International Food Information Council Foundation
Omega-6 Fatty Acids and Health Fact Sheet
June 5, 2009

All about omega-6

Look around and you can’t help but notice that more and more people are talking about omega-6 fatty acids. The conversation comes in the form of ratios and cutting back just as often as it comes in advice for appropriate levels of consumption. Luckily, most people are coming close to getting the required amount of omega-6s in their diets. But with hype surrounding potential negative impacts of omega-6 consumption as well as increased (and often confusing) discussions about omega-6/omega-3 ratios, it’s important to understand the facts about omega-6 fats.

What are omega-6 fatty acids and where do they come from?

Researchers have known for more than 50 years that diets high in unsaturated fats help reduce risk of heart disease by lowering blood cholesterol. In the 1950s and 1960s, dietary advice to reduce heart disease risk included recommendations to increase intake of unsaturated fats as well as reduce saturated fat and cholesterol in the diet. More recent dietary guidance from the 2005 U.S. Dietary Guidelines for Americans recommends keeping total fat intake between 20 to 35 percent of calories, with most fats coming from sources of unsaturated fats, polyunsaturated and monounsaturated, such as fish, nuts and vegetables oils.1

A Primer on Fats

Technically, fats should be referred to in the plural. Fats are combinations of many different fatty acids that all play specific roles in the body, and they are named based on their chemical structure, which can be either saturated or unsaturated. Saturated fats are a string of carbon atoms, similar to a string of beads, and have no double bonds. Unsaturated fats have double bonds within the carbon chain, which causes the structure to bend, similar to how an arm bends at the elbow. Unsaturated fatty acids with one double bond are called monounsaturated fatty acids (MUFAs), and those with more than one double bond are called polyunsaturated fatty acids (PUFAs).

Polyunsaturated fats are further defined based on where the first double bond is found within the carbon chain. These are known as omega-3 and omega-6 fatty acids. Two types of polyunsaturated fatty acids are essential, meaning they must be consumed in the diet because they cannot be produced by the body. These two fatty acids are linoleic acid, which is an omega-6 fatty acid, and alpha-linolenic acid, which is an omega-3 fatty acid.

Omega-6 containing fats and oils are essential for life and recently their necessity for health has been reconfirmed.2,3,4 Consumption of certain foods such as vegetable oils,
nuts and some fish are encouraged because of their healthful qualities, including fat content, and their potential to reduce the risk of disease, including heart disease and cancer.

Fatty acids exist in foods as mixtures, and certain foods are good sources of specific fatty acids. For example, the principal polyunsaturated fats from vegetable sources include linoleic acid (LA), an omega-6 fatty acid, found in soybeans, corn and sunflowers, and alpha-linolenic acid (ALA), an omega-3 fatty acid, found in flaxseed and flaxseed, canola and soybean oils. Long chain omega-3 fats such as eicosapentanoic acid (EPA) and docosahexaenoic acid (DHA) are found in fatty fish such as salmon, sardines and mackerel.

**Sources of Omega-6 Fatty Acids***

<table>
<thead>
<tr>
<th>Source</th>
<th>Unsaturated Fats</th>
<th>Saturated Fats</th>
<th>% of Oil Used in U.S. Food Supply+</th>
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<tbody>
<tr>
<td></td>
<td>Polyunsaturated Fats</td>
<td>Mono-unsaturated Fats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Omega-6 fatty acid (%)</td>
<td>Omega-3 fatty acid (%)</td>
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<td>Flaxseed oil</td>
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</table>


**Omega-6 consumption recommendations**

In 2002, the Institute of Medicine (IOM) reviewed the evidence for dietary fat requirements and recommended that between five and 10 percent of total calories should come from the omega-6 fat linoleic acid to have beneficial effects on coronary heart disease (CHD); slightly less is required after age 50.\(^5\) This is an acknowledgement of the critical value of this fat for health. The following chart, “Omega-6 and Omega-3 Fatty Acids: Recommended and Usual Intakes,” provides recommended and usual intake data for two specific types of omega-6 and omega-3 fats.

In the body, omega-6 fats, specifically linoleic acid, are elongated to form arachidonic acid, which is incorporated into cells and cell membranes providing structural support. It also can be found in vital organs such as the brain, eyes and kidneys and is an important part of cell signaling.
The omega-6/omega-3 ratio

Despite these recommendations from the IOM, ongoing study of optimal amounts of polyunsaturated fats in the diet has led to the premise that a specific balance of omega-6 and omega-3 fats is necessary for maximizing the benefits of these fats. Some scientists believe that diets high in omega-6 fats relative to omega-3 fats may be associated with increased prevalence of chronic diseases, including heart disease and certain cancers. This theory has led to the proposed use of a target intake ratio of omega-6/omega-3 fats for assessing health risk and making dietary recommendations for a person’s diet as well as individual foods.

The ratio of omega-6/omega-3 fatty acids in today’s diet is estimated to be about than 9.8:1, with some estimates as high as 20-25:1. A few studies suggest that a much lower ratio of omega-6 to omega-3 fats, ranging between 2:1 and 5:1, is desirable in reducing the risk of disease, including heart disease, cancer and autoimmune disorders. Yet, recently a group of nutrition scientists was convened by the American Heart Association to assess the validity of a target ratio. These scientists found that the use of a ratio as dietary advice for individuals is not only difficult to measure and implement, but there are flaws and limitations in applying a target ratio for assessing risk of disease.

Other researchers indicate that the ratio between the two fatty acids is unimportant, but the absolute amounts of each type of fatty acid are critical. They cite the well-established role of linoleic acid to lower blood cholesterol levels; further, they recognize the clinical and epidemiological evidence for the value of omega-3 fats, especially fish oils, to reduce coronary heart disease risk. This research suggests that it is not necessary to change the omega-6/omega-3 fats ratio by lowering intake of omega-6 fatty acids; it is beneficial to raise omega-3 intakes, especially from fish, to the levels recommended by dietary guidance.

Most evidence to date highlights the beneficial role that both omega-6 and omega-3 fats play in reducing risk of disease, not their relationship to each other. While groups such
as the American Dietetic Association, the American Heart Association (AHA) and the U.S. Dietary Guidelines Advisory Committee encourage the consumption of fish during meals, particularly fish rich in long chain omega-3 fatty acids, this encouragement does not diminish the value of omega-6 fatty acids for health. At this time, research does not demonstrate a need to reduce daily intake of omega-6 fats, to the contrary if individuals begin to reduce their intake of omega-6 fats rates of coronary heart disease (CHD) may actually increase, which would have a negative impact on public health.4

**Omega 6 and heart health**

Dietary factors can play a major role in the risk of heart disease. Numerous studies have shown how consumption of certain foods may impact total blood cholesterol, including low-density lipoprotein (LDL) or “bad cholesterol,” high-density lipoprotein (HDL) or “good cholesterol,” as well as triglycerides. Research from experimental animals, laboratory investigations, epidemiology, and genetic forms of hypercholesterolemia indicate that elevated LDL cholesterol is a major cause of CHD. In addition, recent clinical trials robustly show that LDL-lowering therapy reduces risk for CHD. Therefore, the primary strategy for reducing risk of heart disease focuses on reducing LDL cholesterol.14

Epidemiological studies of large populations over a number of years can detect changes in diet over time and can compare individual intakes for a number of nutrients. The Nurses’ Health Study, which followed 99,000 women and the Health Professional Follow-Up Study, which involved 51,000 men, found an inverse relationship between intake of linoleic acid and CHD. The findings showed that people who consumed more omega-6 fats in the form of linoleic acid and more omega-3 fats experienced a reduced risk of developing CHD. These studies point to linoleic acid’s role in reducing LDL cholesterol as well as reducing the ratio of total cholesterol to HDL cholesterol, which is another risk factor for heart disease. Linoleic acid also may act by reducing blood triglyceride levels following a meal or as a means of curbing adverse heart arrhythmias.15

Clinical trials help to clarify the mechanisms related to omega-6 fats and cholesterol reduction, and new studies continue to add insights. In the body, the 18-carbon fatty acids linoleic acid and alpha linolenic acid are elongated to 20 carbon chains, which form hormone-like substances called eicosanoids. Eicosanoids are necessary for normal immune function, inflammation and blood coagulation. The long chain omega-3 fats (EPA and DHA) found in fish may reduce cardiovascular disease by suppressing inflammatory factors. Omega-6 fats likely reduce cardiovascular disease via changes in many other systems, such as those affecting oxygen availability, blood flow, insulin resistance and blood pressure. An analysis of 60 clinical studies found that polyunsaturated fatty acids (primarily linoleic acid) lowered LDL cholesterol, raised HDL cholesterol and reduced total triglyceride levels compared with carbohydrates.22

More research is needed to understand the cardiovascular effects of various fats. Although much is written about the benefits of omega-3 fats, large population
epidemiological studies and clinical studies affirm that higher consumption of omega-6 fats is significantly related to lower risk of CHD. This inverse correlation occurs in men, women, and younger as well as older individuals. Additionally, a recent AHA Science Advisory states that the consumption of at least five percent to 10 percent of energy from omega-6 fats reduces the risk of CHD relative to intakes below five percent of energy.

Cancer and omega-6 fatty acids

The World Cancer Research Fund and the American Institute for Cancer Research released an evidenced-based report on food, nutrition, physical activity and cancer prevention. The report found that there is limited evidence to suggest that total fat intake is a cause of breast, lung or colorectal cancers. Further, studies examining the relationship between specific fatty acids and cancer do not provide a clear picture. A meta-analysis, which evaluated linoleic acid and risk of breast, prostate and colorectal cancer found little data to suggest an increased risk of cancer and linoleic acid intake. The large Japanese Collaborative Cohort Study, which looked at the development of colorectal cancer in normal individuals over a seven year period, showed no appreciable effect of omega-6 fats on increased risk of colorectal cancer. Another study indicated that omega-6 fats were inversely associated with colorectal cancer risk, but the effect was not statistically significant.

However, omega-6 fats also may play a role in breast and pancreatic cancer incidence. Dietary consumption of omega-6 fats was correlated with lower incidence of breast cancer. Preliminary research with specific breast tissue and cancer risk is less conclusive, with cell studies showing both protective and potentially harmful effects. Similarly, preliminary research evaluating pancreatic cancer cells have also shown both beneficial and protective effects of omega-6 on pancreatic cancer risk.

The relationship between omega-6 fats and cancer continues to emerge, and is compounded by the need to better understand how omega-6 fats may play a role in various mechanisms of action in the body. While all cancers are unique and carry their own set of risk factors, current consensus recommendations from the National Cancer Institute recommend that to reduce risk of cancer individuals should quit smoking, manage their weight by increasing physical activity and managing their calories, consuming more fruits and vegetables, and practice avoidance of alcohol.

Additional impacts of omega-6

Given the recent increase in allergy and asthma cases and the connection between the long chain polyunsaturated fatty acids eicosanoids, which play a role in inflammation and immune function, some scientists have speculated that omega-6, omega-3, or the ratio of dietary omega-6/omega-3 fats might be associated with allergies. However, a detailed respiratory survey that included dietary intake and blood tests, revealed no association between fatty acid intake and hay fever or between the ratio of omega-6/omega-3 fats in blood serum and hay fever or allergic sensitivity.
More recent research is evaluating polyunsaturated fats and the effects they may have on the body as we age. Decline in the speed of nerve conduction is a common occurrence of aging. An Italian study found that total dietary polyunsaturated content predicted significantly less decline in nerve conduction velocity (NCV) as well as a second measure of nerve function in individuals less than 65 years of age. Higher baseline omega-6 fatty acid intake predicted less NCV decline in those between 65 and 84 years of age. This study appears to confirm and expand the Rotterdam study report, which found a relationship between total polyunsaturated fatty acids and reduced risk of Parkinson’s disease. Although the authors do not recommend supplementation with omega-6 fats to improve peripheral neuropathy, they recommend further studies to explore this concept.

**In summary**

The evidence is clear that omega-6 fats are essential for optimal functioning of the body and health maintenance. Studies consistently demonstrate their role in lowering total cholesterol and reducing risk for coronary heart disease. Fat is an important part of the diet, along with carbohydrates and protein, and as long as individuals are not exceeding their daily calorie requirements, there is no need to limit the amount of omega-6 in the diet. Additional research evaluating the function of omega-6 fats and their dietary sources will help to promote a better diet for all.

**References**


