

## How Margarine and Shortenings are Made

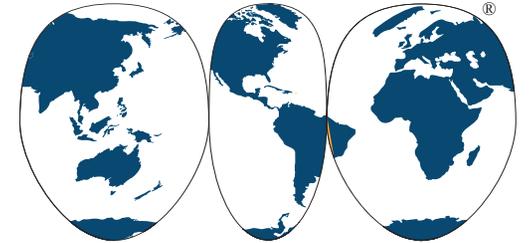
- ♦ Manufacturers start with the cheapest seed oils, extracted at high temperatures and pressures from corn, cottonseed, soybeans, safflower seeds and canola.
- ♦ The last fraction of oil is removed with hexane, a toxic solvent.
- ♦ The oils, already rancid from the extraction process, are steam cleaned. This destroys all the vitamins and antioxidants, but pesticides and solvents remain.
- ♦ The oils are mixed with a finely ground nickel catalyst.
- ♦ The oils are then put in a reactor where at high temperatures and pressures they are flooded with hydrogen gas. The molecular structure is rearranged—what goes into the reactor is a liquid oil, what comes out is a smelly, lumpy, grey semi-solid.
- ♦ Soap-like emulsifiers are mixed in to remove all the lumps.
- ♦ The oil is steam cleaned (again!) to remove the odor of chemicals.
- ♦ The oil is then bleached to get rid of the grey color.
- ♦ Synthetic vitamins and artificial flavors are mixed in.
- ♦ A natural yellow color is added to margarine—synthetic coloring is not allowed!
- ♦ The mixture is packaged in blocks or tubs and promoted to the public as a health food.
- ♦ Even low-*trans* and soft spreads go through many of these processes; and they contain many harmful fillers and additives.

## *Trans* Fats vs. Saturated Fats

Dietitians and government spokespersons are finally admitting that *trans* fats have many harmful effects; unfortunately, they continue to insist that *trans* fats are “just as bad” as saturated fats (the kind found in butter, meat fat and the tropical oils), implying that saturated fats are very harmful. In fact, saturated fats play many important roles in the body chemistry and have the opposite effect of *trans* fats.

- ♦ *Trans* fats raise Lp(a) (indicating they cause heart disease), while saturated fats lower Lp(a).
- ♦ *Trans* fats interfere with immune function, while saturated fats enhance immune function.
- ♦ *Trans* fats promote inflammation; saturated fats reduce inflammation.
- ♦ *Trans* fats inhibit the body’s use of omega-3 fatty acids and the production of long-chain omega-3 fatty acids, while saturated fats enhance the body’s use of omega-3 fatty acids and the production of the long-chain versions.
- ♦ Foods containing *trans* fats are associated with increased asthma; saturated fats are needed for the proper functioning of the lungs.
- ♦ *Trans* fats contribute to weight gain, while some types of saturated fats (the medium-chain triglycerides) boost metabolism and help with weight loss.
- ♦ *Trans* fats are associated with increased cancer and decreased fertility. Sources of saturated fat, such as butter and meat fats, contain many nutrients that fight against cancer and promote fertility.

## All About *Trans* Fats



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## What are *Trans* Fatty Acids?

*Trans* fatty acids are a type of fat molecule produced by a process called “partial hydrogenation,” which rearranges the hydrogen atoms in liquid unsaturated fatty acids to produce an unnatural fat, which like saturated fat, is solid at room temperature.

Natural saturated fatty acids are straight molecules that pack together easily so they tend to be solid at room temperature. In a saturated fatty acid such as stearic acid, each carbon atom is joined to two hydrogen atoms. The hydrogen atoms are arranged in pairs, thus creating stable electron clouds. Each one of our cell membranes is composed of billions of fatty acids; chemical reactions occur in the cell membranes at sites where two hydrogen molecules form electron clouds.

Natural unsaturated fatty acids, such as oleic acid, tend to be liquid at room temperature. They have two or more hydrogen atoms missing where the carbons are double bonded together, but the remaining hydrogen atoms at the double bond are paired on the same side—called the *cis* configuration—forming electron clouds where reactions can take place in the cell membrane.

During the process of partial hydrogenation, one of the hydrogen atoms in a pair is moved to the other side of the molecule, forming a *trans* fatty acid, such as elaidic acid—*trans* means “across.” This causes the molecules to straighten out so that they pack together easily and form a solid fat at room temperature. This is the kind of fat that manufacturers use for frying and to make cookies, crackers and other baked goods; it is less expensive for manufacturers to use partially hydrogenated vegetable oils for these purposes than natural saturated fats like butter, lard, tallow, palm oil and coconut oil.

Unfortunately, when these *trans* fatty acids are incorporated into the cell membrane, they are missing the hydrogen pairs needed for chemical reactions to occur. The result is dysfunction and chaos on the cellular level.

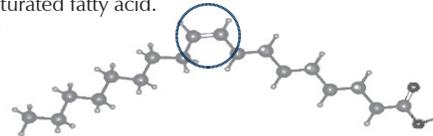
## How to Avoid *Trans* Fat

Until recently, *trans* fats were used in most processed foods, such as commercial baked goods, crackers, bread, chips, pretzels, snack foods and salad dressings. Having learned how dangerous *trans* fats can be, many manufacturers have reduced the amounts in processed foods—often by substituting liquid vegetable oils, which can be just as dangerous. And *trans* fats are still in the food supply, not only in some processed foods but also in the shortening most restaurants use for frying. Any food item containing “partially hydrogenated” oil contains *trans* fats. Small amounts of *trans* fats occurring in deodorized vegetable oils (such as canola oil) and mono- and di-glycerides are not labeled.

The only way to avoid dangerous processed fats and oils is to avoid processed foods. Instead, prepare your own foods using traditional fats such as butter, lard, tallow, goose fat, duck fat, palm oil and coconut oil for cooking and baking; and olive oil for salad dressing. Use butter instead of margarine or spreads. (Even “low-*trans*” spreads should be avoided as they are made from highly processed seed oils and contain many additives.)



STEARIC ACID, a naturally saturated fatty acid.



OLEIC ACID, a monounsaturated fatty acid with two hydrogens forming a pair at the double bond, in the *cis* configuration.



TRANS ELAIDIC ACID, one of the common man-made *trans* fatty acids, with two hydrogens across from each other at the double bond.

### SOURCES AND FURTHER INFORMATION

*Trans Fatty Acids in the Food Supply* by Mary G. Enig, PhD,  
*Know Your Fats* by Mary G. Enig, PhD,  
Bethesda Press (301) 680-8600.

## Dangers of *Trans* Fats

**CANCER:** In many studies, consumption of *trans* fats is associated with increased rates of cancer; *trans* fats interfere with enzymes the body uses to protect itself against cancer.

**DIABETES:** *Trans* fatty acids interfere with the insulin receptors in the cell membranes, thus triggering Type II diabetes.

**HEART DISEASE:** *Trans* fats raise the levels of atherogenic lipoprotein-a (Lp(a)) in humans.

**IMMUNE FUNCTION:** *Trans* fats interfere with both B and T cell functions, thus reducing immune response.

**FERTILITY AND REPRODUCTION:** *Trans* fats interfere with enzymes needed to produce sex hormones; they decrease the levels of testosterone in male animals and increase the level of abnormal sperm.

**LACTATION:** In animals and humans, consumption of *trans* fats lowers the overall fat content in mother's milk, thus compromising the nourishment to the infant. In addition, *trans* fats can cross the mammary gland into mother's milk and interfere with neurological and visual development of the infant.

**DEVELOPMENT AND GROWTH:** *Trans* fats can cross the placenta, creating many problems for the developing fetus including low birth weight; they also interfere with the formation of long-chain polyunsaturated fatty acids needed for growth and development, especially development of the brain.

**OBESITY:** Women who consume *trans* fatty acids weigh more than women who do not consume *trans* fats, even though caloric intake is the same.