EO·3™ – Benefit Through Balance

Rich source of the omega-3 fatty acids DHA and EPA in a palatable liquid form.

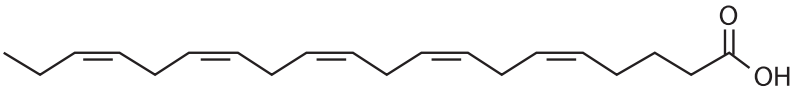
In recent years, horse owners and veterinarians have embraced the notion of using fat in the diets of horses and ponies. Fat is scarce in forages and is therefore a seemingly unnatural feedstuff for horses, but its nutritional advantages are irrefutable. Think of this: some horses are completely relieved of painful muscle conditions when switched from a diet laden in starch to one rich in fat; other horses are more attentive to the demands asked of them by their handlers and riders when calories are provided by fat; and many insulin-resistant horses thrive on high-fat rations.

Now that the advantages of fat are accepted almost universally by horsemen, scientists are delving deeper into how certain fats help horses. Researchers have focused their attention on two distinct families of long-chain polyunsaturated fatty acids (PUFA): the omega-3 family and the omega-6 family. The omega-3 family stems from alpha-linolenic acid (ALA), and the omega-6 family originates from linoleic acid (LA). The term omega-3 is in reference to the location of the first double bond positioned three carbon atoms from the terminal end of the fatty acid chain. Marine-derived oils are rich in the longer chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), 20 and 22 carbon atoms, respectively, while ALA, containing 18 carbon atoms, can be found in plant sources such as flax, soybean, and canola. ALA and LA are considered "essential fatty acids" because they are instrumental in the life cycle, yet they cannot be manufactured in the body and must be obtained from dietary sources.

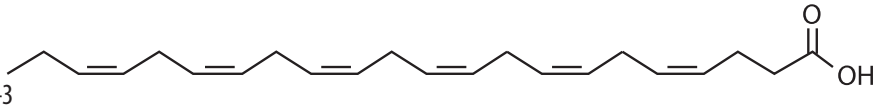
Omega-3 Fatty Acids

Significant members of the omega-3 family are EPA, DHA, and ALA. EPA and DHA are found almost exclusively in fish, namely cold-water species, since they are at the top of a food chain based largely on algae that manufacture EPA and DHA. On the other hand, ALA is found predominantly in leafy plants and flaxseed (linseed).

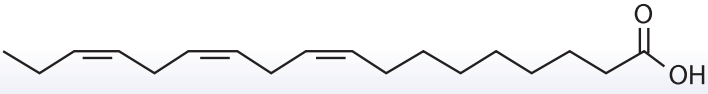
EPA
C20:5-3



DHA
C22:6-3



ALA
C18:3-3



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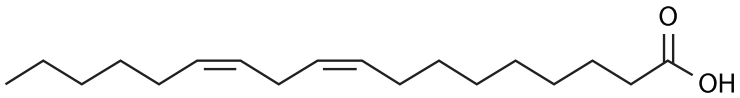
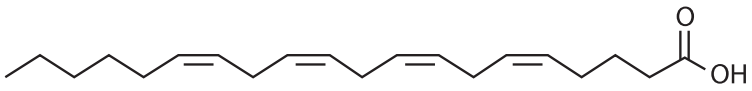
Omega-6 Fatty Acids

The primary source of omega-6 fatty acids in the diet is LA derived from the oils of seeds and grains. Corn, sunflower, and safflower oils contain abundant quantities of LA. Arachidonic acid (AA) is an intermediate in the metabolism of LA to the various cytokines termed "pro-inflammatory" (see flow chart below).

LA
C18:2-6



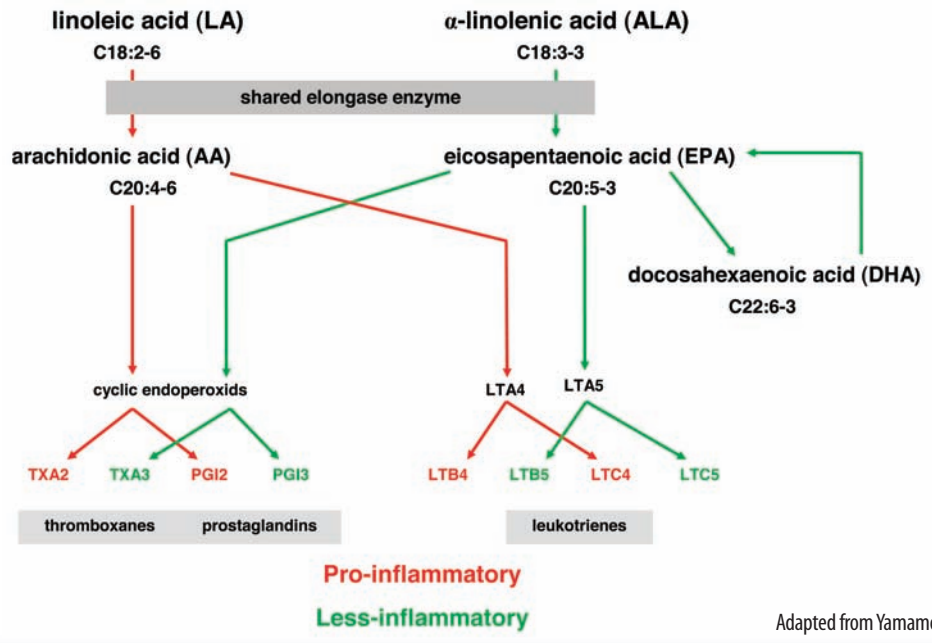
AA
C20:4-6



The Omega-3 to Omega-6 Ratio: A Balancing Act

Omega-3 and omega-6 fatty acids must be balanced within the body in order for both to be effective. The significant biological difference between omega-3 fatty acids and omega-6 fatty acids is related to their roles as precursors of inflammatory and immune intermediaries. For example, each fatty acid is necessary for the production and distribution of prostaglandins. The prostaglandins that evolve from consumption of omega-3 and omega-6 fatty acids have different effects on inflammation processes in the body.

The omega-3 fatty acids, EPA and DHA, are precursors of a class of inflammatory compounds that yield a milder response than those produced from omega-6 fatty acids. In other words, the inflammatory response from cytokines and prostaglandins that originate from these omega-3 fatty acids is moderate compared to the response from cytokines and prostaglandins derived from omega-6, which are considered "pro-inflammatory" by comparison.



Biochemical pathways of omega-6 and omega-3 fatty acid metabolism to respective cytokines and prostaglandins.

Scientists have not pinpointed the optimal ratio of omega-3 fatty acids to omega-6 fatty acids for horses of various ages and uses, though they believe a ratio of 2 to 4:1 may be optimal. Even without an exact ratio, general knowledge of omega-3 and omega-6 fatty acids and typical equine management practices uncover some undesirable trends.

Feedstuffs have varying levels of omega-3 and omega-6 fatty acids. The natural diet of horses—primarily fresh and dried forages—contains more omega-3 fatty acids than diets consisting of a mixture of forage and cereal grains. Domesticated horses are frequently given concentrated sources of energy in the form of grain meals. Grains possess more omega-6 fatty acids than forage. Performance horses are often fed supplemental sources of fat to add much-needed calories to their rations. Corn oil, probably the most popular fat supplement offered to horses, as well as safflower oil, canola oil, and sunflower oil, is rich in omega-6 fatty acids. Feeding one or more of these, especially in combination with a high-grain diet, may supply a horse with a surplus of omega-6 fatty acids, skewing the ratio of omega-3 to omega-6 fatty acids and creating a balance of omega-3 to omega-6 fatty acids that may be inappropriate. Such diets may not be as beneficial as one abundant in omega-3 fatty acids.

The Benefits of Omega-3 Fatty Acids

Interest in omega-3 fatty acids has heightened among nutritionists studying all species in recent years, and equine researchers have begun to study their effectiveness in horses and ponies. Many studies have been undertaken by universities and private research companies to investigate the potential benefits of supplementation with omega-3 fatty acids, and promising results have come to light.

Reproductive advantages of omega-3 fatty acids are abundant. Stallions supplemented with EPA and DHA showed a significant boost in the number of normally shaped sperm and a rise in the concentration of spermatozoa in the semen. Positive effects on sperm viability and motility have also been demonstrated. Supplementation of pregnant mares with DHA and EPA confers benefits to the developing fetus since the placenta may be responsible for providing DHA and EPA to the fetal nervous system. Mares effectively incorporate these fatty acids into their milk, so supplementation of the mare provides for the suckling foal. Broodmares on diets high in omega-3 and omega-6 fatty acids may produce richer colostrum. Studies have shown that foals of supplemented mares seemed to have a stronger immune system than foals suckling mares not fed omega-3 fatty acids. Other findings suggest that mares with a history of abortion may benefit from nutritional support with omega-3 fatty acids.

Of particular interest are the possible benefits to joint health, as well as reduction of inflammatory response linked to omega-3 fatty acids. Though joint inflammation reactivity to omega-3 fatty acids has yet to be studied specifically in horses, a beneficial effect is likely based on studies in humans and other animals. Performance horses might be the perfect candidates for supplementation of omega-3 fatty acids. Because they are often fed large amounts of grain to maintain body condition, these horses may consume diets containing too many omega-6 fatty acids. Scientists are currently studying the effects of a combined dose of DHA and EPA on reducing signs of exercise-induced pulmonary hemorrhage (EIPH), pulmonary inflammation, and joint irritation. Supplemented horses may also be less likely to develop gastric ulcers as omega-3 supplementation has helped alleviate ulcers in other species. Supplemental omega-3 fatty acids are thought to help with numerous inflammatory conditions specific to horses including allergic reactivity, laminitis, and pruritis.

EO•3 – Preferential Source for Omega-3 Fatty Acid Supplementation

Plant sources of omega-3 fatty acids such as flaxseed (linseed) are inferior due to inherent metabolic disadvantages. Even though EPA and DHA (20 and 22 carbon, respectively) can be formed *in vivo* by elongation of alpha-linolenic acid (ALA) (18 carbon), this process is inefficient and complicated. In addition, the enzymes used in the metabolism of ALA to EPA and DHA are the same enzymes used to elongate LA to AA. When horses consume feeds with greater quantities of LA (omega-6) than ALA (omega-3), the concomitant conversion of LA (18 carbon–omega-6) to AA (20 carbon–omega-6) results in the production of more pro-inflammatory cytokines and prostaglandins.

Only fish oils are direct sources of EPA and DHA. In the past, these oils were typically not as palatable as those that provide more generous quantities of omega-6 fatty acids. However, recent studies at Kentucky Equine Research (KER) have shown that advances in processing technology have overcome the palatability issue inherent in the use of fish oil.

EO•3 is a stabilized and flavored EPA/DHA marine-derived oil. KER has shown EO•3 to be highly palatable when compared to other marine-derived oils. EO•3 is intended to be fed to horses of all classes and working levels to improve the critical omega-3:omega-6 ratio in their diets.

EO•3 is the most potent, effective source of long-chain omega-3 fatty acids available. Analysis has shown that EO•3 has the highest percentage of long-chain omega-3 fatty acids as well as the highest ratio of omega-3 to omega-6 fatty acids when compared to other commonly fed oils.

Polyunsaturated Fatty Acid Composition of Commonly Used Oils

Oil Type	Omega-3 Concentration	Omega-3:Omega-6	Predominant Omega-3 Source
EO•3	**35%**	**12**	**EPA and DHA**
Flax oil	54%	4.15	ALA
Soy oil	7%	0.14	ALA
Rice bran oil	1%	0.03	ALA
Corn oil	1%	0.02	ALA

Equine athletes supplemented with EO•3 benefit from a reduction in inflammatory response. In addition, EO•3 has demonstrated benefits to the cardiovascular system, reproductive performance, and bone development in numerous research studies in a variety of animal species. The consumption of EPA and DHA from a source such as EO•3 is the only way to ensure that these fatty acids are available for metabolism of the "less-inflammatory" compounds and other metabolites beneficial for the horse's overall health and well-being.

Typical Analysis of EO•3*

Omega-3 Fatty Acids	35%
Omega-6 Fatty Acids	3%
EPA and DHA	25%
Omega-3:Omega-6 Ratio	12:1
Digestible Energy (DE)	9.0 Mcal/kg

**Since this product is derived from a living source, actual values may vary slightly.*

EO•3 Feeding Instructions

Top-dress 1–2 ounces per day on feed. For optimum results divide equally among feedings.

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