

# Essential Fatty Acid Basics

PHYSICIANS COMMITTEE FOR RESPONSIBLE MEDICINE

5100 WISCONSIN AVE., N.W., SUITE 400 • WASHINGTON, DC 20016  
PHONE (202) 686-2210 • FAX (202) 686-2216 • PCRM@PCRM.ORG • WWW.PCRM.ORG

The body can synthesize most of the fats it needs from the diet. However, two essential fatty acids, linolenic and linoleic acid, cannot be synthesized in the body and must be obtained from food. These basic fats, found in plant foods, are used to build specialized fats called omega-3 and omega-6 fatty acids.<sup>1</sup> Omega-3 and omega-6 fatty acids are important in the normal functioning of all tissues of the body.

Deficiencies in these fatty acids lead to a host of symptoms and disorders including abnormalities in the liver and the kidneys, reduced growth rates, decreased immune function, depression, and dryness of the skin. Adequate intake of the essential fatty acids results in numerous health benefits. Documented benefits include prevention of atherosclerosis, reduced incidence of heart disease and stroke, and relief from the symptoms associated with ulcerative colitis, menstrual pain, and joint pain.<sup>2-4</sup> Omega-3 fatty acid levels have also been associated with decreased breast cancer risk.<sup>5,6</sup>

It is not only important to incorporate good sources of omega-3 and omega-6s in your diet, but also consume these fatty acids in the proper ratio. Omega-6 fatty acids compete with omega-3 fatty acids for use in the body,<sup>7</sup> and therefore excessive intake of omega-6 fatty acids can inhibit omega-3s. Ideally, the ratio of omega-6 to omega-3 fatty acids should be between 1:1 and 4:1.<sup>8</sup> Instead, most Americans consume these fatty acids at a ratio of omega-6:omega-3 between 10:1 and 25:1, and are consequently unable to reap the benefits of omega-3s.<sup>9</sup> This imbalance is due to a reliance on processed foods and oils, which are now common in the Western diet. To combat this issue it is necessary to eat a low-fat diet with minimal processed foods and with naturally occurring omega-3 fatty acids. A lower omega-6:omega-3 ratio is desirable for reducing the risk of many chronic diseases.<sup>9</sup>

## Omega-6 Fatty Acids

Omega-6 fats are derived from linoleic acid and are found in leafy vegetables, seeds, nuts, grains, and vegetable oils (corn, safflower, soybean, cottonseed, sesame, sunflower).<sup>3</sup> Most diets provide adequate amounts of this fatty acid, and therefore planning is rarely required to ensure proper amounts of omega-6 fatty acids.

A less common omega-6 fatty acid, gamma-linolenic acid (GLA), has been shown to have anti-inflammatory effects along with other disease-fighting powers.<sup>10</sup> GLA can be found in rare oils such as black currant, borage, and hemp oils.<sup>3</sup>

## Omega-3 Fatty Acids

It is vital for everyone to eat foods that are rich in omega-3

fatty acids on a daily basis. Unlike omega-6 fatty acids, it may take more planning in the diet to ensure adequate intake of these fatty acids. Omega-3s are used in the formation of cell walls and assist in improving circulation and oxygen uptake. The recommended amount for adequate omega-3 intake is 1.1 and 1.6 grams per day for women and men over the age of 14, respectively.<sup>11</sup>

Omega-3 fatty acids are derived from linolenic acid. The principal omega-3 is alpha-linolenic acid (ALA), which is then converted into eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) by the body. This makes ALA the only essential omega-3 fatty acid. ALA can be found in many vegetables, beans, nuts, seeds, and fruits.

Some of the best sources of ALA include flaxseeds and walnuts, along with different oils such as flaxseed, canola, soybean, walnut, and wheat germ. Omega-3 fatty acids can be found in smaller quantities in nuts, seeds, and soy products, as well as in beans, vegetables, and whole grains. Corn, safflower, sunflower, and cottonseed oils also contain omega-3s, though in lower levels than the previously mentioned oils.

## Fish for Omega-3s?

While fish are frequently referenced as good sources of essential fatty acids, the high amounts of other fats and cholesterol and the lack of fiber make fish poor dietary choices. Fish are also often high in mercury and other environmental toxins that pose dangers to the consumer.

Fish oils have been popularized as an omega-3 supplemental option. However, the omega-3s found in fish oils (EPA and DHA) are actually highly unstable molecules that tend to decompose and unleash dangerous free radicals, making these supplements an unfavorable option. In addition, current research demonstrates that taking fish oil supplements does not actually produce significant protection on cardiovascular health.<sup>12</sup>

Obtaining omega-3s from plant sources is more beneficial for one's health. Research has shown that omega-3s are found in a more stable form, ALA, in vegetables, fruits, and beans.<sup>13</sup> For healthy individuals, natural conversion of ALA to the longer chain omega-3s, DHA and EPA, should be sufficient to maintain tissue function.<sup>14</sup> In fact, according to a European Prospective Investigation into Cancer and Nutrition (EPIC) study, women on vegan diets actually have more long-chain omega-3s in their blood compared with fish-eaters, meat-eaters, and lacto-ovo vegetarians.<sup>15</sup>

## Flaxseeds for Omega-3s

Flaxseed oil and ground flaxseeds are particularly good choices to meet your needs for omega-3 fatty acids. One teaspoon of flaxseed oil or one tablespoon of ground flaxseed will supply the daily requirement of ALA. Flaxseeds must be ground in order for you to absorb the proper nutrients, and flaxseed oil or ground flaxseeds must be stored in the refrigerator or the freezer to protect them from oxygen damage. Also, keep in mind that heat will damage the omega-3s in flaxseed oil, so it is important not to heat this oil. A spoonful of ground flaxseeds can be added to a smoothie or sprinkled on breakfast cereal, a salad, or other dish for easy and efficient incorporation of omega-3s into the diet.

## Plant Foods Rich in Omega-3 Fatty Acids

- Ground flaxseed (flax meal)
- Walnuts
- Soybeans
- Mungo beans\*

## Omega-3 Content of Natural Oils<sup>16,17</sup>

- Flaxseed 53-62%
- Linseed 53%
- Canola 11%
- Walnut 10%
- Wheat germ 7%
- Soybean 7%

## References

1. Groff JL, Gropper SS, Hunt SM. *Advanced Nutrition and Human Metabolism*. New York: West Publishing Company; 1995.
2. Linscheer WG, Vergroesen AJ. Lipids. In: Shils ME, Olson JA, Shike M, eds. *Modern Nutrition in Health and Disease*. 8th ed. Philadelphia, PA: Lea and Febiger; 1994.
3. Barnard N. *Foods That Fight Pain*. New York, NY: Harmony Books; 1998.
4. Omega-3 fatty acids and depression: new data. *Harv Ment Health Lett*. 2003;19:7.
5. Thiébaud AC, Chajés V, Gerber M, et al. Dietary intakes of omega-6 and omega-3 polyunsaturated fatty acids and the risk of breast cancer. *Int J Cancer*. 2009;124:924-931.
6. Yee LD, Lester JL, Clinton SK, et al.  $\omega$ -3 Fatty acid supplements in women at high risk of breast cancer have dose-dependent effects on breast adipose tissue fatty acid composition. *Am J Clin Nutr*. 2010;91:1185-1194.
7. Lands WE, Morris A, Libelt B. Quantitative effects of dietary polyunsaturated fats on the composition of fatty acids in rat tissues. *Lipids*. 1990;25:505-516.
8. Simopoulos AP. Essential fatty acids in health and chronic disease. *Am J Clin Nutr*. 1999;70:560S-569S.
9. Simopoulos AP. The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Exp Biol Med (Maywood)*. 2008;233:674-688.
10. Kapoor R, Huang YS. Gamma linolenic acid: an antiinflammatory omega-6 fatty acid. *Curr Pharm Biotechnol*. 2006;7:531-534.
11. IOM. *Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press; 2002.

## Pregnancy and Lactation

It is especially important to obtain adequate essential fatty acids from the diet during pregnancy and lactation. Recent research suggests that these fatty acids are needed for fetal growth and fetal brain development. Essential fatty acids are also important for infants in order to ensure proper growth and development, and normal functioning of all tissues of the body. Increased omega-3 fatty acid intake in the immediate post-natal period is associated with improved cognitive outcomes.<sup>18</sup>

It is important that the mother's diet contain a good supply of omega-3s because infants receive essential fatty acids through breast milk.<sup>19</sup> Pregnant women and lactating mothers may also opt to take a DHA supplement. A DHA supplement based on cultured microalgae is available in many natural food stores.

## Conclusion

Whether you are interested in promoting heart health, ensuring the proper growth and development of your child, or relieving pain, adequate intake of the essential fatty acids can help you achieve your goal. A well-planned plant-based diet rich in fruits, vegetables, nuts, seeds, and legumes will allow you to obtain plenty of these omega-6s and omega-3s for optimal health benefits.

\*Mungo beans are particularly high in omega-3 fatty acids.

They are sold in many Indian groceries and may be found under the name "urid."

12. Kwak SM, Myung SK, Lee YJ. Efficacy of omega-3 fatty acid supplements (eicosapentaenoic acid and docosahexaenoic acid) in the secondary prevention of cardiovascular disease: a meta-analysis of randomized, double-blind, placebo-controlled trials. *Arch Intern Med*. 2012;172:986-994.
13. Odeleye OE, Watson RR. Health implications of the n-3 fatty acids. *Am J Clin Nutr*. 1991;53:177-178.
14. Williams CM, Burdge G. Long-chain n-3 PUFA: plant v. marine sources. *P Nutr Soc*. 2006;65:42-50.
15. Welch AA, Shakya-Shrestha S, Lentjes MAH, Wareham NJ, Khaw KT. Dietary intake and status of n-3 polyunsaturated fatty acids in a population of fish-eating and non-fish-eating meat-eaters, vegetarians, and vegans and the precursor-product ratio of  $\alpha$ -linolenic acid to long-chain n-3 polyunsaturated fatty acids: results from the EPIC-Norfolk cohort. *Am J Clin Nutr*. 2010;92:1040-1051.
16. Hunter JE. n-3 Fatty acids from vegetable oils. *Am J Clin Nutr*. 1990;51:809-814.
17. Mantzioris E, James MJ, Gibson RA, Cleland LG. Dietary substitution with an  $\alpha$ -linolenic acid-rich vegetable oil increases eicosapentaenoic acid concentrations in tissues. *Am J Clin Nutr*. 1994;59:1304-1309.
18. Makrides M, Gibson RA, McPhee AJ, et al. Neurodevelopmental outcomes of preterm infants fed high-dose docosahexaenoic acid: a randomized controlled trial. *JAMA*. 2009;301:175-182.
19. Makrides M, Gibson RA. Long-chain polyunsaturated fatty acid requirements during pregnancy and lactation. *Am J Clin Nutr*. 2000;71(1 Suppl):307S-311S.