EFFECT OF DIETARY VITAMIN E SUPPLEMENTATION ON THE EXERCISING HORSE

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Vitamin E plays an important role in cellular antioxidant mechanisms, and vitamin E deficiency has been associated with decreased muscle integrity in some species. Because exercise may challenge some of the antioxidant defenses found in muscle cells, the effect of vitamin E supplementation on exercising horses was studied. Nineteen horses were randomly assigned to one of three diets for 90 days. The three diets were 1) a basal diet containing less than 44 ppm vitamin E; 2) the basal diet supplemented with 80 ppm vitamin E (d,l α-tocopheryl acetate); and 3) the basal diet supplemented with 300 ppm vitamin E (d,l α-tocopheryl acetate). The basal diet was adequate in all nutrients (NRC, 1989) except vitamin E for horses in moderate work. During the 90-day period horses were exercised 5 d/wk. Blood and muscle samples were obtained on days 0, 30 and 90 for determination of serum and muscle vitamin E levels. At the end of the 90-day period, all horses completed a repeated submaximal exercise test. Blood samples were taken before and 0, 1, 3, 6, 24, 48 and 72 hours after exercise for determination of creatine kinase (CK) and aspartate amino transferase (AST) activities which were used as indicators of muscle damage. The exercise test used in this study had previously been shown to cause an elevation in serum CK and AST activities post-exercise. Muscle samples were obtained before and after exercise for determination of thiobarbituric acid reactive substances and conjugated diene concentrations.

Mean serum and muscle vitamin E concentrations were not different ($P>0.05$) among groups on day 0 of the 90-day sampling period. Serum vitamin E concentrations declined in horses receiving either the basal diet or the diet supplemented with 80 ppm vitamin E ($P<.05$ and $P<.06$, respectively) during the 90-day sampling period. A similar trend was observed for muscle vitamin E concentrations in horses receiving those diets. Muscle and serum vitamin E levels did not decline in horses receiving the diet supplemented with 300 ppm vitamin E and on days 30 and 90 horses receiving this diet had higher vitamin E concentrations than horses receiving either the basal diet or the diet supplemented with 80 ppm vitamin E (Figure 1). These data may indicate that the current NRC recommended level of vitamin E supplementation (80 mg/kg diet) is not adequate to maintain vitamin E concentrations in regularly exercising horses.

Seventeen horses completed the exercise test at the end of the 90-day sampling period. Mean serum CK and AST activities were increased in all groups after the

exercise tests. However, the increases in CK and AST activities observed in the horses consuming the vitamin E supplemented diets (80 or 300 ppm) were not different from the increases in the horses receiving the basal diet. Similarly, muscle thiobarbituric acid reactive substances and conjugated diene concentrations were not different among groups. Thus, an effect of vitamin E supplementation on muscle integrity in exercising horses was not observed.

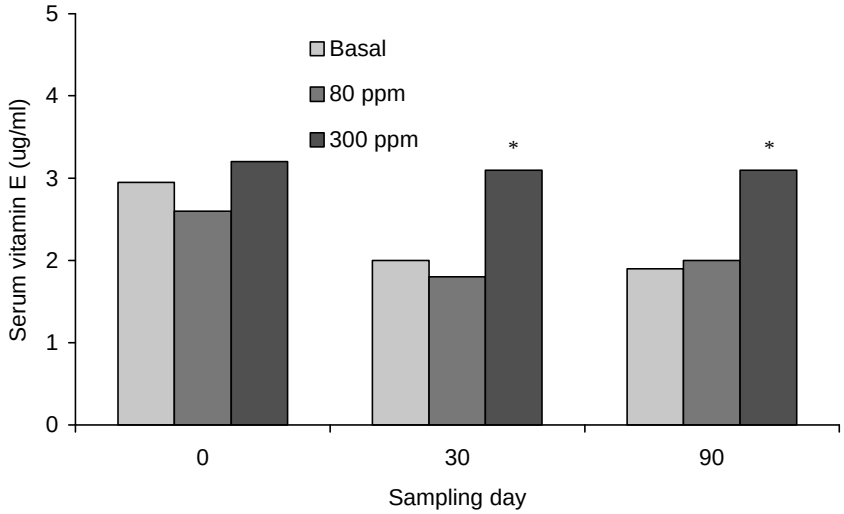

Figure 1. Serum vitamin E concentrations in exercised horses receiving diets containing varying levels of vitamin E. *Horses receiving the basal diet supplemented with 300ppm vitamin E had higher serum vitamin E concentrations than horses receiving the basal diet or the diet supplemented with 80ppm vitamin E

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