Essential fatty acids (EFAs) are so called because they cannot be produced within the body and must be acquired through diet. Present day eating habits contribute to much less ingestion of beneficial EFAs, most notably the omega 3 fatty acids. (Simopoulos, 2001) The decrease in ratio of Omega 3 to Omega 6 fatty acids has been accompanied by increased rates of many diseases (the so-called diseases of civilization) that involve inflammatory processes. There is strong evidence (NIH, 2005) that several of these diseases are ameliorated by increasing dietary omega 3 fatty acids, and good evidence for many others. There is also evidence showing that dietary omega 3 fatty acids can ease symptoms in several psychiatric disorders. (DeCaterina, 2006)

The essential fatty acids are all omega 3 and 6 methylene-interrupted fatty acids. There are 9 types of omega 3 fatty acids including alpha linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic Acid (DHA); 8 types of omega 6 fatty acids including linoleic acid, gamma linolenic acid (GLA), arachidonic acid (AA) and dihomo-gamma-linolenic acid (DGLA). Omega 9 fatty acids, of which there are 5 types including oleic acid, are technically not EFAs because the human body can manufacture a limited amount, provided essential EFAs are present.

EPA cannot be fully considered an essential fatty acid because the human body can convert ALA to EPA. However, this conversion is less efficient than obtaining EPA from ingestion of food or supplement. This also affects levels of DHA as EPA is a precursor to DHA. In addition, medical conditions like diabetes or certain allergies may significantly limit the human body's capacity for metabolization of EPA from ALA. (NIH, 2005) Excellent dietary and supplementary sources of EFAs include flax oil (an excellent source of ALA) and deep sea fish oils that contain a high percentage of EPA and DHA.

A primary function of EFAs is the production of prostaglandins, which regulate body functions such as heart rate, blood pressure, blood clotting, fertility, conception, and play a role in immune function by regulating inflammation and encouraging the body to fight infection.

ALA is the principal omega-3 fatty acid, which a healthy human will convert into EPA, and also DHA. EPA and the GLA synthesized from linoleic acid (omega 6) are later converted into hormone-like compounds known as eicosanoids, which aid in many bodily functions including vital organ function and intracellular activity.

Omega 3s are used in the formation of cell membranes, making them supple and flexible, and improving circulation and oxygen uptake with proper red blood cell flexibility and function.

Omega 3 deficiencies are linked to decreased memory and mental abilities, tingling sensation of the nerves, poor vision, increased tendency to form blood clots, diminished immune function, increased triglycerides and “bad” cholesterol (LDL) levels, impaired membrane function, hypertension, irregular heartbeat, learning disorders, menopausal discomfort, itchiness on the front of the lower leg(s), and growth retardation in infants, children, and pregnant women.

The Inflammatory Response
The actions of the omega 3 and omega 6 EFAs are best described through their interactions, and cannot be fully understood if discussed separately. Omega 3 and omega 6 fatty acids are involved in 2 different metabolic “chains”. The omega 3 fatty acid chain, of which EPA plays a part, can be characterized as anti-inflammatory. The omega 6 chain can both anti-inflammatory, if it converts to DGLA or pro-inflammatory, if it converts to AA.

Arachidonic acid (AA) is a 20-carbon Omega 6 essential fatty acid (Cunnane, 2005) and heads the “AA cascade” – more than twenty different signalling paths that control a wide array of bodily functions, especially those involving inflammation and the central nervous system. (Piomelli, 2000) Most AA in the human body derives from dietary linoleic acid (an omega 6 fatty acid), which comes from both vegetable oils and animal fats. The end product of this chain is series 2 prostaglandins which promote platelet aggregation (clot formation); inflammation; sodium retention; and may influence heart disease, blood clots, increased cortisol production, etc. Reducing prostaglandins series 2 is generally beneficial for health.

Two groups of essential fatty acids form cascades that parallel and compete with the AA cascade. EPA (omega 3 fatty acid chain) provides the most important competing cascade. As mentioned, it is ingested from oily fish or derived from dietary ALA found in, for instance, flax oil. It eventually converts to prostaglandin 3 series formation, the primary end product of the omega 3 metabolic chain. Simply, the most important job of series 3 prostaglandins is to prevent AA from being released by cells, thus preventing the production of inflammatory series 2 prostaglandins.

DGLA (the anti-inflammatory EFA of the omega 6 chain) heads the next group which provides a third, less prominent cascade than the EPA cascade. It derives from dietary GLA, also an omega 6 fatty acid, and can be supplemented through borage oil. It is generally converted to series 1 prostaglandins which, like the 3 series, are also anti-inflammatory. Series 1 prostaglandins also relax blood vessels, improve circulation, lower blood pressure, improve nerve function, regulate calcium metabolism, improve T-cell function, and also prevent the release AA from cells. Borage seed oil also contains oleic acid, an omega 9 fatty acid that promotes the anti-inflammatory pathways for GLA.
These two parallel cascades soften the inflammatory effects of AA and its by-products. Low dietary intake of these less inflammatory essential fatty acids, especially the Omega 3’s, is associated with a variety of inflammation-related diseases.

**Neural Response**

The AA cascade proceeds somewhat differently in the brain. AA is released from neuron cell membranes as a free fatty acid and may affect the activity of the neuron’s ion channels and protein kinases (protein modifiers). Or it may be metabolized to form eicosanoids, which are theorized to act as secondary messengers within the brain and control presynaptic inhibition and the activation of protein kinase C (Piomelli, 2000) The EPA and DGLA cascades are also present in the brain and their eicosanoid metabolites have been detected. The ways in which these differently affect mental and neural processes are not nearly as well characterized as their effects in inflammation.

However, there is good evidence that psychiatric illness is associated with depletion of EFAs and, crucially, that supplementation can result in clinical amelioration. Cerebral lipids and EFA-derived long chain polyunsaturated fatty acids (LC-PUFAs) in particular, have significant direct and indirect actions on cerebral function. In fact, the dry weight of the mammalian brain is approximately 80% lipid (the highest of any organ) and EFAs and LC-PUFAs comprise 15–30%. Their effect on neuronal membrane dynamics and therefore on receptor, transporter and neurotransmitter function is profound.

The principal central nervous system-related EFAs are EPA and DHA (both omega 3s) and AA (an omega 6). They are important components of phospholipids and cholesterol esters, which are themselves integral to the neuronal cell membrane, especially synaptic and dendritic membranes, and also intracellular membranes such as mitochondria and vesicles. If unavailable, they will be replaced by non-EFAs, changing the behaviour of membrane bound receptors and associated neurotransmitters.

The well-documented shift in the Western diet away from EFAs (and the omega 3 family in particular) parallels the large rise in all psychiatric disorders seen over the past century. A report (Hibbeln, 1998) looking at a number of countries was able to conclude that the annual prevalence of major depression is strongly inversely correlated with national fish (a principal source of omega 3 EFAs) consumption. A similar inverse relationship exists for the prevalence of postpartum depression and fish consumption.

There is considerable research demonstrating the efficacy of EFAs in a diverse number of psychiatric conditions: For depression, one study involving 70 patients (Peet & Horrobin, 2001) showed a threefold treatment re-placement effect, noting a 50% reduction in Hamilton Rating Scale for Depression (HRSD) scores as evidence of clinical response.

For bipolar affective disorder, in a 4-month study (Stoll et al,1999) patients had longer periods of remission in the omega 3-treated group and significant improvements in depressive symptomatology.

There are various, generally positive data in psychopathic/aggressive/impulsive populations. One study involving young adult prisoners, a combination of omega 6 and omega 3 EFAs reduced offences by 26.3%, increasing to 35.1% if on supplementation for a minimum of 2 weeks (Gesch et al, 2002). The greatest reduction occurred for the most serious incidents including violence.

**Our Products**

Our products are each formulated to address your patients’ individual needs.

**EFA 3-6-9**

This product contains flax, borage seed and deep sea fish (18:12) oils. Flax oil is an excellent and primary source of ALA, deep sea fish oils are high in EPA and DHA and borage seed oil is rich in GLA, and also contains oleic acid, an omega 9 fatty acid. In total, each capsule contains 75mg EPA, 52mg DHA and 105mg GLA.

**EFA 40:20**

A fish oil concentrate of 40% EPA and 20% DHA in 1000mg caps. Each capsule contains 400mg EPA and 200mg DHA. The deep-sea fish oil is derived primarily from cod, tuna, sardines & anchovies; known particularly for their high EPA content.

**Flax Seed Oil**

Flax oil is an excellent and primary source of alpha-linolenic acid, an omega 3 oil. This product is 100% unrefined and cold pressed with Vitamin E added.

Our oils are manufactured according to pharmaceutical GMP standards and analyzed for pesticide and herbicide residues and heavy metals. The flax and borage seed oils are non-GMO, hexane free and expeller cold pressed.

**Our Company**

Integra Nutrition Inc. is the exclusive distributor of Alpha Science products. We have been servicing the health care professional since 1997. Our mission is to provide products of uncompromising quality with unquestionable integrity.

Alpha Science is a pharmaceutical licensed manufacturer and is an NHDP (National Health Products Directorate) site licensed facility and as such has to meet the highest standards set out by governmental health agencies. This includes meeting the requirements of Good Manufacturing Practices (GMP).

Further, Alpha Science also meets the highest standards set out by our natural health care clientele. All our products are 100% natural and contain no additives. Our products are regularly assayed for heavy metal contamination and a complete certificate of analysis verifies the purity and content of each ingredient.