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Topic: Plasma membrane

Plasma membrane

- Plasma membrane is the outer covering of all living cells, which by regulating transport of substances maintains the constancy of cytoplasm.
- It was called **cell membrane** by **Nageli** and **Cramer** and **Plasmalemma** by **J.Q. Plower.** It is an important structural component of all cells.
- It is an exceptionally thin elastic and selective permeable membrane.
- It is about 75 to 100A° thick and bears several pores of 8A° to 10A°.

Chemical compound:

Lipids (35 to 40%)

- Phospholipids are a main component of the cell membrane. These are lipid molecules made up of a phosphate group head and two fatty acid tails.
- The properties of phospholipid molecules allow them to spontaneously form a double-layered membrane. When in water or an aqueous solution, which includes the inside of the body, the hydrophilic heads of

phospholipids will orient themselves to be on the outside, while the hydrophobic tails will be on the inside.

- The technical term for this double layer of phospholipids that forms the cell membrane is a phospholipid bilayer.

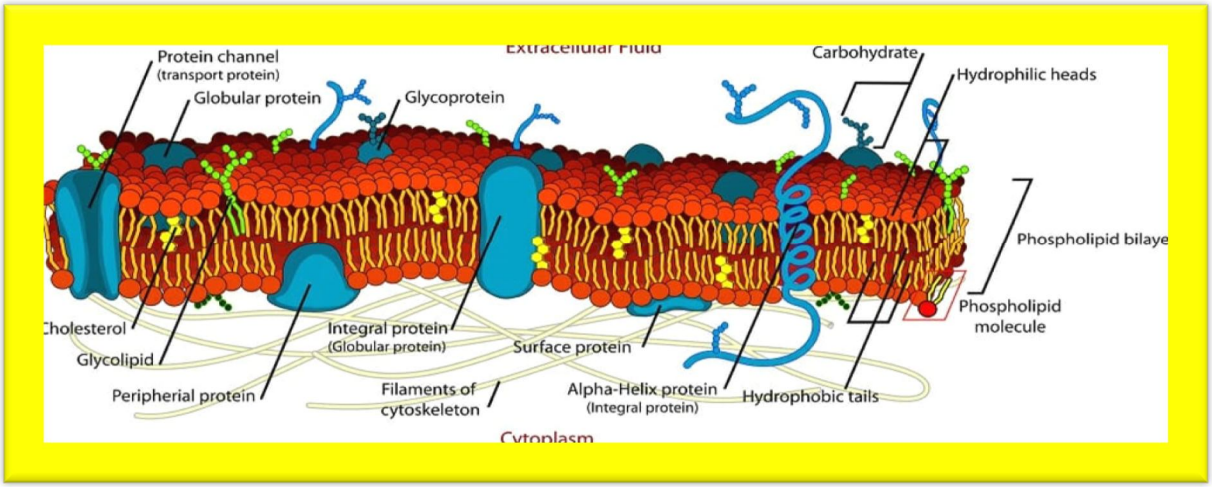

Fig :- Cell membrane diagram

- Eukaryotic cells, which make up the bodies of all organisms except for bacteria and archaea, also have a nucleus that is surrounded by a phospholipid bilayer membrane.
- The cell membrane contains glycolipids and sterols.
- One important sterol is cholesterol, which regulates the fluidity of the cell membrane in animal cells.
- When there is less cholesterol, membranes become more fluid, but also more permeable to molecules.
- The amount of cholesterol in the membrane helps maintain its permeability so that the right amount of molecules can enter the cell at a time, not too many or too few.

Protein (52 to 60%)

On the basis of degree of association types of proteins are

1. **Extrinsic or Peripheral Proteins:**
   I. Easily separable
   II. At the surface of membrane
   III. Soluble in aqueous solution
   IV. Linked to hydrophilic or polar part of lipid
   V. Very weak association bounded by electrostatic interaction.eg - Enkyrin,Actin,Band 4.2.
2. **Integral or intrinsic Protein (80%)**

   Insoluble in aqueous solution, amphipathic and asymmetrically distributed. It is lead to associate firmly with membrane. Ex- Glycophorin

Carbohydrate (8%)

Chiefly oligosaccharides ,hexoses ,glycosamines ,fucore sialic Acid are present . most of them are associated with proteins or lipids . no carbohydrate is located at the Cytoplasmic or inner surface of the P.M.

Structure :-

Time to time various scientist has suggested a no of model to explain the structure of plasmalemma. In which the structure is best understood by-

- **Bilayer model of Gorter and Grandell** (1925)- told about polar bilipid layer of membrane.

- **Sandwich model of Daveson and Danielli (1935)-**they added one layer of protein on the head of polar lipid layer after the study of surface tension of membrane.
- **Unit membrane model by Robertson (1953)-** He gave trilaminar model having two 20A° thick protein and one 35A° thick lipid layer . But all these models failed to explain all the properties of membrane . then Fluid mosaic model was proposes.
- **Fluid Mosaic Model (1972) by singer and Nicolson:-** they suggested the widely acceptable model of biological membrane. According to this model they explained that bilipid layer of membrane in intercalated by interrupting protein on both sides.
- Protein that found on the polar head of lipid from outside called extrinsic protein , while that penetrates or span the membrane transvensally called intrinsic or integral protein .
- They have weaker association and they are bonded to lipid of membrane by electrostatic interaction i.e., ionic , H- bond and mainly
- Hydrophobic in nature. There proteins are globular molecule found in mosaic pattern.
- Lipids and both types of proteins are amphipathic molecules (hydrophilic & hydrophobic end) . Hence polar regions of integral proteins protruding from the surface and non-polar regions embedded in the hydrophobic interior of the membrane.
- Not only that this model also explained the lateral movement of lipid and protein within the Bilayer . Through which membrane can transport some matters and enzymes.

- It also explained the fluidity of membrane. That is essentially a property of lipids.
- This concept implies that the main component of the membrane are help in place only by means of Non- covalent interactions.Due to this it is capable to regulate some physiological activity.
- This model has two experimental evidence in support of their explanation-

I. Evidence in support of mosaic arrangement of protein.

II. Evidence in support of fluid property of lipid Bilayer.

Functions :-

I. Campart mentalisation – separates cells from external environment.

II. Bio membranes bound the semifluid contents of the cells.

III. Protects cell enjury.

IV. As plasmodesmata and gap junctions , the bio membranes provide different granelles of the same cell as well as between one cell and other.

V. Bio membranes have the property of receptivity that is , they do not allow the outward passage of substances already permitted entry.

VI. Differential permittivity and retentively controls cell metabolism.

VII. Cell membrane has receptions for certain hormones . The hormone combines with its particular receptors and either changes membrane permeability or activates enzymes to adenylate cyclase to produce cyclic AMP from ATP .CAMP then triggens a set of enzymes to perform a particular function.