

Treating and managing EMS and PPID in equine patients

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The two major equine endocrinopathic conditions – equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID) – are the most common causes of laminitis in horses and ponies.



Figure 1a. The diagnosis of equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID) may sometimes be obvious, although such cases simply represent the extreme tip of the iceberg. EMS occurs in horses not obviously fat and PPID occurs in horses not excessively hairy.

Any case of laminitis without obvious alternative causation (for example, toxæmia or excessive load bearing), therefore, deserves an endocrine investigation as, in all likelihood, an underlying endocrinopathy will be present that will inevitably lead to laminitis recurrence if not treated effectively.

The diagnosis of these two conditions is beyond the scope of this article, although it will involve a combination of clinical, historical and laboratory investigations. It is important to bear in mind EMS and PPID are by no means mutually exclusive and may often be found to coexist (**Figure 1**). Therefore, simply diagnosing one condition does not rule out the other.

Indeed, from a pathophysiological standpoint, the two conditions share significant features – most

notably insulin dysregulation and a propensity towards excessive postprandial hyperinsulinaemia. Given the proven direct association between excessive hyperinsulinaemia and laminitis, it is possible both conditions predispose to laminitis via similar mechanisms. As laminitis is generally the most concerning consequence of both conditions, a focus on control of insulin regulation is logical in both conditions.

EMS

EMS cases may have both genetic and acquired elements contributing to insulin dysregulation. However, the fact laminitis is unusual in very young subjects does emphasise the importance of acquired factors. Obesity undoubtedly promotes insulin dysregulation and should be carefully evaluated in suspected cases.

Although EMS cases may not always be obese, careful consideration should be given to the implications of this term. Strictly speaking, obesity is not directly related to the quantity of fat in an individual, but rather the negative health impact the fat may be having.

It is perfectly possible some individuals might have a modest amount of fat (especially in certain regions) that is having a negative health impact and are therefore obese, whereas others might carry a far greater quantity of fat overall, which has negligible health impact, and are, therefore, not obese.

An additional level of difficulty when assessing the presence or absence of obesity is the finding from several studies that owners and carers generally consider their horses to be leaner than they actually are. Assessment of the serum concentrations of so-called adipokines might become more useful in the assessment of cases not obviously and overtly obese.



Figure 1b. The diagnosis of equine metabolic syndrome (EMS) and pituitary pars intermedia dysfunction (PPID) may sometimes be obvious, although such cases simply represent the extreme tip of the iceberg. EMS occurs in horses not obviously fat and PPID occurs in horses not excessively hairy.

Adipokines are a family of diverse proteins synthesised by adipose tissue that have various endocrine effects around the body. In an equine context, the two adipokines that have attracted the greatest research interest are leptin and adiponectin, with the latter appearing to be of the greatest potential usefulness.

Adiponectin is released from adipose tissue and appears to improve and augments insulin action. Low serum adiponectin concentrations have been associated with obesity and insulin dysregulation, and this may prove to be a useful objective marker of metabolic (rather than morphologic) obesity. Liphook Equine Hospital Laboratory has validated an assay for this hormone in horses and hopes to offer this test to colleagues in practice shortly.

Dietary intake

Despite the aforementioned debate about the importance and prevalence of obesity, it is clear the majority of EMS cases seen in practice could usefully lose some weight. Dietary calorie intake is, therefore, a crucial target to control, along with increased exercise where possible.

Unfortunately, it is rare for the calorific value of the bulk of most equine diets (that is, forage) to be known and basing a diet on precise caloric values is generally not practical.

A pragmatic approach to designing a diet based on restricting the weight of the ration is generally practiced, along with a realisation continual monitoring of response to the diet and application of appropriate adjustments will generally achieve a satisfactory outcome.

Typically, a ration comprising no more than 1.7% of the horse's body mass each day will be required to achieve weight loss, with some horses requiring as little as 1.2%. If strict application of such diets appears unsuccessful then, other than checking compliance and precise dietary quality, further efforts should be made to increase exercise.

Quality of the ration is important, alongside the quantity, in two main ways. Firstly, weight loss would be most useful if it was fat mass that was lost rather than lean (muscle) tissue. A suitable preferential fat loss may be achieved by maintaining good quality protein intake during the diet.

Feed balancers may be useful in this regard, although not all proprietary brands appear to contain very much protein, so this should be carefully assessed. Given the bulk of the diet may comprise low protein forage, supplemental protein is crucial to ensure at least 1g per kg bodyweight protein in the overall ration.

Secondly, calories in the form of non-structural carbohydrates (NSCs) appear to have far greater detrimental effects on insulin regulation than calories in other forms, such as fermentable fibre or fats.

Thus, special attention should be paid to eliminating (or, at least, greatly restricting) NSC intake in EMS individuals.

Low starch and sugar (less than 10%) feeds are important, but consideration should also be given to the potentially very high NSC levels seen in fresh grass and even many hays. Soaking hay has been proposed as a means of significantly reducing the fructan and sugar content of most hays and is frequently advisable.

However, a surprisingly large loss of dry matter occurs from soaked hay and, therefore, the allowable overall quantity should be increased relative to feeding dry hay (for example, 1.5% to 2% bodyweight when weighed pre-soaking).

Pharmacological aids

Pharmacological aids are commonplace in human metabolic syndrome to aid weight loss and improve insulin, glucose and lipid metabolism. These are especially useful, given generally poor compliance in human dieting, which, unfortunately, also often applies, by proxy, to equine dieting.

Absolutely no substitute exists for getting the diet right in EMS cases, although there may be circumstances where additional pharmacological help might be indicated. The only two products with any reasonable evidence basis and experience are levothyroxine and metformin.

Levothyroxine appears to aid weight loss and improve insulin regulation by increasing metabolic rate, although dietary control is essential to avoid the untoward effects of appetite stimulation. The drug is usually used at a dose of approximately 0.1mg/kg daily, although tends to be very costly in the UK.

Metformin has been used for several years in horses at doses between 15mg/kg to 30mg/kg and is attractive due to its relatively cheap cost and safety profile in horses. Although originally used with the intention of improving insulin sensitivity, it now appears the drug works primarily by blocking intestinal sugar absorption and the consequent postprandial hyperinsulinaemia (the direct cause of most laminitis attacks).

PPID

Where PPID has been diagnosed (as well as, or instead of, EMS) then suppression of pituitary hypersecretion can generally be achieved with the use of pergolide mesylate.

Studies conducted at the Liphook Equine Hospital have indicated approximately 70% of PPID cases will respond well to a standard initial dose of 0.002mg/kg pergolide, with others perhaps requiring higher doses before regaining endocrine control of their pituitary axis and a few (perhaps 5% to 10%) appearing fairly resistant, even to high doses.

Prolonged treatment of many such “resistant” cases may prove to be successful after as long as a few years of treatment and, given few reasonable alternative choices to pergolide are available, this is often the only realistic option in such cases.

Insulin

As previously mentioned, PPID cases show abnormal insulin regulation in a similar fashion to EMS cases and this might be important in explaining their laminitis tendency. The possible involvement of glucocorticoids in PPID-associated laminitis is doubtful, given the invariably normal plasma cortisol in PPID cases and the usual absence of adrenal changes in PPID cases (PPID is not hyperadrenocorticism).

The response in terms of serum insulin following initiation of pergolide treatment in PPID cases is, therefore, also potentially very important.

Further work at the Liphook Equine Hospital also indicates a good response to pergolide treatment in terms of insulin concentrations, with approximately 75% of treated PPID cases showing

substantial improvements in serum insulin concentrations within eight weeks of starting treatment.

Dietary management of PPID cases follows the same general principles of dietary quality as aforementioned for EMS, although may create the additional challenge of catabolism associated with PPID per se and/or associated co-morbidities in older horses (for example, dental disease or parasitism).

Thus, where low body condition is a concern, consideration should be given to higher calorie, non-insulinaemic feeds, such as highly fermentable fibre (for example, non-molasses beet pulp, copra or alfalfa) and/or fat supplementation with vegetable oils or margarine.

Conclusion

Undoubtedly, the biggest advance in management of EMS and PPID cases in recent years, especially with regard to their laminitis susceptibility, has been in a better understanding of dietary quality and quantity commensurate with achieving correct body condition and promoting improved insulin regulation.

Veterinary supervision and involvement in such dietary planning remains the main source of independent advice available to motivated owners and the benefits of correct ration provision to the well-being of the affected individuals is crucial to case management.

- Some drugs in this article are used under the cascade.