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Nutritional management of metabolic disorders

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There are a number of metabolic disorders that are common in modern breeds of horses. Many of these disorders including equine Cushing’s disease (ECD), equine metabolic syndrome (EMS), osteochondrosis (OCD), recurrent equine rhabdomyolysis (RER) and polysaccharide storage myopathy (PSSM) can be managed nutritionally by careful regulation of caloric intake with particular attention paid to the source of energy provided. Although these disorders have very different etiologies, they are all either triggered or aggravated by excessive starch and sugar intake.

Metabolic Disorders

Equine Cushing’s disease (ECD) or pituitary pars intermedia dysfunction (PPID) results from a tumor in the pituitary gland and is frequently recognized in older horses. The pituitary of horses with ECD secrete excessive amounts of adrenocorticotropic hormone (ACTH), which results in an increased secretion of cortisol from the adrenal glands. Horses with ECD are prone to laminitis and may develop cortisol-induced insulin insensitivity which leads to elevated blood insulin (hyperinsulinemia) and elevated blood glucose (hyperglycemia).

The best dietary strategy for horses with ECD will depend on several factors. First, since these horses tend to be insulin insensitive, a ration that produces a low glycemic response is essential. Also avoid rations that contain rapidly fermentable carbohydrates (CHO-FR) such as lush pasture and high grain meals to reduce the likelihood of laminitis. Additionally, the ration must also supply the correct amount of required nutrients for the horse and it must supply the correct caloric intake to maintain or achieve a desired body condition.

Equine Metabolic Syndrome (EMS)

Equine metabolic syndrome (EMS) is an endocrine and metabolic disorder which results in insulin resistance (IR) and an increased risk of pasture-associated laminitis. Horses and ponies with EMS tend to be obese with cresty necks. These animals have often had prior bouts of laminitis and are “easy keepers”. A feeding program for EMS horses should be focused on reducing body weight while providing adequate protein, vitamin and mineral intake. It should be a forage based program, but pasture intake should either be restricted with a grazing muzzle and limited turn-out or completely avoided during times of lush growth.

Recurrent Equine Rhabdomyolysis (RER)

Recurrent Equine Rhabdomyolysis (RER) is a specific form of tying-up seen in Thoroughbreds, Standardbred and Arabian horses. It is an inherited trait caused by abnormal intracellular calcium regulation during muscle contraction. Although the genetic predisposition for RER is evenly divided between males and females, clinical signs of the disease are more often seen in young fillies. Excitement and stress seem to be trigger factors. High grain intakes are associated with tying up in racehorses. Most horses with RER have medium to high energy requirements and need significant calories supplied...
above those found in the forage portion of the ration. An appropriate feed should be fortified to be fed at fairly high levels of intake (4-6 kg/day). It should be low in NSC (<10%), high in fat (>10%) and supply a significant portion of its energy as fermentable fiber.

**Polysaccharide Storage Myopathy (PSSM)**
Polysaccharide Storage Myopathy (PSSM) is another muscle disorder that is more common in Quarter horses, warm bloods and draft breeds. It is characterized by an abnormal accumulation of glycogen in muscle resulting from a hyper-sensitivity of the muscle to insulin. The same type of energy sources used for RER horses is effective for PSSM.

**Osteochondrosis (OCD)**
The source of calories for young horses may also be important, as hyperglycemia or hyperinsulinemia have been implicated in the pathogenesis of osteochondrosis. Foals that experience an exaggerated and sustained increase in circulating glucose or insulin in response to a carbohydrate (grain) meal may be predisposed to development of osteochondrosis. In vitro studies with fetal and foal chondrocytes suggest that the role of insulin in growth cartilage may be to promote chondrocyte survival or to suppress differentiation and that hyperinsulinemia may be a contributory factor to equine osteochondrosis. Research from Kentucky Equine Research suggests that hyperinsulinemia may influence the incidence of OCD in Thoroughbred weanlings. Based on the results of this study, it would be prudent to feed foals concentrates that produce low to moderate glycemic responses.

**Summary**
The five metabolic disorders discussed in this paper have very different etiologies yet are all either triggered or aggravated by excessive starch and sugar intake. While all of these horses require lower GI rations, the most appropriate form of energy supplementation depends on the disorder and the individual’s energy requirement. ECD horses are insulin insensitive and need a low GI ration, but their energy requirement may vary. Some may be relatively “easy keepers” and benefit from mostly forage rations while others may need extra calories in the form of fat and fermentable fiber. EMS horses and ponies tend to be obese and “easy keepers” and should be fed mostly forage rations with an appropriate low inclusion balancer. Both ECD and EMS sufferers are prone to laminitis which can be triggered by access to lush pasture so pasture intake should be carefully controlled. Horses with RER and PSSM horses are not insulin insensitive, but both groups benefit from low starch feeds. Fat is an important supplement for both groups, but their energy requirements are different. RER horses tend to need moderate to high energy intakes while PSSM horses typically require fewer calories. OCD may be triggered by high glycemic feeds, but there is no evidence that young growing horses need extremely low GI feeds. In fact, a certain amount of starch in the ration is desirable for young horses, particularly during sales preparation. Diets for young horses should have moderate glycemic indexes and be fortified to promote optimal muscular and skeletal development.