

# USANA Technical Bulletin

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## Essential Fatty Acids

### Technical Background

- Fatty acids (FAs) are long chain carbon compounds that the body needs for a wide variety of functions. Free fatty acids are almost never found in the body; instead, they are constantly utilized either as fats (triglycerides) or phospholipids.
- Human bodies accumulate triglycerides in fat deposits as a source of stored energy.
- Phospholipids are very similar to triglycerides and form a double-layered membrane that surrounds every cell in the body. The health and function of each cell is highly dependent on the structure of this phospholipid bilayer, which becomes rigid when essential fatty acids are depleted.
- The essential fatty acids (EFAs) are two fatty acids that humans cannot produce, meaning they must be obtained from dietary sources. These two acids are Linoleic Acid (LA), an omega-6 fatty acid, and  $\alpha$ -linolenic acid (LNA), an omega-3 fatty acid.
- In the human body, essential fatty acids are converted into leukotrienes and prostaglandins, hormone-like substances that influence an enormous number of metabolic processes.
- LNA is a precursor for the synthesis of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), each of which is an omega-3 polyunsaturated FA beneficial to the cardiovascular system.<sup>1</sup> Omega-3 FAs are known to be anti-inflammatory and capable of lowering high blood pressure and triglyceride and cholesterol levels,<sup>1</sup> reducing overall risk of cardiovascular disease.<sup>2,3</sup> Omega-3 FAs may also help reduce damage to the blood vessels from abnormal blood clotting (thrombosis) and fatty deposits (atherosclerosis).<sup>4</sup>
- An increase in omega-3 FAs may be cardioprotective for diabetics by helping the body control insulin sensitivity.<sup>5</sup>
- Omega-3 FAs are also important for those subject to inflammatory stress. Diets high in omega-6 acids produce high levels of compounds that have pro-inflammatory activity. Addition of LNA to such diets drives the metabolism of compounds having a much lower inflammatory potential.
- Omega-3 FAs are also essential to nerve cell function, and consequently essential to brain development and mental function. There is a growing body of literature positively linking omega-3 intake and mental health. Levels of omega-3 FAs in blood cells are low in both bipolar and depressed patients, and studies have found that both groups experience a lessening of symptoms when diets are supplemented with omega-3's,<sup>6</sup> with similar results in schizophrenic patients and children with ADHD.<sup>7</sup>

- Recent evidence indicates that EFAs may play an important role in the immune system. One study found that unborn babies who received fish oil supplements had fewer inflammatory and allergic diseases.<sup>8</sup>
- Due to their importance in development, a diet deficient in EFAs can lead to poor growth.<sup>9</sup> A lack of LA can lead to dry, scaly skin, and a lack of LNA can lead to neurological abnormalities,<sup>4,10</sup> increased risk for cardiovascular disease,<sup>11</sup> and psychological disorders.

## Sources and Recommended Intake

- Most of us consume excessive amounts of omega-6 FAs, which are mostly found in corn and vegetable oils. This can increase the risk of heart disease and incite inflammatory response. A healthy diet would include a more even balance of omega-6 and omega-3 FAs
- The main sources of omega-3 fatty acids are fatty fish and green leafy vegetables (cabbage, spinach, broccoli, lettuce, etc.). Unprocessed vegetable oils, especially flax and linseed oil, are also rich sources of EFAs.
- Many commercial oils (including corn, soybean, and canola) contain very low amounts of omega-3 FAs due to refining and hydrogenation processes. Long-term use of these and other hydrogenated oils (margarine and shortenings) is largely responsible for the sharp decrease in omega-3 fatty acids in the average American diet.
- The Food and Nutrition Board has set the adequate intake level of linoleic acid for adult men at 14-17 g/day and 11-12 g/day for women. Girls 9-18 should consume 10-11 g/day, boys 12-16 g/day. Pregnant and lactating women should consume 13 g/day. Adequate intake of ALA is set at 1.1 g/day for adult women, 1.6 g/day for adult men, 0.7-0.9 g/day for children, and 1.0-1.6 g/day for teens.<sup>12</sup> Consumption of larger amounts of omega-3 FAs, however, are advised for improving cardiovascular and mental health.

## Abstracts

**Holub DJ, Holub BJ. Omega-3 fatty acids from fish oils and cardiovascular disease. *Mol Cell Biochem.* 2004 Aug;263(1-2):217-25.** Fish and fish oils contain the omega-3 fatty acids known as eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA). Epidemiological studies have shown an inverse relation between the dietary consumption of fish containing EPA/DHA and mortality from coronary heart disease. These relationships have been substantiated from blood measures of omega-3 fatty acids including DHA as a physiological biomarker for omega-3 fatty acid status. Controlled intervention trials with fish oil supplements enriched in EPA/DHA have shown their potential to reduce mortality in post-myocardial infarction patients with a substantial reduction in the risk of sudden cardiac death. The cardioprotective effects of EPA/DHA are widespread, appear to act independently of blood cholesterol reduction, and are mediated by diverse mechanisms. Their overall effects include anti-arrhythmic, blood triglyceride-lowering, anti-thrombotic, anti-inflammatory, endothelial relaxation, plus others. Current dietary intakes of EPA/DHA in North America and elsewhere are well below those recommended by the American Heart Association for the management of patients with coronary heart disease.

## References

- <sup>1</sup> Harrison N, Abhyankar B. The mechanism of action of omega-3 fatty acids in secondary prevention post-myocardial infarction. *Curr Med Res Opin.* 2005 Jan;21(1):95-100.
- <sup>2</sup> Bautista MC, Engler MM. The mediterranean diet: is it cardioprotective? *Prog Cardiovasc Nurs.* 2005 Spring;20(2):70-6.
- <sup>3</sup> Khor GL. Dietary fat quality: a nutritional epidemiologist's view. *Asia Pac J Clin Nutr.* 2004 Aug;13(Suppl):S22.

- <sup>4</sup> Holub DJ, Holub BJ. Omega-3 fatty acids from fish oils and cardiovascular disease. *Mol Cell Biochem.* 2004 Aug;263(1-2):217-25.
- <sup>5</sup> Nettleton JA, Katz R. n-3 long-chain polyunsaturated fatty acids in type 2 diabetes: a review. *J Am Diet Assoc.* 2005 Mar;105(3):428-40.
- <sup>6</sup> Colin A, Reggers J, Castronovo V, Anseau M. [Lipids, depression and suicide]. *Encephale.* 2003 Jan-Feb;29(1):49-58.
- <sup>7</sup> Peet M, Stokes C. Omega-3 Fatty acids in the treatment of psychiatric disorders. *Drugs.* 2005;65(8):1051-9.
- <sup>8</sup> Dunstan JA, Prescott SL. Does fish oil supplementation in pregnancy reduce the risk of allergic disease in infants? *Curr Opin Allergy Clin Immunol.* 2005 Jun;5(3):215-21.
- <sup>9</sup> Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. National Academy Press: Washington, DC: 2002.
- <sup>10</sup> Dijck-Brouwer DA, Hadders-Algra M, Bouwstra H, Decsi T, Boehm G, Martini IA, Boersma ER, Muskiet FA. Lower fetal status of docosahexaenoic acid, arachidonic acid and essential fatty acids is associated with less favorable neonatal neurological condition. *Prostaglandins Leukot Essent Fatty Acids.* 2005 Jan;72(1):21-8.
- <sup>11</sup> Balk EM, Lichtenstein AH, Chung M, Kupelnick B, Chew P, Lau J. Effects of Omega-3 Fatty Acids on Serum Markers of Cardiovascular Disease Risk: a Systematic Review. *Atherosclerosis* 2006; 189: 19-30.
- <sup>12</sup> Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. National Academy Press: Washington D.C., 2000.