BIOCHEMSTRY AND CYTOGENETICS

TOPIC : LIPID BILAYER

I SEMESTER M.SC ZOOLOGY

REMYA VARGHESE(ASSISTANT PROFESSOR ON CONTRACT)

Lipid bilayer

Lipid Bilayer- definition

- A lipid bilayer is a biological membrane consisting of two layers of lipid molecules. Each lipid molecule, or *phospholipid*, contains a *hydrophilic* head and a *hydrophobic* tail.

- Arrangement of amphipathic lipid molecules to form a lipid bilayer.
- The polar head groups separate the hydrophobic tails from the aqueous cytosolic and extracellular environments.

- The hydrophobic "tail" regions are isolated from the surrounding water while the hydrophilic "head" regions interact with the intracellular (cytosolic) and extracellular faces of the resulting bilayer. This forms a continuous, spherical lipid bilayer.

- Hydrophobic interactions (also known as the **hydrophobic effect**) are the major driving forces in the formation of lipid bilayers

- This complex interaction can include **noncovalent interactions such as van der Waals, electrostatic and hydrogen bonds.**

- **Lipid bilayers are generally impermeable to ions and polar molecules.**
- The arrangement of hydrophilic heads and hydrophobic tails of the lipid bilayer prevent polar solutes (ex. amino acids, nucleic acids, carbohydrates, proteins, and ions) from diffusing across the membrane**, but generally allows for the passive diffusion of hydrophobic molecules**

- This affords the cell the ability to control the **movement** of these substances via **transmembrane protein complexes such as pores, channels and gates.**

- Membranes serve diverse functions in eukaryotic and prokaryotic cells.

- One important role is to regulate the movement of materials into and out of cells.

- The phospholipid bilayer with specific membrane proteins accounts for the selective permeability of the membrane and passive and active transport mechanisms.

- In addition, membranes in prokaryotes and in the mitochondria and chloroplasts of eukaryotes facilitate the synthesis of ATP through chemiosmosis.

- The tail regions, being repelled by water and slightly attracted to each other, congregate together.

- A lipid bilayer functions through the actions of ***polarity*.**
- The inside of the lipid bilayer is *non-polar*, while the heads are *polar* molecules and create hydrogen bonds with other polar molecules

- polar molecules like water and ions cannot as easily cross through the nonpolar tail region of the lipid bilayer.

- The cellular membranes of most organisms are created with lipid bilayer, as well as the *nuclear membrane* and various organelle membranes.

- cells and individual organelles can create an ideal environment for biochemical reactions to occur, allowing them to stay in ***homeostasis*****.**

- **Fluid mosaic model**
- According to the fluid mosaic model of S. J. Singer and G. L. Nicolson (1972), which replaced the earlier model of Davson and Danielli, biological membranes can be considered as a two-dimensional liquid in which lipid and protein molecules diffuse more or less easily.

- An encompassing model of the entire *cellular membrane* is the *fluid mosaic model*, which assumes that proteins within the lipid bilayer act as icebergs within the sea, drifting around but not bound to anything.

- The specific properties of the protein and of the lipid bilayer keep them bound within the layers, but not stationary.