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# Partially Hydrogenated Oils and *Trans* Fats Information for Consumers

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On June 18, 2015, the U.S. Food and Drug Administration (FDA) took a major step to reduce the amount of *trans* fat in foods. *Trans* fats have been linked to increased rates of cardiovascular diseases, such as heart attack and stroke (Klonoff, 2007). The FDA estimates that this move could "prevent thousands of heart attacks and deaths each year," In a recent press release they stated,

> "Based on a thorough review of the scientific evidence, the U.S. Food and Drug Administration today finalized its determination that partially hydrogenated oils (PHOs), the primary dietary source of artificial trans fat in processed foods, are not "generally recognized as safe" (GRAS) for use in food." (FDA Notice, 2015)

Companies have been given until June 2018 to remove PHOs from the foods they produce, or to petition the FDA to allow specific uses for *trans* fats (FDA Notice, 2015). **The FDA has not banned *trans* fats.** But what exactly does that mean? And how will it change the foods we eat? To help consumers understand the FDA's actions, this fact sheet looks at three common questions:

1. What is *trans* fat?
2. What are PHOs?
3. What will replace PHOs?

## What is trans fat?

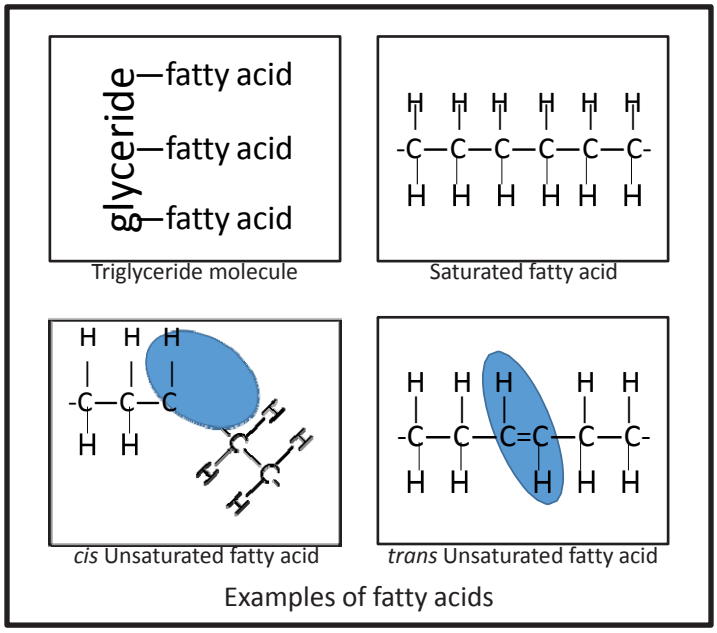
There are a lot of ways to describe the fat in our diets, and it can be confusing. Some commonly used terms are *triglyceride*, *fatty acid*, *saturated fat*, and *unsaturated fat*. It is important to understand what these mean. Fatty acids are organic acids made up of a carbon chain, some hydrogen, and two oxygen molecules. The common fatty acids in foods are between 4 and 22 carbons long.

Triglycerides are what we think of as fats and oils, and are how fatty acids are most often found in our food. Triglycerides are made up of three (*tri-*) fatty acids bound to one molecule of glycerol (*-glyceride*). The combination and order of fatty acids contained in a triglyceride influence how solid it is, how quickly it melts, and how easily it goes rancid.

Fatty acids are saturated or unsaturated. This describes how much hydrogen is bound to each carbon. Saturated fatty acids are "saturated" with hydrogen, meaning they are holding onto as much possible. This makes the fatty acid chains straight, so they are easier to pack together. Saturated fats are more common in animal fats and tropical oils like coconut. Triglycerides with more saturated fatty acids are found in fats that are solid at room temperature, like butter and lard.

Unsaturated fatty acids don't hold as much hydrogen, so some of the carbons in the chain are involved in double bonds. Most often, both hydrogens will be on the same side of the chain. This makes a kink in the shape of the fatty acid, so it is harder for them to pack together closely. Chemically it is more correct to call these "*cis* fatty acids," but we rarely include the *cis* description because this form is so common. Unsaturated fatty acids can have one (*monounsaturated*) or more (*polyunsaturated*) double bonds, with a kink in the chain at each. Omega-3 fatty acids found in fish, like DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid), are examples of polyunsaturated fatty acids. Unsaturated fats are more common in fish oils and seed oils like canola. Triglycerides with more unsaturated fatty acids are found in oils that are liquid at room temperature, like vegetable oil.

*Trans* fatty acids are unsaturated fatty acids that have the



hydrogens bound on opposite sides of the chain. This removes the kink, so *trans* fats have a straight shape like saturated fats. This allows them to pack closer together. *Trans* fatty acids are very unusual in nature. We do see some that occur naturally in foods from ruminant mammals, like beef and dairy products. *Trans* fats can also be created in very small amounts when an oil is heated to high temperatures during normal cooking or processing steps. **The FDA has not banned *trans* fats.**

## What are PHOs?

PHOs, or partially hydrogenated oils, are the main source of *trans* fats in our diets. PHOs are made by exposing unsaturated fats to hydrogen gas in the presence of a catalyst to help start the reaction. This process is called *hydrogenation*, and is commonly used to create shortenings, margarines, spreads, and commercial frying oils. During the first steps of hydrogenation the *cis* form of the fatty acid is converted to the *trans* form. In the later stages, the fatty acids become fully saturated.

If the hydrogenation reaction is stopped part way through, a mixture of *trans* unsaturated fats and fully saturated fats is obtained. This results in a soft, spreadable solid fat or a semi-solid slushy oil. These products are PHOs, and contain a large amount of *trans* fats. **The FDA has banned PHOs. They cannot be sold or used as ingredients in foods after June 2018**, unless they successfully petition the FDA for continued use in a specific product**.**

If the hydrogenation reaction is allowed to finish, a completely saturated, very hard fat is made. These products are called fully hydrogenated oils (FHOs), and contain only a very small amount of *trans* fat. **The FDA has not banned FHOs.**

## What will replace PHOs?

PHOs were very useful in many ways, and replacing them in some products will be a difficult task. The *trans* fats in PHOs give baked goods a crispy, fluffy texture; they can be used to keep frostings from melting; and they keep many fried foods from feeling oily. But food companies have been working for years to find good replacements. Since 2006, when the FDA required that *trans* fat be listed on nutrition facts panels, there has been a large reduction in the amount of *trans* fats used in commercial products (List, 2014). For example, Crisco® shortening was reformulated in January 2007 so it contained less *trans* fat. This was done by blending oil, PHOs, and FHOs to create a similar product that still works in most home recipes. However, like many other shortenings, margarines, and spreads, the newer version of Crisco® still contains PHOs. All of these products must be reformulated again by June 2018 so they no longer contain PHOs. Most likely, we will see PHO-free ingredients like shortening come to market first. Foods containing PHOs as an ingredient will be reformulated once a good replacement can be found.

Old Crisco® Label (before 2007)

INGREDIENTS: PARTIALLY HYDROGENATED SOYBEAN AND COTTONSEED OIL WITH VEGETABLE MONO AND DIGLYCERIDES.

New Crisco® Label (since 2007)

INGREDIENTS: SOYBEAN OIL, FULLY HYDROGENATED PALM OIL, PARTIALLY HYDROGENATED PALM AND SOYBEAN OILS, MONO AND DIGLYCERIDES, TBHQ AND CITRIC ACID (ANTIOXIDANTS).

Some of the processing steps food companies are using to replace partial hydrogenation include full hydrogenation, interesterification, and blending fats and oils together. To completely replace PHOs, most companies will need to use some combination of these techniques.

Interesterification is a process that removes the fatty acid chains in a triglyceride from the glycerol backbone, then reattaches them in a different order. By changing the order of the fatty acids, it is possible to create a more solid, shortening-like fat. In most cases, fats or oils from different sources are added together in the interesterification process. This results in triglycerides that have some desirable properties from both of the original fat or oil sources. This is done quite frequently using FHOs as one of the starting materials. Interesterification can be performed using an enzyme or by using chemicals. There are advantages and disadvantages to each method, so manufacturers will choose the technique that works best for their product (List & Pelloso, 2007).

Home cooks may soon notice that some recipes don't work as well using the new, PHO-free shortenings. Unfortunately, without knowing which specific technologies will be used by food companies, it is difficult to predict how these products will work. But because so many people have been trying to remove trans fats from their diets in recent years, many cookbooks and online baking forums have already given helpful suggestions. Your county Extension office can also provide assistance with specific questions. For a listing of county offices in Utah, visit extension.usu.edu.

## References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