DISEASE CONCEPT OF ALCOHOLISM AND DRUG ADDICTION

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NEURAL CIRCUITRY OF REWARD

- Present in all animals
- Produces pleasure for behaviors needed for survival:
  - Eating
  - Drinking
  - Sex
  - Nurturing
ALL DRUGS OF ABUSE BIND TO THE NEURAL CIRCUITRY OF REWARD
SELF-STIMULATION STUDIES
Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry.
ADDICTION

- An overwhelmingly powerful compulsion to use a substance, with progressively diminished capacity to resist it, despite escalating personal harm
- The use is at the expense of natural rewards
- The development of a negative emotional state
RISK FACTORS

- 40 - 50 \% genetic vulnerability (epigenetics)
- Trauma, neglect, abuse
- Parenting
- Peer group
RISK FACTORS

- Drug availability
- Stress
- Social isolation (especially in adolescence)
- Traumatic brain injury
- Mental illness:
  - Bipolar, ADHD, PTSD, Schizophrenia, Anxiety disorders
ADDICTION AS A DISEASE OF THE BRAIN

- Imaging studies consistently show specific abnormalities in the brain function of addicted individuals.
ALCOHOL SPECT SCAN

Alcoholic brain

Normal brain
HEROIN AND CANNABIS SPECT SCANS
COCAINE PET SCAN

NORMAL

COCAINE ABUSER (10 days)

COCAINE ABUSER (100 days)
DISEASE OF MALADAPTIVE LEARNING

- Addiction is the hijacking of the brain mechanisms for learning and memory.

- These mechanisms (brain circuits and chemicals) are there to shape behaviors with that, through rewards and cues, promote survival
  
  *wrong response to a situation
Addiction as the cause

Pre-existing causes predisposing to addiction

- ADHD
- Fetal alcohol syndrome
- Traumatic brain injury
ADDICTION AND COGNITION

- Cognitive deficits impair ability to benefit from counseling: more sessions, more reinforcement needed, role of Alcoholics Anonymous
Increases in dopamine are not directly related to reward per se, as was previously believed, but rather to the prediction of reward and for salience.

*Salience: motivationally important
“Addiction is a cycle of spiraling dysregulation of brain reward systems that progressively increases, resulting in compulsive drug use and a loss of control over drug taking”

Counteradaptive* hedonic** dysregulation

*Opposite of a proper, effective change

**Pleasure
NEUROADAPTATION

- Drugs change the brain’s pleasure and reward balance
- The brain has powerful mechanisms to oppose this change,
- The counteradaptive action overshoots
- Repeated cycles of use lead to long-lasting neuroplastic changes
ALLOSTASIS

- Change to a new, vulnerable state
- Activation of stress circuitry
- Deficit state: inhibition of brain reward system
- Increased reward threshold
- Altered hedonic tone
- Drugs create the stress that require that they be used to create the very problem that they have created
CRAVING

- Craving and relapse can be triggered by salient cues and stress
- Kindling
- Stress: foot shock, foot shock
- Searching
STRESS REINSTATEMENT PARADIGM

- Our patient’s lives:
- Foot shock, foot shock, foot shock
Addiction is a chronic, progressive brain disease.

In the course of repeated drug use long-lasting changes occur in the circuitry involved in memory, learning, motivation and reward as well as inhibitory control.

Craving and relapse can be triggered by salient cues and stress.
“Just because you got the monkey off your back doesn’t mean that the circus left town.”

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