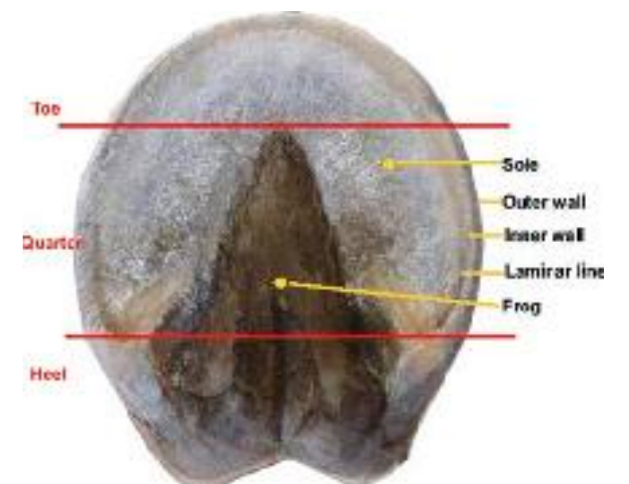
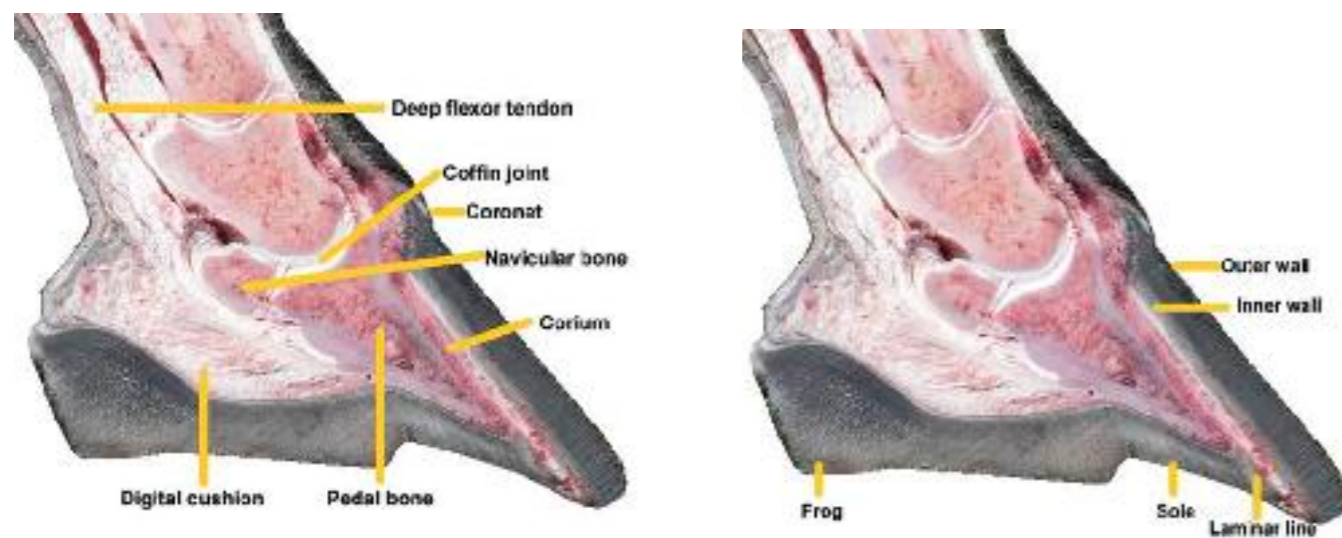


# Horses Have Hooves



*If you own a horse, you own his hooves!  
Each hoof is the fine line between your horse and the hard Australian ground.  
Every stride creates a high frequency impact that needs to be dealt with.  
Hooves need to be the strongest link in the chain.  
Unfortunately, the hooves of domestic horses often become the weakest link,  
leading to loss of performance and often early retirement.*



How we manage our horses' hooves has enormous implications for their long term soundness, but to manage them, we must first understand them a little.

## What is the equine hoof?

The hoof is simply a capsule of hardened skin – not unlike a piece of hard plastic – that fits like a glove over the bones and soft tissues at the business end of the long equine leg (see image on top right).

Within the hoof capsule is a complex array of structures, all of which play an integral role in dissipating the huge concussive forces generated by a large animal in motion.

Everything is there for a reason and all components need to be physiologically correct and fully functioning to achieve life long soundness.

External simplicity belies a highly evolved structure!

The horse evolved over millions of years as a prey animal that was constantly struggling for its very survival, needing to stay one step ahead of its hunters. It was living in the real school of hard knocks and the evolutionary journey produced an animal that had speed, agility, stamina,

a very active flight response, a handy defense mechanism and an ability to sleep on its feet, standing up.

But horses only just made it. They were nearly hunted to extinction by their greatest predatory threat which wasn't lions or wolves, but humans with spears. It was only that they evolved enough to survive the harsh environment of the "Starving Steppe" of Central Asia that they could live where man couldn't. Man was only able to exist in small nomadic tribes and couldn't exert excessive hunting pressure on the last remaining horses.

Horses have well and truly earned the right to be here!

Such a tough journey has produced hooves that are better equipped and stronger than most people would give them credit for. If the hooves didn't work, horses would have been lunch for predators a very long time ago.

The last of the wild horses – from which our domestic stock was directly taken – roamed vast semi-arid grasslands. Horses are prairie animals. They covered many miles every day in their endless search for food and water; many miles over

rough terrain. Movement maintained their hooves. Wear was equal to growth. Their hooves did not get long, but through constant wear stayed short in a balanced framework, so they remained fully functional at all times.

The equine hoof is a successful structure because it is able to fulfill the specific functions that it is designed for and maintaining hoof function is the key to keeping horses sound for life.

## What are the functions of the hoof?

Facilitation of movement – the equine evolved to move, every aspect of its life is influenced by the ability to constantly move.

## Protection

The primary function of the equine hoof is to protect its internal structures. It is the armor plating that keeps trauma on the outside and allows a horse to pound the ground and quickly get out of harm's way. Both the sole and the frog need to be thick and resilient and strength also comes through unity with a tight bond between the sole and the wall through the lamellar line.

*continues page 53...*

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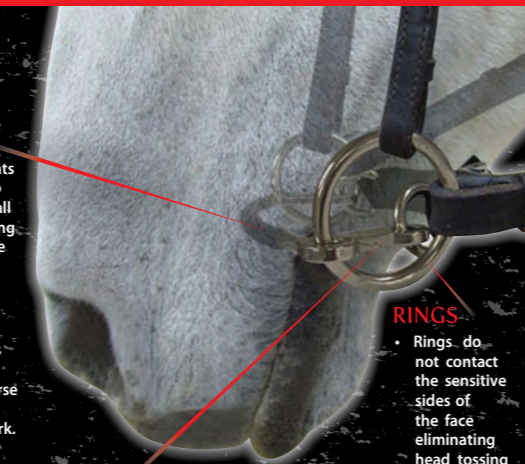
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However, at the same time, the hoof capsule needs to work in harmony with soft internal structures, namely the digital cushion and the lateral cartilages to absorb concussion that is entering the foot as high frequency shock waves.

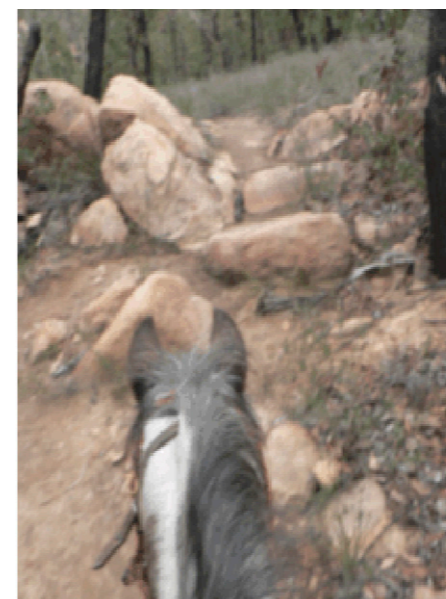
The hoof is a three dimensional shock absorber and converts the impact energy into heat in the blood, made possible by utilizing the moving mass of blood that squeezes through a multitude of small capillaries that are sandwiched between the digital cushion and lateral cartilages.

When the heel landing hoof loads the frog, it presses into the digital cushion, which also gets pressed from above by the descending boney column, so the cushion expands sideways into the lateral cartilages. All of that moving fluid in between very efficiently absorbs the unwanted energy. A master stroke of nature that captures concussion at the ground floor!

### Agility

Survival for horses was not just about pure speed and stamina, but also about agility. For a horse to be agile, it needs to be able to not only feel the surface it is moving over, but it must have spatial awareness of its limbs.

This is called proprioception and there are a large number of proprioceptor nerve endings in the back half of the hoof (the caudal hoof) that are stimulated by frog contact (is there a trend emerging here about the importance of frog function?!).



*Proprioception refers to the spatial awareness of one's limbs*

All mammals have this sense. If you hold your hand behind your back where you cannot see it and point to the ceiling, it is proprioception that is allowing you to know exactly what you are doing, even though you cannot see your hand or arm.

It is also proprioception that allows you to feel pressure, pain, hot and cold. It also causes you not to fully load your bare foot when you step on a rock. It is exactly the same for a horse who senses its world with its hooves.

Agility also requires traction, so the bottom of the hoof is shaped so that it is able to grab the ground. The solar surface of the hoof is not meant to be flat and transforms according to the surface that the horse is living on.

### Provision of comfortable rest

Horses are unique in that they have evolved a special muscular system to sleep standing up!

They are hard wired by nature to have periods when they sleep this way because it allows a prey animal to flee danger very quickly if necessary.

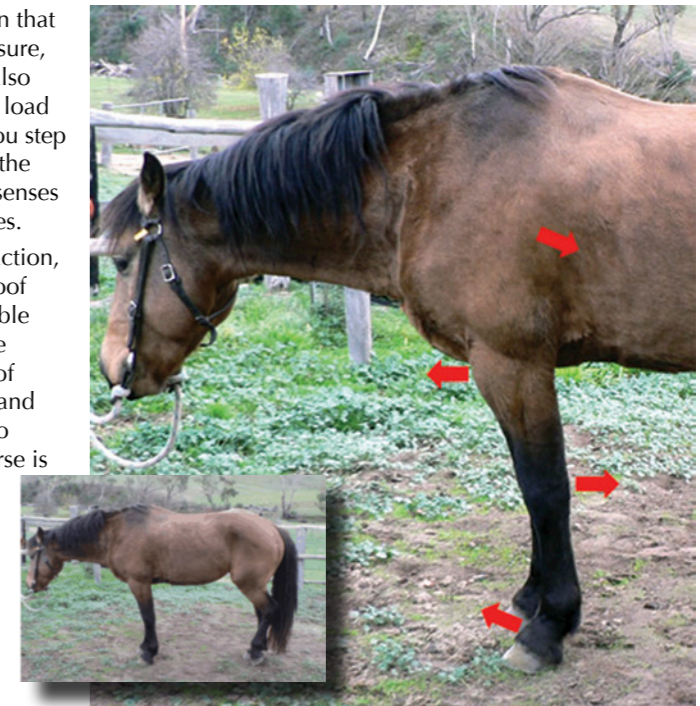
They are able to perform this neat trick because they have a 'stay apparatus', whereby they can lock their legs into a position of exact neutrality (with the opposite and equalizing pull of muscles on each side of the carpus). It's as if the body is held off the ground by a rigid stack of building blocks.

Correct utilization of the stay apparatus is arguably an indirect function of the hooves, but the hooves need to be free from pain so the horse is able to 'stand down' into its frogs on straight legs (frogs get another mention!) and also balanced to the centre of gravity of each limb so the horse does not have to brace itself to engage the stay apparatus.

This system can be severely hindered by dysfunctional or painful hooves, causing horses to adopt abnormal postures that allow them to shift more weight off the caudal hoof area.

The adoption of long term abnormal postures creates many secondary musculo-skeletal issues which are often seen as stand alone conditions, but may actually be stemming from a life on sore, deformed hooves. These secondary musculo-skeletal problems are often the reason that so many performance horses are never able to reach and maintain peak performance.

If you notice your horse adopting a posture as if it is standing on a box like a circus elephant, then it most certainly has caudal heel pain.



*Correct utilization of the stay apparatus is arguably an indirect function of the hooves, but the hooves need to be free from pain*

Be observant and notice if your horse is trying to do toe first landings at slow speeds instead of biomechanically correct heel first landings, often first noticed when a horse becomes clumsy and starts tripping. This is a clear indication that they are avoiding heel pain.

### Circulation assistance

The large amount of blood that is circulating through the hoof helps to form a protective layer that basically lifts the pedal bone off the floor of the capsule, stopping the living corium beneath the bone from having the life squashed out of it. It is actually like having a tiny waterbed in each hoof.

The hoof works indirectly to assist this circulation, by optimizing the pressure within the system. In brief (the circulatory system is extremely complex and possibly not yet fully understood), optimum internal pressure is maintained by ensuring that the greatest possible surface area is sharing the weight that is constantly pressing down from above.

### Advances in research

According to the research of Professor Bowker ([www.pathology.msu.edu/people/bowker.html](http://www.pathology.msu.edu/people/bowker.html)), this means all of the frog, most of the sole and parts of the inner wall should be weight bearing, not just the outer wall. Loading only the outer wall is called peripheral loading which retards circulation and is quite destructive in the long term.

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