Managing and Preventing Laminitis ("Founder") In Your Horse

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You have just spent a stressful day of finding that your broodmare that foaled three days previously and is being treated for retained placenta is now severely lame and in the acute stages of laminitis. You have lost a horse previously from laminitis, and decide to get on Google on your computer to find out the latest on the disease process. You first find what appears to be a “state of the art” article by a well known laminitis researcher that states that laminitis is due to a decrease in blood flow to the feet, and that the horse should immediately be placed on drugs to dilate its blood vessels. You then go on to the next website and find another recent article from an apparently world-renowned researcher stating that the disease process is due to too much blood flow to the foot resulting in delivery of excessive toxins, and that you should place the horse’s feet in ice to constrict the blood vessels and decrease the blood flow. As you’re starting to get a migraine, you decide to visit some farrier sites to at least get a clear idea of what type of shoeing you should have put on the affected feet. On visiting multiple sites, you find that the only shoe that is effective for laminitis is the natural balance shoe, or the rail shoe on another site, or a heart bar shoe on the next site, then a Steward clog on the next site, and then a reverse heart bar shoe on the last site. As you reach for your bottle of Ibuprofen, you’re now getting the picture of over three decades of frustration suffered by veterinarians, farriers, and owners due to the controversies and dogma regarding the pathologic disease mechanisms that lead to laminitis. However, there have been recent advances in our understanding of this disease process which are positively impacting our treatment of the disease. I will first go over what is now known about the disease process, and follow that with advances in treatment of this devastating disease.

The laminae (also termed lamellae) are specialized structures in which leaves of tissue attached to the hoof wall (epidermal laminae) interweave with leaves of tissue attached to the coffin bone (dermal laminae, Figure 1). Because the attachment of these interweaving leaves from the two different tissue types suspends the coffin bone within the hoof wall, the support of the entire weight of the horse is dependent on the fibrous attachment between and overall integrity of these 2 types of laminae. In laminitis, this fibrous attachment breaks down, leading to loss of laminar support of the coffin bone. The downward displacement of the coffin bone can take place either 1) by rotating, where the laminae on the dorsal (front) aspect of the foot separate and the coffin bone pulls away from the dorsal hoof wall and the toe rotates downward (Figure 2), or 2) by “sinking” (also termed distal displacement), where all of laminar attachments of the foot (not only the toe but quarters also) give way at once and the entire foot “sinks” straight down. Rotation occurs most commonly, and more commonly affects the front feet (although they will look like their back feet are also affected because they place them well underneath themselves to take more weight off the forelimbs). “Sinkers” are commonly affected in all four limbs. In some horses, both sinking and rotation will take place.

A major controversy for veterinary clinicians and researchers has revolved around what mechanisms cause the separation of the laminae. We have known for centuries the diseases that put a horse at risk of laminitis, most commonly including gastrointestinal disturbances (such as grain overload, diarrhea, and surgical colic cases), but also occurring in infections such as retained placenta/metritis and severe pleuropneumonia cases. Although most theories of laminar injury in the past revolved around digital blood flow, we have recently discovered that laminar failure appears to occur in a similar manner as organ failure occurs in human sepsis (sepsis is generally defined as an infection that results in the presence of bacteria (bacteremia) or other infectious organisms or their toxins in the blood (septicemia) or in other tissue of the body). In the past, researchers of human sepsis also reported that organ failure was due mainly to decreased blood flow; it has only been in the past few years that researchers have shown that organ dysfunction and injury can occur solely from inflammatory damage where the central event appears to be the migration of inflammatory cells (white blood cells) into the target organs. We have recently discovered that these identical inflammatory events occur in the laminae in the horse suffering from similar sepsis-type diseases as lead to organ failure in humans. Therefore, severe inflammatory injury from white blood cells which enter the laminar tissue and release destructive mediators are also likely to play a central role in laminar injury. Interestingly, we have recently found that severe inflammation starts in the laminae many hours before the horses show signs of foot pain (or even increased foot warmth or digital pulses). This does not mean that disturbances in blood flow would
So, what are we going to see if laminitis occurs? The level of the horse. Value that it is a sedative and may decrease the stress flow is acepromazine (“Ace”). This drug has the added treatment found to effectively increase digital blood about decreased blood flow to the foot, the only possible (by deep bedding, etc.) If we have concerns and are going to encourage it to lay down as much as released. Finally, we are not going to walk the horse, in a foot where injurious enzymes are likely being inflammation and generally slowing the metabolism decrease the laminar injury, most likely by decreasing the feet” (placing the feet in bags of ice) may also There is fairly strong evidence at this point that “icing such as sand which will cup to the bottom of the foot. just place the animals on a soft supportive substance for houses, wrestling/gymnastic mat material), or tape a soft but supportive substance to the bottom of the feet (2 inch commercial Styrofoam insulation where it is needed on the sole. We can then either all forces on the hoof wall and laminae and no support where the laminae as much as possible, by first removing the shoes (gently!), because a standard horse shoe places dobesides treating the inflammation? We can protect the laminae of “endotoxemia” is the critical time to treat these horses aggressively with anti-inflammatory drugs, well before they show signs of laminitis. If we can block the disease process at this point, and do not reach the point of the third phalanx displacing by either rotating or “sinking”, we have a good chance of having these horses come back to full athletic activity. What can we do besides treating the inflammation? We can protect the laminae as much as possible, by first removing the shoes (gently!), because a standard horse shoe places all forces on the hoof wall and laminae and no support where it is needed on the sole. We can then either tape a soft but supportive substance to the bottom of the feet (2 inch commercial Styrofoam insulation for houses, wrestling/gymnastic mat material), or just place the animals on a soft supportive substance such as sand which will cup to the bottom of the foot. There is fairly strong evidence at this point that “icing the feet” (placing the feet in bags of ice) may also decrease the laminar injury, most likely by decreasing inflammation and generally slowing the metabolism in a foot where injurious enzymes are likely being released. Finally, we are not going to walk the horse, and are going to encourage it to lay down as much as possible (by deep bedding, etc.) If we have concerns about decreased blood flow to the foot, the only treatment found to effectively increase digital blood flow is acepromazine (“Ace”). This drug has the added value that it is a sedative and may decrease the stress level of the horse.

So, what are we going to see if laminitis occurs? The first foot signs we will see are increased warmth of the hoof wall and prominent arterial pulses (“digital pulses”) on the back of the pastern area. This may occur within 12-24 hours of a toxic insult, but may not occur for 3 or more days. The first signs of digital pain will usually occur 24-72 hours after the toxic insult, with the average time being approximately 2 days (realizing that it may take several days-weeks to occur during a prolonged illness). Once digital pain is present, the horses will become very reluctant to walk. Digital pain can occur without displacement of the third phalanx (coffin bone), but should be an alarm to the horse owner that displacement either is imminent (without aggressive care) or may already be occurring. What signs do horses with digital pain exhibit? If only their front feet are affected, they will place the forefeet way out in front of them, while placing their hind feet far underneath their bodies to support more of the weight. If all four feet are affected, which occurs more commonly in “sinkers”, the animals will be extremely reluctant to walk also but the animal’s stance will be very different, with the hind feet placed further back than normal (somewhat of a “sawhorse” stance) as their hind feet are usually also affected in the sinkers. At this point, we are definitely in a crisis, but cool heads must prevail if we are to save the feet. First, the animal should not be forced to walk, and should not be transported off the farm (trailering is very hard on the injured laminae) unless the illness that caused the laminitis requires treatment at a veterinary hospital. Second, get your veterinarian out on the farm to assess the animal, and possibly get radiographs to assess whether displacement of the coffin bone has occurred (this will also help in having baseline radiographs to compare with future radiographs). The key at this point is to keep the displacement to a minimum for several weeks by supporting the feet, and have the animal lay down as much as possible. In severe cases in which the coffin bone is undergoing aggressive displacement despite the usual foot support), we may place the distal forelimbs in casts. As a general rule, if we can keep the displacement from worsening for a 3 week period, the laminae will commonly stabilize to the point that we can start working with the animals with corrective shoeing. It is commonly inattention in these first few weeks that leads to irreversible displacement and damage to the laminae.

Once significant rotating or “sinking” of the third phalanx has occurred, we have a poor chance of getting
an animal back as a competitive athlete. However, if we can again halt the process for a few weeks for the laminae to stabilize, we can commonly salvage the animals to at least be sound at pasture (for breeding purposes, etc.) through use of corrective shoeing, and other procedures such as deep digital flexor tenotomy. Once the laminae have stabilized, it is acceptable to transport the animal to a specialist if your veterinarian feels that is necessary. There are commonly clinicians at referral clinics that have an interest in treating laminitis cases, but that is not true at every clinic. Thus, it is best to do your homework through your veterinarian and other sources to ensure that you find an individual that has a reputation (preferably a good one) and an active referral caseload of laminitis cases. This individual may also be your local veterinarian, as there are an increasingly larger number of veterinarians in private practice that take a special interest in equine foot problems.

We are now saving animals which we had minimal chance at helping in the past, mainly due to some innovative farriers, and from learning from our past mistakes. From the work of Gene Ovnicek and others, we now realize that we need to support the coffin bone by providing sole support with rubbery putty (commonly called cushion support substance or impression material) to the entire sole behind the tip of the frog. We can also address the deleterious forces on the laminae by using specialized commercial shoes and shoeing systems now that bring the breakover far backwards (to decrease the stress that a long toe places on the laminae), and raise the heels to varying degrees to decrease the forces from the flexor tendon on the back of the coffin bone. There are several commercial shoes that combine these principals, two common ones being the E.D.S.S. system and the rail shoe by Nanric. The same principals can still be addressed with corrective shoeing such as heart bar shoes by a farrier talented at corrective shoeing; many farriers are combining heart bars with some of these other principals including the placement of putty to support the entire sole behind the tip of the frog. Finally, the Steward clog has become another option for the farrier (with the usual controversy of any new shoe introduced for use in laminitis). In severe rotation cases, we have learned how to better combine shoeing with other techniques such as surgical transection of the deep digital flexor tendon with corrective shoeing and appropriate limb support to allow us to correct the rotation, while extending many animals' lives at a comfortable existence for several years (we were lucky to have the animals survive one year when we started performing tenotomies 20 years ago).

We have not cured laminitis, but, with new cutting edge research tools and increased awareness by funding agencies such as the USDA, Grayson-Jockey Club Research Foundation, *AQHA Foundation,* and Morris Animal Foundation,* veterinary researchers are dissecting away the dogma and are finally getting to the root of the disease process. As we have now found similarities between the pathology of laminar failure and the pathologic mechanisms reported to occur in organ failure in humans with sepsis, we can pay attention to the incredible amount of research from that field to assist us in finding more effective treatments for the disease. With more innovative ideas from our farriers and veterinarians, we will also continue to make progress on treating the physical aspects of the displaced coffin bone in the affected digits. Finally, what can you do as a horse owner to help this cause? All of the private foundations listed above rely on donations from horse owners and other concerned individuals in the horse industry to fund the ongoing laminitis research. Therefore, it is people like you that will allow advances to occur in our understanding and treatment of this devastating disease process.

* All of these foundations can be found on the Web