

MIDTERM #2 REVIEW: action potential/electrophysiology

- Graded potentials in dendrite- Epsp ipsp is local change to membrane, as it travels down membrane, it degrades. More ligand binding, greater the depolarization
- What happens when synaptic potentials degrade and spread? As it moves across membrane, it degrades. Action potential doesn't degrade
- Linked neurons: direct electrical connections through gap junctions, allows ions to go through so you can have direct electrical charges go through
- Ions in high concentration outside cell: sodium
- Other element high outside cell: calcium
- High concentration inside is potassium
 - Negative proteins make cell inherently negative because they are too big to move through membrane
- Sodium channels opening cause epsp, chloride channels cause ipsp
- Why is potassium inside and sodium out? Potassium is more selectively permeable than sodium is... most sodium channels are voltage gated, whereas most potassium channels are leaky membranes
- Absolute refractory period: voltage gated channels are closed, continues as long as they are closed. Once some are reactivated, it is then the relative refractory period
- At epsp, channel activation happens gradually
- Pretty much every sodium channel requires same activation energy to reach threshold
- Ttx=blocks voltage gated sodium channels

- Mtx=blocks voltage gated potassium channels
- Firing rate
- Two things that affect speed of ap=diameter of axon, whether it is myelinated...larger diameter is faster
- Calcium binds to axon terminal spaces, causes activation for exocytosis

NEUROCHEMISTRY

- (NMDA channel) Disbindin (sp) is prob root cause of schizophrenia... inhibits glutamate reuptake
- GABA and glutamate have no central nucleus, spread everywhere over brain...Ach in basal nucleus
- GABA opens chloride ion channels, which leads to ipsp/hyperpolarization. Too much, gaba builds up and eventually shuts things down
- Serotonin: too much, too little... treat depression by increasing serotonin levels. Having reuptake inhibitor increases levels in synapses...reuptake is primary way these synapses are shut down. Pills/meds don't have anything to do with disorder... drug actually makes the brain refine a different system, i.e. a few synapses away the serotonin is malfunctioning , so you take pill and brain accommodates to fix it
- 5HT1A ... receptor in synapse, linked with anxiety(inherited deficiency) and religiosity
- Anandemide-peptide made by brain... on stem cells

Know these receptors:

nicotine muscarinic (ach),

serotonin 5HT1A(live in raffe nuclea) turn off during REM sleep

norepi and dopamine (didn't give us receptors)

Know role of sodium and calcium after release of transmitters:

-Calcium causes vesicles to fuse, sodium depolarizes the membrane

- Dopamine live in cell bodies, project to basal ganglia(projects to frontal lobe)
- NE lives in floor of the fourth ventricle... fat pads are innervates by NE from sympathetic nervous system (enhanced metabolism) some are born to be obese, because the receptor is blocked
- Ach- learning, memory, attention... when activated in frontal lobes you activate contingency/anticipation wave (attention)-degenerates with Alzheimers
- Signals that activate NE: ach, glutamate

- Signals that shut off NE: gaba, serotonin, sleep

DEVELOPMENT

- Radial glial: help move the progenitor cells, turn into astrocytes when done
- 6 layers of cortex formed inside out: starts at ventricular zone (proliferative zone)
- Limiting factor: need space for wiring, which is why we are limited to 6 layer cortex as humans
- Big brains=longevity, trade off is less offspring
- Central sulcus is formed first ,by primary sensory and primary motor gyro
- Myelination last: frontal lobe, degenerate first
- If neuron A dies, neuron B may die because no connection...transneurona degeneration (anterograde and retrograde degeneration) anterograde is like going down stream, from one cell to the other. Retrograde is when cell damages own nucleus
- Stem cells formed in hippocampus, lack of stem cells causes depression, lack of attention