

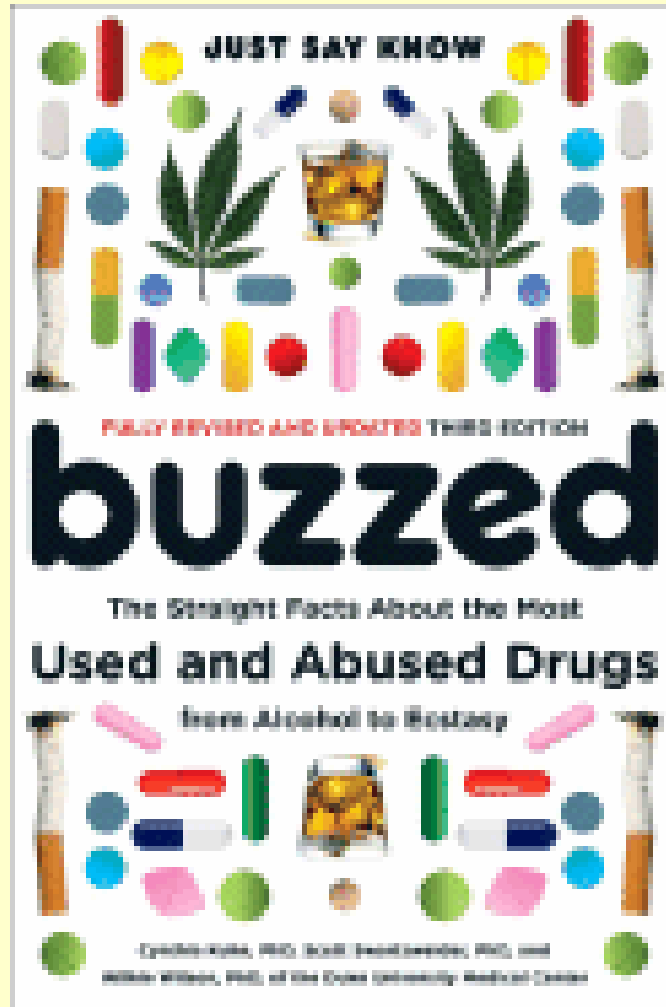
# **Understanding Addiction and Dugs Of Abuse**

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**There is a lot of  
epidemiological evidence that  
addiction begins before brain  
maturity, and lately some  
biological evidence**



**Addiction can rapidly develop at a time in life when a person may be virtually incapable of making wise decisions.**



# Drugs Change The Brain

- **The chronic presence of drugs can cause short and long-lasting changes in the nervous system**
  - **Tolerance and withdrawal**
    - **Brief changes as the brain chemistry resets itself**
  - **Dependence/Addiction**
    - **Long lasting changes in brain chemistry and wiring, like strong memories**



# **Addiction comes from a normal brain activity—stimulation of the brain reward system**

**This system is what gives us the tools to preserve the species**

- the buzz from sex**
- the anticipation of good food**
- the joy of cooperation**
- the euphoria of winning**

**When we anticipate a reward it gives us the tools to get it...**

**Attention, Focus, Power, Suppression of Fear, Euphoria (The Anticipation Response)**

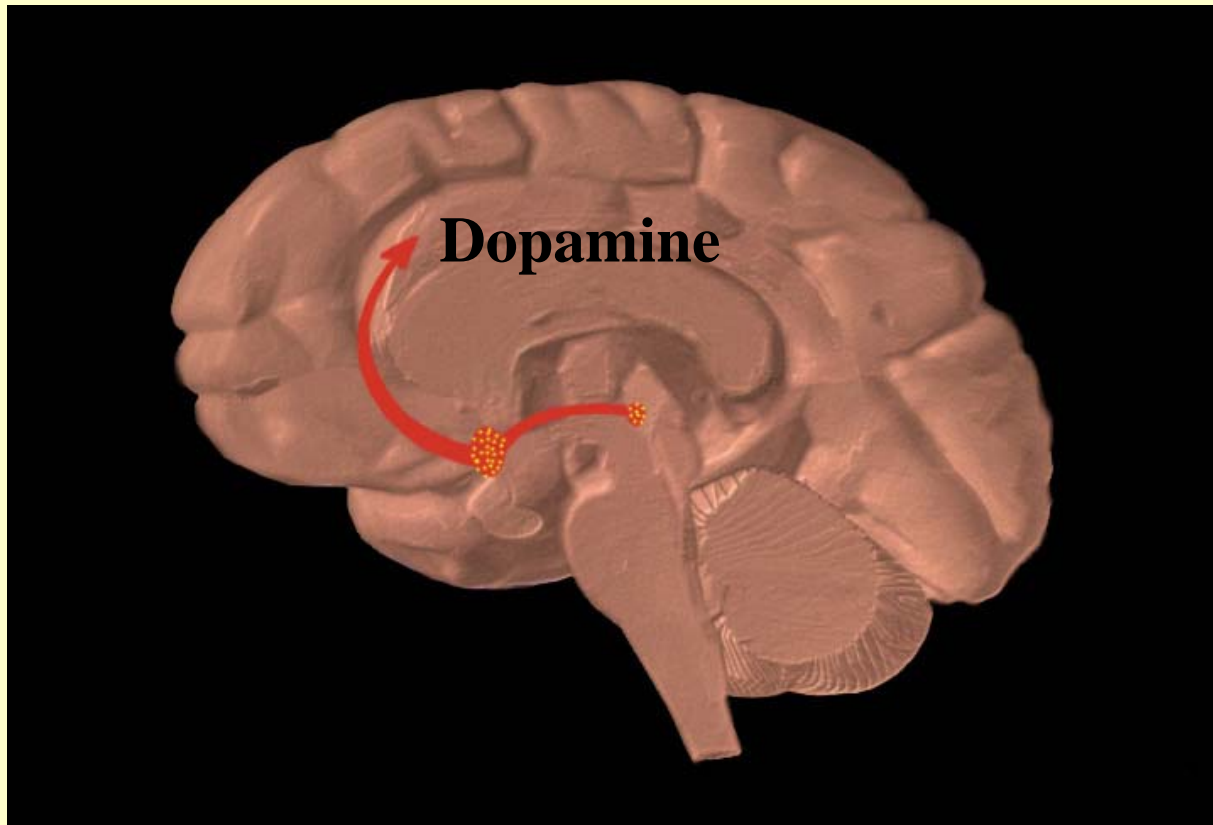


**The brain chemical dopamine is released  
by the reward system, and.....**

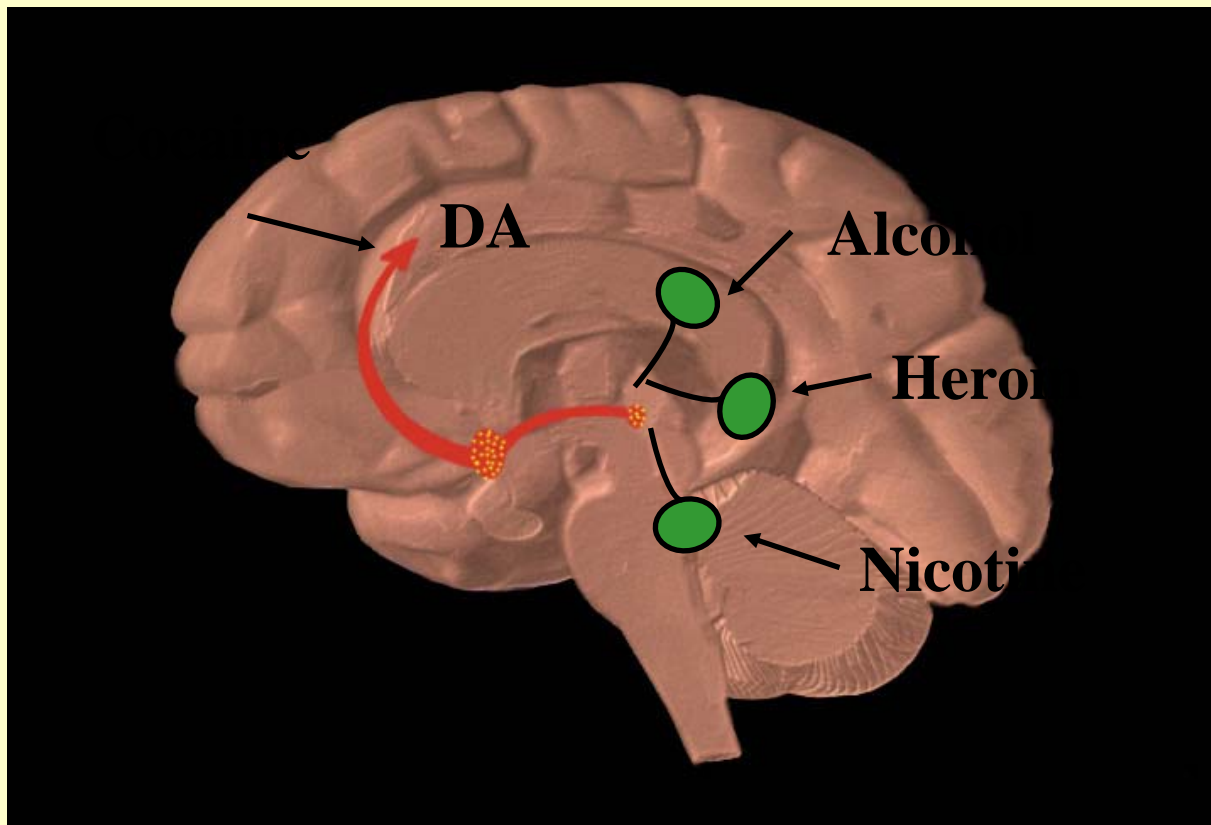
- **ALL addicting drugs release this brain chemical.**
- **Many release much more than natural stimuli**



# Neural Basis of Addiction



# All Addictive Drugs Activate this Circuit



# Repeated Stimulation Changes The Brain: The Addiction Cycle



# **Does The Reward/Addiction System Work Better in Adolescents? Probably**

- **Adolescents are impulsive and risk-taking – risk factors for drug taking**
- **The earlier kids start smoking or drinking, the more quickly they progress to dependence**



# Cocaine Increases Dopamine More in Adolescent Rats

## Time Course of Cocaine-Induced Increase in Released Dopamine

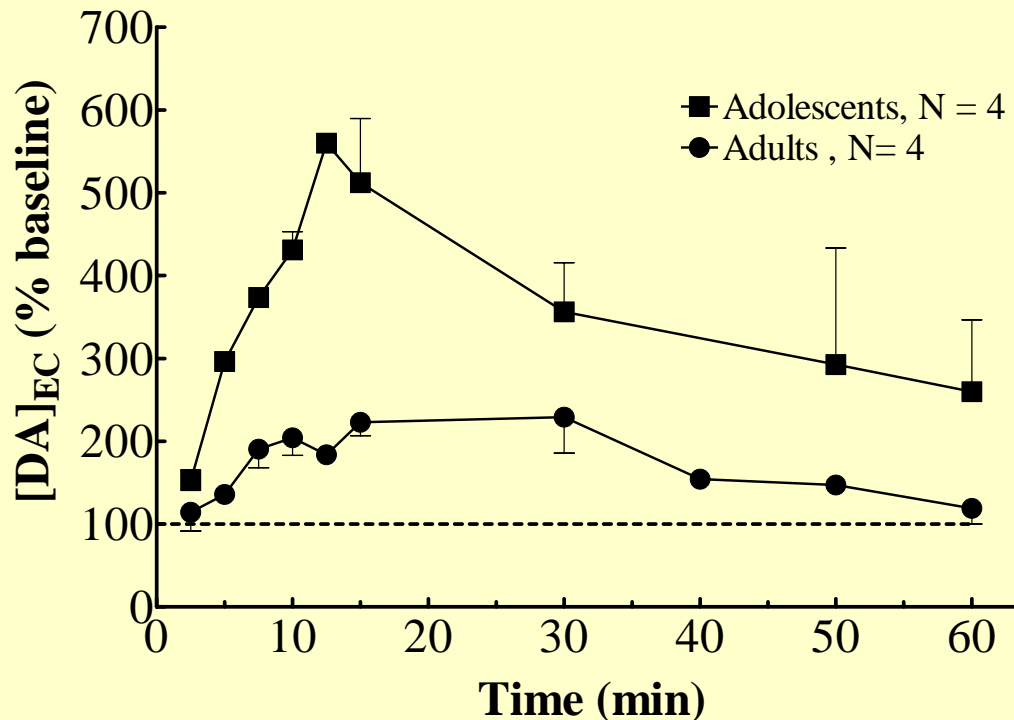


Fig 4. DA release after cocaine (10 mg/kg) at t = 0. Adolescents are different from adults,  $p < .01$  by ANOVA.



# **Now, about alcohol and other drugs...**

**Understanding the basics...**



**Every drug has two effects....**

**The one you know about, and.....**

**The one you don't!**



# Know the T.R.U.T.H. About Alcohol and Other Drugs

- Toxicity--Dead now, dead later, or wish you were dead
- Reinforcement--The heart of addiction
- Understand--So what's the addict getting from this drug?
- Time—What are the pharmacokinetics of the drug and what are the consequences of its repeated use?



# Toxic effects of alcohol

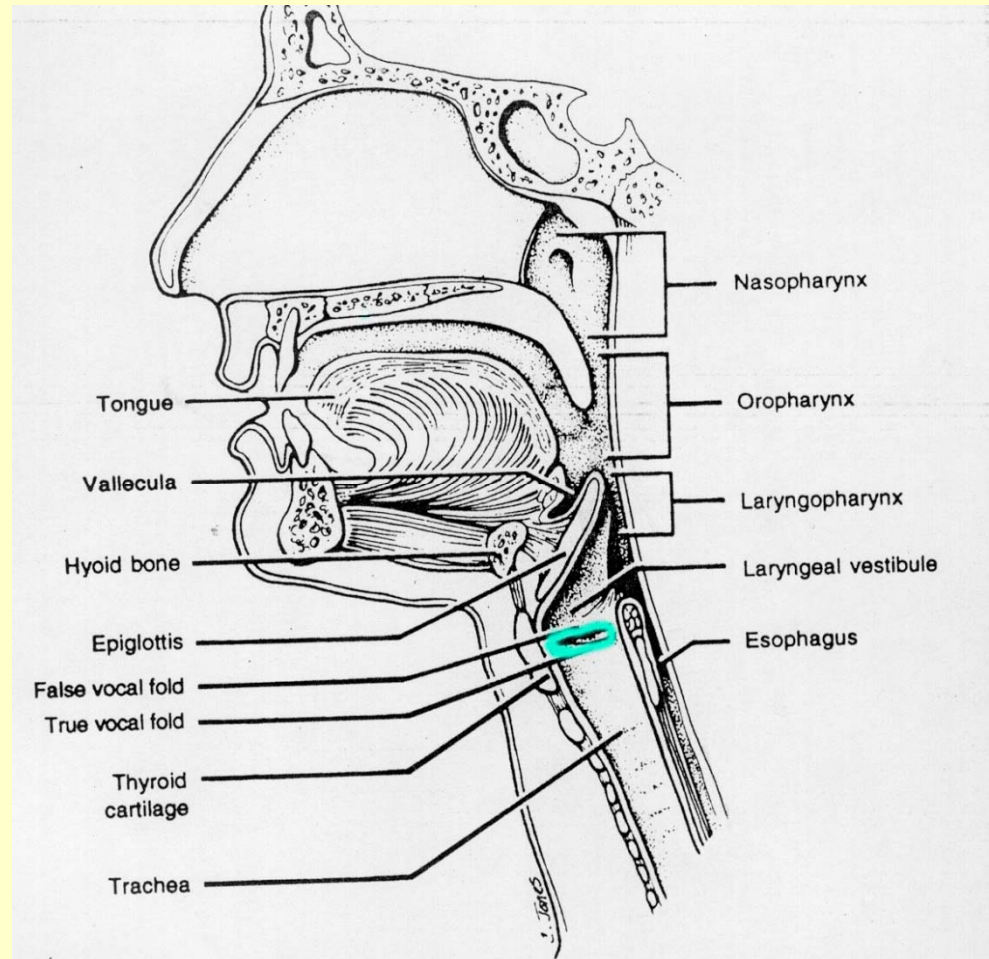
## **Alcohol kills (acutely) in 3 ways**

- **Suppressing respiration**
- **Suppressing reflexes**
- **Producing cardiac instability**
- **People do not understand how little alcohol is required for impairment and death**
- **People need to know the lethal level for their body weight**
- **Women are more sensitive than men**



# Aspiration and Alcohol

- Alcohol paralyzes flap that closes trachea during swallowing
- Stomach contents enter lungs
- Acid and material cause inflammation
- Secondary infection



# **Non-lethal toxicity of alcohol**

- **Significant liver toxicity, especially in women**
- **? Cancer, bone loss, etc.**
- **Significant brain effects for >21 drinks/week**
- **Neuropathological effects of binge drinking**



# Alcohol Tolerance

- **Regular use of any drug causes the brain to adapt.**
- **Don't be surprised if you find people functioning fairly effectively at alcohol levels that would may you or I comatose. They are tolerant.**



# **Does alcohol have positive health effects?**

- **Yes, at low levels of consumption**
- **The National Institute of Health (NIAAA) recommends:**
- **For women, one drink per day maximum**
- **For men, two drinks per day maximum**



# The T.R.U.T.H.

## **R**einforcement or Reward

- We know alcohol is addicting
- Kids are more vulnerable to addiction—  
**WHY?**



# **Have you ever heard this phrase?**

- **I just can't drink like I once could?**



# **Adolescents respond differently to alcohol**

- **Preliminary information based on human and animal studies**
- **Less sleepy and sedated**
- **A greater “Buzz”**
- **More learning impairment so they cannot remember the consequences (blackouts)**
- **30-50% of kids 13-15 yrs. who regularly drink will become alcoholics.**



# The T.R.U.T.H.

**U**nderstand how the drug affects the brain.

**What is the person getting from the drug?**

**Is there and underlying treatable medical condition?**



# **A critical role for treatment professionals--find the problem**

- **Self medicating--for what?**
  - **Anxiety – alcohol reduces it**
  - **Stress—alcohol relieves it**
  - **Depression—alcohol treats its symptoms**
  - **Social phobia—alcohol is disinhibiting**



# The T.R.U.T.H.

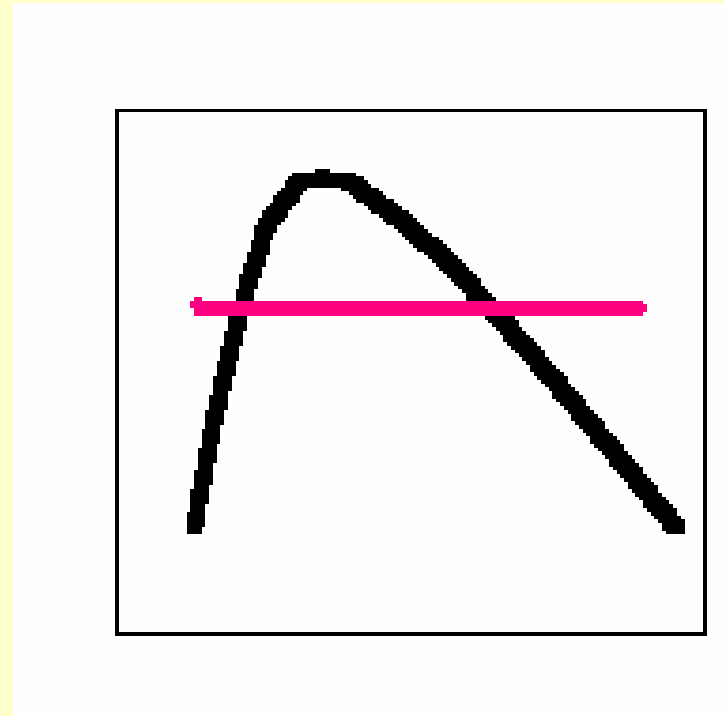
**T**ime: How long does the drug last?

- Most people do not understand pharmacokinetics.
- Do not assume the drug effect is over when the buzz is gone.



# Alcohol

- **Time**
  - Rapid rise in levels
  - Slow fall---  $\frac{1}{2}$  to 1 drink/hour
  - Performance better on rising phase



# **In summary....**

- **Alcohol is a toxic drug that has to be used with care**
- **It is safe and maybe healthy used minimally**
- **It has different effects in kids, making them especially vulnerable**



# Marijuana

- **Toxicity**
  - **Long-term toxicity similar to tobacco use**
  - **Possible interactions with the immune system**



# Marijuana

- **Reinforcement—addicting?**
  - **Clearly some people become dependent**
  - **Because of anxiety-reducing effects, users tend to not deal with their problems, their problems get worse, they smoke more, and they get into real trouble.**



# Marijuana

- **Understanding how it works**
  - **Reduces anxiety**
  - **Produces euphoria in some people**
  - **Impairs all kinds of learning by the brain**
    - **Academics**
    - **Music**
    - **Athletics**
    - **Social skills**

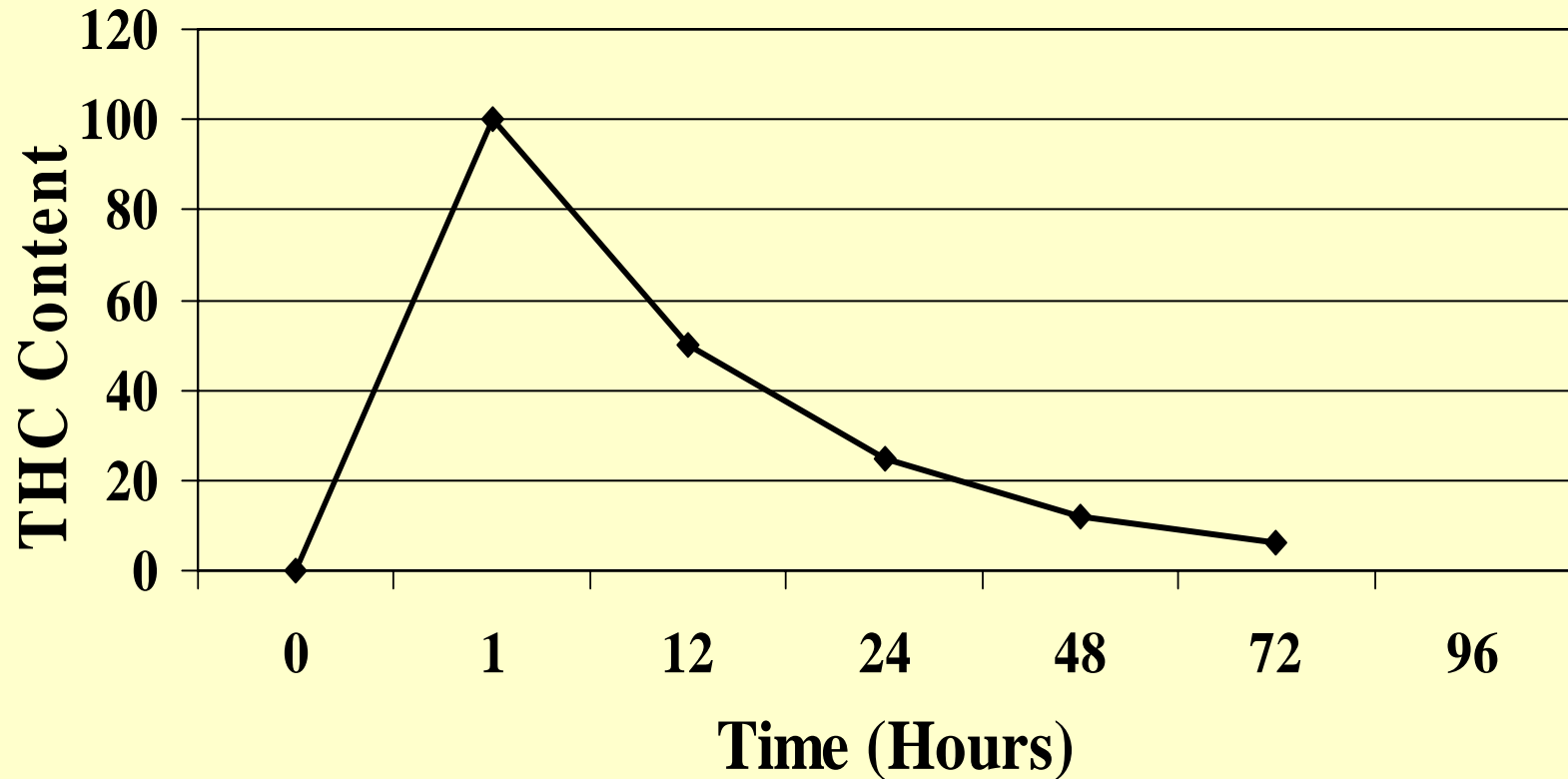


# Marijuana

- **Time**
  - **Stays in the body for weeks—8 days to eliminate 90% of one dose**
  - **Stored in fat**
  - **Metabolized into active compounds**
  - **The brain adapts to its presence**



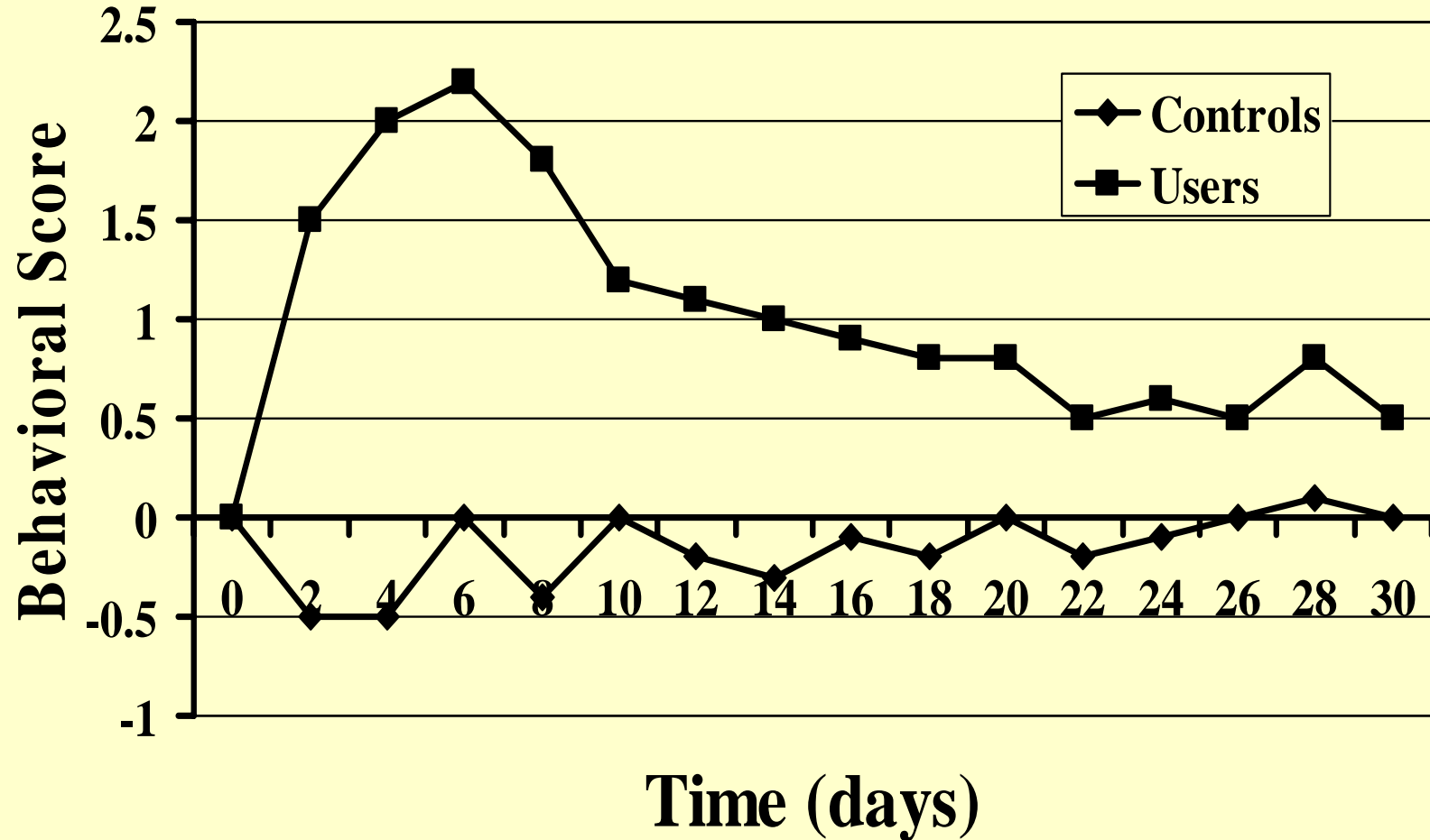
# THC: Slow Removal from Body



**Half life = 12-18 hours**



# Marijuana Withdrawal



From Pope et al,



# **A Major Problem With Marijuana**

- **The adolescent brain is not mature**
- **For proper development, the brain needs learning mechanisms to work properly**
- **Marijuana is persistent and impairs learning**
- **Thus regular marijuana use MAY impair proper brain maturation**



# **Cocaine and Methamphetamine (Stimulants)**

- **Toxicity**
  - **Constricts blood vessels**
  - **Minor and major strokes**
  - **Cardiac irregularities**
  - **With binges, direct damage to neurons**
  - **Quite safe when used medically (attention deficit disorder – Ritalin, Adderal)**



# • Reinforcement

- The most highly reinforcing drugs because they elevate dopamine without sedative effects
- Extremely addictive when used by inhalation or I-V
- Animals will work to their death for these drugs



- **Understanding how stimulants work**
  - **Power**
  - **Euphoria**
  - **Focus**
  - **Disinhibition**
  - **Physical stimulation**
- **With continued abuse, mental changes, including paranoia**



- **Time**
  - For cocaine in the nose, 30-60 minutes
  - For smoked crack cocaine, a few minutes
  - For amphetamines, hours
- **Depression upon withdrawal**
- **Amphetamine abusers can go into marked agitated and psychotic states upon withdrawal**



# Opiates (Heroin and Pharmaceuticals)

- **Toxicity**

- **Lethal from overdose by respiratory depression**
- **Otherwise, not much damage**
- **The distress from opiate use is economic**



# • Reinforcement

- Highly addictive especially if used by smoking or I-V---release dopamine in the reward system
- People can become addicted to oral agents
- Rush Limbaugh's case--oxycontin



- **Understanding how opiates work**
  - **Painkilling by activating the brain's natural painkilling system**
  - **Sedating**
  - **Produce euphoria**
  - **Withdrawal has powerful physical symptoms that inhibits abstaining**
  - **Methadone and other drugs suppress the physical withdrawal symptoms without providing the euphoria**
- **Time: Hours**



# **Club Drugs---Ecstasy, GHB, Ketamine**

- **ECSTASY (MDMA) is toxic acutely and over the long term to the brain's serotonin system, which regulates mood, and lots of basic body functions like appetite, temperature, etc.**
- **It produces a profound sense of love, empathy, and acceptance---exactly what kids seek most from their peers.**



# **GHB (gamma-hydroxybutyrate)**

- **GHB is acutely toxic**
- **A narrow range between “effective dose” and lethal dose**
- **Suppresses respiration**
- **Produces disinhibition like alcohol, but no hangover**
- **Synergistic with alcohol**



# **GHB Tolerance and Withdrawal**

- **Tolerance is slow to develop but extremely problematic**
- **Withdrawal can be lethal**



# **Ketamine**

- **Anesthetic agent made commercially**
- **Used for kids and animals because it produces hallucinations**
- **Does not depress the CNS as much as other anesthetics, thus relatively few deaths.**
- **Kids like it for the hallucinations**



# The T.R.U.T.H.

## Happiness

- **Does not come in a pill**
- **Cannot be found in a bottle**
- **Is not achieved by constantly pursuing hyper-stimulation of the reward system**



# Ways to improve relationships—The Anticipation Response

- **When we anticipate a reward, we get.....**
  - **Attention, Focus, Power, Suppression of Fear, Euphoria**
- **If you want anyone to do anything, the more you can associate that with expectation of reward the more you can invoke the *anticipation response*.**
- **What does the brain like most? Novel hedonic experiences!**



# **Ways to improve relationships—The Anticipation Response**

- **Provide unexpected pleasures enough times...**
  - **Compliments**
  - **Presents**
  - **Surprise activities**
  - **Sincere thanks**
  - **Anything that the other person finds pleasurable**
- **And that person can become “addicted” to you**



**Remember...fear produces just the opposite—people respond, but they build up aversive cues to you.**

**So try to use rewards whenever possible**



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