



Health Connections

LINKING NUTRITION RESEARCH TO PRACTICE

Defining Differences in *Trans* Fatty Acids

Introduction

Awareness of negative effects of certain dietary fats is at an all-time high—over 70 percent of consumers are aware of the link between saturated fat, *trans* fatty acids (TFAs) and increased heart disease risk.¹ Yet few understand what TFAs are, their sources—industrially produced through partial hydrogenation or found naturally in some animal products—or their health effects. This issue of *Health Connections* describes some of the differences in TFAs so that health professionals can guide consumers in their food choices.

Background

From the 1960s through the 1980s, the use of partially hydrogenated fats accelerated as food producers responded to recommendations for consumers to decrease intake of animal fats and tropical oils. Partially hydrogenated fats were considered alternatives because there were limited data on the health effects of TFAs to warrant concern.² These fats also provided stability and functionality for product acceptability and were available at an affordable cost. As awareness linking high levels of TFAs to coronary heart disease increased, the U.S. Food and Drug Administration (FDA) mandated that Nutrition Facts panels list TFAs beginning January 2006. This regulatory action spurred food manufacturers to reformulate products to decrease levels of partially hydrogenated fats, the major sources of industrially produced TFAs in the American diet (see definitions below).

In contrast to the packaged food industry, the foodservice industry does not have a similar federal mandate. Increased consumer awareness of the health implications of TFAs, however, has resulted in local and state efforts to limit or ban their use by restaurants and foodservice establishments. Several cities, food companies and national restaurant chains now have TFA-free policies or products.³ As part of its criterion for using its

heart checkmark on products, the American Heart Association included TFA standards as of January 2008.⁴

Fundamental Differences in Health Effects From Different Sources

All natural fats and oils are a combination of monounsaturated, polyunsaturated and saturated fatty acids. TFAs are unsaturated fatty acids that contain at least one double bond in the *trans* configuration (Figure 1) and are formed when liquid oils are converted into solid fats such as shortening and hard margarines through the process of partial hydrogenation. TFAs formed through this process are considered 'artificially' or 'industrially' produced.

TFAs are found in processed foods made with partially hydrogenated vegetable oils such as crackers, candies, cookies, snack foods, fried foods and baked goods. Commercial frying applications in restaurants and fast-food outlets require stable oils that can resist oxidation, high temperatures and prolonged use—functional characteristics achieved by changing their fatty acid composition through partial hydrogenation.

At high intake levels, industrially produced TFAs increase the risk of heart disease more than saturated fats. Artificially produced TFAs raise total and LDL cholesterol similar to saturated fat. They also decrease HDL cholesterol, raise the total-to

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HDL ratio and may induce systemic inflammation and endothelial dysfunction.⁵ Dietary levels of TFAs necessary to increase LDL-cholesterol appear to be around 4 percent of energy, while 5-6 percent is required to decrease HDL-cholesterol.⁶ A review relating TFAs to other health conditions such as cancer, maternal and child health, type 2 diabetes and macular degeneration has been published.⁶

TFAs found naturally in meat and dairy products from ruminant animals as a result of microbial action in the rumen (fourth stomach) do not appear to be associated with the health issues attributed to artificially created TFAs. Structural differences, such as the position of the double bonds between artificially created and naturally occurring TFAs, can impact health differently. There is emerging evidence that some naturally occurring TFAs such as conjugated linoleic acid (CLA), a polyunsaturated TFA naturally present in fat-containing dairy products and ruminant meats, may have possible human health benefits, including decreasing body fat, enhancing immunity and lowering inflammation. Additional controlled trials are needed to confirm the neutral or even positive metabolic effects of naturally occurring TFAs.⁶

Intake Levels: Recommended and Actual

The Institute of Medicine (IOM)⁷ did not set a "Tolerable Upper Intake Level" (UL) for TFAs in its report on reference intake levels of macronutrients. However, consensus in the professional community is that TFA intake should be as low as possible—no more than one percent of energy—as part of a nutritionally adequate diet.⁷⁻⁹ Eliminating TFAs entirely is not practical because they are unavoidable in ordinary diets. Elimination of food groups such as dairy products and meats that contain naturally occurring TFAs may result

in inadequate intakes of nutrients important for health. The average daily intake of TFAs in the United States has been estimated at about 5.8 grams or 2.6 percent of total energy intake.¹⁰ Intake is anticipated to trend lower as packaged food companies and the foodservice industry reformulate their products.

Labeling *Trans* Fatty Acids

FDA defines TFAs chemically as unsaturated fatty acids that contain one or more non-conjugated double bonds in a *trans* configuration, and does not distinguish by origin (industrially produced or naturally occurring). Fatty acids with conjugated bonds such as CLA are excluded from this chemical definition and subsequent labeling requirement. The amount of TFAs in grams is listed directly under the line for saturated fat. Regulations permit foods containing less than 0.5 grams TFAs per serving to declare zero. There are some legislative attempts to lower this threshold. Canadian regulations similarly exclude CLA from TFA labeling but set the labeling threshold at 0.2 grams per serving.

FDA has not established a Daily Value (DV) for TFAs. However, the agency is currently reviewing different options,¹¹ including a concept for Nutrition Facts labeling that would establish a DV from the combination of *trans* and saturated fats. In addition, FDA has not authorized nutrient-content claims for *trans* fats—such as "*trans*-fat-free" or "low in *trans* fat."

In summary, TFA reduction in the diet involves both reducing the amount in the food supply and helping individuals make informed choices. This goal requires the coordinated efforts of food manufacturers, the foodservice industry, and health professionals who offer nutrition guidance.



Guy Johnson, Ph.D.

Interview — Guy Johnson, Ph.D., Principal, Johnson Nutrition Solutions, Kalamazoo, MI

Q. Why is it important for health professionals to know how TFAs differ?

A. Health professionals need to be prepared to answer consumers' questions about translating fat and fatty acid recommendations into dietary guidance. Understanding how TFAs differ is important because the science is still emerging—for example, the potential benefits in metabolic effects that naturally occurring TFAs like CLA may offer. It is important that consumers do not avoid nutrient-dense foods like dairy or ruminant meats simply because they may contain small amounts of naturally occurring TFAs.

Q. How is the food industry lowering TFAs in the food supply?

A. Nutritional and health benefits, taste and functional characteristics are complex issues to be addressed in the development of *trans*-free fats and oils. Some low-*trans*-fat or *trans*-fat-free products result from processes that increase the saturated fat content, such as blending liquid, soft oils with harder components (tropical oils or animal fats). Another process, interesterification, rearranges the fatty acid molecules on the glycerol backbone using a chemical catalyst or enzyme.⁶ This process often incorporates stearic acid (a saturated fatty

acid with functional characteristics needed for shortenings that does not raise blood cholesterol concentrations). Such fats have some of the desirable functional properties of *trans* fats but without TFAs.

Q. How can health professionals help consumers lower their TFA intake?

A. Even with the emphasis on reducing TFAs, it is important that consumers focus on the overall nutrient quality of their diets by moderating total fat and calories and limiting saturated and *trans* fats. The IOM suggested that intake of TFAs be reduced by limiting foods high in industrially produced TFA—often energy-dense foods with low nutrient quality. The most prudent approach to lowering TFA intake is to choose more nutrient-dense foods such as fruits, vegetables, whole grains, lean protein sources and low-fat dairy products, whether eating at home or away from home.

More specifically, consumers can use the Nutrition Facts panel in combination with the ingredient list to identify, compare and choose foods. The term “partially hydrogenated vegetable oil” in the ingredient statement signals the presence

of TFAs, but possibly in very small amounts. The Nutrition Facts panel should then be consulted to determine the amount of *trans* AND saturated fats present. The term “totally hydrogenated” may appear on *trans*-free products (especially those containing interesterified fats) but should not be a red flag to consumers because such products likely contain enhanced amounts of stearic acid.

Q. Should the threshold allowing products containing 0.5 grams TFAs to claim zero TFAs be lowered?

A. There is understandable concern that consumers may exceed 2 grams TFAs (1 percent of calories on a 2,000 calorie intake) by eating multiple servings of products declaring zero TFAs if they can contain nearly 0.5 grams. However, it is virtually impossible to ensure the accuracy of nutrition labeling below 0.5 grams TFAs per serving. Factors such as natural variation in the initial food source/crop from which the oil is derived, processing and sampling variability as well as analytical error inherent in estimating small amounts of TFAs contribute to this problem. More importantly, the implication that such small amounts of TFAs are critical may divert consumers’ attention from reducing saturated fats that are often present in much higher amounts.

This provision is not a ‘loophole’ developed especially for TFA labeling. Issues surrounding analytical and other sources of variability apply to all nutrients, and FDA allows “dietarily insignificant” amounts of calories, total fat, saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol, sodium and other nutrients of concern to be declared as zero in the Nutrition Facts panel.

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PRACTICE POINTS FOR THE HEALTH PROFESSIONAL

- Stay current on research that differentiates the metabolic and health effects of industrially produced and naturally occurring TFAs.
- Encourage consumers to lower their intake of industrially produced TFAs from processed foods to reduce risk of heart disease.
- Inform consumers that most dairy foods including whole milk, butter, natural and processed cheeses have low TFA levels, allowing a zero value to be listed on the Nutrition Facts panel. However, some dairy-based products formulated with other ingredients containing industrial sources of TFAs may exceed the 0.5 grams per serving.
- Remind consumers that foods reformulated to be low-TFA or TFA-free may still be low in important nutrients. Consumers should look at the overall nutrient profile of the foods. Some foods showing more than 0.5 grams TFA per serving may be quite nutrient-dense.
- TFA data for a limited number of foods can be found in the USDA National Nutrient Database for Standard Reference Release 20, <http://www.ars.usda.gov/nutrientdata>.

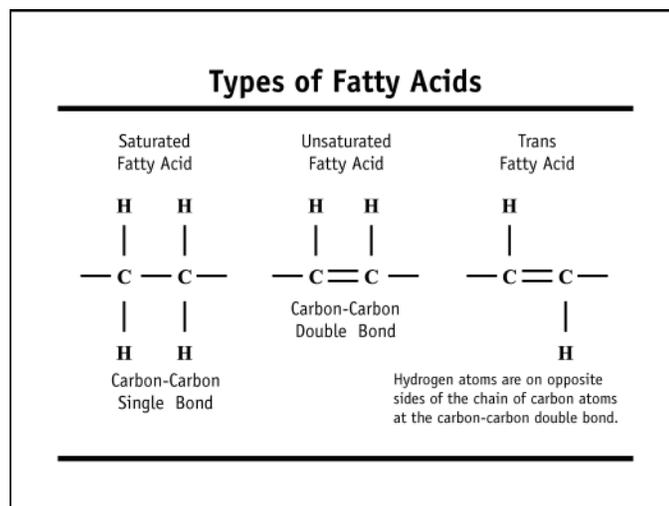


Figure 1: Types of fatty acids showing *trans* configuration. Courtesy of International Dairy Foods Association