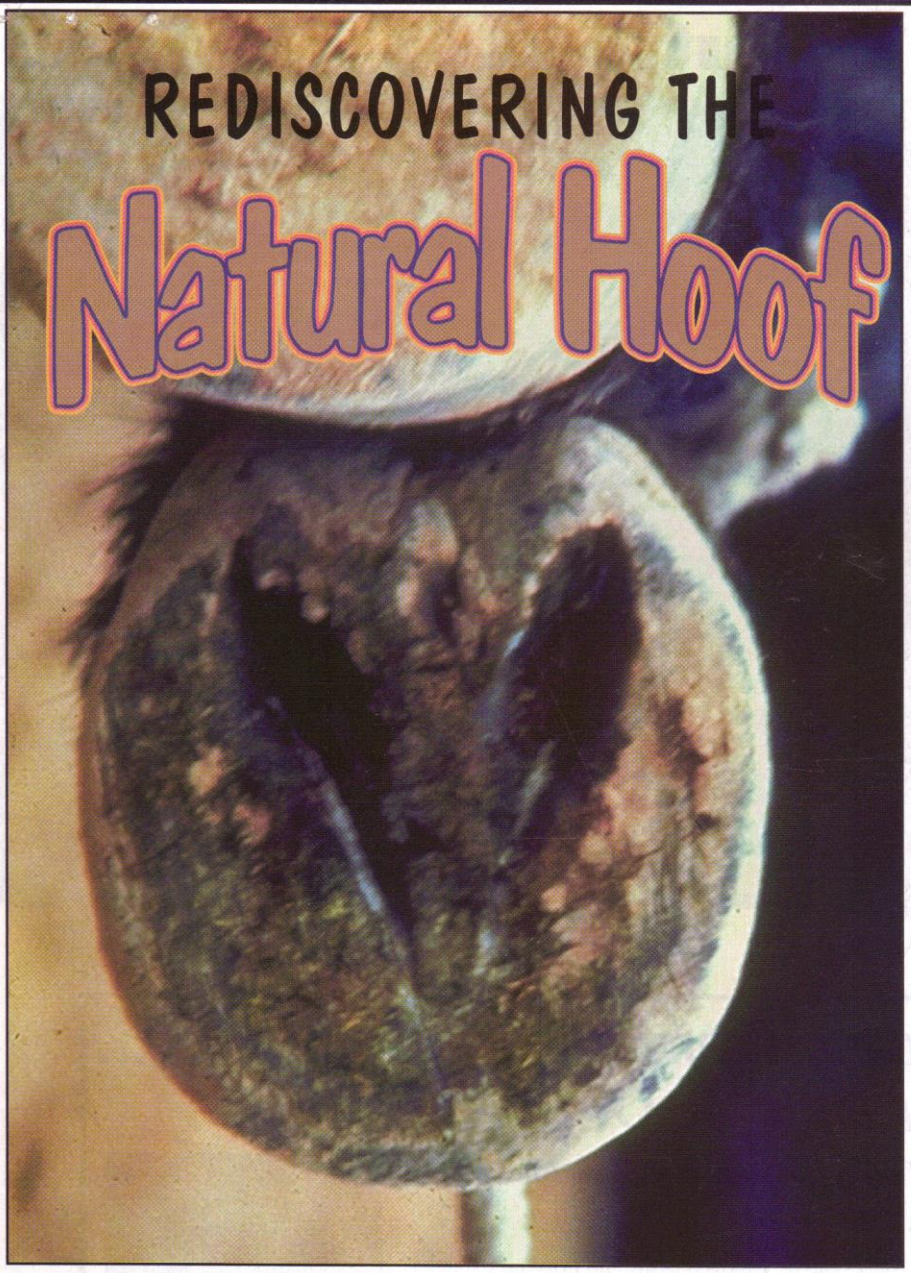
REDISCOVERING THE Natural Hoof



The lame horse is a very frustrating problem to horse owner, veterinarian and farrier alike. It can be expensive not only in actual dollar costs for diagnosis and treatment, but also in lost training time and missed rides or competitions. Farriers and veterinarians alike try to fix lameness problems by "balancing" a foot, but, what is BALANCE in the equine foot? The answer to that question seems to be the age old debate between farriers, veterinarians and horse owners alike. This article is to add to current available knowledge by presenting a new, or rather rediscovered, approach to the balanced foot by using the wild horse as a model for defining balance. By observing and understanding the lessons that nature gives us in the wild horse foot, perhaps additional help can be given to our domestic horses in their times of need.

presented by KIM HENNEMAN, DVM

In The Beginning...

Man has been searching for centuries to balance and protect the foot of his/her equine companion. The adage "no foot...no horse" has been around for hundreds of years. In 1987, one Montana farrier started a search of his own. Gene Ovnicek, frustrated with his inability to help the chronic and vague lamenesses in his practice, decided that the best place to look for the answer to the balance question would be in nature. Using the theory that environmental, nutritional and biomechanical factors unadulterated by man will design the best foot shape for function, longevity and survivability, Mr. Ovnicek measured, catalogued and analyzed the foot forms of over 65 wild horses from various environmental terrains. Knowing that the interference of man on the domestic horse foot is NOT dictated by survivability rules, Mr. Ovnicek then performed the same analysis on randomly selected domestic horses and compared the results between the groups. Some surprising differences were found (see TABLE 1). Additional research is currently being done to understand the differences in internal structures and their relationships between the wild and domestic horses. Preliminary findings are also showing significant differences in the health, sizes, microscopic structure and biomechanics of internal structures between the wild and domestic horse feet.

For the sake of discussion, we will look at the different parts of the horse's feet. The reader is reminded to keep in mind that the foot works as an entire and intact unit. All parts have a job to assist in the function of the foot - land...load...rotate.

Explaining The Differences: HEELS AND FROGS

The significance of these findings is very important when one considers other research currently being done on the biomechanics and physiology of the equine foot. Recent studiesfocus on the circulation of the foot; they show that the primary pathway for blood supply to the foot comes down the back of the leg to the heel and then forward to the toe, with the soft, spongy tissue of the heel (digital cushion) being particularly rich with small veins and arteries. Some researchers think that the frog and soft tissues of the heel act not only as shock absorbers, but also as circulatory pumps. Although this idea has been around for quite some time, it has fallen out of favor in recent decades. However, a thorough look at the interplay between structures and the mechanical characteristics of the tissues involved show that it actually may have some basis in truth.

Veins sitting inside the lateral cartilages of the foot are squeezed and then allowed to open by the compression and relaxation of the digital cushion above the frog. This pumping action allows the blood to fill and then be pushed into the toe and other parts of the foot similar to the function of the heart. The compression of the digital cushion occurs when the horse lands on the foot, specifically

PHOTO 2: A domestic horse foot (4 yr old Thoroughbred-currently racing). This front foot looks like a back foot. The shape of the foot is long and narrow. The frog is narrow and cannot touch the ground. The toe is long and breakover is round.

PHOTO 7: Same horse as in photo 2 but after a Natural trim and application of a World Race Plate™. Note the already apparent expansion of the frog. This horse has had marked improvement of several low-grade ankle and tendon problems since changing to a Natural trim.

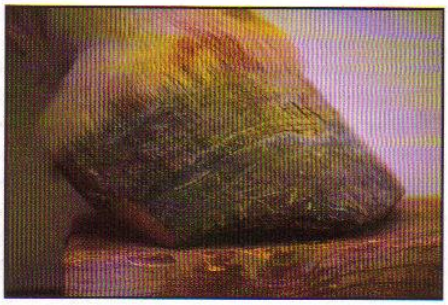


PHOTO 3: A wild foot. Notice how the toe is naturally beveled and toe breakover is actually over the sole. This horse is from a sand and gravel environment, thus the longer heels and worn out quarters. No dish is present down the front hoof wall.

when the frog becomes weight bearing on the ground surface; the relaxation occurs when the foot is non- weight bearing. In order for the frog pump to be effective, it must not only TOUCH the ground, but it must also transmit the forces in the proper direction by landing heel first. This can be simply demonstrated by noticing how your own fingernail color changes from white (poor circulation) to red (good circulation) as you move pressure on the back of your finger from the tip to the fingerprint swirl - pay attention to the color of the very end of the nail. This mimics the circulation movement to the coffin bone and toe lamina of the horse's foot.

Wild horses (in hard terrain) have their heels worn back to the widest part of the frog in order to allow the horse to land and utilize the frog and other soft heel tissues (**Photo 1**). Many shod domestic horses have long heels set further forward thus making the horse land flat-footed and towards narrower areas of the frog. Eventually, the frog retracts and shrinks away from the ground due to lack of proper stimulation and lack of circulation (**Photo 2**). The eventual results are contracted heels, upper leg (knee, flexor tendons, suspensory ligament, shoulder, neck) pain and damage due to loss of shock absorption. Even damage from increased wear and tear to the navicular area can occur.

Horses in medium to soft terrain will not wear the heel down, rather it will grow forward. But in the wild horse, concentrated forces seem to act to break out the hoof walls at the quarter allowing the frog to contact the ground again (**Photo 3**). The broken out heels act as natural caulks for traction. Now think about this in our domestic horses. If the heels are left long (not trimmed back to the widest part of the frog), these same forces and stresses occur - nature's attempt at getting that frog back onto the ground. The shoe, however, prevents the hoof wall at the quarter from breaking out, thus hyperloading of the quarters occurs with the results being quarter cracks, raised coronary bands and, on a more serious level, bruising of the sensitive lamina internally (**Photo 4**).

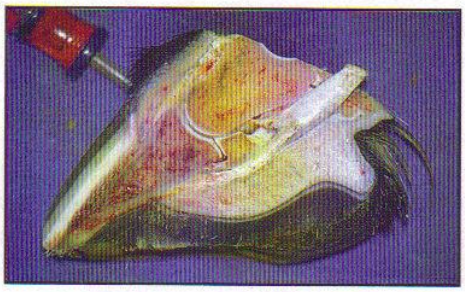
Explaining the Differences: TOES

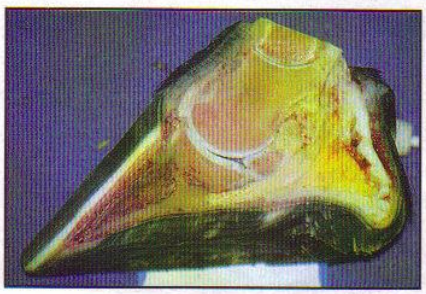
In the wild horse, the toe is worn back in a square shape so that the breakover is just in front of the coffin bone area (see **photos 1 & 3**). The breakover occurs not over the hoof wall as it does in our domestic horses, but rather over a sole callus. The distance from the tip of the frog to the breakover averaged to 1-1/4" in the wild horse. Breakover is quick, movement is fluid, extension is long and interference does not occur.

Our domestic companions, however, typically have a round breakover far removed from the area of the coffin bone. Breakover is delayed, movement can be labored or changed to other joints and interference is a common problem.

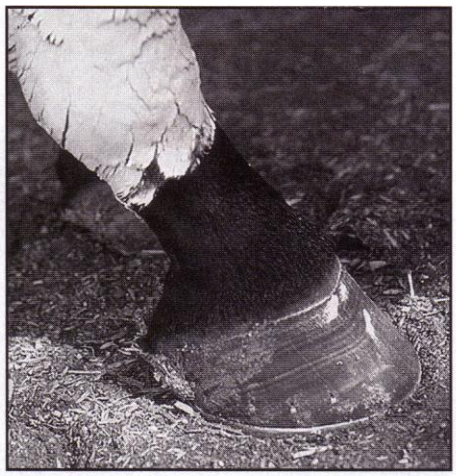
Domestic horses also typically have the foot "cleaned up" for shoeing by paring out the sole so that only the hoof wall touches the ground. Recent research is showing that this move away from the natural shape affects the forces and structures of the foot in many ways. Microscopic comparison of the orientation of the lamina between wild and domestic show significant changes. In the wild horse, the lamina is thicker and the orientation is parallel to the ground. Domestic horses have thinner lamina and an angled orientation to the ground. This change in orientation makes it easier in the domestic horse for the lamina at the toe to stretch and could be a factor in laminitis or founder.

PHOTO 5: Cross-section of a mustang foot (no lameness apparent at time of death). Photo courtesy of Barbara Page, D.V.M. PHOTO 6: Cross-section of a domestic horse foot (no lameness apparent at time of death). Photo courtesy of Barbara Page, D.V.M.





The longer, round toe in the front also increases the lever over which the domestic horse has to break over to move the leg forward. Basic physics and common sense tell us that longer levers can be used to generate more force in a particular area. In the domestic horse, this force may show itself in strains to the suspensory ligaments and flexor tendons (which in turn can effect both knees and shoulders), wear over the back of the navicular bone (where the deep digital flexor tendon passes) and bruising of the tip of the coffin bone (pedal osteitis). Sometimes, we unwittingly may make things worse in our attempts to help by trying to help underrun or contracted heels by using egg bars or longer heeled shoes without addressing an elongated breakover of the toe; we have actually elongated the lever and increased the stress on other structures. These shoes have merit provided the breakover is moved more toward the rear of the foot by rasping away the front of the toe. Understanding the wild horse may help us to address problem heels without causing problems elsewhere.



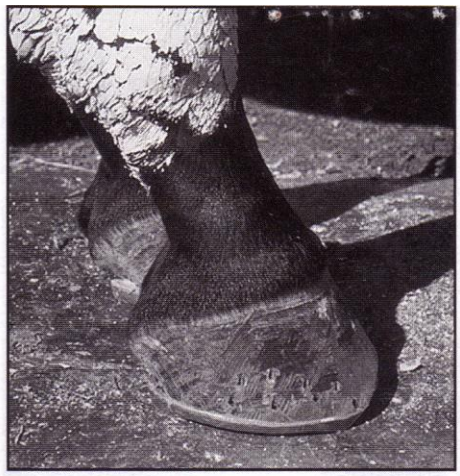


PHOTO 8: Side view of foot from photo 2 & 7 - pre trim. The white on the cannon bone is mud. PHOTO 9: Side view of foot from 8 - after trim. Note how the foot seems to be more under the horse. This horse's racing career and leg health has improved since this foot change.

Explaining the Differences: SUPPORT

What this all boils down to is SUPPORTING the internal structures of the foot in order to allow the foot to do its job. By studying the ground contact of the wild foot, it was noticed that just about all of the sole and frog contact the ground, but very little of the hoof wall does. Only four areas of the wild horse hoof wall actually may be weight bearing, but just about all of the wall in a domestic horse is. The two front points on either side of the toe breakover are called the front pillars and correspond internally with the attachment of the extensor tendon to the coffin bone. The two back points correspond with the part of the heel that strikes the ground first. The hoof wall in the wild horse is important as most skin is - to protect from dryness, excessive moisture, germs and trauma. It is not meant to be the main weight bearing structure, but to assist in it.

Another important, initially overlooked, factor in the mustang was the presence of dirt and mud packed up into the frog and bars. This may be an important factor in furthering a broad base of support for internal structures. In the domestic horse, clean dirt and mud can be left in and around the frog and bars with no apparent detriment to the foot. Stones can't pack into the frog grooves if there is already material there. Thrush doesn't seem to be a problem if the foot is naturally balanced probably due to improved circulation and enhanced immunity to the sole and frog.

Our shod domestic horses have very little of the sole and frog contact the ground. Soles are usually pared away and frogs retract and wither due to lack of stimulation. Mankind has transferred support of the foot away from a broad flat surface and into a narrow outside ring. It has had its consequences. **Photo 5** is a cross section of a mustang foot and **Photo 6** is from a domestic horse that had no apparent lameness problems when it died. Not all the differences in the feet can be discussed here, but some particularly important ones should be noted. First look at the differences between the ground support. The mustang has a thick sole with the ability to touch the ground with just about all of it (some contraction occurs due to processing the foot for study). The domestic horse has a concave sole with very little of it able to touch the ground. Notice the difference between the size relation of the digital cushion (DC) to the navicular (NB) and the coffin bone (CB), the color and size of the deep digital flexor tendon (DDF) and the width and length of the front hoof wall.

Application To The Real World

The trick is now that we may be able to define balance in the natural foot, how do we apply to our domestic horses. Ideally, it would be great to just let our horses go barefoot out in an ideal terrain and let nature do the shaping and balancing that needs to be done. Unfortunately, our horses are asked to jump and race and be ridden at a trot for 100 miles in a day. They are kept in stalls or paddocks where movement is limited. Nutrition is different for the domestic horse thus leading to either fast hoof growth or possible nutrient deficiencies. So what do we do?

It is possible to mimic the mustang foot with both trimming and shoeing. This trim has been called a four point trim, but due to problems caused by individuals who haven't properly applied the lessons from nature, farriers and veterinarians who un-

	WILD HORSE	DOMESTIC HORSE
TOE LENGTH	SHORT (2-7/8" TO 3-1/8")	LONG (OVER 3-1/4")
FLARES	No anterior flare	Consistent anterior flare starting 3/4" to 1" below the coronary band
SOLE THICKNESS	Equal to or greater than hoof wall	Less than the hoof wall
BREAKOVER	1-1/4" from frog apex	(average2" or more from frog apex
MASS DISTRIBUTION	Greater towards rear of foot	Greater toward front of foot
	(2/3 behind widest part of foot)	(1/2 to 2/3 of mass in front of widest part of foot)
RING PATTERNS (hoof wall)	Non existent	Common
COFFIN (P3) bone support	Sole, bars, frog	No support in shod foot (unlessdirt is allowed to pack in foot)
HEEL LENGTH	On hard terrain, heel worn	Heels usually too long and/or
	back to widest part of frog	growing forward
HOOF ANGLE	55°	50° - 65°

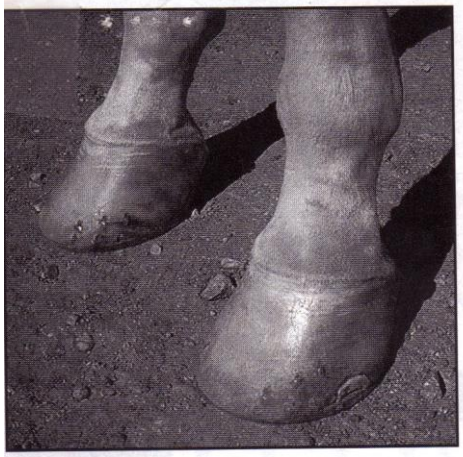


PHOTO 4: A domestic horse showing severe quarter bruising. Notice how one foot has the remnants of a repaired quarter crack. The front of the hoof wall has a significant dish.

derstand the underlying concepts prefer to call it the NATURAL trim. With farrier and veterinarian working together, the anatomy of the individual foot can be identified and used as landmarks for proper heel and breakover placement or in determining whether steps need to be taken to support the sole or frog.

By using the concepts discussed above and having a clear understanding of the interrelationship of all the structures of the foot, a farrier who has been properly trained in the technique working with veterinarian and horse owner can transform a foot into a natural foot. **Photo 7** is the same foot in **photo 2**, now with natural balance and a shoe that mimics the wild foot shape. **Photos 8 and 9** are before and after pictures of a the same foot from the side.

Many horses in various athletic disciplines including endurance have shown not only shortterm improvement in movement, but long-term improvement in health when trimmed and shod using the lessons of Nature to achieve balance and biomechanical stability. Good communication between farrier, veterinarian and horse owner can allow us all to learn in our attempts to keep our equine companions functional and healthy. A clear understanding of concepts and attention to detail are not only desired but are necessary for this technique to be used.

Taking the problem one step further, Mr. Ovnicek has developed the Equine Digital Support System for applying the same natural biomechanics to severe disease such as navicular and laminitis (both acute and chronic) with amazing success. Unfortunately, discussion of the EDSS is beyond the scope of this article, but will be discussed in the future.

For further information on the natural trim or the EDSS, readers are encouraged to contact the author or Gene Ovnicek at 525 Halfmoon Rd., Columbia Falls, MT 59912, (406)892-2977.

Dr. Henneman has a private veterinary practice in Park City, Utah, providing holistic care of the horse including equine chiropractic, acupuncture and homeopathy medicine.