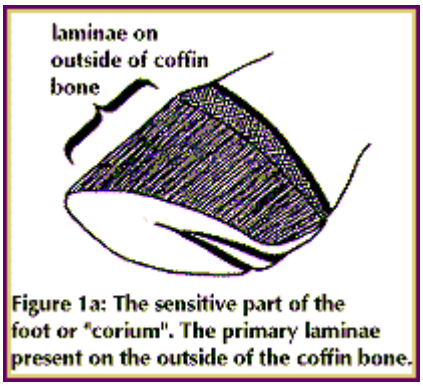

Figure 1a: The sensitive part of the foot or "corium". The primary laminae present on the outside of the coffin bone.

To understand laminitis it is necessary to understand how the inside of the foot is constructed and how horses bear weight. The force created by the horses weight is transmitted down through the bones of the leg to the coffin bone (third phalanx or P3), which sits within the hoof wall. The force is transferred from the bone to the wall, and then from the wall to the ground. The laminae (or laminar junction) connect the outside of the coffin bone to the inside of the hoof wall: it is their presence that prevents the bone from descending through the sole. In effect, the coffin bone (and therefore the horses weight) is suspended from the inside of the wall by these delicate structures. Each lamina runs from the top of the foot to the bottom, one set of laminae projecting out as thin sheets of tissue from the coffin bone (Fig. 1a), a second set projecting inwards from the hoof wall (Fig. 1b). The main laminae are called primary laminae. Each primary lamina has lots of mini-laminae projecting from its surface, known as secondary laminae. The end result of all these primary and secondary laminae is a great increase in the surface area bonding the outside of the bone and the inside of the wall. This increase in surface area reduces the stress across the junction. The laminar junction contains specialised blood vessels known as arterio-venous anastomoses (AVAs) which allow blood to pass rapidly from arteries to veins without passing through the small blood vessels (capillaries) of the foot (Fig. 2). It is only when blood is in the capillaries that it can nourish the tissues. AVAs are probably present in the foot to act as pressure-relief valves so that the capillaries do not burst when the foot hits the ground.

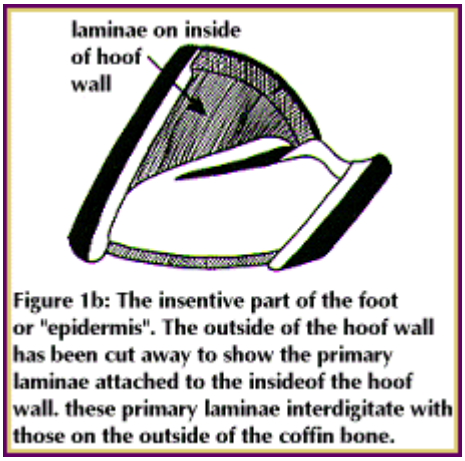

Figure 1b: The insentive part of the foot or "epidermis". The outside of the hoof wall has been cut away to show the primary laminae attached to the insideof the hoof wall. these primary laminae interdigitate with those on the outside of the coffin bone.

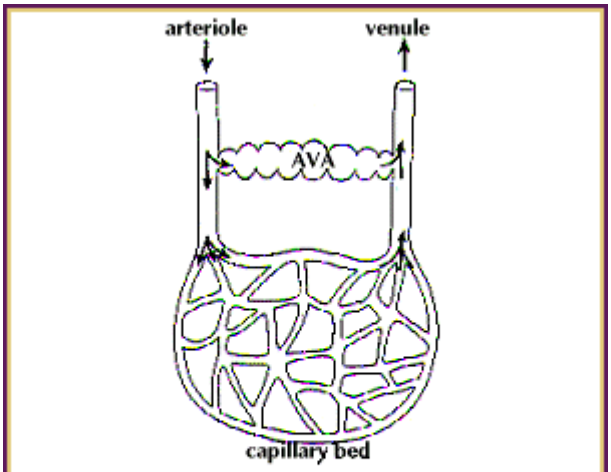

Figure 2: The presence of arterio-venous anastomoses (AVAs) gives an alternate route for blood passing from the arteriole to the venule. When the AVA is open, blood can bypass the capillary bed and is unavailable to the tissues. Prolonged opening of AVAs in the digital circulation may be important in the early stages of laminitis.

Horse Health Care – No Foot No Horse

Laminitis Fact Sheet

EquineCentre
Werribee, Australia

What is laminitis?

Laminitis is a weakening or destruction of the laminae, thought to result from lack of blood supply to the affected region. The development of the disease is not completely understood, however, and other mechanisms may prove to be involved. The lack of blood supply may result from inappropriate prolonged opening of AVAs which shunt blood away from the capillaries. Mild cases of laminitis may go unnoticed, with no permanent damage to the foot. In more severe cases, the lack of blood supply causes the laminae on the outside of the bone to unzip from the laminae on the inside of the hoof wall. In the worst cases, the weakened laminar junction can no longer support the weight of the horse, and the coffin bone moves relative to the wall. Movement of the bone can further reduce blood supply to the laminae by squashing blood vessels, compounding the damage. The coffin bone can move in two main ways: if the laminae at the front of the foot are affected more severely than those at the heels (a common finding) the bone will rotate (Fig. 3a). If the entire laminar junction is affected the bone may move directly downwards (Fig. 3b). This is a sinker. The position of the bone can (and should) be determined by X-ray. Both rotation and sinking may cause the bone to penetrate the sole of the foot.

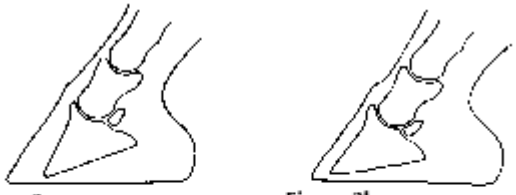

Figure 3a Figure 3b

During an episode of acute laminitis the coffin bone (P3) may move within the hoof capsule. Figure 3a shows a foot in which the coffin bone has "roteted" away from the hoof wall: the bone and the hoof wall are no longer parallel. Figure 3b shows a foot in which the coffin bone has"sunk" within the hoof capsule. Although the bone and the wall are parallel, the bone is now very close to the sole. A combination of rotation and sinking may be present in the same foot.

Causes of Laminitis

Occasionally a horse or pony will get laminitis for no obvious reason. These are the exceptions, however. The factors listed below all significantly increase the chances of an animal becoming affected.

Excessive feed intake: Overfeeding increases the risk of laminitis. Ponies allowed unrestricted access to pasture, particularly lush spring grass, are at extremely high risk. Grass intake should be strictly limited in these circumstances, the aim being to maintain ideal body weight. Such restrictions may seem cruel, but are infinitely preferable to letting the pony get laminitis. Extreme care should be taken if concentrates are fed to ponies, and thought should be given to eliminating them from the diet completely in high-risk animals. Seek veterinary advice. "Overfeeding" laminitis can also occur in horses, where it is most commonly due to excessive concentrate intake. The classic case is the horse which escapes and gains access to the feed bin. If this happens, call a veterinarian immediately: the horse is at very high risk.

Toxemia: Horses which have toxins in their bloodstream are at high risk of laminitis. Common causes of toxemia are severe diarrhea, pleuritis, some types of severe colic and

retention of the placenta (afterbirth) after foaling. The placenta should always be inspected to ensure it is complete. If any pieces are missing, however small, contact your veterinarian.

Trauma: Laminitis occasionally occurs in horses or ponies which exercise excessively on very hard ground.

Excessive weight-bearing: Horses which are very lame in one leg (e.g. due to a fracture) may develop laminitis in the opposite leg due to excessive weight-bearing. If a horse with severe lameness suddenly appears to be more comfortable, this could be because the opposite leg is now painful. If this happens, call your veterinarian.

Steroids: Steroids (more precisely, corticosteroids) can cause laminitis. Although steroids are extremely useful and effective drugs, their use should be kept to a minimum in horses. Short-acting rather than long-acting preparations should be used whenever possible, and particular care should be taken in animals which are already at high risk of laminitis (e.g. fat ponies). Steroids should never be used to treat laminitis.

Cancer of the pituitary gland: One of the more common types of cancer in older horses is benign cancer of the pituitary gland. The most obvious signs are excessive drinking and development of an excessively long coat. These animals are also prone to laminitis. Hairy, thirsty horses should be seen by a veterinarian, who will be able to confirm the diagnosis and advise on management.

Signs of Laminitis

The signs of laminitis vary from mild lameness visible only at a trot, to an animal that stands rooted to the spot, refusing to move, to one that is down and blowing in pain. The main signs are listed below:

- lameness (variable degree)
- reluctance to move standing with hind feet under body and fore feet camped out in front (less obvious in animals affected in all four feet)
- prominent, bounding feel to digital arterial pulse (Fig. 4)
- hot feet (Horses feet normally heat up and cool down during the course of a day. But marked heat in the feet for several hours may be indicative of laminitis.)
- sunken area immediately above coronary band (sinkers)
- landing heel first (laminitis) or flat-footed (sinkers)

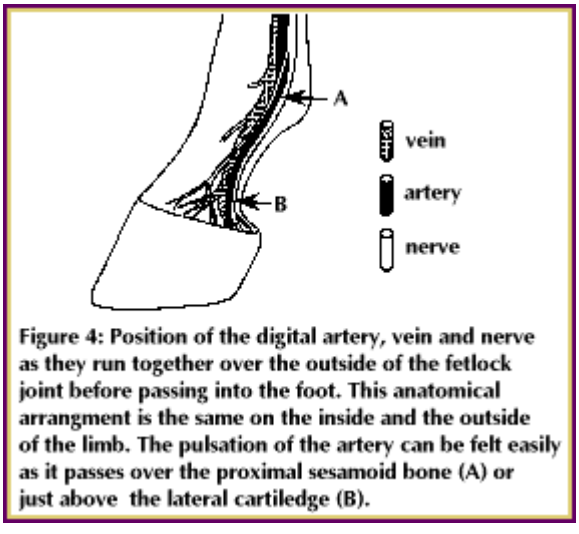

Figure 4: Position of the digital artery, vein and nerve as they run together over the outside of the fetlock joint before passing into the foot. This anatomical arrangment is the same on the inside and the outside of the limb. The pulsation of the artery can be felt easily as it passes over the proximal sesamoid bone (A) or just above the lateral cartiledge (B).

Horse Health Care – No Foot No Horse

Laminitis Fact Sheet

EquineCentre
Werribee, Australia

What to Do

If you think that your horse or pony has laminitis it is important to call a veterinarian immediately. Laminitis is not a "wait and see" condition.

- Do not allow the animal to eat anything until the veterinarian arrives, and do not administer any drugs unless he/she tells you to do so.
- If the animal can walk reasonably easily, lead him gently to a deeply bedded stable. It is preferable to fit frog supports before doing this (consult your veterinarian).
- If it is a long distance to the stable, or if the horse is reluctant to walk, transport him in a low-loading trailer.
- If neither of these options is possible, do not move him until the veterinarian arrives. It is vitally important that the horse is not walked any further or faster than necessary. Forced walking of animals with laminitis is now known to be extremely detrimental (as well as being inhumane).

The severity of the case, the facilities available for treatment and the preferences of the individual veterinarian will determine the treatment recommended. There is no sure cure for laminitis, and different veterinarians may well recommend different regimes. Whatever the treatment, it is important to obtain high quality X-rays of the feet as the case progresses, to monitor the position of the coffin bone within the foot. Also important is a good working relationship between your veterinarian and farrier. In a severe case of laminitis, a good 3-way team of veterinarian, farrier and owner may make the difference between success and failure. Some cases are so severe that the horses are best euthanised. You should be prepared to make this decision for the sake of your animal.

Prevention

Prevention of laminitis resolves around careful, sensible horse management. Some cases of laminitis are not preventable, but the majority of cases would never occur if the following guidelines were followed.

- Do not allow horses (particularly ponies) to become overweight
- Restrict grass intake when glass is lush and plentiful
- Never overfeed concentrate feed
- Keep grain in separate, closed-off area so that horses which escape cannot eat it
- Seek immediate veterinary attention if a horse is sick or lame
- Do not administer drugs without veterinary recommendation
- Provide skilled, regular foot care (approx. every 6 weeks)

By Janet Douglas
Equine Research Centre
Guelph, Ontario, Canada