



Trans Fats in Foods

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Because of the today's focus on a healthful diet and lifestyle, and widespread concern about intake of dietary fats, we may get confused about the functions that fats play in our diets. It is unquestionable that dietary fats are essential to good health. Fats provide the most concentrated source of energy—9 calories per gram, compared to 4 calories per gram from carbohydrates or proteins. Fats (there is no one type of “fat”) are built from mixtures of fatty acids, some of which are classified as essential fatty acids because our body needs them for proper functioning but cannot manufacture them. Essential fatty acids are important for healthy skin, children's growth and development, and production of hormone-like substances that regulate many functions in our body. Fats also carry and help in the absorption of vitamins A, D, E, and K and carotenoids. But aside from these nutritional values, what is often overlooked is the contribution of fats to the eating qualities of our foods—they provide the flavor, texture, and “mouthfeel” (creaminess) and contribute to the feeling of being satiated. These factors often comprise the overall appeal and acceptability of foods and thus strongly influence our overall nutrient intake.

Saturated vs. unsaturated fats

Fatty acids are composed of three elements also found in carbohydrates and proteins: carbon, hydrogen, and oxygen. Compared to carbohydrates and proteins, fatty acids contain more hydrogen atoms and fewer oxygen atoms, with the carbons being connected to each other by means of single or double bonds. Fatty acids with *only* single bonds connecting the carbons are saturated with hydrogen atoms—hence the name *saturated* fats. Higher amounts of saturated fats are typically found in meats, egg yolks, whole milk, and milk products. Fatty acids with double bonds connecting the carbons have fewer hydrogen atoms and thus are called *unsaturated* fats; these fats are found particularly in nuts and liquid vegetable oils. Unsaturated fats with only one double bond between carbons are called mono-unsaturated fatty acids, whereas those with more than one double bond are called poly-unsaturated fatty acids. All fats contain both saturated and unsaturated fats, but

they are present in different proportions in different fats.

Single bonds between carbon atoms are more stable than double bonds. Thus, compared to unsaturated fats, saturated fats are more stable and are usually solid at room temperature. Unsaturated fats are liquid at room temperature and are called *oils*. Unstable fats become rancid, lose their flavor, and diminish in their cooking performance more rapidly than saturated fats.

Partial hydrogenation and trans fats

Most shortening and margarine products are solid, although some of them may contain up to 75 percent unsaturated fats. These solid products are made from mostly unsaturated vegetable oils (liquids) to which have been added some hydrogen atoms, through the process called hydrogenation, until the desired food characteristics of flavor, texture, and stability are achieved. The resulting firmer product still has more unsaturated than saturated fats.

During the hydrogenation process, some hydrogen atoms change their configuration from being on the same side (*cis*) of a carbon-carbon double bond to being on opposite sides (*trans*). If complete hydrogenation is achieved, there are no trans fats, and saturated fats result. If only partial hydrogenation is obtained, some double bonds remain, and trans fats are produced. In response to consumer demand in the 1960s and 1970s to reduce dietary saturated fats intake from sources such as lard, tropical oils, and beef tallow, partial hydrogenation was increasingly used in the 1980s as a functional replacement for saturated fats. Partially hydrogenated fats were believed to be more stable, be resistant to oxidation (providing longer shelf life), and enhance the texture properties of foods. At that time, it was also thought that partially hydrogenated fats were more healthful than saturated fats. Nutrition science studies since then have disproved this belief, and partially hydrogenated fats (resulting in trans fats) have been recognized to be harmful to our health.

Trans fats occur naturally in small amounts in beef, lamb, and dairy products. Most trans fats in the American diet, however, are from partially hydrogenated oils found in cookies, crackers, pastries, and fried foods, which gen-

erally make up only a small amount (~2–3%) of the average total caloric intake.

Disease concerns and recommendations

Intake of excess dietary saturated and trans fats has the potential of raising blood cholesterol, which is a risk factor in the development of coronary heart disease. Cholesterol is itself a fat-like substance that is part of all body cells and is essential in the formation of brain and nerve tissues and some hormones. Contrary to common belief, most blood cholesterol is manufactured by the body and is not derived from foods. Fats should not be confused with cholesterol. Not all foods with fats contain cholesterol. Only foods from animal and animal by-products contain cholesterol. Vegetable shortenings, nuts, fruits, and vegetables do not contain cholesterol.

The National Academy of Sciences' Institute of Medicine concluded that trans-fatty acids affect blood low-density lipoprotein cholesterol (LDL, or "bad" cholesterol) similarly to saturated fats and dietary cholesterol. Results of other studies further indicate that increased intake of trans-fatty acids may lower high-density lipoprotein cholesterol (HDL, or "good" cholesterol). While many risk factors affect coronary heart disease, there are some risk factors that we can influence. As most nutritionists agree, Americans should reduce their dietary intake of saturated and total fats.

The 2005 Dietary Guidelines for Americans recommended that total fat intake be limited to 20–35 percent of total calories for adults. The NAS Institute of Medicine recommends that the intake of saturated fats be less than 10 percent of total calories, that cholesterol intake be less than 300 mg/day, and that trans-fatty acids consumption be as low as possible.

Alternatives to trans fats use

As nutrition science advances, trans fats are more understood now than just 20 years ago, although more research is needed to determine their overall impact on heart disease. In the meantime, food manufacturers must reformulate products to reduce or replace existing trans fats to meet consumer needs and desires, such as real benefits that the consumer can understand and believe, no changes in flavor or behavior, a good benefit/value ratio, and suitable healthy alternatives. To date, these options include the use of

- naturally stable fats and oils (e.g., corn and cottonseed oils, and nutritionally enhanced oils)
- fully hydrogenated vegetable oils
- partially hydrogenated oils with significantly reduced trans fats content
- alternative vegetable oil crops, such as canola, sunflower, or the new soybean oil
- products that are free of trans fats through use of new fats processing technologies
- new ingredients (e.g., fats substitute *Olestra*TM, olive and canola oil blends, and functional oils)
- omega-3 fatty acids (e.g., eicosapentaenoic acid and docosahexaenoic acid), contained in fish from cold waters, such as salmon, mackerel, tuna, and trout, which are especially rich in these fatty acids (results of some studies, however, caution that not all sources of omega-3 fatty acids will have the same health implications)
- *Enova*TM, from ADM Kao LLC, which contains high concentrations of diacylglycerols that contribute to management of body weight and body fat and that reduce serum triglycerides.

Monitoring trans fats consumption

As of January 1, 2006, the Nutrition Facts panel on food packages must include the absolute trans fats amount in the food on a separate line, immediately under the saturated fat declaration. The U.S. Food and Drug Administration defines trans fatty acids as "all unsaturated fatty acids that contain one or more isolated (i.e., nonconjugated) double bonds in a trans configuration." Dietary supplements with at least 0.5 gram of trans fat must also declare trans fat on the product's Supplement Facts panel. The trans fat declaration is designed to help consumers make food choices and determine overall healthfulness.

Linoleic acid with conjugated double bonds (CLA) is an exception to the new trans fats labeling law. Although CLAs are truly a type of trans fats, results of studies continue to contribute to a growing list of possible health benefits, such as slowing the buildup of plaque along artery walls, regressing the deposit of fats, and reducing the incidence of cancer. CLAs are now called the "good trans fats."

Why not just eliminate trans fats from the diet?

According to experts in nutrition and dietetics, completely eliminating trans fats involves major dietary changes (e.g., elimination of meats and dairy products that contain trans fats) and may result instead in inadequate intake of some nutrients, creating health risks.

Resources

http://www.fda.gov/fdac/features/2003/503_fats.html
<http://ific.org/publications/qa/transqa.cfm>
<http://members.ift.org/NR/rdonlyres/99748704-4B23-4009-A13D-A33F6552D0DB/0/0405duxbury.pdf>
<http://www.sciencenews.org/articles/20010303/bob9.asp>
(Sites accessed October 4, 2006.)