

AP Biology
Notes: Lipids

Lipids A group of polymer like molecules that have one characteristic in common, they do not mix with water. They are hydrophobic. Some important groups are fats, phospholipids, and steroids.

Fats : are large molecules composed of 2 types of "monomers", glycerol (an alcohol containing 3 carbons) and 3 fatty acid molecules. The bond connecting the glycerol and fatty acids in the fat molecule is called an ester bond. There are two types of fatty acids: saturated and unsaturated. The saturated fatty acids do not contain any double bonds between the carbons, while the unsaturated fatty acids contain one or more double bonds between the carbon. These double bonds cut down on the number of hydrogen atoms that can be attached to the carbon in the molecule. This causes the molecule to bend or kink, at each of the double bond sites

Characteristics of Fats:

Saturated	Unsaturated
solid at room temperature	liquid at room temp.
found mostly in animals	found mostly in plants
no double bonds between carbons	double bonds between carbons.

saturated, mono-unsaturated, and poly-unsaturated refer to the number of hydrogen attached to the hydrocarbon tails of the fatty acids as compared to the number of double bonds between carbon atoms in the tail. Fats, which are mostly from animal sources, have all single bonds between the carbons in their fatty acid tails, thus all the carbons are also bonded to the maximum number of hydrogen possible.

Hydrogen vegetable oil started out as "good" unsaturated oil. However this commercial product has had all the double bonds artificially broken and hydrogen artificially added

In unsaturated fatty acids, there are two ways the pieces of the hydrocarbon tail can be arranged around C = C double bond. In **cis bonds**, the two pieces of carbon chain on either side of the double bond are either both "up" or both "down", such that both are on the same side of the molecule. In **trans bonds** the two pieces of the molecule are on opposite sides of the double bond, that is one "up" and one "down" across from each other. Naturally-occurring unsaturated vegetable oils have almost all cis bonds, but using oil for frying cause some of the cis bonds to convert to trans bonds.

Function of fats: Acts as insulation in higher vertebrates, serves as an energy storage source 1 g= 9 Kcal of energy, and shock absorber for internal organs.

Phospholipids: structurally related to fats but contain 2 fatty acids and one molecule of phosphate. These molecules are found making up the plasma membrane of cells. They exhibit a polar and non polar quality. The phosphate group is hydrophilic while the fatty acid area is hydrophobic.

Steroids:

are the central core consisting of four fused rings is shared by all steroids, including estrogen, progesterone, corticosteroids such as cortisol, aldosterone, testosterone, and Vitamin D.

Lipoproteins

are clusters of proteins and lipids all tangled up together. These act as means of carrying lipids, including cholesterol, around in our blood. There are two main categories of lipoproteins distinguished by how compact/dense they are. **LDL** or **Low density lipoprotein** is the bad guy, being associated with deposition of "cholesterol" on the walls of someone's arteries. **HDL** or **high density lipoprotein** is the good guy, being associated with carrying "Cholesterol" out of the blood system, and is more dense/more compact than LDL.