

Omega-3

WINTER 2000



What is OMEGA-3?

Omega-3 fatty acids are unique types of polyunsaturated fatty acids (PUFA's) that are essential to human health and are of dietary importance since our bodies do not produce them. Recently, the role of the dietary significance of omega-3 has gained increased importance in scientific circles. In fact, controlled intervention studies in humans indicate that dietary omega-3 fatty acids provide both essential fatty acids for optimal health and offer prevention against cardiovascular disease and management of chronic disorders.

Omega-3 fatty acids are found in 3 main forms, the shorter chained alpha linolenic acid (LNA) and the longer chained eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). **See Table 1 for clarification.**

Table 1: Common Forms of Omega-3 Fatty Acids

Symbol	Abbreviation	Scientific name
18:3 n-3	LNA	alpha linolenic acid
20:5 n-3	EPA	eicosapentaenoic acid
20:6 n-3	DHA	docosahexaenoic acid

The typical North American consumes proportionately too much omega-6 and insufficient omega-3. This is because agribusiness, food technology and processing including hydrogenation has:

- greatly increased our intake of both 'trans' and omega-6, fatty acids, and
- greatly depleted the availability and consumption of foods containing omega-3 fatty acids.

There is now a much greater availability of foods high in omega-6 relative to omega-3, including corn oil, olive oil, safflower oil and soybean oil along with various processed foods.

In the average North American diet, approximately 1000-2000 mg daily of omega-3 fatty acids are consumed. The problem lies in that most of this is in the form of alpha-linolenic acid (LNA) only, as found in plant food sources such as canola and soy oils, flaxseed, walnuts, with very minor amounts in fruits and vegetables. Less than 10% of the total dietary omega-3 is consumed as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA); **These are the most physiologically important omega-3 essential fatty acids.**

Typical North American intakes of EPA/DHA are approximately 100-150 mg daily - one-fifth of what is considered necessary for the maintenance of optimal health. **See Table 2.** These special types of omega-3 fatty acids are found predominantly in fish and fish oils, and now also in a new egg replacement called Omega Pro liquid eggs and to a lesser extent, Omega 3 shell eggs.

Plant foods and vegetable oils are completely lacking in EPA and DHA.

Table 2: Adequate Intakes (AI) for Adults

Fatty Acid	Grams/Day (based on 2000kcal/diet)	% of Energy
Omega-6 or Linoleic acid	4.44	2.0
Omega-6 (Upper limit)	6.67	3.0
Omega-3 as LNA	2.22	1.0
Omega-3 as DHA plus EPA	0.65	0.3
Omega-3 as DHA (lower limit)	0.22	0.1
Omega-3 as EPA (lower limit)	0.22	0.1

Note: For pregnant and lactating women, ensure at least 300 mg/day (0.3 gm/day) of DHA.

Health Canada says...

Excitement has been fuelled by official recognition from governmental agencies and expert health groups that omega-3 fatty acids are essential dietary nutrients for optimal human health. In 1990, Health Canada established recommended minimal intakes of dietary omega-3 fatty acids for all sectors of the Canadian population. While Health Canada only recommends TOTAL omega-3, evidence for the health promoting, disease preventing and managing potential of EPA and DHA has continued to mount in leading scientific and clinical journals.

The downside of not getting enough OMEGA-3 as DHA and EPA.

- Inadequate levels of DHA and EPA in the adult diet has been linked to an increase in heart disease and all cause mortality.
- Research suggests that pregnant and nursing mothers do not get enough DHA for the development of unborn children and infants.
- The depletion of DHA levels to sub-optimal concentrations in the brain and retina due to insufficient intakes of this essential nutrient has been associated with impaired learning ability and reduced visual performance.

This is why...

Certain body tissues are highly enriched in the long-chain omega-3 fatty acids – EPA and DHA. For example;

- The high levels of DHA in the brain and retina accounts for the physiological essentiality of this nutrient.
- The membranes of the heart, blood cells and other tissues are enriched in EPA and DHA when omega-3 fatty acids are consumed.

LNA is found in much lower amounts in the cells and tissues of the body as compared to EPA and DHA while dietary LNA is inefficiently converted into the longer chain DHA and EPA.

In fact, recent research suggests that only 4% of LNA is converted into the longer chain DHA in adults and less than 1% is converted in infants.

Good News for the heart...

There is extensive published epidemiological evidence to indicate that increased consumption of foods containing the omega-3 fatty acids DHA plus EPA offers *considerable protection against cardiovascular disease (CVD) and death from myocardial infarctions.*

- Fish and fish oils enriched in EPA/DHA favourably reduce several risk factors for CVD independently of a blood cholesterol-lowering effect.
- Intervention trials have demonstrated a lowering of circulating triglyceride levels, lowered blood viscosity, reduced blood platelet reactivity/thrombogenicity, along with other beneficial effects which, in combination, likely contribute to the reduced mortality from CVD in those with higher intakes and corresponding higher levels of EPA/DHA in the circulation and in tissues.
- *Considerable attention has been given recently to evidence from animal and human studies supporting the anti-arrhythmic effect of EPA/DHA enrichment in cardiac tissue with respect to reduced myocardial damage with infarction and reduced sudden cardiac death.*
- Data from the MRFIT study indicate that increasing the intake of EPA/DHA (combined), up to approximately 650-700mg daily over several years is associated with *reductions* in both coronary disease-related and all-cause mortality from cardiovascular disease and, cancer.
- Recent clinical trials indicate that fish oil concentrates providing 1000-1500mg daily of EPA/DHA (combined) can retard the progression of CVD as measured by angiography in patient groups.
- Very recently, the GISSI-Prevenzione Study has reported that, over and above the clinical use of appropriate pharmaceutical therapeutics plus a Mediterranean-type diet including fish, supplementation with 900mg daily of EPA/DHA (combined) could reduce sudden cardiac death by approximately 45% in patients having a previous myocardial infarction. Note that vitamin E supplementation was without effect.

Other benefits of increased OMEGA-3 intake.

In addition to CVD-directed applications and risk factor modifications, supplementation with omega-3 enriched fish oil has been found to be beneficial in selected inflammatory disorders such as rheumatoid arthritis, bowel disorders, autoimmune disorders (IgA nephropathy), and specific neurological plus psychiatric disorders.

Increasing dietary intakes of omega-3 fatty acids will increase the levels of EPA plus DHA in the body and has been indicated to;

- improve health with respect to brain and retina functioning and
- aid in the prevention and control of various chronic conditions including cardiovascular, inflammatory, and neurological disorders.

Evidence from published research indicates that DHA is a physiologically essential nutrient for early human development and functioning including neuronal performance and visual acuity.

- Sufficient maternal intakes of DHA during pre-conception and pregnancy provide DHA for its active accumulation in the brain of the developing fetus.
- Ample intakes of dietary DHA during lactation also results in higher levels of DHA being available in breast milk.
- Randomized controlled trials in term infants given infant formula lacking DHA (as is the current North American situation) versus milk formula supplemented with 0.35% DHA, indicated that early dietary supply of DHA was a major determinant of improved performance on the mental development index for the latter group.

Food Sources of OMEGA-3 fatty acids...

Plant based foods are the best sources of LNA, including flaxseed, walnuts, soy and canola oils and to a lesser extent in green leafy vegetables. See Table 3 for a summary of the omega-3 content in different food sources. Although certain types of coldwater fatty fish provide the highest concentration of the longer chain physiologically essential DHA and EPA, there are now other food sources available including egg-based products like Omega Pro liquid eggs and Omega 3 shell eggs.

Table 3: Omega-3 Fatty Acid (as DHA, EPA and LNA) Content of Selected Fish and Plant Foods

Fish/Seafood	DHA+ EPA mg/ 250 cal.	Omega-3 Fatty acids,EPA,DHA, LNA (mg/typical serving)		
		Serving Size	DHA + EPA	LNA
Mackerel	3,050	100 g	2,500	100
Herring	2,500	100 g	1,600	100
Salmon	2,100	100 g	1,200	200
Trout	1,050	100 g	500	100
Halibut	910	100 g	400	100
Tuna	690	100 g	400	<50
Shrimp	470	100 g	200	<50
Cod	910	100 g	300	<50
Egg Based foods				
Omega Pro liquid eggs	1,800	100 g	500	50
Flax based Omega 3 shell eggs	275	100 g	165	61
Plant-derived foods				
Flaxseed	0	75 g	0	17,000
Walnuts	0	50 g	0	3,000
Nuts (mixed)	0	75 g	0	150
Vegetables (mixed)	0	75 g	0	300
Beans/Peas (common)	0	75 g	0	300
Canola Oil (monohydrogenated)	0	14 g	0	1,400
Soya oil (non-hydrogenated)	0	14 g	0	980
Olive Oil	0	14 g	0	Trace
Corn oil	0	14 g	0	Trace
Vegetable oil	0	14 g	0	Trace

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