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Changes in Red Blood Cell Fatty Acid Composition in Exercised Thoroughbred Horses Supplemented with Either KER EO-3 or Flax Oil for a Two-Month Period

Thirteen fit Thoroughbreds in training at the Kentucky Equine Research Performance Center in Ocala, Florida, were used in this study. The horses were divided into two groups and supplemented with either KER EO-3™ oil (n=7) or flax (linseed) oil (n=6) to supply similar daily intakes of omega-3 fatty acids. The horses were then trained for two months. Training consisted of galloping three days/week on a dirt racetrack and walking 30 minutes/day on a mechanical exerciser three days/week. Blood samples were taken at 0, 1, and 2 months of supplementation and red blood cell (RBC) fatty acid composition was measured.

The daily intake of omega-3 fatty acids is shown in Figure 1. An intake of 45 mL/d of EO-3 oil supplied 9.9 g of omega-3 fatty acids consisting mainly of eicosapentaenoic acid (EPA) (C20:5n3) and docosahexaenoic acid (DHA) (C22:6n3), while 23 mL/d of flax oil supplied 11.1 g of omega-3 fatty acids as alpha-linolenic acid (ALA) (C18:3n3). Red blood cell EPA (Figure 2) and DHA (Figure 3) were significantly increased in the horses supplemented with EO-3, but not in the horses supplemented with flax oil.

Incorporation of long-chain omega-3 polyunsaturated fatty acids (n-3 PUFAs) into cellular membranes results in a decrease in the production of pro-inflammatory eicosanoids and cytokines. Also, novel eicosanoids generated from n-3 PUFAs, known as resolvins and protectins, have anti-inflammatory properties. The most potent n-3 anti-inflammatory PUFAs are EPA and DHA. Studies in humans have shown that these long-chain n-3 PUFAs are nine times as potent as ALA.

The present study clearly demonstrates that daily intake of EPA and DHA from KER EO-3 significantly increases RBC membrane EPA and DHA but that a similar amount of omega-3 in the form of ALA from flax oil does not. Researchers at Colorado State University[1] and University of Florida[2] have reported similar findings. Horses do not appear to be able to efficiently convert ALA into EPA and DHA. Therefore, a dietary source of EPA and DHA like KER EO-3 is needed to affect long-chain n-3 PUFA cellular membrane composition.

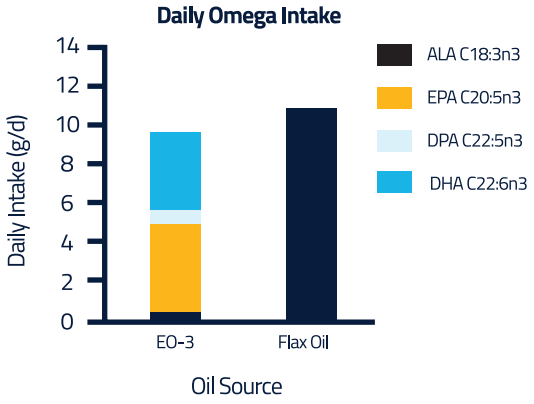

Figure 1

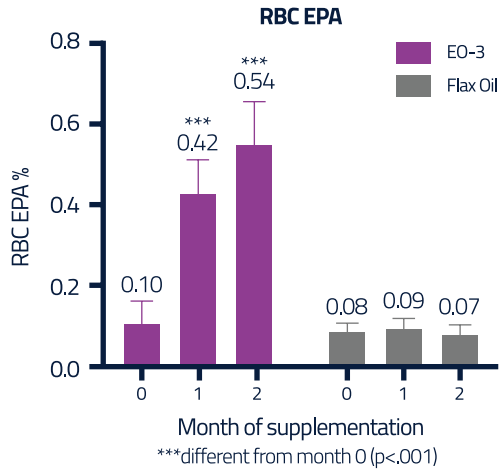

Figure 2

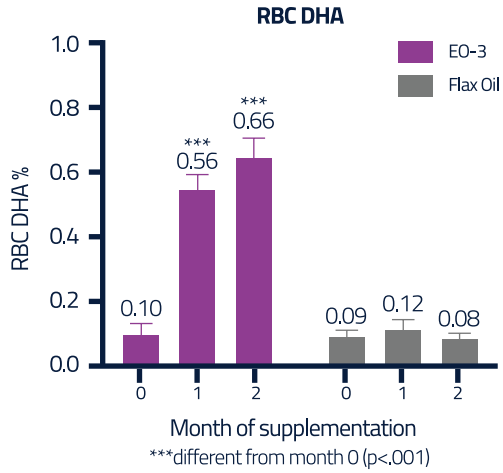

Figure 3

[1]Hess, T.M., J.K. Rexford, D.K. Hansen, M. Harris, N. Schauermann, T. Ross, T.E. Engle, K.G.D. Allen, and C.M. Mulligan. 2012. Effects of two different dietary sources of omega-3 highly unsaturated fatty acids on insulin sensitivity, and incorporation into the plasma, red blood cell and muscle cells in horses. J. Anim. Sci. 90:3023-3031.

[2]Vineyard, K.R., L.K. Warren, and J. Kivipelto. 2010. Effect of dietary omega-3 fatty acid source on plasma and red blood cell membrane composition and immune function in yearling horses. J. Anim. Sci. 88:248–257.

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