NUTRITIONAL SUPPORT FOR LAMINITIS

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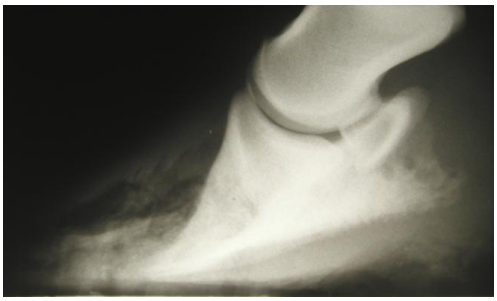
Laminitis is one of the most common conditions affecting horses, one of the most distressing syndromes facing veterinarians, farriers and owners. It has affected the equine industry from as early as 350BC when Aristotle termed it 'Barley Disease' – although since then we have learned that in the early stages of laminitis, ice baths are more beneficial than hot water!

Laminitis affects 2% of all horses with the incidence going up to 5% in spring.

The term 'laminitis' means 'inflammation of the laminae' - the normally resilient bonds that suspend and anchor the coffin bone within the hoof capsule. These bonds are formed by around 6000 interlocking leaves (laminae) that attach the coffin bone to the inner surface of the hoof wall. They enable the weight of the horse to be transferred to the hoof wall rather than through the sole of the foot.

Laminitis is usually secondary to disturbances in areas of the body far removed from the feet – disorders in any system can precipitate laminitis, including gastrointestinal, respiratory, reproductive, endocrine, immune and musculoskeletal systems. Once clinical signs of laminitis are apparent, the course of the disease is related to the amount and severity of damage to the laminae. In the chronic stage, there is mechanical failure of the laminae and rotation or sinking of the coffin bone as shown in the xray.



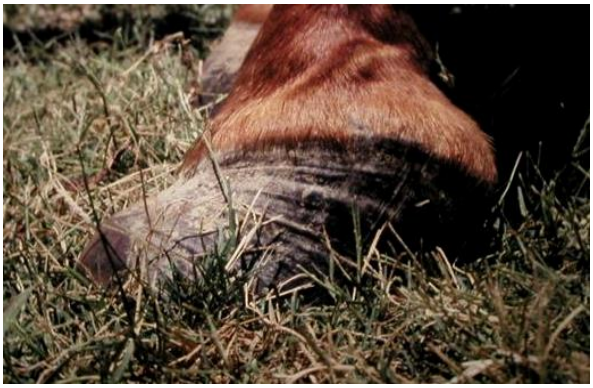
Laminitis is a common sequel to inflammatory conditions such as colitis, colic and retained placenta, but the most common causes of laminitis are grazing stressed or lush pastures, grain-based diets, obesity, equine metabolic syndrome, pituitary dysfunction and insulin resistance. Insulin resistance is a factor in obesity, Type II-diabetes, hypertension, vascular disease and related disorders in humans and animals, and is the common link between laminitis and Cushing's disease, obesity, inactivity, pregnancy, lush pasture and grain intake.

The definition of insulin resistance is '..an inability of insulin to promote glucose uptake by the cells..'. What this means is that glucose entry into cells is impaired and also that much higher amounts of insulin have to be produced before glucose moves into the cells. The laminae are particularly sensitive in terms of glucose requirement and this may explain why they are so sensitive to insulin resistance. The laminae have a high requirement for glucose and insulin resistance reduces the entry of glucose into the laminae cells. Large fluctuations in glucose and insulin occur with feeds high in sugar and this promotes insulin resistance.

Insulin is a potent anabolic hormone and increases fat accumulation – so the higher the insulin levels, the more fat deposition in the body. Ponies are the classic example of insulin resistance, which explains their increased susceptibility to laminitis – some researchers believe that there are really only two types of ponies – ponies that have laminitis and ponies that are going to get laminitis! But while ponies are more

commonly affected by laminitis, it is important to note that sub-clinical laminitis is of great importance in horses too, including thoroughbreds.

Certain physical characteristics should lead proactive owners to reduce the risk factors. There is a solid correlation between laminitis, neck circumference and good doers - fat pads behind the shoulder, around the tailhead and over the loin or a slight crest with a dip in front of the withers. Fat tissue produces inflammatory hormones which enter the circulation, affecting the whole body and increasing the horse's susceptibility to laminitis and insulin resistance. Horses with cresty necks and laminitis may or may not have thyroid problems to go along with it. Poor thyroid function may be a result of selenium and magnesium deficiency. Selenium is needed for the liver to convert the inactive form of thyroid hormone into the active hormone. Magnesium and chromium are important for insulin and glucose metabolism, iodine and selenium for thyroid function. Selenium and thyroid tests are available and a veterinary examination is important. Hoof tenderness, rings on the hoof wall and a stretched white line with blood specs when viewed from the bottom, could indicate previous episodes of laminitis.



There are differences in susceptibility to laminitis between breeds, ages and individual horses due to pasture preferences and grazing patterns. However, not all fat horses are insulin resistant and not all insulin resistance horses are fat – laminitis is also linked to disturbances to the gut flora.

Grain feeding and grazing lush or stressed pasture - particularly in autumn and spring - are major risk factors for laminitis, with twice as many cases reported during the spring (52.5% of the cases), compared to summer (26.9%) or winter (20.5%). Although man has sought to promote growth rates in sheep and cattle with ever-increasing sugar and starch pasture levels, it is now recognized that such pastures are not appropriate for horses. The sugars and starches in grain and pasture are fermented in the large intestine. Feasting lavishly on loads of undigested sugar and starch, starch-fermenting bacteria overgrow prolifically - producing acid, swamping the slower fibre-fermenters and initiating a cascade of events that inflame the intestinal wall and allow toxins to cross over into the bloodstream - where they trigger laminitis.

Pasture lushness is not a predictor of pasture sugar or starch content – in fact frost killed pasture is far from lush, but has a very high sugar content. Grass sugar storage increases when nutrients and sunlight are plentiful or when plants are exposed to drought or winter conditions. Abrupt changes in plant sugar levels occur day-to-day and even hour-to-hour as plant composition changes from night to day and from sunlight to shade. Levels tend to be lower in the morning and to accumulate throughout the day. Pasture sugar levels are higher during sunny days with cool nights, as grasses grow from leafy to stemmy stage, just prior to flowering, and after seed formation. Grass seed heads and clovers are also high in sugars.

But laminitis is not just a disease of ponies – it is a disease of domestication. Rarely would wild horses have constant access to top quality, genetically improved lucerne hay, lush pasture or grain-based diets. Never would they have been fed large meals once or twice a day, with little in between. Many diseases and veterinary emergencies are related to feeding management and under- or over-feeding.

A feature of laminitis is that clinical signs (pain, heat in the hoof and bounding pulses) are not seen until tissue damage in the hoof is well underway – making it difficult to treat and critical that aggressive therapy is initiated early in the disease process. Treatment is directed towards eliminating or minimizing any predisposing factors, the judicious use of non-steroidal anti-inflammatory medications, strict stall confinement and foot support. Cooling the feet for at least 24 hours in the early stages can have a huge impact on successful management. Once a horse has had a laminitic episode, even if successfully treated, they are likely to suffer from a recurrence of the disease.

Because there is no known cure for laminitis, good management and appropriate nutrition are important - the challenge is to avoid feeds and feeding management practices that disturb the digestive system. Treatment for laminitis is largely an exercise in damage control and dietary and management measures are the mainstay of prevention. The two principle strategies for addressing insulin resistance are (1) reduce weight in obese horses, and (2) improve insulin sensitivity through dietary management and exercise.

Nutritional intervention should support the horse's immune system - which has the overall task of repairing the damage to the laminae. Risk reduction measures include a low-glycaemic diet rich in anti-oxidants and the omega 3 fatty acids that modulate inflammation - including the inflammatory component of insulin resistance. Countermeasures include replacing starch and sugar-based feeds with appropriately formulated oil- and fibre-based feeds that produce low glycaemic and insulin responses, and avoidance of pastures with high sugar and starch content.

Because pasture-associated laminitis occurs on pasture, it may be necessary to prevent access to pasture in horses with recurring laminitis, and to feed high fibre, low starch alternatives. Current advice includes the following: horses predisposed to laminitis should preferably be denied access to pasture during the growing season and when pasture is stressed. If grazing is unavoidable, grazing should only be permitted very late at night until mid- to late morning (3am – 10am) and on cloudy days. Horses should not be turned out onto grass that is stemmy, changing from a vegetative to a growing state, or exposed to low temperatures and bright sunlight. Neither should they graze recently cut stubble. Plant low-fructan grasses where possible.

The amount of starch and sugar in hay and chaff also varies with the date of planting, season of harvest, ambient temperatures and plant maturity at harvest. Soaking hay for 1 to 6 hours reduces the sugar content. Soaked molasses-free beet pulp, rinsed twice in warm water to remove sugars and then soaked for 10 to 30 minutes in warm water is mostly digested in the large intestine and supports the fibre-fermenting flora.

Understanding why some animals are predisposed to laminitis will help identify those at risk so that preventative measures can be implemented. Work is continuing to better our understanding of the pasture and climatic conditions associated with increased risk of laminitis and to give owners guidance to reduce the risk. Although we have yet to determine a specific triggering mechanism for laminitis, research has concluded that proper grazing and feed management could prevent approximately 50% of cases. In one study, no cases of laminitis occurred in ponies when starch intake did not exceed 4% of the diet. In addition, insulin response was reduced by 80% and the glycaemic effect by 40-60% when horses were fed an appropriately formulated oil-protein-fibre feed. Pelleted feed elicited the lowest average insulin response and insulin levels.

The interaction between diet and laminitis provides an opportunity for nutritional intervention and justifies the use of measures known to reduce the risks in healthy horses and ponies.

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