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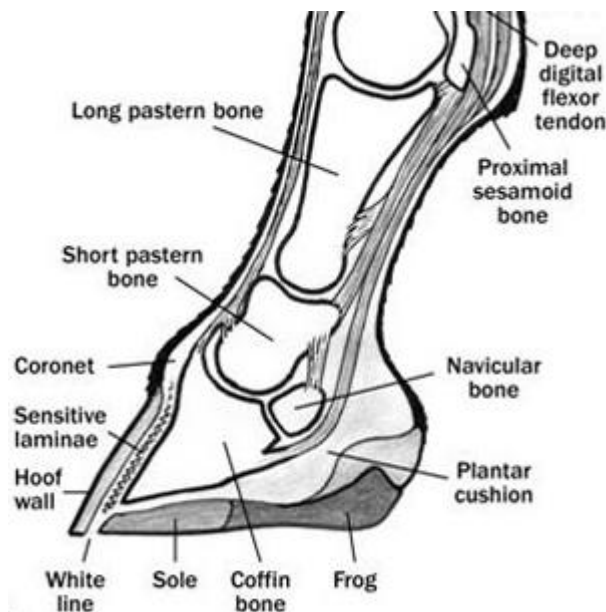
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What is Laminitis, Anatomy of the Foot and Common Causes with predisposing factors

Laminitis, by definition, is inflammation of the laminae, which is the cobweb like structure which supports the pedal bone within the hoof capsule.



REFERENCE: <http://www.omafr.gov.on.ca/english/livestock/horses/facts/12-019.htm>

The laminae are a complex structure which absorb impact and support the bone, but they are also very dynamic. They are vital in growth of the hoof from the coronary band and have a high energy requirement for both growth and the constant repair of micro damage. The laminae have a rich blood supply in micro vessels called capillaries, the whole structure is vulnerable in the face of inflammation. This weakens the strong attachments (rather like Velcro failing) and this failure allows the pedal bone to follow the forces applied to it. The deep flexor tendon at the back of the pedal bone pulls it to rotate downwards and the weight of the horse leads to sinking (founder).

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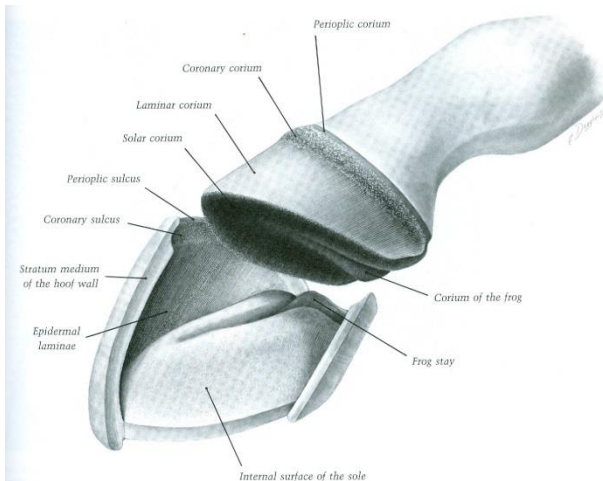


FIG. 1-4. Dissected view of the relationships of the hoof to the underlying regions of the corium.

The common causes of laminitis can be grouped into 3 areas:

- **Metabolic causes.** Metabolic laminitis is a key clinical symptom of Equine Metabolic Syndrome and of Pituitary Pars Intermedia Dysfunction (commonly called Cushing disease). Both of these diseases result in a change in the body's response to the hormone insulin (similar to diabetes in humans) the lack of response to insulin following glucose entering the system leads to more insulin being released. This affects the blood flow to the laminae in the feet. The laminae become weakened due to inflammation and this causes pain and can lead to movement of the pedal bone.
- **Trauma**, overloading the lamellar structures either due to external trauma such as galloping in hard ground, or internal pressure such as severe lameness in the other leg causing increasing weight bearing. This creates inflammation and then weakening of the laminae.
- **Some toxins** such as severe bacterial infection can cause laminitis. Common causes are mare's that have not passed the placenta after foaling, severe colics with damaged intestine, or following concentrate overload (such as breaking into the feed room).

Both trauma and toxic causes are often more problematic in horses with an underlying primary metabolic disease state.

Diagnosis:

The clinical exam is important, there may be warmth in the hoof, increased pulse strength to the foot and reluctance to walk forwards particularly on hard or uneven ground. Not all of these are always present. There may be increased sensitivity to hoof testers. As disease progresses the horse may rock back on the heels and develop tense back muscles. There may be reluctance to pick up feet for examination. Blood tests are vitally important in diagnosis of metabolic conditions.

PPID - this blood sample can be taken any time and looks for a raised level of a hormone called adenocorticotrophic hormone (ACTH).

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Metabolic syndrome -

One single blood test to look for adiponectin, this can suggest an ongoing issue with insulin regulation. More accurately a dual blood sample, the first taken in the morning after starving overnight, the second a set period of time after a high glucose oral dose. This indicates how well the body copes with glucose with its insulin response.

Once the cause of laminitis has been identified, we move onto assessment of any damage caused by the disease process. X-rays are advised in ANY case of laminitis as even subtle movements of the pedal bone can cause long term foot problems if left undetected and rectified.

Laminitis Acute stage treatment:

Pain relief. Bute is highly effective and our first choice. Other drugs may be used such as paracetamol and for severe pain we use opioids (fentanyl) in a skin patch.

Supporting the feet is very important. A deep shavings bed will mould to the hoof when the horse stands and relieves pressure from the wall of the hoof especially at the toe. There are other methods of padding feet which can be used such as polystyrene pads and silicone putty which can be used to mould to the sole of the hoof. This help reduce pressure through the laminae by distributing weight over more of the foot.

Treatment of the underlying cause. This is most commonly the metabolic causes.

PPID is treated with a tablet medication called pergolide which reduces the levels of ACTH in the system allowing the horse to control the laminitis episode.

Metabolic syndrome may be managed initially with drugs such as metformin which aids in sugar level management, and levothyroxine which raises the horses metabolic rate to reduce sugar levels and regulate insulin as well as acting on other hormones such as thyroxin.

Ongoing treatment of metabolic syndrome involves carefully dietary management. A realistic body score (fat level) of the horse is made.

Foot support. Standard shoes may be adequate if mild cases, in severe cases foot trimming may need to be significant to counteract pedal changes and relieve inflammatory fluid. Glue on shoes are an excellent short term management plan.

Treatments such as acepromazine (ACP) and topical vascular agents have no supportive evidence and we tend not to include these in our treatment plans.

Nutritional Management:

Diet will be changed immediately with reduction in carbohydrates and in most cases a plan for weight loss. It is important to remember food intake is always balanced with exercise and as strict rest is advocated in the early stages, food must be cut back even in a standard weight horse.

Calorie reduction is key with particular restriction of sugar and cereal content. We recommend a total food intake of 1.5% body weight daily for weight loss. During the period of box rest required it is advisable that soaked hay be fed to aid weight loss/prevent weight gain. Normally we recommend that this be soaked for a minimum of 6 hours, which is easiest done by soaking a night net from the morning, and a morning net overnight. Fresh water should be used for each soaking so that resorption does not occur.

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A wide variety of laminitis approved diets are readily available on the market. Most of these feeds are specifically designed to feed in small quantities and should only be given if absolutely required, normally to give pain relief and additional treatments in.

Often the easiest feeds are those such as molasses free Happy Hoof, Safe and Sound, Bailey's or Topspec Lo calorie Balancer, Mollichop Lite, Speedibeet/Fibrebeet or any other plain low calorie feeds. Most of these are highly palatable and easily hide sachets of Phenylbutazone and additional treatments. No sweet syrup supplements should be given, most are available in powder form, even if just for a short period of time.

Ongoing management of a laminitic should not range too far away from the above management, just altering soaking of fibre, time out on grass (increase slowly off box rest), and concentrate feed type or quantity but still on the lower cereal and sugar diets. If you have any concerns about safe concentrate feeds the laminitis trust has approved certain feeds which are listed on their website.

Long term management and shoeing:

Ongoing management of the underlying causes is vital, repeat blood samples will be recommended at intervals appropriate to the individual horse.

Weight control and exposure to new or higher levels of sugar is also vital, such as turning out on to a new, rich paddock, changing feed to a mix based rather than pellet etc. If there is ever a doubt about whether a grazing area is too green/rich for your laminitic then strip grazing +/- a grazing muzzle is always a good idea. Turnout overnight is also beneficial rather than in the day, as the sugar levels in the grass is less at this time and therefore the risk of an insulin resistance induced sugar high is lessened.

If the horse or pony spends much time in the stable then access to forage is vital, but steadying the intake to be able to control quantity of consumption is also incredibly useful. There are many ways to do this such as; double netting haynets, hanging multiple small nets around the stable, hanging one net from the middle of the stable so there is no wall to pin it against to eat it faster, upside down haybar/flexi-rac to trickle feed down on the floor. Hay is far better than haylage for less sugar consumption, and if your horse/pony still does too well then soaking the hay for 6-9 hours may be required to decrease the starch/sugar content even further.

Hard feed must be considered very carefully for ongoing management of chronic laminitics, whether they even need any, and if so what bare necessities do they need without excess calories, energy or sugar. See the nutritional advice paragraph for further details on this.

Follow up X-rays to support ongoing farriery correction is a very important aspect of care of a laminitic both in acute and chronic phases. Ensuring the hoof pastern axis is as good as possible so that the support of the pedal bone, short and long pastern bones are in the best alignment possible is important in any horse or pony but when ongoing strain is being put on the internal structure of the foot it is even more so. Laminitis will have altered hoof growth and need to have their toes kept back, often with a rolled toe for early break over to minimise pressure in this area, with good depth of heel for caudal foot support. If the pedal bone has rotated the heels may need to be cut back to help rectify this. It is not possible for the farrier to do this without X-ray guidance.

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In some chronic cases heart bar shoes may be required to apply support over the frog area and thereby supporting underneath the area of the pedal bone. Some cases even require solar padding of some format for at least a short period of time to minimise impact to the sole and reduce the risk of bruising and irritating the laminae again. These sort of decisions are made depending on the individual case and effective communication between your vet and farrier. Regular trimming and shoeing is needed to stay on top of the feet so it is advised that the horse or pony is shod every 4-7 weeks depending on rate of hoof growth.

Laminitis is a serious condition but in most cases, with prompt and appropriate management, horses can return to soundness and health. Laminitis often presents as an acute emergency and the attending vet may refer you for long term management to another member of the team. This is to make sure we are able to provide the most comprehensive ongoing care package. If you have any concerns or questions please do not hesitate to contact your case vet.

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