

# Hijacking the Brain: When Using is Not a Choice

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Caron Treatment Centers




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ASAM Disclosure of Relevant Financial Relationships  
Date of Activity: Nov 3, 2016

Name	Commercial Interests	Relevant Financial Relationships: What Was Received	Relevant Financial Relationships: For What Role	No Relevant Financial Relationships with Any Commercial Interests
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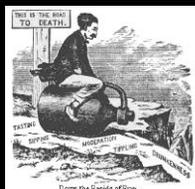
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## What is Addiction?

- **Possession by evil spirits?**
  - Demon rum
- **Lack of moral fiber?**
  - War on drugs
  - "Just say no"
- **Disease?**
  - Alcoholism recognized in 1956 by the AMA
  - Addiction recognized in 1987 by the AMA




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### ASAM definition of addiction



- Addiction is a stress induced, genetically mediated, primary, chronic disease of brain reward, motivation, memory and related circuitry.
- Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations.
- This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors...

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...primary, chronic disease of...

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## Disease

- A "defect in an organ system that produces a consistent pattern of signs and symptoms"

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## An Evil Disease

- Doesn't look like a disease
- Self-deception (denial) is a sign
- Affects genetically susceptible (vulnerable) people
- Has a highly variable prognosis
  - Poor prognosis if untreated
  - Some recover spontaneously
  - Chronic/relapsing
- Culturally & politically divisive: challenges societal values and norms.

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## Chronic Diseases.....

- Treated, not cured
  - characterized by relapse and remission
- Outcomes depend on continuity of care over time
- Genetic plus environmental factors determine..... "vulnerability"

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## ...genetically mediated...

- Genetic predisposition accounts for about 50% of the likelihood that an individual will develop addiction
  - Polymorphisms
  - Dopamine & Mu opioid receptor genes
- A child is 3 to 4 times more likely to be alcoholic if s/he has one alcoholic parent
  - Stress and genetics interact to make future generations more vulnerable to addiction

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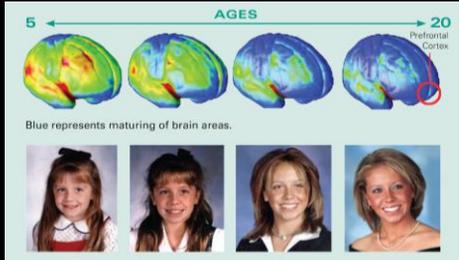
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Exposure to drugs of abuse during adolescence may have profound effects on *Brain Development* and *Brain Plasticity*



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Addiction is *stress induced*



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# Childhood stress

Adverse Childhood Experiences Study (ACES),  
V.J. Felitti, MD and R.F. Anda, MD

## ACEs: The 10 Areas of Trauma

1. Psychological Abuse
2. Physical Abuse
3. Sexual Abuse
4. Emotional Neglect
5. Physical Neglect
6. Loss of a Parent (for any reason)
7. Mother Treated Violently
8. Substance Abuse
9. Mental Illness
10. Criminal Behavior in the Household

The questions are described on the ACE website  
[www.acestudy.com](http://www.acestudy.com)

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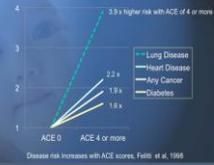
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## Childhood stress (ACEs) predicts development of disease as an adult

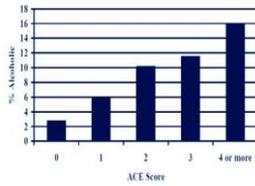
ACEs predict chronic disease in adulthood

4 ACEs are predict a 7x risk of alcoholism

ACE Score & Risk for Chronic Disease



ACE Score vs. Adult Alcoholism




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...brain reward, motivation, memory...

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Nora Volkow, MD. Director, National Institute of Drug Abuse, 2003- present

"Thus, those who say 'it was their own choice' after a person dies of an overdose fail to grasp that an addicted person's brain has a disrupted choice mechanism."

"It isn't enough to say that addiction is a chronic brain disease. ...the circuits that enable us to exert free will no longer function as they should."

"...The good news is that behavioral therapies and medications can help addicted individuals repair their damaged self-control capacities, as long as they actively participate in treatment."



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### Brain Neurochemistry 101

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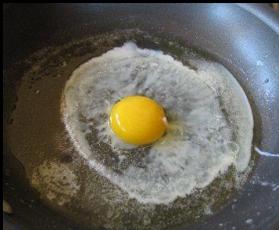
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### Were you thinking this?



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### 80 – 100 billion neurons



Each nerve cell may have up to ten thousand connections. Each connection is called a *synapse*

The brain has 100,000,000,000,000 synapses

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### Synapse = nerve connection



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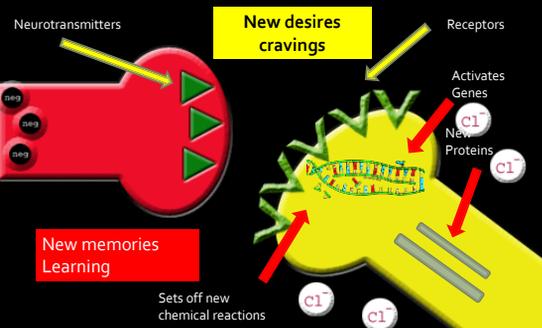
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Neurotransmitters

New desires cravings

Receptors

Activates Genes

New Proteins

New memories Learning

Sets off new chemical reactions

Cl<sup>-</sup>

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# Memory

- Simple model of memory:
  - Encoding (chemical)
  - Storage (anatomical ?)
  - Retrieval (???)



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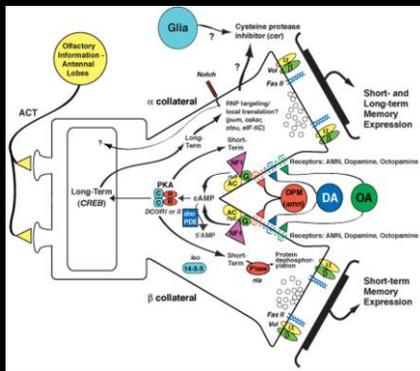
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### "Reward circuit" re-enforces survival behavior

- Midbrain (VTA): Reward driven, impulsive (motivation)
- Nucleus Accumbens: memory and learning associated with reward
- Prefrontal cortex: Executive function
  - Top down decision making
  - Inhibitory control: "Brakes and steering" (choice)

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### Survival Brain (Limbic Area)

Our brain connections ensure that we will repeat life-sustaining activities by associating those activities with pleasure.

Survival behaviors:

- Food/Fluid intake
- Feelings/nurturing
- Fight or Flight response
- Flirting/sex

Limbic

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### Reward system affects thinking

dopamine

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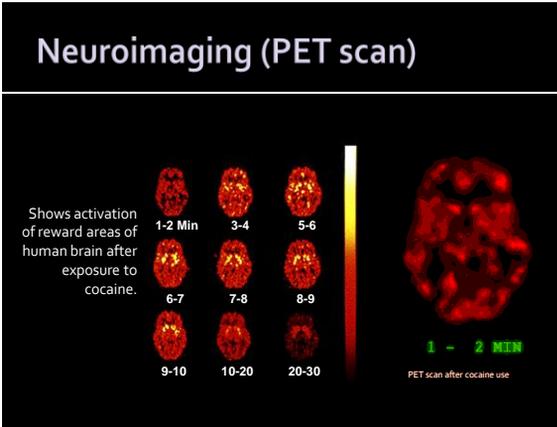
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- ### Substances and behaviors associated with dopamine release
- Alcohol/Sedative hypnotics
  - Opioids
  - Cocaine/Amphetamines
  - Ecstasy (MDMA)
  - Hallucinogens
  - Dissociants
  - Cannabinoids
  - Nicotine
  - Anabolic Steroids
  - Food/sugar
  - Sex/love
  - People, "co-dependency"
  - Gambling
  - Exercise
  - Achievement
  - Collection/Accumulation
  - Rage/Violence
  - Media/Entertainment

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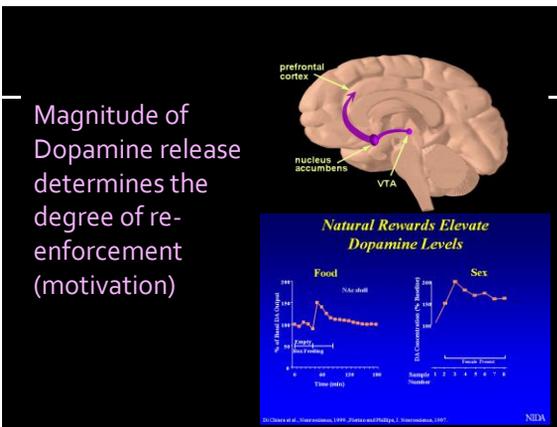
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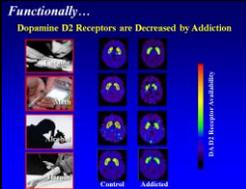
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## Dopamine 2 receptors are reduced in addicted brains

### "Anhedonia"



The brain adapts to massive dopamine release by decreasing dopamine receptors

In doing so, the brain becomes numb to natural rewards

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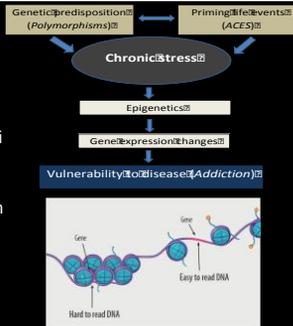
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## Plasticity of the Brain

- Brain adapts to experience
  - Changes in receptors and neurotransmitters
  - Changes in chemical reactions elicited by stimuli
  - "Rewiring" of nerve connections
  - Changes in gene expression aka *epigenetics*




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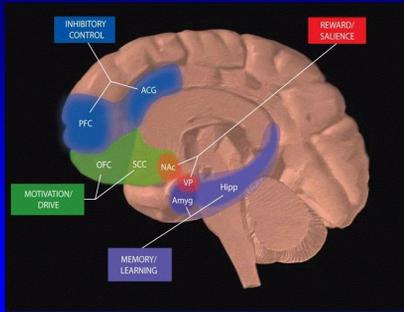
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### Circuits Involved In Drug Abuse and Addiction



All of these brain regions must be considered in developing strategies to effectively treat addiction

NIDA

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### Memory for Drugs and Related Cues

- Memory of prior euphoric experiences
- Both drugs and associated memories
  - drug cues
- Cues motivate behaviors associated with drug use
  - Craving, drug seeking




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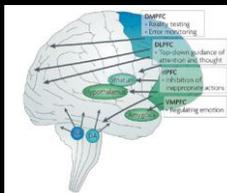
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### PREFRONTAL CORTEX: EXECUTIVE FUNCTION AND INHIBITORY CONTROL

- Integrates sensory and emotional information
- Assigns salience (importance) to stimuli
- Decision making and motivation
- Inhibits inappropriate or risky behavior
- Planning: strategy evaluation
- Personality expression and empathy
- Self-awareness: *metacognition*




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## ADDICTED BRAINS ARE DIFFERENT



- Gene expression
- Brain metabolism
- Reactions to conditioned cues

**= DEFECT IN THIS ORGAN SYSTEM**

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## Substances *and* behaviors associated with dopamine release

- |                              |                           |
|------------------------------|---------------------------|
| ▪ Alcohol/Sedative hypnotics | ▪ Food/sugar              |
| ▪ Opioids                    | ▪ Sex/love                |
| ▪ Cocaine/Amphetamines       | ▪ People, "co-dependency" |
| ▪ Ecstasy (MDMA)             | ▪ Gambling                |
| ▪ Hallucinogens              | ▪ Exercise                |
| ▪ Dissociants                | ▪ Achievement             |
| ▪ Cannabinoids               | ▪ Collection/Accumulation |
| ▪ Nicotine                   | ▪ Rage/Violence           |
| ▪ Anabolic Steroids          | ▪ Media/Entertainment     |

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## Addiction is Characterized by...

- Inability to consistently ABSTAIN
- Impairment in BEHAVIORAL CONTROL
- CRAVING
- DIMINISHED RECOGNITION of problems with one's behavior and interpersonal relationships
- Dysfunctional EMOTIONAL RESPONSE

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## Addiction: Abberant behavior

- Loss of control over use
- Preparation for use, use, and recovering from use takes up time
- Use in the face of physical and psychological problems
- Social, work, family problems
- Hazardous situations
- Amount and frequency of use are secondary




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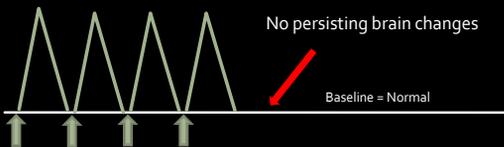
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## Non-addict brain response to drug




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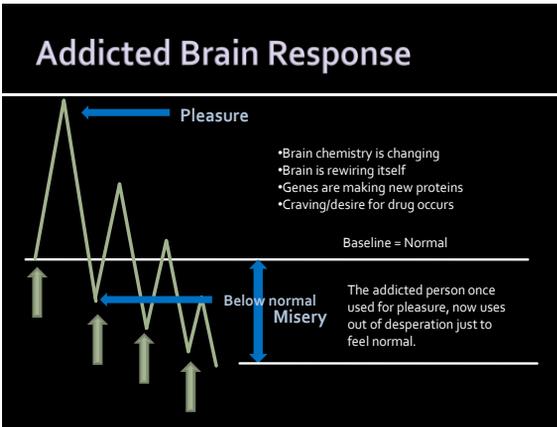
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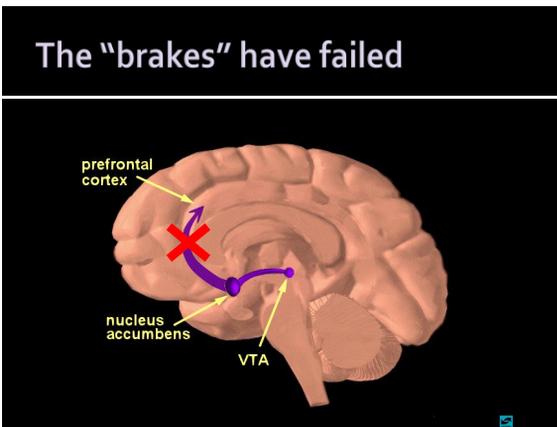
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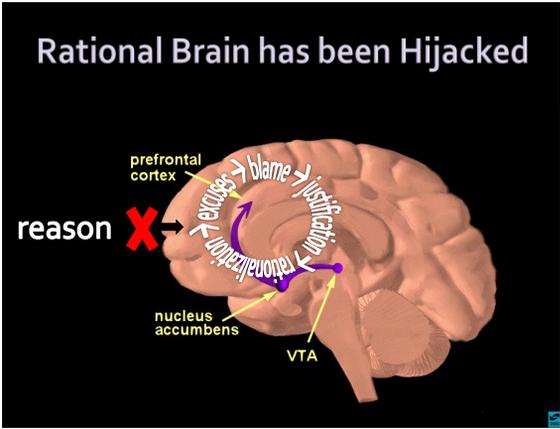
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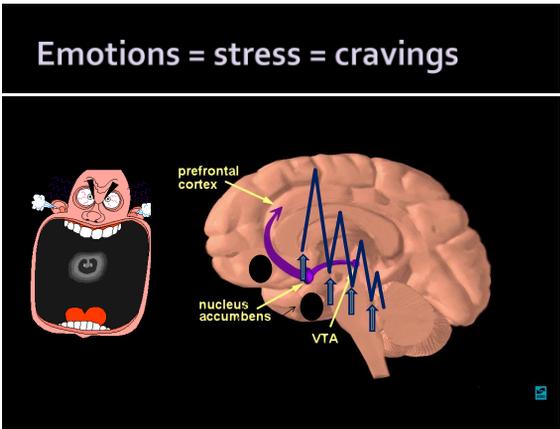
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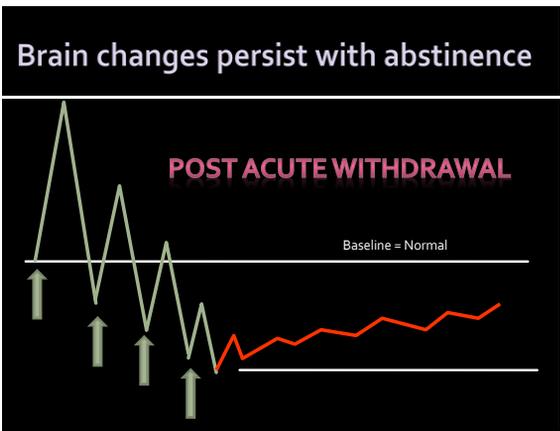
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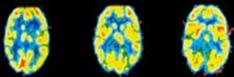
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### Persistent brain changes



Normal

This slide shows three axial brain scans with a normal distribution of activity, represented by yellow and red colors. The word "Normal" is centered below the scans.

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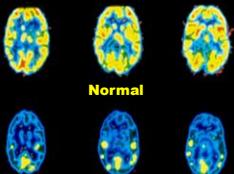
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### Persistent brain changes



Normal

Cocaine Addict (10 days abstinent)

This slide compares three normal brain scans (top row) with three brain scans of a cocaine addict 10 days after abstinence (bottom row). The normal scans show high activity (yellow/red), while the addict scans show significantly reduced activity (blue).

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### Persistent brain changes



Normal

Cocaine Addict (10 days abstinent)

Cocaine Addict (100 days abstinent)

This slide compares three normal brain scans (top row) with three scans of a cocaine addict 10 days abstinent (middle row) and three scans of a cocaine addict 100 days abstinent (bottom row). The 100-day scans show a partial recovery of activity compared to the 10-day scans, but they remain less active than the normal scans.

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Heroin addicts who have been clean and sober may have violent withdrawal symptoms including nausea, vomiting and stomach cramps from watching a video of drug use.



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### Use of other drugs of abuse

- Once addiction is established, use of any substance which stimulates the reward system may stimulate cravings.



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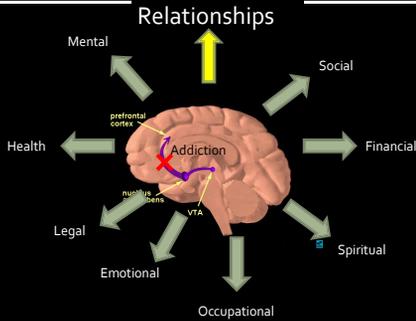
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### Addiction affects all areas of life - "unmanageability"



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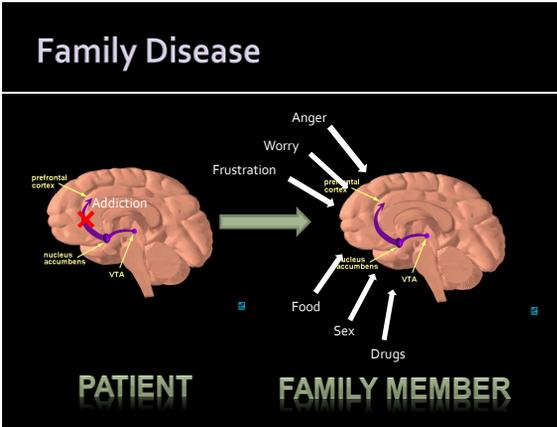
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Below is a list of drugs that cure addiction:

**Any questions?**

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### Medication Assisted Treatment (MAT) for Opioid Use Disorders

- Evidence based approach to treating opioid use disorders
  - Methadone
  - Buprenorphine
  - XR-naltrexone (Vivitrol)
- Decrease craving
- Reduce risk of relapse/OD
- Harm reduction
  - decreased criminal behavior
  - decreased communicable diseases

A graphic showing a compass needle pointing towards the words 'BEST PRACTICE' written in a curved banner.

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## Federal Law on MAT

- Medication-Assisted Treatment (MAT) is the use of medications, in combination with *counseling and behavioral therapies*, to provide a “whole-patient” approach to the treatment of substance use disorders.
- Research shows that a combination of medication and therapy can successfully treat these disorders, and *for some people* struggling with addiction, *MAT can help* sustain recovery.
- Under federal law, MAT patients *must* receive counseling, which could include different forms of behavioral therapy. These services are required along with medical, vocational, educational, and other assessment and treatment services.

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## SAMHSA directive:

- **Integrate pharmacologic and nonpharmacologic therapies**
  - All medications for the treatment of the opioid use disorder should be prescribed as part of a *comprehensive individualized treatment plan* that includes *counseling* and other *psychosocial therapies*, as well as *social support* through *participation in Narcotics Anonymous* and other *mutual-help programs*.

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## SAMHSA directive:

- **Refer patients for higher levels of care, if necessary**
  - Refer the patient for *more intensive or specialized services* if office-based treatment with buprenorphine or naltrexone is *not effective* or the clinician does *not have the resources* to meet a particular patient’s needs.

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## WHY?

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## The goal of MAT

- The ultimate goal of MAT is full *recovery*, including the ability to live a self-directed life. This treatment approach has been shown to:
  - Improve patient survival
  - Increase retention in treatment
  - Decrease illicit opiate use and other criminal activity among people with substance use disorders
  - Increase patients' ability to gain and maintain employment
  - Improve birth outcomes among women who have substance use disorders and are pregnant

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## SAMHSA Guiding Principles of Recovery



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## SAMHSAs 4 Dimensions of Recovery

- **Health**—overcoming or managing one’s disease(s) or symptoms (abstinence), and, for everyone in recovery, making informed, healthy choices that support physical and emotional well-being
- **Home**—having a stable and safe place to live
- **Purpose**—conducting meaningful daily activities, such as a job, school volunteerism, family caretaking, or creative endeavors, and the independence, income, and resources to participate in society
- **Community**—having relationships and social networks that provide support, friendship, love, and hope

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## Medications insufficient to achieve these goals

Addiction Consequences	Yes	No
Acute withdrawal symptoms	√	
Post acute withdrawal symptoms (maintenance drugs)	√	√
Cravings	√	√
Psychiatric problems	√	√
Medical Consequences	√	√
Response to environmental cues		√
Rewired brain and altered chemistry		√
Change in gene expression		√
Emotional damage, shame, guilt		√
Unmanageability of life		√
Damage to families		√

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## What is Recovery?

- It is **NOT** simply abstinence
- Includes **well-being** in these dimensions:
  - Biological
  - Psychological
  - Social
  - Spiritual

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## Digging Deeper

- "making informed, healthy choices that support physical and emotional well-being"
  - Do YOU always do that?
    - I don't!
  - This implies the need for comprehensive, ongoing treatment
    - Education
    - Community and connection
    - Individualized guidance

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## The Solution

- **Comprehensive treatment**
  - Abstinence from *all* mood altering drugs (remove the poison)
    - +/- medication assistance
  - Treatment of co-occurring disorders (medical/psychiatric)
  - Avoidance of "people, places and things" (conditioned cues)
  - Spiritual program of recovery (e.g. 12-step program)
    - "When the spiritual malady is overcome, we straighten out mentally and physically." *Alcoholics Anonymous*, p64
- **Time**




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## Brain healing - recovery

Despite the healing of the brain, the disease is forever imprinted, recovery needs to be a lifelong process.

Medication plus comprehensive treatment

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## What We Don't Know

- How long until the brain resumes "normal" function
- What about other substances and behaviors?
- Long term effects of MAT on recovery outcomes
- Optimum duration of MAT
- Is gene therapy a possibility?

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## Summary

- Addiction is a disease that primarily affects the brain – it is not a lack of willpower
- Addiction is a complex disease that requires a comprehensive solution
- Medication alone is insufficient to treat addiction
- Recovery is more than abstinence
- Recovery is a progression toward optimum wellness across biological, psychological, social, and spiritual dimensions.
- Recovery is a lifelong process
- We have much to learn!




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*"It is by going down into the abyss that we recover the treasures of life. Where you stumble, there lies your treasure." – Joseph Campbell*

*Thank You*

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