

## Chapter 4 Physiology of Cells

### I. Passive Movement Across Cell Membranes

- A. Diffusion
  - i. No energy needed
  - ii. Moves from an area of high concentration to an area of low concentration (concentration gradient)
  - iii. Affected by temperature & distance
- B. Facilitated Diffusion
  - i. Carrier proteins embedded in membranes
  - ii. Occurs faster
    - Ex. Insulin attached to glucose
- C. Osmosis
  - i. Diffusion of water across a selectively permeable membrane
  - ii. Occurs until molecules have reached equilibrium
  - iii. Osmotic pressure develops in solution
  - iv. Hypotonic solution
    - 1. Fewer molecules in the solution
    - 2. Cell swells
  - v. Isotonic solution
    - 1. Equal number of molecules in the cell and solution
    - 2. No change in cell size
  - vi. Hypertonic solution
    - 1. More molecules in the solution
    - 2. Cell shrinks

- D. Filtration
  - i. Hydrostatic pressure forces water and solutes through a membrane
- II. Active Transport Processes
  - A. Active Transport
    - i. Requires energy
    - ii. Molecules move against the concentration gradient
      - Ex. Muscles contraction based on  $K^+$
  - B. Endocytosis – Bringing into the cell
    - i. Phagocytosis – condition of cell “eating”
      - Ex. wbc attacking a foreign particle
    - ii. Pinocytosis – condition of cell “drinking” (liquid)
    - iii. Figure 4-11

- C. Exocytosis – exit out of the cell
  - i. Assists molecules leaving when they are too large to go through the plasma membrane
- III. Cellular respiration
  - A. Cell harvesting energy
    - i. In mitochondria
    - ii. Occurs in presence of oxygen
    - iii. Produces ATP
  - B. Glycolysis
    - i. Break down of glucose
    - ii. Does not require oxygen
    - iii. Produces 2 Pyruvic Acids
    - iv. Occurs in cytoplasm
  - C. Krebs' s Cycle
    - i. Occurs on cristae of mitochondria
    - ii. Aerobic
    - iii. Gain 2 ATP
  - D. Electron Transport System
    - i. Occurs on cristae of mitochondria
    - ii. Aerobic
    - iii. Net gain 36 ATP
  - E. Fermentation occurs when oxygen is not present
    - i. pyruvic acid turns into lactic acid

#### IV. DNA

A. Code for protein synthesis

B. Two parts to the process

i. Transcription

1. occurs in the nucleus

2. same information (as DNA),  
different form – mRNA

a. DNA “unzips”, exposing base  
pairs

b. Complimentary base pairing  
(A-U, G-C)

c. mRNA leaves the DNA strand  
and exits through the nuclear  
pores

ii. Translation

1. Occurs in cytoplasm

a. mRNA bonds with ribosome

b. tRNA brings appropriate  
amino acid

c. peptide bonds for a chain,  
called a polypeptide

#### V. Growth and Reproduction

A. DNA Replication

i. Complementary strands are “read” to  
try and avoid errors

ii. Occurs during interphase of the cell  
cycle

B. Mitosis

- i. Cell reproduction
- ii. Results in 2 identical cells
- iii. 4 phases
  1. Prophase
    - a. Nuclear membrane disappears
    - b. Centrioles move to opposite poles of the cell
    - c. Chromosomes condense
  2. Metaphase
    - a. Chromosomes line up along equator of the cell
  3. Anaphase
    - a. Chromosomes are pulled apart by spindle fibers
  4. Telophase
    - a. Cell begins to split
    - b. Cytoplasm with organelles divides
    - c. 2 smaller, identical cells are formed.