Plasma membrane structure & passage of materials through it

By Assist. Lec. Enas K. Alkhazraji

OUTLINE

- Plasma membrane
- Fluid mosaic model
- Components of plasma membrane
- Function of plasma membrane
- Differences between cell membrane and cell wall

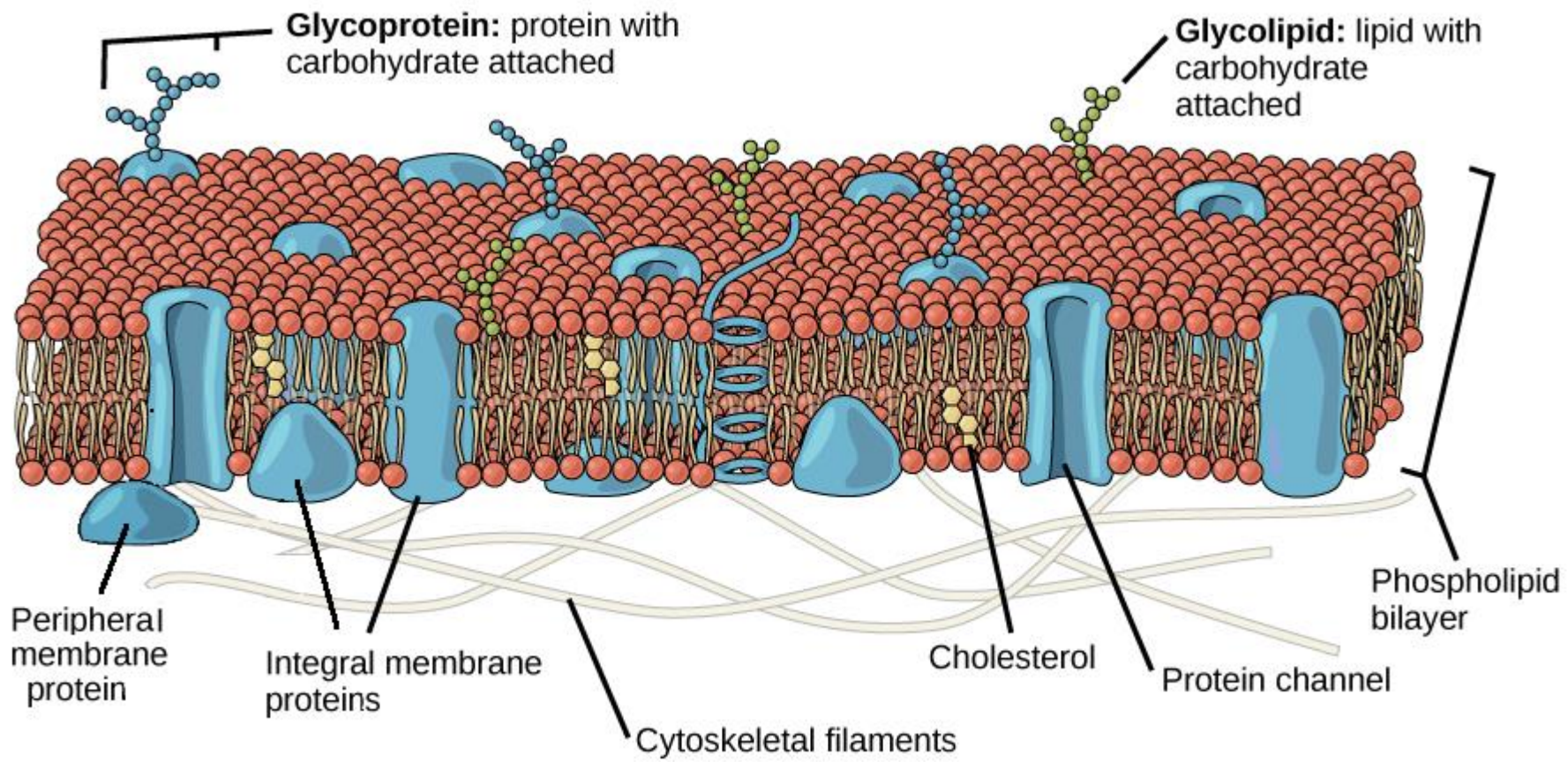
Plasma membrane

- **The plasma membrane, also called the cell membrane, is the membrane found in all cells that separates the interior of the cell from the outside environment. In bacterial and plant cells, a cell wall is attached to the plasma membrane on its outside surface. The plasma membrane consists of a lipid bilayer that is semipermeable. The plasma membrane regulates the transport of materials entering and exiting the cell.**

Fluid mosaic model

- The currently accepted model for the structure of the plasma membrane, called the **fluid mosaic model**, was first proposed in 1972. This model has evolved over time, but it still provides a good basic description of the structure and behavior of membranes in many cells.
- According to the fluid mosaic model, the plasma membrane is a mosaic of components—primarily, phospholipids, cholesterol, and proteins—that move freely and fluidly in the plane of the membrane. In other words, a diagram of the membrane (like the one below) is just a snapshot of a dynamic process in which phospholipids and proteins are continually sliding past one another.
- Interestingly enough, this fluidity means that if you insert a very fine needle into a cell, the membrane will simply part to flow around the needle; once the needle is removed, the membrane will flow back together seamlessly.

Fluid mosaic model



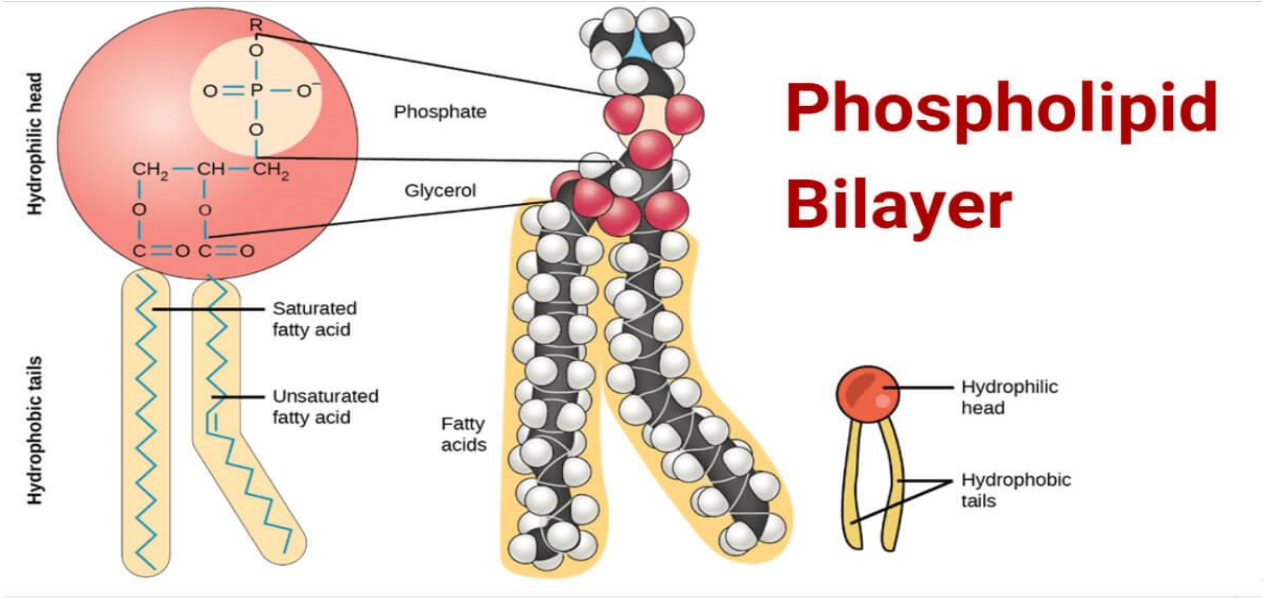
Components of plasma membrane

- The principal components of the plasma membrane are **lipids** (phospholipids and cholesterol), proteins, and carbohydrate groups that are attached to some of the lipids and proteins.
- A **phospholipid** is a lipid made of glycerol, two fatty acid tails, and a phosphate-linked head group. Biological membranes usually involve two layers of phospholipids with their tails pointing inward, an arrangement called a **phospholipid bilayer**.
- **Cholesterol**, another lipid composed of four fused carbon rings, is found alongside phospholipids in the core of the membrane.
- Membrane **proteins** may extend partway into the plasma membrane, cross the membrane entirely, or be loosely attached to its inside or outside face.
- **Carbohydrate** groups are present only on the outer surface of the plasma membrane and are attached to proteins, forming **glycoproteins**, or lipids, forming **glycolipids**.

Components of plasma membrane

phospholipids

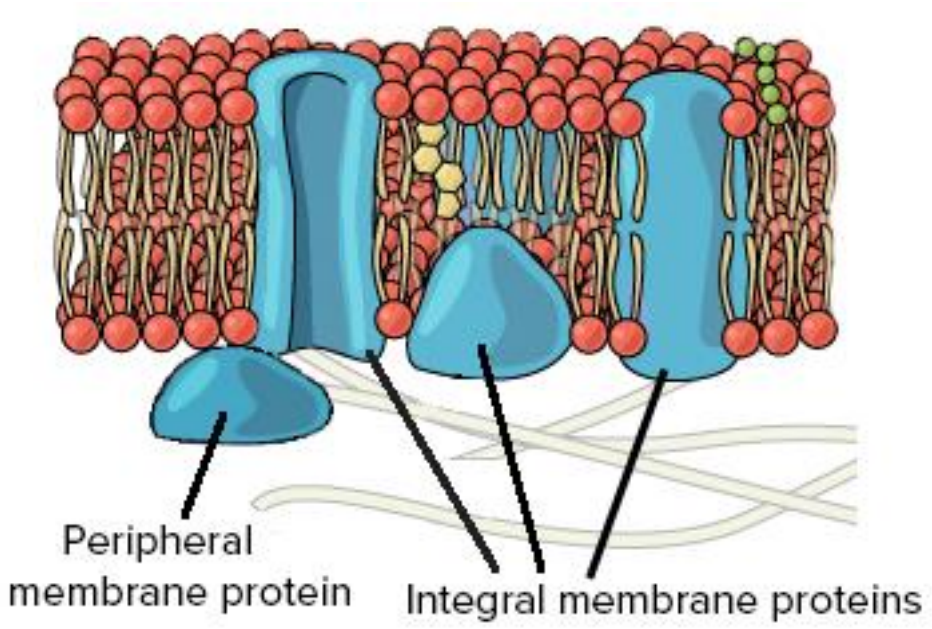
Phospholipids, arranged in a bilayer, make up the basic fabric of the plasma membrane. They are well-suited for this role because they are **amphipathic**, meaning that they have both hydrophilic and hydrophobic regions.



Components of plasma membrane

Proteins

Proteins are the second major component of plasma membranes. There are two main categories of membrane proteins: integral and peripheral. **Peripheral membrane proteins** are found on the outside and inside surfaces of membranes, attached either to integral proteins or to phospholipids Unlike **integral membrane proteins.**



Components of plasma membrane

Carbohydrates

Carbohydrates are the third major component of plasma membranes. In general, they are found on the outside surface of cells and are bound either to proteins (forming **glycoproteins**) or to lipids (forming **glycolipids**). These carbohydrate chains may consist of 2-60 monosaccharide units and can be either straight or branched.

Components of plasma membrane

Component	Location
Phospholipids	Main fabric of the membrane
Cholesterol	Tucked between the hydrophobic tails of the membrane phospholipids
Integral proteins	Embedded in the phospholipid bilayer; may or may not extend through both layers
Peripheral proteins	On the inner or outer surface of the phospholipid bilayer, but not embedded in its hydrophobic core
Carbohydrates	Attached to proteins or lipids on the extracellular side of the membrane (forming glycoproteins and glycolipids)

Function of plasma membrane

- Protecting the integrity of the interior cell.
- Providing support and maintaining the shape of the cell.
- Helps in regulating cell growth through the balance of endocytosis and exocytosis.
- The cell membrane also plays an important role in cell signalling and communication.
- It acts as a selectively permeable membrane by allowing the entry of only selected substances into the cell.

Difference between Cell Wall and Cell Membrane

Cell Membrane	Cell Wall
1.) Present in all Cells.	Present only in plants, bacteria, fungi and algae
2.) It is semi-permeable.	It is fully permeable.
3.) Main function is to protect protoplasm.	Main function is to protect cell membrane and maintains shape of the cell.
4.) It is alive and it is active metabolically.	Non-living and inactive.
5.) Made up of lipids, protein and carbohydrates.	Made up of peptidoglycan (in bacteria), chitin (in fungi) and cellulose in plants.


THANK YOU :)