Feeding Race Prospects & Racehorses in Training

P. G. Gibbs, G. D. Potter and B. D. Scott
In recent years, significant research attention has been directed toward the equine athlete, particularly racehorses and young horses destined for the track. New information is becoming available and new concepts are being formed about the physiology and nutrition of racehorses.

One reason for this attention is that over the past 50 years, the physical performance of racehorses has improved very little. Although racing times over common distances have improved some, the magnitude of improvement has been relatively small compared to that of human athletes. This is in spite of efforts to breed horses with greater racing ability. Further, too many horses continue to succumb to crippling injuries brought on by acute fatigue and a compromised skeletal integrity.

Conversely, the performance of humans improves yearly, monthly and in some cases even daily during certain athletic competitions. This phenomenon is explained by the dramatic improvements in the diet and training regimens being developed continually for human athletes. Horses also can be expected to perform better if they are properly conditioned and fed a balanced diet containing the fuel (energy) and other nutrients needed to do the work. A horse that is “dead fit” and fed a good ration will run as fast as genetically possible if that horse has any “heart.” The term “heart” in a horse may in fact be closely related to that horse’s fitness and diet. If the horse has the available energy and the nutrients to use that energy, it can voluntarily run faster and perform at a higher level than horses with insufficient fuel and other nutrients to perform these tasks.

To ensure that racehorses can perform at optimum levels, trainers need to pay close attention to nutrition, providing the appropriate amounts and forms of energy, protein, vitamins and minerals for young prospects as well as for racehorses in training. If the nutritional requirements are met accurately and feeding management is conducted properly, racehorses’ performances will be improved over those horses fed imbalanced diets in irregular amounts at inappropriate times.

Race-bred prospects

To produce and maintain a successful racehorse, you must begin with proper feeding and early development of a young prospect. This process begins soon after a foal is delivered. Two vital goals are to promote early growth and sound skeletal formation. If these goals are to be achieved, weanlings cannot be fed the same rations as yearlings, and long yearlings in training must be given nutrient mixes that are different from those fed to yearlings not being exercised. A field study was conducted on the manage-
ment practices of 58 Texas farms raising almost 2,000 thoroughbred and quarter horse race-bred prospects. Most of the owners/managers of those farms identified nutrition, exercise and genetics as three major factors contributing to problems such as contracted tendons, epiphysitis or osteochondrosis. Contracted tendons were reported more often in foals; most epiphysitis problems were observed in weanlings; and osteochondrosis appeared to be most prevalent in yearlings.

Recommendations for weanlings

The study uncovered one common feeding practice that is detrimental to weanlings: Farms are failing to provide the high ratio of concentrate to hay needed to meet the weanlings’ requirements in a reasonable amount of daily feed. In fact, 90 percent of the farms are trying to grow weanlings by feeding more hay than concentrate.

Furthermore, 22 to 44 percent of these young horses are receiving a total daily diet that is either deficient in amino acids or unbalanced in its mineral concentration or mineral ratios. In short, weanlings and yearlings are being fed almost identical rations. The feeding programs for yearlings are much more in line with National Research Council (NRC) recommendations than those for weanlings (Table 1).

<table>
<thead>
<tr>
<th>Age/Class</th>
<th>% Concentrate</th>
<th>% Hay</th>
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<tbody>
<tr>
<td>Weanling</td>
<td>70</td>
<td>30</td>
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<tr>
<td>Yearling</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Long-yearling (in training)</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Two-year-old (in training)</td>
<td>55</td>
<td>45</td>
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</tbody>
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Source: National Research Council (1989) *Based on recent work of Nielsen et al. 13 Stephens et al. 22 and Nolan et al. 15

To develop properly, race-bred weanlings must be given a concentrate feed that provides at least 0.7 percent lysine, calcium and phosphorus to ensure that they have the proper nutrient-to-calorie ratio. The mineral-to-calorie ratio is more critical than the calcium-to-phosphorus ratio, which also merits some consideration.

A well-formulated balanced feed will most likely provide the minimum acceptable amounts of amino acids and minerals as well as trace minerals and vitamins. Such a feed almost always eliminates the need for any supplements because the nutrient mix is balanced.

Conversely, a diet of straight oats and either alfalfa or grass hay is unsuitable because it:

- Fails to provide the requirement for absorbable lysine.
- Provides less than desirable amounts or ratios of minerals.1 7
- Often jeopardizes skeletal development.

Furthermore, overfeeding hay and feeding unbalanced concentrates will combine to give foals a “pot-bellied” appearance. Oats can be used as the primary grain source if they are fortified with a good amino acid source as well as the mineral concentrations needed to provide the proper calcium-phosphorus ratio and to meet the needs for trace minerals. Although most commercial feeds contain some oats, other grains are also used routinely.

Recommendations for yearlings

If not being conditioned for sale, yearlings can achieve a moderate rate of growth on good-quality, improved pastures. The digestive tract of a yearling can process more roughage than that of a weanling. Good-quality grazing appears to support acceptable growth and development at this stage.7

However, yearlings being prepared for sale or being retained for placement into pre-race training have significantly different nutrient requirements when rapid growth and/or forced exercise becomes part of the management scheme. For these horses, you must provide a balanced concentrate.

Horses in race training

Researchers have recently found that the fuel supply available in the muscles of a horse and the horse’s ability to use that fuel may be altered by including different ingredients in the diet and by using appropriate feeding management and training regimens.

To achieve high performance, racehorses in training must have adequate energy, protein, vitamins and minerals, and overall feeding must be managed well.

Energy

Racehorses often require twice as much energy (measured in calories) as do nonworking horses. You must ensure that the racehorses’ diet provides enough energy to complete the assigned work (Table 2).

A significant challenge in feeding a racehorse is to achieve and maintain ideal body condition for training and racing while providing enough

<table>
<thead>
<tr>
<th>TABLE 2. Approximate daily nutrient requirements of race-bred prospects and racehorses in training (1,100 pounds mature weight).</th>
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</thead>
<tbody>
<tr>
<td>Digestible Energy (Mcals)</td>
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<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>RACE-BRED PROSPECTS</td>
</tr>
<tr>
<td>Weaning (moderate growth)</td>
</tr>
<tr>
<td>Weaning (rapid growth)</td>
</tr>
<tr>
<td>Yearling (moderate growth)</td>
</tr>
<tr>
<td>Yearling (rapid growth)</td>
</tr>
<tr>
<td>RACEHORSES IN TRAINING</td>
</tr>
<tr>
<td>Long yearling</td>
</tr>
<tr>
<td>Two-year-old</td>
</tr>
<tr>
<td>Mature-intense work</td>
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</table>

Source: National Research Council (1989) *Based on recent work of Nielsen et al. 13 Stephens et al. 22 and Nolan et al. 15

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Once training or forced exercise begins, the feeding program should be evaluated even more carefully.
To achieve maximum performance in racehorses, feed them a fat-supplemented, high-carbohydrate diet—not a high-fat, high-fiber diet. When feeding a fat-supplemented diet, consider several factors:

- Horses need time to become adapted to fat in the diet, sometimes as much as 4 weeks.
- Because a fat-supplemented diet provides more energy, you should decrease the total daily feed intake if the work level and body condition are to remain the same.
- If you plan to top-dress fat or vegetable oil on the feed, begin with a small amount and increase it gradually, keeping an eye on eating behavior and general well-being. You must reassess the total dietary nutrient balance (see section on protein), especially for race-bred yearlings and 2-year-olds receiving exercise.

Remember: The energy requirements for work take precedence over the storage of energy as fat in the body. Animals that are not fed enough energy to maintain body weight will use the energy stored in body tissues—including muscle glycogen stores—to meet the energy requirements for work. A thin horse may not be physiologically able to exercise strenuously because it does not have enough available energy for fuel. Horses that are exercising, adding fat to the diet results in higher muscle glycogen concentrations than in horses fed conventional diets.6,12

Feeding some fat to racehorses helps protect them from fatigue even when their body condition is reduced. When selecting a commercial feed, check the amounts of fat and fiber listed on the feed tags. The information will help estimate the energy density of the grain mix. There is an inverse relationship between fiber and the expected digestible energy content (Table 3); knowing this can help you choose concentrates that are a better buy per unit of energy. Lower fiber feeds usually contain more energy than higher fiber feeds. If you feed good-quality hay, there is no need to spend more money on additional fiber in a bagged horse feed. Some commercial feed manufacturers produce fat-supplemented diets. If a feed tag lists a fat concentration of 8 percent, in most cases about 4 to 5 percent additional fat has been included. At any given level of crude fiber, a grain mix with 5 percent supplemental fat will have up to 8 percent more energy than a similar feed with no supplemental fat. This supplemental fat affects the relationship between crude fiber and expected digestible energy content by about 0.10 megacalories or 100 kilocalories per pound of feed. Of identical amounts of two concentrates—one with supplemental fat and one without—the you with the supplemental fat will contain significantly more energy, meaning that you can feed less on a daily basis.

To be able to meet the nutritional needs of racehorses, you need not only to know the amount of energy in a feed, but also to recognize the caloric needs for training and racing. Horses that are calorie-deficient cannot run at the same intensity as those with enough energy in the diet and stored in the muscles.

When a horse’s body weight is reduced significantly, it often depletes its body energy reserves so that it has too few calories to perform at a high level for an entire race, regardless of the length of that race. The goal should be to achieve sufficient body condition in the horses to maintain muscle glycogen reserves, but not so much as to cause thermal stress.20

Although racehorses must have adequate body condition to do their job, excess body fat causes thermal (heat) stress on the horse. Regardless of body condition, feeding a fat-supplemented diet reduces the thermal stress on horses.14,20 Thus, it is important that you maintain the horses in lean...
Horses obtain significant amounts of protein in most cases, it takes from 9 months to 2 years. Also, horses fed higher protein diets retain some nitrogen for muscle synthesis or it is excreted in the urine. When fat is added at 5 to 10 percent of the grain mix, the concentrate should contain about 14 percent crude protein. This is especially important for 2-year-old racehorses that are still growing.

It is useless to feed high-protein feeds to mature racehorses. Giving a horse more protein than it requires creates metabolic stress on the horse and is an unnecessary expense for the racing facility.

Vitamins
Vitamin needs are not as well defined in horses as in other species. Nevertheless, vitamin supplementation of great interest to many racehorse owners, to the extent that vitamins are often grossly overfed in the horse industry. Excess vitamin supplementation does not improve performance and, in fact, may be toxic and dangerous. If a horse’s diet is well balanced and contains enough vitamins to meet its needs, over-supplementation of vitamins will not enhance its physiological performance in training or in a race.

Vitamin A: Horses obtain significant amounts of the fat-soluble vitamins A, D, E and K from top quality fresh hays. In an athlete, vitamin A helps maintain normal eating behavior and respiratory health. However, excessive vitamin A may eventually cause the horse to become fat.

Reputable feed manufacturers balance concentrate rations by supplementing vitamin A, often in a vitamin premix. Race stables mixing their own concentrate rations may use 2,000 international units (IU) per pound of feed (see tables 4, 5 and 6 as examples).

Vitamin D: Dietary requirements for vitamin D in horses have not been identified. Horses that receive normal exposure to sunlight and that have fed sun-cured hay will have enough vitamin D for calcium homeostasis and mineral absorption.

This vitamin is usually supplemented in commercial horse feeds at no more than 10 percent of the concentration of vitamin A. Excessive vitamin D can cause calcification of soft tissues.

Vitamin E: Vitamin E has received increased attention for its possible role in reducing tissue damage and as an antioxidant. Most feed manufacturers already provide supplemental vitamin E (Tables 4, 5 and 6). If it is not added to the commercial diet of racehorses, vitamin E will need to be supplemented to provide at least 45 IU per pound of feed.

Vitamin K: Because Vitamin K is synthesized and absorbed in a horse’s large intestine, there is no dietary requirement for it. Adequate amounts of this vitamin are produced by anaerobic bacteria of the hindgut. Although vitamin K has been added to the diets of performance horses to treat or prevent exercise-induced pulmonary hemorrhage (bleeders), its influence on “bleeding” has yet to be documented by equine research.

B-vitamins: Of all nutrients used in the horse industry, B-vitamins are the least understood yet most widely used, if not abused. Like vitamin K, the B-vitamins are synthesized in and absorbed from the large intestine. Stables often incorporate B-vitamins into feeding programs to promote anaerobic work with delayed onset of fatigue.

Racetracks can utilize calories from a combination of carbohydrate and fat sources to better perform anaerobic work with delayed onset of fatigue.

In many reported cases of “track sour” horses, adding brewer’s yeast to the diet appears to stimulate the appetite and return the horse to a spirited, energetic attitude with improved work performance. One of the largest components of brewer’s yeast is thiamin, among other B-vitamins.

Heavy worked horses receiving traditional diets benefit from having thiamin added to the diet. If the commercial feed has not been supplemented with thiamin, stables should include a good supplement containing the B-vitamins, particularly thiamin, in the diet of racing horses. However, there is no benefit in over-supplementing B-vitamins.

Another B-vitamin, biotin, is often added to enhance hoof growth or strength. Limited clinical reports have claimed some improvement in one-third of horses receiving biotin supplements.

More recent research has demonstrated that d-biotin supplementation reduces the incidence and severity of hoof wall defects, increases hoof wall integrity and reduces the incidence of white line disease.

Note: In most cases, it takes from 9 months to more than a year for the benefits of biotin supplementation to become observable. Although more research is needed before exact recommendations can be made about supplementing the diets of horses with poor hooves, providing horses about...
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tion.

Important: See Table 7 on expected feed consumption, and always introduce new grain feeds gradually. Because this ration contains about 6 percent more energy than straight oats, smaller amounts of this ration will usually maintain similar body condition. + Percentages and weights of vitamins A and E will vary, depending on the vitamin premix used.

Thus, during the early stages of training, a 2-year-old horse requires about 130 mg/kg/day of calcium, 70 mg/kg/day of phosphorus and 40 mg/kg/day of magnesium. Juvenile horses in training require total dietary concentrations of calcium of 0.60 percent; phosphorus, about 0.35 percent; and magnesium, 0.2 percent. See tables 4, 5 and 6 for examples of rations with suitable miner-

al levels.

Electrolytes: During workouts and racing, horses lose significant amounts of electrolytes — sodium, chloride and potassium — in the sweat. Usually it is not difficult to meet the increased requirements for these minerals in horses receiving intense exercise. The majority of these increased requirements can be satisfied by good-quality forage, minerals provided in the concen-

trate mix and supplemental salts. However, com-

mercially prepared horse feeds do not normally contain enough electrolytes for horses that sweat a lot, particularly in the summer. To compensate for the loss of these electrolytes in the sweat, diets must be supplemented with sodium, chlo-

tide and sometimes potassium. Even if a com-

mercial feed contains salt, horses that work hard and sweat profusely will still need about 3 ounces (90 grams) of supplemental salt per day in addition to the salt already in the feed.

Few studies have been conducted on the use of orally drenched electrolytes. The value of this practice is questionable. Also, there is a chance that adding electrolytes to the drinking water could cause a horse to drink less water, which could result in dehydration. The most effective way to meet the electrolyte needs of horses is to select roughage and concentrates that have a good balance of all the minerals required and to feed them in adequate amounts to meet the animals' energy requirements. Horses that sweat excessive-

ly will need additional salt, a total of about 1 per-

cent of the horse’s daily ration. Also, give specific attention to meeting the potassium requirement of exercising horses, which may be twice the maint-}

enance requirement, particularly if forages are not of top quality. The potassium requirement for heavily exercised horses is about 1.2 percent of the total diet.19

Feeding management

To achieve the highest level of performance with a minimum of digestive disturbances, it is important that feeding is managed well and that rations are balanced. Horses must receive the proper amounts and ratios of nutrients and be fed at regular intervals.

It makes no difference whether a race stable chooses to balance rations by buying formulated, finished feed or by buying the ingredients and mixing them. The critical point is to provide enough nutrients to racehorses to meet their daily requirements and to maintain the ideal body condition for racing. Either approach will work if careful attention is given in the formulation process. Excessive amounts of nutrients must not be fed because it results in nutritional imbalance and metabolic stress on the horse.

15 milligrams of biotin a day or about 1.5 parts per million in the diet appears to help.

Minerals

As high-performance athletes, racehorses require a balanced supply of minerals for mainte-

nance of skeletal tissue, muscle contraction and energy transfer. It is much more critical for stables to ensure that the horses have enough minerals such as calcium and phosphorus, relative to the amount of energy they take in, than to be con-

cerned with exact calcium:phosphorus ratios.

However, the total diet of horses being trained or raced should always contain at least as much calcium as phosphorus. Diets with inverted ratios (more phosphorus than calcium) can contribute to weakened bones and subsequent lameness in a stressed horse. Because cereal grains contain more phosphorus than calcium, inverted or improper ratios often occur in the horse industry.

Cafeteria-style and free-choice mineral feeding programs do not meet a horse’s requirements for minerals.14 The only reliable way to achieve min-

eral balance is through accurate ration formula-

tion.

Recently, Texas A&M researchers studied the mineral requirements of young horses in race training.11, 13, 22 They found that calcium, phosphorus and magnesium requirements are affected by the combination of growth and exercise. Young horses in race training are building bone as a part of growth, and they are modeling and remodeling bone in response to exercise. During the initial stages of training, the calcium and phosphorus needs of juvenile horses in train-

ing appear to be increased by 30 to 35 percent, and magnesium requirements increased by 80 to 100 percent, over current NRC (1989) recommendations. These increases in mineral requirements in early training are caused by the demands of bone modeling and remodeling.23

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Similar feed with the same nutrient composition and physical characteristics, especially crude fiber.

If none of those is available, buy good clean oats as a last resort.

For horses that have been in strenuous training during the week with Sundays off, reduce the concentrate feed accordingly on the off day. When combined with some free exercise, this reduction can help prevent metabolic disorders caused by feeding high-concentrate feeds in the absence of exercise.

Reduce the concentrates to about half the normal amount and increase the hay allowances. This practice will help prevent feeding-related muscular problems, azoturia (Monday morning disease) and the feeding-related “tying-up” syndrome.

Riders should take adequate time to warm up the horses before strenuous work and cool them down after strenuous work.

Summary

Nutrition is one of the most important aspects of overall development and management of horses. Feeding horses of economic significance is an everyday responsibility.

On more than 55 percent of Texas farms, the single biggest cost of keeping race-bred prospects and racehorses is nutrition. Although feeding racehorses successfully is a challenge, it can be done. The primary focus should be on meeting the energy and other nutrient needs in an amount of feed the horses can eat comfortably. If a horse’s nutritional requirements are met, but not exceeded, its performance will be improved over those horses that are fed imbalanced diets in irregular amounts.

New research information currently available offers new approaches to ration formulation, feeding management and training regimens for racehorses. Adjustments in these areas offer the best opportunity to improve athletic performance, delay fatigue and reduce injuries to the high performance horse.

In the future, stables that use research information and follow sound management practices will consistently achieve the highest level of performance in racehorses. Remember: Indiscriminate feeding of supplements will not result in top athletic performance. Rather, the focus should be on feeding racehorses correctly. It is complicated, but it can be done.

Tables 4, 5 and 6 show examples of rations that contain differing sources of energy and are balanced for protein, minerals and vitamins. Daily feed intake typically ranges from 2 to 3 percent of a horse’s body weight. In some cases, extremely hard-working horses may require feed at 3 percent of horse body weight; such high levels of daily feed must always be provided in two or more feedings per day.

In general, concentrate intake should not exceed 0.75 percent of body weight per feeding, and time intervals between feedings must be the same. If horses can be maintained with concentrate intakes of 1.5 percent of body weight daily or less, they can be fed twice daily at 12-hour intervals. If they require more feed, they should be fed three times daily, at 8-hour intervals. It is sometimes difficult to maintain appetite and normal feeding regularity in horses that are in race training or at the track. For these horses, it helps to follow these recommendations:

- Use only the highest quality feeds with very high energy density, and try to feed the horses three times a day at regularly spaced intervals around the clock, taking workout sessions into account.
- Do not feed concentrates or hay to racehorses within 3 hours before a workout or race. Although you can offer hay after the workout or race, do not feed concentrates for at least 2 hours after exercise. Offer water free choice after exercise, but make sure that the horses drink slowly, initially, after a workout.
- If the normal feeding time is delayed, reduce the concentrate portion of the next ration at the late feeding, then resume the normal amounts of feed at the next feeding. If feeding is delayed for several hours after a very strenuous workout or because of transport, feed the horse only hay at the next feeding and then offer the normal concentrate allotments at the next regular scheduled feeding. Do not feed any extra concentrate to compensate for feed missed because of travel or other interruption in normal management.
- If a racehorse stable runs out of feed, buy feed in the following priority order:
  - The same feed if possible.
  - Similar feed with the same nutrient composition and physical characteristics, especially crude fiber.
References


