Importance of Lipids

Lipids include various Biomolecules whose common property is their insolubility in water. Lipids include a variety of molecular types, such as neutral fats, oils, steroids, and waxes. Unlike other classes of biomolecules, lipids do not form large polymers.

Two or three fatty acids are usually polymerized with glycerol, but other lipids, such as steroids, do not form polymers.

Lipids perform many important functions in biological systems, including:

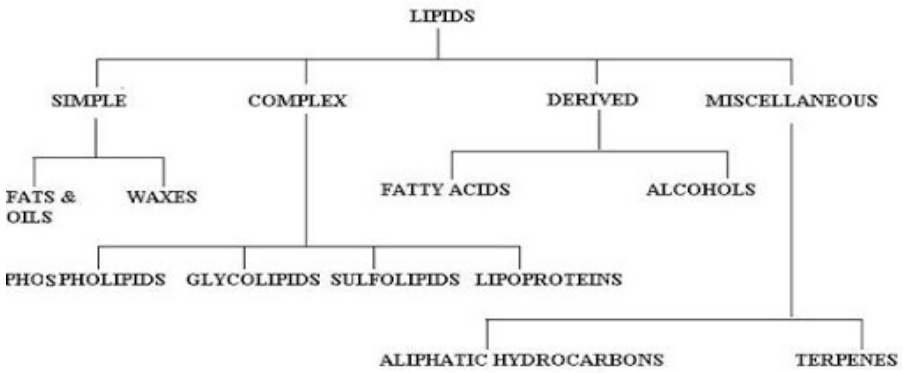
1. Structure of cell membranes and cell compartments
2. Protecting against desiccation (drying out)
3. Storing concentrated energy
4. Insulating against cold
5. Absorbing shocks
6. Regulating cell activities by hormone actions
7. Steroids function both as hormones (such as the sex hormones estrogen and testosterone).

Lipids in the body:

Lipids have several roles in the body, as

1. Chemical messengers, 2. Storage as fat and 3. Provision of energy

Classification of Lipids:



(1) Fats serve as reserved food in both plants and animals. Hibernating animals store extra fat prior to onset of winter. Migratory birds also do so before migration.

(2) They function as concentrated food because as compared to carbohydrates they yield more than twice as much energy per unit weight (9.3 kcal/gm: 4.5 kcal/gm).

(3) Fats can be converted to carbohydrates. Therefore, fats stored in oil seeds (e.g., Groundnut, Mustard, Castor, Sunflower, Cotton, and Coconut) not only provide energy but also raw materials for growth of embryo.

(4) In seeds and spores lipids help in thermal insulation, protection from ultraviolet radiations and loss of water.

(5) Vitamin A, D, E and K are soluble in fats. The latter not only act as their carriers but also protect them from oxidation.

(6) In animals fat occurs as droplets inside cells called adipocytes. Adipocytes of cold blooded or poikilothermic animals have higher amount of unsaturated fatty acids as compared to warm blooded or homoeothermic animals.

Fatty or adipose tissue forms an insulating layer below the skin of animals for protection against low temperature. Whale has a very thick layer of subcutaneous fat called blubber. Animals of colder regions also have a thick fatty layer for insulation, e.g., Polar Bear.

(7) Subcutaneous fat rounds off the body contours of animals and human beings. In animals the fats produce a shock absorbing cushion around eye balls, gonads, kidneys and other vital organs.

(8) Edible oils extracted from many seeds are used in cooking. Animal fats present in milk yield butter and ghee.

(9) Plant oils are used as low cholesterol fat. They are also hydrogenated to form vegetable ghee.

(10) Soap was previously manufactured from animal fat. Now-a-days plant fats are used for this purpose.

(11) Drying oils having unsaturated fatty acids are used in paint industry.

(12) Waxes form a protective layer over the animal fur. They protect the floating leaves of aquatic plants against wetting. In land plants they reduce the rate of transpiration.

(13) Myelin sheath around nerve fibres takes part in insulation.

(14) Phospholipids, glycolipids and sterols are components of cell membranes.

(15) Fragrance of many plant products is due to fat-like substances called terpenes.

(16) In birds, oil from preen gland is used to lubricate feathers and protect them from wetting. Hair are similarly lubricated in mammalian skin. It prevents their felting. The skin is also protected from drying up.

(17) Desert animals employ fat as source of metabolic water, e.g., Kangaroo Rat, Camel. Kangaroo or Desert Rat does not drink water. Camel uses fat stored in its hump for obtaining metabolic water during extreme desiccating conditions.

Summary:

- Lipids are biological molecules such as fats, oils, phospholipids and steroids.
- They are important for cell membranes, energy storage, insulation, cell-cell communication.
- Lipids have a wide variety of structures but all include a hydrocarbon chain which is almost always in the form of a fatty acid.
- Fats are lipids made by bonding fatty acids with an alcohol – the most common fat is triacylglycerol which contains three fatty acids bonded to a 3 carbon alcohol called glycerol.
- Phospholipids are the compounds that make up cell membranes – they have water soluble and water insoluble ends which form a useful barrier around cells.
- Steroids are a form of lipid with carbon atoms arranged into four rings. They are produced naturally in the body and include hormones such as cholesterol, testosterone and estrogen.