



Technical Bulletin

Forage First® Programs for Broodmares

The objective of a feeding program for mares is to provide all required nutrients and keep the mare at a desired body condition.¹ Mares should be moderately fleshy, but not fat, which means condition scores of 5-7 on the Henneke scale.^{2,3} The mare's body weight and condition should be used to indicate the amount of dietary energy needed.¹ Because of differing nutrient needs of broodmares at different stages of pregnancy and lactation, at least three feeding programs are recommended:^{1,4}

1 Mares that are barren, non-growing maiden, non-lactating and gestating prior to the last three months can be fed using National Research Council (NRC) recommendations for maintenance² as minimum requirements.

2 Mares in the last three months of gestation have dietary energy requirements that progressively increase 10%–20% during the last trimester. Protein, calcium, and phosphorus needs also increase.²

3 Lactating mares have dietary energy requirements that increase by 80% over maintenance. Protein, calcium, and phosphorus needs also increase.²

Mare Body Condition and Nutrient Needs

If allowed to, pregnant mares will often self-regulate their feeding and store some energy for later lactation.⁵ This is recommended as long as the mare is not over condition score 7³ and does not severely over-eat.

If adequate energy is not consumed or the mare is in thin condition, with a condition score below 5,³ decreased milk production and reproductive efficiency can result.^{6,7,8,9} Also, inadequate intake of digestible energy (DE) or protein may prevent ovulation or result in early embryonic death.^{10,11,12} Weight loss in pregnant mares can result in decreased colostrum and milk production leading to decreased passive immunity and growth rate in their foals.⁶ Obesity can also result in decreased milk production in mares.¹³

Mares fed sufficient nutrients produced 3%–4% of body weight/day of milk during the first two months, then slowly declined to 2% by five months.^{7,14,2} Nutrient content of milk declined steadily throughout lactation.⁷ Dietary energy needs are increased by 792 kcal/kg of milk produced.² In most cases, manipulation of an already appropriate diet for a broodmare will not affect the nutrient content of the milk. However, if the mare



is not maintained in adequate body condition, changes can occur in milk quality.

During pregnancy, mares need to gain 9%–12% of their body weight in foal tissue and placenta.¹ The amounts of additional protein, calcium, and phosphorus needed for fetal development and milk production are greater than the amount of additional energy needed, so increased percentages of these nutrients are needed in the diet.²

Variation in Forage Nutrient Content

All forages are generally too low in phosphorus, and grass forages don't provide enough calcium for mares during the last three months of pregnancy and lactation. At these times, it is best to allow free access to a salt, calcium, and phosphorus source as the only salt source.¹ GROSTRONG® Minerals for Horses are formulated to provide these nutrients as well as other essential vitamins and minerals.

When consuming mature grasses and pasture, as in late fall and winter, mares also need supplementary protein and dietary energy.¹⁵ If hay has adequate energy, but not protein, use 2 lb of a 25-30% protein supplement¹ to increase the protein percentage in the total ration. StaySTRONG™ 33 Ration Balancer (33% protein; 1–2 lb/day feeding rate) and Patriot® 36 Ration Balancer (36% protein; 1–2 lb/day feeding rate) are excellent products for that purpose. Other products that are excellent for broodmares include JUNIORGLO® (19% protein; 5-6 lb/day feeding rate) and Patriot Mare & Foal (16% protein; 5-6 lb/day feeding rate).

It is recommended that hays be analyzed to determine nutrient content,¹ since nutrient content of hays² and other feedstuffs¹⁶ varies greatly. Average trace mineral concentrations in some common feedstuffs typically run only 40% to 70% of NRC table values.^{16,2} Variation within samples of legume-grass

forage for total digestible nutrients was 1.4-fold and for protein was 5-fold (comparing maximum value/minimum value from analysis). A 30- to 50-fold range in trace mineral concentration is common within a given forage. When the maximum value was divided by the minimum value, the results were 46x for copper, 260x for iron, 44x for manganese, and 38x for zinc.¹⁷ The analytical variation (AV which equals two times the standard deviation) for trace minerals from the Association of American Feed Control Officials¹⁸ was iron, 25%; copper, 25%; manganese, 30%; zinc, 25%; iodine, 40%; cobalt, 25%; and selenium, 25%. Major variations exist in nutrient content, even in relatively small regions of the US. Variation also occurs because of sampling and analytical variation and differences in crops sampled. Some differences include the genus, species, or variety of the crop; the type and mineral concentration of the soil; the stage of maturity of the plant; and the climactic and seasonal conditions.¹⁶

What does this mean? When determining supplementation values, extra nutrients must be provided to allow for these variations in calculated nutrient values. This is probably one of the reasons why such excellent results are seen when feeding GROSTRONG Minerals!

Increasing Dietary Energy Density

Added dietary fat or oil is beneficial for pregnant and lactating mares, especially if increased weight gain is needed. Added fat (5%) in the diet of mares from two months before through two months after foaling increased milk fat content by 25%.¹⁹ (see ADM Animal Nutrition's article "Feeding Fats and Oils to Working Horses.") HEALTHY GLO® Meal, HEALTHY GLO Nuggets and MOORGLO® are excellent sources of added fat.

Toxicities and Deficiencies

Several specific disorders can result from toxicity or nutritional deficiencies in pregnant and lactating mares. Vitamin A deficiency in foals results in increased risk of infectious diseases, particularly respiratory and diarrheal diseases. It can result from decreased vitamin A secretion into colostrum from deficient mares.¹

Vitamin E and selenium both serve as cellular antioxidants, but function in different parts of the cell. Selenium is a component of the enzyme glutathione peroxidase and is located in the hydrophilic (water-containing) areas inside the cell. Vitamin E is located in the fat-soluble areas of the cell membrane. They act synergistically, meaning that an excess of one can partially, but not completely make up for a deficiency of the other. Inadequate selenium intake by the dam during pregnancy or inadequate selenium and/or vitamin E during lactation can result in vitamin E and/or selenium deficiency in foals from birth to one month of age.¹

Signs of selenium deficiency include muscular weakness, muscle stiffness, myalgia (muscle pain), and dysphagia (trouble

swallowing). Clinical signs of selenium deficiency include proteinuria (excess protein in the urine), myoglobinuria (excess myoglobin in the urine), hematuria (blood in the urine), increased muscle enzyme activity, and decreased glutathione peroxidase activity.²⁰ Vitamin E levels are low in mature forages.² High levels of natural-source vitamin E, which is more available than synthetic vitamin E, are found in stabilized rice bran as d-alpha-tocopherol and tocotrienols (all natural-source). Selenium is a natural component of HEALTHY GLO and is included at 30-36 ppm in GROSTRONG Minerals. Vitamins A and D are also provided in GROSTRONG Minerals.

Hypomagnesemia (lactation tetany) and hypocalcemia (eclampsia) occasionally occur in mares during late pregnancy and lactation.¹ Therefore, care should be taken to ensure that broodmares receive sufficient magnesium and calcium (contained in GROSTRONG Minerals).

Hyperlipemia

Very low feed quality and/or a decrease in feed intake can result in hyperlipemia, which usually is seen in thin horses. Hyperlipemia occurs because a negative energy balance results in peripheral body fat mobilization at a rate faster than it can be utilized. Fatty acids are metabolized for energy in the liver, but if not used, are re-esterified to fats or triglycerides, released back into the blood and deposited in the liver, causing decreased liver function. The symptoms include inappetence, failure to drink, rapid loss of body condition, fever, dullness, lethargy, and depression.¹

Problem Forages

Broodmares are also susceptible to disorders resulting from ingestion of certain types of forages. Ingestion of fescue forages infested with the endophyte fungus *Neotyphodium coenophialum* (previously known as *Acremonium coenophialum*) during the last trimester of pregnancy may cause abortion, prolonged gestation, and a thickened placenta resulting in dystocia (difficulty foaling), agalactia (no milk production), and the birth of weak or dead foals.¹ Sorghum forage, sudan grass, Johnson grass, Sudex, and other sorghum-sudan grass hybrids produce a glycoside that may be converted to cyanide, which can cause ataxia, abortion, and other symptoms.¹

Conclusion

Broodmares need specific nutrients at each stage of pregnancy and lactation. Also, some feeds can cause medical problems in broodmares. Forage First programs are designed to meet the special nutrient needs of broodmares. Call ADM Animal Nutrition's Equine HELPLINE at 1-800-680-8254 for custom feeding recommendations for broodmares.

Literature cited on next page.

Literature Cited

- ¹Lewis LD: Equine Clinical Nutrition: *Feeding and Care*. Williams and Wilkins, Media, PA (1995).
- ²National Research Council: *Nutrient Requirements of Horses*. 6th ed., National Academy Press, Washington, DC (2007).
- ³Henneke DR, Potter GD, Kreider JL, and Yeates SF: A scoring system for comparing body condition in horses. *Equine Vet J* 15:371 (1983).
- ⁴Frape D: *Equine nutrition and feeding*. Longman Group United Kingdom, limited, Scientific and Technical; Churchill Livingstone, Inc., New York pp 123-125 (1986).
- ⁵Powell DM, Lawrence LM, Parrett DF, et al: Body composition changes in broodmares. *Proc Equine Nutr & Physiol Soc Symp*, pp 91-94 (1989).
- ⁶Banach MA, Evans JW: Effects of inadequate energy during gestation and lactation on the estrous cycle and conception rates of mares and their foals' weights. *Proc Equine Nutr & Physiol Soc Symp*, pp 97-100 (1981).
- ⁷Gibbs PG, Potter GP, Blake RW, et al: Milk production of Quarter Horse mares during 150 days of lactation. *J Anim Sci* 54: 496-499 (1982).
- ⁸Gill RJ, Potter GD, Kreider JL, et al: Nitrogen status and post partum LH levels of mares fed varying levels of protein. *Proc Equine Nutr & Physiol Soc Symp*, pp 84-89 (1985).
- ⁹Jordan RM: Energy requirements for lactating pony mares. *Proc Equine Nutr & Physiol Soc Symp*, pp 27-32 (1979).
- ¹⁰Kundsen O, Bengtsson G: Feed and ovarian activity of trotting mares in training. *Cornell Vet* 53: 404-411 (1963).
- ¹¹van Niekirk CH, van Heerden JS: Nutrition and ovarian activity of mares early in the breeding season. *J S Afr Vet Med Assoc* 48:351-360 (1972).
- ¹²van Niekirk CH: Early embryonic resorption in mares. *J S Afr Vet Med Assoc* 36:61-69 (1965).
- ¹³Kubiak JR, Evans JW, Potter GD, et al: Milk production and composition in the multiparous mare fed to obesity. *Proc Equine Nutr & Physiol Soc Symp*, pp 295-299 (1989).
- ¹⁴Martin RG, McMeniman NP, Dowsett KF: Pasture intakes of pregnant and lactating mares in Southeast Queensland. *Proc Equine Nutr & Physiol Soc Symp*, pp 77-78 (1991).
- ¹⁵Gibbs PG, Davison KE: A field study of reproductive efficiency of mares maintained predominantly on native pasture. *Proc Equine Nutr & Physiol Soc Symp*, pp 71-76 (1991).
- ¹⁶Berger LL: Variation in the trace mineral content of feedstuffs. *The Prof Anim Scientist* 12:1-5 (1997).
- ¹⁷Adams RS: Variability in mineral and trace mineral content of dairy cattle feeds. *J Dairy Sci* 58:1538 (1975).
- ¹⁸Association of American Feed Control Officials: 1995 official publication p 150, AAFCO, Atlanta, GA, (1995).
- ¹⁹Davison KE, Potter GD, Greene LW, et al: Lactation and reproductive performance of mares fed added dietary fat during late gestation and early lactation. *J Eq Vet Sci* 11(2):111 (1991).
- ²⁰Brent K: Nutrition-Selenium. *Equine Athlete* Jan/Feb pp 40-41 (1999).