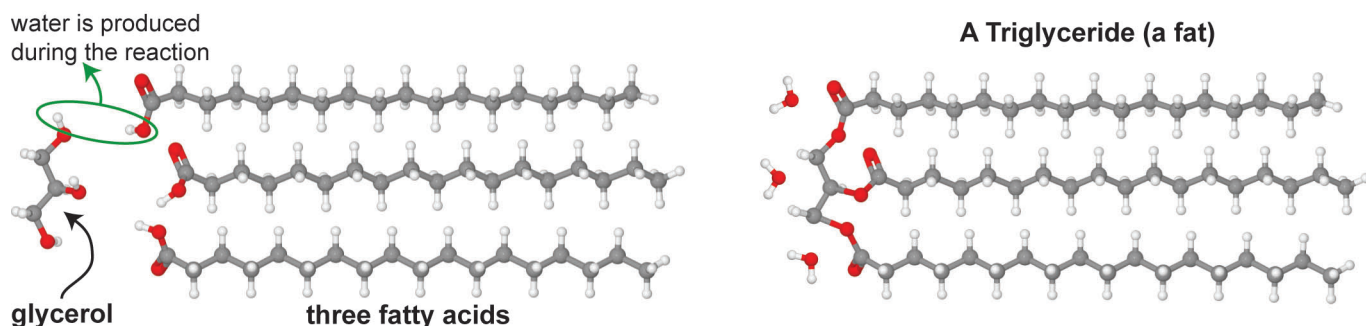


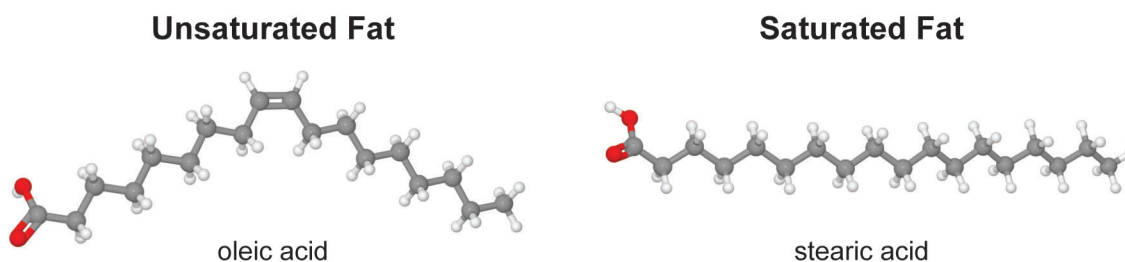
Why shapes and charge matter: Trans-fat and your health

You have probably heard how some fats are good and some are bad for you. Terms like *saturated*, *unsaturated*, *trans fats*, or *partially hydrogenated* can all be found on nutritional labels. These labels are really describing the different structures of fat molecules. Fats and oils are made by both plants and animals as a means for storing chemical energy. Each molecule is composed of a glycerol backbone containing 3 carbons and each carbon is attached to a long chain fatty acid. Chemists often refer to fats and oils as triglycerides. Tri- meaning three, and glyceride meaning glycerol backbone. The triglyceride resembles a three pronged fork, with each prong representing the long chain fatty acids.

A chemical reaction between fatty acids and glycerol results in a triglyceride, a typical “fat” or “oil” molecule found in living things.



The term “saturated” means each carbon in a fatty acid chain is bonded to the largest number of hydrogen atoms possible. Saturated fats, like butter, are solid at room temperatures, because their long straight chain fatty acids contain only single carbon-to-carbon bonds. This allows them to stack very neatly together, like the logs in the walls of a log cabin.



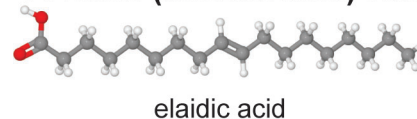
The fatty acids in unsaturated fats contain some carbon-carbon double bonds. These double bonds create “kinks” along the chain that interfere with the stacking of these fat molecules. They are unable to stack in an organized way. Unsaturated fats, like olive oil, are liquid at room temperature.

Saturated fats can have a negative impact on cardiovascular health. Unsaturated fats, while still high in calories, are beneficial, helping to reduce the bad cholesterol and increase the good type of cholesterol. Originally, scientists thought the story of good fat vs. bad fat ended with saturated vs. unsaturated. However, “trans” fats, unnatural fats made during the “partial hydrogenation” process, are as bad or even worse than saturated fats. The difference in this example is the way the carbons are bonded together around the double bond.

Unsaturated fats tend to be liquid at room temperature.



A Trans (unsaturated) Fat



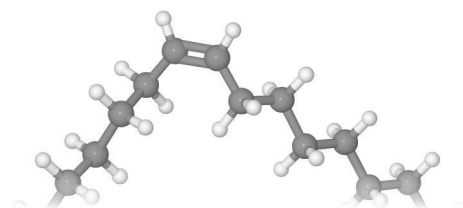


If you walk down the grocery store aisles, you will see items being advertised as containing zero grams of “Trans Fat”. Some food labels also say that they are “heart healthy.” Companies are making sure consumers notice their efforts to reduce or eliminate the harmful trans fats. So what is a “trans” fat, and why are they considered bad for us?

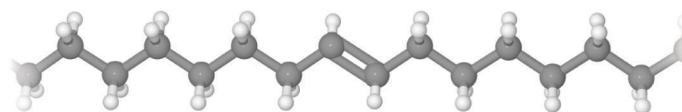
There are two very interesting facts about naturally occurring unsaturated fats. Naturally occurring unsaturated fats form “cis” double bonds. “Cis” in Latin literally means “on the same side”. This refers to the fact that both hydrogen atoms are on the same side of the double bond. Secondly, “cis” fats react more readily with oxygen in the air and result in a shorter shelf life for a food

product. When “cis” fats react with oxygen they break apart, forming smaller chains that do not taste good and smell bad. Manufacturers discovered that when they used the healthier naturally occurring fats to make their food products, it resulted in a much shorter shelf life. So manufacturers searched for a way to increase the shelf life of items made with unsaturated fat. The method of “partial” hydrogenation was discovered in the early 1900’s, and this process allowed for a longer shelf life for food products. Crisco^(TM) was the first product of this new technology. Proctor and Gamble^(TM) first marketed Crisco^(TM) in 1911.

Part of a Cis-fat Molecule



Part of a Trans-fat Molecule



“Trans” in Latin means “across”, which indicates the hydrogen atoms are on opposite sides of the double bond. When a naturally occurring “cis” fat is heated at a high pressure in the presence of hydrogen gas (H_2) and a metal catalyst, such as nickel, one hydrogen atom is added to each carbon joined by the double bond. This results in the carbon becoming single bonded as it is in a saturated fat. During the partial hydrogenation process only some of the double bonds are transformed to single bonds. The remaining double bonds are converted from “cis” to “trans”. This is how a trans fat is made. Trans fats are less likely to react with oxygen than the naturally occurring “cis” fats, and this made them last longer in food products, increasing shelf life.

Originally, it was thought that these fats were healthier for us than saturated fats. Margarine was advertised as a heart healthy alternative to butter! Doctors recommended margarine for patients with heart disease or high cholesterol up until the late 1980’s. Current research has shown that trans fats cause an increase in blood levels of low density lipoproteins, LDL’s. These LDL’s are known as the “bad” cholesterol, because as it travels in the blood it can deposit some cholesterol in the arteries. It is also important to note that just because a label says “zero grams of Trans fats” does not mean it is healthy to consume large quantities. Try to avoid eating these unhealthy fats. Instead, get as much as possible of your daily fat calories from “good oils” such as olive oil.