

# HORSE NUTRITION

## Nutrients

A nutrient is defined as any feed constituent that is necessary to support life. The following is a list of functions that nutrients perform in the horse's body:

- source of energy
- builds the body
- creates chemical reactions in the body
- regulate body temperature

There are six general classes of nutrients needed in the horse's diet:

- water
- carbohydrates
- fats
- protein
- minerals
- vitamins.

Food consumed by the horse contain most of these nutrients in varying amounts. For the horse to utilize these nutrients, the ingested feed must be broken down by digestion and absorbed from the digestive tract.

## Water

Horses need a constant supply of good quality water.

The amount of water a horse should consume is determined by the amount lost in the manure, urine, respiration, and sweat, and is dependent on a number of factors: air temperature and humidity, feed quality, type and amount of feed, physical activity level, and health. As a general rule, horses need 1 to 2 quarts of water per pound of dry matter consumed. This amount will change with increasing activity level and temperature. A mature horse at maintenance (not being worked, not pregnant, and/or not lactating) under normal environmental conditions will consume approximately 1 gallon of water per 100 pounds body weight per day. Therefore, an 1,100-pound Thoroughbred at maintenance would drink about 11 gallons of water per day. If that same Thoroughbred were training intensely for a Three-Day Event, this amount could increase 300 percent, up to 33 gallons of water per day! Lactating mares will increase their water consumption about 50 to 80 percent for milk production.

In all horses, but most importantly in the performance horse, the amount of water required per day is dependent on the amount lost through sweat during exercise. Sweating is an important function in maintaining the core temperature of the horse. Horses can lose up to 3 gallons of sweat per hour. Temperature and humidity will also affect water loss from the horse. Horses generally drink more and eat less when the temperature is high. In an environment with high relative humidity (over 80 percent), sweating does not efficiently cool the horse, so it is at a risk for overheating.

## **Carbohydrates**

Carbohydrates provide the majority of a horse's energy. Carbohydrates such as starch and glucose from grains, and pectins from fiber, are easily used as energy sources by the horse.

Carbohydrates, such as cellulose in plants like hay and grass, can only be broken down by enzymes in the cecum and colon. The carbohydrates are converted to energy, and provide 30 to 70 percent of the horse's energy requirement.

## **Fats**

Fats are a concentrated source of energy (more than twice as much as carbohydrates) and are readily utilized by the horse. They are commonly provided as a vegetable fat, such as corn oil.

Fats are necessary in the equine diet to absorb certain vitamins and provide essential fatty acids. In addition, the use of fats in the horse's diet improves the coat, is an effective way to increase the energy in the diet without increasing the amount of feed, and has been shown to have an effect on reproduction.

## **Proteins**

Proteins are made up of amino acids. They serve as building blocks for muscle and ligaments in the body and are a source of energy. There are 22 amino acids that are needed by the horse, but not all of them have to be provided in the feed. Non-essential amino acids are produced in the body tissues and therefore not needed in the diet. However, essential amino acids must be provided in the diet.

The amount of protein required in the horse's diet depends on the digestibility of the diet and the individual horse's protein needs. In growing horses, the only essential amino acid that may be limited in normal diets is lysine. It must be provided as 5 to 6 percent of the total protein in the diet.

## **Minerals**

Minerals are involved in many bodily functions in the horse. They function in the development and maintenance of muscle, bone, and ligament, play roles in how the body functions, and are involved in energy transfer. Minerals also function with vitamins and with hormones and amino acids. Horses are able to obtain a large portion of their mineral requirements from the feed, but the concentration and availability varies with soil mineral concentration, plant species, and stage of maturity.

There are seven major minerals required in the diet: calcium, phosphorous, sodium, potassium, chloride, magnesium, and sulfur. These are expressed as a percent of the total diet. The horse's requirements for the eight minor minerals are expressed as parts per million and are cobalt, copper, fluorine, iodine, iron, manganese, selenium, and zinc.

## **Vitamins**

Vitamins play a role in regulating many physiological functions in the horse. There are two types of vitamins: fat-soluble and water-soluble.

Fat-soluble vitamins need absorbable fat in the diet to be absorbed in the small intestine. These vitamins, are A, D, E, and K. The horse synthesizes two of these fat-soluble vitamins. Vitamin D synthesis in the horse is activated by sunlight. The microbes in the cecum and large intestine are capable of producing vitamin K. Vitamin A is provided in sufficient quantities by green forages and can be stored in the liver. Vitamin E is present in sufficient quantities in most good quality diets, especially those that include grains.

The water-soluble vitamins are capable of being produced by the horse, therefore, they are not required in large quantities in the diet. Vitamin C and all the B-complex vitamins (thiamin, niacin, riboflavin, biotin, etc.) are all water-soluble vitamins.

## **Fiber**

Horses evolved as natural grazers and, therefore, have to consume fibrous feeds, or roughage. Roughage is a very important part of the horse's diet. It provides nutrients for both the horse and microbes in the hindgut as well as stimulates muscle tone and activity of the gastrointestinal tract.

There are many different fiber types that can be utilized in the equine diet, but not all of them are as efficient to use. Roughage quality varies widely across types and is due to plant species, soil fertility, and stage of maturity at the time of harvest. Common roughage sources are pasture and hay.

## **Pasture**

The most common type of roughage fed to horses is pasture. There are two types of pasture: legumes and grasses. The legume pastures include alfalfa and clovers (red and white) and are usually mixed with grasses. Grasses are subdivided by their growing characteristics into cool-season and warm-season grasses.

Cool-season grasses grow best in temperatures of 60° - 80° F and include Kentucky bluegrass, orchardgrass, timothy, brome, and tall fescue. Warm-season grasses grow best in temperatures greater than 70° F and include bermudagrass, bluestems, and bahiagrass. Although spring pasture growth provides horses with an abundance of nutrients, nutrient content decreases as the grasses mature.

## Hay

Hay is the most popular and one of the least expensive forms of roughage. Hay may be processed as round bales, square bales, cubes, or pellets. There are three major types of hays: legumes, grasses, and cereal. The main legume hay fed to horses in the United States is alfalfa. It can be mixed with grass to form an alfalfa-grass combination. Alfalfa, if processed correctly, has the highest nutritional value when compared to other hays. The second major type of hay is grass hay. Grass hays include timothy, orchardgrass, bluegrass, brome, and bermudagrass. The third major type of hay is cereal hay. Cereal hay is hay made from grain crops that have not been harvested for grain, such as oat hay.

The leaves of all hays contain two-thirds of the total energy and the majority of the total protein in the plant. Therefore, leaf loss decreases the nutritional value and quality of the hay.

Haylage or silage, is another source of roughage that can be fed to horses. Haylage is not a popular feed for a couple of reasons. First, there is an increased risk of the horse consuming spoiled haylage that contains botulism, a mold that grows in hot, moist conditions. Second, haylage is not readily available in some areas.

## **Byproducts**

The by-products of grain production can be used in horse diets. By-products are made up of the fibrous stems or hulls of a plant. Bran and beet pulp are the most common examples of by-product feeds. Some by-products provide little nutritional value to the horse but can be used as a source of roughage, or "bulk," in the diet. Beet pulp is a popular by-product feed used in horse diets because it provides fiber similar to the fiber in hay and has a digestible energy content similar to oats.

## **Concentrates**

Certain classes of horses, such as growing or working horses, require more energy or protein than can be provided by hay or pasture alone. Therefore, it is necessary to provide horses with concentrates. Grains are the harvested seed portions of cereal crops that serve as a high nutrient feed. Cereal grains can be fed to horses as the whole grain or processed by cracking, rolling, crimping, steam flaking, or extruding. Grains are very palatable, dense, and usually low in fiber if processed correctly. Common grains used in horse feed are oats, barley, and corn. Concentrates should be fed to horses as a supplement to the forage portion of their diet and should not be greater than 50 to 60 percent of the total diet.

## **Complete Feed**

Complete feeds are another way to feed the horse. They contain all the concentrates (both energy and protein feeds), vitamins, and minerals that a certain class of horse will need. The advantage to feeding this kind of feed is that you don't have to measure out each ingredient at every feeding, which can be time consuming, and difficult to balance properly.

## **Energy Feeds**

Feedstuffs that contain less than 20 percent crude protein are considered to be energy feeds. These include oats, corn, barley, wheat, sorghum, and rye. Certain by-product feeds can be used for energy as well, such as wheat bran, wheat middlings, soybean hulls, and sugar beet pulp. Fats/oils (animal or vegetable) and molasses are also used to increase the palatability and energy density of the diet without increasing the amount of feed.

## **Protein Supplements**

Feedstuffs that contain more than 20 percent crude protein are considered to be protein supplements. The most common protein supplements are soybean meal, canola meal, cottonseed meal, and linseed meal. Other protein supplements include casein and dried skim milk. Both are good for growing horses.

## **Vitamin and Mineral Supplements**

Mineral supplements are usually required in the horse's diet. Macrominerals are added to a horse's diet to balance the ration to meet mineral requirements. Athletic horses lose a lot of sodium chloride (salt) in sweat and need to be provided a salt block. Many horse rations are deficient in either calcium or phosphorous and in some cases both. Trace mineral blocks are the most common way to meet trace mineral requirements.

Although there are plenty of vitamin supplements available on the market today, vitamin supplementation is not necessary unless a low-quality roughage is being fed or the horse is in strenuous exercise.