**Lipids (Fats)**

Lipids include the fats and oils. The basic difference between the two is that oils tend to be liquid at room temperature, and fats tend to be solid.

Lipids are typically composed of large molecules. Like carbohydrates, a lipid molecule also contains carbon, hydrogen, and oxygen, but the proportion of H to O is not 2:1.

Structurally, a fat molecule consists of one molecule of glycerol which has been bonded by dehydration synthesis to three molecules of fatty acids. Glycerol is an oily substance whose molecule consists of a 3-carbon chain containing 8 atoms of hydrogen and 3 atoms of oxygen. Fatty acids are long-chain hydrocarbon molecules which contain a carboxylic acid group (-COOH) on one end. During dehydration synthesis, three fatty acid molecules bond with the three different -OH groups of the glycerin molecule to form a molecule of fat and 3 molecules of water.

There are 3 different kinds of fats (and fatty acids). A *saturated fat* molecule contains as many hydrogen atoms as the carbons in the fatty acids can hold. In an unsaturated fat, one or more double bonds between carbon atoms takes the place of hydrogen atoms. If only one double bond is present, it is a *monounsaturated fat*. If two or more double bonds are present, it is a *polyunsaturated fat*.

Our bodies require that certain fatty acids be included in the food we consume. These are called *essential fatty acids*, because our bodies cannot manufacture them. That's why it is important to consume these fats as part of our diet. Two essential fatty acids are the polyunsaturated omega-3 and omega-6 fatty acids. However, most modern diets contain an overabundance of the omega-6 fatty acids and a deficiency in omega-3 fatty acids. Fish oil is the best source of omega-3 fatty acids. Flaxseed oil is another good source.

Fatty acids are used by the body in various ways. They are a primary component of cell membranes, for example, and they are used to make hormones and hormone-like substances called eicosanoids that help to regulate various bodily functions. Cell membranes consist primarily of saturated and monounsaturated fats.

Some studies link saturated fats with an increase in serum cholesterol, and for that reason, it is often vilified by mainstream dieticians and health care professionals. But both HDL (good cholesterol) and LDL (bad cholesterol) are increased, so whether or not saturated fats are "bad" is still being debated. Certainly, some amount of saturated fat in the diet is beneficial. It helps to balance the fatty acid profile in the body and mitigate certain harmful effects documented by a diet too high in polyunsaturates. It is of interest that the majority of plaques found on the arteries of cadavers are composed of polyunsaturated vegetable fats. Butter is a good source of saturated fat. It also contains a lot of vitamin A.

Monounsaturated fats tend to lower the bad cholesterol (LDL) and increase the good cholesterol (HDL). Evidence is mounting that monounsaturated fats are beneficial. Olive oil, and canola oil are two of the best sources. Peanut oil is also a good source of monounsaturated fatty acids. It might surprise some to discover that lard and pork products are also good sources of monounsaturated fatty acids. In fact, most meats are high in this important lipid.

Polyunsaturated fats tend to lower both good and bad cholesterol. Except for the essential omega-3 fatty acids, one should limit consumption of polyunsaturated fats because some studies indicate that they may increase the likelihood of developing some cancers. Polyunsaturates are unstable and tend to oxidize readily. Corn oil and most other vegetable oils contain mostly polyunsaturated fats.

[Trans fats](http://wilstar.com/lowcarb/transfats.htm%20) are a type of fat produced by artificially hydrogenating (adding hydrogen atoms to) vegetable oil to make it more solid. Margarine and shortening contain hydrogenated trans fats. Most commercially-prepared baked goods are made with trans fats. Although a few trans fats occur naturally and are not harmful, the partially hydrogenated trans fatty acids are the most unhealthful of all and should be avoided on any diet.

Adipose tissue is the specialized connective tissue that functions as the major storage site for fat in the form of triglycerides (sugars). The primary reason for this fat storage is as a source of energy, but it is also an insulator and a mechanical cushion. Much more energy can be derived per gram of fat than per gram of carbohydrate or protein. Because fat is stored with very little water, it makes sense for animals to store energy in this way.