

MicroSteed Demystifies Ration Values

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Since its inception a decade ago, Kentucky Equine Research (KER) has been an innovator in evaluating feeding rations for horses. Combining the most current research with computer technology has allowed the nutritionists at KER to advise thousands of farm managers, trainers and backyard horsemen on proper equine nutrition. Through a carefully designed computer program, MicroSteed, equine nutritionists, feed manufacturers and veterinarians have been able to use the KER recommended values, which have become the industry standard, to design feeding programs for their clients' horses. Today, KER has made a horseman's version of MicroSteed available to the general public that will allow all horse owners the opportunity to devise the best nutritional program for their horses.

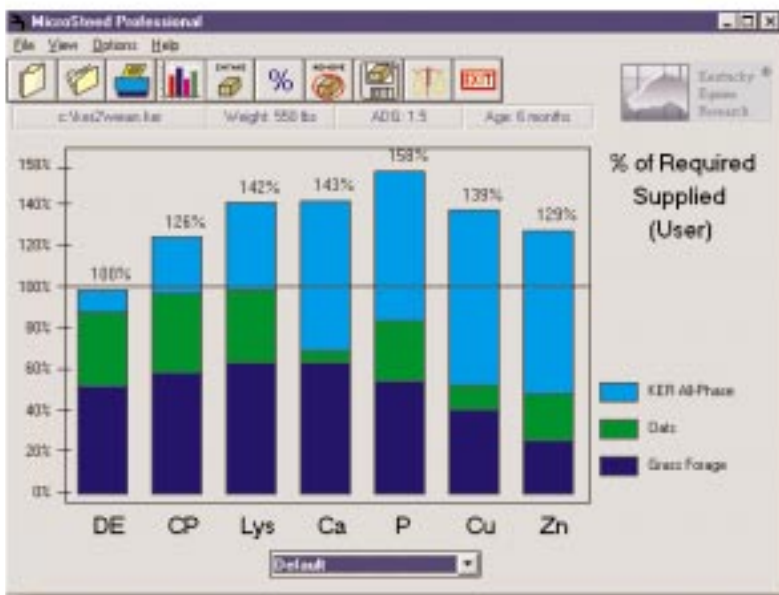
great deal of emphasis on the nutrient content of the feeds and supplements they produce or feed to their horses.

Often, extremely rigid values are used for certain nutrients. For instance, horse owners will insist that they feed a 14% protein concentrate to their yearlings; 13% protein would be considered completely inadequate and 15% protein would be excessive. These preconceived ideas about the correct nutrient concentration for different classes of horses are more a product of tradition and misinformation than science. In fact, the concentration of a specific nutrient in a grain mix or supplement is relevant only when it is viewed in the context of a total ration. Often the ingredients are given in milligrams per pound when a horse needs milligrams per day. Therefore, it is important to have a system to accurately evaluate the complete ration of the horse. MicroSteed was developed to simplify a process that is really quite complicated. Nutrition evaluations in the past have been based on a number of assumptions and estimates that may or may not be correct.

The protocol

Every nutrition evaluation should follow the same series of steps. Omitting any of these steps can lead to serious errors in an evaluation. The obvious place to start with any nutrition evaluation is by classifying the type of horse that is being fed. Different classes of horses have different nutrient requirements, and they will eat different amounts of forage and grain. Horses can be classified into broad categories as in Table 1.

Within each class of horse, it is also important to know the horse's current body weight, its age and mature body weight if it is growing, and its rate of body weight gain or loss. Obviously, for a growing horse weight change will constitute growth, but for adult horses weight changes will also have a large influence on nutrient requirements. For example, an adult horse that is too thin may need to gain weight to reach a desirable body condition. This extra weight gain will require additional dietary calories which will increase the horse's total daily energy requirement. MicroSteed allows the horseman to enter



MicroSteed uses information entered into the program to calculate the nutrients supplied by each of the components of the diet. Entering the class of horse, growth rate, body weight and level of activity allows the program to determine the nutrient requirements for that horse. The end result is a simple, easy to read and understand bar graph that clearly indicates whether the horse's diet matches its requirements.

Feed manufacturers and horse owners place a

Table 1. Classes of Horses

Growing horses	Broodmares	Adult Horses
suckling foals	barren	idle
weanlings	early pregnant	light work
yearlings	late pregnant	moderate work
long yearlings	early lactation	heavy work
two year olds	late lactation	geriatric

into the program the exact type of horse and that horse's level of activity.

Nutrient requirements

Ration evaluations are intended to compare a horse's daily nutrient intake to a set of requirements to see how well the feeding program meets the horse's nutrient needs. This seems to be a straightforward accounting exercise, but what nutrient requirements should be used? The National Research Council (NRC) publishes a set of requirements for horses as it does for other species of livestock, so many nutritionists choose to use these numbers to evaluate a ration. Unfortunately, the NRC figures fall short in several respects. For the most part, NRC values represent minimum requirements for most nutrients. These are the levels of intake that are required to prevent frank deficiency symptoms. There is no allowance included as a safety margin to take into account factors which may increase the requirement for a nutrient. Different sources of nutrients may have different bioavailabilities and there may be other substances within a ration that interfere with the digestibility or utilization of the nutrient. What the nutritionists at KER have taken into consideration for the ration evaluation they have developed is what the nutritional requirements are for optimum growth and/or use. As a result, while the NRC values are useful tools, the KER values have become more an industry standard because of the success of horses fed following these guidelines.

Digestible energy and protein are two NRC requirements that fairly accurately describe the needs of horses maintained under practical management conditions. These two requirements were for the most part developed from direct measurements of growth response and energy balance in a number of different experiments. Other requirements such as calcium and phosphorus were developed using more theoretical calculations involving estimates of endogenous losses and digestibility. Still others were based on values

developed for other species or from single experiments that were far from conclusive. For most of the vitamins and minerals, the nutritionists at KER use values ranging from 1.25 times NRC to values as high as 3.0 times NRC. These more liberal requirements are based on KER's own research and experience in the field. All of these nutrient requirements are far from absolute and will continue to evolve as more data become available.

One way to approach a ration evaluation is to determine a current ration for nutrient adequacy by tallying up what is currently being fed and comparing that to the horse's

requirements. This is actually more difficult than it may first appear. It can be hard for the general public to know exactly what their horses are eating without having hay and pasture analyzed, and the information provided on many feed tags does not contain enough data on the nutrient values to complete the equation. Any ration evaluation depends on the concept of energy balance to match feed intake to requirements. Calculating energy balance allows a primary overall evaluation of how well a ration meets the horse's needs.

Energy is the key

The first step for every evaluation is to calculate the energy requirement of the horse. KER nutritionists use units of digestible energy (DE) to describe dietary energy requirements. Once the energy requirement is established, a ration must be designed. A horse's ration must contain an adequate quantity of forage to maintain proper gut function. This amount, both in absolute terms and as a percentage of the total diet, will change depending on the age and physiological status of the horse. What makes MicroSteed so valuable to the average horseman is that it has these variables already calculated for easy use.

A mature horse at maintenance needs to consume at least 1% of its body weight and 50% of its total ration as forage. How much digestible energy does this amount of forage provide? The answer depends on the type of forage selected. MicroSteed allows the user to easily calculate this information and it also provides nutrient specifications of many common feedstuffs such as corn, oats and barley.

It should be emphasized that these energy values are only estimates since very few actual DE determinations have been made on individual feed ingredients, and those that have been made have used mathematical formulas to calculate the energy content of individual grains. Only the DE content of forages can be determined directly.

Table 2. DE Content (Mcal/Lb) of Common Equine Feedstuffs.

Hays		Pasture		Grains and supplements	
<i>As fed</i>	<i>DE (Mcal/lb)</i>	<i>Dry basis</i>	<i>DE (Mcal/lb)</i>	<i>As fed</i>	<i>DE (Mcal/lb)</i>
Timothy (early bloom)	0.83	Alfalfa	1.34	Barley	1.49
Timothy (midbloom)	0.80	Bahiagrass	0.92	Beet pulp	1.06
Timothy (late bloom)	0.78	Bermudagrass	1.08	Corn	1.54
Alfalfa (early bloom)	1.02	Bluegrass	0.95	Molasses	1.20
Alfalfa (midbloom)	0.94	Clover	1.14	Oats	1.30
Alfalfa (late bloom)	0.89	Fescue	1.01	Soybean meal	1.43
Bermuda grass	0.85	Orchard grass	1.04	Sweet feed	1.35-1.40
Bluegrass	0.72	Pangola grass	0.89	Vegetable oil	4.08

Calculating pasture intake

One of the most difficult challenges in designing a feed ration is to calculate the contribution the pasture makes to the ration as a whole. The amount of pasture eaten by any class of horse can be calculated by subtracting the DE intake from all other feedstuffs from the horse's daily energy requirement. Dividing this number by the pasture's calculated energy density yields daily dry matter intake. For example, a yearling that weighs 725 pounds with an average gain of 1.25 pounds per day should require a specific amount of DE per day. If that yearling is eating 8 pounds of sweet feed (10.8 Mcal DE) and 4 pounds of mature alfalfa hay (3.6 Mcal DE), then it must be consuming around 6 Mcal of DE from pasture. Most grass pastures contain about 1 Mcal DE per pound, so this yearling must consume about 6 pounds of pasture dry matter per day. These intakes can then be used to evaluate the adequacy of the ration for other nutrients in addition to energy. This method of calculating pasture energy intake works well provided that two assumptions are correct: the horse is really consuming the intakes of the other feedstuffs, and the correct energy requirement has been chosen.

Often, using the method described above for estimating pasture intake yields a negative number. If this occurs, then either the DE intake of the other feeds was too high or the calculated energy consumption was too low. Sometimes, horse owners report higher intakes for feeds than are actually eaten. This is particularly true for forage where hay is rarely weighed and large quantities are often wasted. Grain intake can also be overestimated since the coffee can that is used to measure grain doesn't hold nearly as much grain as coffee! Other times, the hay and grain intake may be correct, but the horse may be consuming more energy than calculated. This can happen if the horse is expending extra energy because of activity or cold environmental conditions, or it may be that a young horse is growing faster than assumed.

Evaluating nutrient adequacy

After nutrient requirements are established and intakes estimated, the various feedstuffs should be sampled and analyzed for other nutrients. The accuracy of the entire nutrition evaluation depends on the use of proper methodology for sampling feedstuffs.

The feeds should be thoroughly mixed and a representative sample taken. This is not difficult for pelleted feeds since each pellet is fairly uniform in composition. For textured feeds and home mixes, however, sampling is more critical. If an odd nutrient value is encountered, look to sampling error as a likely cause. Sampling forages presents a challenge, especially when sampling pasture. A hay core can be used to get a representative sample from baled hay for analysis. Pasture analysis is more difficult. The first question that must be addressed is whether the entire pasture should be systematically sampled or if only those areas heavily grazed should be sampled. Since horses tend to be "spot" grazers, it is probably best to sample the areas heavily grazed rather than the entire pasture.

MicroSteed has much of this information already in its programming and is on the fast track to becoming the industry standard of computerized software for the knowledgeable horseman. It will vastly decrease the time of calculation and will create stacked bar graphs such as those displayed in this article to clearly illustrate horses' needs from information already entered into the program. MicroSteed will automatically calculate nutrient requirements for each class of horse. There are help screens that contain useful information about horse weights and growth rates. A free 30-day trial of the professional version of MicroSteed is available and can be downloaded from the KER homepage at www.ker.com. For a copy of the free horseman's version using KER feeds which are available in your region, contact KER at 3910 Delaney Ferry Road, Versailles, Kentucky 40383, 606-873-1988 or by fax 606-873-1163. 