CYTOPLAN

TECHNICAL INFORMATION SERIES

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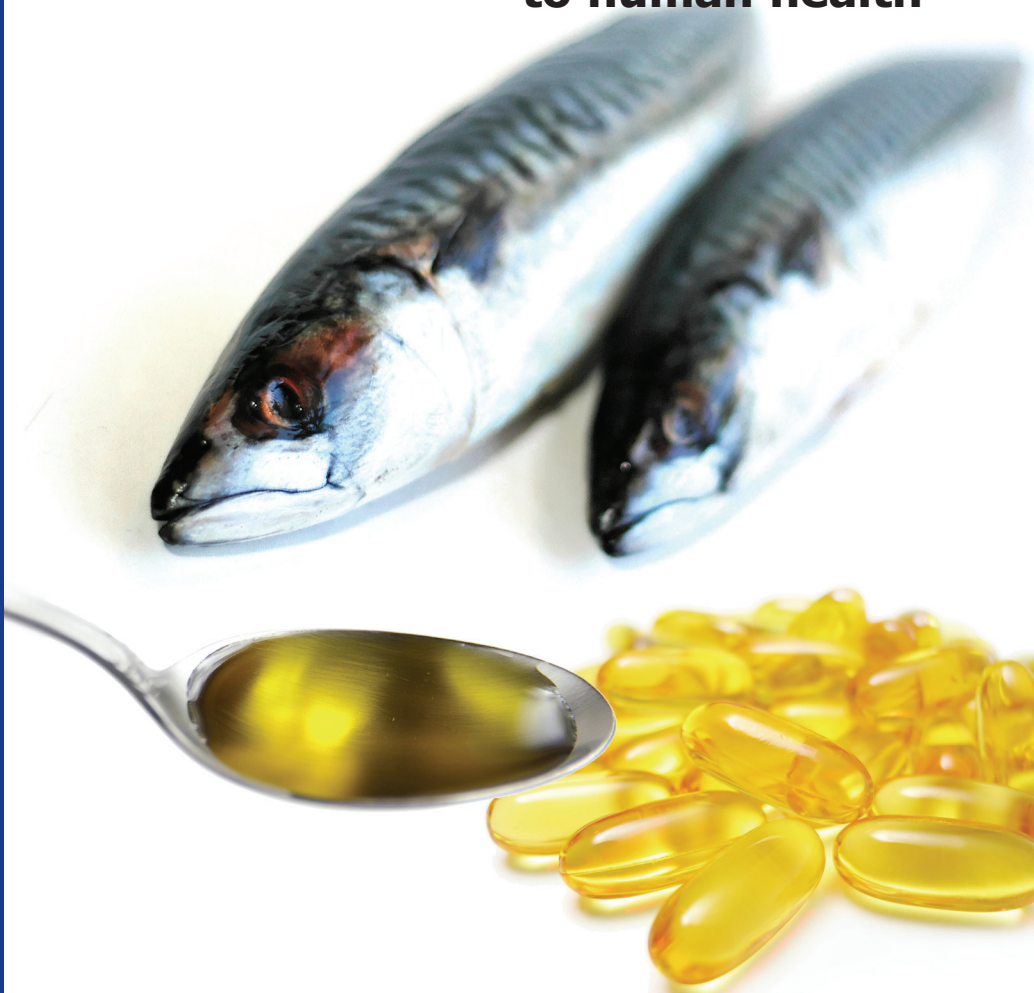
ISSUE 4

The benefits of Fish Oils to human health



There are good fats and there are bad fats. Artificially produced trans-fatty acids are bad in any amount and saturated fats from animal products should be kept to a minimum. The best fats (or oils, rather, since they are liquid at room temperature), are those that contain the essential fatty acids, so named because without them we die. Essential fatty acids are polyunsaturated and grouped into two families, the omega-6 EFAs and the omega-3 EFAs.

Seemingly minor differences in their molecular structure make the two EFA families act very differently in the body. While the metabolic products of omega-6 acids promote inflammation, blood clotting and tumour growth, the omega-3 acids act in an entirely opposite manner.

Although we do need both omega-3s and omega-6s, it is becoming increasingly clear that an excess of omega-6 fatty acids can have dire consequences. Many scientists believe that a major reason for the high incidence of heart disease, hypertension, diabetes, obesity, premature aging and some forms of cancer is the profound imbalance between our intakes of omega-6 and omega-3 fatty acids. Our ancestors evolved on a diet with a ratio of omega-6 to omega-3 of about 1:1. A massive change in dietary habits over the last few centuries has changed this ratio to something closer to 20:1 and this spells trouble. [1-3]

Sources and requirements

The main sources of omega-6 fatty acids are vegetable oils, such as corn oil and soy oil, that contain a high proportion of linoleic acid. Omega-3 acids are found in flaxseed oil, walnut oil, marine plankton and fatty fish. The main component of flaxseed and walnut oils is alpha-linolenic acid, while the predominant fatty acids found in fatty fish and fish oils are

eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The most beneficial and active of these fatty acids are EPA and DHA. Alpha-linolenic acid can be converted to EPA and DHA in the body, but the conversion is quite inefficient: especially in older people. [1, 2]

Scientists were first alerted to the many benefits of EPA and DHA in the early 1970s, when Danish physicians observed that Greenland Eskimos had an exceptionally low incidence of heart disease and arthritis despite the fact that they consumed a high-fat diet. Intensive research soon discovered that two of the fats (oils) they consumed in large quantities, EPA and DHA, were actually highly beneficial. More recent research has established that fish oils (EPA and DHA) play a crucial role in the prevention of atherosclerosis, heart attack, depression and cancer. Clinical trials have shown that fish oil supplementation is effective in the treatment of many disorders, including rheumatoid arthritis, diabetes, ulcerative colitis, and Raynaud's disease. [1-5]

Recognising the unique benefits of EPA and DHA and the serious consequences of a deficiency, the US National Institute of Health recently published Recommended Daily Intakes of fatty acids. They recommend a total daily intake of 650 mg of EPA and DHA, 2.22g/day of alpha-linolenic acid and 4.44g/day of linoleic acid. Saturated fat intake should not exceed 8 per cent of total calorie intake, or about 18g/day. Whilst it is recognised that ALA does have the potential to be converted to DHA/EPA, this conversion process is often not efficient: particularly in older people, which is why the intake needs to be so much higher of ALA than DHA/EPA.

The other problem faced by those taking ALA from vegetable sources is that the enzyme that is needed to convert ALA to DHA and EPA is the very same enzyme that converts omega 6 to its metabolites, and the omega 6 fatty acids have priority of

uptake. See diagrams on pages 9 and 10. There is also a risk that if one consumes an oil that contains omega 3, 6 and 9, omega 6 will be given priority by the body on this enzyme and omega 3 may not be converted.

It is clearly best to obtain DHA/EPA from fish sources, but if you choose to use flax oil it is best to take it separately from any other fat or oil sources to give the omega 3 fatty acids a clear run on the convertase enzyme.

Good For The Brain

The human brain is one of the largest "consumers" of DHA. A normal adult human brain contains more than 20 grams of DHA. Low DHA levels have been linked to low brain serotonin levels, which again are connected to an increased tendency to depression, suicide and violence. A high intake of fish has been linked to a significant decrease in age-related memory loss and cognitive function impairment and a lower risk of developing Alzheimer's disease. A recent study found that Alzheimer's patients given an omega-3-rich supplement experienced a significant improvement in their quality of life.[6-9]

Several studies have established a clear association between low levels of omega-3 fatty acids and depression. Other studies have shown that countries with a high level of fish consumption have fewer cases of depression. Researchers at Harvard Medical School have successfully used fish oil supplementation to treat bipolar disorder (manic-depressive illness), and British researchers report encouraging results in the treatment of schizophrenia. [10-15]

Researchers at the University of Wyoming have found that supplementation with 3.3 grams/day of fish oil markedly reduces breathing difficulties and other symptoms in asthma

patients. Other research has found fish oil to be beneficial in the treatment of other lung diseases, such as cystic fibrosis and emphysema. [23- 29]

The Heart's Best Friend

An enormous amount of medical literature testifies to the fact that fish oils prevent and may help to ameliorate or reverse atherosclerosis, angina, heart attack, congestive heart failure, arrhythmias, stroke, and peripheral vascular disease. Fish oils help maintain the elasticity of artery walls, prevent blood clotting, reduce blood pressure and stabilise heart rhythm. [1-4, 30-33]

Danish researchers have concluded that fish oil supplementation may help prevent arrhythmias and sudden cardiac death in healthy men. An Italian study of 11,000 heart attack survivors found that patients supplementing with fish oils markedly reduced their risk of another heart attack, a stroke or death. A group of German researchers found that fish oil supplementation for 2 years caused regression of atherosclerotic deposits, and American medical researchers report that men who consume fish once or more every week have a 50% lower risk of dying from a sudden cardiac event than do men who eat fish less than once a month. [34-40]

Greek researchers report that fish oil supplementation (10 grams/day) reduces the number of attacks by 41% in men suffering from angina. Norwegian medical doctors have found that fish oil supplementation reduces the severity of a heart attack, and Indian researchers report that supplementation started immediately after a heart attack reduces future complications. Bypass surgery and angioplasty patients reportedly also to benefit from fish oils, and clinical trials have shown that fish oils are safe for heart disease patients. The

evidence is indeed overwhelming. An adequate daily intake (about 1 gram) of EPA and DHA is essential to maintain a healthy heart. Fish oils are especially important for diabetics, who have an increased risk of heart disease. [41- 49]

Researchers at the University of Cincinnati have found that supplementing with as little as 2 grams/day of fish oil (410 mg of EPA plus 285 mg of DHA) can lower diastolic pressure by 4.4 mm Hg and systolic pressure by 6.5 mm Hg in people with elevated blood pressure: enough to avoid taking drugs in cases of borderline hypertension. Several other clinical trials have confirmed that fish oils are indeed effective in lowering high blood pressure and that they may work even better if combined with a program of salt restriction. [50-55]

Reduces Pain and Helps Prevent Cancer

Fish oils are particularly effective in reducing inflammation, and can be of great benefit to people suffering from rheumatoid arthritis or ulcerative colitis. Daily supplementation with as little as 2.7 grams of EPA and 1.8 grams of DHA can markedly reduce the number of tender joints and increase the time before fatigue sets in. Some studies have also noted a decrease in morning stiffness, and at least two clinical trials concluded that arthritis patients who took fish oils could eliminate, or sharply reduce, their use of NSAIDs and other arthritis drugs. [56-61]

Patients with ulcerative colitis have abnormally low blood levels of EPA. Clinical trials have shown that supplementation with fish oil (2.7 grams of EPA and 1.8 grams of DHA daily) can reduce the severity of the condition by more than 50% and enable many patients to discontinue anti-inflammatory medication and steroids. [62-64]

There is now also considerable evidence that fish oil consumption can delay or reduce tumour development in breast cancer. Studies have also shown that a high blood level of omega-3 fatty acids, combined with a low level of omega-6 acids, reduces the risk of developing breast cancer. Daily supplementation with as little as 2.5 grams of fish oils has been found effective in preventing the progression from benign polyps to colon cancer, and Korean researchers recently reported that prostate cancer patients have low blood levels of omega-3 fatty acids. Greek researchers report that fish oil supplementation improves survival and quality of life in terminally ill cancer patients. [65-73]

Safe and Easily Available

It is estimated that 85% or more of people in the Western world are deficient in omega-3 fatty acids, and most get far too much of the omega-6 fatty acids. Vegetarian diets, for example, tend to be very high in omega-6.

The recommended daily intake of EPA plus DHA is about 650 mg rising to 1000 mg/day during pregnancy and lactation. Clinical trials have used anywhere from 1g/day to 10 g/day, but little additional benefit has been observed at levels above 5 g/day of EPA and DHA combined. The benefits of therapeutic supplementation may become evident after a few weeks, when blood parameters (triglycerides, fibrinogen) are involved, but may take 3 months or longer to materialise in degenerative diseases like atherosclerosis and rheumatoid arthritis. [74, 75]

The processing and packaging of the fish oil are crucial in determining its quality. Low quality oils may be quite unstable and contain significant amounts of mercury, pesticides and undesirable oxidation products. High quality oils are

guaranteed to be clean and stable and are usually packaged in an environment that shields the delicate fatty acids from light.

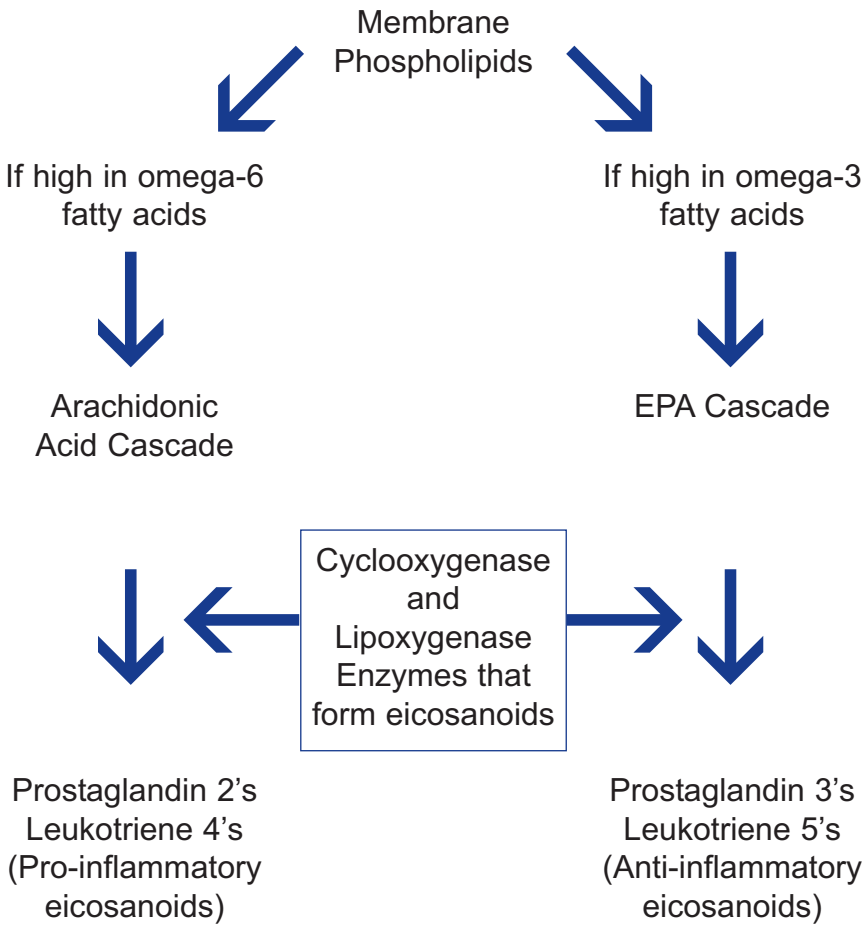
Cod liver oils and fish oils are not the same. Cod liver oil is extracted from cod liver and is an excellent source of vitamins A and D. Fish oils are extracted from the tissues (flesh) of fatty fish like salmon and herring which are good sources of EPA and DHA. Fish oils contain very little vitamin A and D, but cod liver oil does contain EPA and DHA. However, you would probably exceed the recommended daily intake of vitamins A and D if you were to try to obtain therapeutic amounts of EPA and DHA from cod liver oil.

Supplementing with fish oils has been found to be entirely safe with no significant adverse effects reported in hundreds of clinical trials using as much as 18 grams/day of fish oils.

MEDIATORS
Essential Fatty Acid Metabolism

SOURCES	OMEGA-6 PATHWAY	ENZYMES	OMEGA-3 PATHWAY	SOURCES
	LA		**ALA**	
safflower sunflower sesame	alpha linoleic acid		alpha linolenic acid	flax pumpkin hemp walnut soybean
	▼	◀ D6 ▶ delta six desaturase	▼	
	GLA gamma linolenic acid		SDA stearidonic acid	blackcurrant
borage evening primrose blackcurrant human milk fungi	▼	◀ elongase ▶	▼	
	DGLA dihomogamma linolenic acid (PGE1 - anti-inflammatory)		ETA eicosatet-ranoic acid	
	▼	◀ D5 ▶ delta five desaturase	▼	
	AA arachidonic acid	Cyclooxygenase Lipoxygenase ◀ (pro-inflammatory)	EPA eicosapentaen oic acid	fish oils
			▼	
			DPA docosapentae noic acid	
		D4 ▶ delta four desaturase Cyclooxygenase Lipoxygenase ▶ (anti-inflammatory)	▼	
			DHA docosahex-aenoic acid	fish oils marine algae

ENZYME COMPETITION



If the diet is high in omega-3 fatty acids, they will compete with arachidonic acid for enzymes necessary to form eicosanoids. If more omega-3 eicosanoids are formed, there is less inflammation.

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