

Unit Two Homework Assignment

C14 Brain

Two Minute Neuroscience: The Meninges

1. What are the three membranes of the meninges?
2. What are the two functions of the meninges?
3. What are the three functions of the dura mater?
4. What layer of the meninges is attached directly to the brain?
5. What layer is in the middle? How is this layer described? Filled with what?

Cerebrospinal Fluid Explained

1. What type of damage is prevented by the CSF?
2. 3. What are the four functions of the CSF?
4. What structure separates the two lateral ventricles?
5. What structure produces CSF? Location?
6. What is the name given to the structures which prevents unwanted substances from leaking into the CSF?
7. What is the circulation pathway for the CSF?

Two Minute Neuroscience: Ventricles

1. What are the ventricles? Function?
2. What are they lined with?
3. What cells produce the cerebral spinal fluid?
4. What is the function of the cerebral spinal fluid?
5. How many ventricles are in the brain?
6. Where will CSF flow into from the fourth ventricle?
7. What condition occurs if CSF is not able to flow out of the fourth ventricle? Condition?

Two Minute Neuroscience: The Brainstem

1. What three structures are connected by the brainstem?
2. What are the three segments of the brainstem? Functions of each?
3. What are the four bumps on the posterior of the midbrain called? What are the functions of the upper and lower bumps?
4. What molecule is produced in the midbrain? What two regions in midbrain produce this molecule? What functions are associated with these areas?

The Triune Brain - How the brain works.

1. What is the most primitive part of our brain? Inherited from what type of animal?
2. What type of functions were essential for the survival of reptiles?
3. What is the "instinctual" function of the reptilian brain?
4. What was the second brain formation to evolve? What type of early animal did we inherit this from?
5. What type of functions were acquired from the second brain formation?
6. Is the limbic system conscious or unconscious thoughts?
7. What was the last part of the brain to form? Functions?
8. What brain formations provide for conscious and unconscious minds?

Hack Your Lizard Brain

1. What part of the brain takes care of all the regulatory stuff for us?
2. What type of stuff is the middle portion of our brain about?
3. What is the function of the last part of the brain to evolve?
4. If the reptilian brain sets the heart rate then what brain formation makes adjustments as a consequence of different emotional states?
5. Do the different brain formations “talk to each other”? Give examples.
6. What is the principle by which bio-feedback works? What brain formations are “talking to each other”?

Addiction: A Disease of Our Survival System - 12 min1.

1. What is addiction?
2. What is a cause of addiction?
3. What is addiction a disease of?
4. What is the one function of the brain?
5. What two principles is used by the brain to complete its function?
6. What neurotransmitter is used by the brain to reward pleasure and avoid pain?
7. What two basic stimuli associated with survival will cause the release of dopamine and cause pleasure?
8. What two terms maybe used to describe dopamine's functions?
9. What is the function of the anterior cingulate cortex?
10. What is the function of the orbitalfrontal cortex?
11. How do the anterior cingulate cortex and orbitalfrontal cortex work together to safeguard your survival?

Addiction and the Brain (10 min)

1. Why was the function of the Mesocorticolimbic Dopamine Reward Pathway developed?
2. What three structures contribute to the reward pathway?
3. How do you feel when rewarded?
4. What two things activate the reward system?
5. What neurotransmitter do all addictive drugs modulate?
6. What is the first stage of addiction? Two brain structures involved?
7. What two neurotransmitters are responsible for feeling of pleasure?
8. What are two other brain regions activated in start of addiction? Function of each?
9. What is the second stage of drug addiction?
10. What brain structures are associated with the second stage of drug addiction?
11. What happens to dopamine levels when the addict is not using the drug? Feeling caused?
12. What role is played by the extended amygdala in the second stage of addiction? Type of hormone produced?
13. When do you realize you are addicted to a drug (or behavior)?
14. What is the final stage of addiction?
15. What occurs in the final stage?
16. What role does glutamate play in the final stage of addiction?
17. What role does the hippocampus play in addiction?

Opioid Addiction: Mechanism of Action - Part One (12 min)

1. What is the worst sensation a person can experience?
2. What class of drugs block pain? Common types?
4. What is the main opioid receptor? Location?
5. After an opioid drug crosses the blood brain barrier, what will happen?
6. How do neurons communicate?
7. How do opioids block pain?
8. What type of receptor is the opioid receptor?
9. What are the two subclasses of the G protein?
10. What do mu G-alpha opioid receptors on the synaptic knob do?
11. How do mu G-alpha receptors on the post synaptic membrane effect the signal?
12. What do mu G-alpha proteins do? Effect on neuron?
- 13.. What are the three ways opioids stop pain signals?
14. What is the function of the ascending pain pathway? Number of neurons in pathway?
15. What is the function of the descending pain pathway?
16. What is function of opioid on these two pathways?
17. What type of information is transmitted to the brain by the tertiary ascending neurons?
18. What is the normal state of the descending pathway?

Opioid Addiction - Addiction and Overdose - Part Two (16 min)

1. Where does addiction start in the brain? Responsible for what? Activated by?
2. What sensation is felt when the reward pathway is activated? Causes what behavior?
3. What are the two most important structures in the reward pathway? Neurotransmitter released?
4. What type of interneuron inhibits the ventral tegmental area? Causing what? 5. What type of receptor is on the GABAergic interneuron? Ligand for this receptor?
6. What is "drug liking"? Drives what?
7. What may influence the rate of drug liking and make some people more vulnerable to addiction?
8. What are the three factors associated with opioid Use Disorder?
9. What is drug tolerance?
10. What is the risk associated with opioid tolerance? higher the intake the greater for overdose and death
11. What is currently the most studied theory of opioid tolerance? cyclic AMP pathway
12. What is cAMP effect on a neuron? more cAMP activates neuron // less cAMP inhibit neurons
13. What occurs after chronic use of opioids? Causes what? no longer decreases cAMP and results in tolerance
14. What role is homeostasis in causing tolerance? opioids reduce cAMP levels below normal so homeostasis tries to restore cAMP levels to normal levels but overshoots target causing higher levels of cAMP // taking opioid now brings cAMP levels only back to normal // to inhibit neuron then more and more opioid is required
15. How may changes in opioid receptor also contribute to tolerance? receptor phosphorylation, receptor internalization, receptor uncoupling
16. How is withdrawal symptoms related to cAMP? What happens to cAMP levels during withdrawal? cAMP levels now unusually higher than normal // certain neurons now overactive and cause withdrawal symptoms
17. What are the brain's three areas associated with withdrawal? ventral tegmental area, locus ceruleus, small and large intestines
18. What is the pattern of neuron function seen during opioid use and withdrawal? use = opposite of normal function (inhibition) // withdrawal causes excess of normal functions (overactivation)
19. Where is the locus ceruleus located? Functions? brainstem // wakefulness, psychological stress plus activates the sympathetic nervous system when activated causes sweating, pupil dilation, increase heart-reperation rate
20. What occurs to cAMP when LC becomes tolerant to opioids? What then happens during withdrawal? higher than normal cAMP level // no opioids to bring back to normal level // over stimulation with jitteriness, anxiety-panic-stress, excess sweating, extreme dilated pupils rapid heart-respiratory rate // all extreme versions of normal LC functions

21. What happens in the digestive system during opioid use? Why?
22. What happens in the digestive system during withdrawal? Why?
23. What happens in the ventral tegmental area after chronic opioid use or during withdrawal?
24. Do people chronically addicted to opioids take the opioids to get high (pleasure) or to feel normal?
25. How do addicts die during an overdose?
26. How may you reverse an opioid overdose? Mechanism?

Addiction 101

1. What is the number one injury related cause of death in US?
2. Why do we need dopamine?
3. How much dopamine do you need to motivate you to start your day?
4. What about a really bad day?
5. The best day?
6. Favorite food?
7. Sex? 92 nanograms per deciliter
8. What about methamphetamine?
9. Why does it become a survival issue for the brain?
10. What two limbic brain structures are directly responsible for the reward pleasure pathway?
11. What happens with chronic use of methamphetamine?
12. How low may dopamine be in withdrawal? Condition of patient?

Serotonin VS Dopamine (10 min)

1. What is the neurotransmitter dopamine telling you?
2. What is the neurotransmitter serotonin telling you?
3. What is the role of cortisol? What part of the brain is the target for cortisol? Function?
4. What does a broken prefrontal cortex turn you into? Leads to what?
5. How are serotonin receptors affected by cortisol? Leads to what?
6. What condition occurs when a substance causes higher than normal levels of dopamine?
7. What happens if you do not receive reward? Will you get out of bed?
8. What are the differences between reward-pleasure and contentment-happiness?
9. What neurotransmitters are responsible for pleasure and happiness?
10. What is the post-synaptic effect to dopamine?
11. What is the post-synaptic effect to serotonin?
12. How will a post-synaptic neuron protect itself from death due to excess dopamine? Condition called what?
13. Why may dopamine kill a neuron but serotonin will not kill a neuron?
14. What down regulates serotonin?
15. Why do you have less happiness when you seek more pleasure?
16. What three events occur if you have a lack of dopamine?
17. What is the brain telling the drug addict if they can not get their drug of choice?
18. What area of the brain "lights up" to indicate survival behavior?
19. How will the brain light up for the following stimuli: dehydrated, starvation, drug craving?
19. What type of behavior occurs with craving?
20. How long will it take after the addict stops taking the drug for the craving to stop?
21. Why is methadone used to help patients recover from opioid use disorder?
22. What do you need to think when you hear dopamine? = motivation
23. What is the purpose for reducing craving? stop relapse
24. What is decision fatigue?
25. How may society help treat the opioid epidemic?
26. What is the key idea to take away from this video?