Nutrition and Insulin Resistance in Horses

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Abstract

Insulin-resistant horses have an increased susceptibility to laminitis. Overweight horses are often insulin resistant as are those with equine Cushing's disease. Insulin resistance may be managed with the implementation of proper management techniques consisting of increased exercise and dietary changes including limiting the access to pasture grasses. Diets consisting of hay with a low non-structural carbohydrate content fortified with a quality vitamin-mineral supplement have been shown to be effective in weight reduction in obese horses.

Key Facts

- Easy keeper and overweight horses are often insulin resistant and those with equine Cushing's disease may also be affected.
- Insulin resistance can be diagnosed with blood tests.
- Insulin-resistant horses have an increased susceptibility to laminitis.
- Non-structural carbohydrates contain sugars and insulin resistant horses cannot convert these sugars to energy.
- Diet changes and exercise programs are essential components of any management plan for insulin-resistant horses.
- Diets consisting of hay with low non-structural carbohydrate content and pelleted specialty feeds, fortified with a quality vitamin-mineral supplement, designed with their specific needs in mind, can help with weight reduction.

Horses with a cresty neck or other abnormal fat deposits such as the sheath and tail head regions may be insulin-resistant. Insulin-resistant horses have been shown to be susceptible to laminitis so it is important to know which horses are insulin-resistant and how to prevent the problems.

Glucose is required by all body cells and insulin is required for glucose to enter the cells. Field studies suggest insulin resistance has a genetic component. Dr. Nicholas Frank, University of Tennessee, suggests insulin resistance could alter blood flow to the foot.

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There are two types of horses that are insulin resistant. Predisposed horses, which are often overweight, have a condition called equine metabolic syndrome and need to be on a low non-structural carbohydrate diet. Most of these horses need to be on a hay-only diet with a quality vitamin and mineral supplement that doesn't include grain. Because some hays can also be high in non-structural carbohydrates, the hay should be analyzed before feeding to these susceptible horses.

The second type of horse is one that has pituitary pars intermedia dysfunction (PPID) due to a pituitary mass and needs the same feeding program but also needs to be on specific medication. PPID is sometimes referred to as equine Cushing's disease.

Insulin resistance is more likely to cause clinical problems in horses that are consuming a ration containing large amounts of non-structural carbohydrates. The most common sources of non-structural carbohydrates are grains and young growths of pasture grasses. Large amounts of non-structural carbohydrates can cause insulin-resistant horses to develop laminitis since these carbohydrates contain starch and sugars. Also, large amounts of non-structural carbohydrates can change the bacteria in the large colon and lead to the production of toxins.

It would benefit many horses to reduce the amount of carbohydrates in their diets. High carbohydrate diets are implicated in the so-called carbohydrate diseases including tying-up, Cushing's, laminitis, obesity, or insulin resistance. The two types of carbohydrates in the diets of horses are structural and non-structural.

Structural carbohydrates are often referred to as fiber. Hay, mature pasture grasses, beet pulp, and soybean seed coats are good sources of fibrous carbohydrates. Structural carbohydrates (fiber) should not be the target for dietary elimination. Fiber is essential for proper function and motility of the horse's digestive system. Fiber is also a valuable source of safe calories for horses.

Non-structural carbohydrates consist of sugar or carbohydrates such as starch that can be broken down to simple sugars within the horse's digestive system. Feed ingredients rich in sugar and starch include oats, corn, barley and molasses.

Controlling the carbohydrate content in a horse's diet should involve reducing the amount of non-structural carbohydrates. Ideally, the nutritional goal for the insulin resistant horse is the elimination of non-structural carbohydrates.

Sugars in Hay and Pasture

Hay or pasture that contains high levels of fibrous carbohydrate, which is essential for normal gut function, is required by all horses. However, hay or pasture also contains sugar and starch so the complete elimination of sugar and starch from a horse's diet is not possible.

Photosynthesis occurs during daylight hours and carbon dioxide, water and energy from the sun are utilized by the plant to form sugar. Sugar is then utilized by plants at night in a process called respiration to form more complex fibrous carbohydrates. When photosynthesis outpaces respiration as occurs during cool nights in the spring and fall, plants will accumulate sugar. Plants also accumulate sugar if they are stressed by drought or nutritional deficiencies.

The sugar content of forage contributes to the total non-structural carbohydrate content of the diet and when horses are sensitive to these sugars, they need to be minimized. If horses are to graze, it should be early in the morning when the sugar content of the pasture is lowest. Even this can be risky for horses with poorly controlled insulin resistance, especially if they have a history of laminitis.

The sugar content of hay can be reduced by soaking hay in cold water prior to feeding. It has been shown soaking the hay for 30 or 60 minutes significantly reduces the sugar content of forage by as much as 19% to 30% respectively, although some hays do not show this great a reduction. Selecting specific types of hay will not always guarantee a low sugar content since sugar content is influenced by environment and plant health.

Sugar in Grain

Most grain concentrates contain a combination of corn, barley, oats, wheat, or molasses so it should come as no surprise the non-structural carbohydrate content is high. Starch in grains is digested to the sugar glucose before it is absorbed. To minimize non-structural carbohydrate intake, the amount of grain fed must be reduced. Unfortunately, most grain concentrates contain the supplemental vitamin-mineral portion of the diet and the reduction in the amount of concentrate fed also decreases the amount of vitamin and mineral fortification. Certain grain concentrates may contain fewer non-structural carbohydrates than others if the fat and fiber content from beet pulp, soybean hulls and alfalfa are increased and the grain and molasses content is reduced. These reduced nonstructural carbohydrate feeds may be appropriate for mild insulin resistant horses but they are often just as calorie dense as traditional grain mixes. Many also still contain levels of nonstructural carbohydrates that are too high for horses with severe insulin resistance or with laminitis. For these horses, a predominantly grass hay diet with a little plain beet pulp as the carrier in the supplement is safest. Supplementation should target the common deficiencies in a hay based diet.

Low Carbohydrate Alternatives

Diet changes and exercise are key components of any management plan for insulin resistant horses that are prone to developing laminitis. Restricted access to pasture is vital to success when trying to induce weight loss. A low non-structural carbohydrate feeding option can readily be developed for obese horses.

A diet consisting of hay with low non-structural carbohydrate content either natural or soaked to reduce the sugar content can be fortified with a quality vitamin-mineral supplement to produce an optimum weight reduction ration. The supplement should provide the essential vitamins and trace minerals commonly lacking in hay based diets.

The supplement should provide limited amounts of calcium, phosphorous, and magnesium which are usually abundantly available from quality hay. Supplements fortified with methionine and biotin to enhance hoof condition are recommended. Vitamin E acts in synergy with selenium to provide improved muscle metabolism and helps protect from the inflammation and oxidative stress found in insulin resistance. Zinc and copper aid in maintaining proper enzyme balance and intracellular antioxidant enzyme systems. Essential fatty acids from a vegetable source can be added to the diet to replace those normally present in grass.

Target IR is a unique high quality concentrated equine supplement designed to provide optimum nutritional support for horses on a hay based diet.

References

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