Clinical chemistry instrumentation &technology
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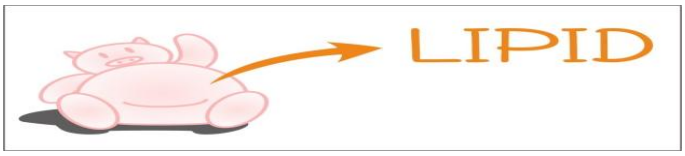
هندسة تقنيات الاجهزة الطبية

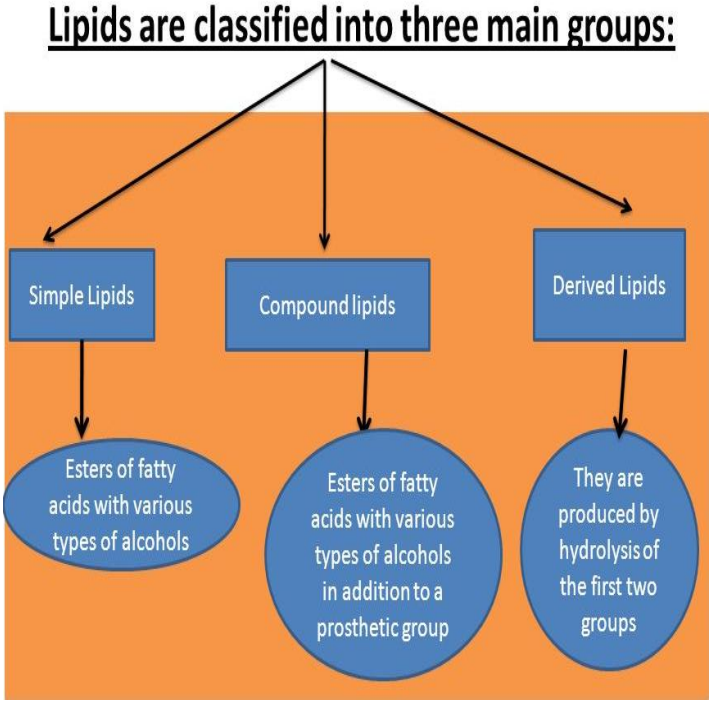
Fats and its important



Lipids are one of the four major classes of biologically essential organic molecules found in all living organisms (**lipids-carbohydrates-proteins-nucleic acids**) that are poorly soluble in water but soluble in organic solvents such as ether & chloroform.

Lipids classification

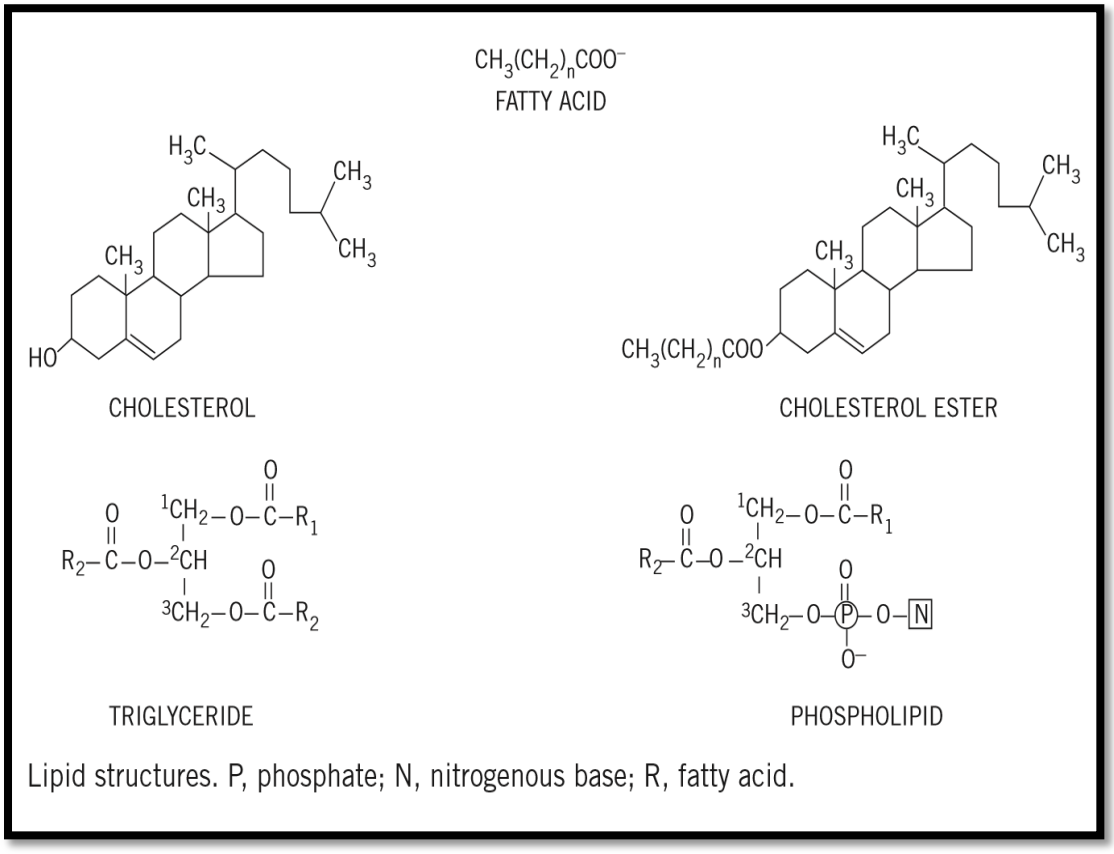
They may be classified based on their physical properties at **room temperature** (solid or liquid, respectively fats and oils), on **polarity**, polar phospholipids, short chain of fatty acid and non polar TG, Cholesterol and other or on their **essentiality** for humans, but the preferable classification is based on their **structure**



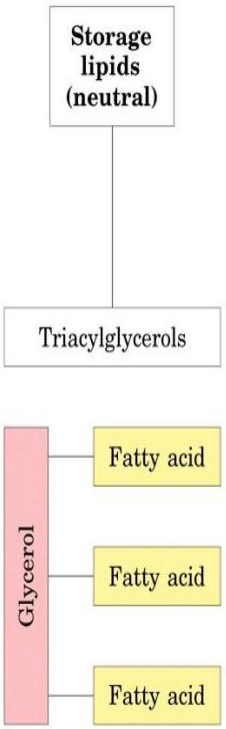
PLASMA LIPIDS

The chemical structures of the four main forms of lipid present in plasma

1-Cholesterol & Cholesteryl esters.
2- Phospholipids. 3- Triglyceride.
4- (free) fatty acid.

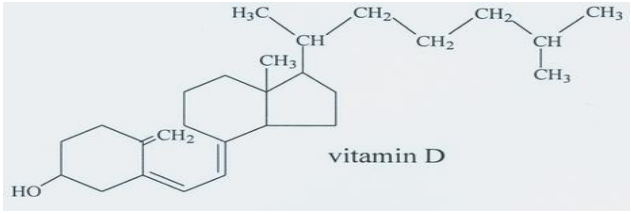


Lipid structures. P, phosphate; N, nitrogenous base; R, fatty acid.



Role of lipids

1-Lipids played the role of storage of **energy**, Storage as triacylglycerols (1gm ➡ 9cal).

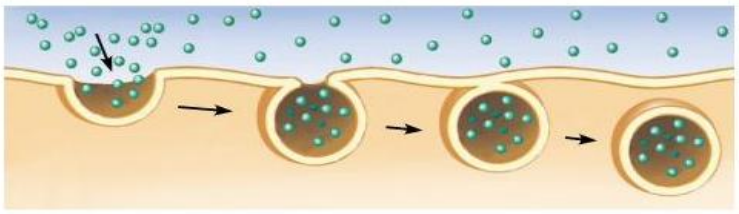


2- Lipids are important dietary components because of their high energy value and also because of the fat soluble vitamins (A, D, E and K) are essential nutrients with numerous functions.

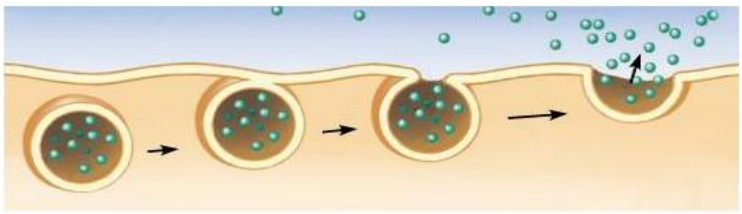
3-Maintenance of body temperature, Layers of subcutaneous fat under the skin also help in insulation and protection from cold. (Thermal insulators)

4- Forming structure of cell membranes where they confer several important properties to the membranes, one of the most important properties are fluidity and flexibility of the membrane.

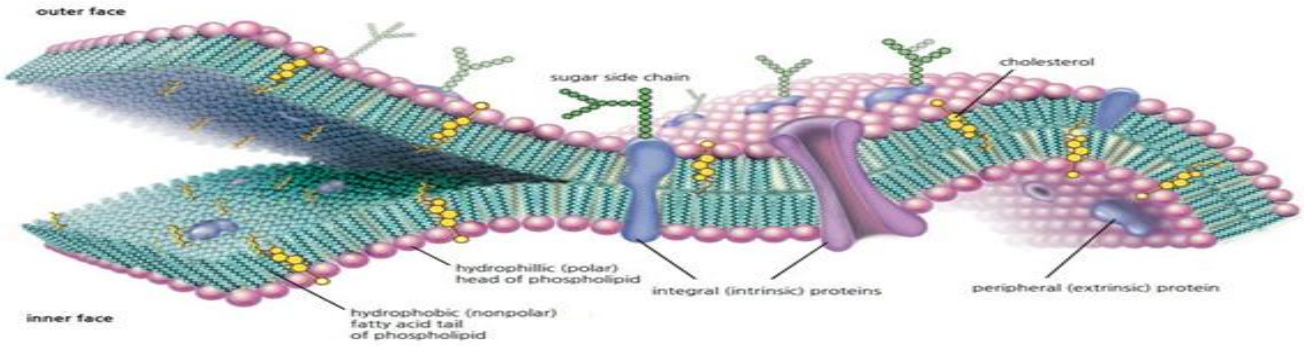
phospholipids allow for membrane fluidity / flexibility which is important in endocytosis and exocytosis.



endocytosis

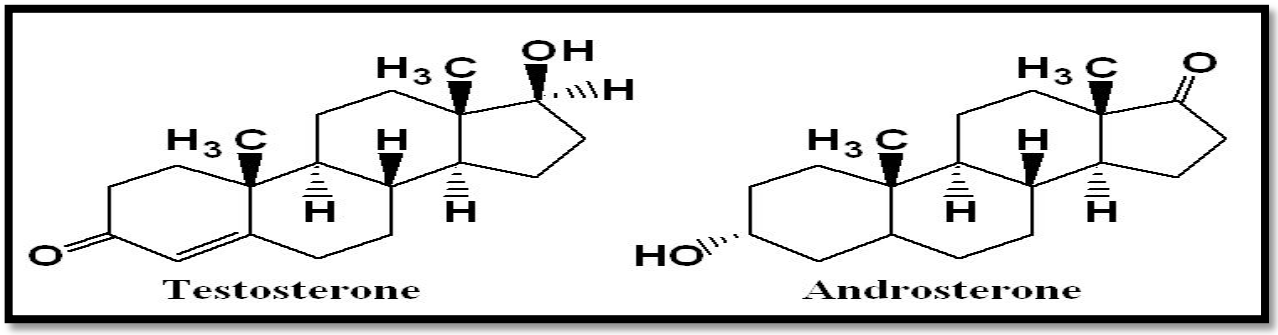


exocytosis

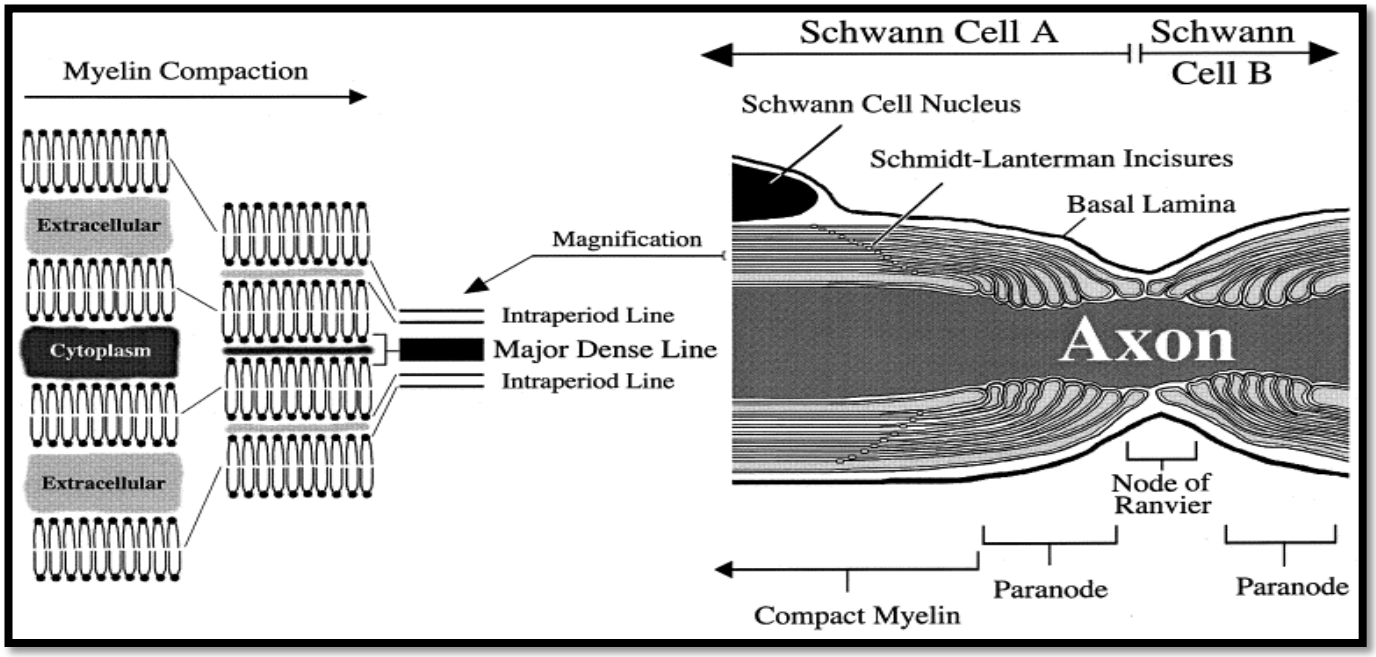


5- protective cushion for many tissues & organs.

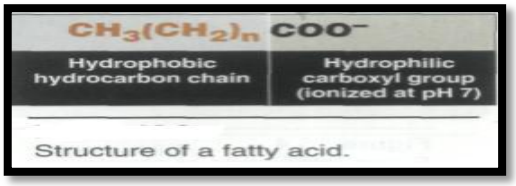
6- structure of secondary sex characteristics the precursor of important biologically active compounds The steroid hormones



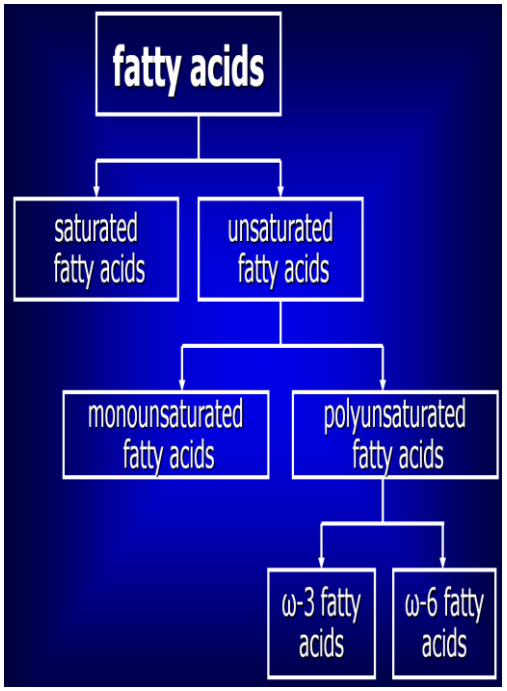
7- Serves an important role in the function of nervous tissues nonpolar lipids act as electrical insulators, allowing rapid propagation of depolarization waves along myelinated nerves



FATTY ACIDS : A fatty acid consists of a hydrophobic hydrocarbon chain (chain carbon) with a terminal carboxyl group , these are straight- compounds of varying lengths. They may be saturated, containing no double bonds, monounsaturated, with one double bond, or polyunsaturated, with more than one double bond.



Structure of a fatty acid.



Some of the major fatty acids found in the plasma

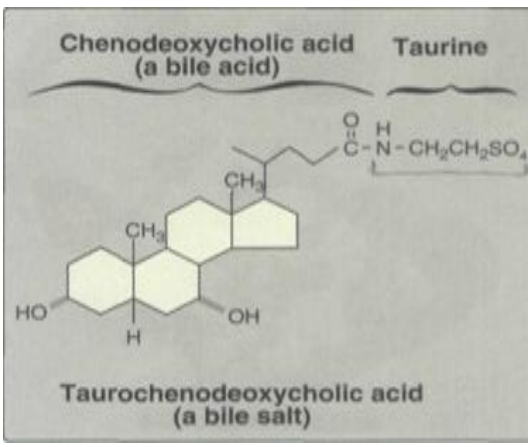
Group	Name	Carbon-chain length	Source
Monounsaturated	Palmitoleic	C16	Plant oil
	Oleic	C18	Olive oil
Polyunsaturated	Linoleic	C18	Plant oil
	Linolenic	C18	Plant oil
	Arachidonic	C20	Plant oil
	Eicosapentaenoic	C20	Fish oil
Saturated	Myristic	C14	Coconut oil
	Palmitic	C16	Animal/plant oil
	Stearic	C18	Animal/plant oil

Cholesterol: is a **very hydrophobic** compound. Consists of four fused hydrocarbon **rings** (A, B, C, and D, called the "steroid nucleus"), and it has an branched hydrocarbon chain attached to of the D Cholesterol is a number of essential functions in the body.

- It is a lipid that is an essential component of mammalian cell membranes , modulating their fluidity, and, in specialized tissues,
- Cholesterol is the precursor of three important classes of biologically active compounds
  - ✓ The bile acids
  - ✓ The steroid hormones
  - ✓ Vitamin D

  Therefore of critical importance that the cells of the body be assured a continuous supply of cholesterol.

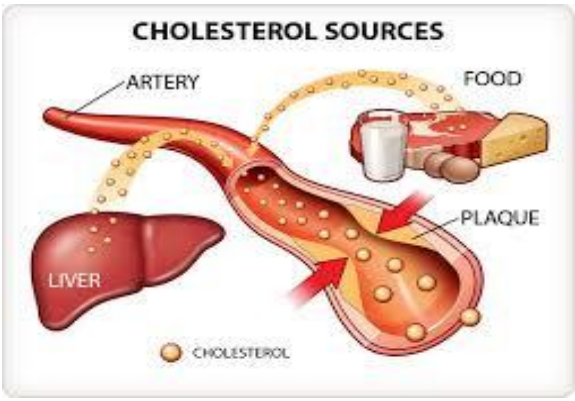
❖ The **liver** plays a central role in the regulation of the body's cholesterol homeostasis.



Taurochenodeoxycholic acid (a bile salt)

Cholesterol enters the liver's cholesterol pool from a number of sources including

1. dietary cholesterol
2. Cholesterol synthesized by the liver itself.



Phospholipids: are complex lipids, similar in structure to triglycerides but containing phosphate and a nitrogenous base in place of one of the fatty acids. They fulfil an important structural role in cell membranes, and the phosphate group confers solubility on nonpolar lipids and cholesterol in lipoproteins.

Triglycerides: neutral fats are transported from the intestine to various tissues, including the liver and adipose tissue, as lipoproteins. Chylomicrons