Essential Fatty Acids

In the course of evolution, human beings lost the ability to make enzymes that produce the omega-3 and omega-6 fatty acids. These fatty acids are essential to life and must therefore be supplied by the diet as they cannot be synthesised by the body, hence the term essential fatty acids (EFA). hanges occurred partly in response to these dietary influences. However, rapid dietary changes over short periods of time as have occurred over the past 100- 150 years is a totally new phenomenon in human evolution.

Some indications that an EFA deficiency or imbalance are present are: dry skin; the need to use moisturizing creams and lotions; "chicken skin", the presence of tiny rough bumps, usually on the back of the arms; dry or unruly hair; dandruff; soft, fraying or brittle nails; menstrual cramps; premenstrual breast tenderness.

EFAs support cells by:

Keeping membranes fluid and flexible

Holding proteins in the cell membrane, easing the traffic of nutrients and promoting normal detoxification

Contributing to structural parts of the cell (endoplasmic reticulum, the Golgi apparatus, the vesicles, the mitochondria, the nucleolus and the nucleus)

Facilitating electrical channels on the membrane, allowing bioelectrical messages to pass from cell to cell (important in neural transmission)

Omega-3 Fatty Acids

Omega-3 fatty acids fall into two major categories: plant derived, yielding alpha-linolenic acid or marine derived (fish oil, yielding both EPA and DHA).

The omega-3 fatty acids can be supplied as **alpha-linolenic acids (ALA)** (from green leafy vegetables, canola [rapeseed], flaxseed [linseed] oils, soybean, walnut, and Brazil nuts), **Eicosapentaenoic Acid (EPA)** (seafood) and **Docosahexaenoic Acid (DHA)** (available from tuna, tuna/salmon oil, organ meats: brain, liver, DHA enriched foods).

Deficiency Signs

- Growth retardation
- Weakness
- Impairment of vision and learning ability
- Motor incoordination
- Tingling sensations in arms and legs
- Behavioural changes

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Helping children achieve their full potential

The human brain is rich in omega-three EFAs (comprising approximately 60% of the weight of the brain); their deficiency causes abnormalities in the development and function of the nervous system as well as immune defects.

DHA in retina and postsynaptic membranes is crucial for adequate functioning of embedded proteins, i.e., rhodopsin for vision and postsynaptic receptors for neurotransmission.

Research on Omega-3

Omega-Research is a website with comprehensive studies available to access on-line which show the valuable benefits of supplementing omega-3 oils to children and adults.

Flaxseed Oil or Fish Oil?

Extensive research published since 1985 has demonstrated that **flaxseed oil** can prevent cancer, improve bone health, birth defects in animals.

Fish oils, the other concentrated source of omega-three's, have made front page news because of their ability to prevent disorders such as cancer, heart attacks, migraine headaches, and premature births, and to reverse the effects of conditions such as psoriasis, ulcerative colitis, rheumatoid arthritis and cystic fibrosis. More recently the benefits of omega-3 oils in the treatment of children with behavioural disorders is finally being accepted by the medical profession and being reported more widely in the news.

Many parents supplement flaxseed oil to their children instead of fish oils in the belief that the body will convert to EPA and DHA (seeEssential Fatty Acids diagram). However, conversion of ALA to DHA is either limited or absent in adults. In a trial where participants were given 3g of a- Linolenic acid from flaxseed oil, plasma **EPA levels at 12 weeks in the flaxseed oil group increased by 60%,**and docosapentaenoic acid (DPA) levels increased by 25%. Plasma **DHA levels did not change**. Even so the conversion of alpha-lenolenic acid (ALA) to EPA depends on the efficiency of the **enzyme delta-6-desaturase,** can be inhibited by various conditions such as a diet high in linoleic acid (Omega-6), trans-fatty acids such as fast foods and baked goods, alcohol intake, certain health conditions, and the lack of co-factors, including **vitamin B6, B3, vitamin C, magnesium** and **zinc**. Also there is competition between omega-3 and omega-6 for the delta-6-desaturase enzyme.

For the sake of balance regarding the conversion of ALA to EPA and DHA there is counter argument put forward by Dr Udo Erasmus, author of the book "Fats That Heal Fats That Kill". What would happen if a person could not convert ALA to EPA and DHA? They would be dead! Therefore the studies that there is no or minimal conversion of ALA to DHA are misleading.

Conversion of ALA to DHA and EPA is decreased by low vitamin B6, B3, C, magnesium, zinc, and being male (females convert more effectively due to oestrogen). If DHA is low it lasts longer in the body and conversion in the brain is 2-6 times faster than in other tissues. Studies that measure peripheral levels of EPA and DHA are not reflective of tissue levels, especially brain levels.

Fish oils are highly processed to ensure purity from contaminants (heavy metals, dioxins and PCBs) and to ensure a pleasant taste to increase patient compliance. However this increases **processing damage molecules** (molecules damaged by processing). Manufacturers don't talk about processing damage, the focus is only on industrial toxin levels.

No manufacturer lists levels of the following processing damage molecules in their product specifications:

- cross-linked molecules
- cyclized molecules
- fragmented molecules
- double bond shifted molecules
- trans fatty acids
- polymerized molecules

No studies have been undertaken to examine the possible adverse effects of these molecules. It is interesting to note that studies using fish oils published pre-2003 show better results than studies published post-2003 with more highly refined / deodorised oils.
For an excellent **review** by Dr Udo Erasmus, click here.

So the question remains, seed oils or fish oils?

In my clinic I use both depending on need. Fish oils especially cod liver oil (Nordic Naturals Arctic Cod Liver Oil) if there is a requirement for additional vitamin A and/or vitamin D. A blend of seed oils with a balance of omega-3, 6 and 9 essential fatty acids if high levels of vitamin A and D are not required or if fish oil compliance is an issue.
Udo has been researching essential fatty acids for over 25 years and has developed a pure, cold extracted blend of oils (Udo's Ultimate Oil Blend), and if additional DHA is required (expectant mothers or young children) then an oil blend is now available with DHA extracted from algae (Udo's DHA Blend). Care if there is a sensitivity to soy as this oil blend contains lecithin which is soy based.

Omega-6 Fatty Acids

Although most people consume more than enough of the omega-6 EFAs, there is a small but significant proportion of the population (about fifteen per cent, who are unable to properly metabolize omega-6 EFAs and will benefit from supplementation with oils that are rich in omega-6's.

Deficiency Signs

- Skin problems (itching, eczema, dry patches)
- Hair that is thin and weak
- Nails that crack and break
- Behavioural changes

The three most useful omega-six rich oils are **evening primrose oil, borage oil** and **black currant seed oil**. These oils contain **gamma-linolenic acid (GLA)**, which allows the body to produce compounds called prostaglandins which help control inflammation, dilate blood vessels, promote healing and regulate water loss.
In some conditions such as **kryptopyrrole** disorder there is a requirement for more omega-6 rather than omega-3.

Interactions and Precautions

Unfortunately we cannot inter-convert Omega 3 and Omega 6 fatty acids within our bodies, so it is essential to eat the right proportions. When we get this ratio too far out of balance, problems can develop:

- Excessive levels of Omega- 3 may reduce blood clotting time.
- Excessive levels of Omega- 6 increases the risk of coronary heart disease.

Essential Fatty Acids and Autism

Listed below are a number of studies that have looked at the deficiencies of, and benefits of essential fatty acids in autism.

Omega-3 Fatty Acids Supplementation in Children with Autism: A Double-blind Randomized, Placebo-controlled Pilot Study.

Essential fatty acids and phospholipase A2 in autistic spectrum disorders.

Plasma fatty acid levels in autistic children.

Fatty acid metabolism in neurodevelopmental disorder: a new perspective on associations between attention-deficit/hyperactivity disorder, dyslexia, dyspraxia and the autistic spectrum.

Clinical trials of fatty acid treatment in ADHD, dyslexia, dyspraxia and the autistic spectrum.