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Nutritional Minute



Clarifying Carbohydrates Part I

There are three different types of carbohydrates utilized by horses: simple sugars and starches, rapidly fermentable carbohydrates, and structural carbohydrates. This part of our series will deal with simple sugars and starches.

What are carbohydrates and why are they important?

Carbohydrates are substances made up of the elements carbon (C), hydrogen (H) and oxygen (O). Various forms of carbohydrates are made through different physical combinations (molecular structure) of the C, H and O components. The simplest, most basic units of carbohydrates are monosaccharides or single sugars (e.g., glucose and fructose). Monosaccharides are the building blocks used to make increasingly more complex carbohydrates. The varied structures of carbohydrates play a major role in how and where in the horse's digestive tract they are processed and absorbed.

Carbohydrates have to be broken down into glucose before they can be used as energy in a horse's cells. Once broken down, glucose circulates through the bloodstream, supplying cells with energy. Excess glucose is stored as glycogen in muscle tissue and the liver for later use. Horses are able to meet roughly 30-70% of their energy needs with carbohydrates, making carbohydrates an important part of their diet.

Simple sugars and starch

Sugars are the simplest carbohydrates. Sugars are either monosaccharides or disaccharides (molecule of 2 monosaccharides). Variations in the physical arrangements of the monosaccharides result in different types of sugars. Simple sugars commonly found in feed include sucrose, fructose and maltose. Starches, on the other hand, are a bit more complex. Starches are molecules containing many monosaccharides, called polysaccharides. Starches can be broken down into two components: amylose and amylopectin.

Simple sugars and starches are digested in the foregut (mouth, esophagus, stomach and small intestine). Gastric acids and enzymes aid in breaking down sugars and starches. The resulting glucose is absorbed in the small intestine. This

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glucose is immediately available, via the bloodstream, as an energy source. Because of limited enzyme availability and acid production, it is important to note the foregut has a limited capacity for digesting sugars and starches. When large amounts are fed, the excess sugars and starches are passed into the hindgut (cecum and large intestine), where they can cause digestive upset or laminitis. Carefully controlling the amount of simple sugars and starches fed to horses is a key management consideration.

Where are simple sugars and starches found?

Plants produce sugars and starch to meet their own energy requirements. Plants store excess sugars and starches in seeds and other plant tissues. Grains, which are seeds of plants, are high in these types of carbohydrates. Oats, corn and barley are commonly used in equine feeds and contain relatively high levels of starch and sugar.

Grass and hay also contain these simple carbohydrates, but not to the extent of plain grains and grain concentrates. The content of simple sugars and starches in grasses can vary, depending on growth stage and seasonal temperatures. Hay, once baled, contains about 4-5% less starch and sugar than fresh grass.

Stay tuned for Part II of Clarifying Carbohydrates, when we'll discuss the rapidly fermentable carbohydrates, such as fructans, pectins, resistant starches and more!



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