

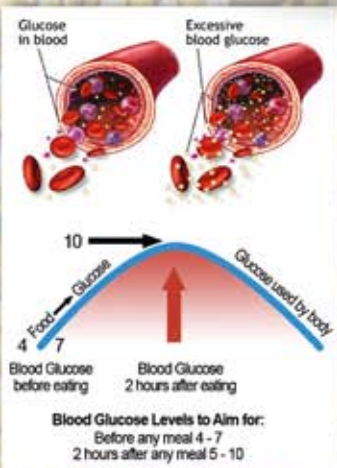
LAMINITIS

A Disease of Domestication

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The identification
of horses at high risk
of developing laminitis
can allow preventative
measures to
be taken.



The burgeoning girth of human and horse in the 21st century has deep prehistoric roots. Hunter-gatherer humans and the majority of ponies adapted exquisitely over millennia to thrive in harsh, seasonal environments where food was limited and of variable quality. They evolved with a natural adaptive drive to store carbohydrates (carbs) as body fat in summer as a buffer against expected scarcities in winter. The ability to rapidly convert carbs to fat, ensuring survival of species evolving in nutritionally harsh environments, was facilitated by insulin resistance.

WHAT IS INSULIN RESISTANCE?

One of the roles of insulin is to move glucose out of the blood and into the liver and muscles to provide energy. Insulin-resistance occurs when movement of glucose into the liver and muscles fails. The result is high blood insulin plus high blood glucose, and so the insulin moves the glucose into fat tissue for storage – increasing body fat levels.

This had a distinct evolutionary advantage as it ensured body fat stores were built in preparation for the next harsh winter.

In the 21st century, high carb diets transform the evolutionary advantage of storing carbs as fat, into a predisposition for certain diseases – notably type 2 diabetes in humans, and its equivalent – laminitis in horses. The major problem with overeating carbs is the development of insulin-resistance. In fact, it has been predicted that 1 in 3 people will become insulin-resistant – but not find out till they develop type 2 diabetes as their pancreas gives up from exhaustion at responding to their wayward appetites! Overfeeding carbs to people is a tried and true method for producing diabetes! Insulin-resistance is the common factor in obesity, type 2-diabetes, hypertension and vascular disease in humans, and is the link between laminitis and Cushing's disease, obesity, inactivity, lush pasture and grain intake in horses.

In humans, two metabolic syndromes – high blood glucose and abdominal obesity – increase the risk of type 2 diabetes. In horses, 'metabolic syndrome' is characterized by high blood insulin and glucose levels (insulin-resistance) and obesity in some, but not all, cases. Insulin-resistance develops from the cumulative effects of the high starch content of spring pasture and/or high carb feeds.

In a study of equine fossils from around 20 million years ago up to the time of domestication (about 6000 years ago), there was no evidence of osteochondrosis, navicular disease, sesamoiditis, spavin, arthrosis or laminitis. Feral and wild horses and ponies are also conspicuously free of the laminitis that so commonly affects domestic horses. Since the agricultural revolution, grains and improved grasses have supplied abundant, year-round carbs to humans and horses. Like diabetes and cardiovascular disease in humans, laminitis in horses is thought to be one of the ills of western civilization.

WHY SOME ARE AFFECTED AND NOT OTHERS ?

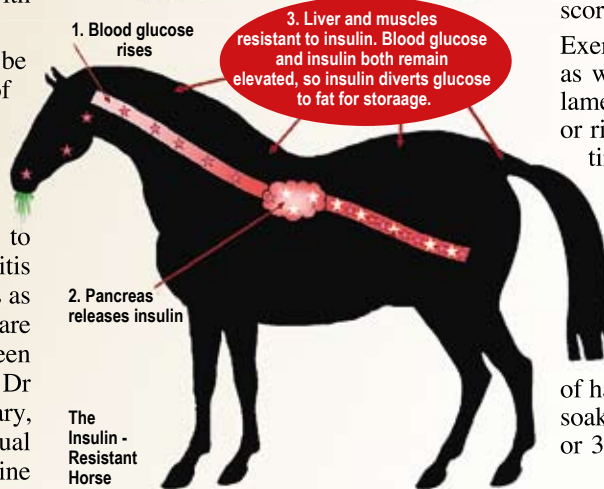
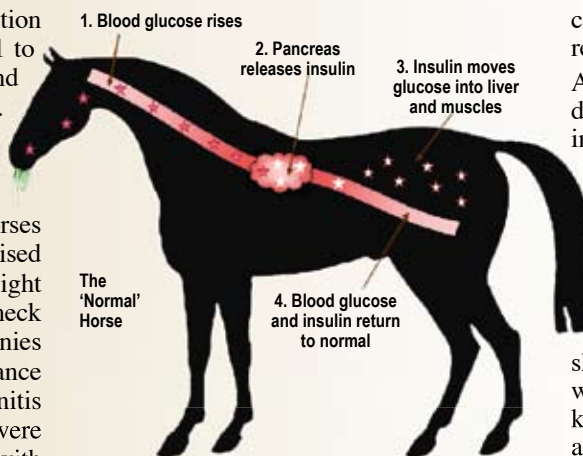
Certain breeds or genetic lines likely evolved in harsher environments, making them better at converting poorer quality forages into energy for storage as fat in preparation for winter scarcity. Under modern conditions the winter period of little food rarely comes and these adaptations predispose the horse to obesity. Metabolic syndrome and insulin-resistance may therefore begin with the genetically susceptible horse or pony grazing lush pasture or being fed large amounts of high-carb concentrates.

The most common causes of laminitis are insulin resistance, equine metabolic syndrome, grain-based diets, obesity, pituitary dysfunction and grazing stressed or lush pastures. This article addresses insulin-resistance and pastures – and how both can be managed to increase feeding safety.

Identification of horses and ponies that are susceptible to insulin-resistance allows preventative measures to be taken, and research into diagnosing insulin-resistance is well underway. A 2006 study found that high blood glucose and insulin levels (insulin-

resistance), a cresty neck, body condition score of greater than 6 (on a scale of 1 to 9) with localised fat deposits on neck and tailhead, increased the risk of laminitis. At-risk horses and ponies are often described as 'easy keepers' — however, not all fat horses are insulin-resistant and not all insulin-resistant horses are fat — they may have either a generalised overweight appearance, or normal weight but with enlarged fat deposits in neck and tailhead regions. Horses and ponies identified as 'at risk' had an 85% chance of developing laminitis. Bouts of laminitis occurred when blood insulin levels were high and recovery was associated with decreases in insulin levels.

All of the pieces of the puzzle must be assembled before a full understanding of the link between insulin-resistance and pasture-associated laminitis is clear, but it is thought that insulin-resistance alters blood flow to the hoof, impairs glucose delivery to the hoof, and leads to obesity. A fundamental driver of laminitis research is to offer early diagnostic tests as part of the veterinary service, and tests are now available that can be used to screen horses and ponies for insulin-resistance. Dr Chris Pollit, the leading laminitis luminary, advocates that just as humans have annual tests for diabetes, so should our equine



companions be tested annually for insulin-resistance.

As with the medical management of diabetes, the twin strategies for addressing insulin-resistance in horses are reducing weight in obese horses, and improving insulin sensitivity through dietary management and exercise. In horses, as in humans, eating less and exercising more are key strategies for weight loss. Body weight, measured directly or with a weight tape, and body condition score should be monitored every two to four weeks - aiming for a weight loss of 25-30 kg over four to six weeks — this equates to a one point reduction in body condition score.

Exercise will improve insulin-sensitivity as well as weight loss and if there are no lameness problems, horses can be lunged or ridden for 20-30 minutes twice or three times a week, building up to four or five times a week.

DIETARY MANAGEMENT

Restricting intake of carbs and all dietary changes must be introduced gradually as abrupt starvation can lead to life-threatening hyperlipaemia. If a horse is suspected of having insulin-resistance, hay should be soaked for at least 60 minutes in cold water or 30 minutes in hot water, then drain the

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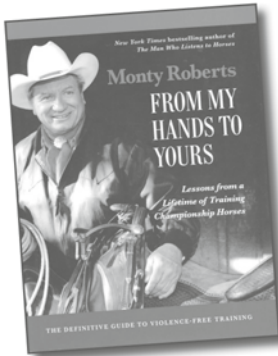
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Laminitis continued...

water away. If possible, for carbohydrate-intolerant (insulin-resistant) horses hay should be tested for non-structural carbohydrate (NSC), and avoided if the levels are above 12%.

Preventing obesity helps to avoid insulin-resistance and, equally importantly, owners should pay close attention to potential laminitis-triggering events, including alterations in sugar and starch levels in hay and pasture. Sugar, starch and fructan concentrations in hay and chaff are dependent on environmental conditions – abrupt changes in plant sugar levels occur day-to-day and even hour-to-hour as plant composition changes from night to day and from sunlight to shade. Horses like sugar just as much as humans do and prefer grass grown in full sun as it is sweeter than grass grown in the shade.

At-risk horses and those with recurring laminitis should be denied access to pasture during the growing season and when pasture is stressed.

SAFEST GRAZING TIMES

The safest time for grazing is early morning; the safest stage for grazing is when the pasture has leaves but not seed heads; the safest weather is overcast or cloudy, and the safest place for grazing is shaded. The lushness of pasture should not be mistaken as a predictor of sugar or starch content as the highest danger occurs in stubble left from mowing or overgrazing; grass that is heading, flowering or stressed due to lack of water or nutrients; during afternoon and early evening grazing, and after sunny days and cold nights. Using this information, appropriate small paddocks can be subdivided off to keep horses in safer areas. Grazing muzzles are also an option, but some horses can still graze efficiently through the holes in the muzzle – and others will tear a bigger hole in the muzzle!!

Current advice from the Laminitis Trust is that at-risk horses and those with recurring laminitis should preferably be denied access to pasture during the growing season and when pasture is stressed - and instead fed high fibre, low starch alternatives.

Recent findings suggest that underlying hormonal and metabolic disorders determine laminitis susceptibility and that diet plays an important role in this process.

Care must be taken to diagnose and control underlying problems such as obesity, insulin resistance and Cushing’s, and the diet adjusted accordingly. Important



Grazing muzzles are an option for high sugar level times of the day, however some horses can still graze efficiently through the holes in the muzzle.

considerations when feeding laminitic horses include having the horse checked to determine if it suffers from an underlying hormonal or metabolic disorder that lowers the threshold for laminitis; if the diet is exacerbating an underlying problem and if every precaution is being taken to avoid triggering events for laminitis.

It is now recognized that pasture is linked to 54% of laminitis cases, with the triggering events for pasture-associated laminitis often going unnoticed. However, proper grazing and feed management could prevent approximately 50% of laminitis cases. But while ponies are more commonly affected by pasture associated laminitis, it is important to note that sub-clinical laminitis is of great concern in horses, including Thoroughbreds – because laminitis is the price they pay for the grains of domestication. Starch and sugar levels in feeds can be measured – hopefully hard feeds, hays and forages will all one day come with a guaranteed analysis showing NSC, starch and sugar levels – assisting horse owners to better meet the nutritional needs of domestic horses and ponies, without increasing the risk of laminitis. 🐾

About The Author

Dr Jennifer Stewart worked at the Universities of North Carolina, Michigan and Florida USA in equine medicine, antibiotics and exercise physiology as well as time spent in Newmarket and Cambridge, England in stud and race track research and practice, before establishing an exclusively equine practice on the Central Coast of NSW. She has been an official veterinarian for the Australian Jockey Club for over 20 years, was one of the team of equine veterinarians for the Sydney 2000 Olympic Games and a consultant nutritionist for Mitavite. Dr Stewart has spoken at seminars internationally including the Middle East, South Africa and Hong Kong. www.drjenniferstewart.com

