The Future of Fat and Fatty Acids in Horse Diets; Beyond Energy

G. Pusillo, BS, MS, PhD, PAS, ACAN, AAFS, and T. Purevjav, PhD
INTI Service Corp.

Today, many horse owners seek natural alternatives to synthetic pharmaceutical products to aid with a variety of disorders experienced during daily training. While modern equine science recognizes the importance of fat content in horse feeds, very few functional fats and fatty acid blends are being used for other purposes other than for supplying energy.

For many years, various levels of fats and oils have been added to commercial horse feed formulations as a dust suppressant, palatants, and to improve the passage of ingredients through manufacturing plants (Kronfeld, 1996). The fatty acids most commonly included in equine diets are synthesized by plants and have the first two or more double bonds six carbons away from the methyl end of the fatty acid. Currently, many different concentrations and types of fats and oils are being used in commercial horse feeds and supplements to provide energy while avoiding excess carbohydrate feeding. Recent evidence has been presented that suggests specific fat and fatty acid supplementation of equine diets could diminish excitability and improve athletic performance. For instance, some studies using orally administrated fish oil described in vitro and in vivo anti-inflammatory effects (Hall et al., 2004) as well as improved exercise variables, lower heart rates were observed during exercise in a fish oil treated horse group, in horses (O'Connor et al., 2007). Holland et al., (1996) reported reduced reactivity to pressure, acoustic and visual stimuli, and reduced locomotion when horses were fed test diets containing additional fats. They found that foals given access to a fat and fiber dietary supplement had lower pre-weaning cortisol levels than foals given access to a starch and sugar based dietary supplement. They also examined the foals' behavior at weaning and found that foals that had received the fat and fiber supplement performed more grazing behavior and appeared to be less stressed. Recently, Nicol et al., (2005) found that horses fed diets high in fat and fiber appeared less distressed immediately after weaning, and were less flighty, more willing to perform and possibly more attentive or sensitive to their environment than horses fed high starch and sugar diet. Kronfeld (1996) measured the affects of fat supplementation on horse performance, by documenting changes in stamina, heat production during speed and stamina testing, diurnal heat production, and power to weight rations. Results of fat supplementation indicated increased stamina as a result of altered substrate use and a glycogen – sparing effect, reduces heat production during a speed and stamina test and even more throughout the day. Reduced DM intake, bowel ballast, fecal output, and water requirements improved power – to weight ratio (Kronfeld, 1996).

In the recent past, naturally derived "functional" products have had a negative connotation by most medical professional involved in the practice of veterinary medicine. These negative feelings were a direct result of an industry though well intentioned; failed to self-regulate and promote responsible formulation, ingredient standardization, and consistency in response. The situation is exemplified by undifferentiated inflammation. Inflammation has been extensively studied with many drugs having been developed as a result. Similarly, many studies have shown that unaccustomed exercise or training, particularly if it involves eccentric exercise in which the muscle is forcibly lengthened as it is activated, results in damage to the muscle structure and post-training soreness. It is believed that free radicals, may be involved in the damage that occurs to muscle membranes. An increased generation of free radicals is also associated with damage to cellular DNA and to a variety of lipids and proteins. If the post-

training damage can be reduced by an increased intake of antioxidants, then recovery after training and competition is more rapid and more complete.

Unique and reliable antioxidants play important roles when feeding fats and fatty acids in horse diets. There is a growing body of evidence to suggest that supplementation of key antioxidants matched to specific fats and fatty acids, may reduce the extent of training induced oxidative damage to tissues. If this is indeed the case, it may be that the horses undertaking a strenuous training program may benefit in the long term by being able to sustain a higher training load. Antioxidants are purported to reduce the extent of lipid peroxidation and muscle damage, and their efficacy is often measured through the assessment of thiobarbituric acid reactive substances, glutathione peroxidase and superoxide dismutase activities, and the extent of muscle damage is reflected by measurement of creatine kinase and aspartate transaminase activity (Kirschvink et al., 2008). The omega-3 fatty acids may also have antioxidative properties in their ability to affect the membrane fluidity of red blood cells. When fish oil extract was fed to horses in combination with vitamin E and copper, erythrocyte membrane fluidity was maintained following exercise, though there was no effect on the oxidant/antioxidant balance (De Moffarts et al., 2007).

The equine industry is keenly interested in efficacious, natural fatty acids, fats, and antioxidant blends that deal directly with the complications associated with gastro intestinal tract problems that result in an overactive inflammatory response, better immune response to natural and vaccine challenge, increase muscle mass, better digestion and nutrient integrity, less intestinal upsets, better recovery after exercise, and less erosion in those areas known to initiate ulcers.

Literature Cited

De Moffarts, B., K. Portier, N. Kirschvink, J. Coudert, N. Fellmann, E. van Erck, C. Letellier, C. Motta, J. Pincemail, T. Art, and P. Lekeux. 2007. Effects of exercise and oral antioxidant supplementation enriched in (n-3) fatty acids on blood oxidant markers and erythrocyte membrane fluidity in horses. Vet. J. 174: 113-121.

Hall, J. A., R. J. Van Saun, and R. C. Wander. 2004. Dietary (n-3) fatty acids from Menhaden fish oil alter plasma fatty acids and leukotriene B synthesis in healthy horses. J. Vet. Intern. Med. 18: 871-879.

Holland, J. L., D. S. Kronfeld, and T. N. Meacham. 1996. Behavior of horses is affected by soy lecithin and corn oil in the diet. J. Anim. Sci. 74: 1252-1255.

Kirschvink, N., B. d. Moffarts, and P. Lekeux. 2008. The oxidant/antioxidant equilibrium in horses. Vet. J. 177: 178-191.

Kronfeld, D. S. 1996. Dietary fat affects heat production and other variables of equine performance, under hot and humid conditions. Equine Vet. J. 28: 24-34.

Nicol, C. J., A. J. Badnell-Waters, R. Bice, A. Kelland, A. D. Wilson, and P. A. Harris. 2005. The effects of diet and weaning method on the behaviour of young horses. Appl. Anim. Behav. Sci. 95: 205-221.

O'Connor, C. I., L. M. Lawrence, and S. H. Hayes. 2007. Dietary fish oil supplementation affects serum fatty acid concentrations in horses. J. Anim. Sci. 85: 2183-2189.