Chapter 5 Notes

I. Membrane Structure and Function

A. The Lipid Bilayer

1. The cell membrane is “fluid” in nature
   a. Made up of Phospholipids
      1) Hydrophilic heads
      2) Hydrophobic tails

2. Phospholipids are the structural foundation for cell membranes
   a. Phospholipids
      1) differ in their hydrophilic heads and length and saturation of their tails
   b. Glycolipids
      1) sugar monomers attached at the head
   c. Cholesterol abundant in animal membrane

B. Fluid Mosaic Model of Membrane Structure

1. Movement within membrane bilayer
   a. Sideways, spin, flex their tails to prevent close packing

2. Different sides of the membrane may have different arrangement of molecules (asymmetric)

II. Membrane Proteins

A. Transport proteins: Allows water soluble movement of substances through their interior

1. A channel protein either open or gated serves as a pore through which ions, water and soluble substances can move

   Message transmitted across the nervous system

2. A carrier protein binds specific substances

   a. Some work passively while others are active requiring ATP to function

B. Receptor proteins have binding sites for hormones

1. Triggers changes in the cell’s activity like - growth
C. Recognition proteins

1. Functions in cell to cell recognition and coordination

D. Adhesion proteins

1. Glycoproteins that help cells stay connected to one another in a tissue

III. Water Movement

A. Concentration Gradients and Diffusion

1. Concentration - the number of molecules in a given volume

2. Molecules move down a concentration gradient (High to Low)

3. Movement of molecules down this gradient is called diffusion

4. Rate and direction of diffusion controlled by

   a. Electric gradient - differences in charge between to regions -- sodium and chloride atoms

   b. Temperature - higher temperatures cause increased agitation of molecules

   c. Molecular size

      Small molecules move faster than larger ones

   e. Pressure gradient --

      a difference in pressure between two adjoining regions can influence the rate and direction of diffusion

B. Bulk Flow

1. Tendency of different substances in a fluid to move together in the same direction due to a pressure gradient -- (animal circulatory system)

C. Osmosis

1. Defined

   a. Passive movement of water across a differentially permeable membrane in response to a solute concentration gradient, pressure gradients or both

2. Tonicity

   a. Denotes relative concentration of solutes in two fluids

      Extracellular fluid and cytoplasmic fluid
Three possible conditions:

1. **Isotonic** same concentration of solutes in the two fluids between inside and outside a cell
2. **Hypotonic** fluid outside the cell has a lower concentration of solutes in solution then the fluid in the cell
   - *The cell may exploded*
3. **Hypertonic** fluid outside the cell has a greater concentration of solutes than the fluid in the cell
   - *The cell may shrivel up*

V. Routes Through the Cell Membrane

A. Simple diffusion

1. Small electrically neutral molecules will move across the lipid bilayer membrane
   - a. H₂O, O₂, CO₂, Ethanol (ETOH)

B. Facilitated Diffusion

1. Carrier proteins -- function in a passive transport manner moving molecules to the side of the membrane where they are less concentrated
   
   Cellular uptake of Glucose (remember glucose is a large polar molecule).

2. Will continue until solute molecule are equal on both sides

C. Active Transport

1. Requires ATP energy to move substance across membrane against a gradient
   - a. pumping of ions -- Calcium ions to make the cell up to 1000 times lower in Ca²⁺ concentration

D. Exocytosis and Endocytosis

1. **Exocytosis** -
   
   cytoplasmic vesicle move substances from cytoplasm to plasma membrane

2. **Endocytosis** -
   
   enclose particles in small portions of plasma membrane to form a vesicles and then moves material into cytoplasm
   - a. Pinocytosis - meaning cell drinking or taking up of water
   - b. Phagocytosis - or cell eating