

Omega-3 Oils

These days most people are aware of omega 3 oils (also called fatty acids), and that they may be good supplements to take. At the same time, there seems to be some confusion as to exactly what they are, their functions, and the differences between the various sources.

Generally speaking, fatty acids can be divided into two categories—saturated or unsaturated. Nutritionists further categorize unsaturated fatty acids into groups based on molecular structure—omega 3's, omega 6's, and omega 9's.

Fatty acids have both structural and hormonal functions in the body. Hormones are chemical signals that control, regulate, activate, and inhibit cellular functions. The class of hormones derived from omega 3 and 6 fatty acids are called eicosanoids and their best known role is in the modulation of inflammation. However, it is now apparent that they can have different actions in different tissues.

In general, those hormones made from omega 6 fatty acids are pro-inflammatory and those made from omega 3 fatty acids are anti-inflammatory. Some of the eicosanoid hormones you may have heard of are the prostaglandins, leukotrienes, and thromboxanes.

It should be noted that the issue is not that omega 6 oils are bad and omega 3 oils are good. While omega 6's do tend to be pro-inflammatory, we should not forget that without inflammation we could not fight infections and heal wounds—in short without it, we could not survive.

The key is to have a proper balance of omega 6 to omega 3 so that the inflammatory response remains properly modulated. Unfortunately, our modern diets are grossly skewed towards omega 6 and deficient in omega 3. It is believed that our hunter-gatherer ancestors ate a diet containing omega 6 and omega 3 in a range of a 5:1 to 1:1 ratio, while modern diets, even organic ones, tend to be approximately 20:1. Even just 100 years ago the ratio was much lower. For these reasons, it may be prudent for most people to supplement with omega 3 oils and people with specific health concerns may benefit from large doses.

Alpha-linolenic acid (ALA) is an omega 3 fatty acid found in highest concentrations in a variety of seed oils. Of the oils that are readily available commercially, flax provides the highest concentration. Lesser concentrations are found in hemp and canola oil. ALA is also found in lower concentrations in leafy greens, meat of animals that eat them (e.g. grass fed beef, wild game), and cold water fish.

ALA can be converted to eicosapentaenoic acid (EPA) in the body. This process requires 3 enzymes, the last of which is very weak in humans making this conversion inefficient—estimated to be no greater than 10%. Two additional enzymatic steps are required to convert EPA to docosahexaenoic acid (DHA).

Studies have associated ALA with decreased risk of cardiovascular disease, slowing the spread of some cancers, and helping rheumatoid arthritis. Unfortunately, the weight of evidence in these studies is weak and it is unclear whether the benefits are directly related to ALA or to its products, EPA and DHA. Lignans, a type of fiber found in flax seeds, may also be responsible for some of these associated benefits.

ALA does have an effect on our DNA, resulting in a reduction of pro-inflammatory gene products. On a less positive note, high levels of ALA have been associated with an increased risk of prostate cancer and macular degeneration. These findings are not without controversy. A

single study in the Netherlands did find ALA to have a slight protective effect on prostate cancer, but in combined analysis of all ALA prostate studies an increased risk is shown. At this time, it cannot be determined if this risk is real or if it is due to other unknown factors.

Interestingly, fish oils containing EPA and DHA have been shown to be protective against both prostate cancer and macular degeneration. Studies done on flax seeds (as opposed to flax oil) have also shown protection against prostate cancer.

The omega 3 fatty acids EPA and DHA are found in highest concentrations in cold water fish oils. They are also present in some algae, human breast milk, and to a smaller extent in grass fed beef.

EPA is the direct precursor molecule for anti-inflammatory eicosanoid hormones. Some known effects of these hormones are decreased inflammation, prevention of blood clots, decreased triglycerides, increased HDL (good) cholesterol, regulation of blood pressure, and improved cell membrane integrity.

Like ALA, both EPA and DHA affect gene expression to reduce pro-inflammatory products. EPA is specifically known to suppress the production of COX, a major enzyme responsible for the production of pro-inflammatory eicosanoids. EPA also physically blocks the omega 6 (arachidonic acid, or AA), from binding to COX, further reducing the production of its pro-inflammatory products (this is similar to the action of aspirin and other pain relievers). Finally, EPA prevents another enzyme from releasing AA from the cell membrane (cortisol and other corticosteroid hormones also do this).

DHA does not make any eicosanoids, but new research is showing that both DHA and EPA produce some similar compounds, which appear to be potent anti-inflammatory and immune regulating molecules. DHA is the most abundant fatty acid in brain tissue, the retina of the eye, and sperm and is clearly important for normal healthy function of these cells—the full understanding of how and why requires further discovery.

There are literally thousands of studies on EPA and DHA and clear, consistent, and convincing evidence of the health benefits of these fatty acids is established. The list of conditions that benefit from EPA and DHA is too long to give in full, but benefits for cardiovascular health, chronic pain and inflammation, intestinal health, joint health, skin health, reproductive health and child development, mental health, visual health and development, allergies, cancer, autoimmune conditions, and reductions in specific and overall mortality have all been shown.

Fish oil from the muscle of sardines and anchovies typically provides more EPA than DHA, while cod liver oil provides more DHA than EPA. Specially concentrated preparations are also available. For cardiovascular and joint health one might choose a fish oil, while a cod liver oil may be preferred for mental health and development. When taking cod liver oil pay attention to the amounts of vitamins A and D in the product, as large quantities of these vitamins should not be consumed except as directed under the care of your physician.

When looking for a supplement, look for oils that are in light resistant glass bottles or gel caps, are manufactured in a low heat, low light, zero oxygen environment, and bottled with nitrogen replacement, natural vitamin E, and other antioxidants. With fish oil, look for products that are tested to ensure they are free from heavy metals, PCBs, and other pollutants. With seed oils, look for organically grown raw materials. Finally, if you purchase a product that is not encapsulated, be sure to store it in the refrigerator once it has been opened and use some sort of vacuum seal cap (such as those sold for wine) to remove the oxygen from the bottle after each use.