

Equine Metabolic Syndrome (Insulin Resistance)

Equine Metabolic Syndrome (EMS) is being diagnosed in record numbers with the median age of diagnosed horses a shockingly young 15 years old. Equine Metabolic Syndrome is a condition of the domestic horse and can include obesity, insulin resistance (IR), diabetes (high blood sugar) and metabolic hormones imbalances such as Cushing's Syndrome. EMS is solely caused by the over-feeding of sugars and starches, usually combined with a lack of exercise and/or stress. It often affects the at-risk "easy keeping" breeds: ponies; minis; fjords; Icelandics; Arabs; mustangs; morgans; draft horses and gaited horses. "Easy keepers" are easy because their ancestry and metabolism is adapted for survival in harsh, low nutrient environments rather than lush sugar-laden pastures with sweet feed for dessert. The over-weight horse standing knee-deep in a lush grass field with no reason to walk or run, other than to graze and get to the water trough is a classic image. However, metabolic syndrome is now also seen in recreational horses and some performance horses.

Here's how it begins:

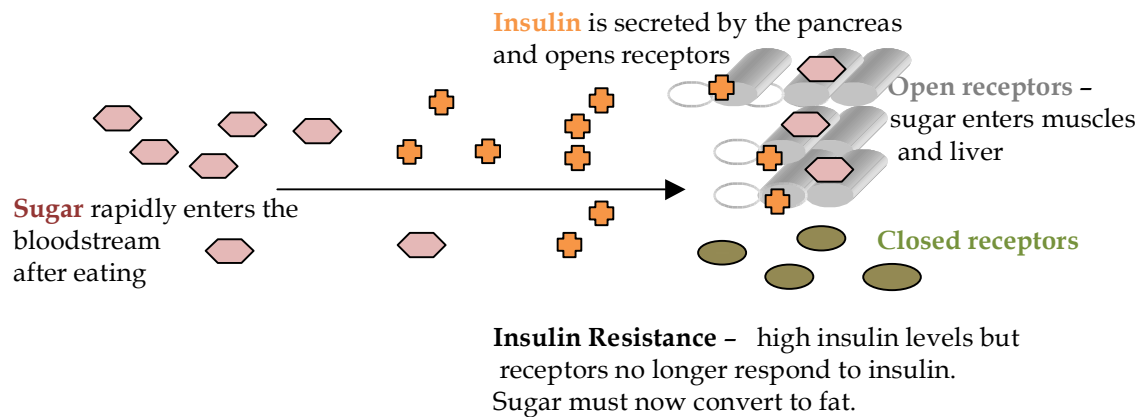
Normal Sugar Metabolism

When a horse (or human for that matter) ingests any kind of sugar or starch from grass, grain or hay, it is absorbed from the small intestine into the blood. The sugar in "sweet" food such as grass or grain enters the bloodstream very rapidly compared to the slow absorption of sugars in high fibre feeds such as beet pulp or coarse hay. This rate of absorption is known as the Glycemic index. Once it enters the bloodstream, sugar must now find its way into the liver and muscle cells where it is either burned for immediate energy or is stored as glycogen (a type of starch) and converted back into sugars as required later. In healthy animals the transport of sugars into the cells is accomplished with insulin, a hormone produced by the pancreas. Insulin controls blood sugar levels by attaching itself to specific receptors in the liver and muscle cells, thereby opening those receptors and allowing the passage of sugar from the blood into the tissues.

The Mechanics of Insulin Resistance

Over time in a high-sugar, low-fibre diet, these cell receptors become non-responsive to the increasingly high insulin levels, at which point they can no longer open - the receptors have become resistant to the effects of insulin. It is likely that the receptors are not damaged, but are acting defensively to protect the muscle and liver tissue from sugar over-load. With nowhere else to go, these sugars must now convert immediately to fat - via the liver - and the easy keeping "sugar hound" becomes very efficient at storing excess blood glucose in the form of a crested neck, fat pads (eyes, shoulders, and

hindquarters) and pot bellies. These fat pads are actually a sign of an overloaded “fatty liver” that pops out fat globules. The IR horse can have a ravenous appetite – they don’t feel satisfied no matter how much they eat. Surges of insulin trigger pangs of hunger by causing blood sugar to rise and fall erratically.



Diabetes Is Next

Once the fat stores become saturated, the blood sugar levels increase permanently; the pancreas can no longer produce enough insulin and the insulin levels drop from an insulin resistance high to a hormonal low. This condition of high blood glucose and insulin deficiency is known as diabetes mellitus, or Type II diabetes. The diabetic horse exhibits signs of excess thirst, frequent urination, excessive hunger, fatigue and/or depression. An advanced metabolic horse or pony can actually lose weight at this point since they are no longer able to use glucose as a source of energy; instead they must burn fat and muscle in order to fuel vital body functions. This is as seen as the “skinny diabetic”.

Then Cushing’s Syndrome

It is at this stage that now the metabolic horse moves beyond blood sugar problems, and other significant hormones besides insulin become imbalanced. The chronically elevated levels of insulin cause the adrenal glands to increase the production of cortisol and corticosterone – steroid-like hormones that normally combat stress, decrease inflammation and regulate carbohydrates. However, elevated cortisol levels also increase blood sugar, depress the immune system, increase weight, dissolve bone density, weaken the muscles and catabolize connective tissue - including the lamina.

This causes the pituitary – a small endocrine gland at the base of the brain – to increase its levels of ACTH (adenocorticotrophic hormone) in an effort to regulate the cortisol levels. However, if the underlying cause – high starches and a lack of exercise – isn't resolved, the excess production of ACTH leads to fatigue, sweating, curly hair and slow shedding of the hair coat. It is not unusual for the thyroid to become less active too – thyroid hormones are suppressed in the presence of high insulin and high cortisol levels. These collective hormone imbalances exacerbate and perpetuate weight gain, stress, digestive problems, poor immunity, fatigue and laminitis.

Horses at Risk – Prevention and Lifestyle

Aside from the at-risk breeds previously mentioned the biggest risk factors that predispose any horse to EMS are diet, lack of exercise and stress.

FIBRE = EQUINE ENERGY

- 1) Unlimited grazing on lush grass and/or the regular feeding of grains are the two most common dietary faults in the barn. Contrary to popular opinion horses do not require a high starch or high sugar diet (or high protein for that matter) to maintain weight nor energy levels. Horses use fibre for energy: the intestinal tract of a horse is evolved to digest high-fibre forage which is typically low in sugars. Fibre is fermented in the cecum by billions of strains of friendly bacteria, known as probiotics. This fermentation process produces volatile fatty acids which are used at the cellular level for energy. Once the dietary starch-fibre ratio becomes unbalanced so will the horse's energy and metabolism.
- 2) Lack of exercise further contributes to faulty metabolism. Exercise is critical to stimulate the movement of feed through the intestines, improve digestion, increase circulation, maintain optimum metabolic rates, prevent obesity, regulate blood sugar levels and decrease stress. There are a lot of fun ways to exercise horses other than riding – ponying, hand-walking, practicing ground work or playing running games in the arena with one of more of the herd are not only physically beneficial but help to engage the horses' minds and give them variety in their daily routine. Exercise your horses at least twice per week.
- 3) Stress exacerbates blood sugar imbalances by elevating cortisol levels. As we now know cortisol is a major contributor to EMS, poor immunity and laminitis. Common causes of stress in the barnyard are infrequent feedings, physical pain, over-training, confinement, isolation, lack of companionship, herd dynamics, boredom, neglect (remember horses are social herd animals) and emotional distress.

The development of EMS is usually a slow process as the years of an unnatural lifestyle gradually progress. This development may not be apparent until the early signs or symptoms of EMS begin to appear including weight gain, fat pads, excessive appetite, thirst, fatigue and/or laziness. Sore hooves are also common but some horses can be metabolic without ever showing signs of tender-footedness. While lab tests are available to test insulin, ACTH and other hormone levels they are not always conclusive – endocrine hormones are secreted into the blood in “bursts” rather than in a steady flow making them difficult to track. Rather than wait for a definitive diagnosis or for clinical signs to appear it is more prudent to implement prevention strategies as the standard in all horse-keeping practices - no matter the breed or the discipline. Prevention of EMS is nothing more than common-sense horse-keeping: you cannot capture or breed wild animals then domesticate them with a high-sugar/high-protein diet, confine them and increase their stress levels and then expect them to be healthy. The equine species has spent centuries surviving on freedom – the freedom to forage, the freedom to move and the freedom to run with the herd.

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Leaky Gut (Cecal Acidosis)

Sugars and starches are normally digested with enzymes in the small intestine. When large amounts of sugars and starches are ingested the small intestine cannot digest them all at once thus the digestive load is forced back into the cecum in the hindgut for fermentation. The excess fermentation of sugars causes abnormal levels of gas (often causing colic), heat, and acids. These destructive lactic acids destroy beneficial bacteria (probiotics) but are favoured by harmful strains of bacteria such as Salmonella, Streptococcus, and E. Coli as well as yeast cells. These bacteria then produce a variety of different toxins that are very damaging to the colon walls. This cocktail combination of gas, heat, acids and toxins is known as cecal acidosis, a condition that not only permanently disrupts the natural balance of microflora by killing off beneficial bacteria and encouraging the growth of unfriendly bacteria, but damages the intestinal lining of the colon making it abnormally permeable. Known as “leaky gut syndrome” the damaged colon allows the migration of bacteria, yeast, acids, and related toxins to leak across the membranes, out of the colon and into the general body systems affecting the liver, kidneys, heart, muscles, immunity, and the ever sensitive laminellar hoof tissue. “Leaky Gut” is a major cause of laminitis as well as arthritis, skin conditions, digestive disorders and poor immunity.

Laminitis

Because of the highly vascular nature of the horse's hoof it is extremely susceptible to inflammation and damage especially from digestive toxicity. Once the laminar tissue becomes weakened the connection between the hoof wall and coffin bone begins to separate causing pain and inflammation.

While not all metabolic horses are laminitic the three main causes of laminitis are insulin resistance, leaky gut and Cushing's Syndrome:

- 1) Insulin Resistance (IR): Once blood sugar levels remain permanently high, the sugar levels in all the body tissues drop as the body conserves sugar to protect vital organs. This is bad news for the hooves since the laminar tissue is now starved for sugar, a primary source of energy and nutrition, resulting in the separation and stretching of the lamina. Since blood sugar levels are higher in the morning it is not unusual for horses to be more sore in the early part of the day.
- 2) Cushing's Syndrome: Once the endocrine gland system becomes strained the elevated levels of insulin, cortisol and ACTH combined with depressed levels of thyroxine perpetuates blood sugar problems and damages hoof tissue due to protein loss and tissue degradation. Stress of any kind - including physical pain and/or emotional and mental distress - further increases cortisol and insulin levels. The continued release of cortisol puts an "easy keeper" at risk by prolonging the high blood sugar phase. The aged horse is particularly prone to this since the older horse is unable to turn off the cortisol response to stress as quickly as the younger horse.
- 3) Leaky Gut: Acids, unfriendly bacteria, yeast and related toxins migrate from the damaged colon walls through the bloodstream to the hooves. Unfortunately, the laminellar tissue has very little resistance to these toxic substances resulting in damage to the lamina resulting in inflammation and lameness. Modern research has found evidence of streptococcal bacteria embedded in the laminae. Leaky gut can be a major contributing factor to laminitis with or without the presence of IR and/or Cushing's.

Treatment - Dietary Strategies

First and foremost the diet must be changed. Supplements and natural remedies will be virtually useless if the diet is not appropriate:

- a) Restrict all grass grazing.
- b) Feed low sugar, high-fibre hay only. Either do a hay analysis or soak the hay up to one hour before feeding - this is a temporary measure. Change hay types often until the inflammation decreases naturally.
- c) Eliminate all alfalfa.
- d) Eliminate all grains including oats, barley, corn, COB, sweet feed, extruded feeds, complete feeds or any other feeds with added sweeteners.

- e) Use slow feeders that enable the horse to eat small amounts of hay all day long thus alleviating digestive problems, blood sugar spikes, boredom and stress. Never let a horse run out of hay.
- f) Increase fibre intake by feeding coarse hay, soaked beet pulp and/or soaked soybean hulls. Fibre reduces appetite, regulates blood sugar and increases digestive efficiency.
- g) Avoid over-using antibiotics, non-steroidal anti-inflammatories, glucosamine and chemical dewormers, all of which either alter the colonic eco-system, damage the intestinal mucosa, or elevate blood sugar.
- h) Exercise your horses regularly and always give them freedom to move. (Never stall a metabolic or laminitic horse).

Leaky Gut - Supplements

Pro-Colon - ¼ tsp daily

(replenishes friendly bacteria; encourages optimum digestion)

Pro-Dygest - ¼ cup daily (Psyllium Seed, Comfrey Leaf)

(cleanses, detoxifies and heals the colon; adds extra fibre slowing sugar absorption into the blood)

Vitamin B12 - 1 tsp daily (= 6,000 mcg daily)

(digestive support, energy, liver detox, colon health)

Insulin Resistance/Diabetes - Supplements

Pro-Colon - ¼ tsp daily

Pro-Dygest - ¼ cup daily

Blood Sugar Formula - One dose (5-10 pump sprays) daily for 7 days only

(balances blood sugar; aids the liver)

Vitamin B6 - ¼ - ½ tsp daily

(regulates blood sugar; encourages storage of sugar as glycogen)

Cushing's Syndrome - Supplements

Treat for leaky gut or insulin resistance if present.

Vitamin B6 - ¼ - ½ tsp daily

(supports pituitary function)

Chaste Berry - ¼ cup daily (berries) or 1 tsp daily (tincture)

(normalises pituitary function; balances hormones)

Life+Plus - ¼ cup daily (Ginseng, Fo-Ti)

(adrenal function; balances blood sugar, energy and vitality, immunity)

Hormone Boost - ¼ cup daily (Ashwagandha, Chaste Berry, Kelp, Licorice Root, Raspberry Leaf)

(boosts entire endocrine system including pituitary, thyroid, adrenals, and reproductive hormones)

Laminitis

Treat for leaky gut, insulin resistance, and/or Cushing's if present

Happy Foot - gradually increase from 1 Tbsp to ¼ cup daily (Birch Bark, Boneset, Cayenne, Hydrangea Root, Valerian Root)
(increases hoof circulation; natural pain and stress relief; strengthens hoof vessels)

Joint-Clear - ¼ cup daily (yucca, burdock root)
(natural anti-inflammatory; and detoxifier)

Ensure a regular trimming schedule with a barefoot trimming specialist who has experience with laminitis.

Good News

Equine metabolic syndrome is the result of modern horse-keeping; it is entirely caused by the lifestyle that humans have created for the domesticated horse. And so it is that the responsibility lies on us as the horses' care-givers to eradicate this unnecessary disease. With proper management of diet, exercise and horse-keeping the symptoms of metabolic syndrome and laminitis can not only be reversed but most horses can be rehabilitated to the point of being completely well again.

Ask Bernice, the beloved owner of Kazak. Zak is a 22 year old Arab gelding living in Calgary, Alberta. His story came to me in October 2005 when he was 16 years old and already showing the visible signs of metabolic syndrome and Cushing's disease. Zak was at least 100 pounds overweight with fat pads around his tail head and his shoulders, a pot belly, a long coat that got curly when he was wet (he looked like a buffalo), easy sweating, runny and dull-looking eyes, depression and a low energy level. Needless to say Zak loved food. His diet consisted of grass pasture, crushed oats, four to five carrots per day and a molasses based vitamin and mineral mix.

The first thing we addressed was Zak's diet. We switched him from grass pasture to grass hay and eliminated his oats, his carrots and his vitamin mix. Zak's first supplement program consisted of Vitamin B6, Vitamin B12 and Folic Acid to support blood sugar levels, liver function and digestion, as well as Riva's Pro-Dygest and Pro-Colon (probiotics) to detoxify the colon, slow down sugar absorption and encourage better digestion of fibre and nutrients.

Zak's initial response to his new lifestyle was weight loss, an increase in energy and improved shedding. A few weeks later we focused his program on pituitary and thyroid function, as he continued to sweat and his energy levels and depression were somewhat erratic; the long years of excess weight and high dietary sugars had taken its toll on his hormones. Zak started Siberian Ginseng to improve the overall endocrine

hormone function. Throughout Zak's recovery, Berniece always continued to ride him regularly - at least four to five times per week even if his exercise was kept to a walk. She often stated that she would feel terribly guilty doing it, especially on days when he was so tired and depressed, but she knew that his exercise program was a significant part of his healing journey. Zak made a gradual recovery and continued to improve every step of the way. To this date Zak is completely recovered - healthy, happy, ridden regularly and looking like a horse, rather than a buffalo.



Zak - Before



Zak - After

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