

## The Future of Equine Nutrition

Judith A. Reynolds, Ph.D., P.A.S., Dipl. A.C.A.N.  
Dr. Judy Reynolds Equine Research and Consulting

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A considerable amount of equine nutrition research has been done since 1989, when the 5<sup>th</sup> edition of the U.S. National Research Council (NRC) Nutrient Requirements of Horses was published. The NRC was used worldwide as a guideline for feeding horses and contained the then-accepted philosophy that each class of horse (Growing Horses, Working Horses, etc.) should be fed from tables that started with forage-to-concentrate ratios (40-60, 50-50). Following that philosophy resulted in feeding large amounts of cereal grains (corn, oats and barley) to almost all classes of horses. Since then, over 20 Equine Grain-Associated Disorders (EGAD) have been identified including some forms of colic, laminitis, gastric ulcers, tying-up, and developmental orthopedic diseases. Dr. Reagor, equine veterinarian at the Texas A&M University veterinary diagnostic lab, spent his career determining the causes of sickness and death in horses. I heard him comment that horses would be better off if there was never another kernel of corn fed to them. The more I learn about horses, the more I agree with him!

The popular high-grain rations of the past century were used because grain was available, advertised, and the only way to increase the caloric content of rations. The problems with grains are their high starch content (corn 71%, barley 60%, oats 53%), the poor digestibility of their starches in the foregut (29% for corn; 21% for barley) and the large fluctuations in post-meal blood sugar (oat). The other contributing factor is an important misconception about forage requirements in horses, which is still pervasive today. In virtually all nutrition textbooks, you find the phrase, "Horses need at least 1% of bodyweight in daily forage." This is technically correct, but has been misinterpreted to mean that all horses should be fed 1% of body weight of forage. Then, we need to add concentrate feeds to make up the rest of the ration, which consists of about 2-3% of an adult horse's bodyweight daily. In fact, most adult horses can easily consume over 2.5% of their body weight in forage, and can and should get all of their protein, energy and fiber from their forage. When fed concentrate instead, they become dangerously overweight. Realistically, race horses and nursing foals are fed at the lower end of forage intake (1%), while broodmares and hard-working horses should be fed at the upper end (2-3%). Many horses are overweight and, when fed appropriate forage, do not need any concentrate for energy.

The most significant trend over the last three decades has been the use of fats in equine nutrition, which allows high-energy rations to contain more forage. Historically, added fat was not fed to horses due to a belief that it was 'unnatural' and/or that horses couldn't digest it. Since forages generally contain less than 3% fat and cereal grains only contain about 4-6% fat, typical horse rations contained less than 4% fat. Also, horses have no gall bladder to store bile, the fat emulsifier made by the liver. Since horses' digestive tracts are meant to process small amounts of fibrous feeds throughout the day and night, they secrete bile continuously into the small intestine rather than in bursts from a gall bladder in response to large meals as humans and other 'meal eaters' do. Interestingly, mare's milk contains between 14 and 18% fat on a dry matter basis, so all horses are capable of digesting fat from birth. New research shows they can digest up to 20% fat in the total ration, even as adults. The use of fat allows us to reduce the amount of grain to a reasonable 5-6 pounds per day, maximum. Adding fat to horse rations was virtually unknown in the 1970s. In 2014, virtually all broodmare and performance horse feeds contain added fat. I predict that, in the future, there will be more and more emphasis on fat sources and fatty acid content of each fat. Another important trend is that most horse people will continue to feed vegetable fats to horses, rather than animal fats, even though they are more expensive.

The former use of grains (1.3 Mcal Digestible Energy/lb) for energy is being replaced in modern rations by more good-quality forages (0.8-1.1 Mcal DE/lb), digestible fibers (soybean hulls and beet pulp, 1.3 Mcal DE/lb) and high-quality fats (4 Mcal DE/lb). After all, horses have a zero requirement for cereal grains, with the possible exception of race horses. Research is ongoing to answer that question. The modern, forage-based rations reduce the EGAD and are safer for horses and better for horse owners. They are becoming better-accepted every day due to research, education, and their successes. They are also horse-owner favorites, according to representatives of the major feed companies I have consulted on the topic. Research has also shown that horses are less bored and likely to develop stereotypies when eating more forage. These trends have resulted in a major revision of the NRC Nutrient Requirements of Horses, in the 6<sup>th</sup> edition, 2007. The old forage-to-concentrate ratio tables are gone. Rations now start with forage, as they should, for all classes of horses. An important 2014 reference book was also written with the same modern, forage-based philosophy (1).

Since forage is not a good source of balanced vitamins and minerals (including salt) for horses, they must be supplied in addition to forage in all horse rations. Thankfully, another important trend is toward more supplementation of vitamins and minerals. Recommendations for vitamin E have been increasing over the last 20 years, and the natural form has been shown to be more effective than the synthetic form. Stressed horses benefit from additional B vitamins and vitamin C. However, we are also recognizing that since horses are grazers, if we feed more forage and limit starch, the microbes in their hindguts are able to make more B vitamins. Research shows that young horses are not able to utilize the amino acids from the protein in forages very well. A formerly popular feeding program of oats and alfalfa hay for weanlings seems to have enough protein, but when fed these rations, the horses are actually amino acid deficient. Concentrates with high-quality protein from milk and soybean meal solve this issue. 'Senior' horses are the largest segment of the equine population. Due to major improvements in deworming and a better understanding of equine nutrition and medicine, horses are living much longer than they did 40 years ago. Now, they often work well into their twenties and live to be over 30. They benefit from feeds specially formulated for them. In fact, horse feeds are now more often labeled for classes of horses than for protein content (10%, 12%, 16%), as they were in the past. However, horses are all still individuals, so 'one feed does not fit all.' Feeding programs must be designed to allow for customization.

I enjoy working as a consultant because equine nutrition has changed dramatically and has become very complex. There has been an explosion of feeds and supplements available for horses making it difficult for horse owners to know what to feed. Vitamins and minerals must be balanced in order to work correctly. Feeding many feeds and supplements when not needed does not help and may hurt the horse and is expensive. If supplements are fed, they must be used as part of balanced total programs. General, multiple vitamin/mineral supplements are less expensive and more likely to be balanced than single-nutrient (biotin, vitamin E) or single purpose (hoof, coat) supplements in most situations. They may all have their places in the ration, but must make sense for content and cost. Because of the above, almost all horse owners will benefit from nutrition consultation and will save money on their total programs. In my online abstract for this conference, I outlined economic issues that have recently affected the equine industry. In my opinion, the change to a forage-based feeding philosophy is the most important trend in the last century. I see it continuing until high-grain rations, forage-to-concentrate ratios and the EGAD are distant memories, for the benefit of horses.

#### **Reference:**

1. Equine Applied and Clinical Nutrition: Health, Welfare and Performance by Goer, Harris and Coenen, 2014.