

Equine Insulin Resistance

Insulin resistance in horses and ponies is often compared to Type II diabetes in humans

Overview

Insulin resistance is one of the newest medical conditions recognized in horses and is a hot topic among equine veterinarians.¹ Insulin resistance is a hormonal disorder that most commonly occurs in horses with equine metabolic syndrome (EMS) and in horses with Cushing's disease (pituitary pars intermedia dysfunction, PPID).¹

Insulin is a hormone produced by the pancreas, and its main function is to control blood sugar (glucose) levels by signaling fat, muscle, and liver cells to take up glucose (a simple sugar resulting from the digestion of food) from the blood and store it as glycogen. Insulin resistance is a reduction in a horse's sensitivity to insulin that makes it harder for the fat, muscle, and liver cells to transport the glucose out of the bloodstream and store it as glycogen.

Initially, the horse's body compensates for this decreased sensitivity to insulin by simply increasing the amount of insulin produced by the pancreas. In the short term, this effectively maintains normal blood sugar levels. Over the long run, however, even very high insulin levels can't properly control blood sugar levels, resulting in abnormally high circulating levels of both glucose and insulin.^{2,3} Insulin resistance in horses is often compared to Type II diabetes in humans.³

The number of horses with insulin resistance and the exact causes of this medical condition remain largely unknown. Experts speculate that diet, breed, age, and body condition all contribute to the development of insulin resistance. For example, horses more than 20 years of age that are either "easy keepers" or obese are more at risk than their younger, leaner counterparts (although insulin resistance and EMS can be diagnosed in horses as young as 5 years of age). Horses fed diets high in sugar or starch (e.g., high-concentrate diets) rather than high-fiber/high-fat diets



Insulin resistance is thought to occur more commonly in the hardier horse breeds and in ponies.

are more likely to be insulin-resistant, even if they are not obese. Insulin resistance is thought to occur more commonly in the hardier horse breeds and in ponies, particularly those that are prone to developing a "cresty neck."^{2,3}

One reason that insulin resistance is important in equine medicine is because of its strong relationship to the development of laminitis.

Clinical Signs

The physical changes that develop in insulin-resistant horses are primarily related to elevated blood glucose levels (hyperglycemia). Common signs include weight loss (due to muscle loss); the development of a cresty neck; regional deposition of fat in areas such as the tailhead, behind the shoulder, or over the loin; and lethargy. One of the hallmarks of this condition is chronic, ongoing, or recurrent laminitis. In fact, continued issues with laminitis are often what spur owners to have their horses examined by a veterinarian. Insulin resistance tends to have a slow, insidious onset and its clinical signs can be very subtle initially.

Diagnosis

A variety of tests, each with their own pros and cons, are available to test horses for insulin resistance. But experts recommend first examining the horse carefully and waiting to test until after any bouts of laminitis have resolved. If the horse is laminitic at the time of testing, the pain will increase the horse's production of stress hormones, which can affect test results.⁴

A quick and easy test to screen for insulin resistance is a blood test that measures both glucose and insulin blood levels. Unfortunately, insulin and glucose testing alone does not often provide a definitive diagnosis because multiple factors can impact insulin and glucose testing, such as stress, time of day (i.e., hormone levels naturally fluctuate throughout a 24-hour period), time of year/season, when and what the horse was last fed, and the horse's normal dietary components.

Furthermore, some horses with insulin resistance still have normal levels of both insulin and glucose. This might be because it is too early in the disease process to measure changes in insulin and glucose, or one or more factors have influenced the test results. Diet, feeding and fasting, stress, season, sample handling, and the technique used by the lab to test the samples can all impact the result, making a diagnosis challenging to achieve.

A better assessment of endocrine (hormone) function is the combined glucose-insulin tolerance test (CGIT). For this "dynamic" test, a veterinarian intravenously gives glucose and insulin to the horse, then measures blood glucose and insulin levels over the next few hours. While the test is considered superior to measuring glucose and insulin levels in a single blood sample, the CGIT is not practical for an ambulatory veterinarian to perform. Instead, horses are usually referred to a local clinic.

Treatment

Appropriate management strategies are the most important part of treating insulin-resistant horses. Affected horses should have virtually no access to lush pastures and concentrates (grain). Instead, feed low-sugar/low-starch grass hays and eliminate all other high-sugar feeds from the diet. Have your hay analyzed for sugar content (i.e., hay containing more than 10-12% soluble sugars should not be fed to affected horses). If the sugar content is known or suspected to be high, soak the hay in cold water for 60 minutes or hot water for 30 minutes prior to feeding (and discard the water) to remove some of the sugar. If extra fiber or energy is needed to maintain healthy body condition, try adding barley or beet pulp (without molasses) to the diet. Insulin-resistant horses also benefit from regular physical exercise.⁵ Daily or near-daily exercise in the form of hand walking, longeing, long-lining, driving, riding, ponying, or any combination of the above is advised. Be certain that you do not institute the exercise regime in the midst of a laminitic episode.

In human medicine, a variety of herbal therapies (e.g., insulin-receptor activators such as Chinese cinnamon or stimulators of glucose uptake such as berberine, corosolic acid, and Indian Kino Tree⁶) have been used to help insulin-resistant patients. While these herbal therapies have not yet adequately been studied in horses to make any clinical recommendations, nutritional supplements designed to benefit horses with endocrine disorders and/or laminitis are available. Be sure to choose nutritional supplements wisely and consider all the nutrients in the horse's diet (including supplements).

Prognosis

Horses diagnosed early and given properly instituted, consistent care can lead normal, healthy lives. Severe cases compounded by chronic laminitis, however, need more aggressive management. Recruiting a qualified equine nutritionist to help modify and monitor the diet can be helpful, especially in severe cases. It's also important to have a spring wellness examination done each year by your veterinarian.¹

Prevention

It is not clear at the present time if insulin resistance can be completely prevented. However, instituting the dietary and exercise changes described previously in horses at risk for insulin resistance is encouraged. ◀

KEY REFERENCES

1. Frank, N., Andrews, F. Equine Endocrine Disorders Discussed at AAEP. www.TheHorse.com/15560
2. Nadeau, J. Insulin resistance in horses. Fact Sheet, Department of Animal Science, University of Connecticut.
3. Oke, S. Cushing's or Metabolic Syndrome? *The Horse*, March 2010
4. Watts, K. Diagnosing insulin resistance: Q & A with researchers. www.TheHorse.com/12588
5. Ralston, S.L., Williams, C. A. Metabolic Problems in the Horse: Sorting out the Diagnosis. Rutgers. New Jersey Agriculture Experimental Station. Equine Science Center. www.esc.rutgers.edu/publications/general/FS1067.htm
6. Oke, S. Herbal insulin resistance treatment options reviewed. www.TheHorse.com/15386

Further reading and free horse health e-newsletter: www.TheHorse.com/Insulin-Resistance

Authored by: Stacey Oke, DVM, MSc;
reviewed by: Sarah Ralston, VMD, PhD,
Dipl. ACVN

From tail to hooves we've got you covered.

FORMULA⁴ FEET[®] is the most up-to-date feed balancer and nutritional supplement, providing 65 essential micronutrients which address both the problems of poor horn quality and those of insulin resistance. FORMULA⁴ FEET provides comprehensive support for the horse's metabolism. The inclusion of magnesium, chromium and vanadium makes FORMULA⁴ FEET the product of choice as part of a calorie controlled diet.

Call 888.638.8262
for your free sample!



18 amino acids
10 vitamins
16 minerals
5 antioxidants
essential fatty acids
irresistible apple flavor

Please visit
emeraldvalleyequine.com
for these and our other fine
products or call toll free
888.638.8262

Distributed in the USA by Emerald Valley, Exeter, NH