

Unit 1 Cell Structure and Function

Content Outline: Cell Membrane Structure (1.2)

- I. Cells are said to be *Selectively Permeable* structures.
 - A. The cell “selects” what materials enter or exit the cell through the membrane.
 - B. The membrane also helps to *regulate (control) homeostasis* (stable internal environment) by “controlling” entry or exiting of certain molecules.

- II. Membrane Structure—
 - A. **Phospholipids** make up the *majority* of the membrane.
 1. These are **amphipathic** molecules. (It means there is a *hydrophilic* and *hydrophobic* component.)
 - a. Hydrophilic means “water loving”.
 - b. Hydrophobic means “water fearing”.
 2. These molecules create the bi-layer and the structure is *held intact by the presence of water* outside and inside the cell. The negatively charged phosphorus line up to make a *barrier* preventing water from forming hydration shells around the phospholipids and thereby *dissolving* the membrane.
 - B. **Proteins**
 1. These are also amphipathic molecules. (This is due to proteins folding into a 3-D structure and that proteins are composed of *amino acids*, of which some are hydrophilic and some are hydrophobic.)
 2. Two types of proteins are present on the membrane:
 - a. **Integral** – These run *completely through the bi-layer* from the outside to the inside.
 - i. These function in the transport of molecules and foundation. (Help to maintain the *integrity* of the structure.)
 - b. **Peripheral** – These are located on *one side of the membrane*. (They do not extend into the bi-layer of the membrane.
 - i. These act as sites for attachment of the Cytoskeleton on the inside of the cell and the attachment of the ECM (like armor for the fragile cell) on the outside of the cell.
 3. The proteins of the cell membrane can have several functions.
 - a. *Molecule transport* (Helps move food, water, or something across the membrane.)
 - b. *Act as enzymes* (To control metabolic processes.)
 - c. *Cell to cell communication* and recognition (So that cells can work together in tissues.)
 - d. *Signal Receptors* (To catch hormones or other molecules circulating in the blood.)
 - e. *Intercellular junctions* (For “stitching” cells together to make tissues.)
 - f. *Attachment points* for the cytoskeleton and ECM
 - C. **Cholesterol**
 1. This molecule helps keeps the membrane of all cells flexible.
 2. It also helps to keep the cell membrane of plant cells from freezing solid in very cold temperatures, like the Tundra.
 - D. The membrane is described as a **Fluid-Mosaic model** because it looks like a moving (Fluid) puzzle (mosaic). All the pieces can move *laterally*, like students moving from seat to seat. The proteins moving in this sea of phospholipids would be like the teacher moving around the student desks. Imagine the ceiling and floor are water molecules. They keep you from moving up and down to some extent by their presence.

- III. Why Models? Scientific Model
These are used to *represent* what is difficult to actually see. (Like a model of the solar system. or the model of DNA or a cell membrane.) Further, *The natural world is complex; it is too complicated to comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.*

- IV. Cell-to-Cell Recognition
 - A. This is vital to tissue formation, for example Red Blood Cells (RBCs), and White Blood Cells (WBCs).
 - B. Glycolipids (sugar lipids) and Glycoproteins (sugar proteins) that function in this process *act as hands* on a blind person. Imagine cells are like blind, deaf, and mute individuals... how can they communicate with the environment around them...by using their hands to identify molecules and other cells.