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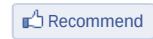


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Forever Foundered?

by: **Karen Briggs**
August 01 2002, Article # 3729

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When I rode past a nearby racing Quarter Horse trainer's farm, my gelding Pokey would always nicker at the trainer's permanent lawn ornament--an ancient black pony mare who slowly cropped the front yard, unfettered by fences or even a halter. "Oh, she's foundered bad," her owner said. "She's not going anywhere very fast. We just leave her to her own devices."

How many horses are left to their own devices after a laminitis attack? Faced with permanent hoof damage, chronic pain, and little hope of future soundness, how many are left to just hobble around as best they can? Is there a way to return a foundered horse to a useful, productive life, and to successfully manage his discomfort and all the associated fallout from laminitis?

In many cases, the answer is yes--but you'll need to call on the resources of your veterinarian and your farrier, in addition to your own diligent care, to make it happen. Nature, as the pony mare knew from experience, often can't do the job on her own.

The Destructive Cascade

When managing a chronically foundered horse, one should know a bit about the process that caused the damage and just how much damage has occurred. Laminitis, a catastrophic inflammation of the laminae that anchor the coffin bone to the interior of the hoof wall, can be triggered by a number of causes. Some causes are well understood, while others still mysterious. But regardless of how it begins, the destructive process is quite similar. In a nutshell, cellular damage occurs, the basement membrane (a thin sheet of structural material that separates the sensitive and insensitive laminae) breaks down, and edema (fluid buildup) begins to swell the laminae. But because there's very little or no room for expansion within the hoof capsule, the edema often pushes blood out of the capillaries (tiny blood vessels) of the sensitive laminae (pressure ischemia). This has two effects: First, it deprives the laminae of essential nutrients that ordinarily are supplied by the blood, and second, it causes severe pain.

The front of the hoof bears the brunt of the trauma when the bond between the laminae and the coffin bone fails, because then the laminae can't counter the pull of the deep digital flexor tendon on the bottom of the coffin bone. During an acute laminitis attack, the sensitive and insensitive laminae separate; many tear away from the front of the coffin bone, allowing the coffin bone's sharp leading edge to plunge toward the sole of the foot (rotation of the coffin bone). In severe laminitis, the laminae can tear all the way around the coffin bone, allowing it to "sink" straight down. Rotation of the digit and sinking is generally considered the worst-case scenario due to the degree of laminar damage, which sometimes results in the coffin bone punching through the sole.

Take a closer look at the physics of the hoof; the wall attaches to the laminae, the laminae to the coffin bone, the bone to the deep digital flexor tendon (DDFT) and extensor tendons, and the tendons to the corresponding muscles above, which are greatly influenced by the weight of the animal. The entire sling is supported by the sole, frog, and bars; alter one of the above major components, and the equilibrium is disrupted.

In sinkers, the descent of the coffin bone crushes capillaries in the sole below, resulting in a crescent-shaped bruise in the horn of the sole (called a symmetrical subsolar hematoma) that you'll see when your horse's feet are trimmed following a



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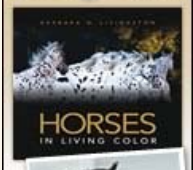
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mild laminitis attack. As the laminae separate like two sides of a Velcro[®] ½ strip being pulled apart, blood and serum (products of the inflammatory process) pool in the resulting cavity or cavities. Mid-scale cases will slowly tear over several weeks, creating a laminar wedge between the rotated and/or sunken coffin bone and the toe of the hoof wall (see photo below).

During this phase, your horse will likely be reluctant to move (he might prefer lying down), so deep bedding and stall rest are essential. If the coffin bone has penetrated the sole, there will be a particularly long and painful road ahead. While once such horses were automatically put down, today it is possible to treat such severe cases. Even those where the entire hoof capsule has sloughed off have been known to recover with diligent, expert care.

Assessment and Initial Treatment

"Therapeutic assessment is the key to planning the type of shoe needed, therapy, surgery, exercise, aftercare, etc.," says Ric Redden, DVM, owner of the International Equine Podiatry Center in Versailles, Ky., and one of the foremost laminitis experts. The destructive cascade of laminitis might continue for days or weeks after the initial attack simply due to the loss of mechanical stability, so the early days are critical as the optimum window of response is quite small. "Preventing mechanical tearing of the laminae is quite similar to preventing a train from moving," he says. "It takes very little mechanical advantage at the onset, and requires more as the cascading sequence of events proceed downhill.

"Knowing where you are in the syndrome and where you started goes a long way to evaluating the degree of damage," he continues. "Radiographs should be taken on the first examination to evaluate the degree of damage--don't delay having your horse examined. These will establish a baseline at the onset, which can provide extremely valuable information as the syndrome progresses. Radiographs can be very informative provided they are taken in a very disciplined, methodical fashion with the intent of obtaining maximum information. The body of the coffin bone is not affected in the early stages of the syndrome, therefore dark film (bone detail) are of little use." Redden explains that there are significant soft tissue parameters your veterinarian will evaluate, including the following:

- **Horn-laminar zone (H-L zone)**--This measures the distance between the outside of the hoof wall and the outer face of the coffin bone. Along a healthy toe, the distance will be the same at the top and bottom of the hoof. A greater H-L zone measurement near the ground surface compared to that at the coronary band indicates rotation has occurred.
- **Sole depth**--This varies greatly from five to 25 millimeters, depending on the health and characteristics of the foot and previous hoof care. Thinner soles provide less support for the coffin bone.
- **Palmar angle**--This is the angle formed by a line drawn along the bottom of the wings of the coffin bone and another line drawn along the ground surface of the foot (and the shoe, if the shoe has a different angle). This can help the veterinarian and farrier detect rotation and evaluate changes in the pull of the deep digital flexor tendon (DDFT).
- **The relationship of the extensor process to the top of the wall**--A horizontal line drawn through the top of the wall and across the top of the extensor process (see photo on page 80) can be the same line with a large majority of strong, normal feet. Some healthy feet will have an extensor process lower than the top of the wall, and with a sinker this height difference will increase.

"Venograms can be used to further evaluate the degree of damage and chronicity of pre-existing problems," Redden adds. "Dye is injected into the palmar veins with a tourniquet over the fetlock, then radiographs are quickly taken that reveal the unique characteristics of the vascular (blood vessel) pattern within the hoof. The location and degree of vascular shutdown can be easily read on various views. This is yet another valuable tool for assessment and possibly a very potent therapeutic aid as well.

"In other words; we don't have to just sit and wait anymore hoping for the best," he encourages. "We have a very detailed protocol that helps us assess the damage, giving the planning stage more meaning."

Early medical treatment is designed to reduce inflammation. Non-steroidal anti-inflammatory drugs do a good job, says Redden. "Phenylbutazone (Bute) and flunixin meglumine (Banamine) are the most popular. Ice is also a very good anti-inflammatory product, and is easily obtained and easy to use.

Shoeing treatments for laminitis are as individual as the patients they're designed to treat. Many different shoes have been used in the past to treat this disease (such as heart bars, egg bars, reversed shoes, and rocker-toe shoes). "Mechanical aids are designed to alter the forces at play that are suddenly very abnormal due to the loss of the key laminar structure," says Redden.

"Treatment choices and success are greatly influenced by the health and conformation of the hoof; thin, flat, weak horn with full-thickness toe cracks will not survive the onslaught as well as solid, upstanding, strong walls and thick soles; the reserve just isn't there," he continues. "Often, treatment decisions will also be based on what has been successful for your practitioners in the past. Here's where experience is key--ask at the outset whether your veterinarian and farrier are competent dealing with laminitis cases. How many cases do they see in a year? If they don't feel they have the expertise to effectively treat your horse, they should be able to refer you to practitioners who specialize in the condition."

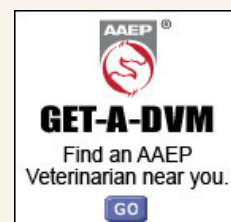
Milton, Ontario, farrier Chris Zizian recommends that your farrier assess the initial set of X rays in consultation with the attending veterinarian provided they both have good training in taking and reading film. From there, he says, the three of you will need to work as a team to restore your horse's health and soundness.

"A good farrier can really make a dramatic difference, but when blood and soft tissue get involved, that's where the farrier's



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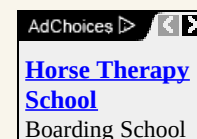
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job stops," he adds. "So you need the veterinarian to address the problems that are beyond the farrier's scope (at the onset).

"We're starting to think now that the amount of sole compression might actually be more important than the degree of rotation," he adds, "particularly in terms of pain management."

Sole support with Styrofoam blocks, dental impression material, and other soft pads have become popular because they allow the horse's foot to sink deep into the padding using all of the sole's surface area including the clefts on either side of the frog to bear weight. This avoids excessive weight-bearing on any focused points of the sole.

"Almost all laminitis cases will benefit from some kind of shoe, even if they were barefoot before the episode," says Redden. "However, the very act of shoeing can often exacerbate further tearing of the laminae--not to mention the pain involved with standing on one foot while the other is in the air--so shoeing has to be approached delicately. The mechanical rating (how effectively it can increase the palmar angle) of the shoe and the demand on the foot should be noted before nailing it on.

"Another goal is to decrease the pull of the DDFT, thereby decreasing the force pulling the coffin bone away from the toe of the wall," he continues. "Raising the heel shortens the distance from the tendon's origin (at the muscle in the leg) to its insertion on the bottom of the coffin bone. The degree of reduction is relative to the starting palmar angle. Research has shown that 20-25½ palmar angles release the tension on the DDFT up to 70%; one can easily feel the flaccid, soft tendon with this degree of elevation." Many options are available for this early emergency aid, from pre-shaped Styrofoam to commercial mechanical boots. In deep bedding, some horses will stand toe-downward to do this themselves.

"Successfully treating laminitis across the board has tremendous options and a relatively good prognosis, regardless of the degree of damage, when farriers and veterinarians work closely together using basic physics, good mechanical principles, and state-of-the-art technology as tools of the trade," Redden states. "The syndrome is very complex, but not near as complicated as we learn more."

Aggravating Abscesses

Your farrier will also have to address the deterioration of your founded horse's white lines. With low- to mid-scale cases, "It takes a year (after a laminitis episode) before the white line achieves any semblance of normality," says Zizian. "Until the damaged section grows out, you're essentially dealing with seedy toe--the white line will be open and crumbly, and initially it will ooze a lot of gunk. You can expect quite a lot of discharge--mostly clear serum--when you take a hoof knife to the toe. There's nothing to be done about it, but if it starts coming from the sole or the coronary band, then you need to consult with the veterinarian."

You can monitor the progress of healthy white line growth on the outside of the hoof wall, he adds. It can appear as a thickened ridge--the more distal horn (further from the coronary band) will be thicker as the swollen laminae have pushed it outward. New horn will grow closer to the bone, and slowly grows down from the coronary band over the months.

A great many mid- to high-scale laminitic horses also face one of the condition's painful after-effects--chronic hoof abscesses (pockets of infection). The space opened by a rotating or sinking coffin bone can fill with pus, serum, blood, and other byproducts of the inflammatory process, creating excruciating pressure on the sole and bone, with significant damage to both.

"You're not out of the woods once the initial attack is over and you've got some shoes on," says Zizian. "A horse can look good for weeks, then start having abscesses break out."

Redden says abscesses must be dealt with mechanically by unloading them, establishing drainage, or both. "The laminae have a four- to six-week reserve," he says. "Many cases appear to be doing well clinically before going down the tube, as can be seen with frequent radiographs and venograms.

"One of the things I emphasize to clients is not to skimp on the X rays," he continues. "Take a new set every couple of weeks; they can give you a heads-up on abscesses brewing and could quite possibly save your horse's life." They can also help the veterinarian and farrier evaluate the degree of treatment success.

Foot Care Down the Road

Above all, employ simple observation and common sense. "If you watch your horse, he'll tell you what he needs," Redden says. "If he's too lame to move, or if he needs pain medication, have your veterinarian examine him. And you really have to keep on top of the mechanics. Don't let those toes get too long. Watch the heel growth, palmar angle, and breakover--you simply want a lot of sole fast. He might need to be on a strict schedule for the rest of his life depending on the damage and response to therapy."

Observation will also tell you when your horse is feeling better. Once the pain subsides, your horse will be far less reluctant to move, making him ready for turnout provided the laminae have healed when it was a mild insult or the laminae have been adequately replaced (which takes several months). Turnout should be limited at first, and preferably on a dry lot if the horse is obese (see "Therapeutic Sustenance" on page 84). As you scale back his pain medication, monitor him closely, checking his digital pulse each day (a noticeable pulse at the back of the pastern indicates inflammation in the feet). Heat can be deceptive since many things can cause heat. Setbacks in his attitude or his willingness to walk, especially on hard ground, are indicators that you might need to consult with your veterinarian to evaluate where you are and what's going on

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inside the foot. The course of recovery from laminitis seldom runs smoothly with mid- to high-scale cases, so you'll need to take it day by day.

FURTHER READING

Briggs, K. The Latest on Laminitis. *The Horse*, August 2001, 32-44. Article Quick Find #939 at www.TheHorse.com.

West, C. Hoofcare Education. *The Horse*, April 2002, 63-70. Article Quick Find #3389 at www.TheHorse.com.

See the Laminitis category under Lameness (Hoof) and Shoeing at www.TheHorse.com.

FEEDING THE LAMINITIC HORSE

Therapeutic Sustenance

Feed foundered horses as if they were not foundered, says Ric Redden, DVM, of the International Equine Podiatry Center in Versailles, Ky. "Fat horses get less, and skinny ones get more. Horses that tend to be fat are always a management problem," he says. Too much carbohydrate-rich grain or lush pasture at one time can lead to pH changes in the gut, killing beneficial fiber-digesting microflora that release endotoxins as they die, starting another destructive cascade. Bearing in mind that horses evolved to digest tough, fibrous pasture plants, not rich concentrates, you'll need to take your chronically foundered horse back to basics--a diet based on low-energy hay with little or no grain.

For many laminitis patients, that unfortunately means restricted access to pasture. It might feel cruel to place your horse on a dry lot with no grazing, but this can save his life. If you have no grassless pastures, try a grazing muzzle, which will significantly limit the amount of pasture he can eat.

No hoof, no horse! Learn the basics from simple cleaning to trimming and shoeing the foot to dealing with lameness in [Understanding Equine Hoof Care](#).

It's also important to maintain a laminitic horse at a healthy, lean body weight. The risk of laminitis seems to increase dramatically in horses and ponies which are overweight. Some veterinarians recommend a daily dose of thyroid hormone to help fat ponies slim down; although these animals aren't clinically hypothyroid, the synthetic thyroxin speeds up the metabolism somewhat and minimizes the development of fat deposits.

University of Florida equine and bovine nutritionist Lori Rice, PhD, suggests that managing the diet of a chronically foundered horse is "not much different than what you would do to prevent laminitis in the first place--trying to restrict grain or lush grass overload." Feeding small quantities, often, rather than one or two large meals per day mimics the horse's natural eating behavior and ensures that any sugars or starches he takes in are fully and safely digested in the small intestine. It may help to feed a probiotic or yeast culture supplement to assist fiber digestion and encourage a healthy population of bacteria in the hindgut.

Once your horse has returned to normal work, he might need more energy than a strictly fiber-based diet can provide. If that's the case, add a feed that is low in carbohydrates and high in fats (such as corn or soy oil, or rice bran). When fat is digested, it provides more energy, pound for pound, than carbohydrates, but it won't throw the gastrointestinal tract into a tizzy because it doesn't acidify the gut or dump large quantities of sugars into the bloodstream. There are a number of commercially balanced high-fiber, high-fat feed mixes available that can simplify your horse's feeding routine.--Karen Briggs

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