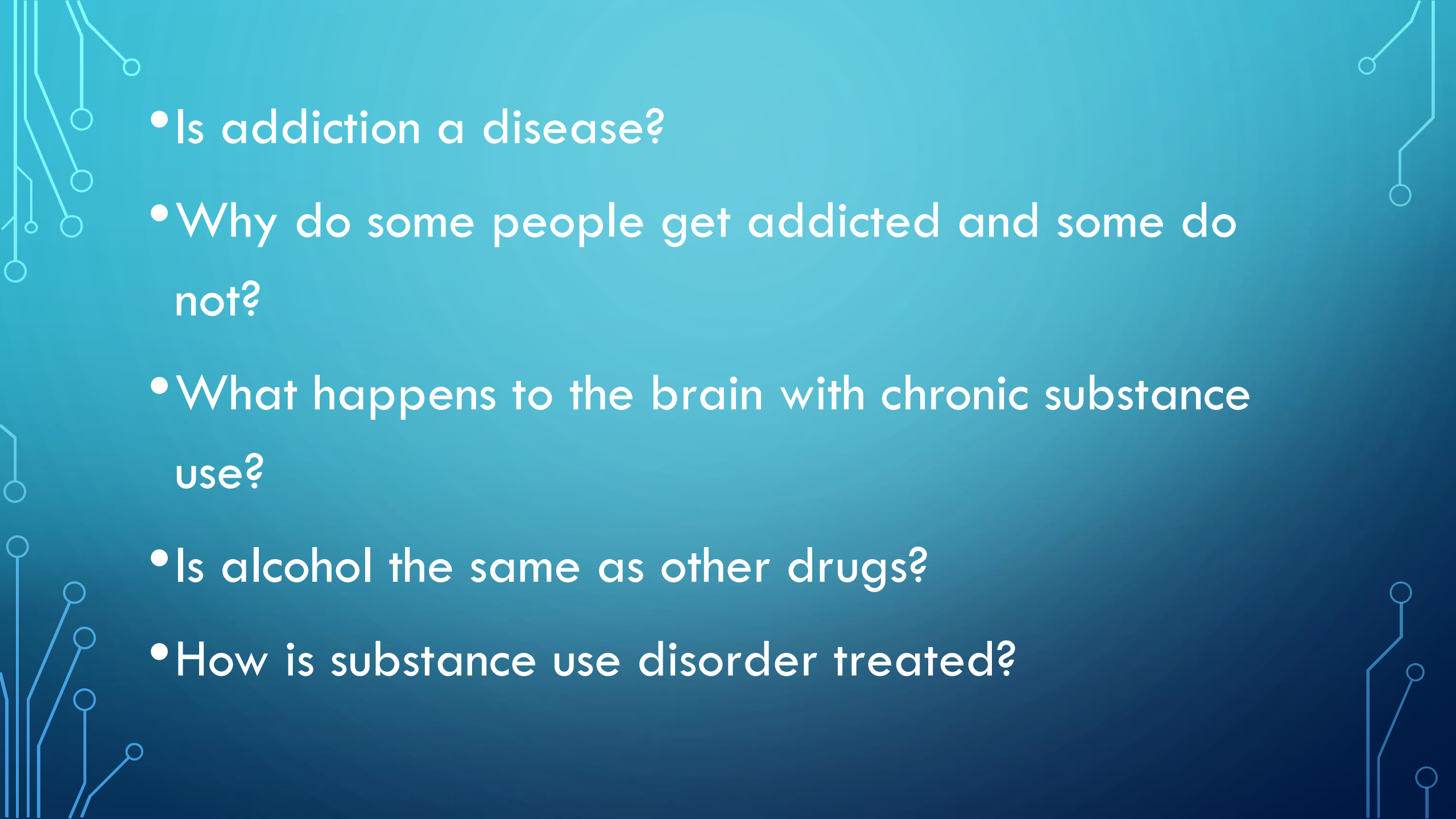




THE BIOLOGY OF THE ADDICTED BRAIN

JOSH WEIL, RN, BSN, VCWN, ROPS

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- The background is a dark teal color with decorative white circuit-like lines in the corners. These lines consist of straight segments connected by small circles, resembling a network or data flow diagram.
- Is addiction a disease?
 - Why do some people get addicted and some do not?
 - What happens to the brain with chronic substance use?
 - Is alcohol the same as other drugs?
 - How is substance use disorder treated?

GENETIC SUSCEPTIBILITY

- McClearn and Rodgers (1959)
- Inbred mice to create groups with identical genetic strains
- Availability of psychoactive substances to self administer
- Noted differences in behaviors of groups
- Habitual, abstinence and intermediate

WHAT DO THESE GENES DETERMINE?

- Receptor affinity
- Receptor sensitivity
- Metabolic process
- Enzyme levels
- Elevated pleasure response (experience)



THE HIJACKED BRAIN

- Human survival and the pleasure/reward circuit
- The limbic system
- The Nucleus Accumbens
- The VTA
- The role of Dopamine in addiction
- The Prefrontal Cortex



THE DRIVE TO SURVIVE

- The human brain is designed to continue to drive behaviors that are good for survival and procreation



THE LIMBIC SYSTEM

**Prefrontal
Cortex**

**Basal
Ganglia**

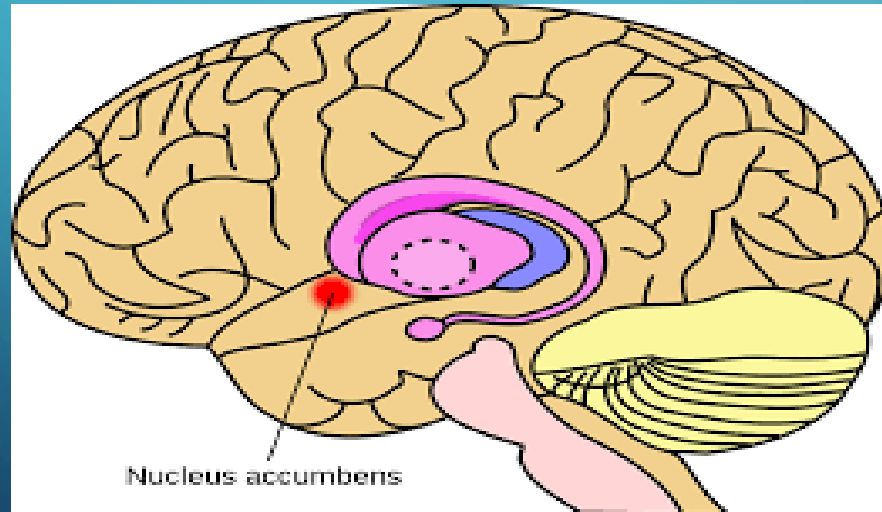
**Nucleus
Accumbens**

**Limbic
System**



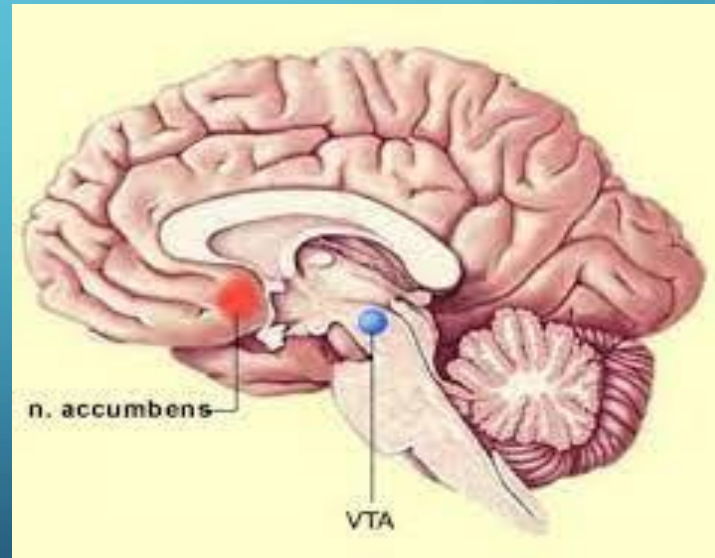
THE NUCLEUS ACCUMBENS

- Known as the “pleasure center” of the brain
- Psychoactive substances act directly on the Nac
- Responds to substances at a higher than normal level



THE VENTRAL TEGMENTAL AREA (VTA)

- Responds to Nac activation
- Not a logical, thinking part of the brain
- Elevated response
- Releases dopamine



THE ROLE OF DOPAMINE IN ADDICTION

- Central role in all addictions
- Significant increase in all addictions
- No longer believed to be associated with pleasure
- Associated with wanting/craving
- Released to ensure survival behaviors continue

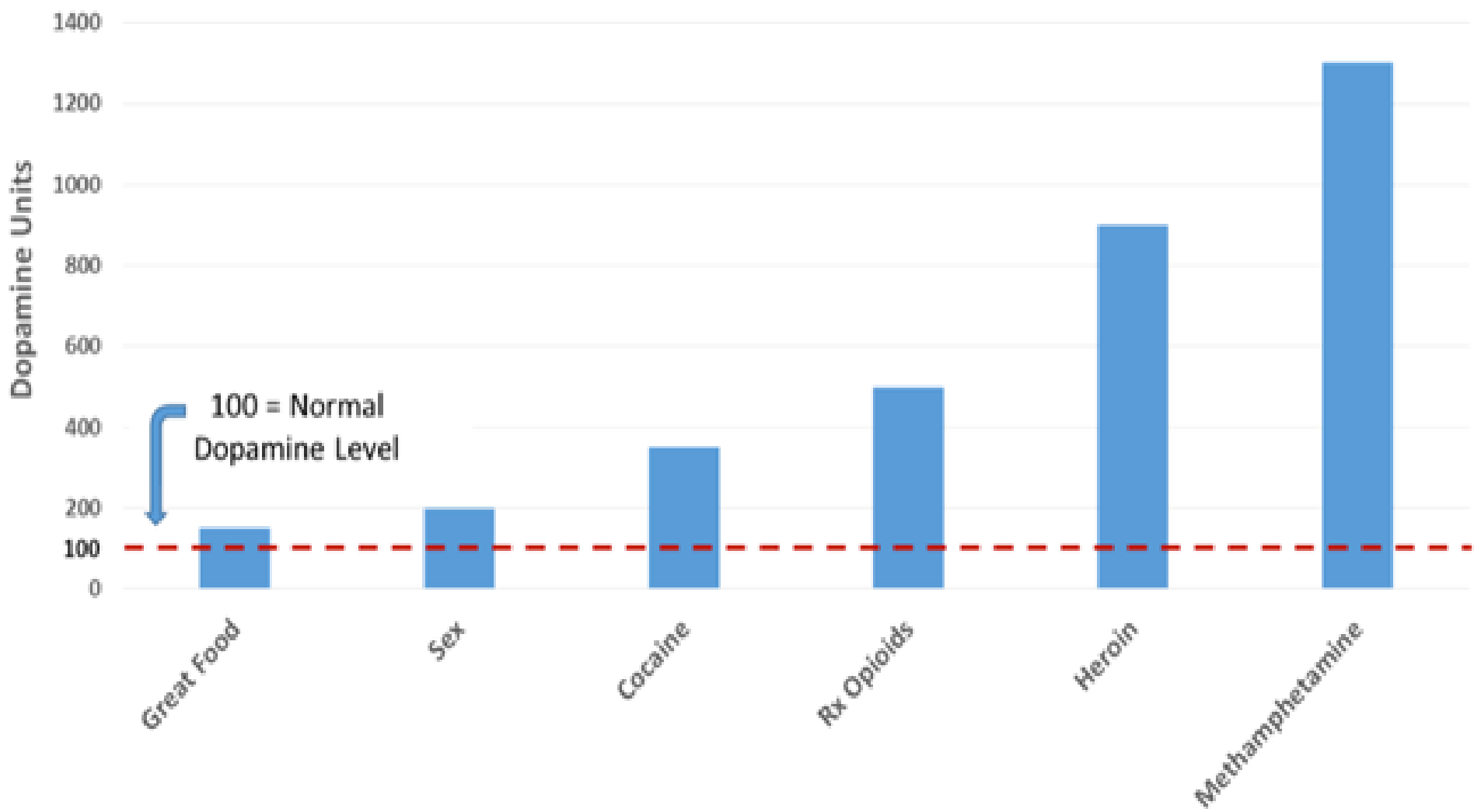
WOLFRAM SCHULTZ MONKEY

- Experimented with monkeys to monitor dopamine levels associated with rewards
- Used fruit juice and a light that would flash before reward
- After repeated behavior dopamine would release when light came on and not while receiving juice
- Level of pleasure remained the same without dopamine

BARRAGE AND ROBINSON

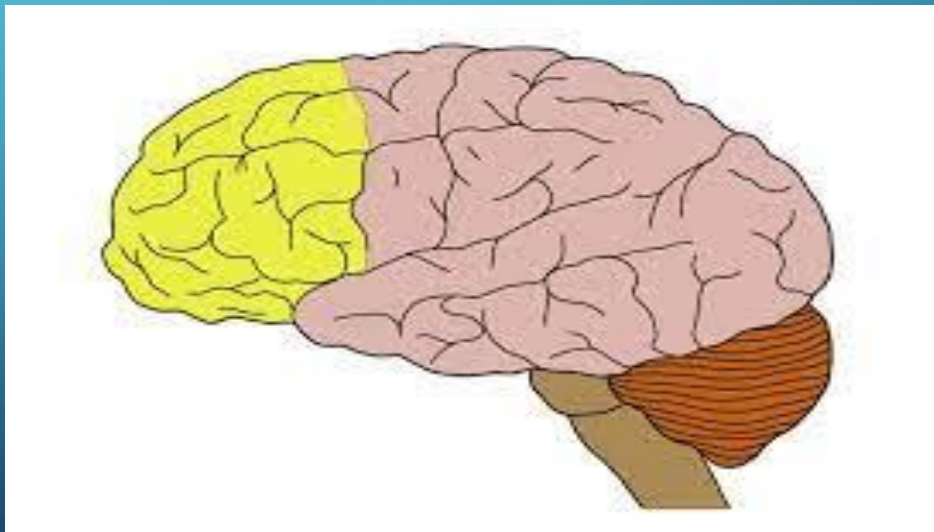
- Used genetically altered mice and rats
- Some produced excess dopamine and some no dopamine
- Motivational behavior was reflected in animals
- Believe dopamine is responsible for primitive impulses and cravings which they called “incentive salience”

Dopamine Levels



THE PREFRONTAL CORTEX

- Logical thinking part of the brain
- Inhibitory system used to override primitive cravings
- Provides the ability to choose not to succumb to survival drives when consequences are harmful



THE PREFRONTAL CORTEX AND CHRONIC SUBSTANCE USE

- Structure of neurons change
- Reduction in mass
- Reduced activity



IS ALCOHOL A DRUG ? COMPARING OPIOIDS TO ALCOHOL



Darwin Brandis/Shutterstock.com

HOW ALCOHOL IS DIFFERENT

- Legal
- Socially acceptable
- Easily obtainable
- Moderate amounts can increase health



HOW ALCOHOL IS SIMILAR

- Strong evidence of genetic susceptibility
- Binds to bodies natural receptors to create an increased or diminished response
- Body produces compensatory response that leads to tolerance and physical dependence
- Withdrawal occurs when substance is no longer in the system

OPIOID MECHANISM OF ACTION

- Attaches to opioid receptors like the bodies natural endorphins creating a decreased response to pain
- Reduces neuronal cell excitability creating a sedative effect
- Activates the nucleus accumbens
- Can create elevated pleasure response

ALCOHOL MECHANISM OF ACTION

- Attaches to the bodies natural NMDA and Gaba receptors
- Causes receptors to be less responsive to glutamate and more responsive to Gaba which decreases neural activity creating a sedative effect
- Activates the nucleus accumbens
- Can create elevated pleasure response

COMPENSATORY RESPONSE (TOLERANCE)

- In response to alcohol the body up regulates NMDA receptors and down regulates Gaba receptors to increase neural activity
- In response to opioids the body down regulates opioid receptors
- With chronic alcohol use the number of enzymes that break down alcohol will increase in the digestive tract
- With chronic opioid use the production of cyclic Amp will increase which opposes the effect of opioids

PHYSICAL DEPENDENCE AND WITHDRAWAL

- When alcohol is no longer present to inhibit the receptors neural activity is dramatically increased due to extra NMDA and decreased Gaba receptors
- Symptoms of alcohol withdrawal include tremors, anxiety, nausea, vomiting, headache, increased heart rate, irritability, confusion, insomnia, high blood pressure and nightmares
- Severe withdrawal can cause delirium tremens which is characterized by seizures, extreme agitation, hallucinations and can be fatal
- According to the world health organization 1 40,000,000 people are physically dependent on alcohol

PHYSICAL DEPENDENCE AND WITHDRAWAL

- When opioids are no longer present the excess of cyclic Amp increases activity that is suppressed by excess opioids and the lack of opioid receptors increases sensitivity to pain
- Symptoms of opioid withdrawal include diarrhea, vomiting or nausea, restlessness, sweating, anxiety, muscle pain, abdominal cramping, increased heart rate and blood pressure, dilated pupils, insomnia, goose bumps and tremors

CONSEQUENCES OF CHRONIC USE

Alcohol

- Heart disease
- Stroke
- Accidents resulting in injury
- Legal problems/incarceration
- Mental illness
- Liver disease
- Death

Opioids

- Abdominal distention
- Increased risk of HIV/HCV
- Accidents resulting in injury
- Legal problems/incarceration
- Mental illness
- endocarditis
- Death

TREATMENT FOR SUBSTANCE USE DISORDER

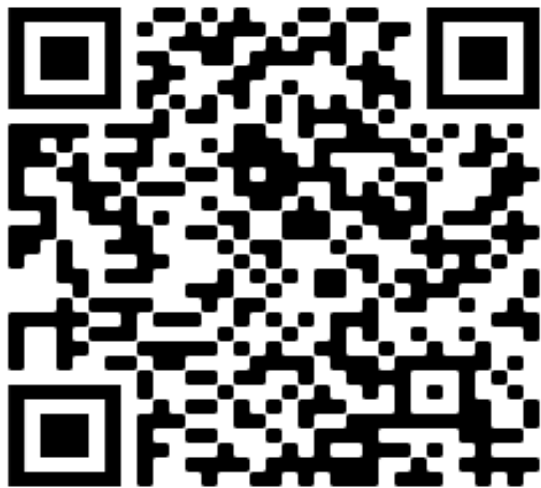
- Addiction is a complex but treatable disease that affects brain function and behavior.
- No single treatment is right for everyone.
- People need to have quick access to treatment.
- Effective treatment addresses all of the patient's needs, not just his or her drug use.
- Staying in treatment long enough is critical.
- Counseling and other behavioral therapies are the most commonly used forms of treatment.

TREATMENT FOR SUBSTANCE USE DISORDER (CONT.)

- Medications are often an important part of treatment, especially when combined with behavioral therapies.
- Treatment plans must be reviewed often and modified to fit the patient's changing needs.
- Treatment should address other possible mental disorders.
- Medically assisted detoxification is only the first stage of treatment.
- Treatment doesn't need to be voluntary to be effective.
- Drug use during treatment must be monitored continuously.
- Treatment programs should test patients for HIV/AIDS, hepatitis B and C, tuberculosis, and other infectious diseases as well as teach them about steps they can take to reduce their risk of these illnesses.

YOU NARCAN SAVE LIVES

FREE community-based Narcan training and access



Tuesday April 13th

2:00pm – 3:00pm

7:00pm – 8:00pm

Free Narcan training for
Summit attendees

Scan QR code for ticket access

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