cell theory

1. All things are made of cells

2. Cells are the basic units of structure and function in all living things

3. All cells come from pre-existing cells

endosymbiotic theory

Mitochondria and chloroplasts were formerly small prokaryotes that began living within larger cells, may have gained entry as undigested prey or parasites.

all eukaryotic cells came from bacterial cells that lived together

proof:all chloroplasts and mitochondria have own DNA and are autonomous (existing and functioning as an independent organism)

cell surface area to volume

smaller cell is faster and more efficient at supplying materials and removing waste than larger cell

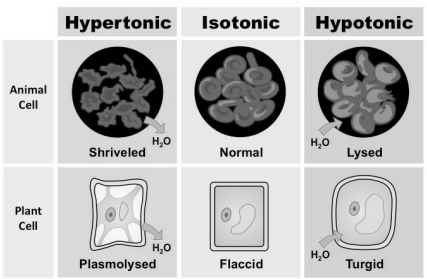
once volume becomes too great for area of cell membrane, pathway is triggered and cell divides

water potential - def and vid

osmotic potential

potential of water molecules to move from a hypotonic solution (more water, less solutes) to a hypertonic solution (less water, more solutes) across a semi permeable membrane

tonicity



- turgor pressure - pressure that water molecules exert against cell wall (considered normal GOOD)
- plasmolysis - cells shrinking away from cell wall
- cytolysis - same as lyse

diabetes

type 1	insulin isn't produced, beta pancreatic cells damaged
type 2	insulin/glucose receptors not working

Hyperglycemia (high blood sugar), hypoglycemia (low blood sugar). Antagonist to insulin is glucagon.

prokaryotic cells

unicellular bacteria

nucleoid region: DNA floating in cytoplasm, no true nucleus or nuclear membrane

considered first form of life - were most likely anaerobic

cell membrane: regulates transport; selective permeability

cell wall: protective layer external to cell membrane

*does not contain phospholipid or transport proteins

*peptidoglycan?

prokaryotic cells (cont)

bacterial cell wall is often target for antibiotic treatment

DNA exists freely in cytoplasm as closed loop

ribosomes: protein synthesis location

capsule: outside of cell wall; made of carbohydrate

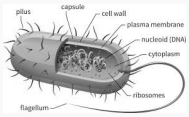
* limit the ability of phagocytes to engulf the bacteria

* cannot be washed off easily

pathogenic (causes disease)

pills make it stick and can't wash off

prokaryotic cells



prokaryotes vs eukaryotes

pro	euk
No Membrane-Bound Organelles	Membrane-Bound Organelles
No Nucleus (single Circular DNA)	Multiple Linear DNA
Free Ribosomes and cell wall	Histones on DNA

endomembrane system

all the different membranes within a eukaryotic cell's cytoplasm	divide the cell into compartments (organelles!)
nuclear membrane	double membrane that encloses the cell nucleus

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endomembrane system (cont)

er	connected to the nucleus; allows for reactions, membraneous;
rer	proteins, has a lot of ribosomes
ser	lipids, responsible for the detoxification of harmful chemicals
golgi body	packaging in membrane and signals for export
lysosomes	used for intracellular digestion and apoptosis, also to fuse w another vesicle to break down using its hydrolytic enzymes
vesicles	may carry hormones that help w body regulation, merges w plasma membrane, releases contents into the external envi, lysosome is a type of vesicle
vacuoles	water and solutes; large and central in plants

cell membrane: regulates transport; selective permeability

endomembrane system (cont)

modifications for cell specificity :

muscle cell has more rer bc of its need for protein

liver cell has more ser bc of its role in detoxification

rest of organelles

nucleus	holds DNA and nucleolus (where ribosomal subunits are made)
mitochondria	double membrane; outer is smooth and inside is folded with enzymes to make ATP (site of cellular respiration)
ribosomes	site of translation-protein synthesis; made of rRNA and protein
cytoskeleton	Microfilaments-contractile protein, gives shape, movement within cells; Microtubules-centrioles, cilia, flagella, spindle fibers
ANIMAL	
lysosomes	contain enzymes; used for intracellular digestion and apoptosis
Centrioles	used in cell division
plants	
Chloroplast	double membrane; site of photosynthesis
Cell wall	middle lamella-pectin; primary cell wall-cellulose; secondary cell wall- lignin

nervous system

Function; sensory input, motor function, regulation

Structure; neuron, axon, dendrites, synapse

Polarized neuron; Na+ outside, K+ and Cl- inside

Depolarization moves Na+ into the neuron, generating an action potential

Repolarization exchanges Na+ and K+ through the sodium-potassium pump

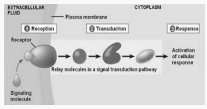
At the synapse, calcium channels open to allow calcium to rush in, stimulating release of neurotransmitters

Neurotransmitters released into synapse to generate action potential for motor neurons or muscle cells

link for signal transduction pathway

https://studylib.net/doc/9812188/cell-signaling-and-communication---part-2

cell signaling / signal transduction



reception: when a receptor protein picks up a signaling molecule on the surface in the phospholipid bilayer. are other ways...

transduction: series of relay molecules or other protein complexes will usually use ATP to transfer the signal down a signal transduction pathway and activate a response

response: changes in enzyme activity, gene expression, and ion channel activity

inactivation: is when response stops - can be apoptosis or a halt of the response.

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transduction

a phosphorylation cascade

phosphorylation - addition of a phosphate group, generally from ATP to a protein or other organic molecule which turns many protein enzyme son and off

stp is merely a lot of different molecules being involved and carrying a signal from the original site of reception to then carry out a response

second messangers

cAMP	broken down even more is cyclic adenosine monophosphate, intracellular messenger
calcium ions	
inositol triphosphate	
can occur on nuclear level	genes turning on or off by activation of proteins called transcription factors in nucleus of cell and will activate or inactivate causing transcription of RNA which is then a messenger and is translated into a protein
organismal response	fight or flight response: encounter lion, could fight it or run away, activated by adrenaline

second messangers (cont)

inactivation	can occur both in inactivation of simple nuclear responses or can be apoptosis (clean programmed cell death)
phagocytosis	one cell eats or breaks down another cell, used both in immune system and apoptosis
apoptosis	cells called phagocytes consume cell that have sent out signals that occur because of other complex signals that say they must disintegrate and be consumed
phagocytes	cyte (cell), phag (consume)

intracellular receptors

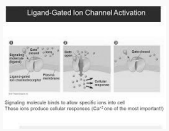
intracellular receptor proteins occur within one cell

Is when a hormone or other ligand can go through phospholipid bilayer bc it is hydrophobic

has a receptor protein inside the cytoplasm of the cell

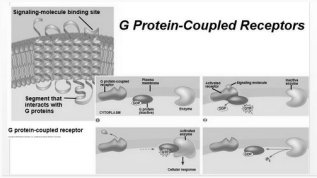
this often reacts with that receptor protein creating a hormone receptor complex that can enter into nucleus of cell and create RNA subscription?

ligand gated ion channel



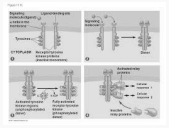
like a door or portal, when signaling molecule attaches to active site on this "gate" will open, usually involved in ion channels, a lot of ions will pass through creating a concentration gradient, on the way out will create ATP and energy of that will be harnessed by the cell

G protein coupled receptors (gpcr)



involved at the surface of the cell a lot of the time w epinepherine//adreniline, affects the fight or flight respsonse in animals. hromone in the endocrine system and neurotransmitters in the synaptic cells

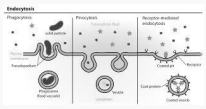
protein kinases (rtks)



kinase-enzyme that catalyzes transfer of phosphate groups from ATP to ADP when it goes through hydrolysis (water breaking off one phosphate ion from ATP). rtk-receptors that when they receive a signaling molecule at their active site, form an unphosphorylated dimer, makes ATP connect to this tyrosine which is a protein and that activates the rtk and turns it into a phosphorylated dimer. Then inactivated relay proteins attach to the phosphates on the dimer and are activated and result in response

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active transport methods



passive transport

no added energy required	movement of molecules from area of high to low concen-tration
concen-tration gradient	difference in concen of mlcs across a distance
diffusion	carbon dioxide and oxygen can pass through membrane bc small and non polar (soluble in lipids)
facilitated diffusion	polar molecules (water) need to pass through pore made by transport protein
osmosis	diffusion of water, water moves from high to low, amount of solute needs to be payed attention to
solute	solid that is dissolved in a solvent
solvent	liquid
hypertonic	high amount of solute, low amount of water in SOLUTION
hypotonic	low amount of solute, high water

passive transport (cont)

isotonic	solute concen inside and outside are the same
isotonic	water moves back and forth in equal amounts (no net movement), cell maintains shape
water moves from high concen of WATER to low concen of WATER	hypo to hyper
contractile vacuole	ex paramecium live in hypotonic, use these to collect excess water and then contract to push water out

our cells pump solutes out of cytosol to bring outside concen closer to inside

plants	take in water through their roots through osmosis

1. molecule binds to carrier protein, 2. carrier protein changes shape, 3. protein releases the molecule to the outside, 4. protein returns to og shape

second way of fd: ion channels, membrane proteins that allow only one specific type of ion through

factors that affect the rate at which mlcs move across membrane:
temp- higher temp
starting concen- extreme diff in starting concen
size of particles- small
all diffuse at a faster rate

active transport

requires added energy (ATP)

moves from low to high concen-tration	up the concentration gradient (sodium potassium pump)
membrane pumps	carrier proteins that moves substances from low to high concentration
endocy-tosis (vesicle movement)	brings items into the cell, process b y which cells ingest external fluid, macromole-cules or other large particles. Phagocytosis is cell eating and Pino cytosine is cell drinking
exocytosis (vesicle movement)	process by which a substance is released from a. cell through a vesicle that transports it to the cell surface and fuses w the cell membrane
	can fuse bc both made of phospholipids, layers press into each other and phosph-olipids rearrange a little so can open up their contents to the outside of the cell

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active transport (cont)

ALL REQUIRES ENERGYYYY

cytoskeleton

a complex of mesh protein filaments that extends throughout the cytoplasm

maintains cell shape

controls position of organelles within cell by anchoring them to plasma membrane

cytoplasmic streaming	flow of cytoplasm

anchors cell in place by interacting w extracellular elements

includes microtubules and microfilaments

microtubules	hollow tubes made of tubulin protein which makes up cilia flagella and spindle fibers
microfilaments	made of actin filaments, support shape of cell

animal cells form cleavage furrow

amoeba to move by sending out pseudopods

skeletal muscles contract as they slide along myosin filaments

cytoplasm

Separates the internal environment of the cell from the external environmen

Phospholipid bilayer (selectively permeable; amphipathic)

Fluid mosaic model (in motion; proteins, cholesterol, glycoproteins, and glycolipids among phospholipids)

cytoplasm (cont)

membrane is hydrophilic on the inside and outside, hydrophobic within the membrane

centriole, centrosome, mtoc

non membranous structures that lie outside NUCLEAR membranes

organize spindle fibers and give rise to spindle apparatus

two centrioles make up a centrosome (ANIMALS)

PLANTS have microtubule organizing center (mtoc) which does the same thing

cell membrane // proteins

give diff types of membranes their unique props

help w facilitated diffusion and active transport

connect cells together

participate in signal transduction

act as marker for cell identification

integral	permanent part of the membrane
peripheral	transiently (not perm) associated w either membrane or integral proteins

associations can be hydrophobic, electrostatic, or non covalent

integral monotopic proteins	attached to only one of two leaflets don't span across membrane

cell membrane // proteins (cont)

transmembrane (are amphipathic - hydrophobic and phillic)	span bilayer, can be bitopic spanning across membrane once or polytonic (more than once)
lipid anchor proteins	covalently attached to lipids in the bilayer
post translational changes to integral and peripheral	addition of fatty acids, diacylglycerol, phrenyl chain,
hydrophobic affect	water molecules want to interact w each other so badly, anything getting in the way of their hydro bonds results in decreased entropy

detergent will disrupt transmembrane proteins bc r amphipathic and will get them out of the membrane

2 types of transmembrane proteins

a helical	found in all membranes
b barrel	only in outer membranes of gram neg bacteria, mitochondria, chloroplasts

function as gateways allowing specific substances to pass across the membrane

may undergo conformational changes

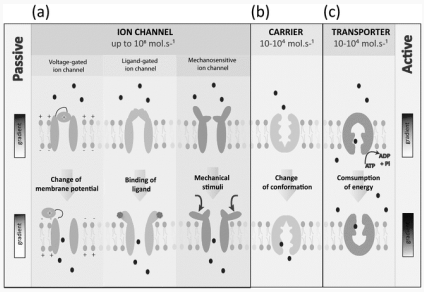
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cell membrane // proteins (cont)

most transmembrane proteins are glycosylated, sugar residues always present on non cytosol leaflet of bilayer

as a result, cell surface is covered in carbs that form cell coat

channels / proteins

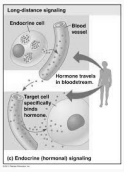


apoptosis // capases

pathways involving enzymes called capases carry out apoptosis

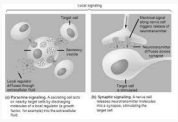
apoptosis is similar in single celled yeast and in mammalian cells means mechanism for apoptosis evolved early in the evolution of eukaryotic cells

long distance signaling



in animals or humans through endocrine system - when specialized endocrine cells withing your glands and lymph nodes and lymphatic system will secrete things and those will travel through you blood and when reach any target cell, that will be effected and give a reaction. hormone ex: oxytocin, epinepherine, it is transported form endocrine system through the circulatroy system

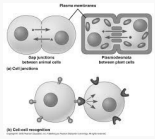
local signaling



paracrine signaling - secreting cells, secrete molecules that diffuse from cell and whenever they hit a target cell w a receptor on surface that fits with molecule then will have an induced effect

synaptic signaling - a motor neuron (efferent-sending signals out) will send some sort of molecule (the effect) across the synapse and will affect a target cell that is stimulated and then has another action potential or response. In muscle contraction, mol would be acetylcholine

communication by direct contact



gap junctions - bet animal cells, junctions that allow molecules to play readily bet adjacent cells w/o crossing the plasma membrane

plasmodesmata - bet plant cells

cell to cell recognition - two animal cells may communicate by interactions bet molecules protruding from their surfaces. protiens or other molecules on the surface of cells jutting out can react w each other. they seem to fit together like a specific protein and a specific substrate

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