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Lecture title: Cytology

Lecturer Affiliation: ***Dr. Ammar Ganim Alhaaik, BVMS, MSc, PhD***
Scientific degree (Assist. Prof.), Department of Anatomy College of Veterinary Medicine, University of Mosul, Mosul, Iraq
https://orcid.org/0000-0002-1473-7631
https://www.researchgate.net/profile/Ammar_Alhaaik4

Cells, Organelles, and Inclusions

Cell: smallest unit of structure and function of body
↓
tissue: group of cell+extracellular ground substance
↓
organ: made up of tissues, have special shape, structure and function
↓
system: organs Which have related function get together.

Four basic tissue that form all of the body:
1---epithelium
2---connective tissue
3---muscular tissue
4---nervous tissue

Definition:- Cytology is study the structure and functions of the cell.

Introduction

A cell is the basic structural, functional and biological unit of a living organism

Tissues that form part of the body consist entirely of cells and extacellular matrix elaborated by cells.

Structural organization of a cell

- Cellular shape, size and structure vary widely and express adaptations for the specific functions of each cell in specialized tissues or organs. However, most cells share general structural characteristics
- Cell membrane
- Cytoplasm
- Nucleus

Cell membrane

- It is also called plasma membrane, plasmalemma or cytolemma
- It measures 8-10nm in width, hence, cannot be resolved clearly at LM
- At EM, it appears as a trilaminar membrane consisting of an outer and inner phospholipid bi-layer each measuring 2.5nm thick and an intermediate layer of proteins measuring 3nm thick
- The lipid bi-layer is primarily composed of phospholipid molecules arranged perpendicular to the cell surface. The polar hydrophilic ends phase the cytoplasm and extracellular matrix while the non-polar hydrophobic ends oppose each other in the centre.
- Proteins lie within the lipid bi-layer with their hydrophobic ends embedded among the fatty acids in the centre.

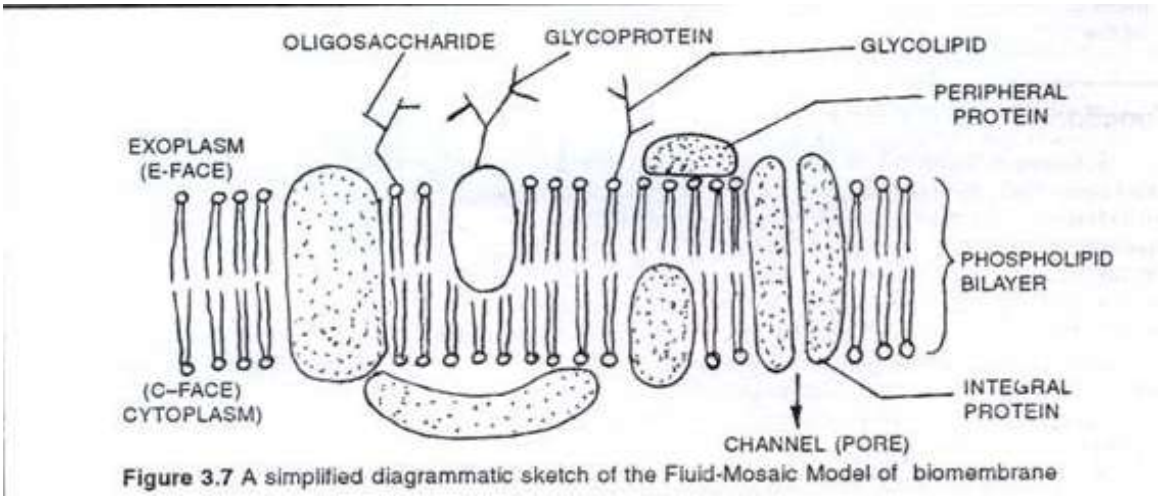
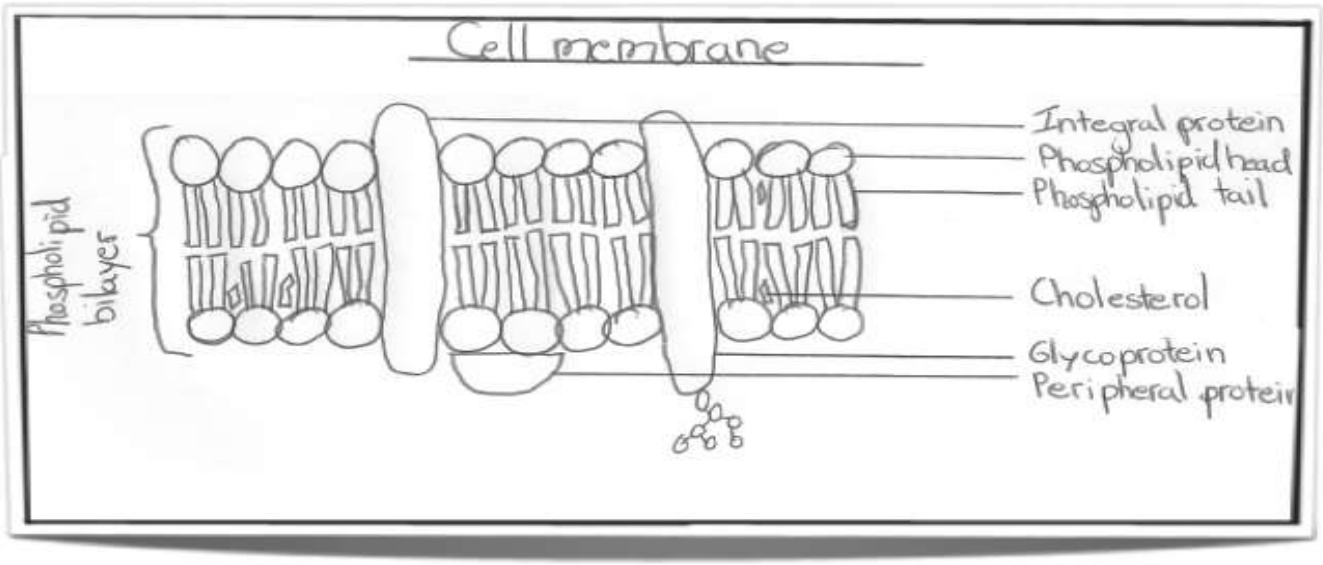


Figure 3.7 A simplified diagrammatic sketch of the Fluid-Mosaic Model of biomembrane

- Transmembrane proteins may cross the membrane and protrude at both s urfaces. Transmembrane and intrinsic proteins together form **integral** proteins.
- Extrinsic (**peripheral**) proteins are present at the cytoplasmic surface.
- Carbohydrates attach to the membrane lipids or protruding proteins forming glycocalyx



Functions of the cell membrane

- It is selectively permeable, to regulates ion conc. Within the cell
- It contains a variety of enzymes for biochemical processes
- It has receptor sites for antigen recognition, antibody production and hormone-triggered cellular events
- Other functions such as endocytosis, phagocytosis,
-

Cytoplasmic organelles

- **Organelles** are small structures whose particular organization gives them a specific function in the metabolism of the cell.
- Organelles lie within the Cytoplasm

- Most cytoplasmic organelles are bound by structured membranes that participate in numerous cell functions e.g synthesis, secretion, phagocytosis, respiration and transmembrane transport.

1- Endoplasmic reticulum

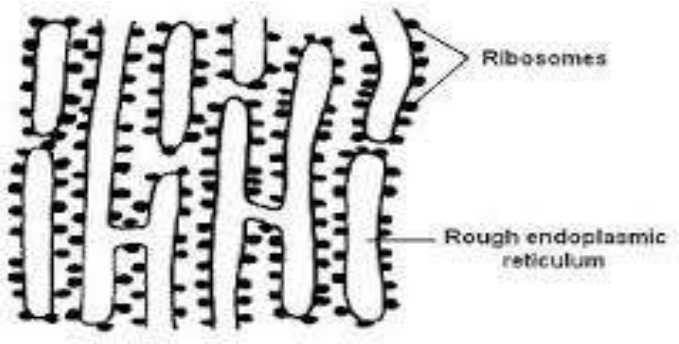
- The re are 2 functionally and structurally distinct forms
  1) Rough endoplasmic reticulum (rER)
  2) Smooth endoplasmic reticulum (sER)

Rough endoplasmic reticulum (rER)

- Consists of a network of flat and wide sacs referred to as cisternae.
- The cytoplasmic surface is studded with ribosomes (hence "rough")

Functions of rER

- Synthesis of proteins for extracellular or intracellular use (e.g secretory prots., lysosomal prots., membrane prots. etc)
- Found in cells specialized for production of proteins



2- *Smooth endoplasmic reticulum SER*

- Consists of a network of tubules that, in most cells, are the ribosome-free
- Found In steroid hormone synthesizing cells and striated cells, sER are well developed
- Functions:
- Steroid hormone synthesis e.g adrenal cortex
- Synthesis of complex lipids.