

## Equine Nutrition Research - Part 2

The latest in equine nutrition research, from the Equine Nutrition and Physiology Society meeting held in June 2003.

by Edgar A. Ott, PhD, Department of Animal Sciences, University of Florida

In the previous article (ec magazine, fall 2003) I wrote about who conducts equine nutrition research worldwide and where it is published. I also described some of the research reported at the Equine Nutrition and Physiology Society meetings in East Lansing, Michigan, last June. In this article, I will review additional reports from the same meeting. The papers reviewed relate to equine nutrition and exercise. cutting horse

### Fat in Diets

Texas A&M researchers reported on an experiment to evaluate the use of supplemental omega-3 fatty acids for cutting horses in training. They tested three diets: a control diet with no supplemental fat (A), the same diet supplemented with 10 percent corn oil (B), and the same diet supplemented with soybean oil (C). Soybean oil is a source of omega-3 fatty acids. The experiment used nine horses in a Latin Square experiment where each animal received each diet for 28 days. The horses were trained six days per week, following a routine of both aerobic and anaerobic work. At the end of the 28 day period, each animal was subjected to a standard exercise test (SET). Blood samples and heart rates were collected during training and during the SET. Heart rates were lower in horses fed the supplemental fat diets during training, but there was no difference in heart rate for the horses fed corn oil versus soybean oil. During the SET, there was no difference in the maximum heart rates because all horses were near maximum, however, horses fed the soybean oil-supplemented diet recovered more rapidly than the other two groups. Horses fed the soybean oil-supplemented diet also had lower cortisol values, suggesting they were less stressed. Feeding corn oil resulted in significant increases in cholesterol, while the other two diets did not. The results of this study suggest that feeding oil to horses in training may be beneficial, and that soybean oil may be a better choice than corn oil, presumably because of its higher omega-3 fatty acid content. (Howard et al., 2003).

### Benefits of Antioxidants

Virginia Polytechnic Institute researchers reported on a Electrolytes benefit horses in training and performance.study of horses competing in three 80 kilometer rides in Virginia. Oxidative stress and muscle membrane leakage were compared on 24 horses finishing the ride and 16 horses not finishing the ride. The three races differed in difficulty and were

inconsistent in the findings, suggesting that differences in training, terrain, and ambient conditions must be considered when interpreting data. Oxidative stress occurs when the antioxidant defense system is overwhelmed with reactive oxygen species (ROS). Evaluation of the animal's ability to cope with ROS is determined by measuring the muscle enzymes and blood oxidative metabolites.

The results of the study revealed that the non-finishers had higher creatine kinase (CK), and aminotransferase (AST) than the horses that finished the ride. All other factors measured were similar. Higher CK and AST suggests more muscle damage. These results suggest that horses in the type of stress associated with long rides may need better training and perhaps more antioxidants in their feeding program (Williams et al., 2003).

Virginia Polytechnic Institute researchers also reported on a study using 22 horses that were used in equitation and/or jumping lessons each week. Half of the horses were housed on pasture and fed orchardgrass/alfalfa hay and a commercial concentrate, the other half were fed the same diet plus 25 mg of folic acid per day for 12 weeks. At the end of the study, the horses performed a submaximal standard exercise test (SET). The supplemental folic acid had no effect on folate status, oxidative stress, or submaximal SET performance. There was a decline in blood vitamin E concentrations. This study suggests that folic acid is not beneficial to the working horse and if animals need supplemental folate it will have to come from another source. It also suggests that vitamin E supplementation may be beneficial. Antioxidants will help your horse stay healthy this winter. (Ordakowski et al., 2003).

#### Protein Requirements

Michigan State researchers reported on a study to determine the protein requirement of exercising horses. They used five Arabian geldings in a 5 x 5 Latin Square experiment where each horse was fed each test diet for 14 days. The diets provided 677 (VL), 790 (L), 903 (C), 1016 (H), and 1129 (VH) g of protein per day. The horses were worked at a moderate level of work for six weeks prior to the start of the study. That level of work was continued six days per week throughout the study. There was no difference between the nitrogen retention on the control, VL and L protein intakes. The H and VH diets resulted in greater nitrogen retention than the control diet. Results indicate that nitrogen retention was maximized at 1016 g protein daily which is 12.5% higher than the National Research Council (1989) recommendations for moderate work (Wickens et al., 2003).

#### Benefits of Vitamin E

Endurance horses expend a considerable amount of energy covering 80

km. Virginia Tech researchers conducted a Research Ride 2002 to evaluate the effect of vitamin E on endurance performance. A pre-ride survey was conducted to estimate nutrient intake. A pre-ride veterinary check was performed the day before the ride and at 27, 48, 72 and 80 km of the ride. Horses' weights without tack, heart rate, temperature, and blood samples were taken at each veterinary check. Twenty-four horses finished the ride and 16 did not. Vitamin E intake averaged 2265 + 114 IU/d, which was more than twice NRC (1989) recommendations. A positive correlation between vitamin E intake and plasma  $\alpha$ -tocopherol adjusted for albumin was detected ( $r = 0.22$ ;  $P = 0.005$ ). A negative correlation was found between vitamin E intake and plasma creatine kinase (CK) ( $r = -0.23$ ;  $P = 0.002$ ) and aminotransferase (AST) ( $r = -0.22$ ;  $P = 0.003$ ). It was also noted that horses finishing higher in the ride generally had higher vitamin E intakes. The results suggest that working horses will benefit from vitamin E supplementation. Vitamin E supplementation may be an excellent benefit for performance horse diets. Vitamin E intake above NRC (1989) recommendations (Williams et al., 2003)

#### Beet Pulp Study

Beet pulp has become a popular ingredient in horse feeds. Beet pulp provides an alternative energy source that, unlike starch, must be fermented in the horse's hind gut to release its energy. German workers used six Standardbred horses to look at the comparison between a pelleted, starchy concentrate and one with the same energy content – 38 percent of which came from beet pulp. The horses were given a standard exercise test (SET). Half were given the control diet and half the beet pulp diet. The horses were exercised for 16 days and subjected to a second SET. The diets were then switched and the experiment repeated. Sweat loss was 8.3 + 1.4 kg at each SET and was not influenced by the diets. Blood lactate, plasma glucose, plasma-free fatty acids, plasma insulin and total plasma protein were not influenced by the diets (Coenen, et al, 2003).

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Water intake and electrolyte supplementation are crucial for the prevention of dehydration in performance horses. This study, with 40 horses tested three concentrates: fat and fiber (EF), starch and sugar (ES) or a commercial concentrate (CS) in endurance horses tested on an 80 km ride. Energy density of the three concentrates were the same but starch was 6, 33, and 16 percent, and fat was 17, 8, and 11 percent in the EF, ES, and CS concentrates. In addition to the concentrates, The EF-fed animals received an electrolyte mixture free of potassium (EM-K), while the animals fed the commercial concentrates received no electrolyte or a potassium containing electrolyte (EM+K). The horses were inspected,

weighed, and blood samples collected the day before the ride (PRE) and at 27, 51, 80 km and 3 hr after the ride (REC). Twenty-four of the 40 horses completed the ride, and only their data was used in the statistical analysis. The concentrates had very little effect on performance or on metabolic measurements. At the end of the ride, the EM-K horses were less dehydrated than the EM+K horses as indicated by the lower plasma albumin and plasma total proteins at the 80 km and REC checks. The lower plasma potassium in the EM-K group and the higher calcium in the ES and EF supplemented horses may help prevent increases in neuromuscular excitability and related clinical signs. The results suggest that low potassium electrolyte mixtures may be of benefit to endurance horses (Hess et al., 2003).