Drug Abuse and Addiction: *What the Research Says*

National Library of Medicine

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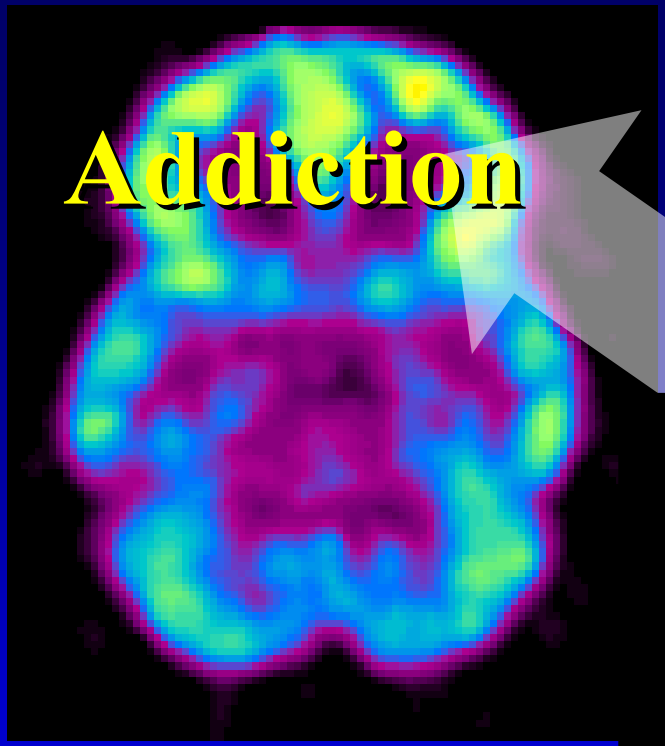
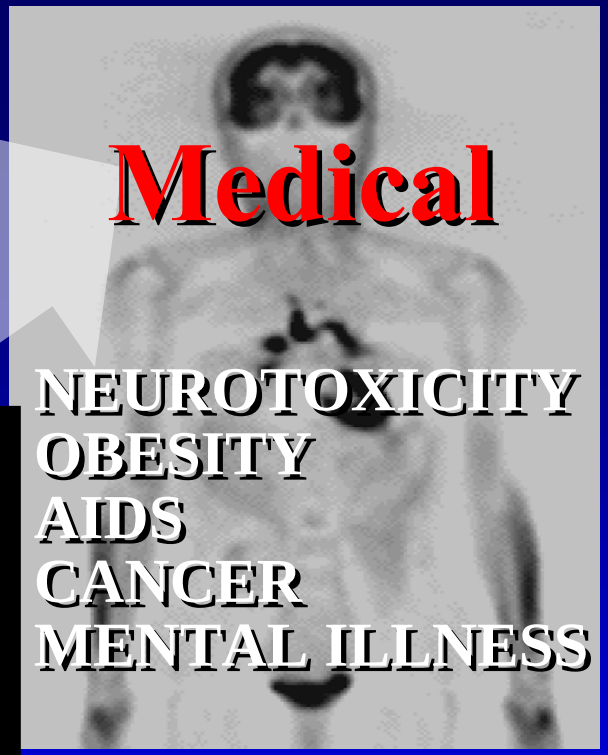
DRUGS

Addiction



Medical



NEUROTOXICITY
OBESITY
AIDS
CANCER
MENTAL ILLNESS

Economic

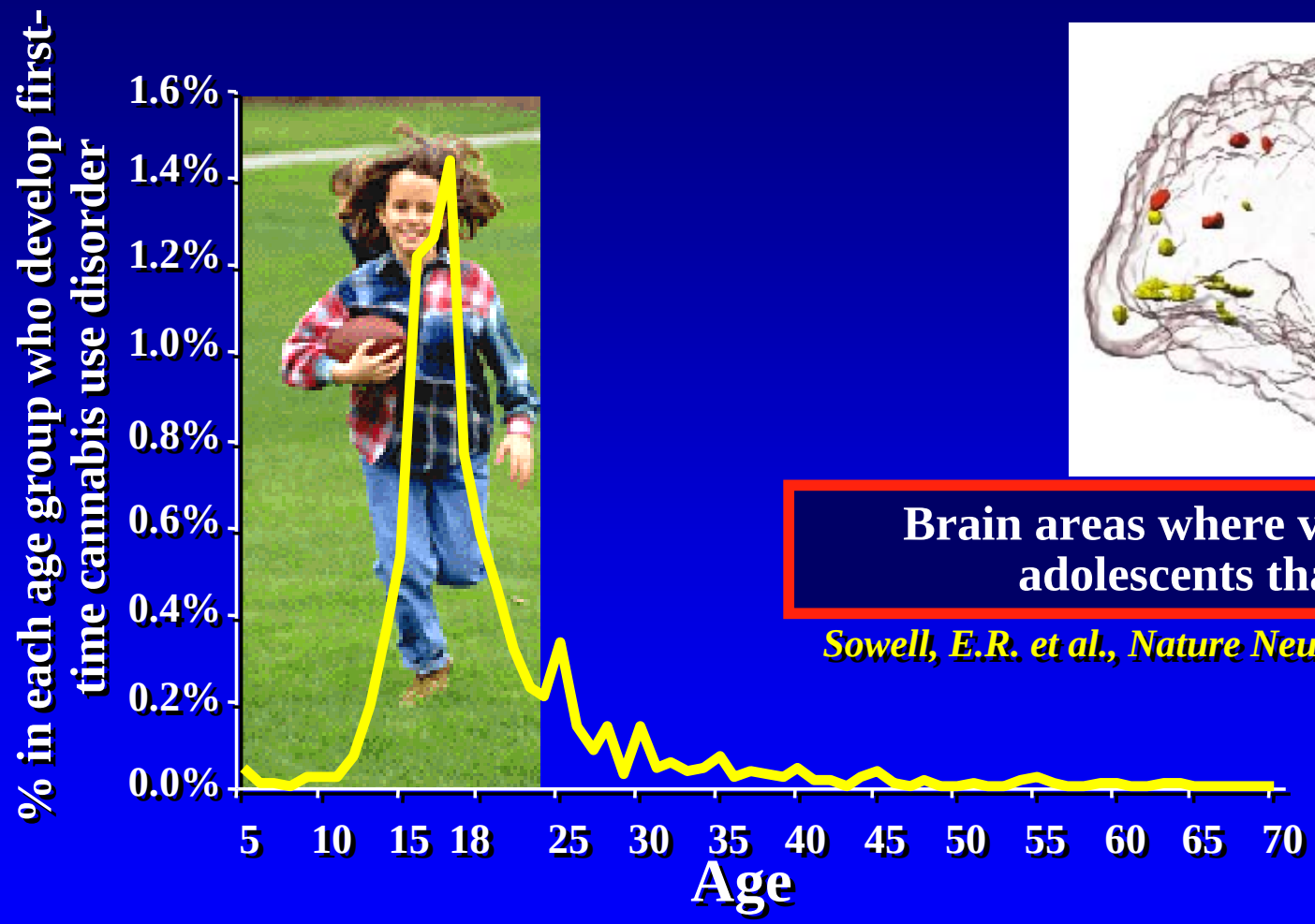
HEALTH CARE COSTS
PRODUCTIVITY LOSS
ACCIDENTS

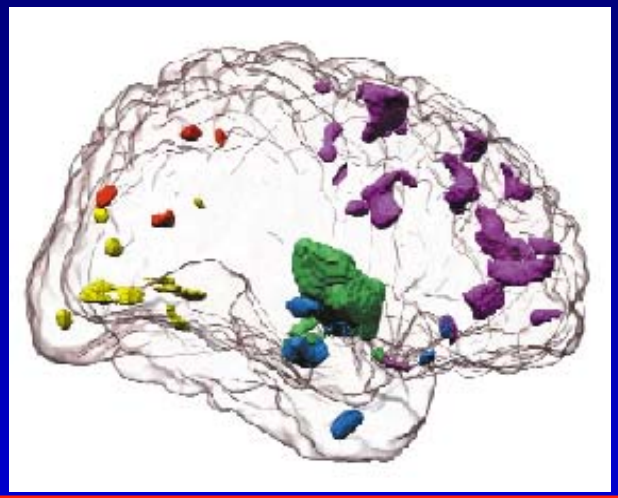
Social

HOMELESSNESS
CRIME
VIOLENCE

Drug Abuse is a Preventable Behavior

ADDICTION IS A DEVELOPMENTAL DISEASE
starts in adolescence and childhood





Brain areas where volumes are smaller in adolescents than young adults.

Sowell, E.R. et al., Nature Neuroscience, 2: 859-861, 1999

Age at cannabis use disorder as per DSM IV

NIAAA National Epidemiologic Survey on Alcohol and Related Conditions, 2003

Drugs of Abuse Engage Systems in the *Motivation* and *Pleasure Pathways of the Brain*

MOVEMENT

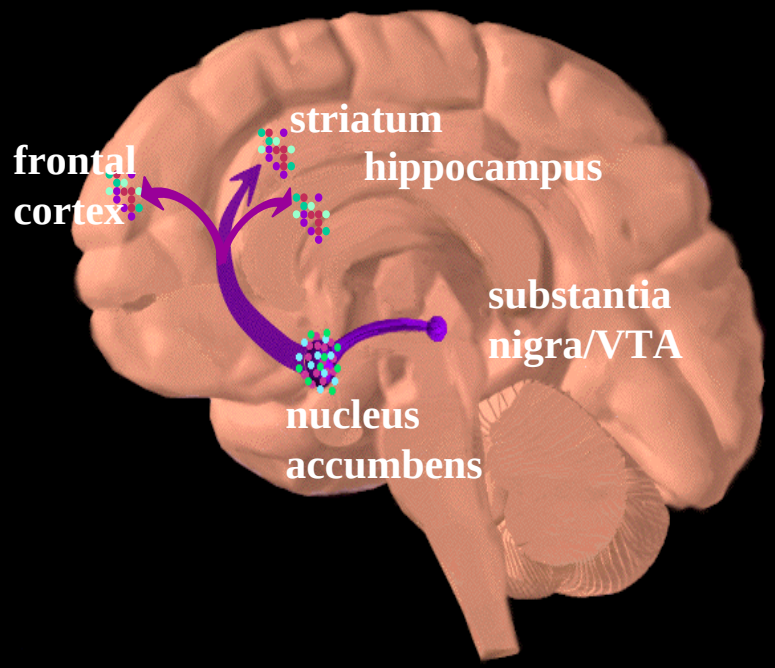
AirBorne
motivation

Dopamine

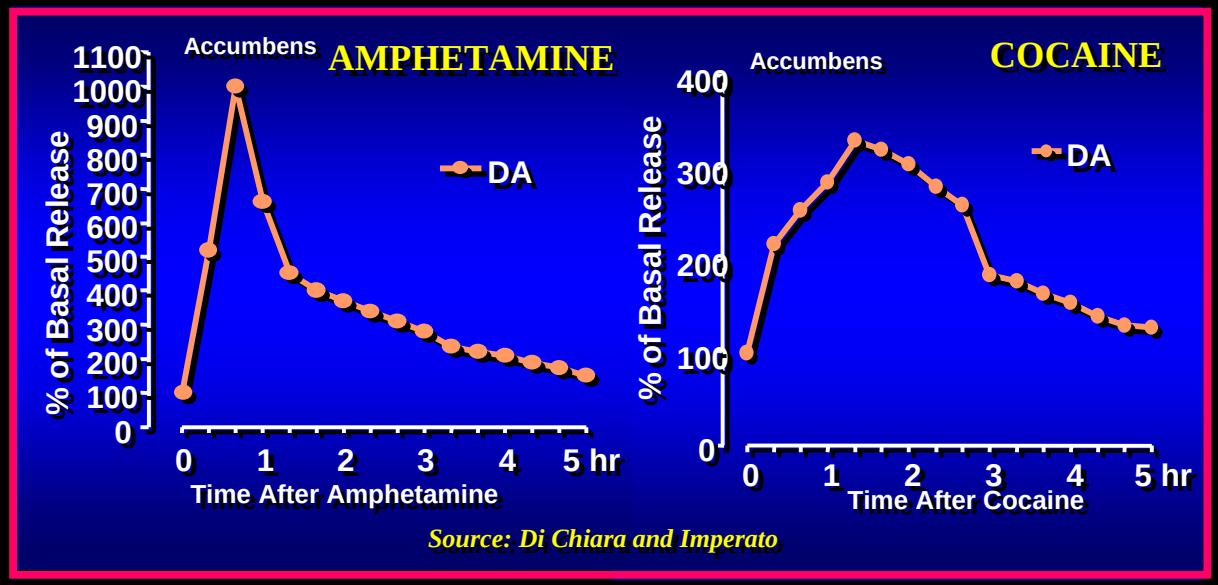
addiction

Reward & well-being

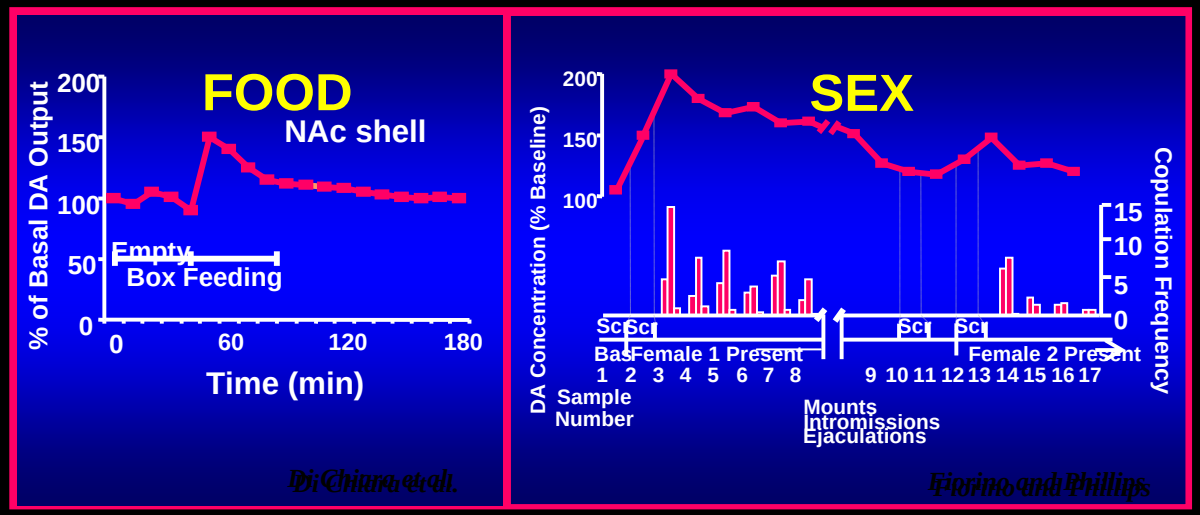
Dopamine Pathways
Principal "Pleasure" System of the Brain



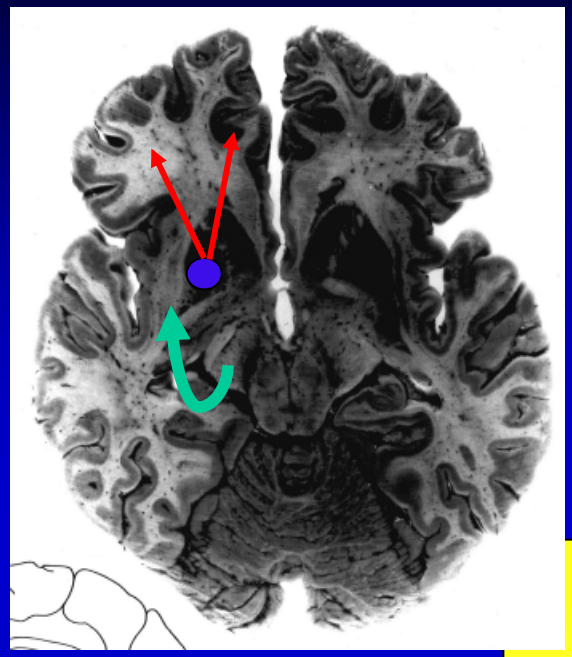
Effects of Drugs on Dopamine Levels



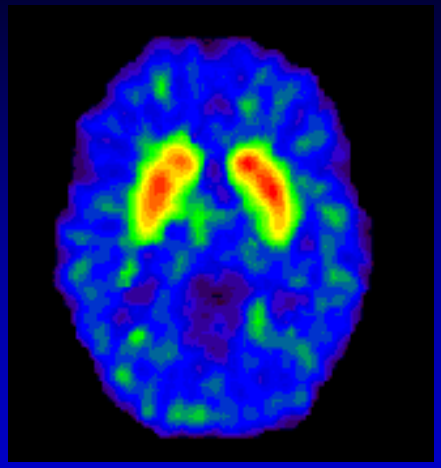
Natural Rewards Elevate Dopamine Levels



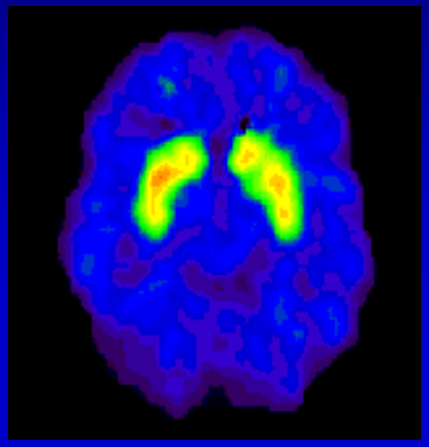
Brain Dopamine System



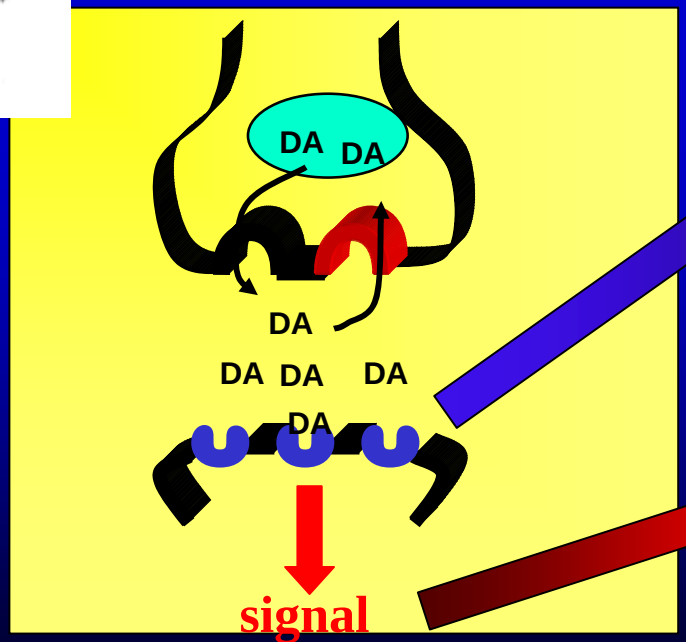
Anatomy



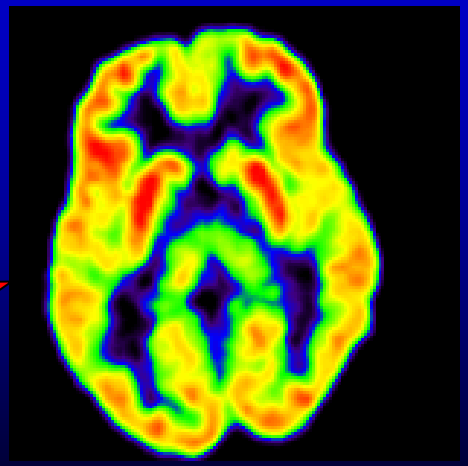
DA Transporters



DA Receptors



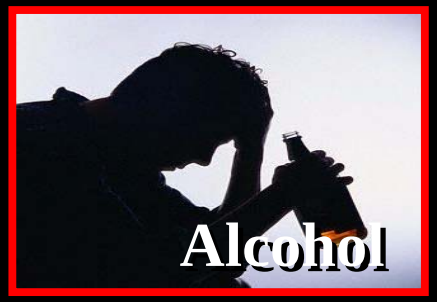
Dopamine Cell

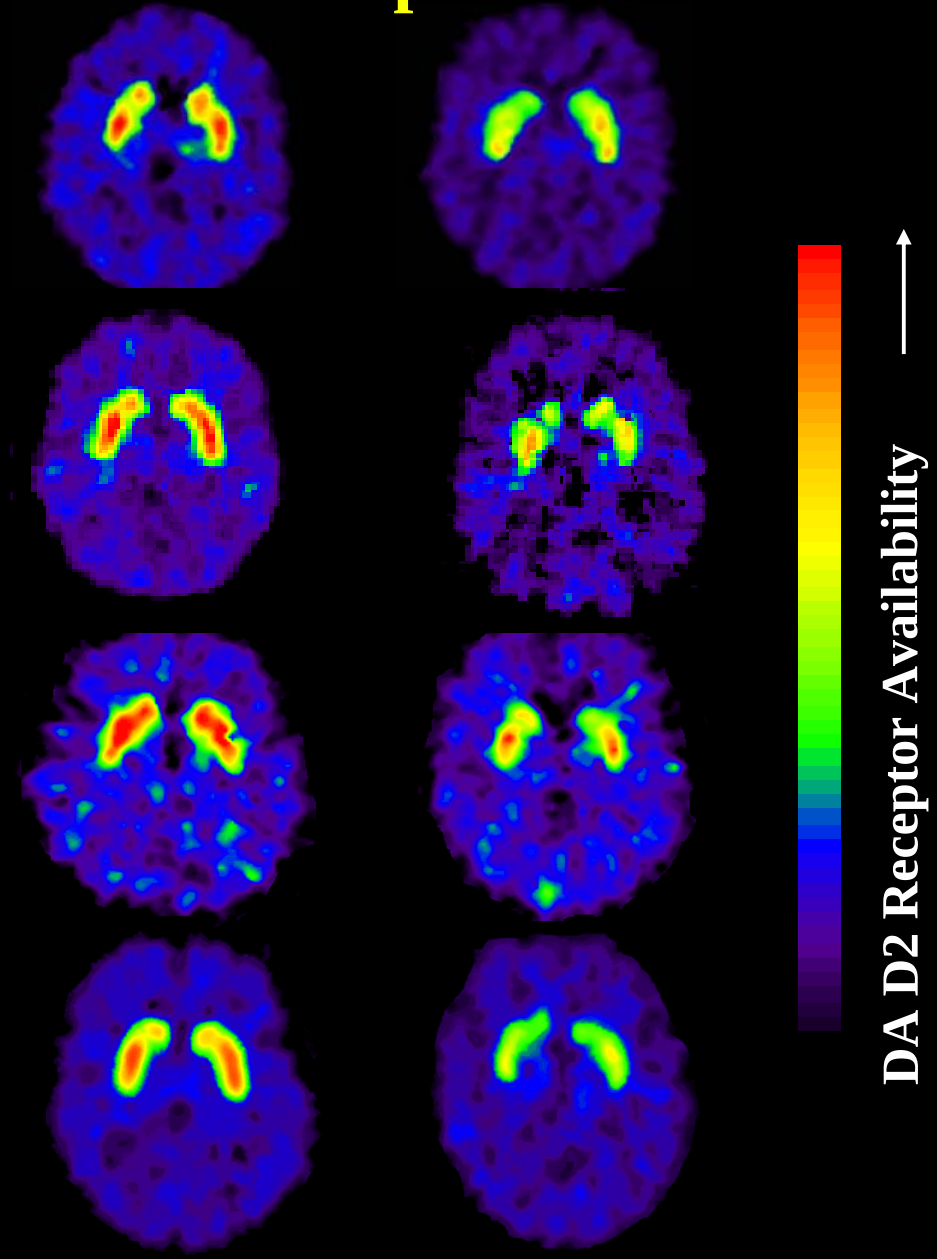


Metabolism

Drug Addiction is a Treatable Brain Disease

Dopamine D2 Receptors are Lower in Addiction

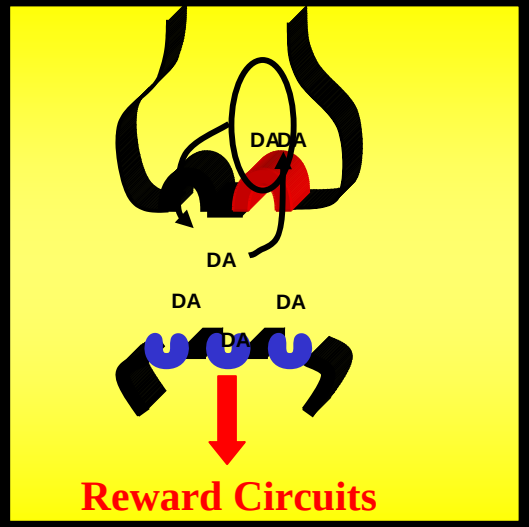




control

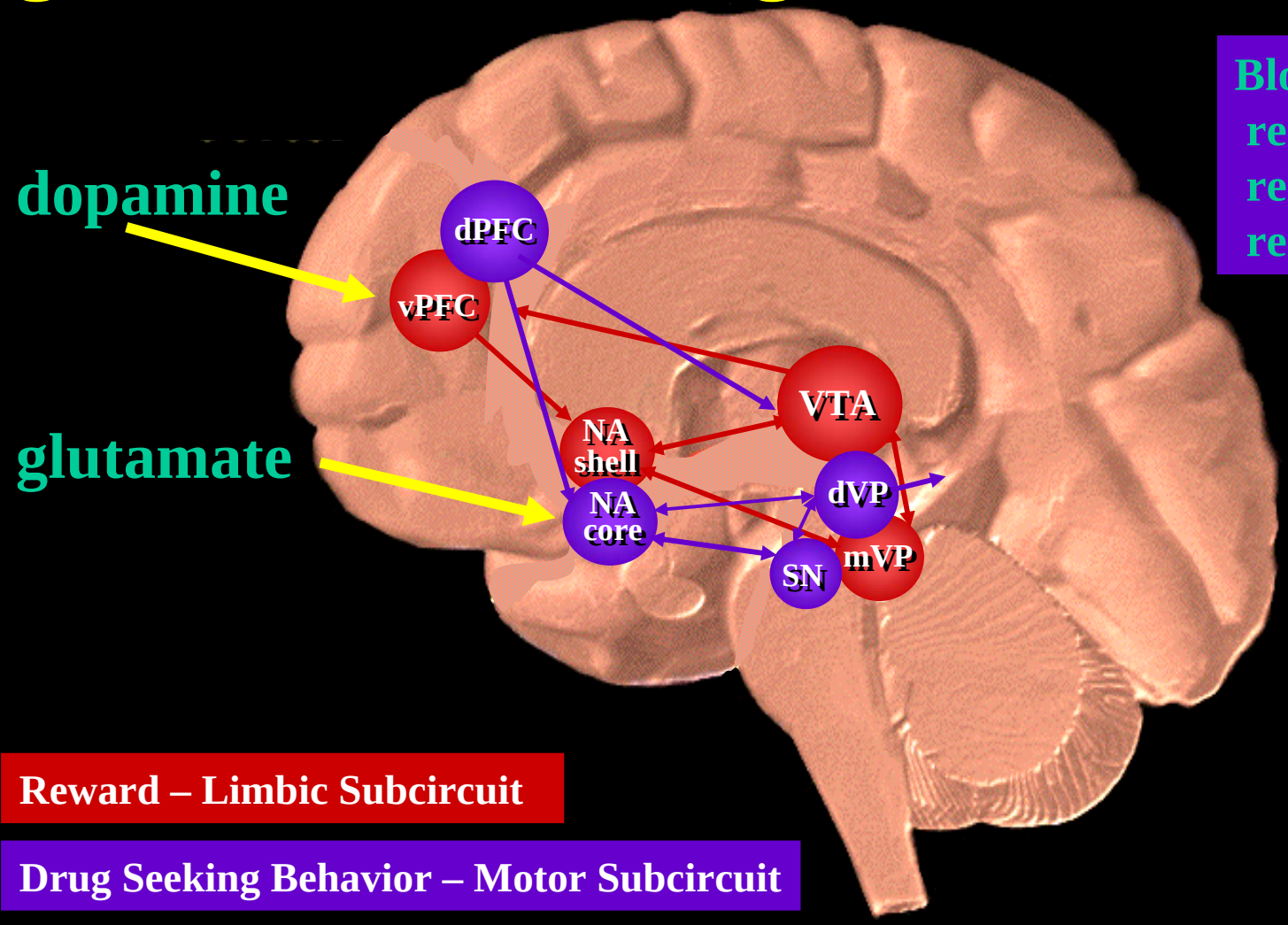
addicted

Non-Drug Abuser



Drug Abuser

Different Brain Circuitry Involved in Drug Reward and Drug Persistance Behavior



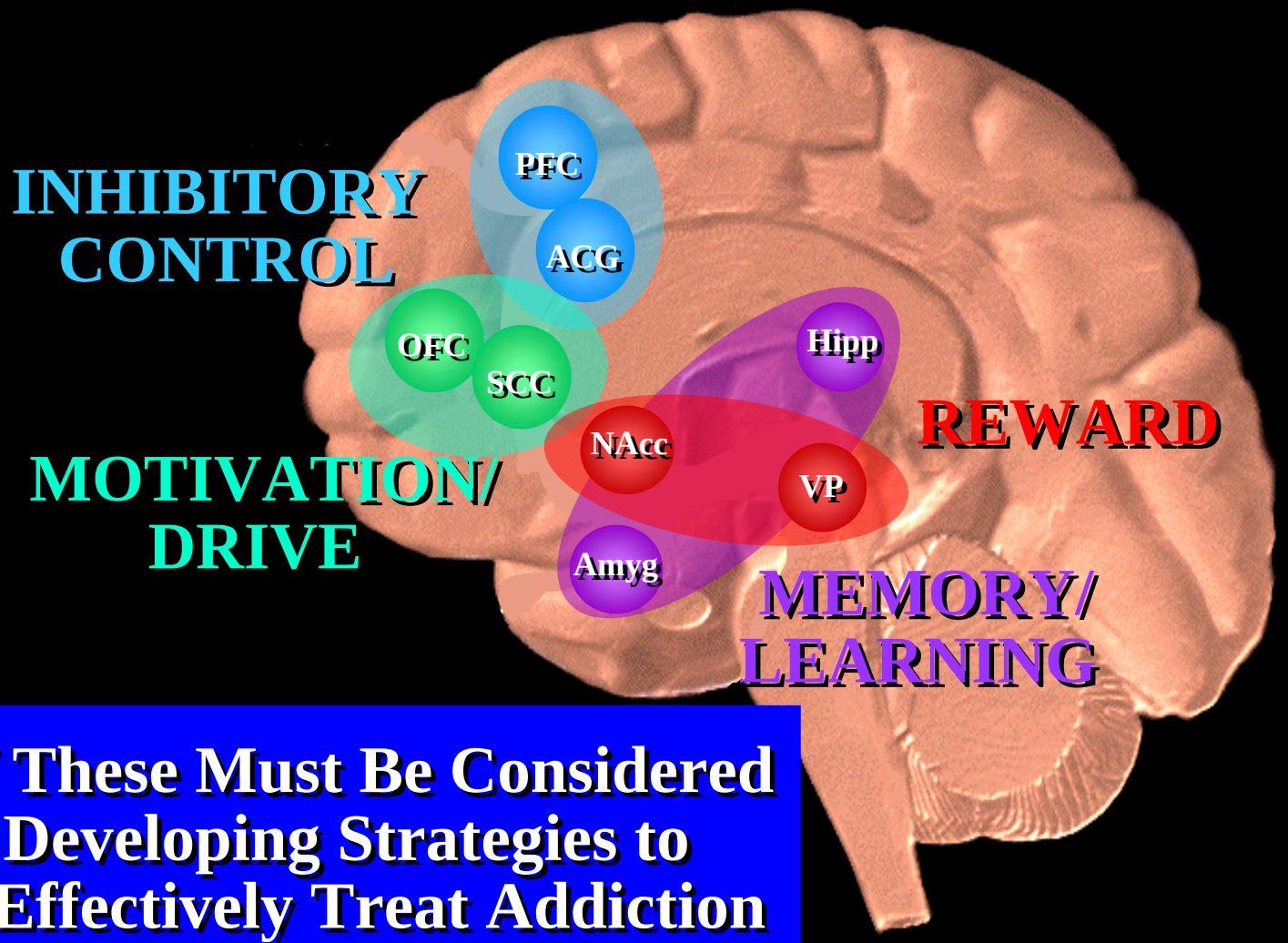
Blockade in these regions blocks relapse or reinstatement

Reward – Limbic Subcircuit

Drug Seeking Behavior – Motor Subcircuit

Source: Adapted from McFarland, K. and Kalivas, P.W. Journal of Neuroscience, 21(21), pp. 8655-8663, November 1, 2001.

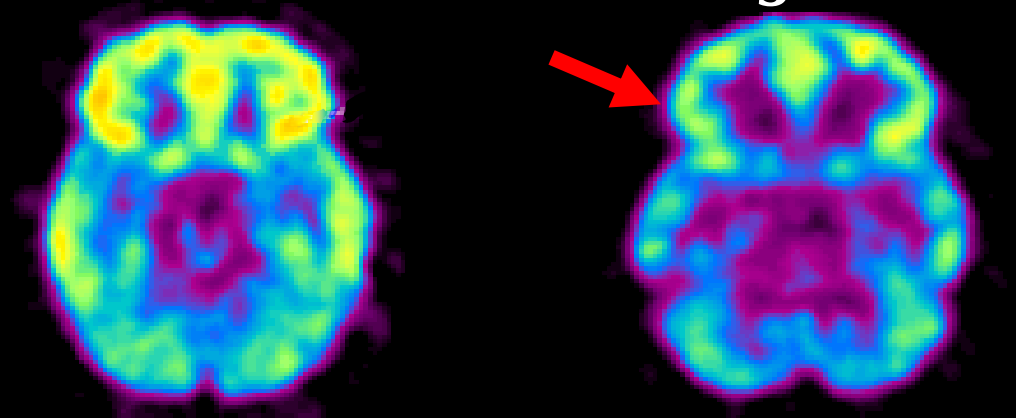
Circuits Involved In Drug Abuse and Addiction



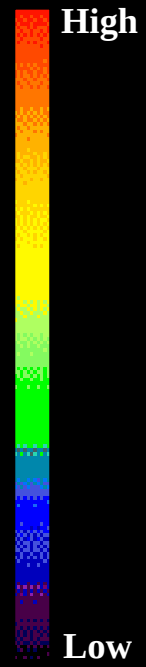
All of These Must Be Considered In Developing Strategies to Most Effectively Treat Addiction

ADDICTION IS A DISEASE OF THE BRAIN
like other diseases, it affects tissue function

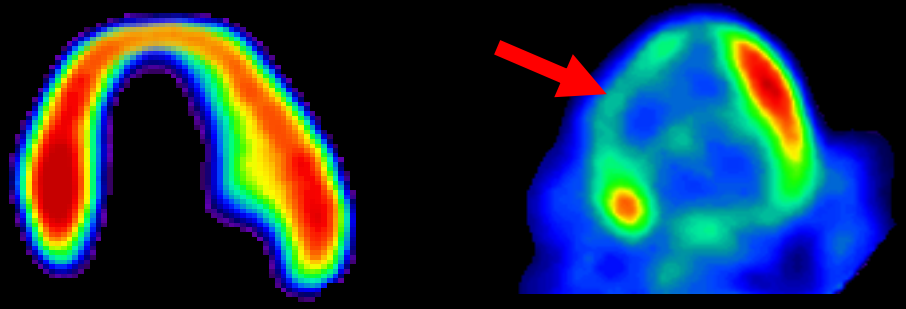
Decreased Brain Metabolism in *Drug Abuse Patient*



Control **Cocaine Abuser**

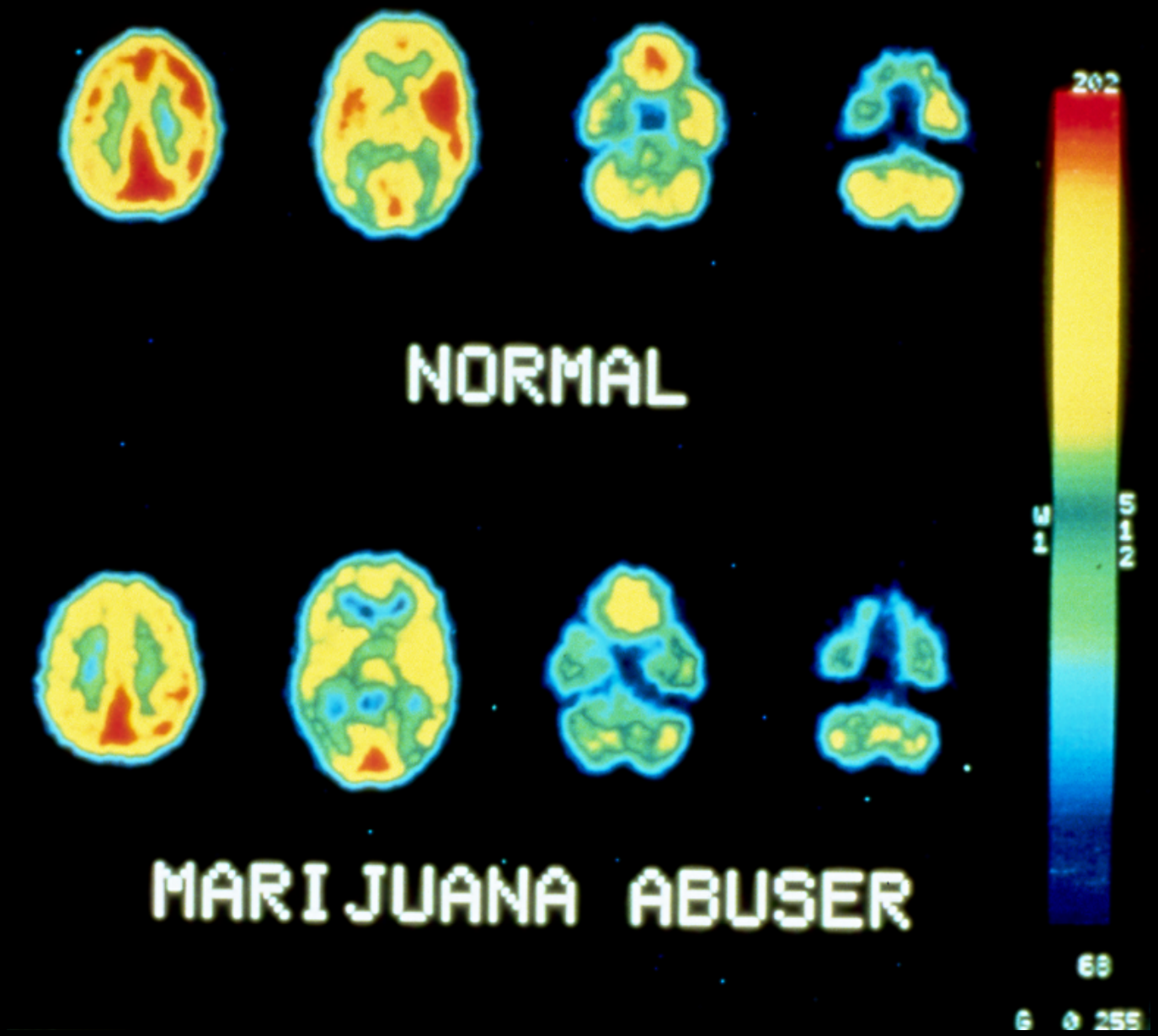


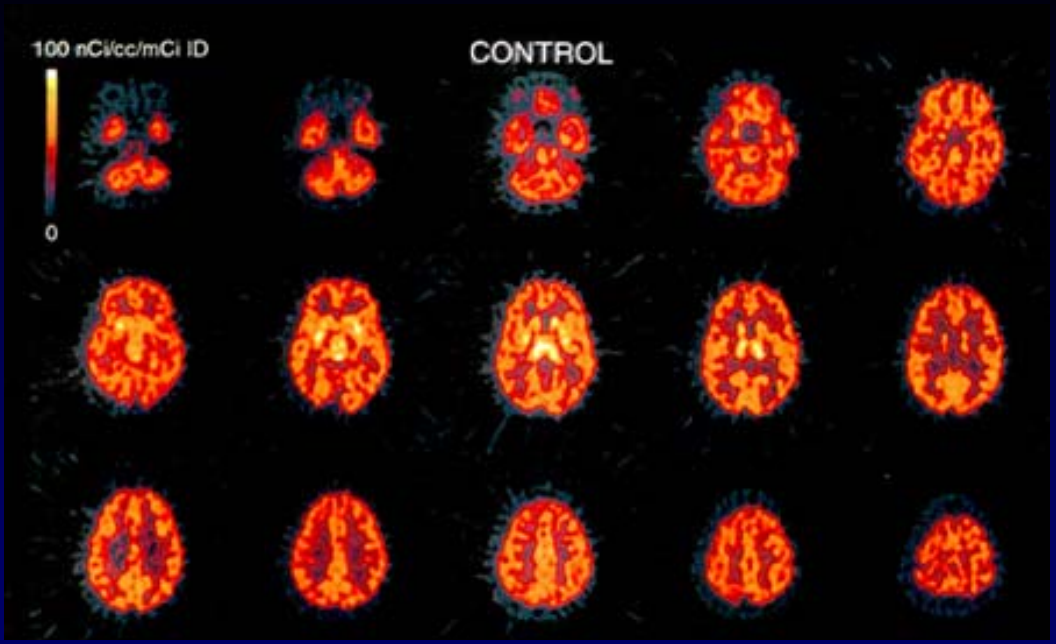
Decreased Heart Metabolism in *Heart Disease Patient*



Healthy Heart **Diseased Heart**

Sources: From the laboratories of Drs. N. Volkow and H. Schelbert


NORMAL
MARIJUANA ABUSER
202
68
G 0 255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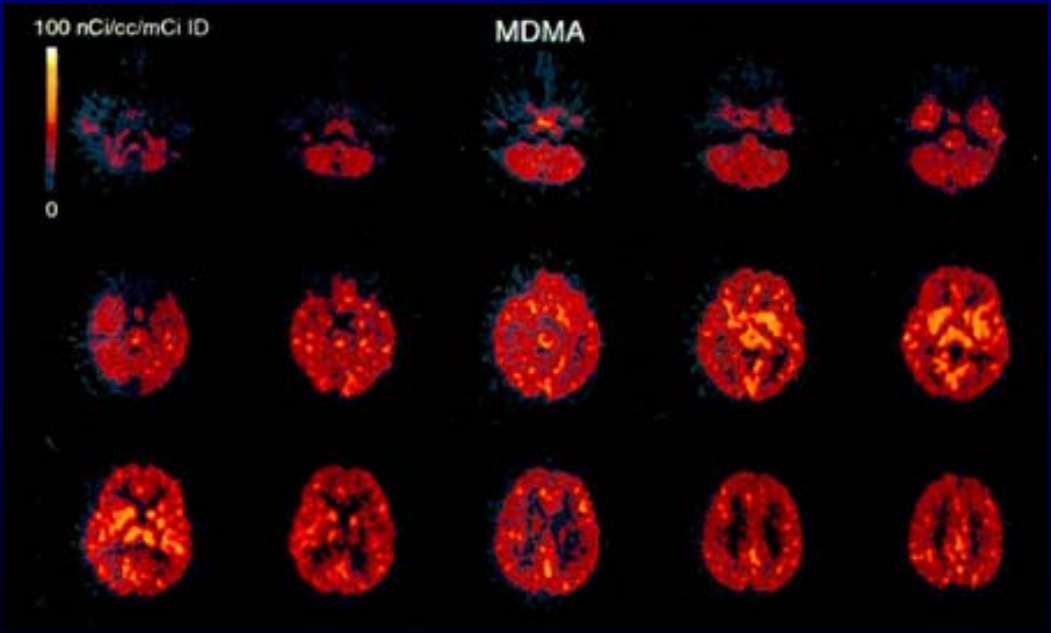
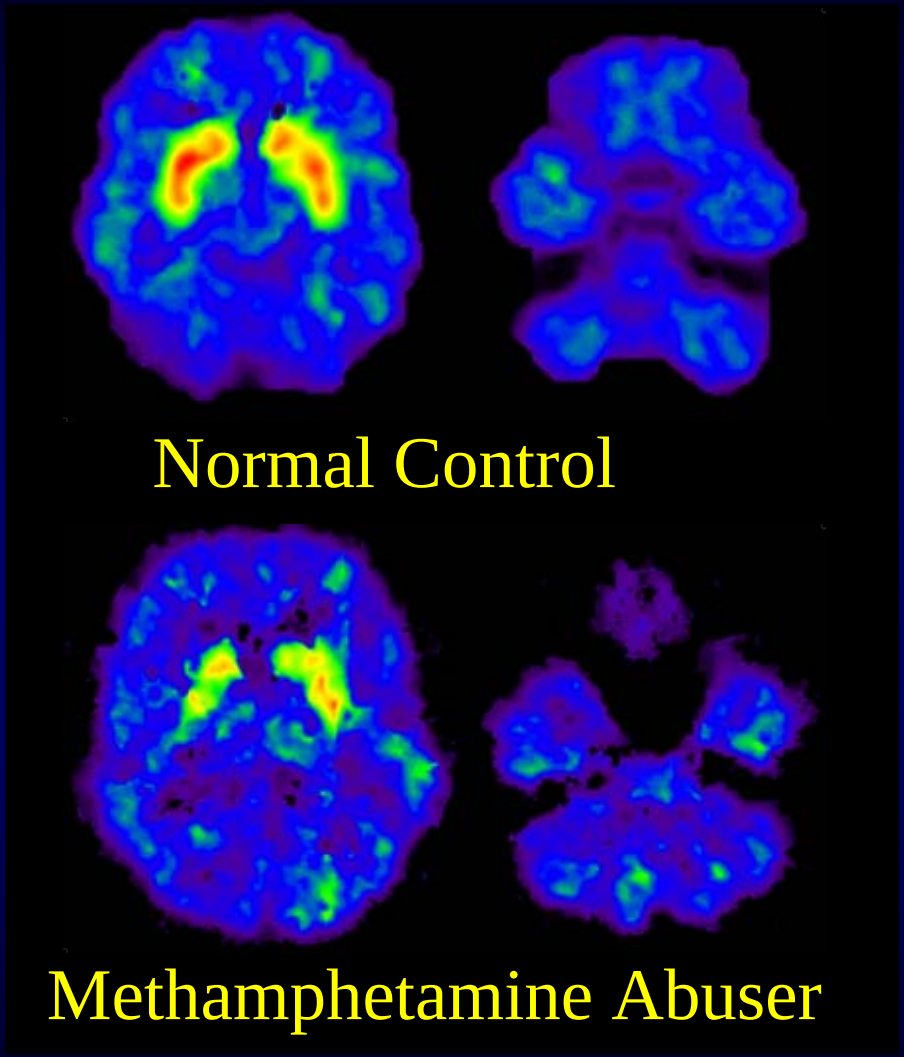
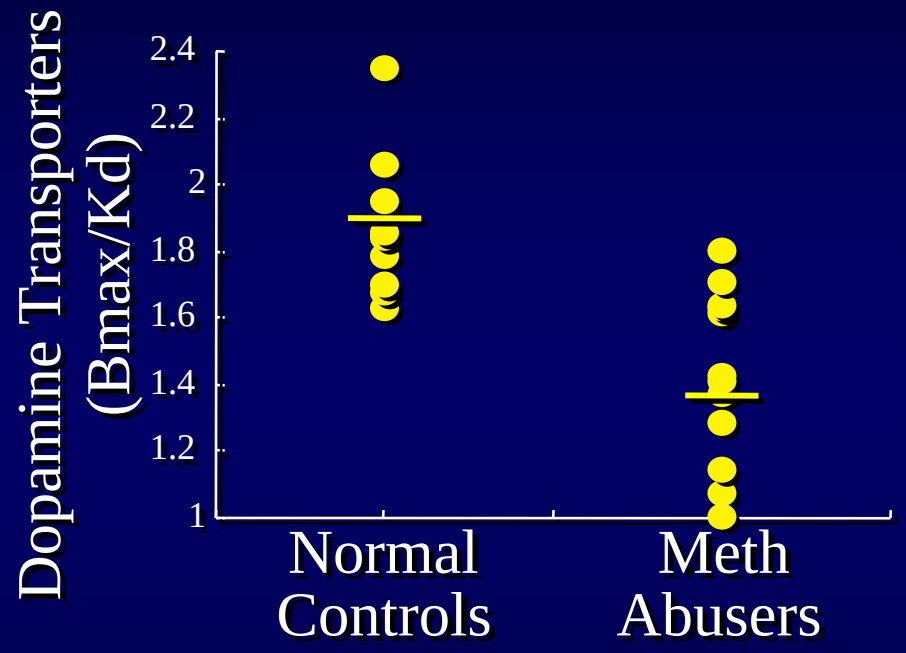
CONTROL
0


100 nCi/cc/mCi ID
MDMA
0

Dopamine Transporters in Methamphetamine Abusers



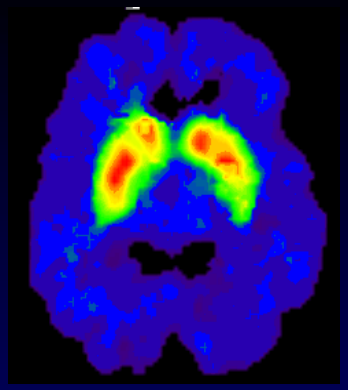


$p < 0.0002$

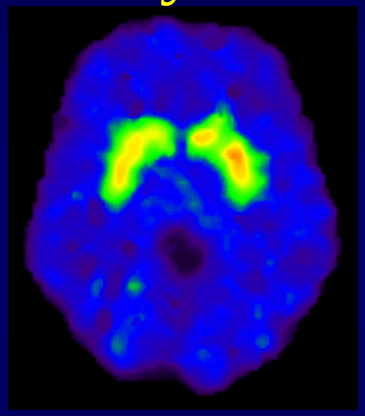
- Methamphetamine abusers have significant reductions in dopamine transporters

BNL
UCLA
SUNY

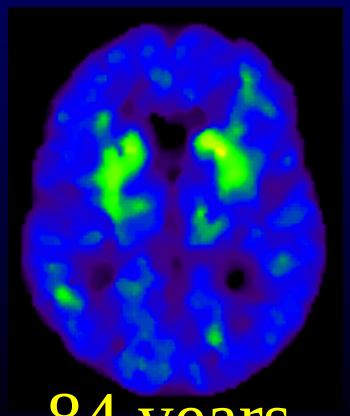
As we grow older we lose dopamine transporters in our brain; methamphetamine accelerates this loss



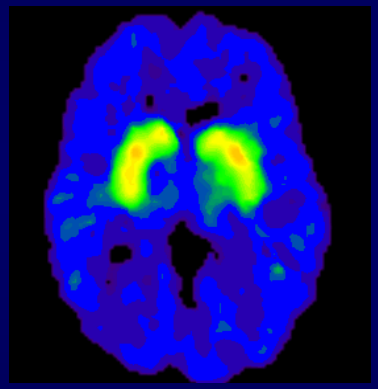
28 years



44 years

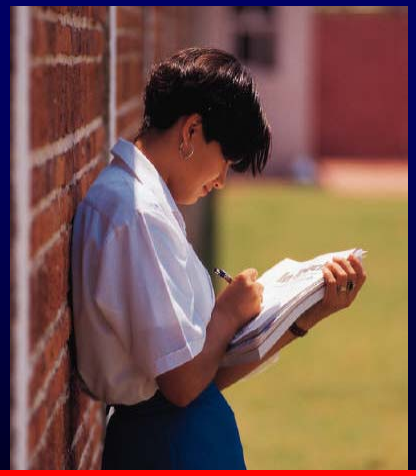


84 years



Methamphetamine
28 years

Will affect motor reflexes



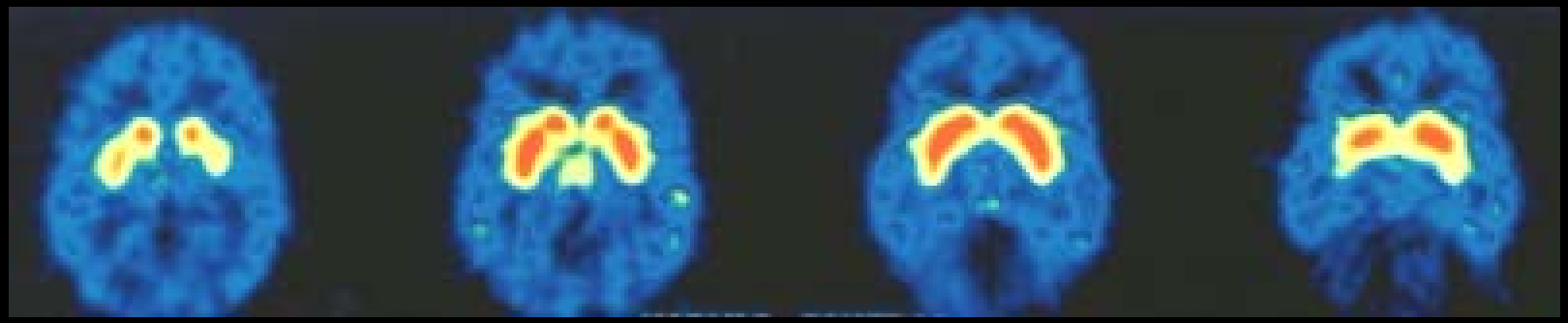
Will affect memory

Chronic use of some of these drugs may alter the way the brain functions, making persons particularly susceptible to mental illness

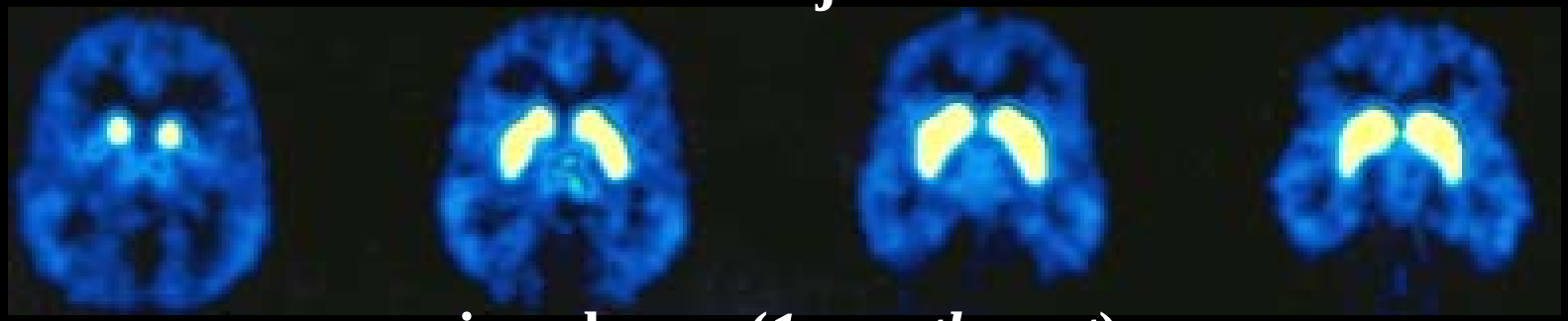
Research Tells Us That STRESS Can Be A Major Factor In the *Initiation of Drug Use*…

And One of the Most Powerful Triggers for *Relapse* In Recovering Addicts…

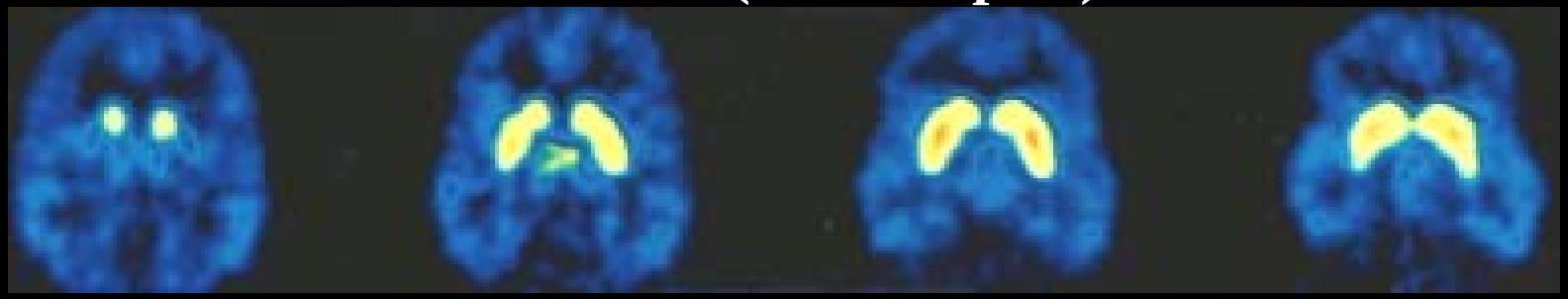
Effect of Cocaine Abuse on Dopamine D2 Receptors



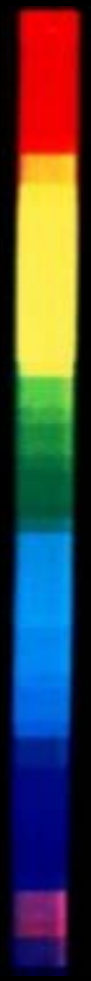
normal subject



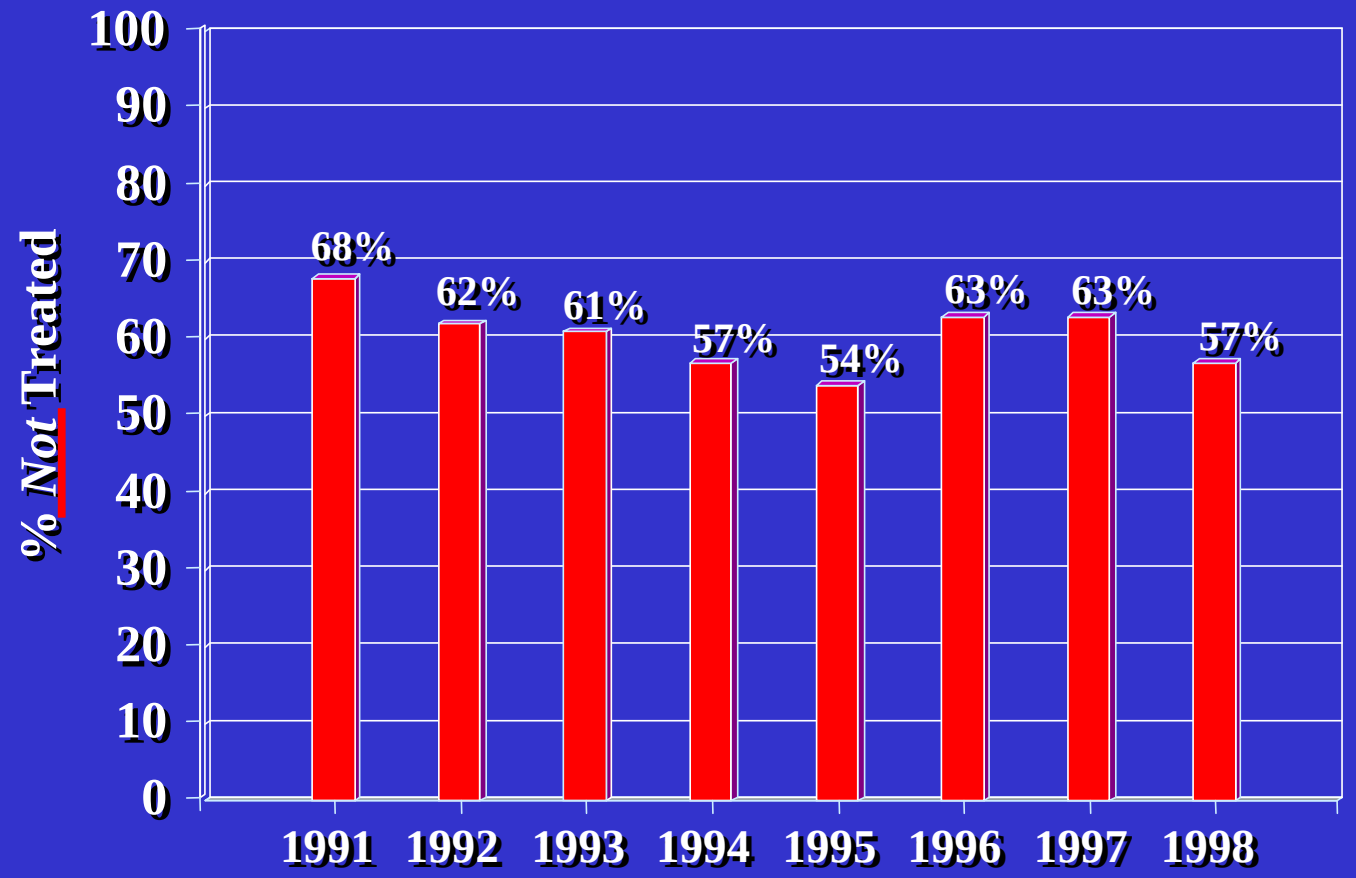
cocaine abuser (*1 month post*)



cocaine abuser (*4 months post*)



The Majority of People Who Need Treatment for Drug Abuse Problems *Don't* Receive It!



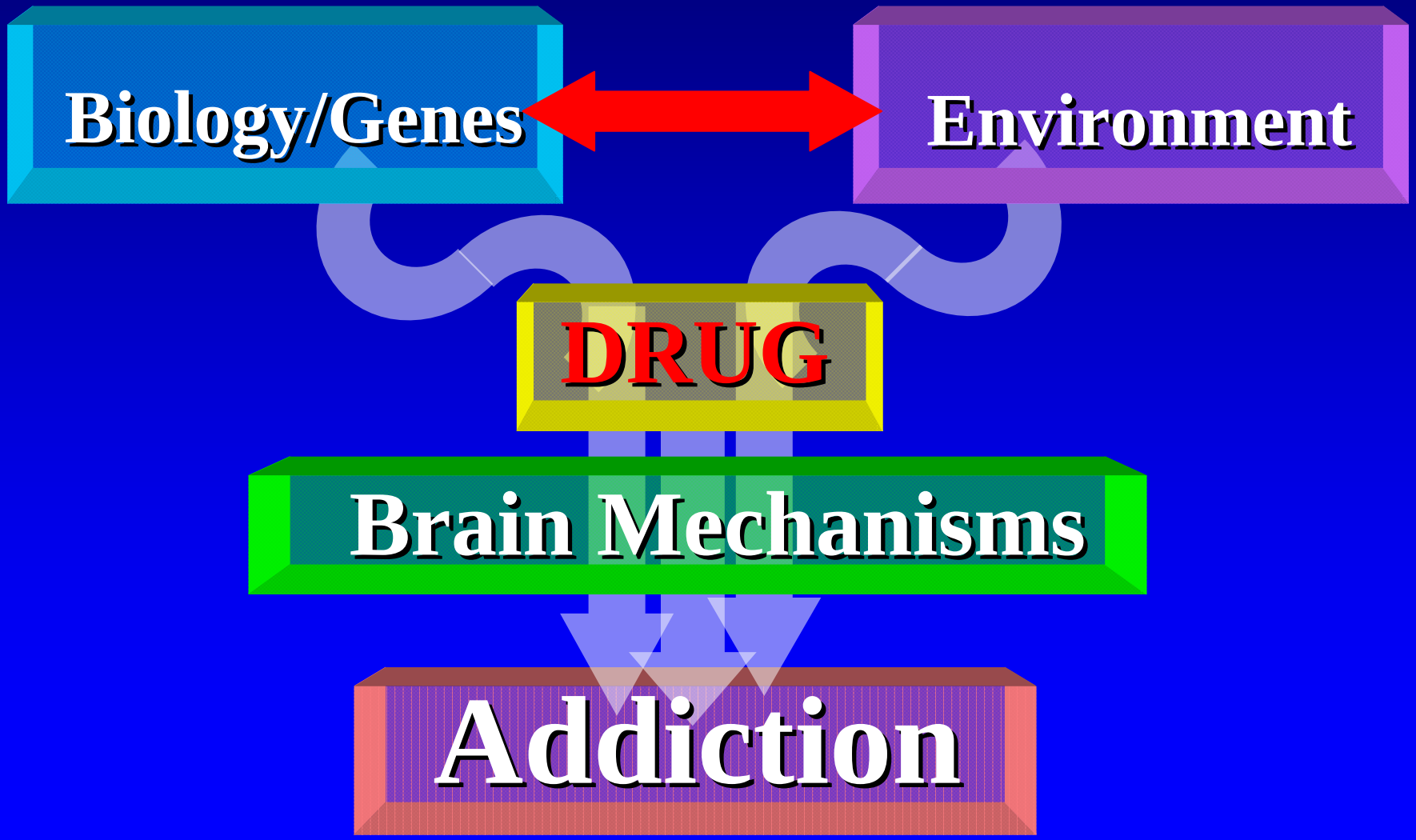
Source: OAS, SAMHSA. Unpublished Data from the National Household Survey on Drug Abuse and Uniform Facility Data Set (1991-1998) – in National Drug Control Strategy 2000 Annual Report Table 39, p. 140.

National Comorbidity Survey (NCS)

- Nearly half of individuals with a past year substance use disorder also had a mental disorder

- Mental disorders found to be most prevalent included affective disorders, anxiety disorders, personality disorders, and psychotic disorders

DRUG ABUSE AND ADDICTION INVOLVE MULTIPLE AND INTERACTIVEFACTORS



www.nida.gov