

# Plasma membrane

## 1. What do you mean by membrane asymmetry?

At present, it has been confirmed that the lipids, proteins as well as carbohydrates are asymmetrically distributed in the membrane instead of having a simple and symmetrical distribution. This asymmetrical molecular organization has evolved to satisfy the functional properties of the membrane.

### (a) Asymmetry of Membrane Lipids-

i) Different lipid molecules have been found to be asymmetrically distributed in the membrane. Phospholipids with positively charged heads are located in the outer leaflet of the lipid bilayer whereas those with negative heads are located in the inner or cytoplasmic leaflet of the lipid bilayer.

ii) Glycolipids are present only in the outer leaflet.

iii) The functional properties of the membrane may be determined by this lipid asymmetry. For instance, the binding of protein-kinase to the inner face of the membrane is facilitated by the negatively charged head groups of phospholipids in the inner leaflet of lipid bilayer.

### (b) Asymmetry of Membrane Proteins-

i) The asymmetrical distribution of proteins in the two halves or leaflets of the membrane has been called as 'sidedness' of membrane proteins.

ii) In RBC membrane, it has been found that two proteins, viz., **band three protein** and **glycophorin** occur as transmembrane proteins with a part of their molecules exposed on either face of the lipid bilayer.

iii) The enzymatic proteins like acetylcholinesterase and NADase lie on the outer face of the lipid bilayer while the cytoskeletal proteins like actin, ankyrin, spectrin etc. and certain enzymes like ATPase and protein kinase lie at the inner surface of the lipid bilayer.

iv) It is suggested that cytoskeletal proteins interacting with the integral proteins maintain cell shape and elasticity while enzymes lying on the outer membrane surface can easily act on extracellular substrates.

### (c) Asymmetry of Membrane Carbohydrates-

i) The carbohydrates are asymmetrically distributed with a remarkable 'sidedness'. They are found only on the external surface of the membrane.

ii) The attachment of carbohydrates renders the status of glycolipids and glycoproteins to those lipids and proteins

## 2. What is fluid mosaic model? (SJ Singer and GL Nicolson in 1972)

*Concept of fluidity:* (find the answer in next question)

**FLUID MOSAIC MODEL:**

1. Lipid and integral proteins are disposed in a kind of **mosaic arrangement**,

2. Membrane fluidity—The concept of fluidity implies that the main components are held in place only by means of non-covalent interactions. In fact, the cohesive forces between lipids and with proteins are relatively weak interactions (i.e. ionic, hydrogen bonds and mainly hydrophobic in character).

### 3. Lipid contents:

i) A biomolecular lipid layer, the surface of which is interrupted by proteins in a mosaic pattern.

ii) Lipid molecules occur in a highly viscous layer, with their spherical, polar head group on the outer surface. The two non-polar tails of each molecule point inwards.

### 4. Protein content—

i) It constitutes (60-80)% of the plasma membrane. Freeze fracture technique revealed that proteins of plasma membrane may be basically of two types: peripheral and intrinsic.

ii) Some proteins that penetrate the bilayer partly or span the entire membrane are called integral or intrinsic or transmembrane protein.