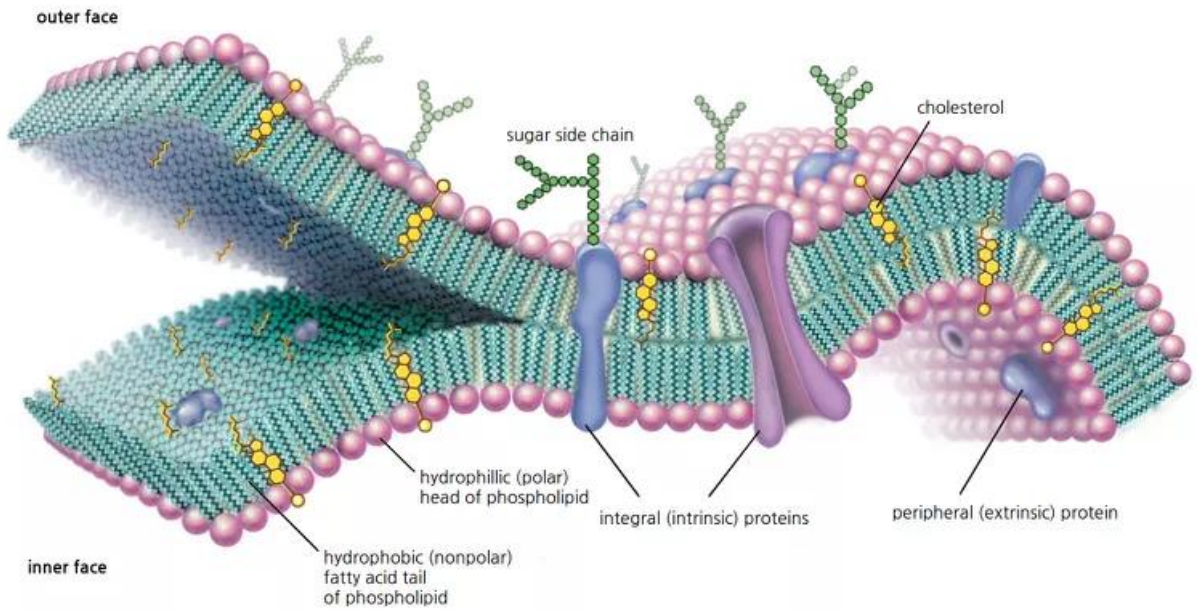
Cell Membrane Structure and Function

The cell membrane (**plasma membrane**) is a thin semi-permeable membrane that surrounds the cytoplasm of a cell. The cell membrane is primarily composed of a mix of **proteins** and **lipids**. Depending on the membrane's location and role in the body, lipids can make up anywhere from **20 to 80** percent of the membrane, with the remainder being proteins. While lipids help to give membranes their flexibility, proteins monitor and maintain the cell's chemical climate and assist in the transfer of molecules across the membrane.



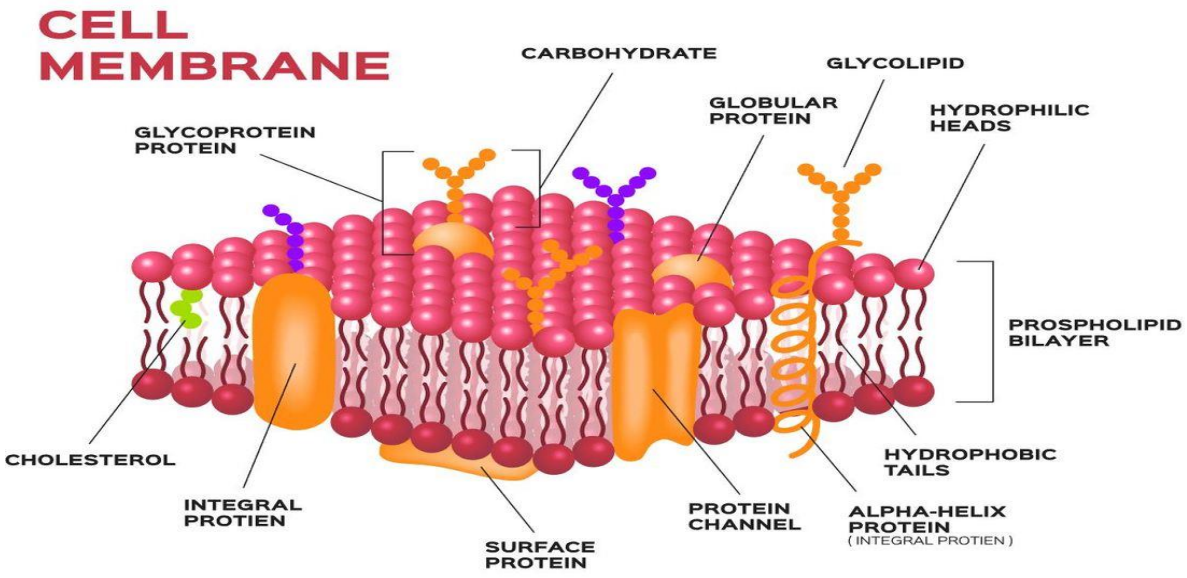
1. Cell Membrane Lipids

Phospholipids are a major component of cell membranes. Phospholipids form a lipid bilayer in which their **hydrophilic** (attracted to water) head areas spontaneously arrange to face the aqueous cytosol and the extracellular fluid, while their **hydrophobic** (repelled by water) tail areas face away from the cytosol and

extracellular fluid. The lipid bilayer is semi-permeable, allowing only certain molecules to diffuse across the membrane.

Cholesterol is another lipid component of animal cell membranes. Cholesterol molecules are selectively dispersed between membrane phospholipids. This helps to keep cell membranes from becoming stiff by preventing phospholipids from being too closely packed together. Cholesterol is not found in the membranes of plant cells.

Glycolipids are located on cell membrane surfaces and have a carbohydrate sugar chain attached to them. They help the cell to recognize other cells of the body.



2. Cell Membrane Proteins

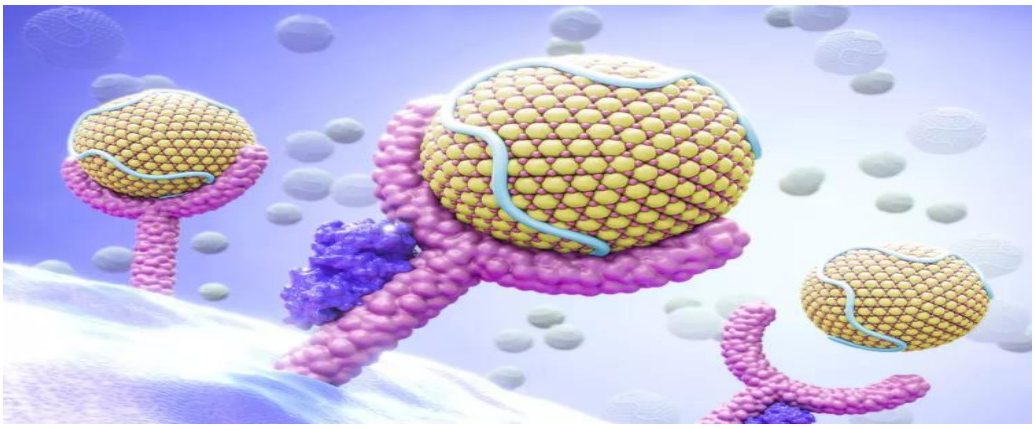
The cell membrane contains two types of associated proteins. Peripheral membrane proteins are exterior to and connected to the membrane by interactions with other proteins. Integral membrane proteins are inserted into the membrane and most pass through the membrane. Portions of these transmembrane proteins are exposed on both sides of the membrane. Cell membrane proteins have a number of different functions.

Structural proteins help give the cell support and shape.

Cell membrane receptor proteins help cells communicate with their external environment through the use of hormones, neurotransmitters, and other signaling molecules.

Transport proteins, such as globular proteins, transport molecules across cell membranes through facilitated diffusion.

Glycoproteins have a carbohydrate chain attached to them. They are embedded in the cell membrane and help in cell-to-cell communications and molecule transport across the membrane.



Cell Membrane Function

1. **Selective Permeability**

- The cell membrane acts as a barrier that controls the movement of substances in and out of the cell. It is selectively permeable, allowing certain molecules to pass while blocking others. Small uncharged molecules (like O_2 and CO_2) can diffuse freely, while larger or charged molecules require specific transport proteins to facilitate their movement across the membrane.

2. **Structural Support**

- The membrane provides structural support to the cell, maintaining its shape and integrity. It anchors the cytoskeleton, which helps maintain the cell's structure and facilitates movement.

3. **Cell Signaling and Communication**

- Membrane proteins play a key role in cell signaling by acting as receptors that detect and respond to external signals (e.g., hormones, neurotransmitters). This interaction is crucial for cellular communication and coordination of physiological processes.

4. **Transport Mechanisms**

- The cell membrane facilitates transport through various mechanisms:
    - **Passive Transport**: Includes diffusion and osmosis, where substances move across the membrane without energy input.
    - **Active Transport**: Requires energy to move substances against their concentration gradient, often using specific transport proteins (e.g., pumps).
    - **Endocytosis and Exocytosis**: The membrane can engulf large particles or fluids (endocytosis) or expel materials (exocytosis), allowing for the transport of macromolecules.

5. **Cell Recognition and Adhesion**

- Glycoproteins and glycolipids on the extracellular surface of the membrane play significant roles in cell recognition and adhesion. This is important for immune response, tissue formation, and cellular interactions.

6. **Barrier Function**

- The membrane serves as a barrier that protects the internal components of the cell from harmful substances in the external environment. It prevents toxic substances from entering while allowing essential nutrients to pass through