**Back on their feet again: Management of endocrine laminitis**

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*Management of naturally occurring endocrine laminitis (EMS, PPID or combination): diet, exercise and medical treatments and case examples.*

**Introduction**

Once you have made a diagnosis of endocrinopathic laminitis, it is important to use that information to guide treatment of the acute laminitis episode as well as to guide long term management to prevent recurrence. However, not all endocrinopathic laminitis cases are lame and the importance of recognising sub clinical laminitis and the development of divergent hoof rings or other hoof capsular changes to enable preventive strategies to be implemented are emphasised.

The aims of this presentation are to:

1. Discuss management of the acute case including managing the pain, providing hoof support and preventing further damage as well as immediate endocrine treatment considerations. The evidence for medical options beyond NSAIDs will be discussed.
2. Discuss management of the endocrine laminitis case after the acute episode, where the management focus is on the underlying cause, principally reduction of reduction of hyperinsulinaemia and improvement of insulin sensitivity using dietary management, exercise and medical therapy, depending on the case.
3. Provide case based examples of endocrinopathic laminitis management, including longer term management, pitfalls and difficulties that may be encountered. This includes consideration of the owner and their requirements – how to tailor your plan to ensure owner compliance and equine welfare.

**Management of the acute case**

Management of acute cases of laminitis involves three basic principles – identification and treatment of the primary disease, pain relief and digital support.

After initiating treatment, the severity and prognosis may be an important component of management, especially in severe or rapidly progressing cases.

Endocrine laminitis is, fortunately, usually less severe and less progressive than laminitis secondary to systemic inflammatory conditions. Nonetheless, an essential part of management is monitoring and managing the underlying endocrine cause as failure to do so can result in treatment failure or recurrence. As mentioned in another presentation (Endocrine laminitis) management should be guided by monitoring of insulin dysregulation not simply pain and grossly visible radiographic or hoof capsular changes, otherwise pathological changes to the lamellar cells can be continuing to occur and chronic severe lamellar changes can occur.

It is also vitally important to remember that not all endocrinopathic cases of laminitis demonstrate lameness, and repeated subclinical bouts of laminitis can occur with or without lameness. 1 The underlying pathology is associated with cellular cytoskeletal disruption, stretching and lamellar elongation 2 which results in abnormal and differential hoof growth, with reduced growth rate especially at the dorsal aspect of the hoof wall resulting in divergent (laminitic) rings. The occurrence of cap horn associated with endocrinopathic lamellar lesions 1 can result in visible widening or separation of the white line and increased susceptibility to hoof abscesses and changes in the position of the pedal bone can cause flattening or convexity of the soles. Early identification of these changes, even prior to clinical laminitis, will allow management strategies to be implemented.

**Managing the pain**

Appropriate analgesia using non-steroidal anti-inflammatory drugs (NSAIDS) is an important part of treatment. There is some evidence that COX-2 is constitutive in the lamellar dermis and epithelium 3 so even though COX-2 has been shown to be upregulated in laminitis, highly COX-2 specific drugs could have detrimental effects on homeostasis. Long term NSAIDS can result in signs of gastrointestinal or renal toxicity, in which case paracetamol can be useful to either in combination with (to reduce NSAID dose) or instead of NSAIDs. 4

Where pain is severe or non-responsive, multi modal analgesia is warranted including opioids, ketamine or lidocaine infusion. Some clinicians have had good results with gabapentin therapy to modulate neuropathic pain.

**Digital support**

Appropriate sole support is vital in severe cases through either styrofoam pads or other moldable soft sole support products. Shoe removal may be not possible in severe cases, but many products can be used with shoes still in place. A deep bed can also reduce pain and is advised. The aim is to spread the weight bearing surface over a wider surface area, with maximal weight bearing on the less affected heel areas and frog. Trimming can be useful to change the point of break over to a more caudal position (i.e. shorten the toe), but may not be possible acutely. Ideally work with radiographs and a good farrier. Exercise restriction in the form of box rest is generally recommended due to the potential to damage or even tear the elongated and weakened lamellae.

**Other therapy**

Acepromazine (0.03 mg/kg) has been used as a sedative and purported peripheral vasodilator in the treatment of laminitis cases, however there is limited evidence for its vasodilatory effects within the hoof. For pasture-associated (endocrinopathic) laminitis, there was a trend towards use of acepromazine and increased survival, 5 but this could be attributed as much to the sedative effects relaxing the horse, helping manage activity as well as stress which could worsen the endocrinopathy.

There is increasing evidence to suggest that the opposite effect, vasoconstriction using cryotherapy (icing the feet) is effective at reducing the effects of experimentally or naturally occurring laminitis associated with systemic inflammatory conditions. 6,7 Much less is known about the effects of cryotherapy in endocrine laminitis, however, increased hoof wall surface temperature indicative of increased blood flow during the development of laminitis induced by hyperinsulinaemia 8 implies that cryotherapy could also have a role. In naturally occurring cases, the insidious onset of many cases is likely to preclude its use.

**Endocrinopathic management**

Whether treating a clinical bout of laminitis or preventing one after identification of hoof capsular changes in an insulin dysregulated horse, management of the underlying endocrinopathy is warranted. Related presentations cover the diagnosis and treatment of equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID) (Equine Cushing’s disease/PPID what do we know now? Getting the old guys back on track:management of PPID; Dilemmas in diagnosis of EMS and managing the waistline: prevention and management of EMS). However, irrespective of the diagnosis, an immediate goal for endocrine management will be changing the diet to limit potential insulinaemic responses to the feed.

**Reduction of insulinaemic responses to feed**

Insulin dysregulation, especially the hyperinsulinaemic response to ingested carbohydrates, is central to the risk for laminitis irrespective of whether the horse has PPID or EMS. Reduction in postprandial hyperinsulinemia is the immediate and ultimate goal of dietary management of endocrine laminitis. This will typically involve removal of all starch rich supplementary feeds such as grains, pellets or mixes, and all fruit and vegetable treats such as carrots and apples (usually high in water soluble carbohydrates) and feeding of a low NSC, forage-only diet, supplemented with a balancer.

Despite many horse-owners’ perceptions, forages can contribute greatly to the NSC load of horse diets, and produce marked hyperinsulinaemic responses in horses when fed. High quality forages from improved pastures can be very high in NSC so it is important to attempt to ensure the forage source has low NSC. The insulinaemic responses to a meal using hays of different NSC (17%, 10% and 4%) were shown in normal horses and horses with PSSM. 9 The 17% NSC hay produced greater insulinaemic responses in both normal and PSSM horses than 10% or 4% (which were not different from each other). That study certainly supports aiming to feed hay of NSC% of 10% or lower. However, pasture species with such low NSC percentages are not always available, particularly not from improved pastures.

Soaking grass hay can be a simple way of reducing the NSC of forage where the NSC content is unknown so is ideal for immediate dietary changes. In a recent study conducted at our institute, Carslake et al. 10 performed a randomised crossover trial investigating the insulinaemic and glycaemic responses to three commonly fed forages in the UK; mixed species grass hay, the same hay soaked and the same species preserved as haylage (hay wrapped and fermented instead of sun cured). This showed a significantly greater insulinaemic responses to haylage over both hay and soaked hay, and considerably greater insulinaemic and glycaemic responses of hay over soaked hay. Insulin dysregulated ponies had much greater responses for all three forages, compared to normal ponies. The insulinaemic response to soaked hay was very small, even in insulin dysregulated ponies, supporting its use for immediate reduction of the insulinaemic response in a laminitic horse.

The effects of feeding alfalfa hay to normal horses has been studied and shown that is is a relatively low glycaemic forage and in young normal horses produces low insulinaemic responses. 11 However, the effect in insulin dysregulated horses is yet to be determined, especially as the high protein content of alfalfa can directly stimulate gut derived incretins. Soaking alfalfa hay has been shown to be effective in even as short a period as 15 minutes at halving the NSC. 12

**Medical therapy**

Levothyroxineis unsuitable for treatment in the face of acute laminitis as stimulation of metabolic rate while being confined. However metformin may play a role in reducing enteric glucose absorption so 15-30mg/kg PO could be given approximately 30 mins before consumption of feed where low NSC feed is unable to be sourced or hay is not able to be soaked.

**Exercise**

Exercise is usually inappropriate in acute cases of laminitis due to concern about the stability of the lamellar attachments. Considering the fact that real improvement in insulin sensitivity requires moderate intensity exercise for 30 minutes duration several times a week (See managing the waistline), it is best to focus on dietary considerations in the early stages following a bout of laminitis.

Once the laminitis has stabilised, ideally confirmed radiographically, and laminitis is < Obel grade 1 off analgesics, exercise can be commenced on a soft surface, ideally sand like in a manège and gradually increased with close monitoring for worsening of lameness. Although not necessarily improving insulin sensitivity, in overweight horses with EMS, even very small increases in exercise can be useful. An example is a tracker system for a horse to find its food which has been shown to increase daily walking distances from 1-3 km and improve body fat indices. 13

Longer term dietary and exercise management for endocrine disease is covered in the accompanying presentations.

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