How horses should be fed is determined by the anatomy and physiology of the equine digestive tract. The horse is a non-ruminant, herbivorous, hindgut fermenter. This means that horses have enzymatic digestion in the foregut (mouth, stomach, small intestine) and microbial fermentation in the hindgut (cecum, colon). As a result, horses can make good use of both high quality and fibrous feedstuffs. Following standard feeding guidelines while ensuring nutrient requirements are met will help to maintain the horse’s optimal health.

**Hindgut and forage**

Because of the anatomy and physiology of the digestive tract, the horse’s diet has to be planned somewhat backwards; that is, starting with the hindgut.

The horse is a hindgut fermenter; therefore forage should make up the bulk of the horse’s diet. Forage is the major source of dietary fiber for the horse. Microbial digestion of fiber occurs in the hindgut. The product of this digestion supplies most, if not all of the horse’s required dietary energy. In addition to supplying energy, fiber is an essential part of maintaining normal gut motility and a healthy balance of microbes. Forage also helps keep the intestines full so as to minimize the risk of twists and torsions (colic).

To maintain the ideal digestive tract environment and minimize the disturbances to the hindgut microbes, horses should have access to forage at all times. Specifically, the horse should receive a minimum of 1% of its body weight as forage per day (dry matter basis). On average, horses will voluntarily consume 2 to 4% of their body weight as dry matter in a 24-hour period. (Hay and typical grains usually contain 90% dry matter, while fresh pastures generally contain 20 to 30% dry matter.) Hay should be fed when grazing is limited, not possible or when the nutrient content of fresh pasture is poor, even if the quantity of pasture is plentiful. In late fall and winter and in times of drought, the nutrient content of pastures declines, making it necessary to feed hay. In early spring, while the grass may be plentiful and a rich green color, the nutrient and fiber content may still be low; therefore, hay feeding will still be necessary. (For information on selecting hay, please see *EquiPage* volume III, issue I: The Main Course: Hay for Horses.)
Forages also provide some minerals and vitamins; however, forages grown in North America are typically deficient in several trace minerals. For this reason, horses on a pasture-only diet or fed unfortified grains should be given a daily trace mineral supplement. Hays are most likely to be deficient in some vitamins and trace minerals; therefore, horses on a hay-only diet or fed unfortified grains will need a vitamin and mineral supplement. A typical trace mineral salt block will not provide enough trace minerals and provides no vitamins.

Forages also provides starches, sugars, proteins, fat, minerals and vitamins, most of which would be digested in the foregut. In many cases, forage with some vitamin and mineral support can meet the horse’s nutrient requirements.

Theoretically, forages should be gradually changed if they are substantially different. Even with different hays, however, there has been no report of digestive upset when the switch has been abrupt. On the other hand, switching from a hay-only diet to a partially or completely pasture diet has resulted in problems. For horses that have not regularly grazed pasture for a significant amount of time, turnout should be gradually increased. Furthermore, horses that are accustomed to poor quality pastures should be gradually introduced to new, lush pastures.

**Foregut and feed (grain)**

Feed should be fed only when the horse’s energy requirements cannot be met on forage alone. The horse’s stomach is relatively small (~2 gallons for an average size riding horse). Digestion occurs only in the glandular (acid-producing) portion, approximately half of the stomach. For optimal digestion, the amount of feed provided should not exceed the capacity of the glandular portion of the stomach. Overfeeding grain may cause an increase in acid production and may increase the incidence and severity of ulcers.

*When feeding grain, an individual feed meal should not exceed the volume of the stomach’s glandular portion. This means that each meal should not exceed 5 pounds for a 1000 pound horse in light to moderate work, or 0.5% of the horse’s body weight.* On average, a 1000 pound horse in light to moderate work should not receive more than 10 pounds of feed per day, or 1% of its body weight. Horses at high intensity work (e.g., racehorses) may consume up to 15 pounds of feed per 1000 pounds of body weight (1.5% of their body weight) due to their increased energy demands. Regardless of the work load, horses should have a maximum feed intake equal to, or preferably less than, the amount of forage consumed on a pound-for-pound basis. This is important in maintaining a healthy digestive tract environment. (For information on selecting the most appropriate feed for your horse(s), please contact McCauley Bros.’ nutritionists.)

Feed (grain) provides a significant amount of digestible energy, primarily from starches and sugars. Enzymatic digestion of starches and sugars occurs in the small intestine. Any undigested starches and sugars entering the hindgut will be converted to lactic acid, which increases the acidity of the hindgut. This creates an unfavorable environment for fiber-digesting microbes and can lead to digestive disturbances, colic and/or laminitis.

Dietary changes should be made gradually. Making gradual changes in the diet allows the microbes and digestive enzymes time to adjust and helps to prevent digestive upset. For instance, switching to a new feed should be done over a week to 10 day period. A safe transition would be exchanging a pound of the “old” feed with the “new” feed each day.

**How to feed**

Because feed scoops come in all shapes and sizes, feed should be measured by weight and not by volume. Knowing the weight of a scoop of feed is important. The weight of feed scooped will differ depending on the size and shape of the scoop, type of feed or grain, and the person doing the feeding. For instance, a quart of USDA grade 1 corn weighs 1.75 pounds, which is 1.6 times that of a quart of USDA grade 1 oats.

Feeding instructions provided on the feed tag or bag should provide an appropriate feeding range to ensure nutrient requirements are met without being excessive. Unfortified grains, vitamins or minerals should not be added to a fully fortified feed unless the impact on the nutrient profile of the diet is known. Properly fortified feeds are formulated with all nutrients in the correct balance to meet the horse’s requirements. Adding unfortified grains, such as oats, or a supplement to a fortified feed may result in deficiencies or toxicities and upset the balance of nutrients.
Special cases
When the function of the digestive tract is compromised, the diet may need to be altered. Some of the conditions which would require a dietary change would include ulcers, enteritis, resection of either the small or large intestine, and colitis.

Gastric Ulcers
In the case of gastric ulcers, sugars and starches need to be reduced; therefore, a diet high in digestible fiber and fat would be recommended. Such a diet would decrease the acid production in the stomach and would still provide adequate calories, albeit from alternative sources (fat and fiber).

Enteritis / Resection of the small intestine
Anytime a portion of the small intestine is damaged or resected, absorption of most of the nutrients (including digestible energy [in the form of starches and sugars], proteins, and many of the vitamins and minerals) will be compromised. In such cases, feeding easily absorbable sources of nutrients and in the case of digestible energy, alternative sources such as fat and fiber, becomes even more critical. In extreme cases, partially pre-digested sources of proteins may be necessary. The diet can be fine tuned depending on which portion of the small intestine is affected.

Colitis / Resection of the cecum or large colon
When a portion of the cecum or large colon is damaged or resected, fiber digestion is compromised. While some fiber is still necessary, the diet should rely more heavily on starches, sugars and fat for energy sources. The starch and sugar sources must be mostly digested in the small intestine with minimal by-pass into the hindgut. For instance, oat starch is well digested in the small intestine, while wheat starch has significant by-pass to the hindgut. The fiber sources should be highly digestible, such as excellent quality pasture, hay harvested when the plants are young, beet pulp, or soybean hulls.

Summary
➢ Forage should be the basis for all horse diets.
➢ When grazing is limited or not possible, hay should be fed.
➢ Feed a maximum 1 to 1.5% of the horse’s body weight as feed.
➢ Each meal should not be more than 0.5% of the horse’s body weight.
➢ Feed by weight, not by volume.
➢ Follow feeding directions for minimum and maximum amounts to feed.
➢ Adjust the horse’s diet throughout the year for changing seasons, pasture conditions, and stage of reproduction or growth.
➢ A compromised digestive tract may require a specialized diet.

Big Shot’s Story
(and Chuck & Peggy Dixon’s too!)

Chuck and Peggy Dixon became acquainted with Big Shot in the fall of 2002. He was a 4 year old Thoroughbred that was retired from racing due to an injury. He was given as a “freebie” to a neighbor who thought he could sell him and make some money. Chuck and Peggy allowed Big Shot to be temporarily boarded at their farm and share a pasture with their Arabian. At that time, Peggy was looking for another Arabian, and the pasture was not large enough to support three horses. After 6 weeks, Big Shot was moved to another farm away from Chuck and Peggy’s care. They later found out he was put in a field with thirty other horses. Unfortunately, Big Shot’s new pasture mates would not allow him to eat, and Big Shot was traded for a box of tools and again, put in with a large herd of horses.

Chuck and Peggy lost touch with Big Shot for about 11 months, after which time they accidentally stumbled upon him. They could not believe it was the same horse. He was starved to “nothing but skin and bones.” In his weakened state, Big Shot got stuck in the mud while trying to drink from a pond. No one knows exactly how long Big Shot laid in the mud before being found.
Peggy paid $250 for him and “surprised” her husband with Big Shot as a gift for their anniversary. “It was really too much to pay for a horse in his condition, but I knew Chuck had become attached to him during the 6 weeks he’d spent with us. Besides, I wanted to bring Big Shot ‘home’.” Peggy immediately called their veterinarian, Dr. John Poe. Upon seeing Big Shot’s condition, Dr. Poe did not expect him to live more than a couple of days to weeks. Besides being emaciated, he had a severe internal parasite infestation. Dr. Poe also told her to contact McCauley Bros.

When we saw Big Shot, we, too, were not sure how Big Shot’s story would end. Because of his emaciated state, we had to proceed very carefully so as not to create another veterinary issue. The feed recommendations were as follows:

*Start with 1 pound of McCauley’s Alam and 1 ounce of McCauley’s Rice Bran Oil twice per day. Increase by 1 pound of Alam and 1 ounce of oil per meal until he is fed 10 pounds of Alam with 6 ounces of Rice Bran Oil per day.
*Feed 1 flake of grass hay every other hour around the clock. Increase the amount of hay every week until he is receiving free-choice hay. After about three weeks, start mixing a small amount of alfalfa hay with the grass hay.
*Hand graze for 15 minutes twice per day. Increase by 15 minute increments each week.
*Stagger the diet changes so as not to introduce more than 1 dietary change in a single day.

Chuck and Peggy followed our instructions to the letter and provided monthly photo updates. Three months into his recovery, we switched Big Shot to Original 12, as his body condition had significantly improved. He was fed Original 12 through the winter. In late February 2004, Amy Parker visited Big Shot to evaluate his body condition. Chuck and Peggy brought Big Shot through winter in excellent condition. In March, we decided to make one last diet change to Pastime and lowered the amount of feed to 6 pounds, with instructions to make adjustments as needed.

The Present
Chuck and Peggy continue to update us on Big Shot. Chuck enjoys riding Big Shot and says he is an excellent trail horse. They adjust the amount of Pastime as needed to maintain Big Shot in ideal body condition. Peggy said, “I got my Arabian mare, and today we have enough pasture fenced in to support all 3 of our horses. Big Shot and the Arabians continue to do very well on Pastime and grass hay. Big Shot is home to stay.”

We have updated our website!
Please visit us at
www.mccauleybros.com,
and let us know what you think!