

Laminitis; Hoping the Grass isn't always Greener

By Brittany Kovar of Kansas State

It's April in Northern Kansas, and as you look around you can't help but appreciate how beautiful the green grass looks, with pastured animals seeming more content than they have all winter. For some equids though, this time of year does not come without problems. Lilly, a local Quarter Horse mare, like many others in the area, had spent her snowy winter in a stable with runs. She had recently been turned back out to graze pasture. Over the course of just a few days, the owners had noticed resistance to walk, and lameness that seemed to be affecting all of her legs. As the veterinarian walked to the barn with the owners, hearing Lilly's history over the last few months, they quickly began to assemble the pieces of this puzzle. In this area, and nearly anywhere else in the country, it is a story we have heard many times.

Laminitis, also known as founder, is a complex disease process, and one that continues to be studied extensively. Many horsemen have heard of the term laminitis, and know the significance of it linked to lameness. More specifically, laminitis literally means inflammation of the laminae. Inflammation simply means redness, swelling, and heat are present, which is due to increased blood flow to that area. The laminae is made of two components. The sensitive laminae are innervated, have capillary blood flow, and attach to the coffin bone. The insensitive laminae are attached to the inside of the hoof wall without blood flow or sensory nerves. The sensitive and insensitive laminae interweave with one another forming an almost zipper like connection that keeps the bone portion linked tightly to the hoof wall. The deep digital flexor tendon, which attaches to the back (caudal) aspect of the coffin bone, contracts or shortens causing the hoof to bend backwards at the pastern joint, like it would when picking out hooves. It is the combined effort of the common digital extensor, on the front (cranial) aspect of the hoof, and the proper functioning of the laminae that counteract the natural pulling effect from the deep digital flexor.

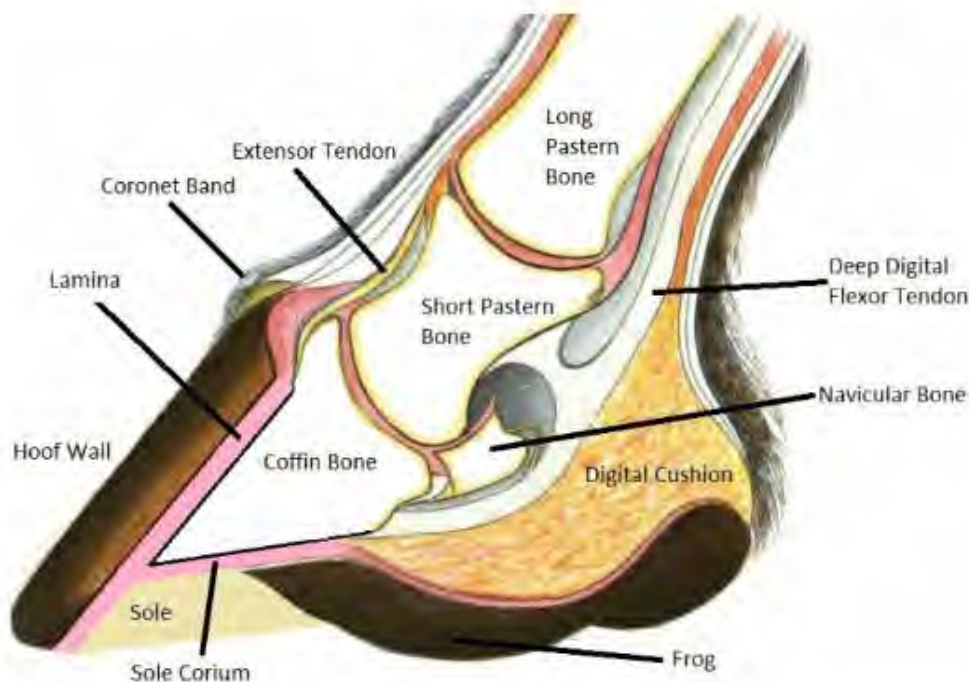


Figure 1: The laminae (highlighted in pink) have two components; Sensitive and insensitive laminae that weave together. Additionally, you can see the deep digital flexor (white) attaching to the back of the coffin bone. It is the combined effort of the common digital extensor (yellow- labeled extensor tendon), and the proper functioning of the laminae that counteract the natural pulling effect from the deep digital flexor.

The laminae are located between bone, and the hoof wall, which are both very hard materials. The hard surfaces provide very limited expansion within the hoof if there is swelling. In fact, swelling there can actually lead to the opposite effect where the increased pressure will lead to complete blockage of blood flow where little to no blood flow can enter or exit those capillaries.

Just like the vague use of the term colic in equine medicine, laminitis has a similar reputation. As I described previously, it means inflammation, or increased blood flow to the laminae. However, that does not mean it tells us the

source of the problem. For example, laminitis can be caused by a blockage of blood flow due to a sprain or stumble, a bacterial infection in the hoof due to cracks, trimming or nails, but it can also be due to bacterial products circulating in the blood. There are many causes for bacterial introduction into the blood stream, but diet and stress are two common contributors to excess acid production in the gastrointestinal tract. . Horses, like Lilly, led back out to graze pasture consume grass that has higher carbohydrate content then their winter forages. This may seem obvious in our transition from winter hay supplements to fresh grass consumption, but can even be a problem depending on the time of day, with late afternoon/early evening grass being the richest due to photosynthesis products. This sugar rich feed can lead to acid production in the hindgut of the horse. If the horse is abruptly changing between feed types, like Lilly's case, it can quickly lead to problems. The pH of the horse's digestive tract is very important for bacterial flora regulation. Small changes in pH that carbohydrate diets create cause death of normal gut bacteria, proliferation of acid loving bacteria, and degradation of barriers between the intestinal cells. Bacterial products like connective tissue degrading enzymes, and endotoxins are able to leak into the blood stream and flow to the hoof due to the intestinal barrier's destruction.

The horse's body now recognizes these products in the blood stream, as far down as the level of the laminae, and knows that they need to be removed. In response, they send more blood flow to the hoof, contributing further to decreased blood flow in capillary beds. This is the reason that we can use the palpation of digital vein and artery pulses as indicators of laminitis. This increased blood flow to a space with limited ability to expand potentiates the problem by creating a stricture as described earlier. The increase of pressure contributes to significant pain in the front of the hoof which is why we see laminitic horses shift their weight to their heels. The hoof is completely supplied by capillary blood flow, and without the transport of those nutrients we are unable to repair the connective tissue in the laminae.



Figure 2. The laminae, or the wispy looking layer I'm pointing at in the photo, is forced to stretch when swelling persists in the hoof. You can see the increased length of the laminae, and wider shape of the right hoof trimming in comparison to the left hoof trimming taken from the same horse. This particular horse was affected by laminitis in only one foot.

The increased pressure forces the laminae to stretch further apart and contributes to lack of shape of the hoof. If not addressed, the stretching can lead to separation, or unzipping of the insensitive and sensitive laminae layers, which ultimately allows for the separation of the hoof wall and coffin bone. Without the connection of the laminae, the common digital extensor on the front of the hoof is not able to balance the strong flexing power of the deep digital flexor. In the worst of situations, this allows for rotation of the coffin bone within the hoof to the degree of puncturing through the sole. Most cases don't escalate to this level, and can be addressed sooner to prevent this progression.

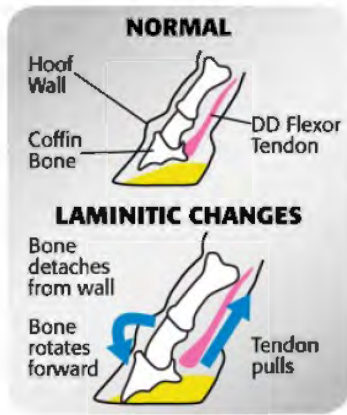


Figure 3. Illustrating the shifting of the coffin bone due to laminitis.

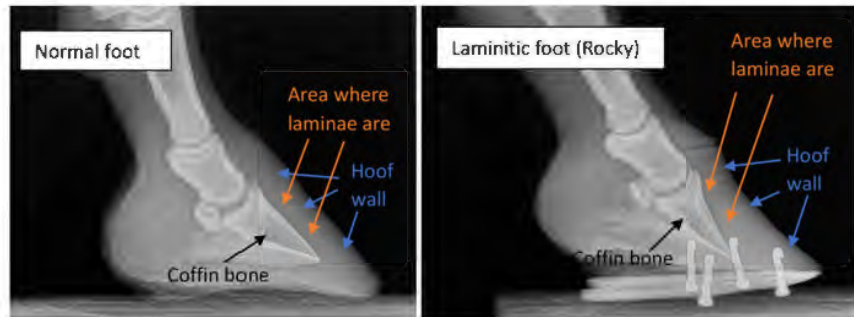


Figure 4: Radiographs to show the shifting of the coffin bone due to laminitis. There is a noticeable increase in angle between the hoof wall and coffin bone in the laminitic hoof.

Lilly, and many other horses, are living more comfortably after starting their laminitis management. If you have concerns about your horses hoof health or nutrition, be sure to consult with your veterinarian and farrier.

Image Legend

Figure 1: Iron Gate Equine Clinic. Everything you need to know about laminitis. October 16, 2017.

<https://www.irongateequine.com/education/laminitis>

Figure 2: Brittany Kovar. Laminitic hoof changes. April 2018.

Figure 3: Horslyx. Spring laminitis deciphered. April 1st 2017. <https://www.horslyx.com/spring-laminitis-deciphered/>

Figure 4: Franklin Vets. The danger time for laminitis prone horses and ponies. October 17, 2018.

<https://franklinvets.co.nz/2018/10/17/laminitis-danger-time/>

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