Structure equals function

Macromolecules:

Lipids:

Fatty acids: string of C's with H's attached w/ acidic tail

Saturated: no double bonds

Unsaturated: single double bond present

Polyunsaturated: multiple double bonds

Triglycerides: fatty acid bound to glycerol

Stored for energy acquisition

Fat cells

Bonds broken thru dehydration

Phospholipids: bound with glycerol

Hydrophobic fatty acid and hydrophilic head

Formed through dehydration

Cholesterol: hydrophobic and hydrophilic portions

Function: make up mass majority of cell membranes, cell signaling, E storage

Carbohydrates:

Made up of binding of monosaccharides

Covalent bonds of Cs and Os in a ring, w/ OHs/Hs off of ring

Two monosaccharides: disaccharide

Multiple monosaccharides: polysaccharide

Split apart by hydrolysis (addition of water)

Energy storage

Starch/Cellulose: energy storage in plants

Glycogen: energy storage in animals

Proteins:

Made up of amino acids H2N-CHR-COOH; differing R groups

Primary: amino acids

Secondary: string of amino acids hydrogen bonded to self/other AAs

Tertiary: Interacting string of amino acids; functional structure

Quaternary: Interacting tertiary strands bound together

Water in anabolism: water removed; dehydration synthesis (building)

Water in catabolism: water added; hydrolysis (breaking down)

Peptide bond: string of amino acids bound together thru dehydration; proteins

Different R groups determine shape of protein; hydrophobic R groups on inside of protein, hydrophilic towards the outside of the protein.

3-D shape determines what the protein can interact with, how it is shaped

Amphipathic molecules form cell membranes and outer boundaries

Homeostasis:

Maintenance of the same state throughout the body; constant temp, etc.

Interstitial fluid and the intracellular fluid

Controls conditions through necessary exchange

Feedback Loops:

- Negative feedback: reverse disturbance back to a set value
  - Main system used to control homeostasis
- Positive feedback: amplify the disturbance
  - Blood clotting, immune response

Physiologic pH: 7.4

Lec 2/3

Anatomy of membranes: compartmentalize one cell/tissue/organ from next

- Separate extracellular from intracellular; cause concentration gradient
- Bilayer of phospholipids

Membrane function determined by proteins on the exterior of cell
Form concentration gradients by pumping ions in/out; utilized for diffusion
Fluid mosaic model: membrane not rigid, rather fluid. Rigidity increased by

- Cholesterol's presence in membrane

Function of membrane proteins: transport, recognition, catalysis, signaling
Selectivity: if substrate can enter channel, correct receptor, polar/nonpolar, size

Diffusion: motion of solutes from high to low concentration; happens at a rapid rate

- Boundary Layer effect: slows diffusion; solutes build up outside cell

Osmosis: colligative property of aqueous solutions; water from high to low

- Dependent on the concentration of solutes in/out of cell
- Utilizes the pressure gradient (hydrostatic pressure)
- Very large conc gradients can cause tremendous amounts of osmotic press.
  - Lead to rupturing of cell

Colligative Properties: depend on number of dissolved molecules rather than nature
Nonpermeable solutes: increase concentration outside of cell; water enters cell
Permeable: Enter cell, causing water to come with; lyse cell
Water moves hypo to hyper
Osmosis: difference of solute concentrations; difference of water (moves hi to lo)
Tonicity: how a cell responds to the solution it is exposed to

- Isotonic: cell is normal shape; osmotic p -> intra = extra
- Hypotonic: cell swells; osmotic p -> intra > extra
- Hypertonic: cell shrivels; osmotic p -> intra < extra

Partition coefficients: a lower pc means less will enter the cell
Channel types: take up very little space; more permeable to its particular ion

- Nerve and muscle impulses: regulated by channels; fast movement
- Movement proportionate to number of channels

Calcium, potassium, sodium commonly found in/out of cells
Na/K Pump: utilizes ATP to provide energy to pump against [] gradient

- Move ions low to high using the ATP
- Pumping of Na out of cell produces large gradient; used to move other ions into the cell to produce electrical differences in/out of cells
- Pumping of Na out also removes Na leakage from inside/osmotic change
- Primary transport; 3 Na for 2 K

Electrogenic pumps: change charge ratio in and out of cells
Active processes: utilize ATP/concentration gradients
Passive process: directly from high to low; partition coefficients
Primary active transport: create a concentration gradient to be utilized
Secondary active transport: use concentration gradient to move
Second messengers: indicate something else needs to happen; amplified
Cellular transport: vesicles; Cell membrane transport: transport proteins
    Endo/exocytosis – membrane recycling
Junctions:
    Tight junction: limits movements between cells
    Gap junction: direct cell to cell communication

Transepithelial transport: symport to enter cell; specialized transporters/antiporters to enter extracellular fluids
Paracellular: goes between the epithelial cells
Symporters: move two things together
Antiporters: One enters, one exits
Stomach proton pumps/Insulin release: potassium in, hydrogen out (electroneutral)
    Potassium in, shifts ATP to ADP for proton pump
    Active primary transport; protons created w/ carbonic anhydrase in parietal cells in stomach epithelium; proton changes

Lecture 4

Functions of CVS: transports gas, heat, nutrients, hormones, waste, cells
    Maintains pH, changes in pressure, increases of blood
RV – RA – Lungs – LV – LA – Aorta
Veins as blood reservoirs
Arteries as pressure reservoirs
Two sided pump allows blood flow in one direction

Blood components: Red blood cells (erythrocytes), white blood cells (leukocytes), platelets (thrombocytes); all suspended in water and plasma w/ albumen: water sponge that maintains H2O in blood; fibrinogen: blood clotting cascade.
Hemoglobin: iron containing protein complex in RBC; used for oxygen transport
Hematocrit: red blood cell count (% occupied by ceterfuge sample)
Anemia: shortness of RBC, low count
Polycethemia: high amounts of RBC; too much/not enough room for RBC
Blood cell functions:
    Neutrophils: common WB; immune response
    Lymphocytes: closest to RBC
    Basophils/Eosiphils: uncommon
    Granules: linked in clotting factor cascade
    Neutrophils -> first on the scene to immunoresponse

Hematopoeisis: formation of new blood