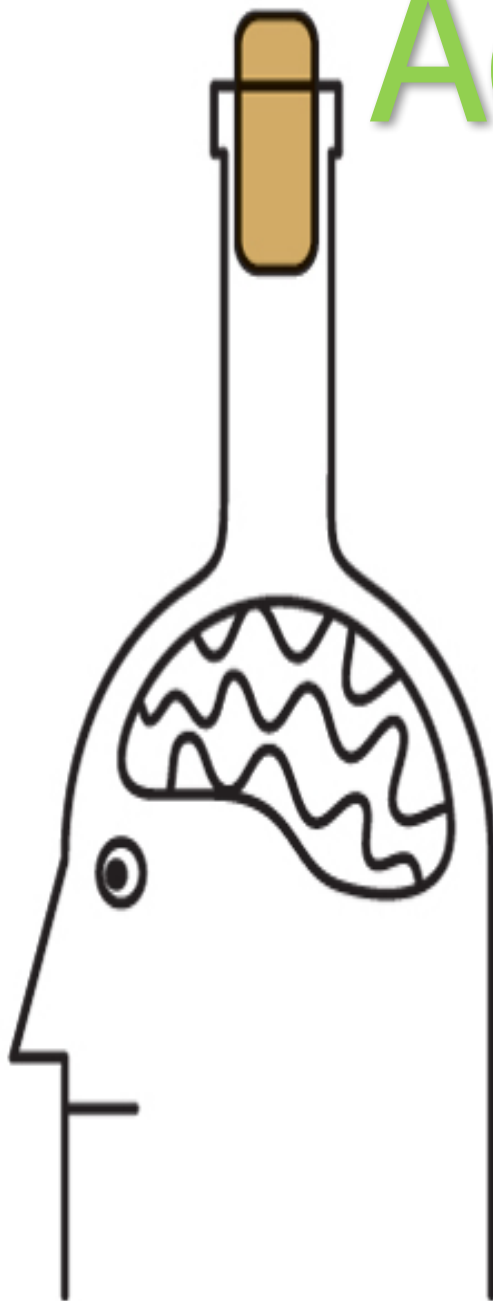
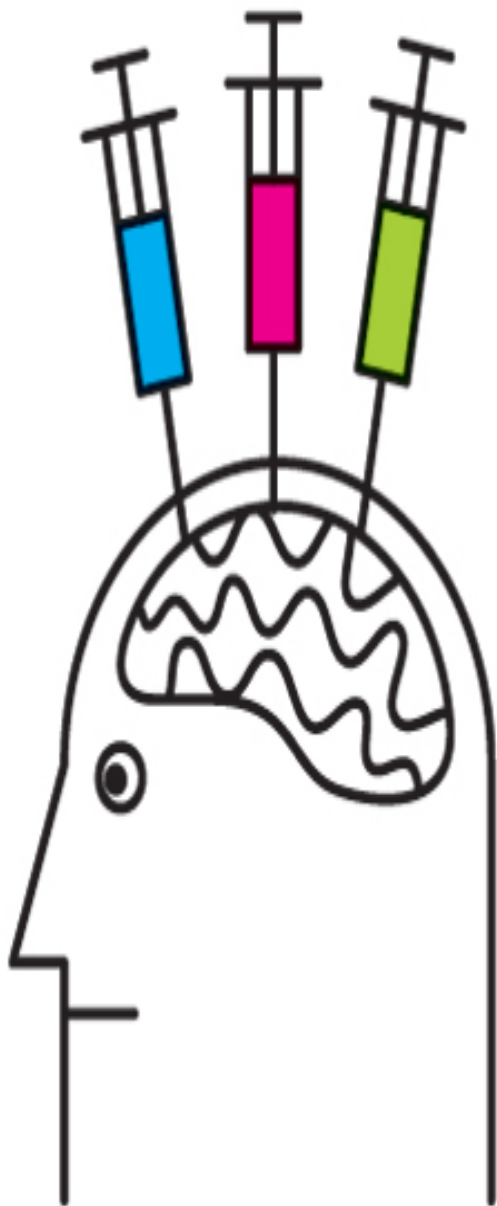


Addiction





Nancy V. Rodway MD MS MPH FACOEM

**Medical Director Lake County General Health District
Occupational and Preventive Medicine
Anatomic and Clinical Pathology**

Objectives

- **Provide an overview of the physiology of and risk factors for addiction, especially for the teenager**
- **Provide detailed information about the opiate epidemic and local community response**
- **Jump into legalization of marijuana: the medical and regulatory consequences**



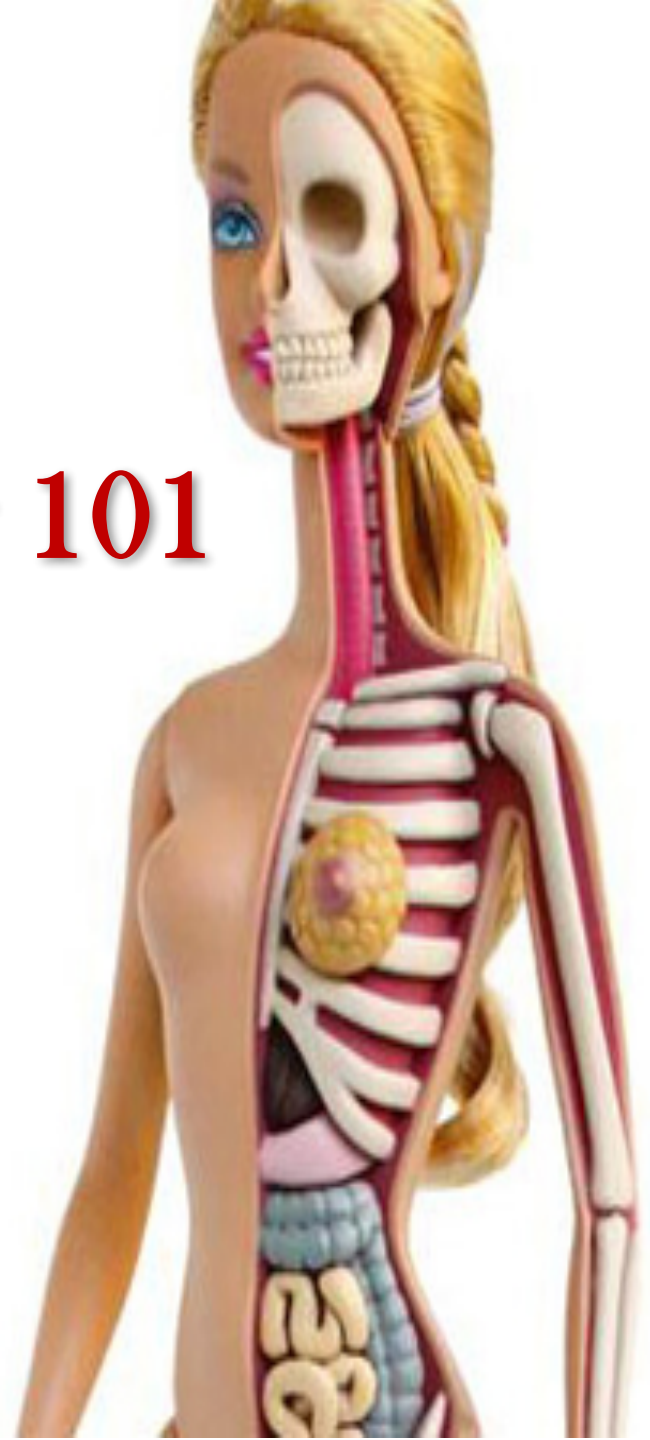
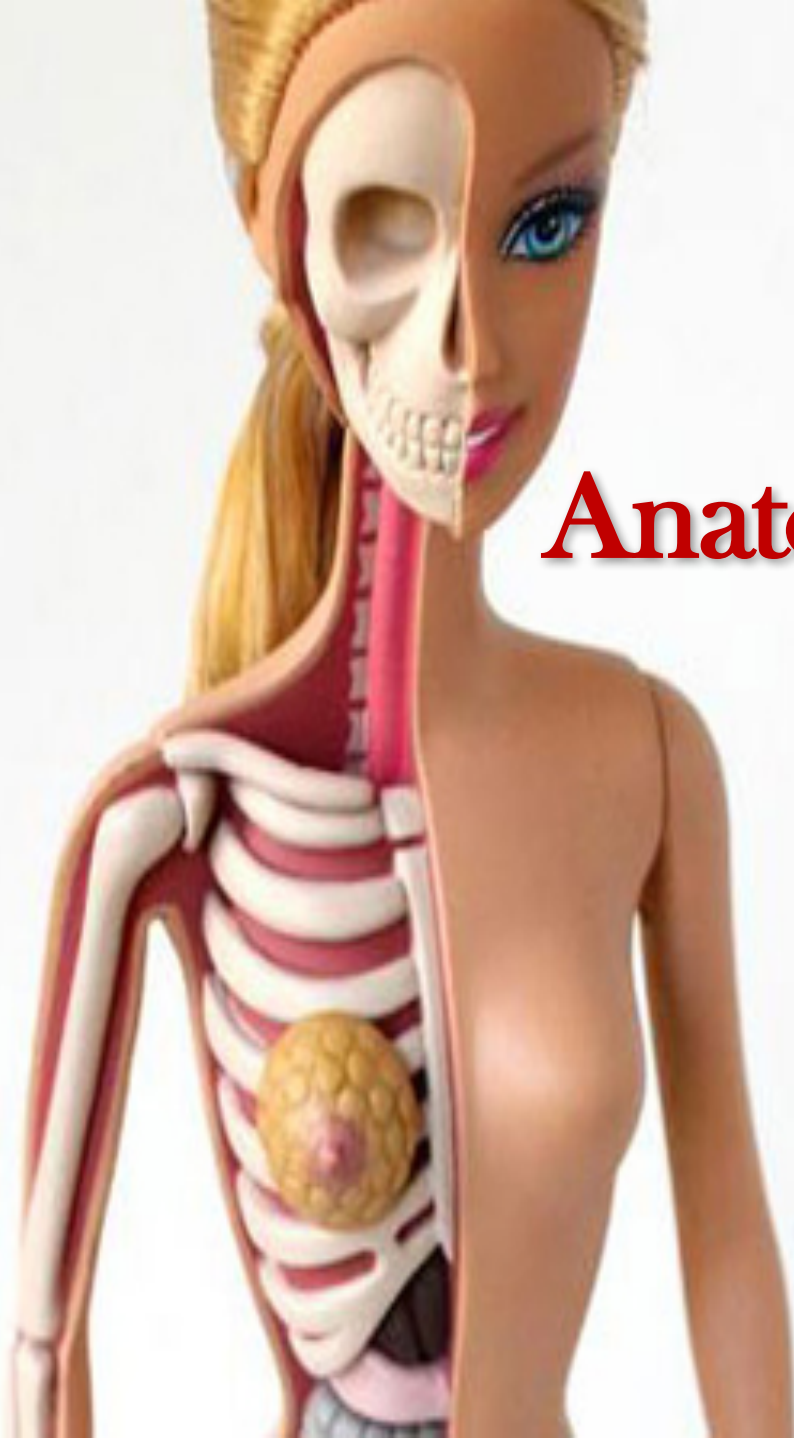




Addiction

Is a disease of the brain in which drugs or actions change the structure and function of the brain, leading to harmful, sometimes permanent, effects

Anatomy 101



The mammalian (limbic) part of the brain controls your emotions by releasing happy and sad chemicals



Sometimes it doesn't talk to the thinking part of the brain

When your brain releases
one of these chemicals,
you feel good.

Dopamine



Serotonin



Oxytocin



Endorphin



Dopamine rewards you for the effort of step toward your needs.

Pleasure

Serotonin rewards you for getting respect from others.

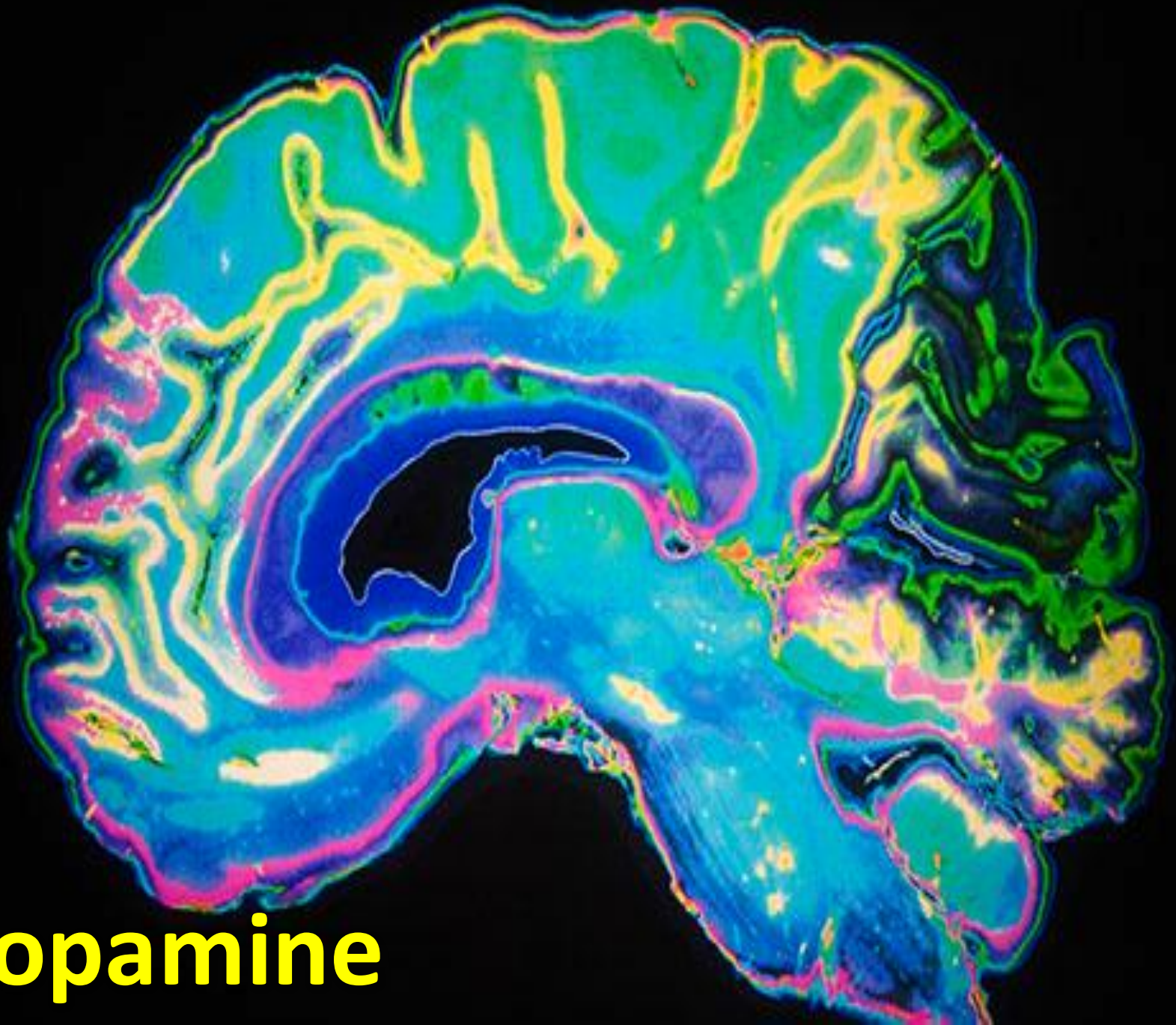
Importance

Oxytocin rewards you for the safety of social support.

Love

Endorphins rewards you for action that deflects injuries.

Runner's High



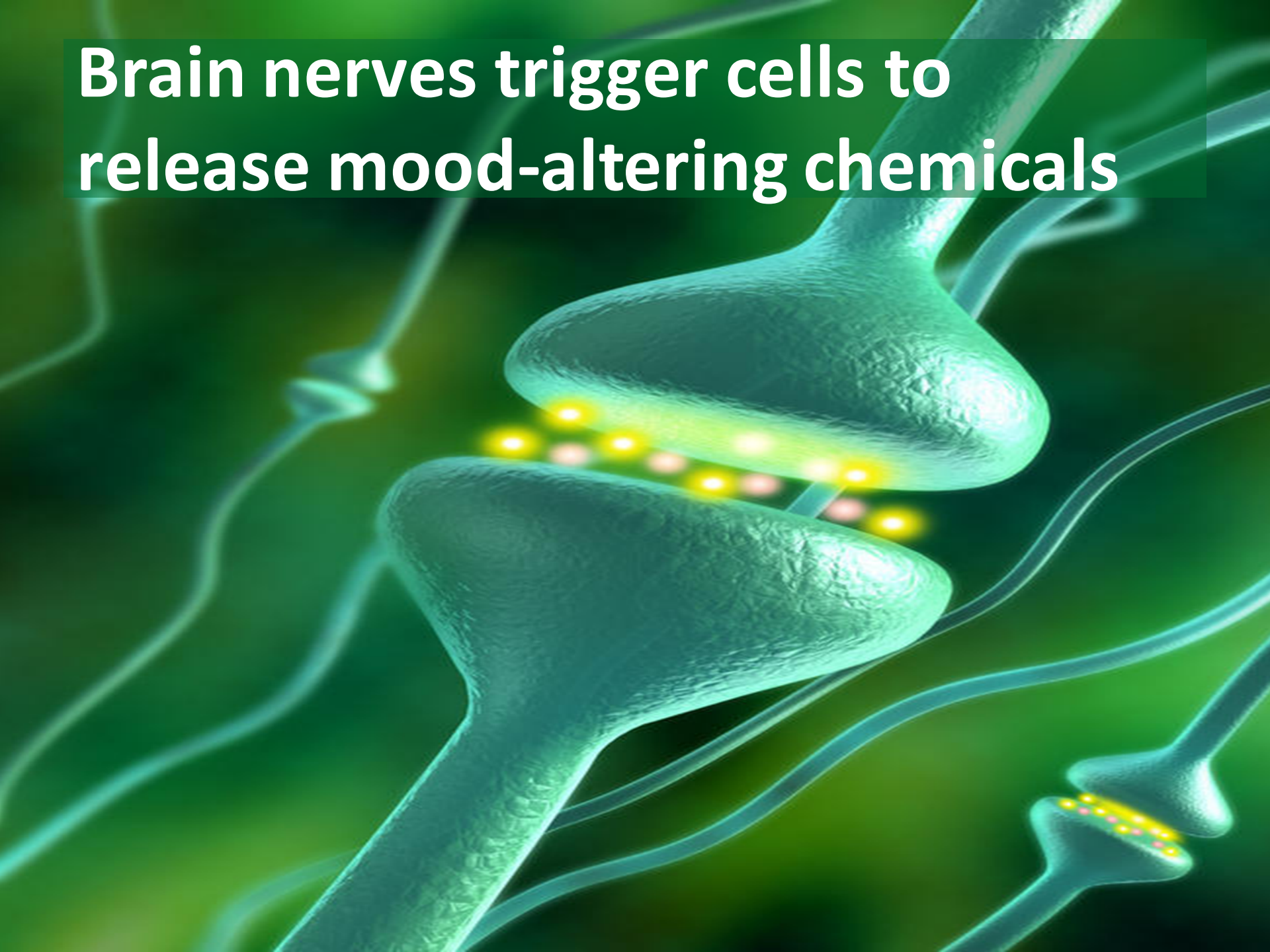
Dopamine

Nerves impulses like familiar roads

**Regardless if the
outcome is good or bad**



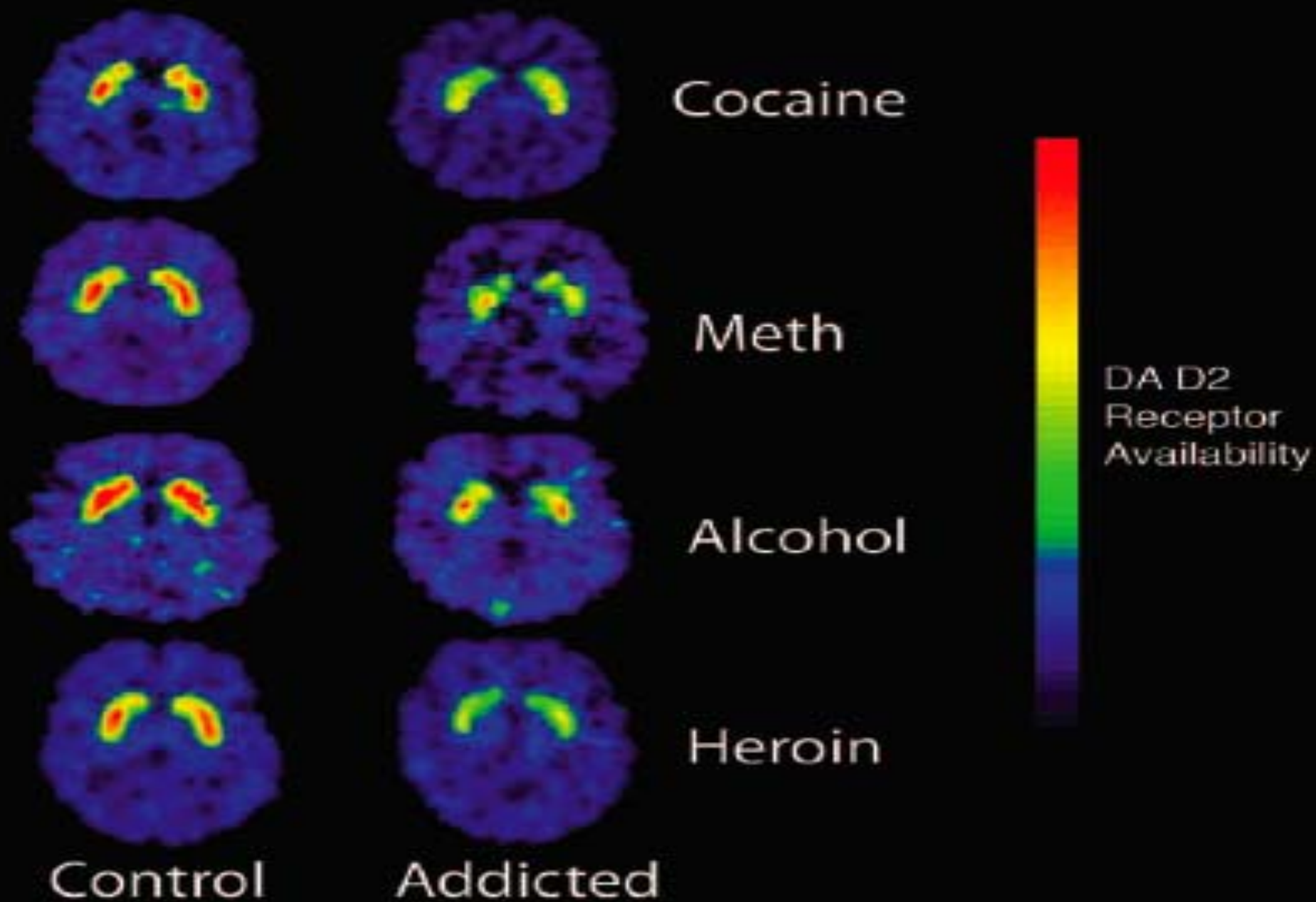
Brain nerves trigger cells to release mood-altering chemicals



DOPAMINE



Dopamine D2 Receptors Are Lower in Addiction



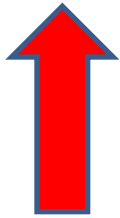


**Some brain cells have special
chemical buttons to push**





Memory
Appetite
Pain
Mood
Immunity



Opiates



Nicotine



Cannabis





Addiction steps

1. First use is voluntary

2. Nerve pathways opened then “greased”
3. Cellular changes with one dose
4. Self control then impaired (hallmark of addiction)
5. Need more stimulation to achieve the same effect
6. Brain shows visible changes in three months

Addiction Risk Factors

- Aggressive behavior in childhood
- Lack of parental supervision
- Poor social skills
- Availability of drugs in school
- Community poverty
- **Social isolation for girls**
- **Lack of extra-curricular activities for boys**



**The teenage brain is
ripe for addiction**

**Teen
Brain
Under
Construction**



Human brain

- Not fully developed until mid to late 20s, especially males
- The frontal lobe EXECUTIVE FUNCTION is NOT CONNECTED TO EMOTION CENTER
- The teenage brain makes more dopamine and has more excitatory neurons; few inhibitory ones
- Teenage years: anatomically is best time in life to learn new behaviors, even bad ones

Addiction is hardwired into the teenage brain

If a person is exposure to an addictive substance before the brain is mature (mid-20s), the frontal brain (executive brain) has little control over the “decision,” the nerve pathways formed are far stronger, and the dopamine reward is far more intense. Rehabilitation is far more difficult

**Addictions starting in
teenagers/young adults are
neurologically, chemically and
behaviorally worse**

Rehabilitation less successful

What can a parent do?

- **Fear of losing their parent's trust and respect is the greatest deterrent to drug use**
- **Set an example**
- **Control the environment**
- **Limit exposures to stressful events**

The sad chemical is cortisol



**Cortisol helps mammals respond
to anticipated stressors**

Our brain can create virtual stressors

Too much cortisol

Can lead to depression

Can lead to addictions

Your body eliminates cortisol in 20 minutes



To free yourself from that awful cortisol feeling, do this when it comes:



1 minute of self-acceptance

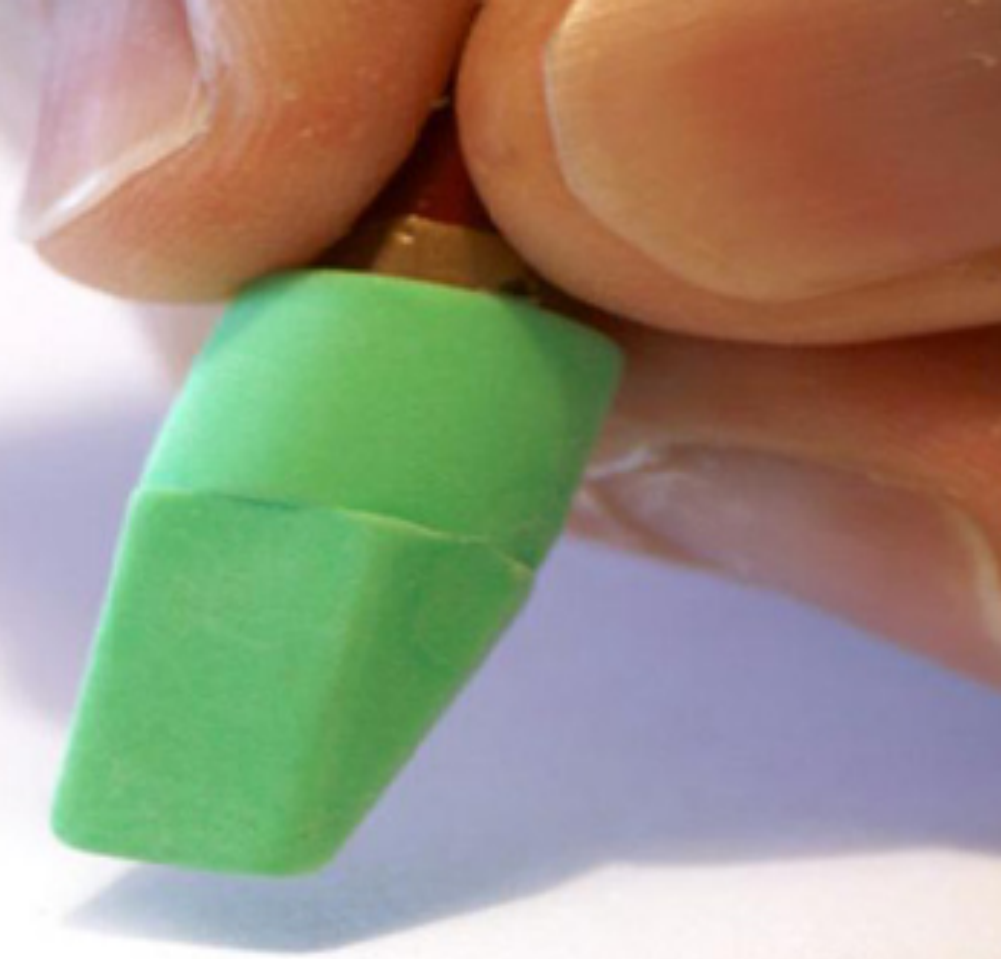


20 minutes of distraction



1 minute of action planning

Treatment of addictions



addiction

Withdrawal from opiates is not fatal

**Withdrawal from
alcohol/benzodiazepines can be**

Treatment starts with withdrawal



Treatment of addiction

- **Intense treatment should last 90 days**
- **Medications specific to condition**
- **Behavioral therapy**
- **Best when used together**
- **EXPECT RELAPSES, similar to nicotine**

A person wearing a yellow jumpsuit is crouching in a prison cell. The cell has a metal grate floor and walls. The background is a dark green color with many thin, white, radial lines emanating from the center, creating a sense of pressure or confinement. The text is overlaid on the top half of the image.

**Addicts who enter treatment
under legal pressure**

**Have as favorable outcomes as those
who enter treatment voluntarily**

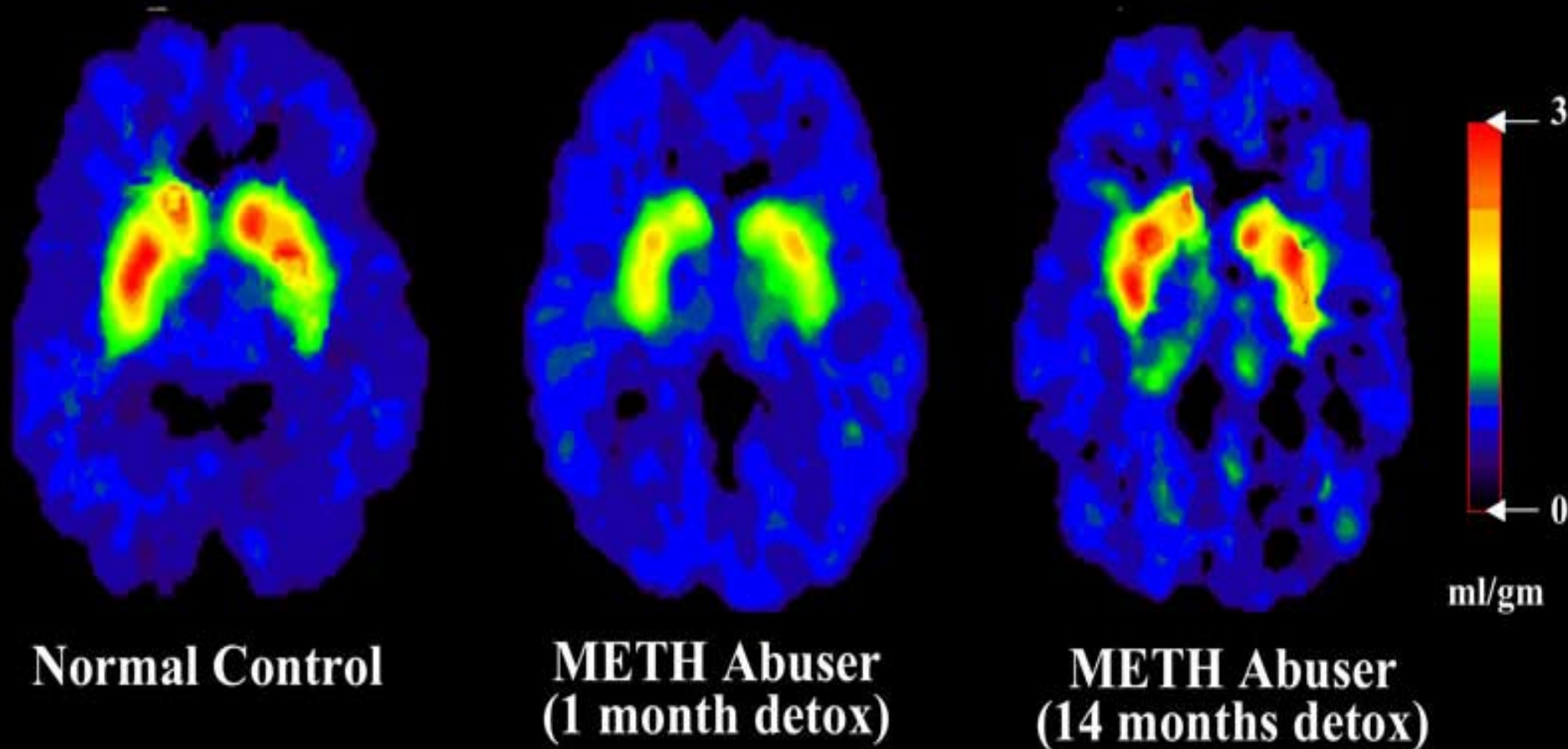
**Remember that addiction
is a chronic disease**

There will be flare-ups

It will take time

Figure 3.

Partial Recovery of Brain Dopamine Transporters In Methamphetamine (METH) Abuser After Protracted Abstinence



Source: Volkow, ND et al., *Journal of Neuroscience* 21, 9414-9418, 2001.

Relapse rates of chronic illnesses

TYPE I DIABETES



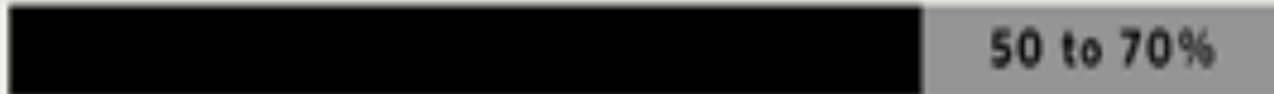
DRUG ADDICTION



HYPERTENSION



ASTHMA



Medications for recovery

- **Tobacco**
 - Nicotine replacement
 - Zyban (Wellbutrin, bupropion)
 - Varenicline (Chantix)
- **Opiates**
 - Methadone
 - Suboxone
 - Naltrexone (Vivitrol injection, pills, implant)
 - Ambulatory Detoxification medications
- **Alcohol**
 - Naltrexone (Vivitrol injection, pills)
 - Disulfiram (Antabuse)
 - Campral (acamprosate)



Suboxone

Opiate replacement
Addictive

Has Narcan in it to prevent injection



Long-acting Narcan
Monthly shot for 12-18 months
Can't get high even with opiate use
NOT ADDICTIVE/NOT AN OPIATE

Prevention of addictions

- **Regulatory**
 - Taxes on substances
 - Prescribing regulations
 - School anti-drug policies
- **Community**
 - Positive relationships
 - Neighborhood pride
 - Random drug programs at work
- **Personal**
 - Good self control
 - Parental monitoring and support
 - Academic competence

Preventing Addictions in Children

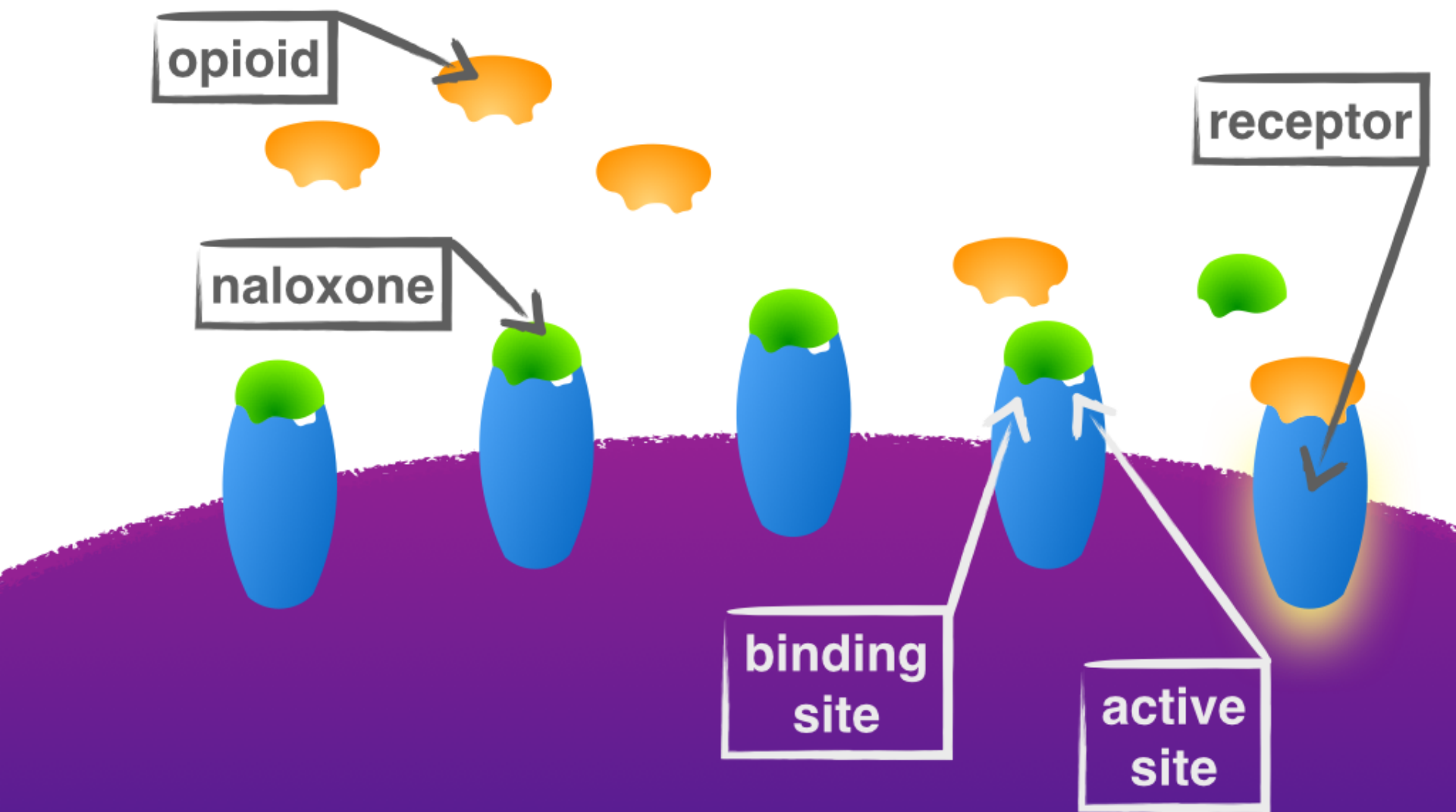
- **Fear of losing their parent's trust and respect is the greatest deterrent to drug use**
- **Set an example**
- **Control the environment**
- **Limit exposures to stressful events**

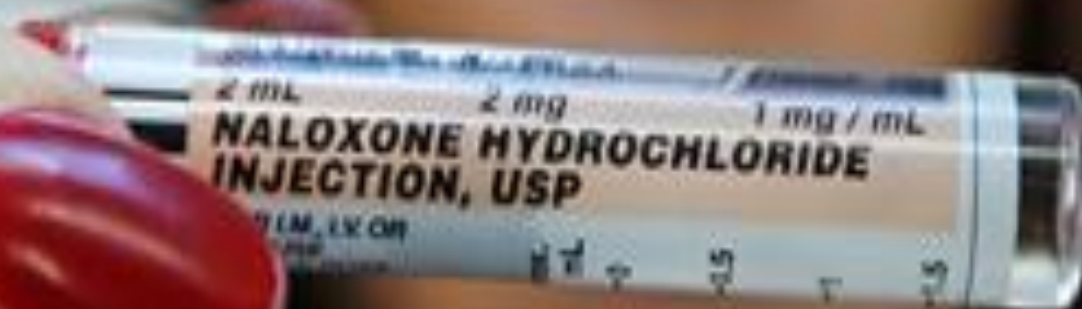


Opiate overdose

**Opiates kill by suppressing
breathing**

Narcan reverses this







Intranasal Narcan/naloxone



**CVS Pharmacies: nasal Narcan
available without a prescription**



Narcan for addicts

- Recommended by the state of Ohio
- Recommended by the CDC
- Recommended by the AMA
- Some studies show increase rates of recovery after overdose reversal with narcan
- “Lazarus parties” may be urban legend

If you want to get free Nasal
Narcan, contact your local
county health department or the
Ohio Department of Health,
Project DAWN Department at
614 466-2144

**19,000 American died from
opiates in 2014**

Marijuana has no overdose threshold

Drugs deadlier than marijuana (2010)

480,000



tobacco-
attributable
deaths

25,692

alcohol-
attributable
deaths *

16,651

prescription
painkiller
overdoses

16,195

non-prescription
drug overdoses

0

marijuana-
attributable
deaths **

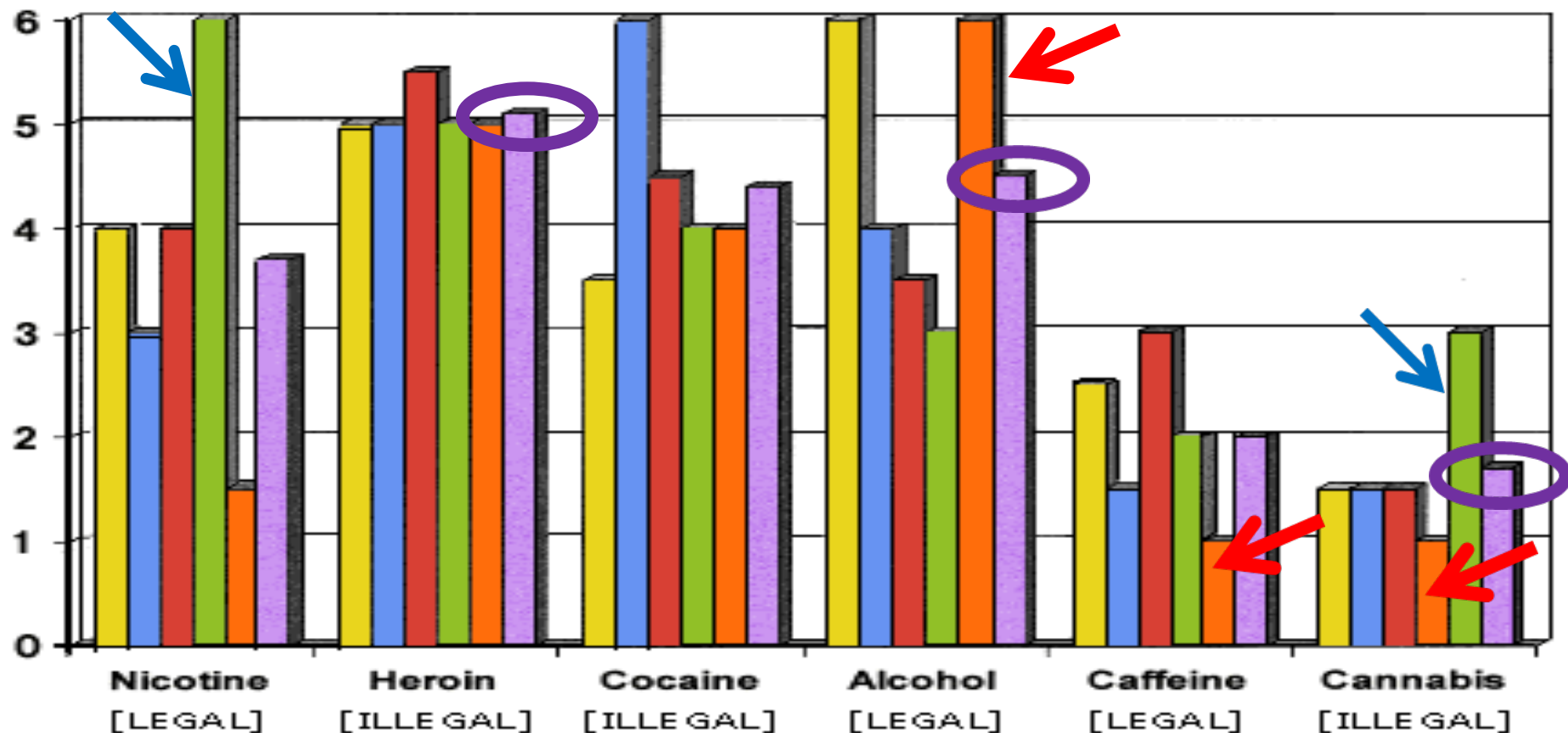
Source: CDC

* Listed alcohol deaths do not include indirect causes like fetal alcohol syndrome, traffic accidents and homicide.

** Listed marijuana deaths leave out indirect causes like traffic accidents.



Substances Compared

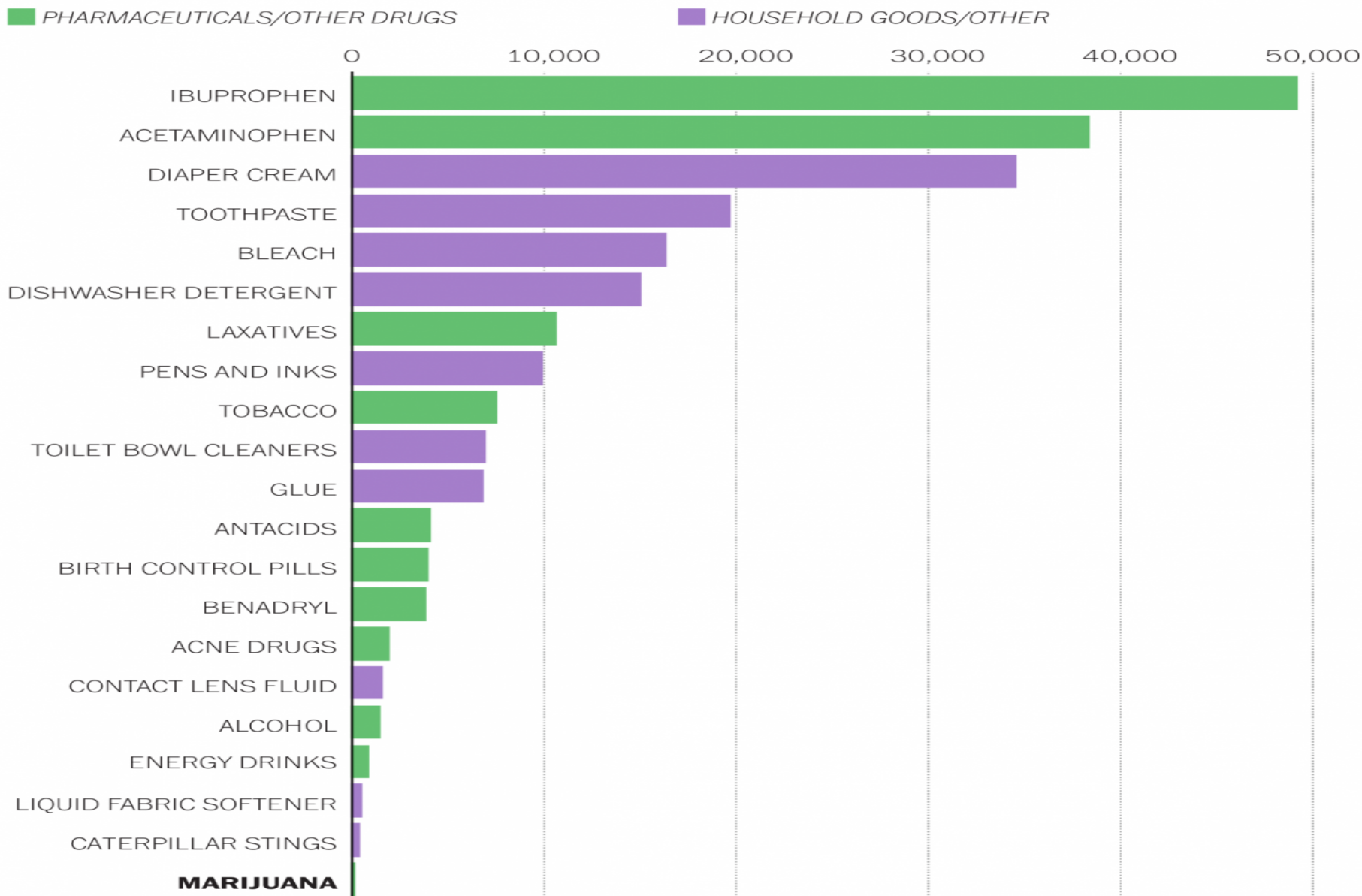


- **Withdrawal**
- **Reinforcement**
- **Tolerance**
- **Dependence**
- **Intoxication**
- **Addiction Potential**

FIG. 15.1. Addiction ratings.
From Henningfield, Benowitz.
New York Times 1994

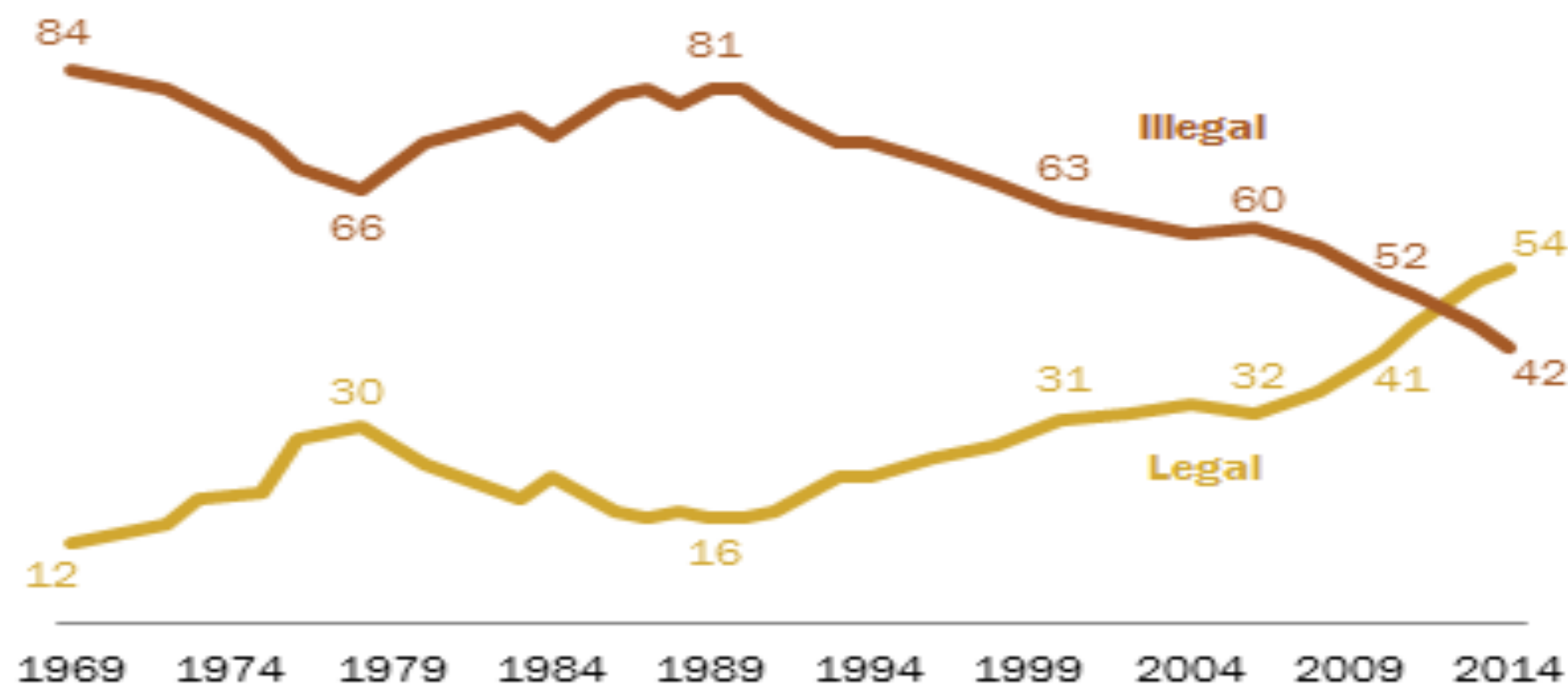
Marijuana poisoning is incredibly rare

Calls to poison centers for exposure to selected substances by kids under age 13, nationwide, 2012



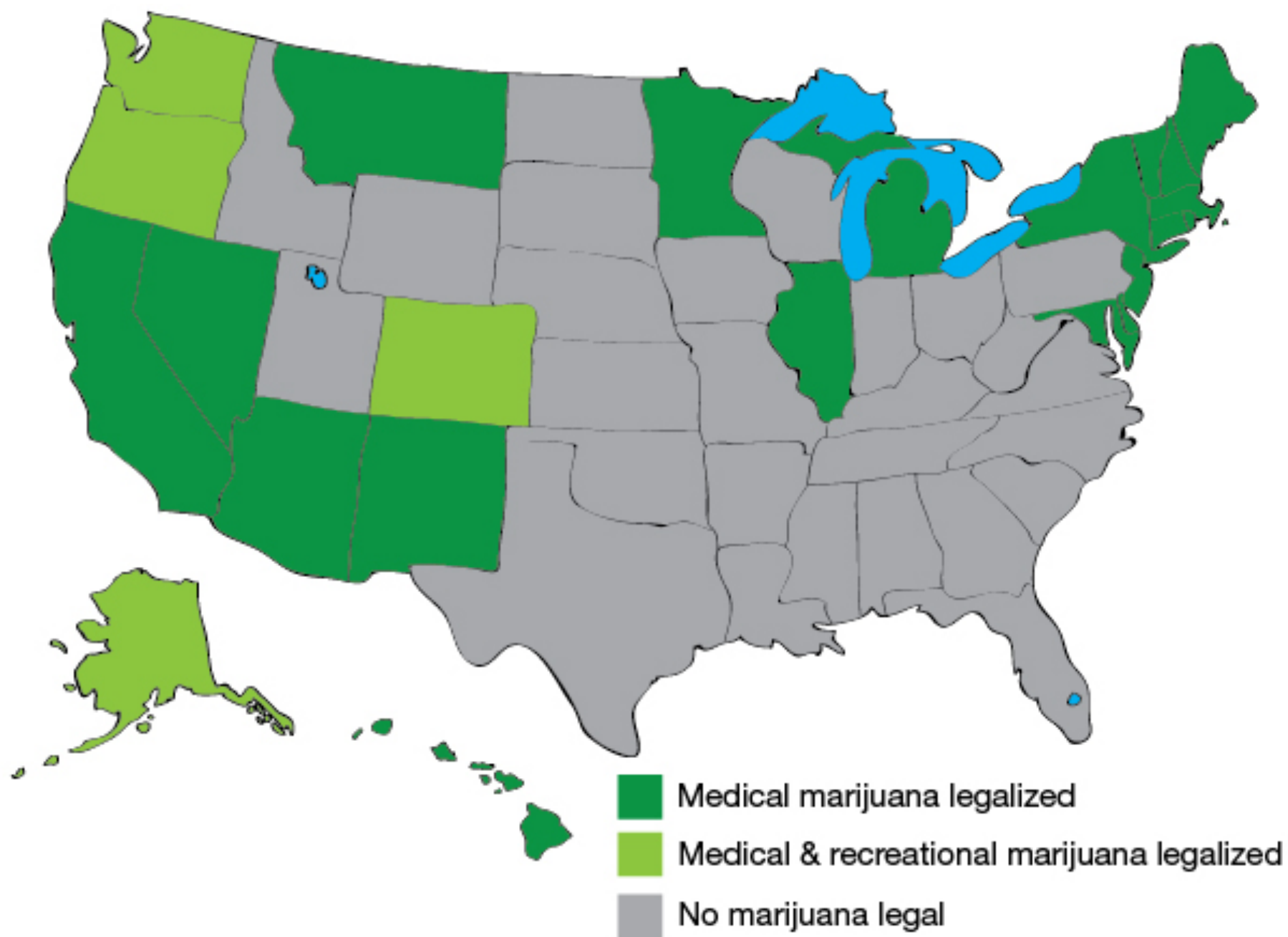
Growing Support for Marijuana Legalization

% saying marijuana should be ...



Survey conducted Feb. 12-26, 2014. 1973-2008 data from General Social Survey; 1969 and 1972 data from Gallup

PEW RESEARCH CENTER



Marijuana/Cannabis history

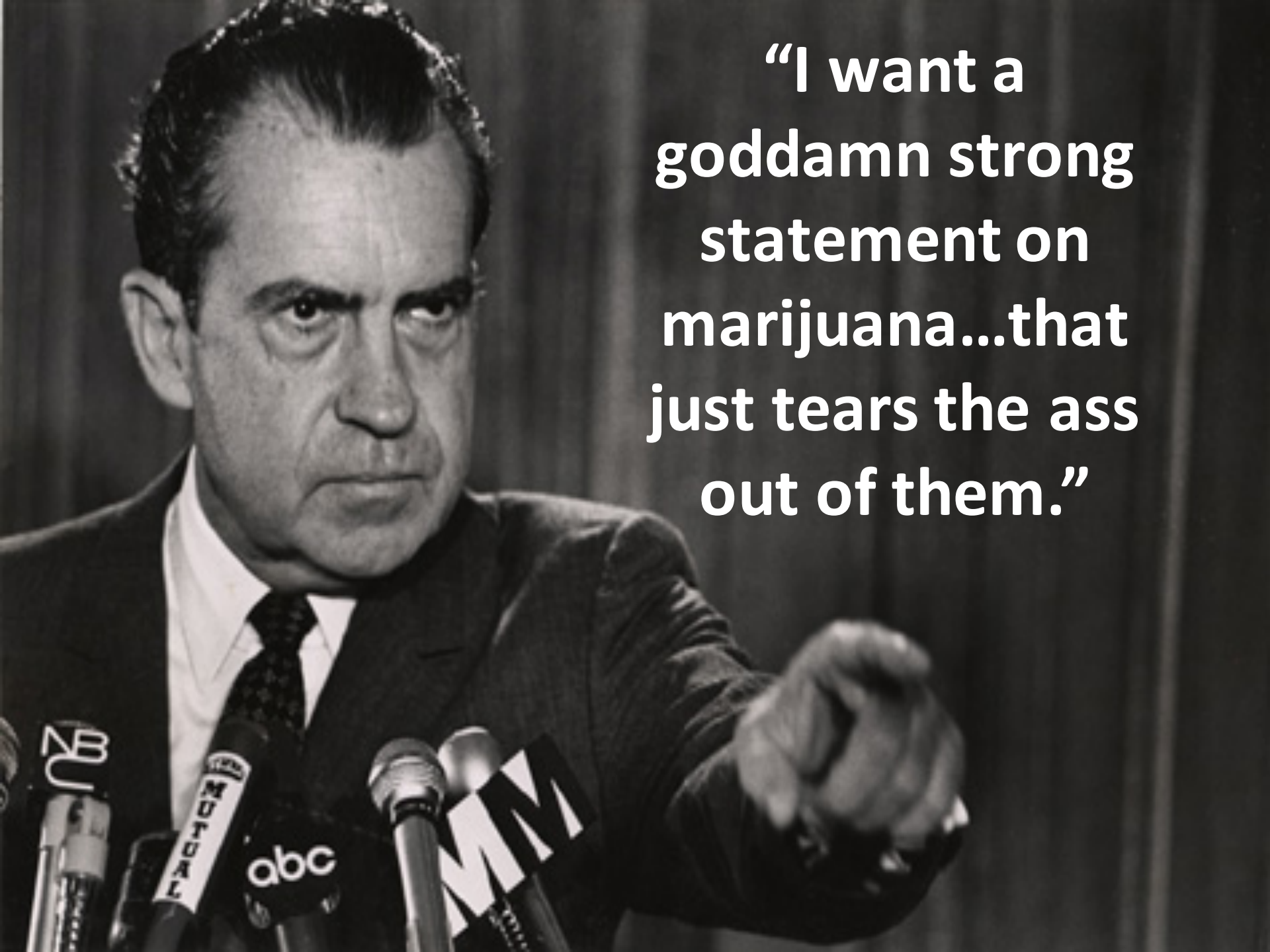
- **Has been used medically for thousands of years**
- **Cannabis has a natural receptor in the brain**
- **Cannabis was a medicine in the United States until 1942 when regulations started**
- **Cannabis “makes white women and black men have sex.”***

* Martin Lee in *Smoke Signals: A Social History of Marijuana*

MJ and the Law

A woman with blonde hair is sitting on a car that is painted with a vibrant rainbow pattern. The car is parked in a field of yellow wildflowers. In the background, there are green trees and a clear sky. The overall scene is bright and colorful.

- Increased use of MJ in 1960s and 1970s
- Congress passed Controlled Substances Act in 1970
- Established MJ as Schedule I drug similar to heroin (high potential for abuse, no legit med use)
- The AMA fought the law



**“I want a
goddamn strong
statement on
marijuana...that
just tears the ass
out of them.”**

Controlled Substances Act

- **Cannabis became a Schedule 1 drug as having “no medical use and a high potential of abuse” similar to HEROIN**
- **Limits government research dollars to studies of the dangerous effects of cannabis**
- **NIDA controls the supply of cannabis for research**

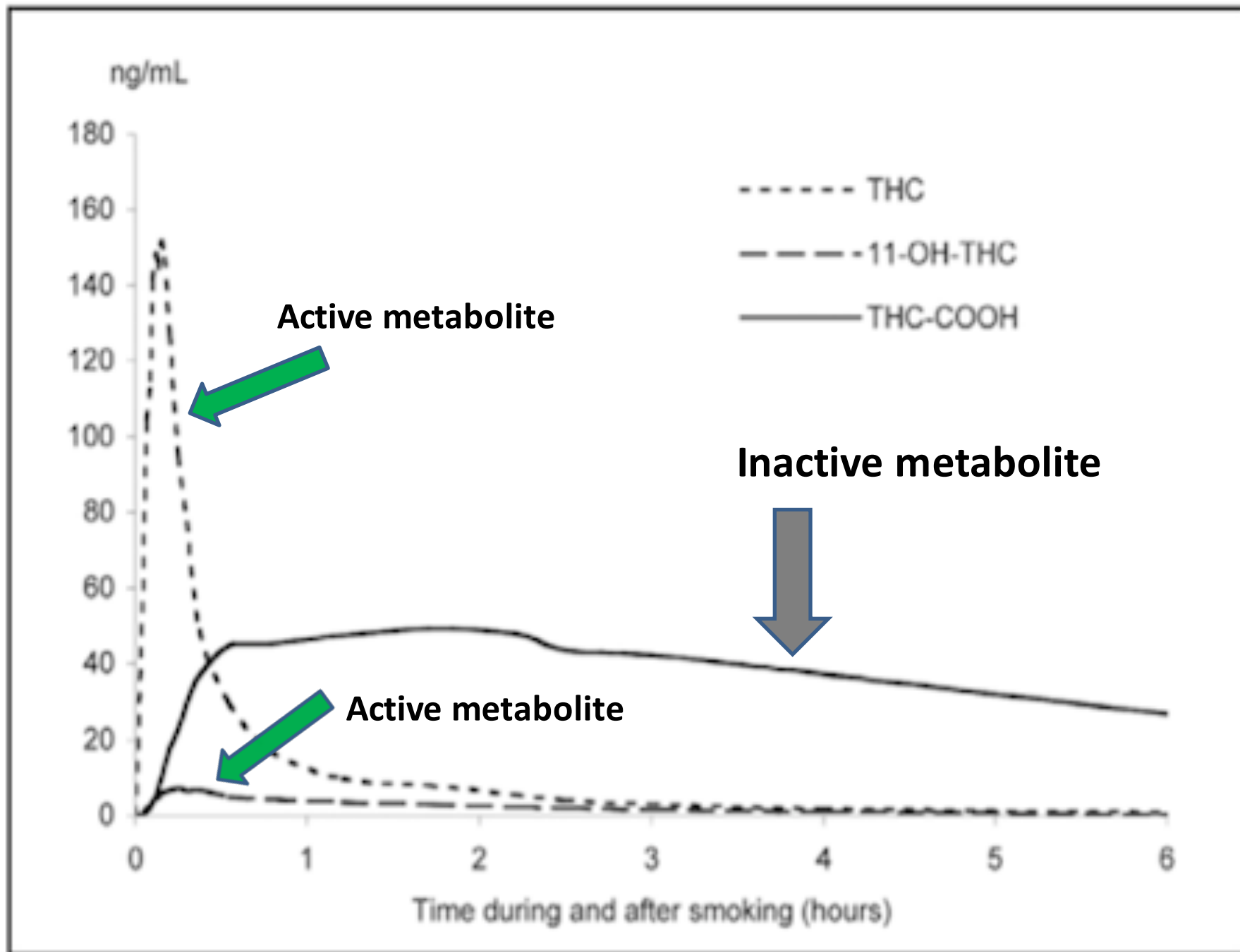
**The only legal source of cannabis
is the NIDA which has a
congressional mandate to only
study its harms.**



CATCH-22

Marijuana

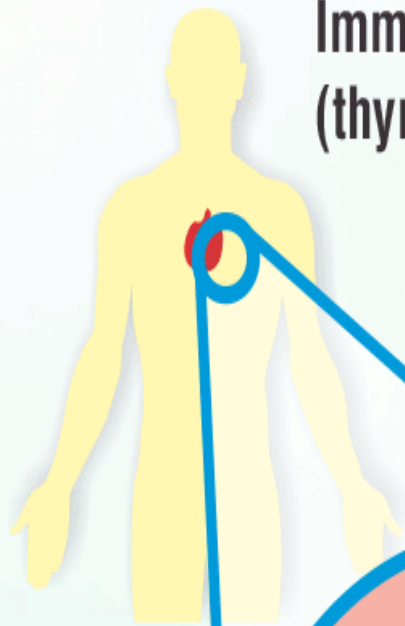




Presence of drug does not = impairment

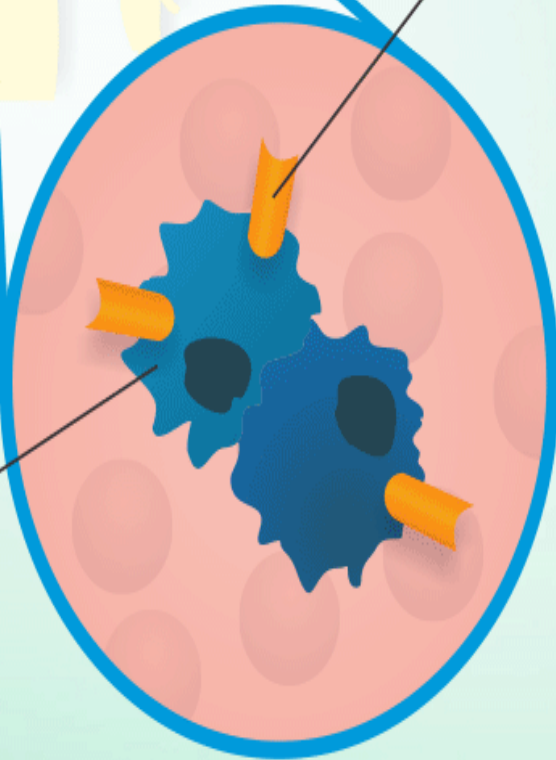
**Impairment based on road-side
or clinical impairment testing**

Immune System (thymus)



CB2 Cannabinoid
Receptor

T-Cells

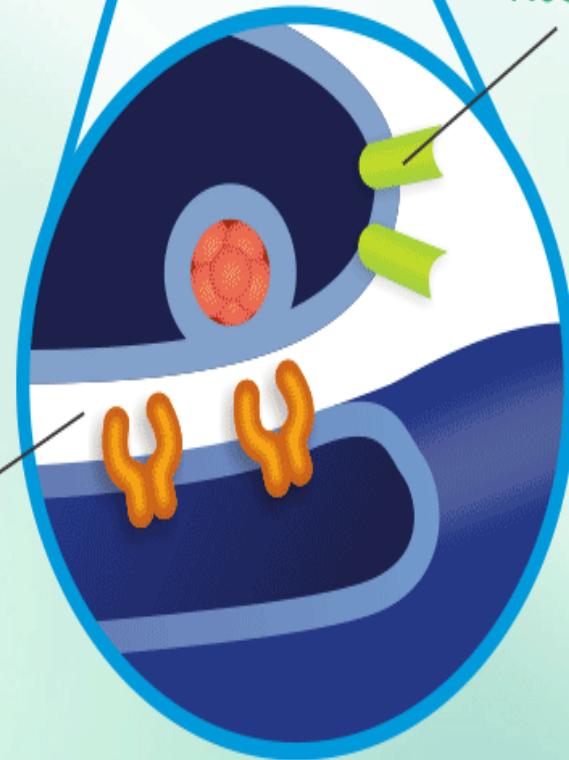


Brain and Central Nervous System



CB1 Cannabinoid
Receptor

Synapse



Scientific studies indicates that cannabinoid drugs, primarily THC, is indicated for pain relief, nausea and vomiting, and appetite stimulation.

Smoked marijuana, however, is a crude THC delivery system that also delivers harmful substances.



Vaporizing marijuana

The Cannarol Inhaler:

Get a Load of This!



Marijuana Side Effects:

- Does not cause significant lung harm
- Does not weaken the immune system
- Does not cause cognitive impairment beyond the acute “buzz”
- Does not cause addiction!
 - 1.5 to 9% of recreational users become addicted (and these may be from childhood use)
 - Unknown addiction potential in medical users

Marijuana Side Effects

- Does not cause long term brain effects*
- Effect on developing brain (teenagers) likely dangerous and needs more study
- Psychosis may be worsened during acute intoxication so caution if comorbidity
- Acute intoxication affects attention memory and perception
- Withdrawal syndrome exists and is mild at best

Marijuana as a medicine

Effective in:

- Chronic neuropathic or cancer pain
- Spasticity
- Nausea and vomiting
- Weight loss
- Glaucoma
- Opiate addiction to diminish opiate dependence

Marijuana as a medicine:

Likely to be effective in:

- Fibromyalgia
- PTSD
- Seizure disorders (children*)
- Irritable Bowel Syndrome/Crohn's disease

Marijuana **SHOULD NOT** be used by:

- Anyone with a personal or family history of psychoses like schizophrenia
- Age younger than 18 years
- Pregnant women
- Breastfeeding women

Marijuana as a gateway drug:

- Marijuana often precedes other drug use however alcohol and nicotine precede marijuana use. ***Thereby, marijuana is rarely THE gateway drug.***
- There is no convincing evidence that legalization will lead to more use within the general population*
- **Marijuana does not trigger significant dopamine production, unlike alcohol and nicotine**

Drugged Driving



Colorado reported 1 of 5 MVAs due to marijuana

National Highway Traffic Safety Administration

DOT HS 812 117 research note Feb 2015

- Case-control study of alcohol and drugs in crash-related drivers and controls in Virginia in 2012
- Case n = 3682 Control n = 7176
- All drivers tested for drugs and alcohol
- 96.2% participation rate

NHTSA RESULTS

| Drug | RISK OF CRASH Odds ratio compared to no drugs | 95% CI | P Value |
|-----------------|--|-----------|---------|
| Marijuana | 1.00 | 0.83-1.22 | 0.98 |
| Antidepressants | 0.86 | 0.56-1.33 | 0.50 |
| Narcotics | 1.17 | 0.87-1.56 | 0.30 |
| Sedatives | 1.19 | 0.86-1.64 | 0.29 |
| Stimulants | 0.92 | 0.70-1.18 | 0.51 |

NHTSA RESULTS

| BLOOD ALCOHOL (BREATH TEST) | RELATIVE RISK FOR CRASH ADJUSTED FOR AGE AND GENDER |
|--------------------------------|---|
| 0.00 | 1.0 (REFERENCE) |
| 0.03 | 1.20 |
| 0.05 | 2.07 |
| 0.08 | 3.93 |

Impaired driving study in Netherlands

DRUID study

- Tested 3,800 drivers for drugs and alcohol
- **Did not find significant increased risk of injury associated with the use of amphetamine, cannabis, cocaine, ecstasy when taken alone.**

DRUID Case-Control MVI risk

2012 N=50,000

| | Substance | Increased relative risk of serious injury or fatality | Risk of injury |
|---------------------|-----------------|---|----------------------|
| Alcohol | 0.1 – 0.5 g/L | 1-3x | Slightly increased |
| | 0.5 – 0.8 g/L | 2-10x | Moderately increased |
| | 0.8 – 1.2 g/L | 5-30x | Highly increased |
| | ≥ 1.2 g/L | 20 – 200x | Extremely increased |
| Illicit drugs alone | Amphetamines | 5 – 30x | Highly increased |
| | Cocaine | 2 – 10x | Moderately increased |
| | THC (marijuana) | 1 – 3x | Slightly increased |
| | Illicit opiates | 2 – 10x | Moderately increased |
| Medicines | Benzodiazepines | 2 – 10x | Moderately increased |
| | Rx opiates | 2 – 10x | Moderately increased |
| Combinations | Alcohol + drug | 20 – 200x | Extremely increased |
| | Drug + drug | 5 – 30x | Highly increased |

Alcohol kills most drivers



Benzodiazepines are second

Drugged Driving Law

17 states and Western Europe, Australia, New Zealand use a legal *blood* limit of THC,
typically 5 ng/ml *

Problems with implementation:

- Drug level does not equal impairment. Depends on drug, tolerance, individual user
- Cost of drug testing for police
- Impairment testing for drugs different than for alcohol
- DRUG RECOGNITION EXPERTS needed to perform field sobriety tests
- Can use sweat, urine, blood, saliva. Colorado uses blood
- Rapid on site testing has high false positive rate
- Fourth amendment: prohibits unreasonable search/seizures without probable cause

What drugs should we test for?

- **Federal guidelines (DOT, FAA) miss many common drugs of abuse like Percocet, Vicoden, Oxycontin, Xanax, Ativan, Valium, Ritalin**
- **These tests also miss newer drugs like Bath Salts and Synthetic marijuana**

Should we do random roadside testing?

Australia does!

https://www.whitehouse.gov/sites/default/files/ondcp/issues-content/drugged-driving/nida_dd_paper.pdf

Marijuana regulation: Should it be a Federal function?

- Marijuana is illegal at the federal level
- Transporting legal marijuana from Colorado to Nebraska or Oklahoma is illegal and a federal crime
- CO being sued by NE and OK due to costs of crime

Marijuana regulation: Should it be a Federal function?

- **In the US (state function):**
 - Sales
 - Distribution
- **In Canada (federal function):**
 - Dosage
 - Purity
 - Growing practices

The states control the commerce but not the quality and dosage.

The potency of cannabis has increased since 1960

BUSTED!

- **Do DUI educational programs work? No evidence**
- **Must connect to treatment**
- **EU and Australia way ahead of us**
- **Need better lab technology**

FUTURE

Current U.S. research on Cannabis:



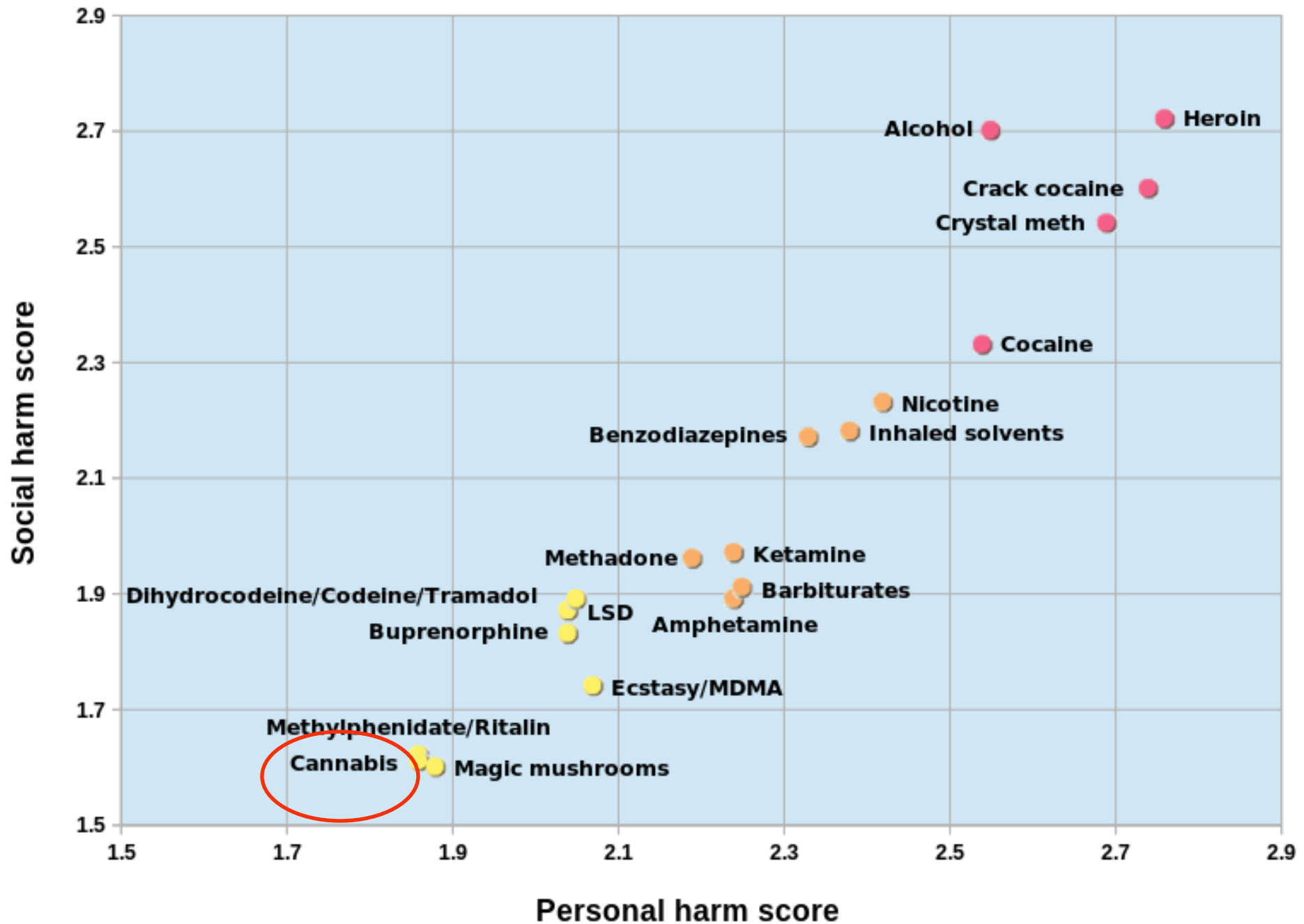
*“The use of MJ increases the risk of drugged driving ‘slightly’
and much less than alcohol”*

FUTURE

The FDA has recently given the DEA
new scheduling recommendations

They are secret!

BUT changes may be coming by summer
according to interagency memo



Addiction references

- NIDAs handbook “Seeking drug abuse treatment: Know what to ask”
- <https://findtreatment.samhsa.gov>
- 1-800-662-HELP
- www.drugfree.org for parents of addicts
- <https://drugpubs.drugabuse.gov> for free publications in the mail
- The Teenage Brain by Frances Jensen
- Don't forget your EAP!