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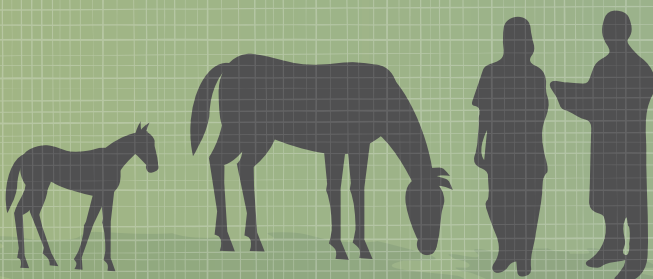
CONGRESS

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Handbook of Presentations



LAMINITIS

Chair: Roly Owers

10.55

How can we assess the future risk of laminitis using endocrine predictors?

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Laminitis is associated with endocrine, inflammatory or mechanical factors. This presentation will discuss endocrinopathic laminitis, considered to be the most common 'type' of laminitis, although the extent to which the pathology of the different 'forms' of laminitis overlaps is not clear.

Disease prediction for an initial episode or a recurrence of laminitis is important because of the pain and structural hoof changes that can be associated with laminitis and because key risk factors are modifiable. Prediction is not straightforward. Endocrinopathic laminitis is a multifactorial disease for which the manifestation of clinically apparent disease involves both the diet and the endocrine response to it. Prediction is further complicated because subclinical laminitis may be common and some laminitis episodes may go unnoticed.

Disease prediction includes both when and whether the condition will occur. In most studies laminitis has shown a seasonal pattern with the highest incidence usually recorded in the spring or summer. However, laminitis may occur at any time of year; for example, two large recent cohort studies have shown high incidences in January.

When assessing the overall risk of disease the starting point is the general level of risk in the population. Risk factors can then be assessed to indicate how they influence that risk. Recent estimates of laminitis incidence in the UK equine population range from around 0.5 to 11 cases per 100 horse/pony-years. The incidence in native pony breeds is typically higher than other breeds.

There is a clear association between insulin dysregulation and the development of laminitis. Insulin dysregulation has been associated with a range of factors including age, breed, obesity, diet, and signs of pituitary pars intermedia dysfunction (PPID). These associations beg the question of whether laminitis can be predicted from physical or management features without the need to assess serum insulin concentrations. To an extent, many of these factors can be used to predict laminitis, in particular evidence of divergent hoof growth. But, insulin dysregulation and laminitis often occur in animals without typical signs of PPID or the equine metabolic syndrome and the assessment of serum insulin concentrations (either basal or following an oral sugar test) provides the most effective laminitis prediction.

Basal insulin or oral sugar test?

Basal insulin concentrations have sometimes been considered to be insensitive indicators of insulin dysregulation and laminitis risk. However, basal insulin concentrations have shown good sensitivity for laminitis prediction. The sensitivity for laminitis development within a year was 78% in one pony cohort study. In another, ponies could be divided into low, medium and high risk based on basal insulin with estimated 4-year incidences of 6%, 22% and 69% respectively. In the same study, the oral sugar test showed similar predictive power although the dose of oral sugar (0.3 mL/kg Karo corn syrup) was lower than is used in some cases.

Assessment of basal insulin is convenient and the value gives an indication of both the animal's metabolic state and its diet at that time. It is therefore useful to monitor animals' responses to their usual diet. Very different insulin concentrations may occur following a dietary change and there may be a good rationale for an oral sugar test, or assessment of basal insulin on the different diet when a significant dietary change is anticipated.

A key aspect to interpretation of basal insulin concentrations is the insulin assay and reference interval. Chemiluminescent assays are commonly used by UK commercial laboratories and show a nonlinear bias when compared with some other assay types. Compared with other assays, chemiluminescent assay results are often low around thresholds of clinical relevance for basal insulin. Thresholds to identify animals as low, medium or high risk of 21.6 μ U/mL and 45.2 μ U/mL for basal insulin using an immunofluorescent assay are around 8 μ U/mL and 23 μ U/mL using the chemiluminescent Immulite 2000XPI analyser. Immulite200XPI thresholds of around 28 μ U/mL and 130 μ U/mL identify similar risk groups 60 minutes after 0.3 mL/kg oral Karo syrup.

What about ACTH?

PPID is a risk factor for laminitis and basal adrenocorticotrophic hormone (ACTH) concentrations are commonly used as a diagnostic aid; however, there is little evidence to indicate that ACTH is a good predictor of laminitis and it is most likely that ACTH acts as a marker for ID. Further research is required into the relationship between PPID, laminitis and insulin dysregulation. Most PPID cases do not have a history of laminitis and many do not have insulin dysregulation. However, PPID is a heterogeneous condition and a subset of PPID cases have insulin dysregulation and laminitis. The situation is also complicated because increasing age is a risk factor for both insulin dysregulation and for PPID. Additional diagnostic tests (such as the thyrotropin-releasing hormone (TRH) stimulation test) or others that might help identify PPID subtypes may become useful for disease prediction but require further research.

Adiponectin

Adiponectin is an insulin sensitising hormone derived from adipocytes. Lower plasma concentrations of adiponectin are associated with obesity and more specifically with adipose tissue dysregulation. Total plasma adiponectin may also be used to predict initial episodes of laminitis and probably has similar but slightly worse predictive power than insulin.

Does combining factors improve prediction?

While multivariable models for laminitis prediction can be constructed, in studies conducted within similar breed types there appears to be little benefit to combining endocrine factors. Similar results may not apply in a more varied population.

Conclusions

Laminitis can occur in any type of equid and at any time of year.

Insulin concentrations (either basal or following an oral sugar test) are the most effective current predictors of laminitis development and recurrence.

While some physical features are associated with insulin dysregulation, very high insulin concentrations and laminitis can occur in ponies of all types including very thin ones.

Disease prevention should focus on altering insulin concentrations.

Further reading

- Knowles, E.J., Elliott, J., Harris, P.A., Chang, Y. and Menzies-Gow, N.J. (2022) Predictors of laminitis development in a cohort of nonlaminitic ponies. *Equine Vet. J.* Epub ahead of print DOI 10.1111/evj.13572.
- Menzies-Gow, N.J., Harris, P.A. and Elliott, J. (2017) Prospective cohort study evaluating risk factors for the development of pasture-associated laminitis in the United Kingdom. *Equine Vet. J.* **49**, 300–306.