

Dietary Factors in Laminitis

Laminitis, or founder, is the most serious disease of the equine foot, and when it strikes it can be heart-breaking for owners and causes great stress and pain to the horse. Past and current research, including an ongoing Australian study funded by the Rural Industries Research & Development Corporation, has focused mostly on issues associated with laminitis caused by dietary factors such as carbohydrate overload and over-feeding. Laminitis can also be caused by metabolic problems such as equine metabolic syndrome (obesity and insulin resistance), Cushing's syndrome (overproduction of corticosteroid hormones by the adrenal gland), and excessive use of corticosteroids to treat inflammation.

Cortisol is a corticosteroid that works with insulin to maintain a stable concentration of glucose in the blood. Cortisol and insulin counteract each other, with insulin promoting tissue glucose uptake and cortisol inhibiting it. They do this by influencing the action of glucose transporters required for glucose to be taken up by various tissues in the body.

Insulin resistance occurs when glucose transporters are overworked, fail, and become resistant to insulin (eg, through overfeeding). When this happens, glucose uptake remains low despite elevated levels of circulating insulin. This is well-known as type 2 diabetes in humans. In horses, the condition is known as equine metabolic syndrome. This problem has not been fully investigated, but it is thought to be a consequence of obesity and over-feeding of carbohydrates.

Corticosteroids inhibit glucose uptake in many tissues by a direct mechanism that limits the movement of

glucose transporters to the cell surface. Corticosteroids can also trigger a complex series of short-term and long-term hormonal events that limit glucose use of tissues.

Healthy hoof tissue requires glucose and uses it at an exceptionally fast rate. Without glucose, or in the presence of glucose uptake inhibitors, the connections between the hoof walls (lamellae) and underlying structures break down rapidly.

This new project aims to understand the mechanisms that control glucose uptake in the hoof and to identify the factors associated with endocrine (hormones) and metabolic abnormalities that lead to impaired glucose uptake and laminitis.

The project will be undertaken by a collaboration of researchers who have extensive skills in different areas.

Professor Martin Sillence is an experienced endocrinologist, Dr Catherine McGowan is an equine veterinarian with a research interest in metabolic disorders, and Dr Chris Pollitt leads a well-established laminitis research group. This collaboration will enhance the productivity, scope, and effectiveness of the study.

The researchers believe that investigating hormonal control of glucose uptake in the hoof will yield important new knowledge that will improve the understanding of laminitis from several different causes. In turn, a thorough understanding of the metabolic causes of laminitis and its association with glucose, cortisol, insulin resistance, and other metabolic disturbances will advance the search for better preventive measures, improved diagnostics, and new treatments.