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Insulin Resistance in Horses

Jenifer Nadeau
University of Connecticut Department of Animal Science

FACT SHEET

Department of Animal Science, University of Connecticut

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By Dr. Jenifer Nadeau, Equine Extension Specialist
University of Connecticut

Insulin resistance is a newly recognized problem in horses that may have been around a long time. You may be wondering what it is all about and how your horse may/may not be affected. It is probably not as common a problem as it may seem. This article will discuss insulin resistance including its causes, effects, diagnosis, treatment and prevention.

What is Insulin Resistance?

Glucose (sugar) normally functions to fuel many metabolic processes in the body and is the primary energy currency of the body. Insulin is normally produced in response to elevated blood glucose and is key to the regulation of blood glucose concentrations and glucose utilization. Insulin promotes glucose uptake by cells and promotes formation of glycogen or fat. Insulin resistance is defined as a reduced sensitivity of the body's cells to insulin's facilitation of glucose uptake.

Basically what happens in insulin resistance is that the cells become resistant to the glucose uptake action of insulin. Initially, this just means that more insulin is needed (hyperinsulinemia) to keep blood glucose concentrations within normal limits after a starchy or high sugar meal. If it is severe enough even super high insulin concentrations are ineffective and blood glucose may also be abnormally high. The problem is that not only does this limit energy availability to the cells but insulin also has other effects on the

body that may be detrimental when it is higher than normal for prolonged periods of time. Unlike humans, horses rarely go into the second stage, where the pancreas becomes "exhausted" and no longer can secrete adequate insulin.

Causes

The exact cause of insulin resistance is still unknown. However, several possible causes include:

- **Diet** - In a recent study, horses had increased insulin resistance when fed high sugar/starch feeds compared to high fiber and fat rations, especially when they were not obese.
- **Obesity** - Overweight horses tend to be insulin resistant, as are "easy keepers" even if they are not obese.
- **Age -** Old horses (>20 years) seem to be more prone to insulin resistance, probably secondary to pituitary dysfunction (Cushing's disease) which is extremely common, especially in mares.
- **Breed -** Ponies were found to have higher degrees of insulin resistance than Dutch Warmbloods or Standardbreds. Breeds that are prone to developing cresty necks and obesity, such as Morgans and some lines of Arabians, Quarterhorses, and Thoroughbreds may be more likely to develop the problem, although a study conducted at the University of Connecticut comparing exercising Morgans and exercising Thoroughbreds did not find a difference between breeds in insulin resistance.
- **Laminitis** - Horses with a family history of laminitis and horses that develop laminitis without an obvious cause (grain overload, sudden access to lush, green grass) may be insulin resistant.

Effects of Insulin Resistance

Insulin resistance may result in:

- Loss of weight
- Loss of muscle
- Lack of stamina
- A condition similar to human Type II diabetes
- Laminitis

Diagnosis

Your veterinarian will be able to diagnose insulin resistance. A single blood sample drawn within 60 to 90 minutes of eating a meal of grain is a quick screening test for hyperinsulinemia. If the results are abnormal the veterinarian should perform a more reliable test by administering a glucose challenge orally or intravenously and measuring the glucose/insulin response over the course of two or three hours. This is not usually practical in the field and the horse may need to be referred to a clinic to get such tests done.

Treatment

Treatment may consist of the following:

- Weight loss through diet and exercise if the animal is obese
- Addition of a minimum of 30 min of exercise
- Limiting carbohydrate intake through elimination of grain and high sugar feeds
- Soaking hay if it is know to contain high amounts of sugars (> 10 to 12% soluble sugars)
- Feeding warm season grasses, such as Bermuda grass, or feeding beet pulp that does not have added molasses
- Cutting down on free choice intake of grass if the horse has a history of founder and is obese

Prevention

Preventative measures to reduce insulin resistance are:

- Feed primarily grass or legume mix hay or pasture. If the horse tends toward obesity, limit access to the forages and feed no grain at all!
- If concentrates are needed to maintain body condition, feed products formulated to have a low glycemic index. For example, oats are commonly used as the standard with an index of 100. Plain beet pulp has the lowest index in most studies and barley has the lowest index of the commonly fed grains.
- Test pastures and dry forages for amounts of sugars present.
- Soak high sugar hay in hot water for 30 min or cold water for 60 min
- Restrict grazing time but only if the horse has a pre-existing case of laminitis and grass is lush
- Add fat and fiber to the diet at 6-10% for fat and at least 12% for fiber.

Insulin resistance can be a serious problem, but actual statistics on insulin resistance are currently unavailable. An accurate medical diagnosis by a veterinarian is extremely important. As with most equine health concerns, prevention is better than treatment. By paying careful attention to diet and condition of your horse, you may be able to prevent insulin resistance from becoming a problem in your horse.

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