BIOCHEMISTRY AND CYTOGENETICS

TOPIC : CELL MEMBRANE FEATURES

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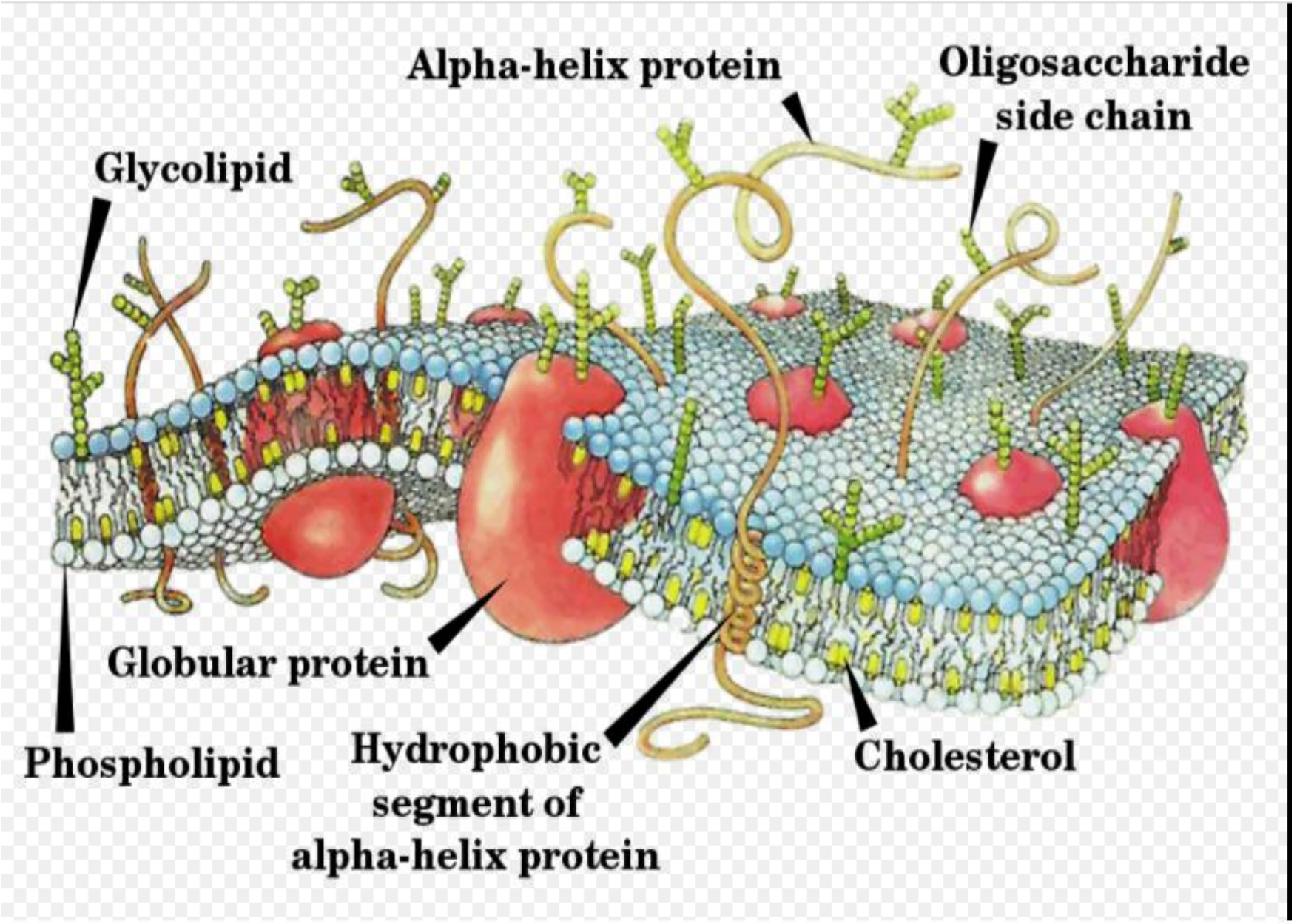
Cell membrane features


Alpha-helix protein
Oligosaccharide side chain
Glycolipid
Globular protein
Phospholipid
Hydrophobic segment of alpha-helix protein
Cholesterol

Composition

- Composition constantly changing for fluidity and changes in the environment, even fluctuating during different stages of cell development.

- Material is incorporated into the membrane, or deleted from it, by a variety of mechanisms:
- Fusion of intracellular vesicles with the membrane (**exocytosis**) not only excretes the contents of the vesicle but also incorporates the vesicle membrane's components into the cell membrane.

- The membrane may form blebs around extracellular material that pinch off to become vesicles (**endocytosis).**

- The **length and the degree of unsaturation of fatty acid chains** have a profound effect on membrane fluidity as unsaturated lipids create a kink, preventing the fatty acids from packing together as tightly, **thus decreasing the melting temperature (increasing the fluidity) of the membrane**.

Homeoviscous adaptation.

- The ability of some organisms to regulate the fluidity of their cell membranes by altering lipid composition is called homeoviscous adaptation.

- The entire membrane is held together via non-covalent interaction of hydrophobic tails, however the structure is quite fluid and not fixed rigidly in place.
- Under physiological conditions **phospholipid molecules in the cell membrane are in the liquid crystalline state.**

- It means the lipid molecules are free to diffuse and exhibit rapid lateral diffusion along the layer in which they are present.
- However, the exchange of phospholipid molecules between intracellular and extracellular leaflets of the bilayer is a very slow process. .

- A fraction of the lipid in direct contact with integral membrane proteins, which is tightly bound to the protein surface is called **annular lipid shell**; it behaves as a part of protein complex

- In animal cells **cholesterol** is normally found dispersed in varying degrees throughout cell membranes, in the irregular spaces between the hydrophobic tails of the membrane lipids, where it confers a stiffening and strengthening effect on the membrane.

- Additionally, the amount of cholesterol in biological membranes varies between organisms, cell types, and even in individual cells

Cholesterol function…

- Cholesterol, a major component of animal plasma membranes**, regulates the fluidity of the overall membrane, meaning that cholesterol controls the amount of movement of the various cell membrane components based on its concentrations.**

- In high temperatures, cholesterol inhibits the movement of phospholipid fatty acid chains, causing a reduced permeability to small molecules and reduced membrane fluidity.

- The opposite is true for the role of cholesterol in cooler temperatures. Cholesterol production, and thus concentration, is up-regulated (increased) in response to cold temperature. At cold temperatures, cholesterol interferes with fatty acid chain interactions

- Acting as **antifreeze**, cholesterol maintains the fluidity of the membrane. Cholesterol is more abundant in cold-weather animals than warm-weather animals.

- In plants, which lack cholesterol, related compounds called **sterols** perform the same function as cholesterol.

- Examples of integral proteins include ion channels, proton pumps, and g-protein coupled receptors.

- Ion channels allow inorganic ions such as sodium, potassium, calcium, or chlorine to diffuse down their electrochemical gradient across the lipid bilayer through hydrophilic pores across the membrane.