

Omega-3 Fatty Acids

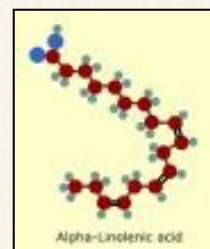
Omega-3 fatty acids are polyunsaturated, meaning they contain more than one double bond. They are called omega-3 because the first double bond counting from the methyl end of the fatty acid is located at the third carbon.

Types

- Alpha-linolenic acid (ALA)
- Eicosapentaenoic acid (EPA)
- Docosahexaenoic acid (DHA)

Alpha-linolenic acid (ALA)

The scientific abbreviation is 18:3n-3, signifying that ALA is an 18-carbon fatty acid with 3 double bonds (18:3). The second portion (n 3) demonstrates that ALA is an omega-3 fatty acid. ALA is essential, but cannot be synthesized in humans; therefore, it must be obtained from the diet. Other longer chain omega-3 fatty acids can be synthesized in the body from ALA. This includes EPA and DHA.



EPA and DHA

The scientific abbreviation for EPA is 20:5n-3, and for DHA 22:6n-3. These two omega-3 fatty acids are referred to as marine-derived omega-3 fatty acids because they occur abundantly in certain species of fish, whereas ALA is considered a plant-derived omega-3 fatty acid.

Alpha-linolenic acid:

Sources



Food	Serving	ALA (g)
Flaxseed Oil	1 tablespoon	8.5
Walnuts, English	1 ounce	2.6
Flaxseeds	1 tablespoon	2.2
Walnut Oil	1 tablespoon	1.4
Canola Oil	1 tablespoon	1.2
Mustard Oil	1 tablespoon	0.8
Soybean Oil	1 tablespoon	0.9
Walnuts, Black	1 ounce	0.6
Olive Oil	1 tablespoon	0.1

EPA and DHA: Sources

Food	Serving	EPA (g)	DHA (g)	Amt providing 1g of EPA + DHA
Herring, Pacific, Cooked	3 ounces	1.06	.75	1.5 ounces
Salmon, Chinook, cooked	3 ounces	.86	.62	2 ounces
Salmon, Atlantic, cooked	3 ounces	.28	.95	2.5 ounces
Oysters, Pacific, cooked	3 ounces	.75	.43	2.5 ounces
Salmon, Sockeye, cooked	3 ounces	.45	.60	3 ounces
Trout, Rainbow, cooked	3 ounces	.40	.44	3.5 ounces
Tuna, white, in water	3 ounces	.20	.54	4 ounces
Crab, Dungeness, cooked	3 ounces	.24	.10	9 ounces
Shrimp, cooked	3 ounces	.15	.12	11 ounces
Cod, Pacific, cooked	3 ounces	.09	.15	12.5 ounces
Fish oil, Menhaden	1 gram	.13	.09	5 grams
Fish oil, Salmon	1 gram	.13	.18	3 grams

Benefits of Fish and Omega 3 fatty acids

Coronary Heart Disease (CHD)

A study following 1,822 men for 30 years found that mortality from CHD was 38% lower in men who consumed an average of at least 35 g (1.2 ounces) of fish daily than in men who did not eat fish, while mortality from myocardial infarction (MI) was 67% lower.



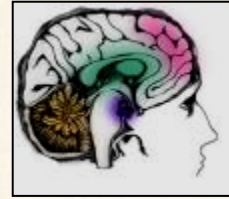
Results of randomized controlled trials in individuals with documented coronary heart disease continue to suggest a beneficial effect of dietary and supplemental omega-3 fatty acids. Therefore, the American Heart Association has recommended that individuals with documented CHD consume 1 g/day of EPA and DHA combined.

Sudden Cardiac Death

In a prospective study, omega-3 fatty acid intakes equivalent to two fatty fish meals per week were associated with a 50% decrease in the risk of primary cardiac arrest. Plasma levels were inversely related to the risk of sudden death, further supporting the idea that omega-3 fatty acids are partially responsible for the beneficial effect of fish consumption in decreasing the risk of sudden cardiac death.

Stroke

A stroke is a result of impaired blood flow to a region of the brain, which may be due to obstruction of a blood vessel by a blood clot (thrombotic or ischemic stroke) or the rupture of a blood vessel (hemorrhagic stroke).



Studies suggest that increased omega-3 fatty acid intake by eating more fish may decrease the incidence of stroke and the risk of thrombotic or ischemic stroke, but not hemorrhagic stroke.

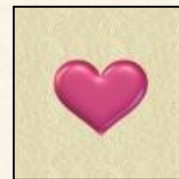
Cancer



Animal models have shown beneficial results from increased intakes of EPA and DHA. Additionally, cell culture studies have shown promising results. However, in human studies, few have demonstrated significant relationships between fish or omega-3 fatty acid intake and the risk for breast, prostate, or colorectal cancers.

Diabetes Mellitus

Cardiovascular diseases are the leading causes of death in individuals with diabetes. Hypertriglyceridemia (fasting serum TG of 200 mg/dl or higher) is a common lipid abnormality in individuals with Type 2 diabetes. There have been a number of randomized controlled trials that have found fish oil supplementation significantly lowers serum triglyceride levels in diabetic individuals.

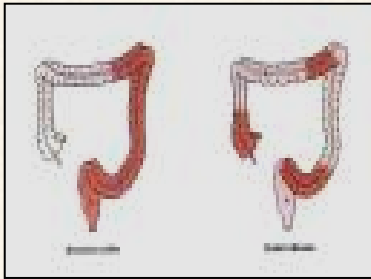


A 16-year study found that those with higher fish intakes were associated with significantly decreased risks of CHD over the duration of the study, suggesting that increasing EPA and DHA may be beneficial to diabetic individuals, especially those with elevated serum triglycerides.

Inflammatory Diseases



Rheumatoid arthritis is the most common systemic inflammatory rheumatic (joint) disease. Studies have determined the effects of omega-3 fatty acids on rheumatoid arthritis. Clinical benefits were observed at a minimum dose of 3g/day of EPA and DHA, and were not apparent until at least 12 weeks of supplementation.



Inflammatory Bowel Disease

Ulcerative Colitis and Crohn's disease

Individuals with Crohn's disease supplemented with EPA and DHA, remained in remission longer than those given a placebo. In studies of ulcerative colitis, supplementation with EPA and DHA had significant improvements.

Immunoglobulin A

Nephropathy

This is an immune function disorder in the kidneys. Omega-3 fatty acids have the potential to modulate immune function and a study is under way to compare traditional treatment versus fish oil supplementation.

Pennington Nutrition Series, Number 5, 2005

Authors:

Heli Roy PhD, RD
Shanna Lundy, BS
Beth Kalicki

Division of Education

Phillip Brantley PhD, Director
Pennington Biomedical Research Center
Claude Bouchard PhD, Executive Director

Edited : October 2009

References:

Siscovick DS, et al. JAMA. 1995;274(17):1363-1367
Daviglius ML, et al. N Engl J Med. 1997;336(15):1046-1053.
Montori VM, et al. Diabetes Care. 2000;23(9):1407-1415.
Fortin PR, et al. J Clin Epidemiol. 1995;48(11):1379-1390.
Kremer JM. Am J Clin Nutr. 2000;71(1 Suppl):349S-351S.

The Pennington Biomedical Research Center is a world-renowned nutrition research center.

Mission:

To promote healthier lives through research and education in nutrition and preventive medicine.

The Pennington Center has several research areas, including:

- Clinical Obesity Research
- Experimental Obesity
- Functional Foods
- Health and Performance Enhancement
- Nutrition and Chronic Diseases
- Nutrition and the Brain
- Dementia, Alzheimer's and healthy aging
- Diet, exercise, weight loss and weight loss maintenance

The research fostered in these areas can have a profound impact on healthy living and on the prevention of common chronic diseases, such as heart disease, cancer, diabetes, hypertension and osteoporosis.

The Division of Education provides education and information to the scientific community and the public about research findings, training programs and research areas, and coordinates educational events for the public on various health issues.

We invite people of all ages and backgrounds to participate in the exciting research studies being conducted at the Pennington Center in Baton Rouge, Louisiana. If you would like to take part, visit the clinical trials web page at www.pbrc.edu or call (225) 763-3000.