Introduction to Feeding
Horse feeding programs may vary considerably among South Carolina horse owners; however fundamentals of nutrition should remain the same. The base for all horse diets should be quality forage with more energy-dense concentrates or grains following. Balanced nutrients should be fed according to stage of production, growth and activity level. Unlike other livestock species which are often fed for relatively short periods of time for the purpose of weight gain and meat quality, horses are fed to maintain a degree of serviceability for a much longer timespan. Improper feeding management can lead to digestive disturbances such as colic or laminitis, poor health in general and poor athletic performance.

Digestion
A horse’s digestive system is classified as non-ruminant; however adaptations to the hindgut allow the horse to be much more suited for digesting roughages than other non-ruminants. The foregut includes the mouth, esophagus, stomach and small intestine. The stomach is relatively small compared to the rest of the digestive tract; and therefore can only contain small amounts of any feedstuff at one time. Only some enzymatic digestion occurs in the stomach. Digestion of most soluble carbohydrates, fat and protein takes place in the small intestine, where a large portion of nutrient absorption also occurs. The hindgut (cecum, large colon and small colon) contains an active population of microbes that break down fibrous (structural) carbohydrates into volatile fatty acids (VFAs), which can then be absorbed and used as an energy source by the horse. Large meals of highly soluble carbohydrates, such as the starch and simple sugars present in various cereal grains, have the potential to spill over into the hindgut where microbial fermentation produces lactic acid. Lactic acid and gas accumulation in the hindgut can then cause concern for digestive disorders such as colic or even founder (laminitis). Horses were designed as continuous grazers and require a somewhat constant supply of forage to maintain good digestive health. This is because the stomach is made up of glandular and non-glandular portions, with the glandular portion secreting digestive enzymes, acids, and its own protective mucous almost constantly. The non-glandular portion, however, is protected only by the natural buffering ability of the saliva produced while eating.

Nutrients
There are five essential nutrients that the equine diet should supply:

1. Water
   a. Water is the most important nutrient. Horses drink 8-12 gallons per day (about 1 gallon per 100 lbs. BW). This increases by as much as 4 times during hot temperatures, hard work, lactation, or extra dry matter consumption (hay in the winter vs. lush spring pasture).
   b. An adequate, clean supply of water should be available at all times. Signs of dehydration include decreased feed intake or physical activity, dry mucous membranes, dry feces or decreased capillary refill time.

2. Energy
   a. Energy is mostly supplied by the carbohydrates and fats in the horse’s diet and is highly affected by the digestibility of these two components. Fat is much more energy-dense than carbohydrates (by about 3 times) and is usually supplied in very small quantities in the...
equine diet. Carbohydrates are the main energy source in most feed and forage sources. Soluble carbohydrates (simple sugars and starch) are readily broken down into glucose in the small intestine and absorbed. Fibrous carbohydrates that make up the plant cell wall (cellulose, hemicellulose, lignin) must be broken down by bacterial fermentation in the cecum. The volatile fatty acids produced by fermentation can then be absorbed in the hindgut for energy.

3. Protein
   a. Protein is broken down into amino acids to be used for muscle development during growth or exercise. Most adult horses only require 8 to 10% protein in their diet; however, higher protein is important for lactating mares, young growing foals and high-level athletes.
   b. Signs of protein deficiency include rough hair coat, weight loss, reduced growth, milk production, and performance.
   c. Excess protein results in increased water intake, urination, and increased sweat losses during exercise.

4. Vitamins
   a. Adult horses at maintenance usually do not need a vitamin supplement if they are consuming fresh forage and/or a premixed ration.
   b. Vitamin D is fixed from sunlight and is found in pasture grasses and sun-cured hay sources. Vitamins A and E are also found in fresh green forages. Horses with limited turn-out or those eating weathered or long-stored forage may need supplementation.
   c. Vitamin K and B-complex are produced by microbes in the hindgut. Vitamin C is produced by the liver; therefore, supplementation of these is not needed.

5. Minerals
   a. Minerals are needed in small quantities in the diet to maintain body structure, fluid balance in cells, nerve conduction, and muscle contraction. Macro-minerals needed are calcium, phosphorous, sodium, potassium, chloride, magnesium and sulfur.
   b. Calcium is high in most forages and higher phosphorus levels are characteristic of grain diets. The ratio of these two minerals should be as close to 2:1 as possible.
   c. Horses in hot environments such as ours or in heavy work will deplete sodium, chloride, and potassium in the sweat; therefore, these horses may need an electrolyte supplement.
   d. Horses consuming fresh green pasture and/or a premixed ration will likely receive proper amounts of minerals in their diet, with the exception of sodium chloride (salt), which should always be available.
   e. Young growing horses may need additional calcium, phosphorous, copper and zinc during their first two years.

Forage
Quality forage from pasture or hay should be the base of every equine diet despite their relative level of production. Horses need at least 65% forage in their diet to maintain normal digestive function, not to mention feeding in this manner can be much more economical than feeding large quantities of grain concentrates. A good rule of thumb is to feed at least 1% of the horse's bodyweight in forage dry matter per day. Dry matter must be considered when comparing fresh pasture to hay because some grasses can contain up to 90 percent water, whereas hay has closer to 10 percent water.

Pasture
Properly managed grass or mixed grass-legume pastures provide an excellent source of energy, protein and vitamins and can meet the nutritional needs of most adult horses. During the growing season, hay and concentrate feeding can be drastically reduced and even eliminated in mature, idle and early-pregnancy horses with access to productive pastures. Luckily, South Carolina has a very good climate for growing high quality forages, but management is key.

Horses will consume approximately 2 percent of their body weight per day in forage dry-matter. If the
major nutrient source is pasture, a 1000-pound horse will collectively consume and waste approximately 3 tons on average of forage dry matter during a typical 6-month grazing season. Thus, with average management, it would take about 2 acres of pasture to meet the nutrient needs of a mature horse. Of course, the carrying capacity of any particular pasture will depend on such things as soil type, soil fertility, drainage conditions, amount of rainfall, time of year, and type of forage species present.

Hay
In general, quality hay can be identified by checking to be sure it is free from dust, mold and weeds. Hay quality is also heavily affected by its maturity at cutting and the storage method. Nutritive value of hay is highest when it is cut at a young leafy stage of growth compared to a mature stemmy hay, which is much higher in indigestible fiber. Hay can be grass or legume. Common grass hays fed to horses in South Carolina are coastal bermudagrass, fescue, and timothy (mostly shipped in from other states). Cool season grasses are usually higher in quality than warm season varieties, depending on specific cultivars. The most common legume hay fed to horses is alfalfa with some grass hays also containing a mixture of clover. Alfalfa is a good option for growing horses, or those with greater nutrition requirements, because it is higher in digestible energy, calcium and protein than grass hays.

Concentrates
Grains
Oftentimes, an all-forage diet does not meet the energy needs of horses in higher production situations, such as those in hard work, growing or lactating. Adding concentrates in the form of cereal grains is an easy way to add extra energy to these horses’ diets. Commercial grain mixes are also a good source of protein, phosphorous and vitamins. Most commercial grain mixes contain several different grain sources such as oats, corn and barley. Oats are the most common horse grain as they are higher in fiber content, more palatable, digestible, and considered to be the safest of the three. Barley is a little higher in digestible energy than oats, and corn is the highest. Corn is low in fiber and very energy-dense, making it easy to overfeed and cause obesity.

All horses do not need grain in their diet, as their digestive system is well-adapted to utilizing forages. Because their relatively small stomach size limits the amount they can eat at one time, a horse’s ration should contain a maximum of 50% grain; the greater proportion of grain in the diet, the higher the risk of digestive upset, laminitis, and obesity. Along with this, grain feeding should be been split into several meals per day (at regular and as even intervals as possible) to limit the amount consumed at one time.

Feeding Guidelines:
1. Forage first! Quality forage should be the base of every ration with concentrates being secondary.
2. Feed by weight not volume. All feedstuffs do not have equivalent nutrient densities or weight (e.g., corn vs. oats).
3. If feeding concentrates is necessary, feed no more than 0.5% bodyweight per feeding.
4. Feed on a set schedule at even intervals. Horses are very sensitive to changes in routine.
5. Change feeds gradually to reduce the incidence of colic and digestive upset.
7. Store feed away from dust, mold, rodents, and contamination.
8. Always supply fresh water and salt free choice.
9. Feed each horse according to activity level and physiological status. Decrease feed if work or activity decreases.
10. Don’t oversupplement!
time. A good rule of thumb is to limit the size of the grain meal to 0.5 lb. of grain/100 lbs. of body weight per feeding.

Fat Supplements
Fat supplements can be used as a top dressing on horse feeds to provide extra calories. Since fats are much more energy-dense than the above grains, small amounts can be fed as a way to safely add weight to a thin horse without overloading the small digestive system. Corn and other vegetable oils, flaxseed oil, and rice bran are all common fat supplements fed to horses. Rice bran is a commercially available by-product that contains about 20% crude fat. If adding an oil supplement as a top dressing to feed (it's not palatable by itself), start by adding ¼ cup/feeding and increase to no more than 2 cups per day over the course of two weeks.

Restricted Calorie Diets
Some ponies and certain horse breeds commonly known as “easy-keepers” do not need to eat concentrates, as obesity problems in these equines would occur quickly. There are many health problems associated with obesity in horses including metabolic syndrome, insulin resistance, and laminitis; so the diet of an overweight horse should be carefully controlled. Body condition scoring is a commonly used method for evaluating fat cover and weight of a horse. This method utilizes visual inspection of common fat-accumulating areas (e.g., neck, ribs, behind shoulders, tail head) as a helpful tool for deciding if your horse is receiving too much feed.

If it is determined that your horse is overweight, reducing the calories in the diet and increasing the amount of exercise are both important steps to returning your horse to a healthy state. Always start a restricted-calorie diet by cutting out grain concentrates and feeding an all-forage diet. Pasture turn-out time is great for increasing physical activity, but at times when even the pasture grass provides too many calories, horses may need to be restricted to a dry lot. Dry lots are mostly sand or dirt and contain very little forage for grazing, if any at all. Containing overweight horses to a dry lot allows you to control exactly how much they eat by offering only hay, while allowing them to still get needed exercise. If a dry lot is not available, the horse can be fitted with a grazing muzzle to restrict grass intake while at pasture. Although restricting the number of hours a horse is allowed at pasture may be a viable option to reduce feed intake, research has shown that most horses just increase the speed at which they eat to make up the difference.

Restricting the energy of a diet without sacrificing other essential nutrients is often a difficult task. Remember, horses need at least 1% of their bodyweight each day in forage to maintain proper digestive health. Good quality hay will likely provide the needed protein and some vitamins, but minerals will be lacking. Supplementing the hay with a vitamin/mineral ration balancer may be needed. As with all changes where diet and nutrition are integral, weight loss in horses should be gradual to avoid any unintentional health problems.

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