The Fat in the Black Hat

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Most of us can remember watching movies where the good guys always wore white hats and the bad guys seemed to always favour black headgear. Things aren't like that in real life, but if they were, "trans fats" would definitely be clad as the villain.

In a previous article, we looked at the difference between saturated and unsaturated fats, or more properly fatty acids. Overall, unsaturated fats tend to be healthier for us than saturated fats. But life is not so simple, since there are some major exceptions to this generalization. This is where we meet up with the "good guys" and the "bad guys".

The carbon chain making up the backbone of an unsaturated fatty acid has at least one double bond between two adjacent carbons. Remembering that carbon atoms like to form four bonds, the carbons on either side of a single bond will grab hold of two hydrogen atoms to satisfy their bonding requirements. In comparison, the carbons on either side of a double bond can only link up with one hydrogen atom while still maintaining their bonds to their neighbouring carbons. It is the alignment of the hydrogen atoms on either side of the double bonds which determines whether or not the fatty acid is good or bad.

Unlike carbons joined together with a single bond, double bonded carbons are not free to rotate on the axis of their bond. This fixes the way in which the hydrogen atoms are aligned.

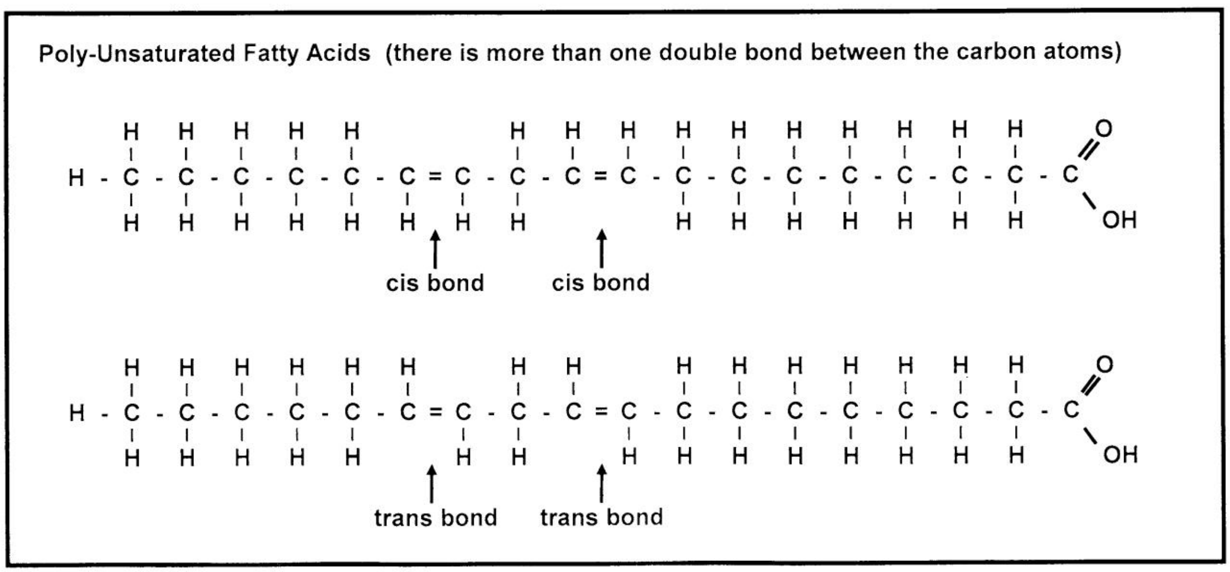
Let's draw two diagrams of a fatty acid with 18 carbons in the main chain and two double bonds positioned as indicated. This will give us a poly-unsaturated fatty acid. All of the carbons linked to each other by single bonds will have two hydrogens attached to them (except for the end ones). The carbons on either side of the double bond can only handle one hydrogen atom each.

There are two ways in which the hydrogens can align themselves. In one case, they can both go above or below the main carbon chain which means they will both be on the same side of the double bond between the carbon atoms. This is called the "cis" configuration (pronounced "sis" as in "sister"). The other option is to have the hydrogen atoms positioned on opposite sides of the double bond in what we call the "trans" configuration. It's easy to remember this arrangement because "trans" means "across". You can see the differences between these configurations in the diagram.

From a food processing point of view, there are certain advantages to using the "trans" form of a fat. Trans fats tend to have a higher melting point than the comparable "cis" form of the same fat. This means that trans fats will give a firmer product due to the fat being present in a solid state rather than in a liquid or oil form which would be the case with a cis fat.

In nature, fats or fatty acids tend to occur in only the “cis” arrangement. As a result, our bodies are geared up to handle only these fatty acids. However, fats derived through man-made reactions which are in the “trans” arrangement are quite difficult for our bodies to handle. Based upon this, the “trans” fats become the black-hatted outlaws of the fat world. While there may not be anything like the gun-fight at the OK Corral between the cis and trans fatty acids, we do need to do our best to minimize the presence of the trans fats in our bodies.

Once again, an awareness of the ingredient line and nutritional content of the foods we eat will assist us in making healthy eating choices.



Note how the “cis” and “trans” forms of the fats differ around the double bonds