

First of all “white line disease” is a misnomer. It is not a disease at all. It does seem to be an epidemic, though, so teaching farriers to deal with it has become my top concern. The telltale signs are stretched white lines and deep grooves filled with rotting material, where healthy hoof walls and white lines should be; flares that won't grow out, hooves that won't hold a shoe, soles that remain flat in spite of the most diligent care, and recurring abscesses. This list goes on. The bottom line is that the hoof wall becomes detached from the lamina and it seems impossible to most professionals to do anything about it.

In the past, a broad spectrum of bacteria, fungi, viruses, yeasts, etc. were blamed. Michael Wildenstein of Cornell University recently published a wonderful study in *Hoofcare and Lameness* magazine and the *American Farriers Journal* that identified fungal infection as the culprit on the leading edge of the destruction, with all of the other pathogens following behind. If the problems are all coming from fungal invasion, we should be able to open up the damaged areas, treat with an anti-fungal product, and have no more problems; right? Farriers and horse owners everywhere are finding out this is not the case, as hooves continue to fall apart before their eyes.

Is fungus really the problem? Certainly it is a part of the problem. The reason this is on everyone's mind right now is that the eastern U.S. has recently had very wet weather, following a four year long dry spell. The fungi are having a field day with our horses' hooves, skin and lungs. As awareness has increased, horse owners and farriers in dry environments are realizing they have been plagued with it for years as well. But, I have found that “white line disease” can be conquered with a three part attack of 1) making adjustments to the environment, 2) making adjustments to the diet, and 3) competent natural hoof care. If you choose to ignore any of the three components, your results will probably be incomplete or downright unsuccessful, but using the three together, the separation rarely stands a chance.

Horse hooves are highly adaptable. In nature, horses living in arid, high desert regions develop very short, deeply concaved hooves that resist chipping and excessive wear very well. Their rugged durability mirrors the terrain they move on every day. A wild horse living in a soft, wet environment has a very different hoof form. The hooves have slightly flatter soles, and a more flared form that can chip and break away in the soft, wet ground where the wearing of hoof horn is impossible. The key things that these two hoof forms have in common, is that the bone column remains correct in both, and the hoof can do its job in its relative terrain. I may stand alone here, but it is my firm opinion that the very thing that allows hooves in a wet environment to flare and chip, rather than severely overgrowing and setting up a very dangerous situation for the horse, is the very fungal invasion

and wall separation we are trying to fight. In other words, the separation is a defense mechanism. Am I nuts? Just use your head.

Can you imagine what would happen without this separation and flaring? Picture a wild horse herd, living its twenty mile per day nomadic lifestyle, foraging over the sparse rangelands. Now if the herd crosses over a ridge and finds a lush fertile valley, with a soft wet river bottom covered with lush green grass, what do you think they will do? Knowing they are just horses, I'd say they would stay right there until they ate every bite, or a predator ran them off.

Immediately, their hooves will overgrow. The rapid growth and thick calloused horn will not be able to wear at all standing around grazing on the soft ground. If nature had not built in a defense system for this situation, that would be the end of the whole herd. The hooves would grow very tall; forcing the bone columns into very unnatural positions, and lift the horses onto “stilts”. The horses would undoubtedly break their legs, and there would be no way for the hooves to recover and remove the excess horn.

Fortunately, the horses have been well prepared for dramatic change to environment. Like many of nature's ways, it's not pretty, but it works. The hoof walls begin to separate from the horses' coffin bones. As the hoof walls flare away, fungi find a perfect environment in the separations and splits and begin to feed on the hoof walls. This further weakens the hooves, and they break away in chunks. Is this bad news for the horse? Not necessarily, because all of this “destruction” is saving their lives. There will be no unnatural hoof wall length to twist their joints into damaging positions, **rob P3 of its natural support by lifting the sole off the ground**, or disrupt their ability to move. As soon as they get back to their nomadic lifestyle the flared, weakened wall will finish breaking away, and healthy horn can replace it.

Recent research from Michigan State University (Bowker) shows that the epidermal laminae in domestic horses go through startling changes where flares are present. They actually become forked, and then the fork spreads back to the base until the lamina has divided into two weaker ones. This is the body's reaction to stress and an attempt to “hang on” to the flared walls. In contrast, flared wild hooves that come to the University don't show this division. In other words, in spite of the fact that the wild horses are moving twenty miles a day on very rocky terrain, the hooves are not stressed. Why? Only in domestication do we try to force flared walls into a support role. In the wild, a flared wall is moved out of an active support role, and the body makes no attempt to hold onto it.

We recently found wild horse hooves in the Great Basin of northern California. The horse was killed in a cattle grate. She was mature and had beautiful hooves, but some flaring was present after a winter in the snow. She has approximately 410 laminae per hoof, opposed to the “normal” 550-600 we see in domestic hooves (not under natural care). In spite of the fact she had lived most of her life on a solid bed of baseball sized lava rocks, her feet had been subject to far less stress than her domestic brothers standing in soft pastures!!!

The flaring she had was simply the natural way getting rid of the excess growth she had during the snowy months. This may seem like a bizarre concept to you at first, but I’ve come to view founder, flaring, and even fungal infection as necessary and healthy adaptations the hooves can make, and we just let them run away to extremes in domestic horses.

Environmental Concerns

So if wall separation is natural and necessary in soft, rich, wet environments, why do natural hoof care practitioners working in wet regions use the high desert hoof as their model? Because people like to ride their horses on firm, rocky footing, and “tricking” the domestic hoof into adapting to a closer facsimile to the high desert feral hoof is essential for barefoot riding on such terrain. It is also essential for restoring a hoof with a severe wall separation to something that can be shod, so even if you have no interest in riding barefoot or in hoof boots, you can find help here. Fungi and bacteria have a hard time invading tight, healthy hooves, so the closer we can maintain the hooves to imitate the desert feral hoof the safer the horse is from opportunistic pathogens.

The movement towards 24 hour turnout can be overdone and improperly used, I think. The truth is that wetness, lush grass and soft ground are our hooves’ fiercest enemies and the harm done to them by standing for days on end in the rain can overshadow the good done to the body by 24 hour turnout. A better plan during wet times (or perhaps anytime if the only pasture available has soft ground) is a compromise. Do everything you can to dry up the horse’s terrain, allow as much exercise as possible, and bring the horse in for “drying out” periods.

I see amazing results for horses when owners put a four inch bed of pea gravel (literally the size of a pea or slightly larger) in their stalls and small paddocks. It actually is very easy to keep clean (as long as you keep on top of it) and is comfortable bedding. It dries out and toughens hooves like nothing else. Another great wet weather option is to provide a dirt paddock that is scraped often with a tractor. The hooves will tamp it into a concrete-like surface if the manure is routinely removed, and soon after it stops raining, the hooves will be dry. This is also a wonderful alternative when dew is soaking the grass and causing the hooves to be wet all night.

If you can provide a combination of both options for your horses, you will watch as most of your problems melt away. Everyone’s situation and capabilities will vary, but the bottom line is that if we want to stop nature from telling the hooves it is desirable to flare and be infected by fungi, we must dry up their situation as much as possible, keep their hooves from becoming too long and get them living on rougher terrain.

Diet

No human was intended to eat cream filled chocolate éclairs. Ever. Some human’s bodies forgive insult better than others, though. I could probably eat ten of them a day without adverse effects, because the horses in my care ensure that I get more than my share of exercise. If my dad ate three of them a day, he would probably blow up like a balloon and notice adverse effects on his health immediately. If his dad ate even one of them, it would most likely kill him on the spot.

Our horses are in the same situation with the rich feeds we were taught to give them. Some get along okay, especially if they are young, active, and don’t have a specific problem in the body that causes them to have trouble processing sugars. In the end, though, it all eventually catches up with them. Lush, fertilized green grass, legumes, fruits, acorns, grains and molasses are all poisoning our horses every day. Our recent wet weather has caused a dramatically increased nutritional value and yield to our pastures. While most hoof care providers realize the importance of eliminating these things from the diet of a foundered horse, few realize how many “little” problems they are causing, like white line disease.

One of the first things to happen on the onset of laminitis is an increase in MMP production. (Pollitt) MMP’s are enzymes that naturally help to remodel the hoof to horse attachments and during even very mild laminitis can kick into overdrive and attack the membrane (basement membrane) surrounding the live corium (quick). The result is a separation of the hoof wall from the laminae. This initial separation occurs at the basement membrane (a layer of proteins) between the live dermal and the epidermal basal cells. The dead or damaged basement membrane is the entry point where the fungi usually establish themselves in the hoof. Pollitt has established that this damage occurs first in even the mildest of laminitis episodes. Even if the horse is not in the typical severe pain associated with laminitis (that **we** can notice), the rich diet has been at work, destroying the hoof wall’s attachment. (Read “Laminitis Update” for a much deeper look into how the diet effects white line integrity)

I am going alone out onto a limb here, but I think this is, too, is a defense mechanism. Horses have been in domestication for a short time relative to their time on earth. Their bodies think they are wild, free roaming, and have just stumbled into an oasis. The only logical way for the hoof walls to react is to attempt to separate themselves from the horse to avoid the dangers of

excessive length and preserve P3 support by the ground. The resulting dead tissue of the basement membrane is an ideal entry point for fungal infection to spread the damage. If a horse is not in pain from inflammation of the supercorium (laminitis), yet the hoof walls continually separate from the laminae, it is probably doing precisely what the rich feed it is receiving is telling it to do. To reverse this destruction, simply treat the horse as if it were suffering from a classic founder episode, and restrict the diet to free choice grass hay, salt block, mineral block and water. Better yet, feed horses that way and PREVENT founder and white line disease.

Don't ignore this step. It is at the root of every "hard case" I have ever seen. Most people supplement their non-working horses out of fear they will lose weight. If you showed me a human Olympic athlete and I pointed out that I could see his ribs and recommended that he start spending more time on the couch and that he eat ten crème filled chocolate éclairs per day until he was healthier, you would laugh at my ignorance. **So why do so few people see the same thing where their horses are concerned?** The same advice makes perfect sense to people when talking about a horse! An increase in feed without an increase in exercise can only add unwanted fat to the horse. If you want your horse to gain weight that is actually beneficial, increase his exercise while providing adequate nutrition, just as you would for the human athlete. Believe it or not, free choice mixed grass hay alone, does this very well for a shockingly high percentage of horses.

Hoof Care

Now for the part you've been waiting for; the trimming. I put it last because it is the least important of the three steps, but like the other two, can't be ignored. The rise of white line disease has driven thousands of horse owners and farriers to natural hoof care. The more a farrier tries to patch or cover up the damage, the wetter and darker the environment becomes for the fungi, and they just get happier and more aggressive. Eventually there is no way to attach a shoe. The hooves must be bare to fix the situation. The flared walls and weak, separated lamina cannot be asked to carry the weight of the horse! Active wall support in this situation can only spread the damage and cause excruciating pain for the horse.

The trimming is simple, with nothing more being done to the errant hoof walls than the basic trimming taught in my book. Particular attention is paid to the aggressive removal of wall flare in the lower 1/3 of the hoof capsule, while the sole is pretty much left alone. (Don't try to learn to trim from this article, please. I wrote a detailed book that teaches natural trimming step by step.) A very large bevel or mustang roll must be applied to the entire outer wall to keep the wall from tattering further, and it must be diligently maintained. It is very important that you do maintenance trims BEFORE the hooves flare again. Remember that when hooves get too long they are SUPPOSED to flare, and this allows

further invasion by fungi and a continual spreading of the damage as fast as the horse can grow new hoof wall.

Also, it is **very** common for hooves with a large amount of flaring to not even have a true white line. When the hooves (and thus the epidermal laminae) mechanically separate from P3. The inner part of the white line produced at the distal border of P3 is often "lost" in the unorganized material of the lamellar wedge. (more detailed discussion of this in my article "Breakover") The result is that rather than looking at the complete white line at ground level, you will only see the epidermal laminae. Since you only have half of the "fingers" present and resulting "holes", this is of course a very easy target for fungi, as well. Again, grow in a well connected hoof wall and the resulting solid white line will be almost impervious to infection.

It may come as a surprise, but the real crux of dealing with white line separation from a trimming standpoint has nothing at all to do with the treatment of the separating hoof walls. The real problem will almost always be in the back of the foot! In every single case of severe white line disease I have seen, the horses have been landing on their toes, in spite of the fact that they usually have no wall support there. A horse is supposed to land flat or slightly heel first at the walk, and heel first at the trot or canter. This is necessary for almost all of the shock absorbing systems to work properly. I see very few domestic horses that have not been under competent natural care that can do this, and it is the reason for most joint problems, wall separation, navicular problems..... The list goes on. It translates to the rider as short, choppy stride, stumbling, unwillingness to trot.....The list goes on.

When a horse is tender on rocks, most people blame the sole. The truth is, if no one has been trimming away at it the sole almost never tender. It was designed to bear the horse on rocky terrain and does this very well. (Notable exceptions are when subsolar abscesses are present and during laminitis, when the sole's corium is suffering the exact same problems as the lamina. Jackson) The true culprit behind most tenderfootedness is the frog and the underlying digital cushion. Watch a horse striding along on grass and onto gravel. If the gravel hurts her, she will probably shorten stride, rise onto her toes, lean her head low and forward, effectively relieving all pressure on the back of the foot and transferring all of her weight to the sole of front of the foot. Time after time, people watch this movement and wrongly blame the soles. (I used to as well, so you're not alone.)

When a horse is forced to move this way by pain at the back of the foot, no matter how well the hoof appears to be set up mechanically, the coffin bone is standing on its pointed tip and continually drives lower and lower into the hoof capsule, destroying the hoof's attachment and perpetuating white line problems. Achieving a heel first landing is the most important thing a farrier can do for a horse.

A vast majority of domestic horses are incapable of using their frogs and digital cushions as nature intended. People are too

programmed to think of hooves only when the horse is standing square on concrete. Although the frog is slightly passive to the heels on wild hooves and properly trimmed domestic hooves, the frog bears quite a load on the varied terrain horses roam and work on. Most domestic horses show a pain response when we pick their frogs and gentle pressure across the frogs with hoof testers can bring them to their knees. There is no possible way the horse can bear impact to the frogs on rocky ground and a horse in this condition will land toe first with a shortened stride on varied terrain no matter how well the hooves appear to be set up when the horse is standing or moving out on flat ground. How did this happen? It is from a lack of use. The soft ground most horses live on is not natural for them, and can't stimulate the frog properly. The underlying digital cushion loses its ability to receive impact and the resulting soft, weak frogs are easily infected by fungus and bacteria. Regardless of terrain, this also happens if the heel walls are allowed to grow long enough to overprotect the frogs. Shoes, pads, and continued wetness from a lack of routine hoof picking are particularly important contributors to the problem. The more people try to protect the sensitive frogs, the worse the problem eventually becomes.

How do we reverse this problem? Put the frogs and digital cushions back to work. Keep the heels as low as possible without invading live sole. Avoid trimming the height of the frog; let it pack into dense calloused material instead. In my book I recommend trimming the heel height to just above the sole, but if the frogs are protruding and are very sensitive, you will need to lower the heels only to the height of the frogs to allow the horse to comfortably begin using them. Passive ground contact will cause the digital cushions to strengthen and move into a higher position and the frog will pack into calloused material. This causes the frog height to quickly recede into a more natural position and you should follow it religiously with the heel height until you reach a level 1/16 inch higher than the live sole. Treat any fungal infections that are present. Do everything you can to dry up the situation for the horse. Exercise often on terrain the horse is comfortable enough to land in heel first. Ride in hoof boots when terrain demands force a toe first landing or cause sensitivity (I am finding the new Boa boots to be wonderful in most situations). This is easy stuff. Recognizing the true problem is most of the battle. Achieving a heel first landing at the trot will make most problems with gait, joints, back, and hoof lameness melt away and should be the top priority in hoof trimming and conditioning. It will also stop the pattern of continued mechanical separation caused by the toe first landing. (Read "Digging for the Truth about Navicular Syndrome" for more on the back of the foot)

I guess I can't write an article on white line disease without the mention of anti fungal treatments. Be sure that any treatment you use does not destroy live tissue on a cellular level. You may be contributing to the problem by creating dead tissue for pathogens to feed on. Notable antifungal treatments that do not damage live tissue are White Lightning, Clean Trax and 50% vinegar/water solutions (In order by effectiveness; in my opinion). I have in

the past, and sometimes still do put customers on a picking and treating or soaking regiment. I am unsure at this time how much it contributes to my success with dealing with these problems. I can tell you for sure, that if you chemically treat the symptoms without dealing with the real problems, anti fungal treatment will appear pretty ineffective, but on the other hand I have seen diligent treatment be a part of countless successful rehabilitations and have customers who swear by each of the half dozen different treatment programs I have experimented with. I also have grown out hundreds of severe white line problems with no chemical treatment going on at all, so you tell me.



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