

Equine Diet Analysis & Clinical Nutrition in the 21st Century

We are becoming increasingly aware of the strong association between nutrition, diet and the health of ourselves and our companion animals. As Veterinarians and Veterinary Nurses, it is one of our many roles to be across current knowledge and to make it available to our clients and their horses. As well as the part they play in health, welfare and behaviour, diet and nutrition can support recovery from clinical conditions. This article provides an update on the applications and limitations of diet analysis and the importance of equine clinical nutrition.

Nutrition is involved in the pathogenesis, management, treatment and prevention of a wide range of equine performance, behavioural and clinical conditions. In addition to disease prevention, correct nutrition is a necessary adjunct when a combination of both dietary and medical/surgical management are needed for the best outcome.

There has been extensive research, experiences and recommendations for feeding horses. Much is accurate and applicable, some is not. Some must be interpreted or combined with other information for it to be useable. In addition, some experiences, anecdotes and recommendations are proven to be false, or true only under certain circumstances. Never-the-less they are often repeated by those unaware of current and recent research, studies and findings to the contrary.

Procedures that may or may not be useful in detecting toxicities and nutrient deficiencies, excesses and imbalances include: history and clinical examination; haematology and biochemistry; urine, hair and other tissue testing, and diet analysis and evaluation. Currently available diet analysis programs are based on reference values developed by Germany, France (INRA) and the National Research Council (NRC) *Nutrient Requirements of Horses* (2007). The NRC calculated minimum requirements through feeding experiments and extrapolation for studies in other species to arrive at minimum feeding standards, and this is what nutritionists use to provide diet and feeding advice.



The limitations of the NRC feeding standards include that they were established for a population of horses of a given age, weight, reproductive and performance status. No consideration is given for weather, climate or the requirements of an individual horse that may vary considerably from group averages. Second, they were established for healthy horses, but those with veterinary clinical conditions; growth or performance problems; sick or post-surgical, and neonates often have increased or decreased requirements. Breed differences studied by the INRA found ponies require 20% less energy than predicted by weight extrapolation from studies in horses. And, the minimum requirements are just that - calculated according to the amount required to prevent clinical signs of deficiencies and excess. Equine clinical nutrition goes beyond minimum recommended intakes and standard feeding guides.

Over the last decade, ongoing research has provided valuable and practical information on various clinical conditions and how diseases affect nutrient requirements, such that many of the NRC (2007) values are no longer accurate. The NRC feeding standards are a useful guide for nutritionists to estimate requirements, but they lack precision and do not include more recent veterinary and scientific studies on genetics and epigenetics, the effects of growth and performance problems, and equine clinical nutrition.



New information has come from epidemiologic studies that have deepened our understanding of associations between nutritional management and clinical conditions — including behaviour, temperament and welfare,¹ colic (including post-foaling volvulus and epiploic foramen entrapment - EFE),^{2,3} developmental orthopaedic disease (DOD),³ endocrine disorders,⁴ enteroliths,⁵ equine metabolic syndrome (EMS),⁶ gastric ulcers,⁷ insulin resistance (IR),⁸ laminitis,⁹ nutritional secondary hyperparathyroidism (NSH),¹⁰ performance,¹¹ polysaccharide storage myopathy (PSSM),¹² recurrent exertional myopathies (RER)¹³ and salmonella shedding in hospitalised horses.¹⁴

While there is strong evidence health can be protected by low-glycaemic (GI) feeds, there is no or scant evidence in support of low-GI claims and to confirm any claims manufacturers need to validate feeds. Some studies have been conducted on starch and sugar levels of commercial horse feeds in Australia.¹⁵ Other Australian studies have cautioned against the use of extruded and micronized feeds in horses at risk of IR — due to increased rate and extent of small intestine starch digestion.¹⁶ There are many international research journals identifying starch, sugar and GI values for common equine feedstuffs. The diet analysis should include this data.

The history and clinical examination can yield valuable information to inform the diet analysis. Many dietary changes disrupt the microbiota and biome disruptions are being investigated as a cause of excessive gas production and risk of displacements and torsions. A 2015 study on post-foaling volvulus in mares found that numerous changes in the microbiota preceded the colic episode by 10-20 days.² It is hoped that this may lead to measures to predict and prevent large colon volvulus in post-partum mares. Several studies have found that a recent change in hay or forage is associated with higher risk of colic than recent changes in concentrate.¹⁷ The history of a recent fatal colic epidemic in over 20 horses on one farm revealed monensin contamination of feed. Horses that suffer from colic, especially if recurrent, should have their history and diet reviewed and analysed.

In animals that are overweight, induction of weight loss is necessary to promote a return to insulin-sensitivity and reduce risk of sub-clinical and clinical laminitis. Alterations to the diet and feeding management begin with a full diet analysis to support medical management. Diet analysis is the only way to determine total daily nutrient intake, set realistic goals and manage weight loss.

Although there is still much to learn in critically ill or hospitalised patients, early enteral nutrition with parenteral supplementation when warranted is the standard of practice. In stressed, catabolic horses, the effects of inadequate nutrition are different to those observed in healthy animals. Amino acids are used by the liver to produce acute phase proteins, and increased glucagon, glucocorticoids, adrenalin and growth hormone cause insulin dysregulation and increased protein catabolism, both of which affect wound healing and immune function.¹⁹ Fine-tuning amino acid balance and intake enables nutrition to support medical and surgical treatments.

Because mathematical calculations alone don't reflect the complexity of requirements for a wide range of veterinary clinical conditions, equine veterinary practices are a primary source of nutritional advice.

Many nutritional recommendations change as new research expands our knowledge. A recent example is Dr Ben Sykes work that revealed how timing of roughage feeding affects the efficacy of omeprazole – resulting in changes to the recommended protocol.²⁰ Although estimates can be found in textbooks and feeding guides, to be clinically applicable and meet 'best practice', nutritional advice requires veterinary knowledge and understanding of pathophysiology and clinical assessment of health, growth, performance and clinical problems.



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