

FEEDING ENDURANCE HORSES

by Dr. John Kohnke BVSc RDA

Horses used in endurance sport competition undergo extended training programs in preparation for competition. Endurance horses are highly trained and time spent training for competition requires the highest daily energy demand of any equine athlete. They must be fed to be responsive and energetic without being hard to control or 'above' themselves. Many horses are given only limited access to grazing, often to reduce the risk of injury and because of the need to control their diets. Endurance competition can also drain a horse's body reserves over a full season of competition, as the stress of travelling and regular competition can often have an adverse effect on body condition, recovery and ultimate performance.

A well balanced diet, formulated to meet the specific needs of each individual horse is essential for health, maximum endurance, fitness, maintenance of condition, and optimum response to training.

Regular teeth care is important to remove sharp edges on the large grinding cheek teeth once every 6 months during training, and when a horse is first brought into training, as well as routine worming to control internal parasites is essential.

ENDURANCE HORSES – Overall Requirements

Many advances in the scientific and practical feeding of endurance horses have been made over the last two decades. Rations now include more fat to reduce the bulk of the ration a horse has to consume to meet the energy needs for long distance exercise. Most upper level competition horses are stabled and fed grain based feeds, with less reliance on pasture as a nutritional base for their diet. Horses are trained for 2-3 years or longer to prepare for long distance competition, so that a ration formulated to meet exercise demands and ensure long term soundness is paramount to continued success. A well cared for and trained endurance horse is able to compete over thousands of kilometres in organised rides over a period of years.

The majority of endurance horses are small framed, hardy horses often based on part or pure Arabian bloodlines. Many of these horses naturally have a reduced capacity for bulky feeds, with limits on appetite imposed by the stress of extended exercise in preparation for competition. In many cases, the diet has to be manipulated to ensure each horse can consume an adequate volume to meet its requirements.

Specific Nutritional Needs of the Endurance Horse

Endurance horses have the following special nutritional needs

- ★ Limited intake of bulk to maintain low gut weight, requiring an energy dense ration based on high energy grains and fat with adequate high quality fibre for digestion.
- ★ Intake of high quality protein to maintain muscle mass and repair, whilst avoiding hindgut heat production from excess protein. Avoid protein overload - less ammonia smell in the stable.
- ★ Adequate fat as an energy boost, as well as Omega 3:Omega 6 balance to maintain muscle function and skin condition
- ★ High quality fibre for efficient fermentation and water holding capacity in the hindgut.
- ★ Provision of adequate, but not excessive, calcium during training to maintain bone strength, with balanced phosphorus and range of trace-minerals for bone and joint repair, and metabolic function.
- ★ A range of vitamins, including Vitamin A for tendon strength, Vitamin D for bone strength, Vitamin E and selenium for muscle strength and stamina and B-group Vitamins to maintain the appetite, metabolic function and offset stress of long distance exercise.
- ★ Adequate intake of electrolytes, especially sodium, potassium and magnesium to maintain muscle/nerve function and fluid balance. Access at all times to a supply of fresh, clean water to replace sweat and other losses. Avoid dehydration and risk of heat stress.
- ★ Opportunity for access to green pasture to maintain appetite and willingness and drain airways with head down grazing.

SPECIFIC NUTRITIONAL NEEDS FOR ENDURANCE HORSES

Endurance Horse - Body weight 400-450kg Condition Score 2-2½

NUTRIENT	REQUIREMENT/SOURCES/GUIDELINES
ENERGY	Daily Requirement in training 130-150MJ DE, 100km ride 210 MJ DE, heavy rider 250MJ DE. 40-50% grain to 40-45% roughage. Feed bulk limited by hard work and small frame size - usually consume 10-11kg daily. Traditionally oats as 30-40% base, with corn, barley and oil as major energy sources, more oil and corn for longer distance rides or in smaller framed horses.
PROTEIN	Require 10-12% crude protein, up to 12-14% in early training, 0.32-0.35% lysine. Above 1 cup daily of oil or on minimal lucerne diets, add extra 3-5% high quality protein such as soyabean or canola meal. An extra 2% protein for 2-3 meals after competition to help muscle and bone repair.
ROUGHAGE	Upper level competition 45-50% grain : 50-55% roughage, lower level 40% grain, 60% roughage. Minimum roughage 1% body weight, but for endurance may limit to 0.5-0.75% to reduce gut weight but still retain hindgut water reserves. Dampen hay to reduce dust and respiratory allergies. Minerals: Mature horse, heavy sweat loss of calcium requires replacement 2.5Ca:1 P. Iron for aerobic muscle enzymes, selenium for muscle strength, chromium for muscle bulk and glycogen sparing effect. Electrolytes: Speeds below 450m/m but extended duration, sweat loss 40-60L during ride. Salt 40-60g, with heavy sweat electrolyte mix double the dose rate and rehydration fluid after exercise. Vitamins: Increased Vitamin E for stamina, muscle strength and as an anti oxidant in an oil supplemented diet. Vitamin B-Group for appetite.
WATER	Daily consumption: - Cool weather 25-30 litres Extended work and hot weather 30-40 litres Heavy sweat loss 50 – 80 litres daily.

COMMON FEED RELATED PROBLEMS

The majority of problems in endurance horses, other than lameness, are metabolic conditions, such as tying-up, loss of appetite due to stress and long term training, dehydration during heavy training with sweat and fluid losses, and poor recovery after hard competition.

“Tying-Up” (Set Fast)

High energy rations in excess of exercise need, particularly when they are still fed on light work or rest days, or if training is interrupted by travelling prior to competition, increase the risk of ‘tying-up’ when normal exercise resumes. Fillies and mares tend to be more prone to tying-up, especially if they have a nervous temperament and are fed a ration based on oats as a major energy source. An endurance horse may tie-up when the blood becomes depleted in calcium, potassium, magnesium and chloride by heavy sweat loss or when dehydrated and exhausted during a long or hard ride.

The overall risk of tying up in these horses can be significantly reduced by cutting the amount of oats to one third or less, and substituting with either rolled barley, extruded feed or rice pellets as the primary energy source. On rest or light workdays, reduce the amount of grain to one third on the evening feed prior to the rest day and make up the bulk with good quality roughage as hay. Reintroduce the grain over 2 days once full training is recommenced. For more information refer to Facsheet No 2.

Depressed Appetite

The high physical demands of endurance training can lead to fatigue and disinterest in food as the appetite is depressed. Many horses will begin to leave feed when subjected to hard or intense exercise or following competition especially after traveling over long distances to a ride. As a horse gains aerobic fitness during training, it will require less energy for an equivalent amount of exercise, and therefore may not voluntarily consume the same amount of feed that it needs in early training.

Small framed horses, such as Arabians, may not be able to physically consume a large bulk of feed. Therefore substitution of oats as a major energy source with more energy dense grains such as corn or steam-rolled barley and oil can help to significantly reduce the bulk of the ration, whilst retaining energy intake and balance of roughage for efficient digestion and water retention in the hindgut.

There are a number of other underlying causes of poor appetite, picky eating and loss of appetite. Low grade irritation due to gastric acid “heartburn” when agitated by relocation and stress of ride preparation, or travelled over long distances on an empty stomach. Ulceration of the stomach and small intestine lining is a common cause of loss of appetite in horses in heavy training on high grain diets, or horses on minimal roughage diets with little or no access to pasture.

Recent research indicated that dosing with highly concentrated electrolyte mixes, liquids or pastes prior to and during a ride can increase the risk of gastric irritation and ulceration.

Dehydration

Many competitive horses are prone to dehydration and ‘tucking up’ in the belly when travelling to and from competition, particularly those with a ‘nervy’ disposition that sweat freely, or sweat heavily when training during hot or humid weather. Loss of fluid and body salts through sweating can result in reduced stamina, poor recovery after a competitive ride and drying out of the coat.

A routine daily supplement of (60-80g) salt and mixed electrolytes such as Cell-Salts (1 scoopful with 1 scoopful of salt) will help increase fluid intake and replace body salts lost during exercise and travelling in sweating horses. Additional supplementation with an oral rehydration fluid will also be of benefit to a dehydrated horse, but care must be taken to avoid concentrated salt mixes or pastes without adequate water during a ride or at a rest point.

Maintaining Muscle Bulk

Training increases the strength and ‘fitness’ of muscles. In horses that are given long slow distance exercise, the bulk and ‘roundness’ of the rump and croup muscles decreases as fat and retained fluids within the muscle structures are reduced. This often corresponds to a loss of condition as a horse improves in fitness and reaches a suitable competitive condition score with less subcutaneous fat.

The trace mineral chromium has been observed in a number of human and animal studies to increase the muscle to fat ratio and help maintain muscle bulk and utilisation of carbohydrates as an energy source.

A daily supplement of 5mg of chromium in conjunction with other minerals and vitamins combined with a diet containing 12-14% protein is recommended to help maintain muscle mass in hard working horses, as in Marathon Endurance. Other supplements, such as Muscle XL, provide high quality protein, Vitamin E and organic zinc to help maintain adequate muscle mass and strength in hard working horses.

‘Cow-pat Droppings’ and Grain in the Manure

Many horses in upper level competition that are stabled and have restricted or no access to grazing, and minimal roughage intake on high grain diets, develop ‘cow pat’ droppings and pass whole grain in their manure. Some of these horses also suffer from sore feet, crumbly white lines and broken-away hoof edges.

The overload of excess grain, particularly where large amounts are given to meet energy demand, can result in hindgut acidosis with increased bowel motility and in some cases, onset of low grade laminitis (founder), and a scratchy, shortened stride and 'sore feet'. Reducing the amount of grain to 1½-2kg per feed and providing adequate roughage will help to reduce hindgut acid build-up.

Special Considerations relating to Feeding Endurance Horses

Minerals

Adequate intake of a wide range of minerals is required by the hard working Endurance horse.

Recent studies have indicated that calcium turnover in bone is increased dramatically when a horse is exercised for more than 16km per day. The rate of calcium deposition in bone was increased by up to 20% when long distance exercise was given, triggering reduced calcium excretion in the urine and increased body retention of calcium.

Excessive calcium intake during training, particularly from high amounts of alfalfa hay, can cause suppression of parathyroid gland function, which normally controls mobilisation of calcium stores from the bones to maintain blood calcium levels. During competition in excess of four hours duration, sweat loss lowers blood calcium, which is not replenished by parathyroid hormone action. Low blood calcium causes a high risk of 'tying up' and the "thumps" during competition.

Recent recommendations suggest that minimal lucerne hay not exceeding 3kg daily, should be provided during training, and meadow hay and pasture should be used as the main roughage source. In the 2-3 days prior to competition, the amount of lucerne hay can be increased to provide a reserve of calcium and water for use during the ride. This feeding method will maintain parathyroid action, which will be activated once blood calcium decreases during long distance competition. The amount of supplementary calcium and phosphorus added to the diet should only be sufficient to balance the ration to meet daily requirements, usually 25-30g as a supplement.

Supplementation with additional but not excessive calcium to maintain bone strength and replace sweat losses, selenium and Vitamin E for muscle function, aerobic metabolism and efficient utilisation of fat added diets, and Vitamin A to maintain tendon strength are widely used to ensure an animal can perform and remain fit and sound over extended training periods and longer competitive seasons. Fluid and electrolyte replacement is essential to combat the large sweat losses, and maintain vitality and performance, but avoid large doses of electrolyte solutions or pastes as "top-ups" during a ride without adequate water intake.

Vitamins

Studies have indicated that when large amounts of energy are metabolised, particularly where increased levels of fat are provided, extra Vitamin E and B-Group vitamins are required. It has been reported that up to 5000IU of Vitamin E is supplemented daily to top Endurance horses. Conservative doses of 1000 – 2000IU, such as in Cell-E Premium or Marathon Endurance are considered to be of practical benefit to maximise stamina and muscle function in Endurance horses during training.

Preparation for Endurance Competition

Endurance horses utilise their muscle energy stores very efficiently through aerobic (oxygen) metabolic pathways. The extended duration of exercise results in depletion of over 50% of their muscle glycogen energy stores during a standard 80-100km ride. Although energy is not diverted for growth, as all competitive endurance horses are mature, adequate energy must be provided for exercise, tissue repair and to maintain body condition during extended training.

In heavy training, feeding extra fat in the diet of endurance horses helps conserve muscle glycogen and reduce the rate of glycogen depletion, thus maintaining glycogen reserves for faster finishes at the end of the ride.

Many successful endurance horses are maintained on relatively small amounts of 3-4kg of grain each day, particularly those that have access to pasture, as they are more settled and tend to do better. Endurance horses also seem to be more sensitive to over-supply of energy in grains, particularly the Arabian breeds, with increased risk of tying up and unsettled behaviour.

The use of 4-5% by weight of vegetable oil (usually 2-3 cups daily) added to the ration to provide a highly digestible, dense form of energy to replace some of the grain is particularly suited to long distance aerobic exercise in endurance horses. It also helps to reduce the volume of the concentrate feed that needs to be consumed, eliminates dust in the ration and helps to conserve muscle glycogen.

Theoretically, it would be an advantage in endurance competition to minimise gut fill and hence body weight and 'load' carried in the lead up to a long distance ride. A lighter horse will expend less energy over a long distance and be less likely to fatigue early during competitive rides. However, concentrating the diet by reducing hay intake can increase the risk of metabolic problems such as tying up and colic, as well as dehydration because of reduced hindgut water reserve normally held in the fibrous roughage. There are a number of modifications to a ration that can be made, taking care not to cause refusal by radical changes in the proportion or type of feeds.

1. For the last 3-4 days before a ride, provide an additional 500-750g grain mix, with protein meal and oil concentrate mixed in a 50:50 blend of cereal and alfalfa chaff to help retain hindgut water reserve in the fibrous structure. Good quality lucerne hay for extra protein, calcium and natural salts can also be fed to appetite as overnight roughage.
2. Supplement with an electrolyte mix made up of 2 tablespoons of salt (providing sodium and chloride), 2-3 tablespoons (40-60g) of an electrolyte mix (e.g. Cell-Salts) on the two evenings prior to a ride to encourage fluid uptake and replace salts lost during taper-off training and travelling. **Ensure adequate water is available at all times and feed dampened feeds, including hay, to increase fluid intake.**

If a horse is dehydrated or 'pinched-up' in the skin or 'tucked up' in the belly, feed the hay should be soaked in water. A wet bran mash at the rate of 1 litre of bran per 100kg body weight can be offered at 72 hours prior to the ride if the horse's droppings are pebbly and dried out.

3. On the two evenings before the ride, increase the Vitamin E from the standard 1000 IU daily to 2000 IU daily. Some riders increase the amount of Vitamin E to 5000iu daily in the last 7 days before a ride, but the horse must be routinely supplemented with at least 1000iu daily for 2-3 weeks before a pre-ride high dose is given. Many riders give a supplement of 10-20g Vitamin C, and a range of oral B-group vitamins about 15-24 hours before the ride to aid the appetite during the ride.

If the horse becomes dehydrated in the 24-36 hours before the ride, administer a rehydration fluid always providing water to drink as well. Avoid administering saline drenches unless under veterinary supervision as strong saline (hypertonic solutions) can increase the risk of gastric irritation and the degree of dehydration and bowel motility leading to low grade diarrhoea and further fluid loss in some cases.

4. At about 5-6 hours before a long ride (no closer), offer a sweetened soaked mixture of 2kg crushed corn (or preferably cooked or extruded corn, barley or rice) or steam rolled barley (including 1 cupful of oil if the horse is currently being given oil for energy), 500g chaff or chopped hay and half a biscuit (about 1kg) of lucerne hay.
5. Up to the time of the ride, provide 1-2 kg dampened good quality mixed hay in a haynet for the horse to consume at its leisure. Always provide water to drink until the start of the ride.

Studies have suggested that offering 500g of sweetened grain mix 10 minutes before starting a ride, and doing the same just before leaving each check point, may slow the onset of fatigue.

During a Ride

A thirsty horse should be 'topped up' with fluid by allowing it to drink at creeks, dams or other fresh, clean water sources during the ride. This will not cause gut discomfort and colic if the horse continues exercising immediately following the drink.

Studies indicate that encouraging a horse to drink at rivers, creeks or other cool, clean water sources will significantly improve its chances of successfully completing a ride.

Many riders carry 1 or 2 syringes of a rehydration fluid in their saddle bags. They administer a dose over the tongue to assist in electrolyte and fluid replacement prior to allowing a horse to drink on the ride. Some riders mix 1 scoopful of electrolyte mix in honey and glycerine to form a paste and carry it for oral dosing in the same way. However, very concentrated pastes must be avoided if water intake is limited. The horse must be allowed to drink at least 4-6 litres of water after electrolytes are given in this way.

At Each Vet Check

The primary need of an endurance horse resting at a check point is fluid and electrolytes initially, rather than trying to tempt it to eat a feed.

Ensure that the horse is cooled-out as quickly as possible after unsaddling, particularly if it is puffing and panting in humid weather. This will help to lower the body temperature and ensure a faster heart rate recovery.

Administer a rehydration fluid over the tongue, and provide 2-4 litres of cool water (chill taken off) initially, and then after 10 minutes, administer another dose of rehydration fluid and offer a full bucket of water to drink, along with dampened feed,

Studies have shown that it is unwise to feed a large amount of carbohydrate based energy feed, such as a high grain mix, at a vet check rest period. The digestion and uptake of large amounts of carbohydrates will depress the metabolism of body and gut fat as the energy source and result in earlier fatigue due to glycogen depletion once the ride is resumed. However, feeding a limited amount of 500g of grain mix about 10 minutes before resuming a ride may actually help to delay the onset of fatigue.

After the Ride

After cooling out, offer electrolytes, such as a rehydration fluid over the tongue, followed by small amounts of water to drink initially. Once the horse has settled down and is ready to eat, provide 1½-2kg of a dampened feed consisting of 60% chaff with added protein to aid muscle recovery, (eg 60g Muscle-XL) and 40% crushed grain or pellets. Mix a standard dose of electrolytes into the feed.

The gut is less active after exhausting exercise, so it is best to provide 500-700g (about 1-2 litres in bulk) of feed at 30 minute intervals, rather than encouraging the horse to eat its fill if it is hungry. Giving large amounts of food immediately after a ride can result in colic.

Once the horse has regained its appetite and gut motility is restored, feeding up to 1½kg of the standard concentrate used in training at 3-4 hourly intervals, mixed with an equal volume of lucerne chaff, will help replenish energy stores. A total of up to 5kg of grain with 5-7% oil added can be given as 3-4 small feeds during the first 18 hours to help restore glycogen stores in the muscles. Each meal should contain 14-16% protein, boosted by adding 200g (1 cupful) soyabean meal to the standard concentrate feed to replace damaged muscle protein. To replace electrolyte loss in sweat, add a dose of a salt mix. Ensure the horse is rested overnight if possible before long distance travel.

Ideally, double the normal doses of electrolytes should be continued for 2-3 days after each ride, with free access to water at all times to restore gut fluid and electrolyte reserves. Dampened good quality hay should be provided ad-lib, or access to pasture after the first 24 hours to help replenish fluid levels in the hindgut.