

المحاضرة الخامسة-Lipids

2-Sphingophospholipids: Sphingosine is the alcohol in this group of phospholipids e.g Sphingomyelin (Sphingosine+ fatty acid +Phosphate + choline)as shown in figure (4)and Figure (5) .

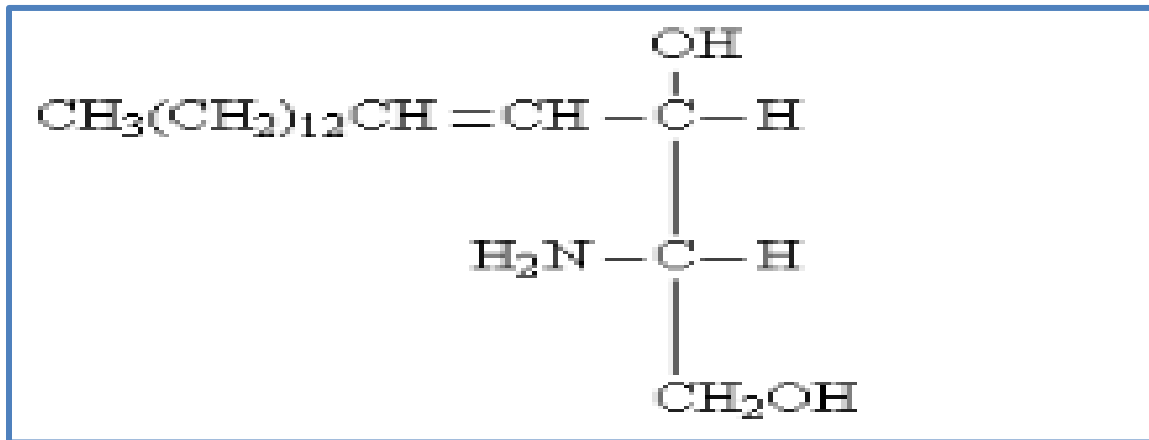


Figure (4) :Structure of Sphingosine

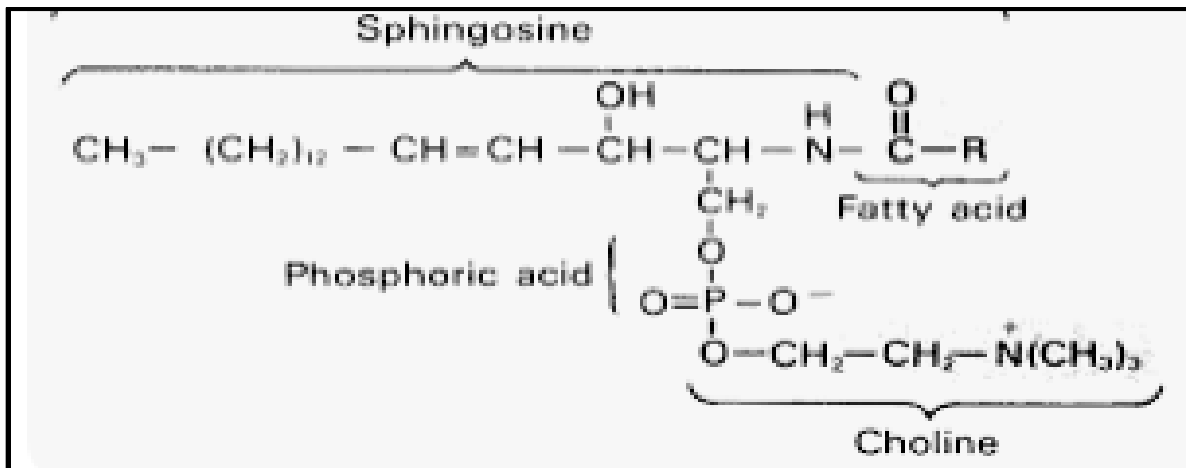


Figure (5) :Structure of sphingomyelin

B. Glycolipids: These lipids contain a fatty acid and carbohydrate, the alcohol is

Sphingosine (also called as glycosphingo lipids) e.g Cerebrosides (Sphingosine+fatty acid + Glucose or Galactose)as shown in figure (6)and figure (7).Cerebrosides is a key component of brain, spinal cord and nervous cells.

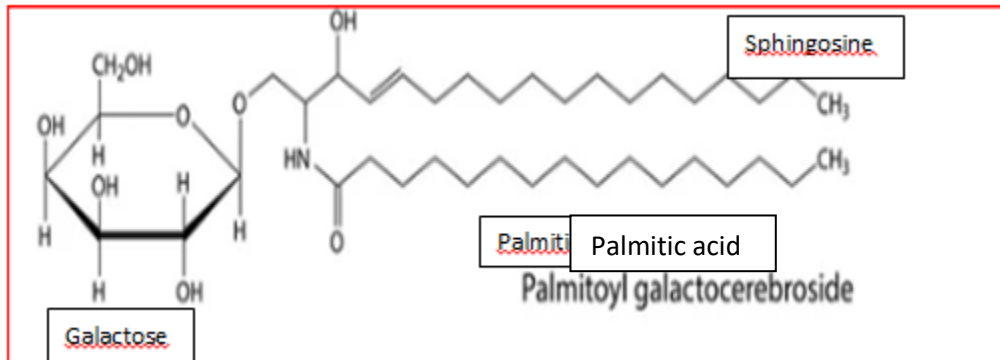


Figure (6) :Structure of galactocerebroside

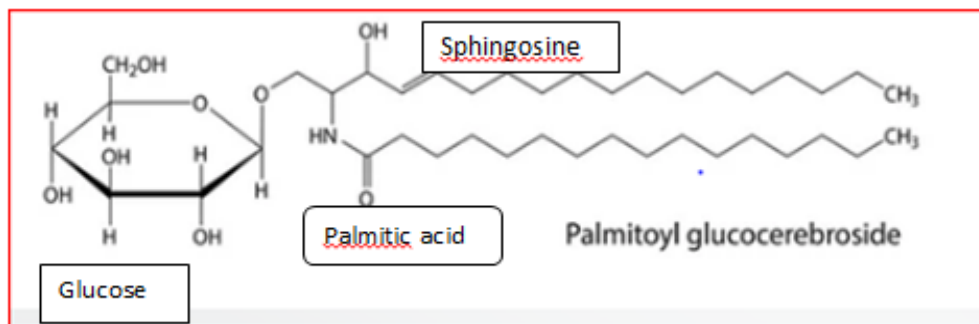


Figure (7) :Structure of Glucocerebroside

C .Lipoproteins: Macromolecular complex of lipids and proteins, they are the transport vehicles for lipids in the circulation. There are five types of lipoproteins:

- 1. Chylomicrons**: Transport dietary lipids from intestine to peripheral tissues.
- 2. Very Low density lipoproteins (VLDL)**: Transport the lipids (endogenously synthesized) mainly TG from liver to peripheral tissues.
- 3. Low density Lipoproteins (LDL)**: (bad cholesterol): Transport cholesterol from liver to peripheral tissues.
- 4. High density Lipoproteins (HDL)**: (good cholesterol) :Carry cholesterol from peripheral tissues to Liver.
- 5. Intermediate density Lipoproteins (IDL)**: Is formed from the degradation of very low density lipoprotein .

3. Derived lipids: These are the derivatives obtained by the hydrolysis of simple and compound lipid. These include fatty acids ,alcohols, mono and diacylglycerol, lipid soluble vitamins and steroids. The most common derived lipids are steroids.

- **Steroids**: Are the compounds containing a cyclic steroid nucleus called cyclopentanoperhydrophenanthrene (CPPP) that contain 17 carbon atoms as shown in figure (8) . There are several steroids in the biological system. These include cholesterol, bile acids, vitamin D, sex hormones , adrenocortical hormone, etc.

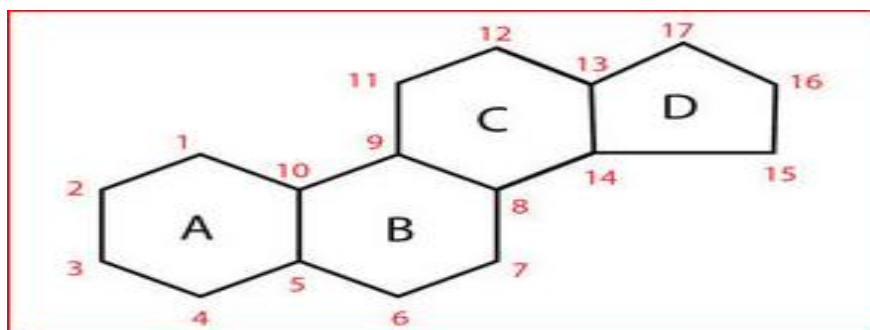


Figure (8) :Structure of steroid ring system

-Sterols: Are a subgroup of steroids with a hydroxyl group at the 3-position of the A-ring. The sterols may have one or more alcoholic groups, they are found in cell membranes and other cellular containing lipids. Unlike other lipids, sterols cannot be saponified.

Cholesterol

Cholesterol is the most important sterol in human body and it includes four rings with general formula $C_{27}H_{46}O$ as shown in figure (9). Most of cholesterol in blood is bound to unsaturated fatty acids by the OH group at site 3 to form cholesterol ester compounds .

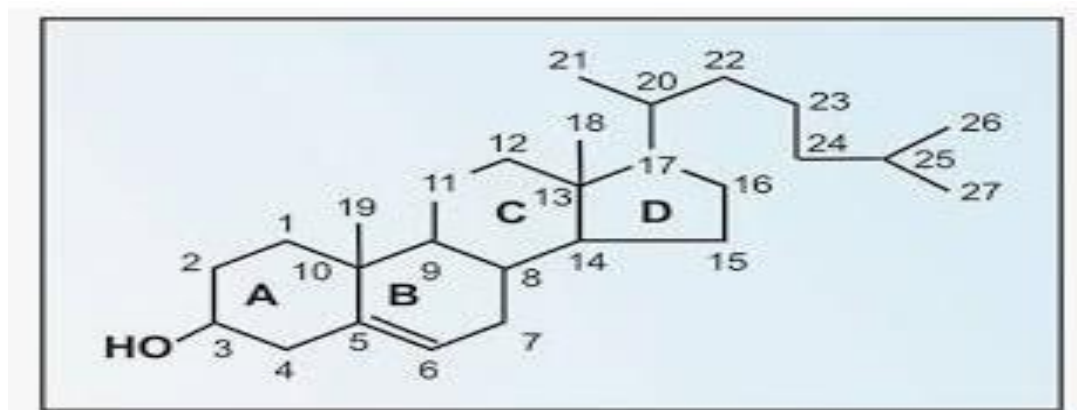


Figure (9) : Structure of Cholesterol

Properties:

- (a) It is an alcohol, insoluble in water, soluble in fat solvents.
- (b) It is present only in animals and not plants.

Functions:

- (a) It enters every structure of the body cell.
- (b) It is the precursor of all steroid hormones.
- (c) It is oxidized in the liver to give cholic acid which form bile salts.
- (d) It is oxidized to give 7-dehydrocholesterol, a provitamin present under the skin which gives vitamin D3 by ultraviolet rays.

Fatty acids:

Are aliphatic mono carboxylic acids that are mostly obtained from the hydrolysis of natural fats and oils. They have a general formula $R(CH_2)_nCOOH$ (n = number of carbon atoms (2-34)). Fatty acids are classified in two main classes:

A. Saturated fatty acids

Are straight chain acids which do not contain any double bonds with 2-24 or more carbons. The general formula $C_nH_{2n+1}COOH$ e.g Acetic acid (CH_3COOH), Butyric acid ($CH_3(CH_2)_2COOH$), etc as shown in table (1).

Table (1):Some of Saturated fatty acids

Common name	systematic name	Structure
Acetic acid	Ethanoic acid	CH_3COOH
Propionic acid	m-propanoic acid	CH_3CH_2COOH
n-Butyric acid	n-Butanoic acid	$CH_3(CH_2)_2COOH$
Palmitic acid	n-Hexadecanoic acid	$CH_3(CH_2)_{14}COOH$
Stearic acid	n-octadecanoic acid	$CH_3(CH_2)_{16}COOH$
Arachidic acid	n-Eicosanoic acid	$CH_3(CH_2)_{18}COOH$