

CANBERRA Equine HOSPITAL

Overview of Basic Nutrients

Horses and ponies are classified as herbivores or roughage eaters. They are a grazing animal with digestive systems designed for constant consumption of plant food, not like humans who eat a few meals a day.

The horse's digestive system is considered monogastric rather than ruminant. This means they have one stomach, which is different to cattle which have four. The stomach and small intestine of a horse are called the upper gut where most of the protein, fat, vitamins and minerals contained in feed are digested and absorbed.

The size of the horse's stomach is quite small and hence many classes of horses are not able to consume enough forage to meet their nutrient requirements. Therefore concentrates are sometimes needed to supplement their nutrient requirements. The stomach of the horse is small because in the wild the horse obtains all its dietary needs through grazing for up to 18 hours a day. Due to this lifestyle their gastrointestinal tract has adapted to enable them to absorb the maximum amount of nutritional value from a diet of roughage.

The unique characteristics of its large intestine, or hindgut, allow the horse to utilize cellulose and other fermentable substrates, as such they are called "Hindgut Fermenters". The horse has an enlarged cecum which serves as a fermentation vat. Billions of bacteria and protozoa produce enzymes that break down plant fibre. In the horse, this fermentation process occurs late in the digestive tract and as a result, horses do not obtain all of the nutrients synthesized by microorganisms in its large intestine.

The horse's large intestine is designed to utilize plant fibre, which is very different to humans. Insoluble carbohydrates such as cellulose and hemicellulose from forages, as well as starch and other soluble carbohydrates flow into the large intestine, as they are undigested in the foregut. As feed leaves the small intestine it first enters the cecum and is fermented. After fermentation, feed enters the colon for further digestion and absorption. Microbial fermentation in the hindgut results in the production of volatile fatty acids which are an important nutrient source for the horse. As such there is a synergistic relationship between the bacteria and the horse, keeping the bacteria happy will keep the horse happy. The hindgut also serves as a reservoir of water and electrolytes which are vital to sustain exercise performance.

Today's horse's dietary needs are greatly influenced by its breed and the lifestyle imposed upon it. The most important aspect of any horse's food intake is to make sure that the main proportion of feed comprises good quality forage.

To ensure the diet is adequate it is good to know the 6 basic nutrient categories that must be met; Carbohydrate, protein, fat, vitamins, minerals and water.

CARBOHYDRATES

Carbohydrates make up the largest portion of the horses diet. There are two categories of carbohydrates; Structural (Fibre) and non-structural(sugars and starches) The grains have both soluble carbs (the inner parts of the seed or kernel) and insoluble carbs (the outer parts of the seed and remainder of the plant). Structural carbohydrates are found mainly in roughage such as grass and hay. These are able to be digested by the horse thanks to the design of the hind gut. Non-structural carbohydrates are easily digested. These sugars and starches are primarily found in grains and provide a more concentrated form of energy to the horse than the structural carbohydrates.

However, remember that the horses digestive tract evolved to process a roughage based diet. Therefore ensure the diet is based on forage and concentrates should only be supplemented when to meet the energy requirements of the horse that cannot be met with forage alone (Performance, pregnant and young horses or those in a heavily stoked agistment paddock). Horses's should always be fed a minimum of 1% of its body weight in forage and ideally should be fed 1.5-2% of its body weight. Ensure when adding concentrates or changing your horses diet, do it slowly to help the digestive tract adapt. If feed changes are done too fast or your horse is fed too little forage material, colic and ulcerations can develop.

PROTEIN

Proteins are the building blocks of a horse's body. They make up about 20% of an adult horse's weight and are important for building muscle and replacing lost or damaged cells. There are 22 amino acids used in the construction of proteins, Proteins are broken down in the small intestine into amino acids and these amino acids are recombined to make proteins in the body forming muscles, hair, hoof, hormones etc. The main amino acid or what is called rate limiting amino acid for horses is lysine. This amino acid tends to run out first and due to its absence other proteins will not be able to be formed. Therefore it is important to ensure your horse is meeting its lysine needs. Protein can also be used to produce energy when there is a metabolic need, but this comes at the expense of heart and other muscles.

Younger, growing horses have a much greater requirement for protein than mature horses but protein requirements increase again once the horse reaches old age. Growing horses generally need about 12-18% crude protein in its diet whereas mature horses will only need 8-12%. Horses under intense training will need the upper level of this range (12%). It is important to note feeding horses higher levels of protein than they need simply means the horse breaks down the excess and excretes it in urine. This is not good in stabled horses where an increase in urine production and hence ammonia in the environment can lead to respiratory problems.

FATS

Fats are also broken down and absorbed by the small intestine. From there the fats can either enter the biochemical energy production pathways or be stored for release later.

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Recent research has shown that the fats can make up to 10-20% of a horse's daily energy requirements and be well utilized. Fats contain two times the energy production ability on a gram to gram basis compared to soluble carb's or protein. Fat added to a ration or feed will increase the energy content of that feed and for some horses will mean they need less of it. When adding fat to a diet, it is important to ensure all other dietary needs are being met (protein, vitamins, minerals etc) and not just the energy requirements.

Vitamins

Vitamins are critically important organic compounds. They must be present in the body to enable important reactions to take place allowing the animal to live. There are two categories: Water soluble and fat soluble vitamins. The water soluble vitamins include B-complex vitamins (B1, B2 etc) while the fat soluble include Vitamins A, E, D and K. Remember when looking at the feed contents, vitamins have a proper chemical name and might be found under that. Sufficient vitamins are usually acquired through foraging and grains but, in some cases, supplements are given. Indications include stress from illness or excessive training. Excess of vitamins can also be problematic, while water soluble vitamins are excreted in urine, fat soluble vitamins are stored in fat and can cause toxicities.

Minerals

Minerals are needed for metabolic functions, proper working of the skeletal system, and hormone and enzyme regulation. For horses, important minerals include calcium, magnesium, sodium, chloride, potassium and phosphorous. The main mineral ratio you need to remember is calcium:phosphorus, as a rule of thumb, this ratio should be between 1:1 and 2:1. If the phosphorus levels are high in relation to calcium, calcium will be pulled from the bone into the blood stream to correct the imbalance. Most feed are high in phosphorus as such they are supplemented with calcium. Many minerals can be used to help problems seen in horses. Biotin, zinc and copper supplements have shown good results in improving hoof strength. Just remember minerals in excess can also cause toxicities.

WATER

Water is the most important nutrient. Your horse could live for weeks without ingesting any feed, but two to three days without water would cause severe illness or death. The average 500kg horse drinks over 20 litres of water per day. Fresh water is needed to fill this requirement at all times.