being held off the ground by a rigid steel band, whilst peripherally loaded on the walls. Corrective shoes and wedge shoes, egg bars and the like, will further crush the caudal heel area and speed up the deformation process. They are merely palliative care for horses and they mask the ongoing cumulative damage, in my opinion from the vast number of successful rehabilitations I have seen

If you have a horse suffering navicular syndrome this is directly related to hoof deformation, you need to contact an Equine Podiotherapist who can discuss his rehabilitation with your veterinarian. There are new techniques available now that do not require invasive procedures and are very successful.

## **Why are some horses so sore when their shoes are removed?**

When you remove your horses shoes often the comment is made "look how sore he is ..... you can see he needs shoes". Actually what he needs is hoof protection and rehabilitation!

You are only now seeing the full extent of his hoof damage. When you see horses creep along gingerly guarding every step, it's not because they "need" shoes it's because their hooves have become so dysfunctional that the protective structures have wasted away and they now they are walking on depleted soles, and have poor digital cushions, so they are very tender.

If you are going to remove shoes from a long term shod horse then do not apply a barefoot trim straight away.

## **How do you reverse hoof deformation?**

Firstly you need to redevelop those depleted caudal heel structures and slowly remove the leverage forces from bottom of the walls, plus get those heel platforms re-established...basically you are going to try to restore normal hoof balance so that the biomechanical centre of the hoof is again in the correct place, and the horse bears weight as it should. This cannot be done in one trim and if you try to do it that way you will make your horse very very sore.

Never let anyone weaken the hoof by excavating bars "supposedly" to speed up the decontraction. Bars are part of the structural integrity of the hoof capsule and this practice will not decontract the hoof. Bars that are greatly overgrown can be tidied up if necessary. Frogs are also an important element of the hoof. They should not be cut back and manicured...they contain millions of proprioceptors that send information to the horse about the ground surface and the amount of pressure he is placing on the hoof.

Rehab. must be done slowly over many trims. There are years of damage in that hoof and it may take six months or longer to reverse it. But.....if your horse is continually abscessing during this process, then it's time to question your hoof care provider about what methods they are using.

Abscessing is also not a normal outcome of shoe removal and trimming. Ask an Equine Podiotherapist to assess your horse if you are having problems with constant abscessing you may have a horse with sub-clinical laminitis. By careful use only non invasive trimming that removes the excess leverage from the hoof capsule and encourages the hoof shape to slowly grow towards a more normal form, the deformation issues can be resolved without too much stress.

It may take some time and several trims and it will require the owner to have the horse trimmed no longer than four weeks apart. This is really important! If you leave your trim cycle longer than that you are right back where you started. Often as the horse progresses it speeds up the rehab. if your trimmer can show you how to do some very basic maintenance trimming yourself.

Many owners are seeking to attend workshops and learn a basic maintenance trim so that they can take over the ongoing maintenance of their own horse. It really speeds up the rehab process even if you do no more than rasp around the hoof wall in between professional trims.

## How to transition out of steel shoes.

When you remove the shoes for the first time leave as much of the sole as you can for protection no matter how cruddy it looks. Then just turn the horse out in a soft pasture with a bland diet and do not touch his feet for a couple of weeks. There are many changes happening inside those newly unshod hooves and the horse needs time to adjust.

If you are removing shoes due to laminitis I suggest that you find an equine Podiotherapist to assist you or if you do not have access to this type of help that you consider reading the book by Master Farrier & Equine Podiotherapist Andrew Bowe. This text logs his successful rehabilitations at Mayfield Barehoof Centre in Victoria. It is a “hands on” guide for owners/vets/farriers dealing with serious laminitis. See [www.barehoofcare.com](http://www.barehoofcare.com) I believe this is one of the best texts on this subject available at this time.

Good trimming is often not about what you take off, it's about knowing what to leave until the hoof can cope with trimming that encourages it to reshape into a more healthy form over several trims. When you come to trim the horse you will probably see that there is a lot of flaring to remove on these imbalanced hooves.

Be careful and only take off the flares on the bottom third of the wall. Never allow trimmers/farriers to file flares off all the way up to the coronet band, it creates excess flexion in the hoof capsule and promotes soreness.

These hoof capsules are already weakened and if you make the foot look tidy by filing off flares up towards the coronary band you will have a very sore horse in those early weeks. If you just remove the flares from the bottom of the hoof which still removes the leverage forces and starts the hoof capsule growing into a more normal form. Then after a couple of trims you can deal with the rest of the flares as they grow down.

## Does the rehabilitating horse need hoof boots on in the paddock?

No, the average horse needs to be barefoot in his pasture. If he is laminitic then yes, he needs hoof protection and comfort.

The horse generally will protect his own feet by carefully picking his way at a pace that he can cope with, and he needs the stimulation from walking gently around on lots of surfaces to help develop his sole and digital cushion areas.

When riding a rehabilitating horse you will require the use of hoof boots and pads. Yes, I do sell boots and so would naturally recommend them, but I came to do sell boots in Australia because of their benefits to the horse and the need for professional hoof care providers and owners to have access to hoof protection.

Boots & pads also allow the owner to enjoy their horse as they always have which is also very important.

Restoring good hoof function requires that the internal structures be regenerated and slow gentle ridden exercise helps this happen.

**Do you always need pads with boots for rehab?** For horses with depleted thin soles you will need to use pads in your boots. The pads provide comfort and stimulate the tissues above. They also help the horse become brave enough to stride out heel first as he should. The horse's own heavy weight in motion can be a powerful rehab tool. But... without boots they will creep along trying to maintain those toe first landings, looking for heel protection even in boots. They will continue to hunch their shoulders and brace their bodies to protect their feet and this adds to their already existing musculo-skeletal issues and slows down their recovery. With pads inside their boots they relax and load their heels again.

## **Whats all the fuss about avoiding laminitis & founder?**

Laminitis is a precursor to founder which is one of the most painful and distressing equine problems you will ever encounter. It is little understood and the warning signs are often overlooked by horse owners and veterinarians.

Laminitis can be brought on by many things, obesity, insulin resistance, stress, snake bite, surgery, travel. Usually it is insulin resistance that is the culprit.

Laminitis is a complex and dangerous condition for any horse. It should never be taken lightly and the warning signs should be heeded long before the horse slips into serious founder. Laminitis stems from a metabolic breakdown in the digestive system which releases metalloproteinase enzymes into the horse's system.

It can be from any type of insult to the horse's system. These enzymes destroy the lamellar attachment apparatus that holds the pedal bone tightly to the hoof capsule wall. Once this attachment breaks down the horse's own weight on the toe of the hoof is enough to lever the capsule away from the front of the pedal bone. When that happens the bone may then press down and penetrate the sole. This advanced state of laminitis is called founder.

**Always call your vet if you suspect your horse may have laminitis, it is life threatening if not treated quickly.**

**If you have a horse that is a "good doer" then beware if he/she is also overweight and probably insulin resistant already.**

These horses are insulin resistant and are prone to founder. (see [www.safergrass.org](http://www.safergrass.org)) They are only one "insult" away from disaster. The trigger can be as simple as a frosty night changing the amount of sugars in the grasses of their pasture, an illness, a long float trip, retained placenta or access to sugar rich feed.

Founder is life threatening and catastrophic and even if horses survive, it will take months of painful rehab. before they are able to walk correctly again. (see [www.barehoofcare.com](http://www.barehoofcare.com)) If you suspect your horse is developing laminitis you **MUST**

call a vet straight away as symptoms don't become evident until the syndrome is quite advanced. If you feel your horse might be foundering call your veterinarian at once! If you see the classic leaning back stance where the horse places both his front feet forward, your horse is in deep deep trouble and is already foundered.

There is more information on dealing with founder and a wonderful text to help owners/farrier/vets see [www.barehoofcare.com](http://www.barehoofcare.com)

## **Is founder/laminitis linked to Cushings Disease?**

There is a wonderful website by Robin Siskel in 1999, co-owned with Dr. Eleanor Kellon, VMD. It offers support and information for the owners of horses with Cushings Disease and the owners of insulin resistance horses where both are discussed fully and if you have a horse that is diagnosed with Cushings then we recommend that you visit this site. [www.ecirhorse.com/](http://www.ecirhorse.com/)

### **What is Cushing's Disease?**

Cushings Disease is very common in older horses.

Cushing's Disease is a disorder of the pituitary gland and results in hormonal disturbances. The pituitary gland secretes high levels of the hormone ACTH which stimulates the production of cortisol, a stress hormone. This is generally considered a disease of middle-aged or geriatric equines.

What is Insulin Resistance? Insulin Resistance (IR) is a condition where cells do not respond to insulin, the hormone primarily responsible for transporting glucose into the cells. It is sometimes also referred to as "Equine Metabolic Syndrome" or by the terms "Pre-Cushings" or "Cushingoid" which further complicates obtaining a correct diagnosis.

While IR often occurs in the horse with PPID, it is a distinctly separate condition from Cushing's disease and it can occur without Cushing's. What diets do foundered horses need? Founder recovery cannot be thought of as just a hoof issue. If you have a laminitic horse you will need to carefully monitor every mouthful of food they have access to for the rest of their life. That includes taking into account what nutrients they are receiving in the pasture as sometimes even the most ordinary grasses are rich in sugars.

If your horse is in pasture that was originally dairy country you need to know exactly what they are eating.

For advice and emergency diets see [www.balancedequine.com.au/](http://www.balancedequine.com.au/)

If you have a performance horse you also need to know exactly what it is missing in its diet...glossy adds on feed bags are not good enough, your horse's entire diet including pasture needs to be assessed.

### **What is mechanical laminitis?**

In performance horses there is often a very common condition whereby the laminae connections are weakened by continual inflammation from the shearing forces operating on the front of imbalanced hooves with a brake-over too far forward.

This happens to a lot of racing thoroughbreds & performance horses often it is due to the myth that having a long toe creates a longer stride. This has been proven not to be correct by various researchers into equine biomechanics. What it does cause is more stresses on the toe and a delayed breakover. These horses are constantly tender footed and unable to reach peak performance.

Diet and confinement in stables also predisposes horses to sub clinical laminitis. This ongoing tenderness in the hooves causes them to carry a litany of musculo-skeletal issues. If they suffer an "insult" from illness or diet because they are teetering on laminitis already they can easily pass to the next phase of full blown laminitis.



**How to spot Sub-clinical laminitis** The picture above shows clearly the horizontal lines that appear in the hoof walls of sub clinically laminitic hooves. These are not growth lines, or stress lines they are signs of serious metabolic disturbances. Note how they widen at the heels a clear indication of sub clinical laminitis.

## What do healthy hooves look like?

They are truly beautiful!



References: The research articles of Professor Robert M Bowker:

Navicular Syndrome: Demonstrable Changes within the Vascular Cushion of the Rostral Frog: Deterioration of the CPL's (chondropulvinale ligaments) and AVC's (arteriovenous complexes)

Navicular Syndrome: Initial Pathological Changes Occur in the CPL's (chondropulvinale ligaments) and AVC's (arteriovenous complexes) of the Rostral Frog

Ultrasonic and Microscopic Evaluation of the Cuneate Frog: Earliest Degenerative Neurovascular and Ligamentous Signs Observed in Navicular Syndrome Affected Horses Rather than the Podotrochlear Apparatus

Differences in Tissue Perfusion of the Equine Foot on Different Ground Surfaces During Stance using Doppler Ultrasound

TISSUE PERFUSION OF EQUINE FOOT IN NAVICULAR SYNDROME USING DOPPLER ULTRASOUND

INTERSECTION REMODELING AND DECREASED TISSUE PERFUSION IN NAVICULAR SYNDROME

INTERSECTION REMODELING; BLOOD LOSS AND BLOOD FLOW: CONTRIBUTIONS TO NAVICULAR SYNDROME

COFFIN BONE AND INTERSECTION REMODELING AND BONE LOSS: CONTRIBUTIONS TO NAVICULAR SYNDROME

OSTEOPENIA AND STRESS CHANGES OF THE COFFIN BONE IN NAVICULAR SYNDROME

SIGNIFICANT CONTRIBUTIONS TO HOOF AND SOLE BY LAMINA AND BARS

DYNAMIC STRESS CHANGES OF DISTAL PHALANX AS THEY RELATE TO NAVICULAR SYNDROME

NAVICULAR SYNDROME; CHANGES IN ARCHITECTURE OF INTERSECTION DUE TO STRESS

DYNAMIC AND FUNCTIONAL ARCHITECTURE OF INTERNAL FOOT AS THEY RELATE TO NAVICULAR SYNDROME

HOOF WALL EPIDERMAL LAMINAE: ADAPTIVE RESPONSE TO STRESS

DYNAMIC AND FUNCTIONAL ARCHITECTURE OF INTERNAL FOOT

PEPTIDES AND THEIR ROLES IN NAVICULAR DISEASE

Peptide Roles in the Mediation of Navicular Syndrome

FUNCTIONAL ANATOMY OF PEPTIDE MEDIATION OF INFLAMMATION

OSTEOARTHRITIS IN THE EQUINE; ITS MODULATION BY NEURAL INTERACTIONS

OSTEOARTHRITIS IN THE EQUINE: ITS MODULATION BY NEURAL INTERACTIONS WITH THE SYNOVIAL MEMBRANE

NEUROTRANSMITTER INTERACTIONS BETWEEN NRO AND VLM CARDIOVASCULAR AREAS

NAVICULAR DISEASES: POTENTIAL INFLAMMATION BY NEURONAL PEPTIDES

FUNCTIONAL ANATOMY OF PEPTIDE MEDIATION OF INFLAMMATION

OSTEOARTHRITIS IN THE EQUINE: ITS MODULATION BY NEURAL INTERACTIONS WITH THE SYNOVIAL MEMBRANE

Andrew Bowe — Healing Laminitis with Barefoot Rehab. The Pony that Didn't Die Text [www.barehoofcare.com.au](http://www.barehoofcare.com.au)

Like to hear more about the fascinating research work of Professor Bowker?

The Australian College of Equine Podiotherapy brings Professor Bowker to Australia to as a lecturer for the Diploma of Equine Podiotherapy course which trains professional hoof care providers in specialist rehabilitation with natural hoof care practices. Plus bi-annually the College offers a seminar open to hoof care professionals, vets and farriers where Professor Bowker presents his latest research. Also featured are other presenters, all leaders in the field of equine health.

If you would like to be contacted when the next seminar is held, or have an interest in learning rehabilitative natural hoof care practices, just email the college on [admin@equinepodiotherapy.com.au](mailto:admin@equinepodiotherapy.com.au) and ask to be put on the mailing list.