

# Neuroscience of Drugs and the Brain

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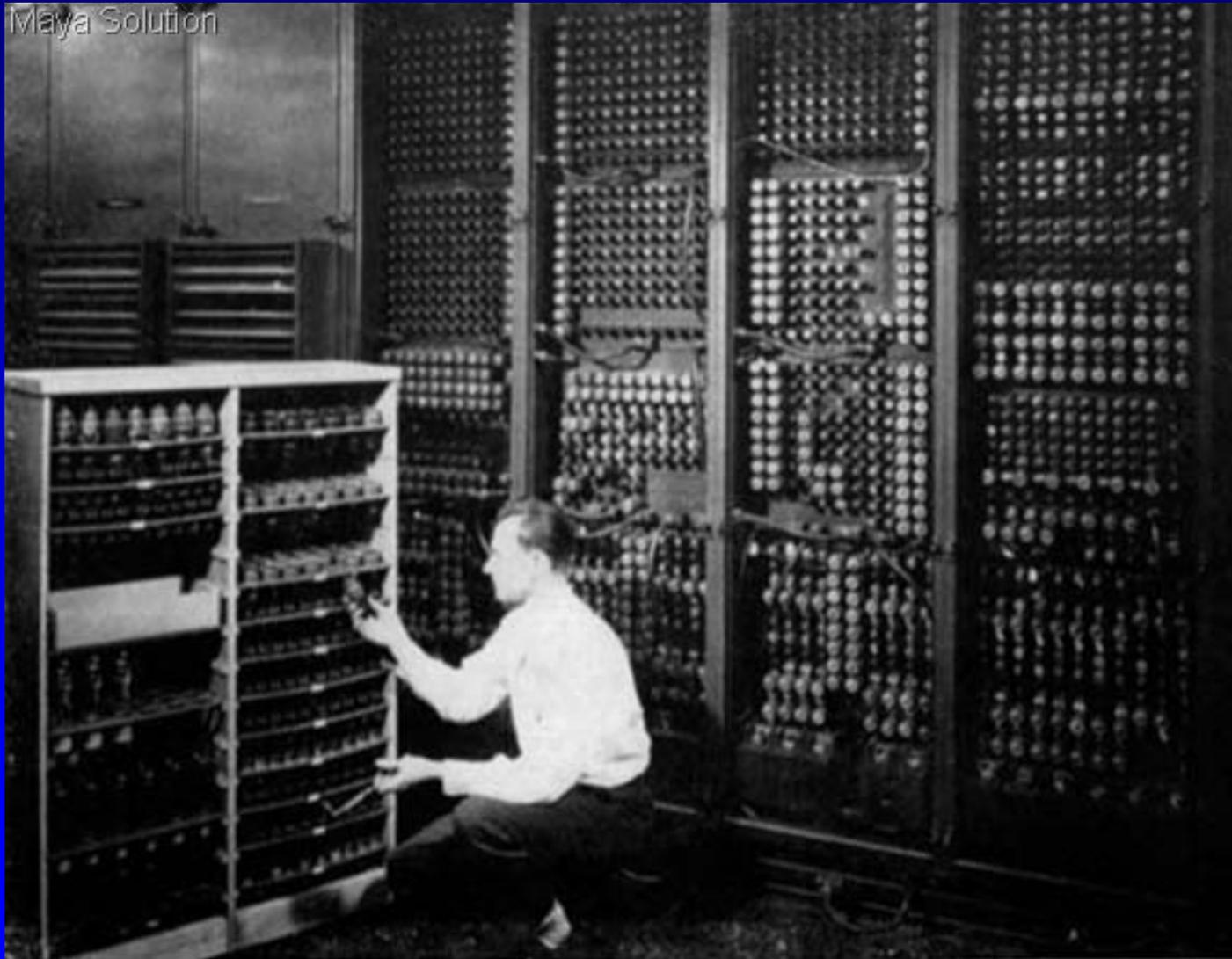
**CRIMINAL JUSTICE REFORM SUBCOMMITTEE of the COURTS,  
CORRECTIONS AND JUSTICE COMMITTEE**

July 30, 2014  
Second Judicial District Court  
Albuquerque

**Advances in Science  
Have Revolutionized Our  
Way of Life...  
And Our Fundamental Views of  
Drug Abuse and Addiction**

# Then...

Maya Solution



Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

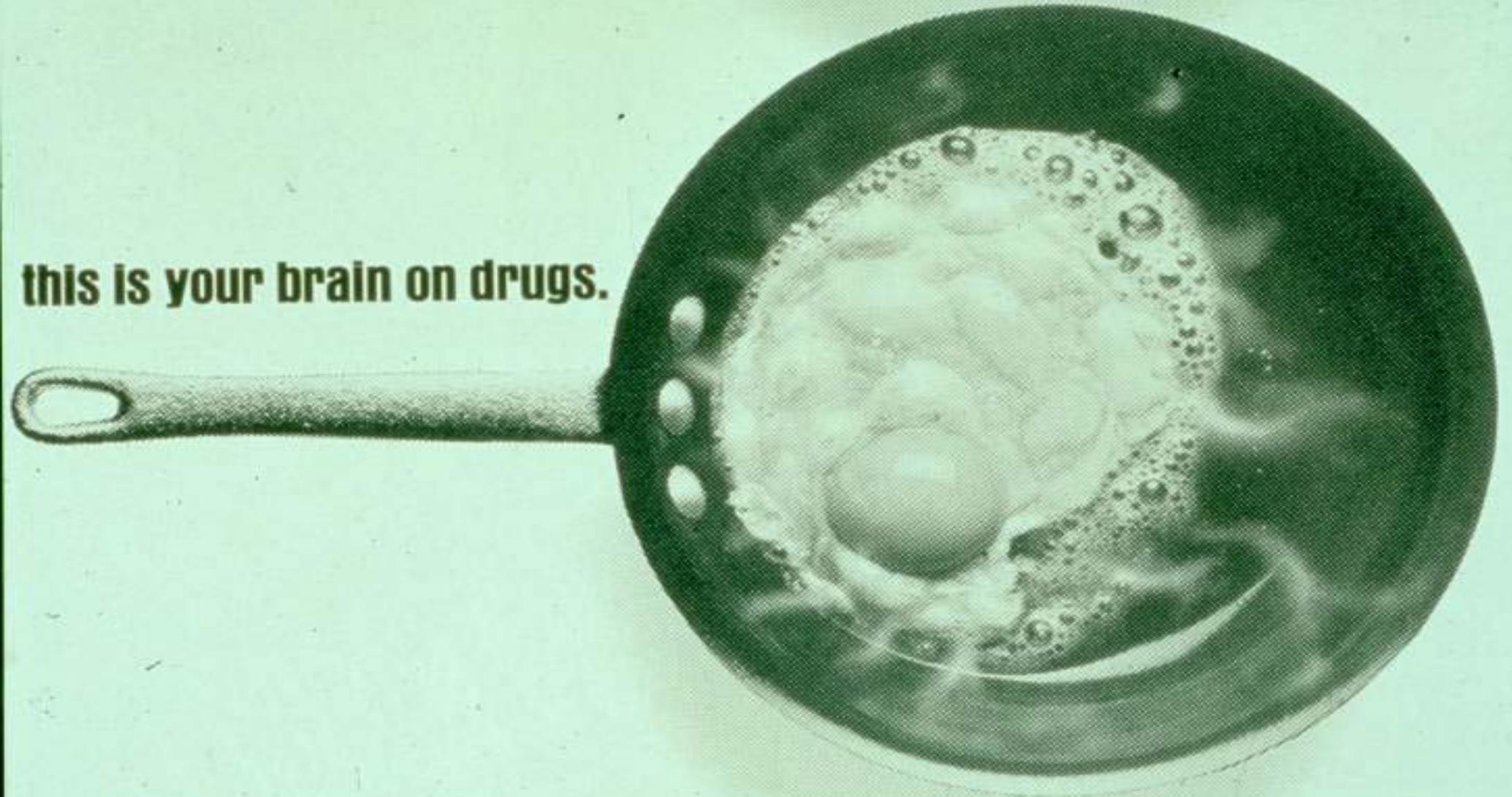
# And Now



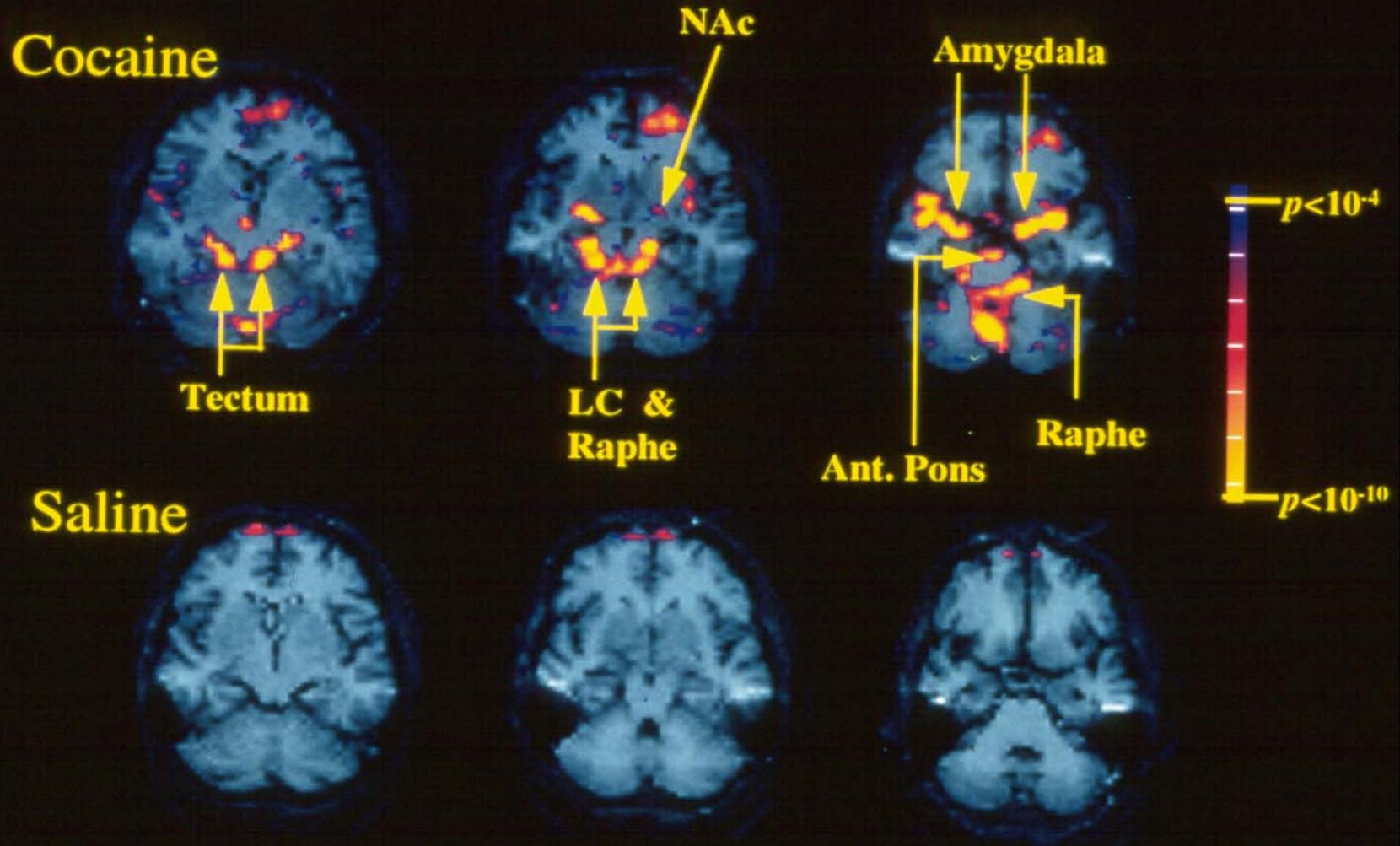
**Advances in Science  
Have Revolutionized Our  
Fundamental Views of  
Drug Abuse and Addiction**

# Your Brain on Drugs - Then

**this is your brain on drugs.**



# Your Brain on Drugs – Now



MGH-NMR Center & Dept. of Psychiatry

Source: Breiter & Rosen, Ann N Y Acad Sci 1999

*What have we learned?*

**Drug Abuse Is A Preventable Behavior**

**Drug Addiction Is A Treatable Disease**

*Partnership for a Drug Free America*

*Why ?*

*Why do people take drugs?*

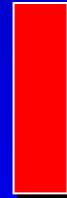
# **Drug Abuse Risk Factors**

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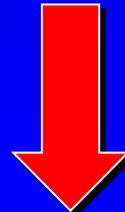
**Community**



**Peer Cluster**



**Family**



**Individual**

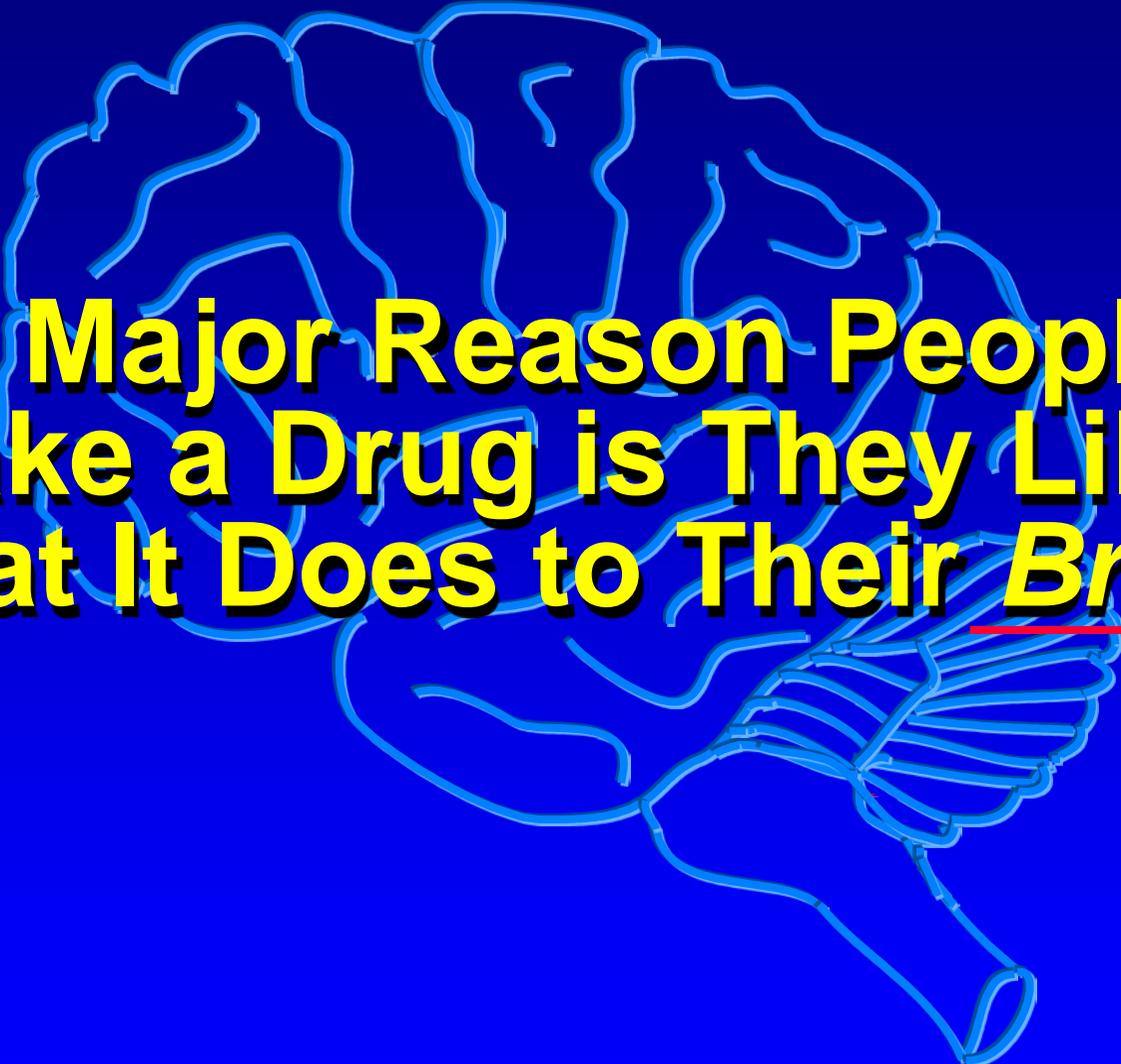
# Why do people take drugs?

**To feel good**  
To have novel:  
Feelings  
Sensations  
Experiences  
**AND**  
To share them



**To feel better**  
To lessen:  
Anxiety  
Worries  
Fears  
Depression  
Hopelessness  
Withdrawal

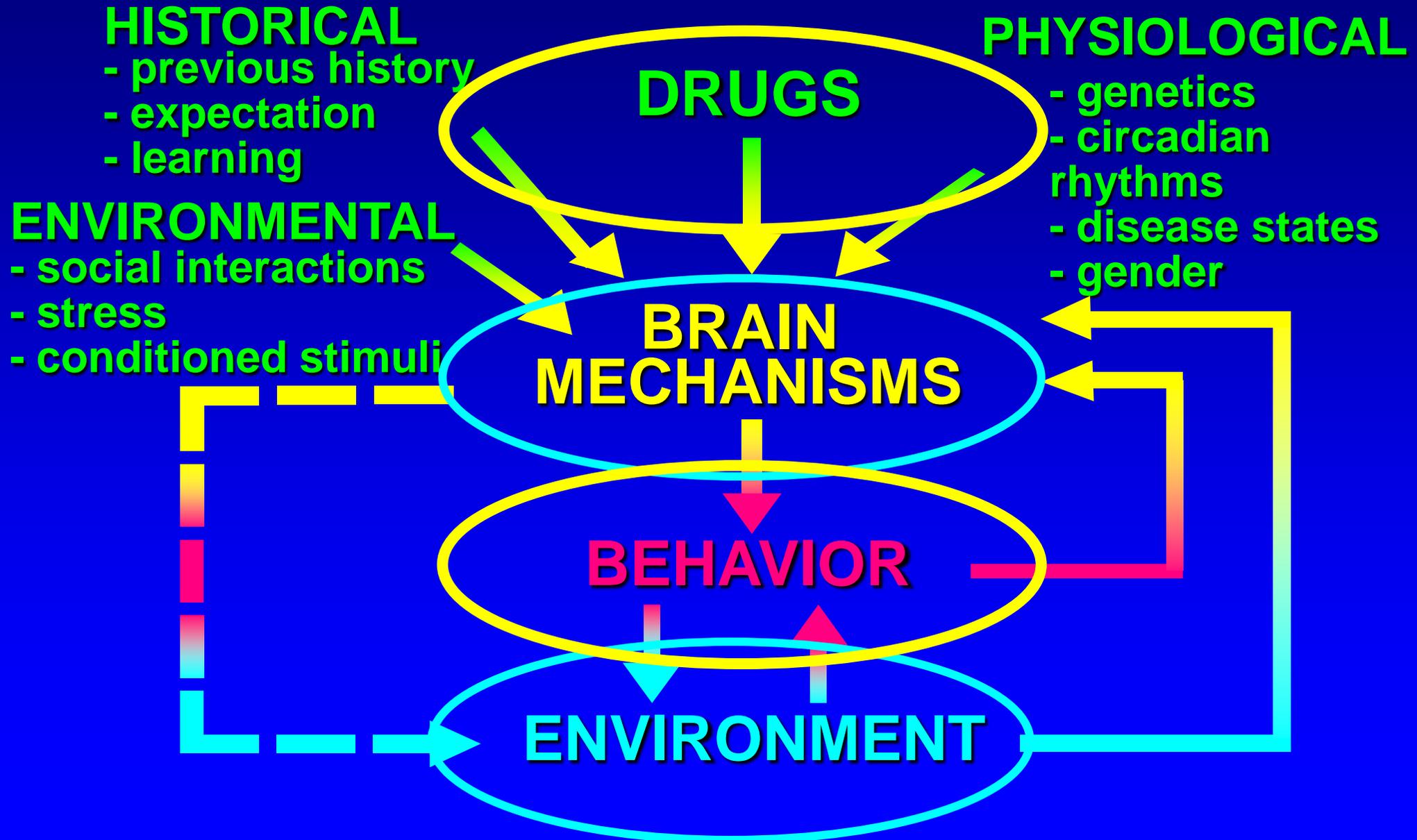
*Drawings courtesy of Vivian Felsen*



**A Major Reason People  
Take a Drug is They Like  
What It Does to Their Brains**

# Drug Addiction:

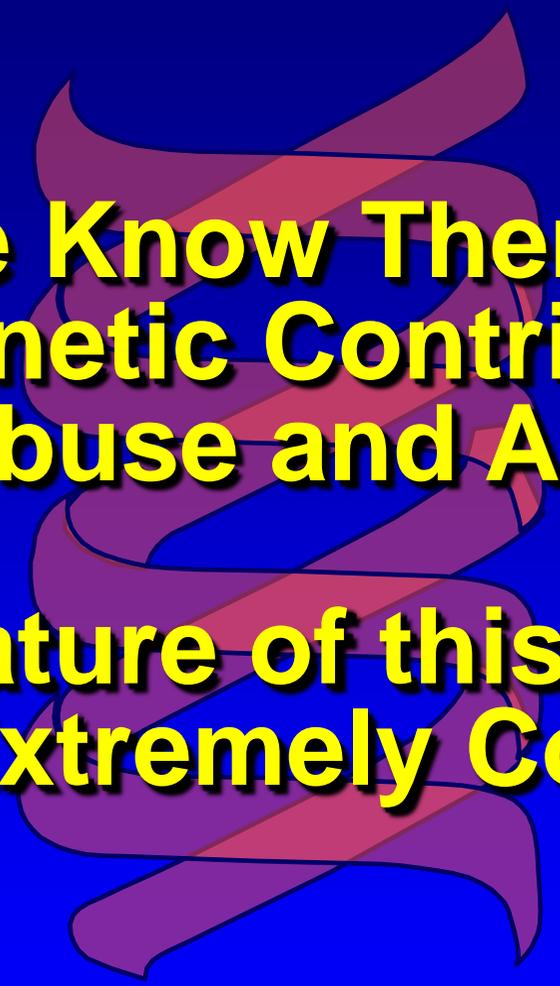
## A Complex Behavioral and Neurobiological Disorder



# **What have we learned about Vulnerability?**

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**Why do some people  
become addicted while  
others do not?**



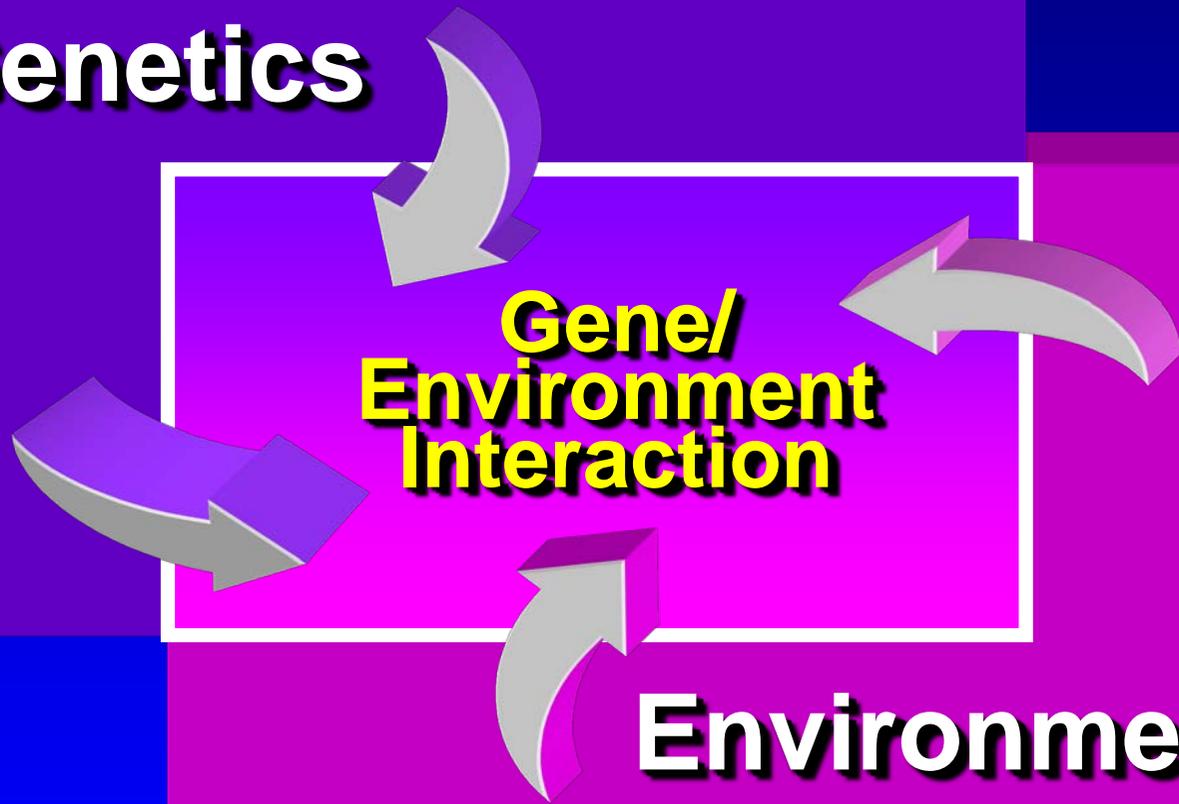
**We Know There's A  
Big Genetic Contribution To  
Drug Abuse and Addiction...**

**And the Nature of this Contribution  
Is Extremely Complex**

**Genetics**

**Gene/  
Environment  
Interaction**

**Environment**

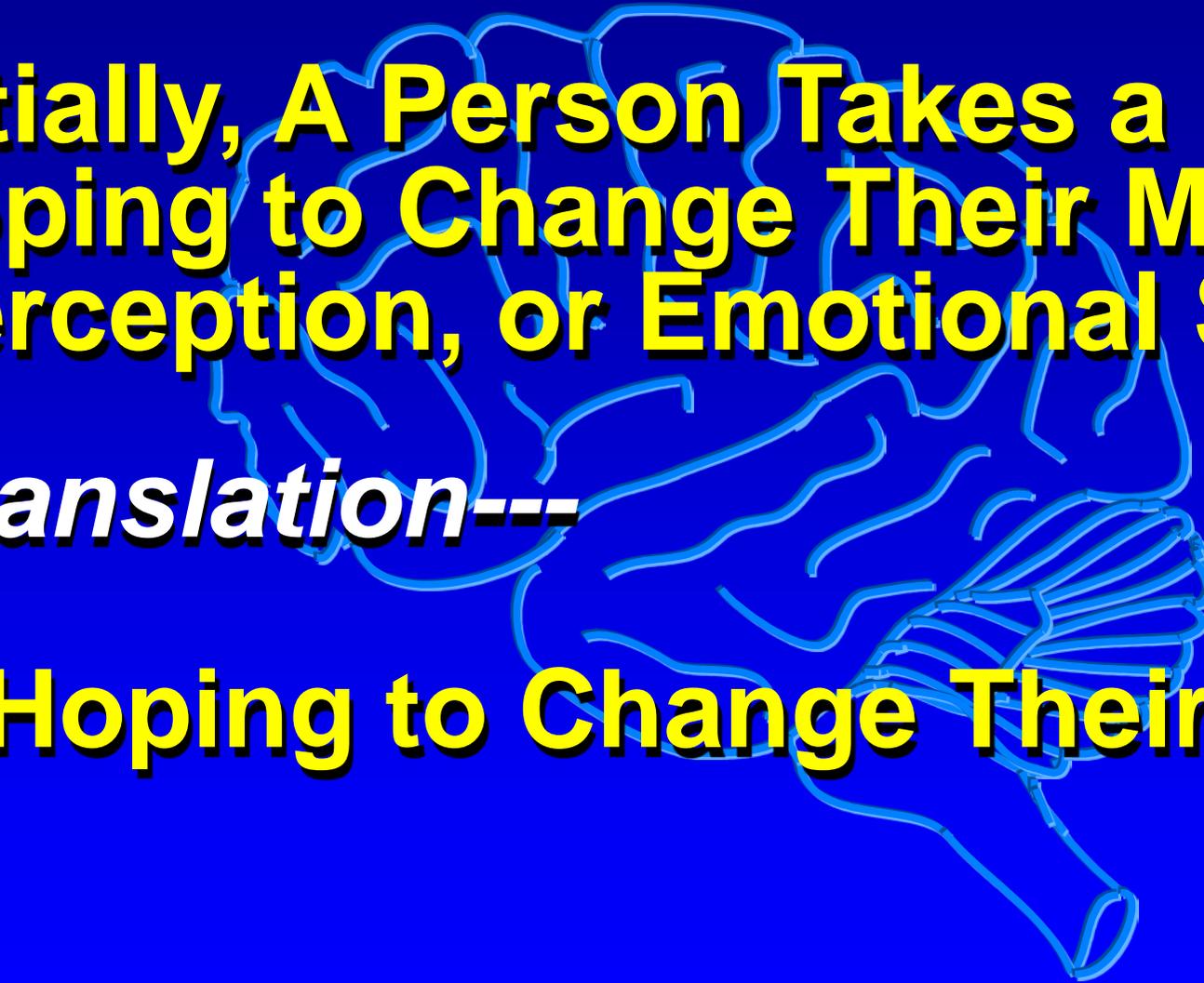




**Between 30 and 60 percent of drug abusers have concurrent mental health diagnoses - including personality disorders, major depression, schizophrenia, and bipolar disorder**

**Initial Drug Use Is A  
*Voluntary* Behavior...**

**A Person *Chooses* to  
Take a Drug for the First Time**



**Initially, A Person Takes a Drug  
Hoping to Change Their Mood,  
Perception, or Emotional State**

***Translation---***

**...Hoping to Change Their *Brain***

# Dopamine Pathways

frontal  
cortex

striatum

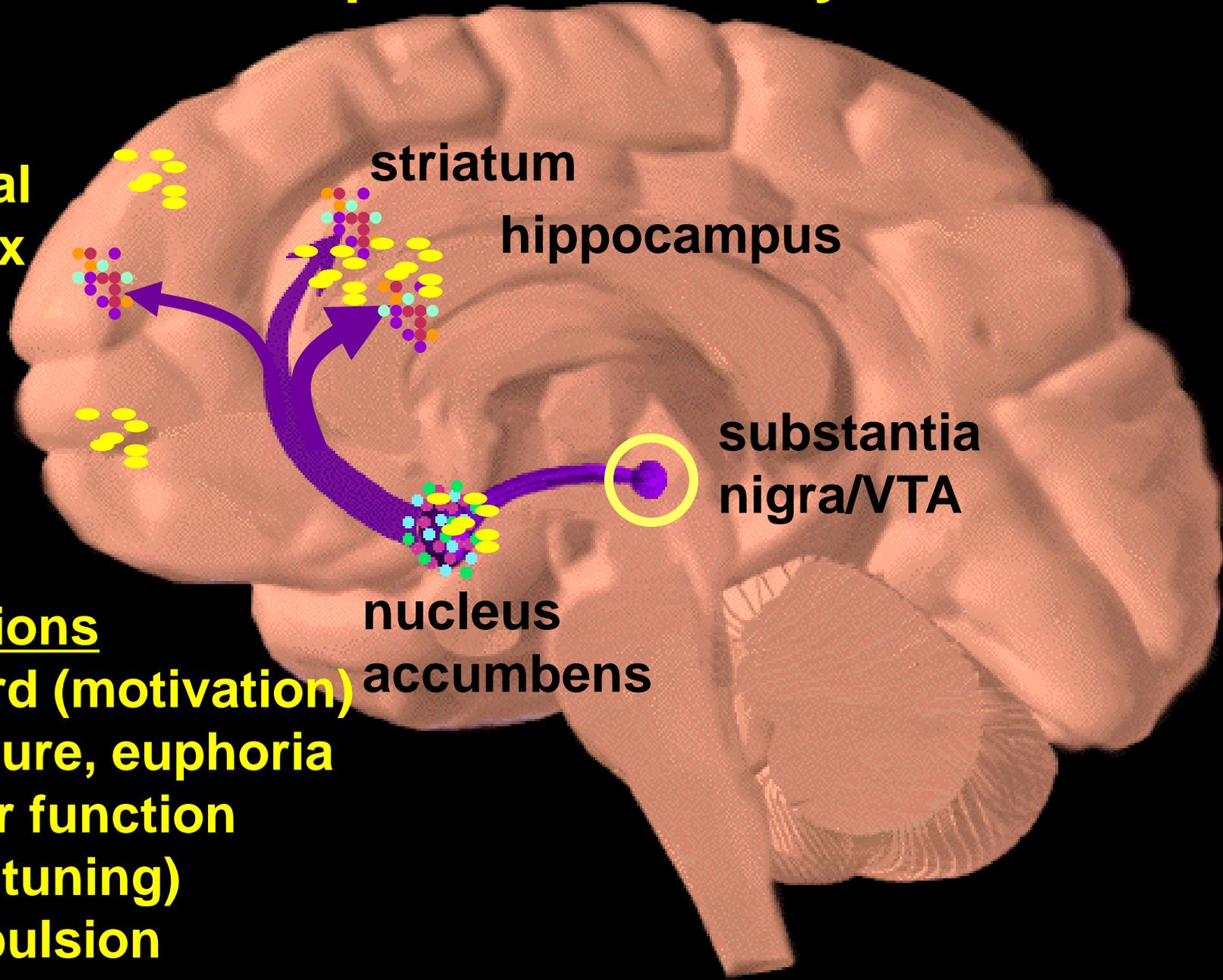
hippocampus

substantia  
nigra/VTA

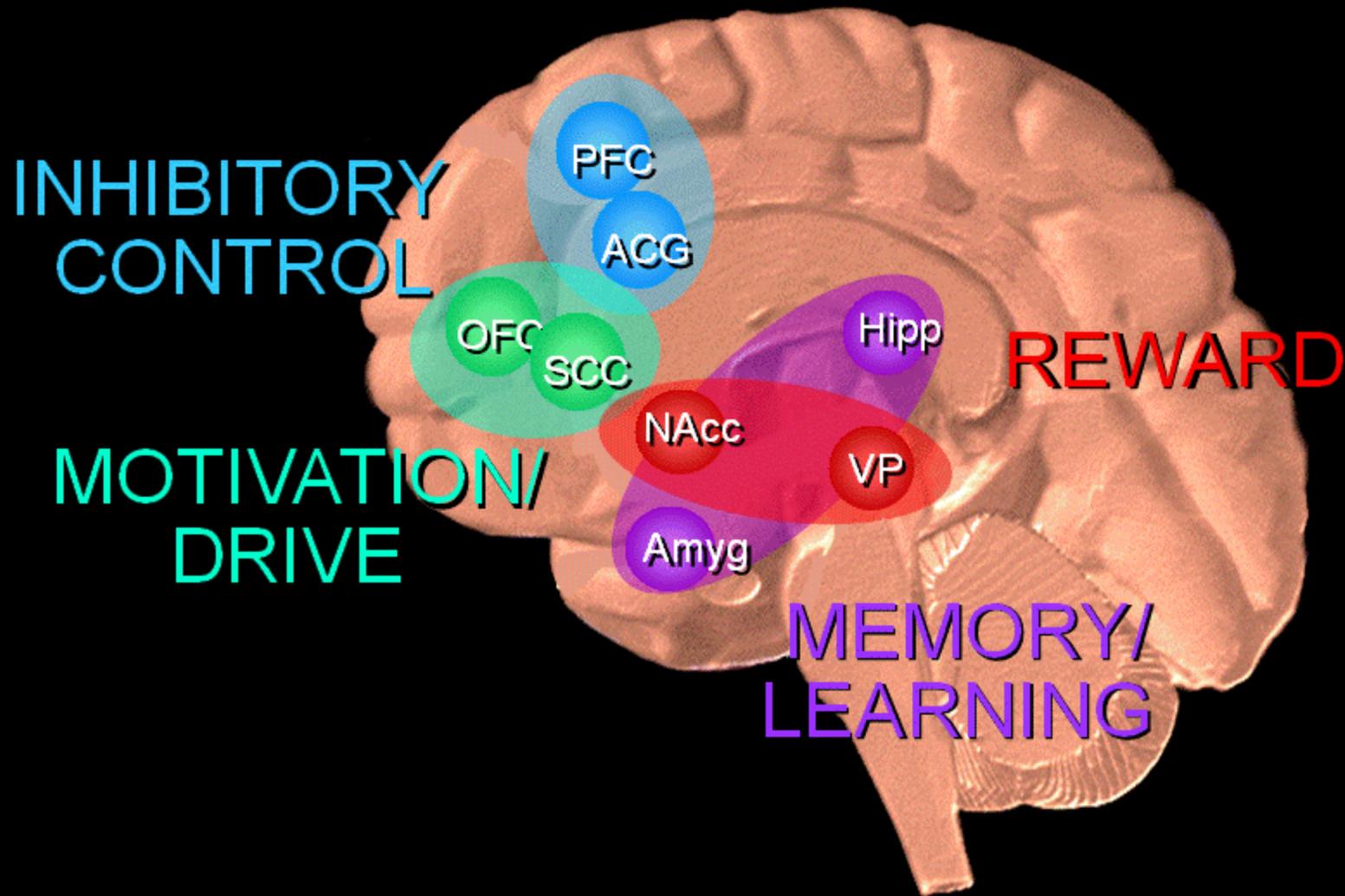
nucleus  
accumbens

## Functions

- reward (motivation)
- pleasure, euphoria
- motor function  
(fine tuning)
- compulsion

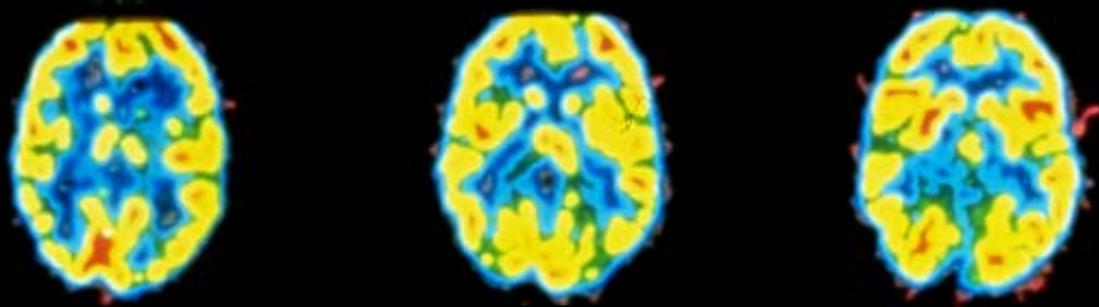


# Circuits Involved In Drug Abuse and Addiction

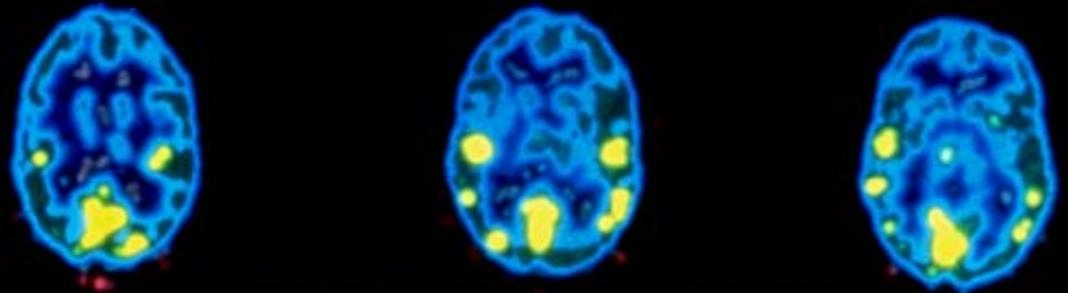


*Science Has Generated A Lot of  
Evidence Showing That...*

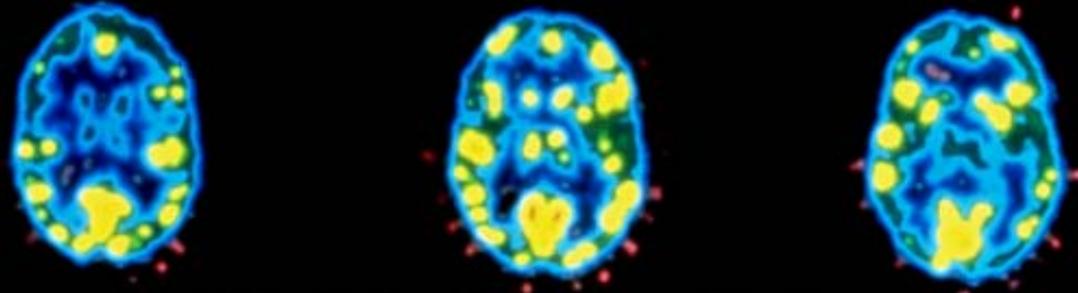
**Prolonged Drug Use Changes  
the Brain In Fundamental  
and Long-Lasting Ways**



Normal

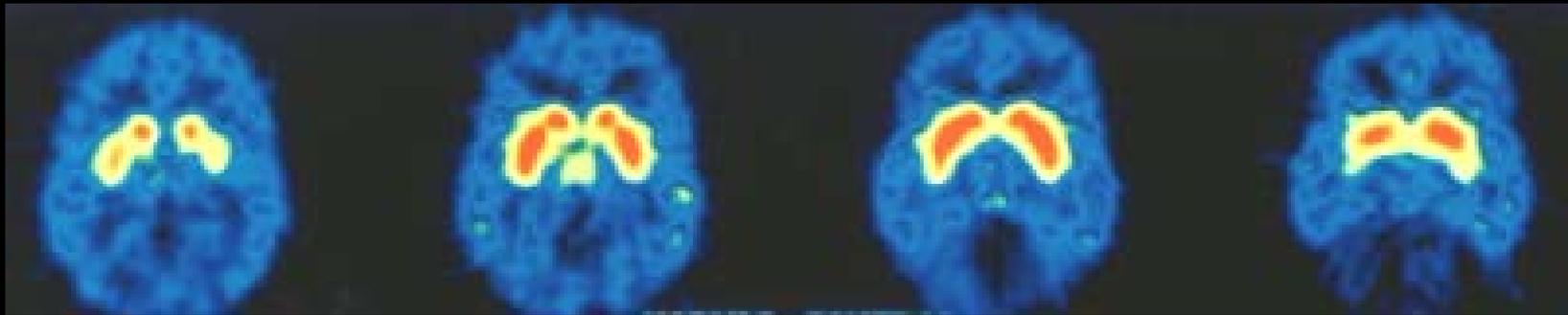


Cocaine Abuser (10 Days)

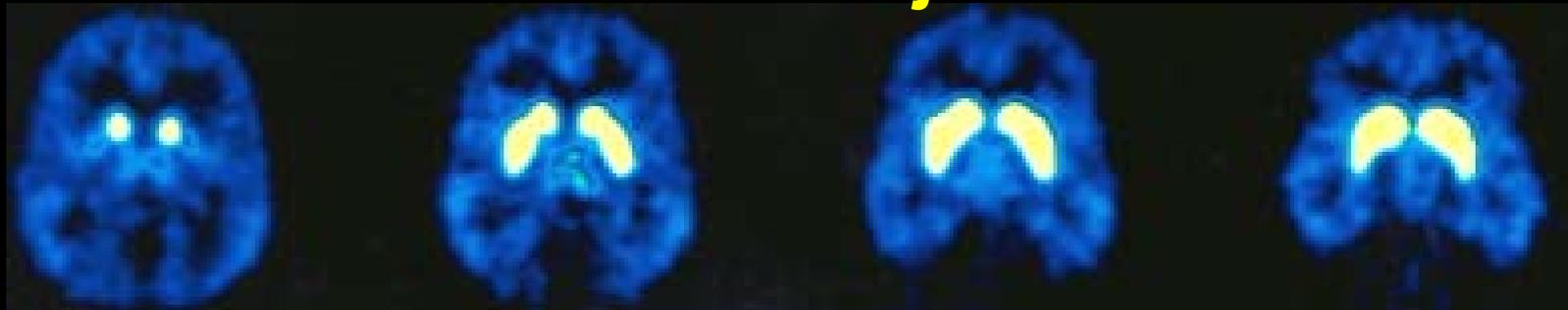


Cocaine Abuser (100 Days)

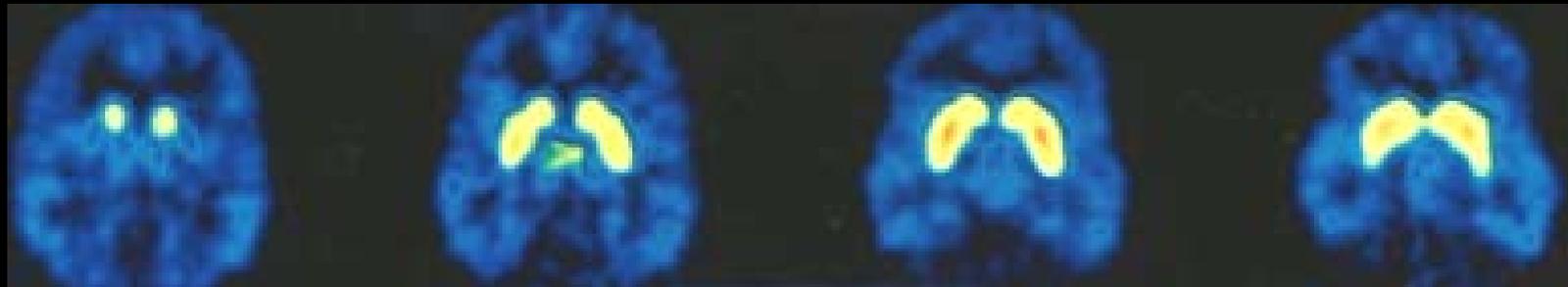
# Effect of Cocaine Abuse on Dopamine D2 Receptors



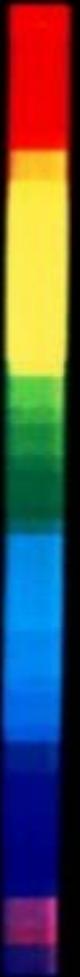
**normal subject**



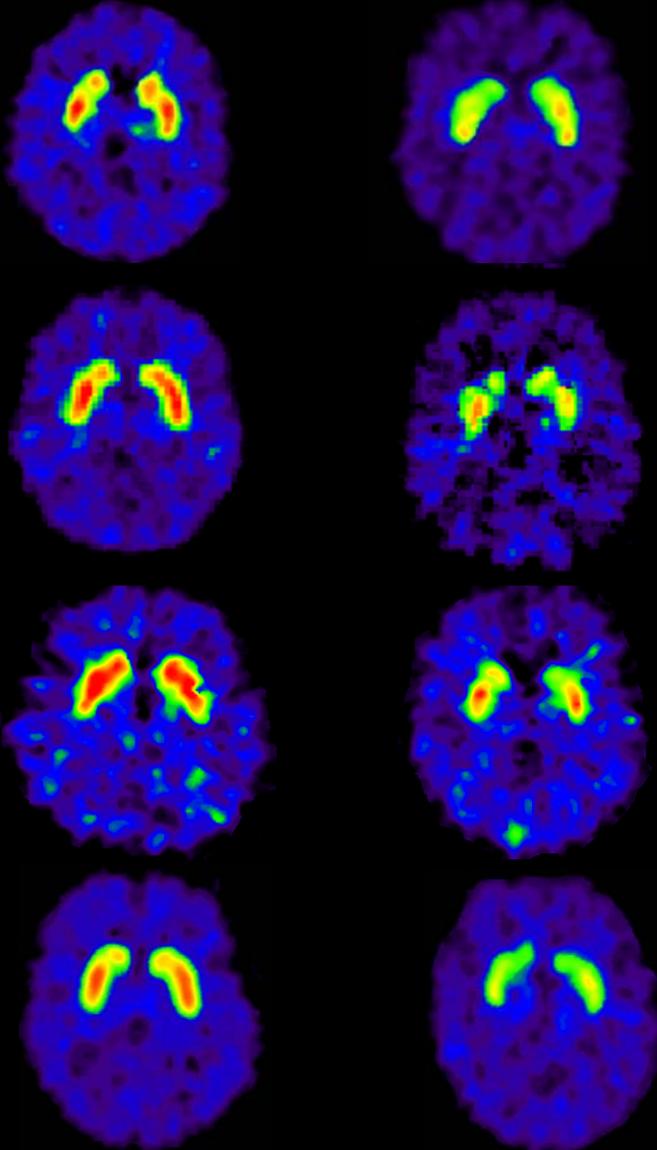
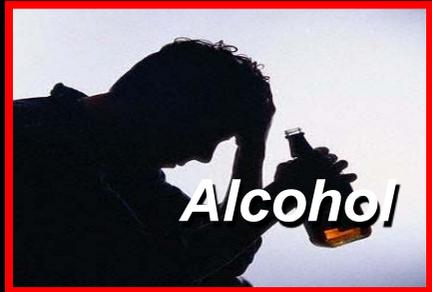
**cocaine abuser (1 month post)**



**cocaine abuser (4 months post)**



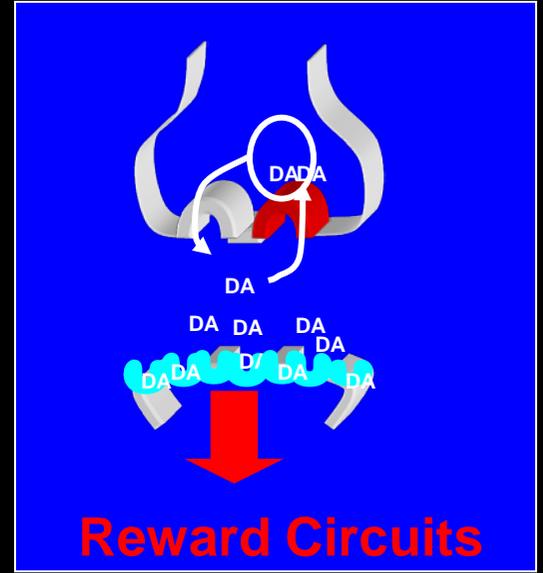
# Dopamine D2 Receptors are Lower in Addiction



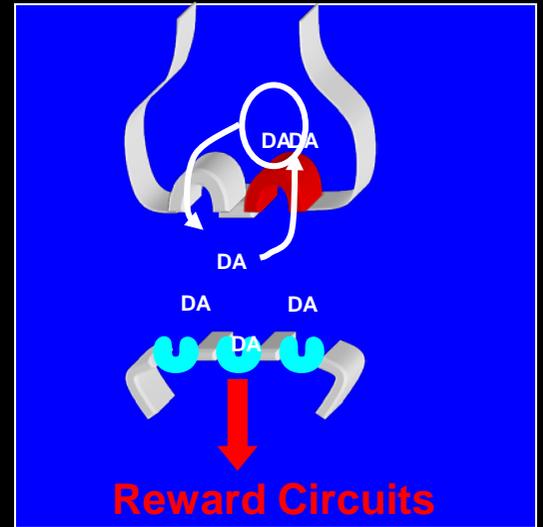
Control

Addicted

DA D2 Receptor Availability



Non-Drug Abuser



Drug Abuser

**Prolonged Drug Use Changes  
The Brain In Fundamental and  
Long-Lasting Ways**

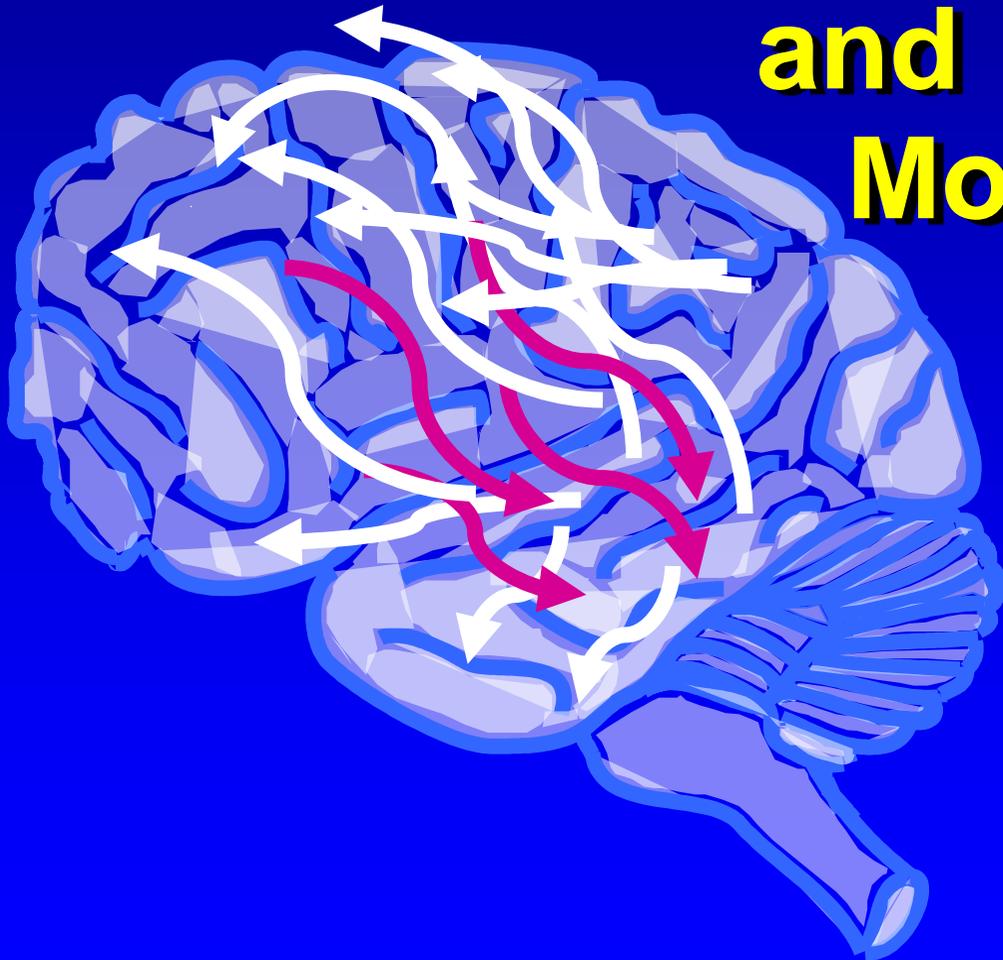
**As We've Seen, Drug Use Can  
Lead to Structural and Functional  
Changes in the Brain...**



**Addiction is, Fundamentally, a  
Brain Disease**

**Drugs Are Usurping  
Brain Circuits  
and**

**Motivational Priorities**



**This Results in  
“Motivational Toxicity”  
and Compulsive Drug  
Use (Addiction)**

*Because...*

**Their *Brains***



**have been**

***Re-Wired***

**by *Drug Use***

**Addiction is the  
Quintessential  
Biobehavioral Disorder**

**The Brains of Addicts  
Are Different From  
the Brains of Non-Addicts**

**...And Those Differences  
Are An Essential Element  
of Addiction**

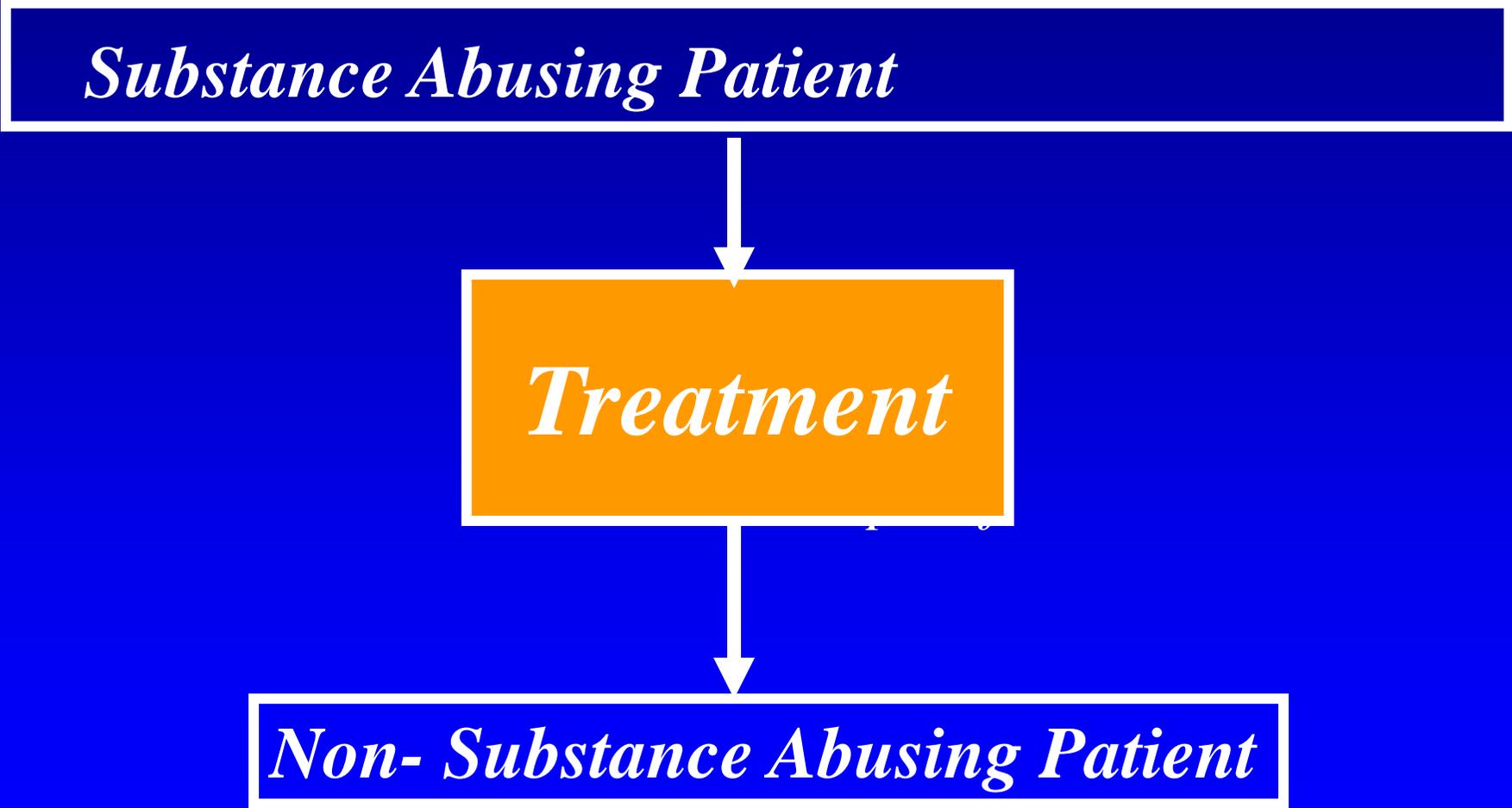
**Treating a Biobehavioral  
Disorder Must Go beyond just  
Fixing the Chemistry**

# **The Most Effective Treatment Strategies Will Attend to all Aspects of Addiction:**

- **Biology**
- **Behavior**
- **Social Context**

# The Acute Care Treatment Model

*Substance Abusing Patient*



```
graph TD; A[Substance Abusing Patient] --> B[Treatment]; B --> C[Non-Substance Abusing Patient]
```

The diagram illustrates the Acute Care Treatment Model as a vertical flow. It begins with a white box containing the text 'Substance Abusing Patient'. A white arrow points downwards from this box to a central orange box containing the text 'Treatment'. A second white arrow points downwards from the orange box to a final white box containing the text 'Non-Substance Abusing Patient'.

*Treatment*

*Non- Substance Abusing Patient*

**Detox is NOT Treatment**  
**It is a part of treatment**

# A Continuing Care Model

*Primary Care*



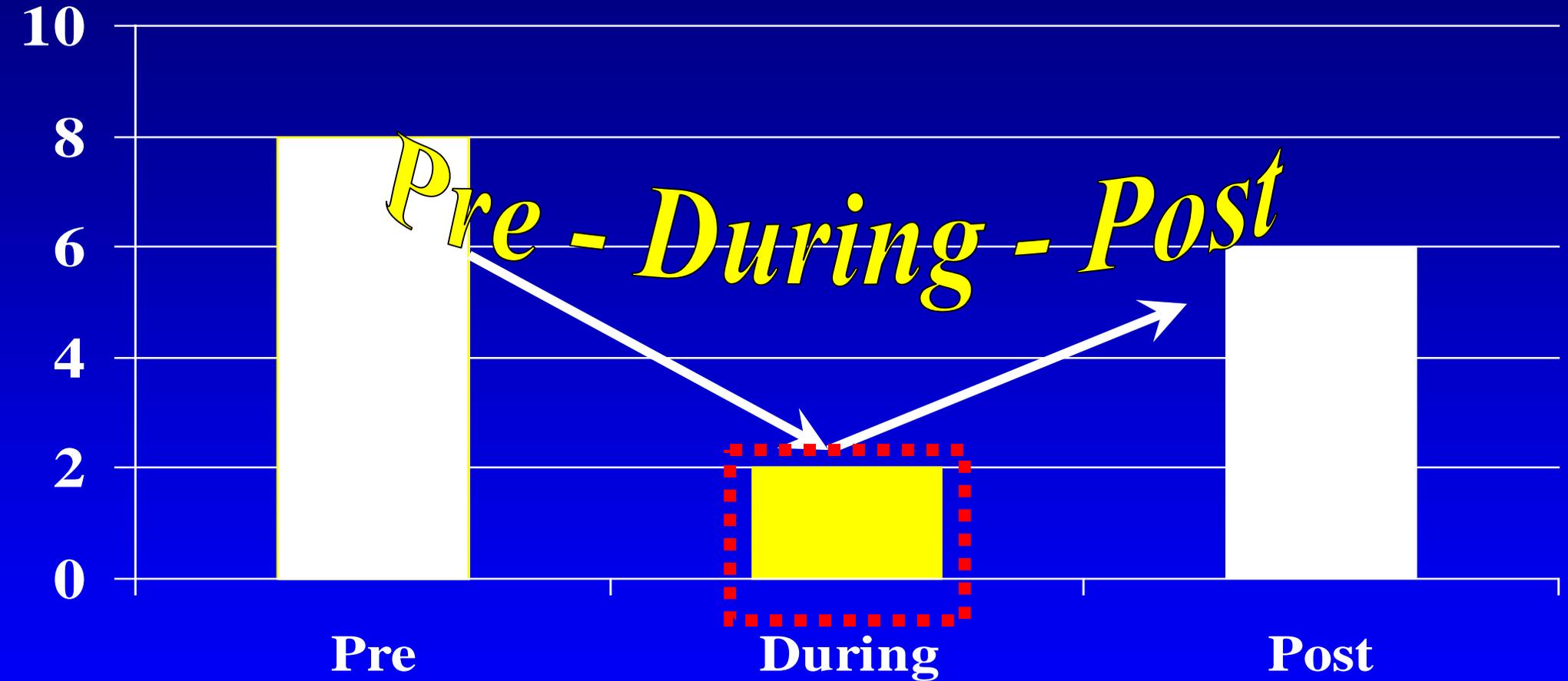
```
graph TD; A[Primary Care] --> B[Specialty Care]; B --> C[Primary Continuing Care];
```

*Specialty Care*

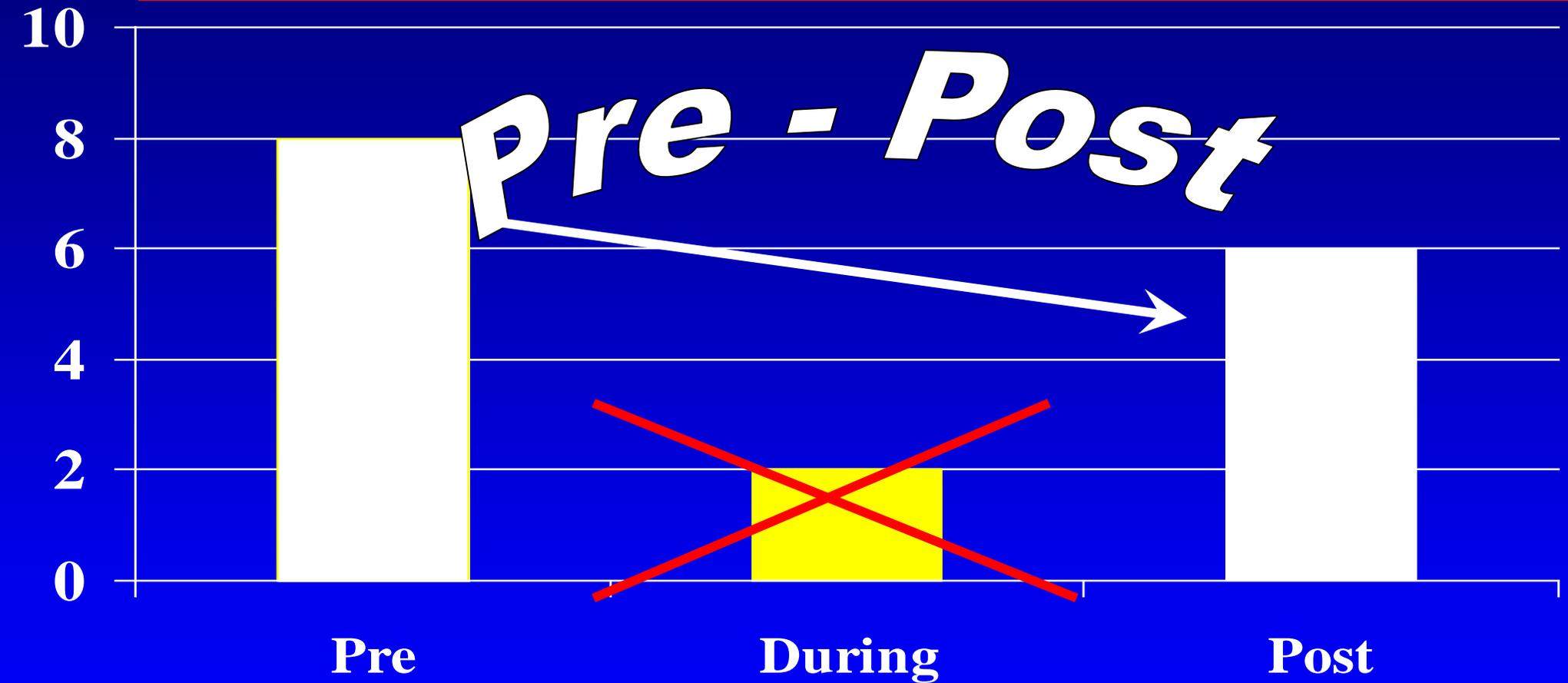
*Primary  
Continuing Care*

***We Need to View and  
Treat Addiction as a  
Chronic, Relapsing Illness***

# Outcome In Diabetes



# Outcome In Addiction



***If we treat a diabetic and symptoms don't subside....what do we do?***

***Would we increase the dose?***

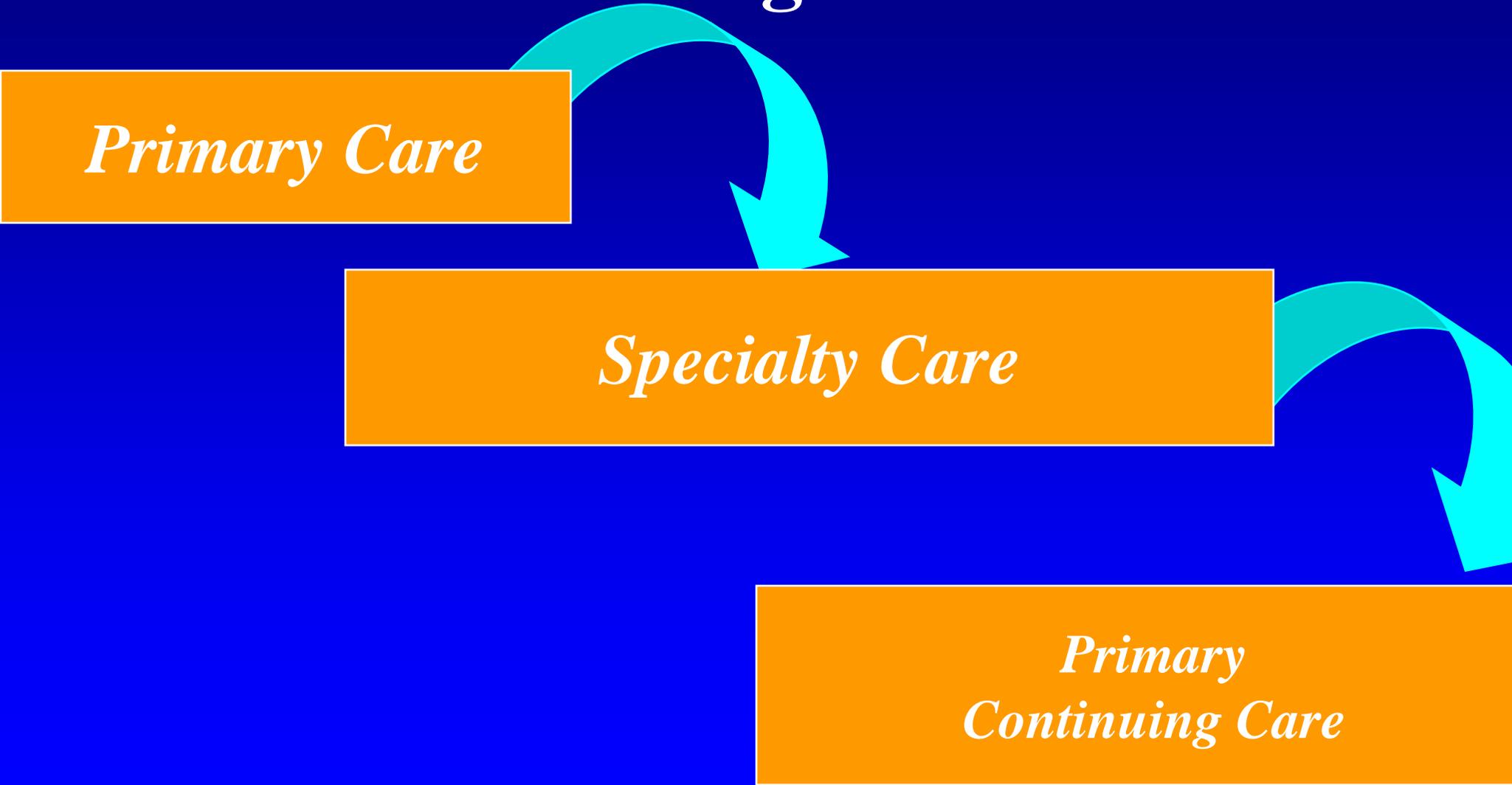
***Would we change medications?***

***Would we change treatment approaches?***

***Would we fail to provide ongoing treatment for a diabetic?***

# A Continuing Care Model

*Primary Care*



```
graph TD; A[Primary Care] --> B[Specialty Care]; B --> C[Primary Continuing Care]
```

*Specialty Care*

*Primary  
Continuing Care*

*In Treating Addiction...*

*We Need to Keep Our Eye on  
the Real Target*



**So....Advances in Science  
Have Revolutionized Our  
Fundamental Views of  
Drug Abuse and Addiction**

***And these advances have  
the potential to help  
improve both the***



***CRIMINAL JUSTICE***

***and***

***HEALTH***

***Approaches to Addressing  
Drug Abuse and Addiction***

# Ineffective System for Addressing Drugs and Crime

*Public Health Approach*  
*-disease*  
*-treatment*

*High Attrition*

*Public Safety Approach*  
*-illegal behavior*  
*-punish*

*High Recidivism*

# *Integrated Public Health-Public Safety Strategy*

*Community-based treatment*

*Close supervision*

*Blends functions of criminal justice and treatment systems to optimize outcomes*

*Opportunity to avoid incarceration or criminal record*

*Consequences for noncompliance are certain and immediate*

# *Where do we go from here?*

- *Provide upfront alternative to incarceration for individuals with SUDs*
- *Provide treatment while incarcerated for individuals with SUDs*
  - *Embrace all forms of treatment including medication assisted treatment ( MAT)*
    - *Treat addiction as the chronic disease that it is!*
- *Expand enrollment of CJ populations in Centennial Care*

- 
- *Reduce Crime*
  - *Save Money*
  - *Improve Lives*

Treatment  
is the Key  
[drugabuse.gov](http://drugabuse.gov)

*Thank You*

*[Tcondon@unm.edu](mailto:Tcondon@unm.edu)*



*Center on Alcoholism, Substance Abuse &  
Addictions*