Cells & Tissues

1. Cell Theory
    1. basic structural & functional unit of organisms
    2. organismal activity based on individual & collective activities of cells
    3. complementarity- biochemical activities determined by subcellular structures
    4. continuity has cellular basis
2. Generalized, Composite Cell
    1. nucleus
    2. cytoplasm
    3. organelles
    4. plasma membrane
3. Plasma Membrane
    1. Quote: "To stay alive, you have to be able to hold out against equilibrium, maintain imbalance, bank against entropy, and you can only transact this business with membranes in our kind of world." -Lewis Thomas *in* The Lives of a Cell, 1974
    2. Fluid Mosaic Model
        1. lipid bilayer
            1. phospholipids
                1. hydrophobic
                2. hydrophilic
            2. glycolipids
            3. cholesterol
            4. integral proteins
            5. peripheral proteins
                1. enzymes
                2. mechanical
            6. glycocalyx
    3. Specializations
        1. microvilli- increase surface area
        2. membrane junctions
            1. tight junctions- impermeable
            2. desmosomes- anchoring
            3. gap junctions- chemical communication
4. The Cytoplasm
    1. cytosol
    2. organelles
        1. ribosomes- protein synthesis
        2. endoplasmic reticulum- canals
            1. RER
                1. protein production
                2. protein distribution
            2. SER
                1. cholesterol synthesis/breakdown
                2. fat metabolism
                3. detoxification
        3. golgi apparatus- protein modification & packaging
        4. lysosomes- breakdown bodies
        5. peroxisomes- detox, free radicals
        6. mitochondria- ATP production
        7. cytoskeleton
            1. intermediate filaments
            2. microfilaments
            3. microtubules
        8. centrioles- cell division (mitotic spindle)
    3. inclusions
        1. fat
        2. pigment
        3. secretions
        4. crystals
5. Cell Physiology
    1. membrane transport
        1. Situation: solutions = solvent + solute
        2. Question: how balance & control?
        3. Answer: selective permeability
            1. passive transport
                1. diffusion
                    1. simple- osmosis, concentration gradient
                    2. facilitated- use carrier
                2. filtration
                    1. pressure gradient
                    2. size selective
            2. active transport
                1. solute pumping (active transport)
                    1. use ATP against concentration or electrical gradients
                    2. can be very selective
                2. bulk transport
                    1. exocytosis- secretion
                    2. endocytosis
                        1. enclosure w/in membrane
                        2. can be receptor mediated
                    3. phagocytosis- eating
                    4. pinocytosis- drinking
    2. cell division
        1. IPMAT
        2. cytokinesis
    3. protein synthesis
        1. Central Dogma: DNA to RNA to Protein (i.e., transcription & translation)
6. Tissues
    1. epithelium- covering
        1. functions
            1. protection
            2. absorbtion
            3. filtration
            4. secretion
        2. characteristics
            1. continuous sheets w/ junctions
            2. one free apical surface
                1. slick
                2. ciliated
            3. rests on basement membrane
            4. avascular (!)
            5. regenerative
        3. classification
            1. simple
                1. simple squamous
                2. simple cuboidal
                3. simple columnar
                    1. goblet cells- mucus
                4. pseudostratified
            2. stratified
                1. durable
                2. stratified squamous
                3. stratified cuboidal & columnar
                4. transitional
                    1. stretchy, flexible
                    2. urinary system
            3. glandular
                1. endocrine
                2. exocrine
    2. connective tissue- support
        1. functions
            1. protection
            2. support
            3. binding
        2. characteristics
            1. usually well vascularized
            2. extracellular matrix
        3. classification
            1. bone
                1. cells in lacunae
                2. calcium salts in matrix of collagen fibers
            2. cartilage
                1. hyaline
                2. elastic
                3. fibrocartilage
            3. dense connective tissue
                1. collagen fibers from fibroblasts
                2. tendons
                3. ligaments
                4. dermis
            4. loose connective tissue
                1. areolar
                    1. protective
                    2. loose
                    3. reservoir
                    4. loaded with phagocytes
                2. adipose
                    1. sub-Q
                    2. around organs
                    3. depots
                3. reticular
                    1. delicate fibers
                    2. stroma for lymphoid organs
            5. blood
                1. cells in plasma
                2. fibers usually soluble, except when clotting occurs
    3. muscle- movement
        1. skeletal
            1. voluntary
            2. striated
        2. cardiac
            1. involuntary
            2. intercalated disks
        3. smooth
            1. unstriated
            2. slow
    4. nervous tissue- control
        1. irritability
        2. conductivity
        3. large size range
        4. supporting cells
    5. repair
        1. injury
        2. inflammation
        3. regeneration vs. fibrosis (scarring)
            1. tissue type
            2. severity of injury
        4. clotting
        5. scabbing
        6. granulation tissue