

Equine Cushing's Disease and Metabolic Syndrome: What They Are and How to Treat Them

By Kathy Newcomb

Equine Cushing's disease and equine metabolic syndrome are related endocrine disorders and they share some similarities, particularly the **predisposition for periodic bouts of laminitis**, but they have very different origins. Every horse that has Cushing's disease is not necessarily insulin resistant (which is a component of metabolic syndrome), but they are at risk of becoming insulin resistant some time in the future. Likewise, not every horse that is insulin resistant has Cushing's disease. It is important that you (and your vet) understand that management must be directed toward the correct condition.

What is Cushing's Disease?

In dogs and humans, Cushing's disease is caused by a tumor on the pituitary gland; however, equine Cushing's disease is caused by enlargement of the pituitary and overproduction of its hormones (adrenocorticotropin, or ACTH) as a result of faulty regulation by the hypothalamus. Levels of cortisol produced by the adrenal glands also are affected by Cushing's disease. Because the equine disorder is distinctly different in origin from the classic form of Cushing's disease, it often is referred to as pituitary pars intermedia dysfunction (PPID), which is merely a description of the area of the pituitary gland that is affected. Clinical signs of Cushing's disease include a long, wavy hair coat that does not shed; excessive sweating; lethargy; poor performance; excessive water consumption and frequent urination; fat accumulations above the eyes, in the tail head, neck crest, and sheath; infertility; weight loss and muscle wasting; and increased susceptibility to infections. Virtually all horses with Cushing's disease will develop chronic laminitis and recurrent foot abscesses. Most horses affected by Cushing's disease are middle aged or geriatric; the average age at the time of diagnosis is 20 years. Without treatment, their condition usually worsens, and many horses are euthanized after suffering repeated bouts of laminitis or other complications.

Diagnosing Cushing's Disease

The long hair coat, **chronic founder**, and other clinical signs that occur in more advanced cases are sometimes all the vet needs to diagnose Cushing's disease, and further testing often is not required when these classic signs are observed. However, for younger horses and early cases with fewer clinical signs, the vet may find it necessary to conduct certain tests to diagnose Cushing's disease. Some of the tests available are impractical and inaccurate, but at this time, the most reliable are the dexamethasone (a corticosteroid) suppression test and measurement of ACTH levels in the blood. The dexamethasone suppression test requires two blood samples. The first one is collected in the late afternoon, after which a low dose of dexamethasone is given by intramuscular injection. The vet returns the following day around noon to collect a second sample. Both samples are tested at a laboratory for cortisol levels. If the horse is normal (doesn't have Cushing's disease), the level of cortisol in the second sample will be lower than that in the first sample. A horse with Cushing's disease will have a higher level of cortisol in the second sample. In addition to being somewhat expensive because it requires two visits from the vet, the administration of dexamethasone bears some risk of causing laminitis in a horse that has Cushing's disease. The alternative test, measurement of ACTH levels in plasma, which will be elevated if the horse has Cushing's disease, generally is considered less accurate than the dexamethasone suppression test because ACTH can quickly degrade in the sample, leading to a false negative test. Conditions such as pain or stress, on the other hand, can elevate levels of ACTH, causing a false positive result.

Treatment of Cushing's Disease

Unfortunately, there is no cure for Cushing's disease. The only option is management, which is something that will have to be done for the duration of the horse's life. It often is possible to avoid having to give medication in the early stages, and some early cases or seasonal cases might only require intermittent treatment; however, at some point, these affected horses will require daily medication. Medications used to treat Cushing's disease act by reducing the amount of ACTH and other hormones secreted by the pituitary. The two primary medications currently used for this purpose are cyproheptadine (Periactin®) and pergolide (Permax®). Of the two, pergolide has become the drug of choice. The recommended dose is approximately 1 mg for a 1,000-lb horse given orally once daily; this dose may be gradually increased if improvement is not observed after one to two months of treatment. More advanced cases sometimes require treatment with both cyproheptadine and pergolide. Another medication used for treating Cushing's disease is trilostane, which acts by inhibiting synthesis of cortisol by the adrenal gland. This drug has shown some promise in clinical trials in the UK, but it is not yet available in the United States. Other supportive care, dietary modifications, and exceptional health care will be required to provide good quality of life. In particular, horses with Cushing's disease may need to be body clipped periodically and close attention paid to the care of their teeth. These horses may also be insulin resistant, so sweet feed and other feed high in soluble carbohydrates should never be fed to these horses. New feeds with a low glycemic index are being produced for horses that must avoid high levels of sugar or molasses. Many of these new feeds (e.g., Triple Crown Lite, Triple Crown Low Starch, McCauley Bros. Alam) have beet pulp as a base. Beet pulp that is produced without molasses added is a beneficial feed for horses with Cushing's disease and/or insulin resistance. Certain nutritional supplements, especially those with magnesium and chromium, may also be useful for horses with Cushing's disease, particularly if it is complicated by insulin resistance or hyperglycemia (high levels of glucose in the blood).

Equine Metabolic Syndrome

Metabolic syndrome is a condition characterized by obesity, insulin resistance, and chronic laminitis. What causes metabolic syndrome? In many cases, it is obesity, but there are other factors, including genetic predisposition, that may be contributors to development of metabolic syndrome. Frequently, these horses have been eating relatively large amounts of grain, particularly feeds that contain high levels of starch and sugars, and they often have had an inadequate level of exercise. It generally is observed in horses younger than those affected only by Cushing's disease. The common age range for horses to develop metabolic syndrome is six to 20 years; however, it appears that the nutrition (excessive quantities of grain, especially sweet feeds) and body condition (obesity) of young horses have a strong influence on the possibility of developing metabolic syndrome later in life. Affected animals will have normal levels of ACTH if tested and they will not respond to treatment with pergolide or cyproheptadine. Humans also are affected by metabolic syndrome, but there are some differences in that humans usually have high blood pressure and elevated levels of lipids in the blood with their version of the disease. Horses, however, don't have these signs.

Thyroid Replacement

Some research suggests metabolic syndrome often is misdiagnosed as hypothyroidism, and that the thyroid replacement hormones being purchased for these horses probably provide no benefit for their condition. This theory was tested in a study with horses that had their thyroid gland surgically removed. None of the horses became obese or developed laminitis, so it was concluded that low levels (or even the absence) of thyroid hormones do not cause signs that are classic for metabolic syndrome. The researchers acknowledge that some horses with metabolic syndrome may also have low levels of thyroid hormones, but they felt it was unlikely it would be of any value in providing thyroid supplementation for more than one or two months in most cases of metabolic syndrome.

Breeds Affected

The literature indicates metabolic syndrome is more common in some pony breeds, mustangs, Peruvian Pasos, Paso Finos, European warmbloods, American saddlebreds, and Morgans. A search of an online listing of cases, where owners enter their information into the database, showed a large number of Arabians and Quarter Horses also are affected (as well as being affected by Cushing's disease).

Insulin Resistance

Insulin is a hormone that prompts cells to store glucose, a natural sugar that is present in higher quantities in the blood after a meal is consumed. In a normal horse, as the amount of glucose in the blood increases, insulin signals the body's cells to take it in and use it immediately for energy or convert it to fat or glycogen and store it for energy needs in the future. A hormone called glucagon, in turn, prompts cells to release stored glucose into the bloodstream when needed. Insulin resistance generally is defined as a condition in which insulin is produced in adequate quantities by the pancreas in response to the higher levels of glucose in the blood, but the hormone is unable to get the cells to respond the way they are supposed to, so the glucose remains in the bloodstream instead of being used or stored. Insulin resistance can lead to the development of Type 2 diabetes in a small percentage of horses.

Clinical Signs of Metabolic Syndrome

Affected horses are commonly quite obese, and (similar to signs seen with Cushing's disease) they usually will have excessive pads of fat in the crest of the neck, over the rump, at the shoulders, and in the sheath. The horses almost always are said to be "easy keepers" or "air ferns," and they usually have a voracious appetite. Mares will be difficult to breed and their cycling patterns are abnormal. **The most profound sign in most horses with metabolic syndrome is laminitis, and some horses will have several recurrent bouts.**

Diagnosis of Metabolic Syndrome

Unfortunately, it is usually a laminitis episode in an obese horse that leads to the diagnosis of metabolic syndrome. Tests can be done by a veterinarian to measure levels of insulin and glucose concentrations in the blood, which frequently will be elevated when the condition is in an advanced stage.

Treatment of Metabolic Syndrome

Presently, the treatment of equine metabolic syndrome is focused primarily on slimming down obese horses; controlling insulin resistance by strict modifications of the horse's diet to restrict the intake of sugars, starches, and/of fructan (collectively known as non-structural carbohydrates); and implementing a healthy exercise program for horses as long as they are not affected by active laminitis.

Feeding Insulin-Resistant Horses

The most important principle of feeding insulin-resistant horses is that carbohydrates must be strictly limited. Many of these horses will maintain well on good quality, mature grass hay fed at approximately 1.0 to 1.5 percent of their body weight daily. Hay that has been dried rapidly is higher in carbohydrates than hay dried slowly. **The best way to leach out the sugar content from hay being fed to these horses is to soak it for at least half an hour before feeding, preferably in hot water.** You also can substitute beet pulp for up to approximately one-third of their hay ration. The beet pulp should have no molasses, but if it is not available without molasses, you can rinse it with hot water several times until the water runs out clear before feeding. Most horses enjoy beet pulp, but picky horses may need some encouragement. Start by feeding a small amount of beet pulp mixed with a low-starch pelleted feed. Insulin-resistant horses should have no grain or senior feeds that contain grain products or molasses. Low-carb feeds (beet pulp-based) mentioned above for horses with Cushing's disease are recommended for horses with metabolic syndrome. Wheat bran also should be avoided because it has nearly triple the amount of carbohydrates as most grass hay. Carrots, apples, or treats containing sugar or molasses should never be fed to these horses—not even one! Insulin-resistant horses should not have access to grass, even if it is brown. Grass varieties today have been genetically engineered to have very high levels of carbohydrates. These improvements have been done to increase milk production and weight gain in cattle as well as to make the grasses resistant to drought and cold weather. Surprisingly, studies show that grass growing in the autumn when days are sunny, with low humidity and cool nights, is apt to be the highest in sugar content. Lush green grass that is high in water content is actually less of a threat than stemmy brown grass or grass grown during a drought. Also, overgrazed pastures that are taken over by certain kinds of weeds as well as unfertilized fields contain high levels of sugars and fructan. Grazing muzzles or limited grazing time are the best options for insulin resistant horses and for those at risk for becoming insulin resistant. Nutritionists are still investigating many supplements for their value in the management of equine metabolic syndrome, but there may be some benefit to adding chromium, calcium, magnesium, phosphorus, copper, zinc, manganese, and selenium. There is also some evidence that supplementing Vitamin E (up to 10,000 units per day) could be helpful. Some nutritionists also advocate giving cinnamon in the feed at a rate of four teaspoons per 1,000-lb horse daily. Cinnamon has been shown to be of some value for humans with Type 2 diabetes, so it speculated that it could also benefit insulin-resistant horses. Most experts agree, "It can't hurt."

Take-Home Message

New research is being conducted and published about Cushing's disease and equine metabolic syndrome, but there are still many mysteries left to solve, just as there are in humans, and there are still more questions than there are answers. For now, we must accept that there is no cure for either condition; however, horses with Cushing's disease can often live comfortably for years with proper nutrition, adequate attention to their health care, and daily medication. Equine metabolic syndrome is preventable, but Cushing's disease probably is not. There are several ways to help to prevent metabolic syndrome, including the following:

- Avoid feeding young and inactive horses excessive quantities of grain.
- Avoid feeds with high sugar and/or starch levels.
- Provide adequate level of exercise.
- Limit grazing time by using grazing muzzles or dry lot fields for turn-out.
- If possible, provide smaller amounts of grain three or more times daily.
- Monitor body condition to prevent obesity.

Author's Note: *She was ours for the past seven years, and she gave us two lovely foals that are now grown and living with families who adore them as we did their exquisite mother. She suffered but survived three bouts of laminitis and a dangerous colic because of metabolic syndrome. For years, we provided her with specialized hoof care; we fed her supplements and the recommended diet; and we medicated her for the pain, but we recently realized that her pain was not well controlled anymore. So, on November 28, 2006, we laid the beautiful and courageous mare Moriah Mercedes Beam to rest. 'Cedes, we dedicate this article to you.*