

Equine Laminitis

Prevention and Treatment

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Anatomy and Function

Firstly we need to look at how the whole foot works. It really is an incredible design.

- The pedal bone has laminae attached onto its dorsal surface. This is the part of the bone that sits below the hoof wall. These laminae then interdigitate with the laminae of the inside of the hoof wall.
- They fit together perfectly, like a puzzle but much more intricate. It has two layers a primary and secondary. Therefore what happens is that the weight of the horse is transmitted from the pedal bone through these laminae to the hoof wall.
- The horse's weight is not meant to be on its sole through the pedal bone but this hoof wall. It can be said then that the horse hangs or is slung in its hooves.
- The hoof wall grows from the coronary band and it is along here that the laminae are formed to grow down the laminal grooves of the pedal bone.
- The blood supply to the pedal bone and its structures is complicated. But essentially it comes from the back of the pastern down to the pedal bone and then to these structures.
- This as well as some other factors have important implications in this laminitis syndrome.

Why is this so frustrating?

Before we go into the disease process and what we can do about it there are a few important things that everyone must know when they have a horse with laminitis. This is can be a very frustrating and disheartening disease for both you as the client and also us vets.

- The exact cause of laminitis is often difficult to determine. It may be an easy case where the horse is sick or it has got into a grain store but speculating on a possible cause does not always help and can put the blame on something that may not actually be fact.
- This disease is being intensely investigated but because we still do not know the exact mechanisms of its cause we do not therefore have a gold standard treatment that works.
- Controlled studies indicating what the best treatment regimen for your horse is, does not exist! What this means is that the vet will create a treatment protocol that has worked from his experience and also one that suits your pony.
- In some cases the initial treatment may not work, and a different method will be needed. This is no-ones fault it is just a fact of the disease.
- There are those cases where we try everything possible and unfortunately it all fails or does not work well enough for the animal to be comfortable.
- Most times when the horse is first seen we can't predict what the outcome of the disease is going to be. So how lame the horse is or even how it responds to painkillers does not always tell us this will be a good or bad outcome.
- By the time the horse or pony shows clinical signs of laminitis, the process has already been going on for some time up to 12 hours so there may already be structural changes in the foot.
- Chronic and complicated laminitic cases will often need lifelong and sometimes expensive treatment, with lots of vet attention like taking repeat x-rays and corrective farriery.
- Expect all horses that have had a bout of laminitis to be prone to it in the future. Even if they responded really well to treatment and/or have not had a bout for years.

Ok so what happens in laminitis?

- Laminitis is then the inflammation of these laminae. That is the heat, pain and swelling of these structures resulting in a breakdown of this interdigitation and then separation of the

pedal bone from hoof wall. Each case is different and that is why this separation happens to a greater or lesser degree.

- As I said earlier because these structures carry the horse's weight it shows why they can be so painful because the force of its weight is on these already sensitized structures. Another cause of the severe pain is when the pedal bone has rotated or sunken onto the sole putting direct weight onto this pedal bone and the sole which is abnormal.

Physiology

- There are quite a few hypotheses about the physiology of laminitis. This is complicated and it's not really necessary to go into but it is being intensively researched to aid us in our knowledge. It involves a reduction in blood flow to the foot this can be caused by various means such as some toxins hormones and enzymes. They may have direct effects on the laminae or the blood flow. Also overloading of these structures may result in their failure.
- This leads to poor oxygen delivery, tissue swelling and cell death.

Predisposing factors that can cause Laminitis

Carbohydrate Overload	Management	Support Laminitis	Infection and Sepsis	Miscellaneous
<ul style="list-style-type: none"> -Excess grain intake -Lush Pasture -Feed change to high-energy Legume 	<ul style="list-style-type: none"> -Overweight horses or ponies -Trimming hooves too short -Unconditioned horse working on a hard surface -Ingestion of cold water by overheated horse -Black walnut shavings 	<ul style="list-style-type: none"> -Severe lameness -Rehabilitation of fracture repair 	<ul style="list-style-type: none"> -Severe colics requiring surgery and then a long recovery period -Colitis and anterior enteritis -Pleuropneumonia -Retained placenta, abortion. -Any other cause of sepsis 	<ul style="list-style-type: none"> -Frost -Continuous oestrus in mares -Treatment with corticosteroids -Allergic reaction to certain medications -Hypothyroidism

I am only going to discuss the factors that are more common and that you as the owners will have a chance of attempting some sort of prevention, because otherwise we'll be here a while.

Diet Management

So in Point #1 it's all about diet management. The important thing to know is not to change your pony's diet suddenly. It's these drastic changes that cause problems. This is the same for putting them in a new unused paddock, especially in the spring time when there has been an increased growth of rich grass. So if you need to use a new paddock put them in for an hour or so and then increase this daily. If you need a change in diet or you want to increase the amount of food because you have to increase the work load again do this over time a week to 2 weeks.

Now the reason we must do this is because the normal bacteria in the gut have to adapt to this new diet. If it is changed suddenly we can get an overgrowth of a particular bacteria type which can cause a pH change in the gut. This is what makes them susceptible to laminitis. Bacteria then die off and endotoxins as well as other factors are released and have direct effects on the laminae and its blood supply.

Metabolic Syndrome

Point 2 is from an owner's point of view the most important area for laminitis. This is the part where you can help prevent this dreadful disease.

- Overweight horses and ponies are prone to laminitis. I can't say that they will get laminitis but there is a good chance that this may happen. Ponies in particular are very prone so watch out!
- Needless to say that just their increased weight puts extra strain on their feet and in particular the lamina area, that was made for a pony supposed to be a bit lighter. But it goes a lot deeper than this.

- From observing horses with laminitis no matter what the cause, the heavier animals in relation to their hoof size just don't seem to respond as well to treatment, as a leaner fitter animal.
- It has been researched and proven now as well that there is an underlying metabolic problem with overweight ponies that also contributes to this disease. I'm going to try and explain it a bit.
- The extra fat or adipose tissue in the pony's body acts like a new organ and has effects on the animal's metabolism. The body's cells become insulin resistant due to factors or hormones released by these excess fat cells. In humans this would lead them to becoming a diabetic but horses can't become diabetic in this way, but it does make them prone to metabolic diseases. One of the more common effects is making them prone to laminitis.
- This has become known as "Metabolic Syndrome" and there are now blood tests available to see whether your pony is at risk.
- The test does not give you a yes/no answer that your pony will get laminitis. What it does is it tests certain hormones, chemicals and proteins in the blood and then if they are above the normal range in a few of the categories then we can say your pony is at risk. So the test is an interpretation of results. What this essentially does is tests the well being of a horse or pony and will then tell you then if it is in a metabolic syndrome state or not.
- The test is unfortunately not fool proof and there may be a few cases that never get laminitis no matter how overweight they are and also the reverse can be true that a pony with a normal test result can still get laminitis. But we have to remember that there are still a lot of other factors that may be beyond our control and what we are trying to do is reduce this risk.

More Management

Too radical hoof trimming can cause laminitis. This is more often the case of chronic laminitic ponies and can be the reason the laminitis is reactivated. This is why management of chronic cases is so important. We'll get onto more of that shortly.

I had a case back in South Africa where a pony was stolen from a farm. The thieves then rode or marched the horse 30km's for reasons unknown and after he was exhausted they abandoned him. He was picked up by the SPCA a day or two later unable to move and was diagnosed with acute laminitis. This was very likely caused by the massive distance he had to travel on a surface that his hooves were not accustomed to travelling on. Sadly he did not receive treatment early enough and he was not able to respond when he was treated. This is highlighting that point that excessive exercise on a hard surface may result in laminitis.

Don't let a hot horse drink too much cold water too quickly. Limit his intake over time (an hour) so that he quenches his thirst slowly. I have not seen this before and there is not much about it in the literature so just don't do it. I think black walnut shavings causing laminitis occurs in America so it will not happen in England commonly or at all. Most of them recover well they must just be removed from the inciting cause and treated as an acutely laminitic horse. They tend to respond quickly to treatment.

Intensive Hospital Cases

The next two columns or categories fall into your hospital or intensive cases. Horses with systemic infection caused by severe colic, retained placenta or pleuropneumonia to name a few are at risk to develop secondary laminitis. We also have those horses that have a fractured limb or severe non-weight bearing lameness that then develop support laminitis in the contra-lateral or all other limbs- this is from overload and possibly sepsis.

These cases are often being treated quite intensively by the vet or team of vets and they know that an unfortunate and disastrous complication can be laminitis. This group generally has quite a poor prognosis because they are already compromised. Also very often in these cases the vet has predicted that laminitis may be a problem and has put in place preventative measures. So you can sometimes see sick or injured hospital cases with supportive shoes or pads in place and a good layer of bedding. They will also be on medical treatment as a preventative measure.

Most cases that have had these measures in place do not develop laminitis but it can happen. We can all remember Barbaro, the Kentucky Derby winner in the US who broke down in The Preakness Stakes and had to have surgery on his hind pastern. They had every conceivable measure for prevention in place but unfortunately load was too great and he developed laminitis with disastrous consequences. What a desperate end to such a magnificent creature. The case did highlight that there is a lot more research needed for this disease and that we still don't fully understand all the mechanisms of it.

Miscellaneous Causes

Other causes of this disease are for the most part fairly rare so we'll touch on them briefly. Frost or frozen ground is an interesting one. We are not sure whether it is the change in nutrient structure in grasses during times of frost or the actually physical effect of the cold on the hoof. It may also be the change in temperature from a relatively warm stable to the frozen ground. In most of these cases though the animal is already a chronic laminitic case and it must therefore become part of the management of these cases.

Corticosteroids or cortisone products have received a lot of attention for their part in causing laminitis and rightly so. Firstly you must know that these are for the most part very worthwhile products if used judiciously. That is the important thing, they should not be overused or abused and each case must be looked at individually. Most times they will not cause laminitis. Each owner should know the reason that a cortisone product needs to be used and that potentially there is a chance of laminitis however small. So low doses targeting specific sites such as topicals, inhalers for lungs, local injections, short acting as apposed to long acting should be used. Unfortunately in some instances or conditions a longer acting systemic drug may need to be used. So therefore each case should be discussed with the owner and the merits of whether or not to treat with a cortisone product decided upon.

Stages of Laminitis

Acute laminitis is what happens in the initial stages. It is the active inflammation of the lamina and it's when you first see your pony showing the typical laminitic signs. This must be seen as a medical emergency and treated promptly and aggressively. Unfortunately most times the disease has been going on for a few hours and a lot of the damage may already have occurred. At this stage there is no rotation or sinking of the pedal bone so if radiographs are taken the hoof and pedal bone will still look fairly normal. If the process is alleviated and halted at this stage it then moves into the subacute stage and there is a good chance for a good recovery. We must make sure that the patient is still treated correctly for the next month, and if there are no further changes on radiographs after this time then we can say the horse has recovered. If the lamina structures cannot stand up to the forces exerted on them during this acute phase then they may collapse to a greater or lesser degree it then moves over to the refractory and chronic laminitic stages. This is diagnosed by radiographs.

Subacute laminitis is those cases that respond well to initial treatment or the inciting cause was not that excessive. In these cases there are no hoof changes and the signs of pain will gradually diminish and disappear. We must remember though that the lamina have been microscopically disrupted so they are weakened even though we can't see it so these cases are still susceptible to another bout which could then be far worse. So treatment must be maintained for at least 1 month after the clinical signs have disappeared to try and prevent this.

If there is no improvement of an acutely laminitic horse in 7-10 days or if there is rotation or sinking of the pedal bone then we can say the case has become refractory. In a lot of these cases the prognosis for returning to work or staying sound becomes poor. Rotation of the pedal bone is when pull of the deep flexor tendon overcomes the strength of the dorsal laminae and the pedal bone rotates down and caudally, in most circumstances the greater the degree of rotation the poorer your prognosis. Sinking is when the laminae all collapse at the

same time and the weight of the horse forces the pedal bone down onto the sole. These cases carry your poorest prognosis. With the rotation cases you can clinically feel a depression in the coronary band at the front of the hoof and in sinkers you can feel this depression all around the coronary band.

Chronic laminitis or Founder is now when there is no more active degeneration or necrosis going on. You get a pony with the typically deformed hoof as it cannot grow normally due to all the changes inside it. So there is a long toe, overgrown heels, diverging rings on the hoof wall and dropped soles. These horses are prone to seedy toe and hoof abscesses because of the cracked and abnormal hoof growth. They are also prone to recurrent attacks of acute laminitis.

Diagnosis

This is based on the clinical signs: bilateral lameness, increased digital pulse, coronary band depression and excessive heat in the hoof wall. Hoof testers can be used by the vet to elicit pain over the toe area. Sometimes the patient can be so painful that he will not move or allow you to lift a limb because then that exerts extra pressure on the opposite hoof which is too much for him to endure. In these instances nerve blocks may help you make a diagnosis as well as to alleviate the pain for a while.

In most cases radiographs should also be taken of the patient which will then serve as a baseline for future radiographs taken. It can help give a prognosis during the course of treatment. As was discussed earlier the degree of rotation can give you a prognosis to treatment and possible outcome. It does not always give an indication of the pain the horse may be in though. There are some cases when there is only a small amount of displacement but the pain can be so great it is uncontrollable. So we must make our decisions for the benefit and welfare of the horse and use the whole clinical picture to make that decision.

Treatment

A horse without laminitis is the best case scenario, so that is what we must aim for. We have to try and react as best we can before an animal can develop such a debilitating disease. We must therefore make sure that all the predisposing factors causing laminitis discussed earlier are as reduced as possible.

When confronted with a case of laminitis the inciting cause must be removed or treated. Often it is not known so blanket treatment may then be given. If a horse eats too much grain or has a diet change it is drenched with mineral oil or activated charcoal to prevent further absorption of toxins. Take it off the lush pasture if that's the cause. Treat with antibiotics if septicaemia is present and drugs to reduce endotoxaemia.

Each practice or individual vet will have a slightly different way of treating but essentially their aims are the same.

-Firstly reduce the pain and this will alleviate your pony's anxiety at the same time.

- The mainstay of treatment is anti-inflammatories like Phenylbutazone. Initially morphine derivatives can also be used.

- Nerve blocks are reserved for the really severe cases.

- Thick bedding and padding of the sole and providing frog support will also help to reduce the pressure on the hoof and sole thereby reducing pain.

A large amount of research is going into blood flow to the equine digit in laminitic cases. As we said earlier the blood flow becomes compromised so treatment is also introduced to try and improve this blood flow. Platelets involved in blood clots tend to stick together in the small blood vessels of laminitic horses so drugs are used to reduce this like Aspirin or Heparin. Certain drugs like ACP are used to dilate these blood vessels and thereby improve the blood flow to the digit. The drugs used at the moment are not specific for this area so they do have systemic effects but they are trying to find new and better ones that may be able to work on these sites and possibly even counter-act some of the inciting causes. I have not mentioned all the drugs and treatments but mostly the general principles.

Preventing further rotation of the pedal bone.

- Shoes should be removed at the onset of laminitis and the foot trimmed where necessary. At this stage there is no reason for radical trimming unless justified because it may exacerbate the painful state.
- One of the first and simpler things to do is to apply frog support. This attempts to take some of the pressures off the laminae and also the sole. This can be done with simple Styrofoam pads and manufactured pads like lilly pads. What is important is that they must fit well and that the frog trimmed to its natural position so it is not overgrown and thereby putting pressure onto the sole.
- Another very important aspect is to reduce the horse's movement drastically and in most cases this means box confining them for at least 30 days in a stable with deep bedding. This allows the horse to stand in its most comfortable position sometimes digging the toe into the shavings at a bit of an angle. Then if the pain gets too much he can lie down for periods quite comfortably. Movement puts extra strain on the laminae and therefore could contribute to their break down.

Long Term Treatment

- Long term treatment of these patients is incredibly important. We have to do as much as possible to promote hoof growth and healing. This can be done with systemic hoof supplements, making sure the foot is regularly trimmed and seen to by the farrier or vet and preventing or reacting quickly to subsolar abscesses and seedy toe.
- The horse's health is also very important so while it is suffering from this disease all pressure sores that have developed while the pony is recumbent must be well treated. We have to make sure they are getting on adequate diet that has good quality roughage and fibre to make sure the GIT works normally. Diet is also important in making sure the pony is not overweight and any

other subsequent diseases are treated in time so it may not exacerbate this laminitic horse.

Corrective Trimming and Shoeing

Corrective shoeing and trimming becomes the primary treatment for chronically laminitic horses. We are trying to make the horse more comfortable and at the same time trying to return the pedal bone to its normal anatomic position. This basically involves shortening the toe, lowering the heel and supporting the sole. Regular trimming is needed every 4-6 weeks. It can be highly detrimental to let the hoof grow for too long without trimming!

Shoeing goes hand in hand with trimming and has similar goals namely - protecting the painful sole; preventing further rotation; providing support for the foot and enhancing the healing process.

There are quite a large array of types of shoes used and decisions made when to use what. Wedged shoes can relieve the tension of the deep flexor tendon thereby reducing pain especially in acute cases. Newmarket putty moulds to the sole and frog area and hardens to a gel like substance that can aid in frog support. It can also be placed under a shoe pad increasing its supportive role. Fairly recently glue on Imprint shoes have been developed. These can be moulded to the foot while they are heated and pliable, and the correct support can then be fashioned. Again I must emphasize that each case is different and it takes the owner, vet and farrier working as a team coming up with the best treatment that is possible in that situation.

More radical treatments

There are other more radical treatments available for treating laminitic cases. These are reserved for the most part the refractory cases that are not responding to the initial treatment or keep having follow-up bouts of acute laminitis. This can involve hoof casts, inferior check ligament desmotomy or deep flexor tendon tenotomy and dorsal hoof wall resection to name a few. They do have their place in treating laminitic cases but for a lot of these cases they are salvage procedures which will leave the horse pasture sound at best. But in

some cases they may work really well, so it is something to consider if the current treatment is not working.

Conclusion

Acute Laminitis is a medical emergency that needs prompt treatment for a chance to have a better outcome. Unfortunately for a lot of the cases the prognosis for return to past level of performance is guarded. This does not mean that you won't have a happy horse after a bout of laminitis but just that in most cases there are changes in the hoof and the pony will be susceptible to future acute insults. He may also not be quite as competitive so in some cases it will mean retiring to pasture (but not too good quality). Again I must emphasize that the all important thing is to do our best not to let them get it! The last thing which no-one likes talking about is that we are doing this for the pony's welfare and if at any stage that comes into question then the hardest decision of all should be made.