

# Understanding Addiction and Dugs Of Abuse

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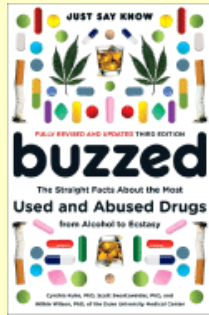
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**There is a lot of epidemiological evidence that addiction begins before brain maturity, and lately some biological evidence**

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

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### **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

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### **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)**

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**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

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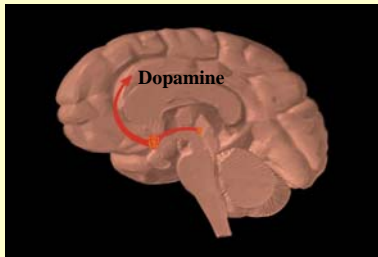
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### **Neural Basis of Addiction**



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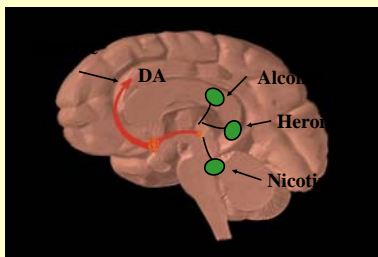
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### **All Addictive Drugs Activate this Circuit**



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## Repeated Stimulation Changes The Brain: The Addiction Cycle




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## 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

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## Cocaine Increases Dopamine More in Adolescent Rats

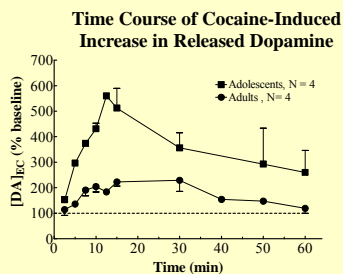


Fig 4. DA release after cocaine (10 mg/kg) at t = 0. Adolescents are different from adults, p < .01 by ANOVA.

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

**Understanding the basics...**

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

**The one you know about, and.....  
The one you don't!**

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**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?**

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## 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

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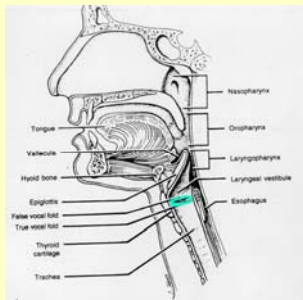
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## Aspiration and Alcohol

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



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## 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

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## **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.

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## **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

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

### **R**einforcement or Reward

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

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**Have you ever heard this phrase?**

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

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**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.

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**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?

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## 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

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## 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.

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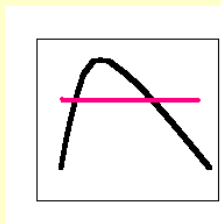
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## Alcohol

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



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### **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

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### **Marijuana**

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

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### **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.

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## 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

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## 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

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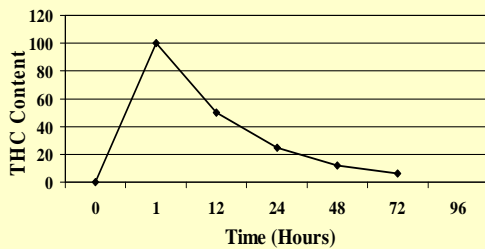
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## THC: Slow Removal from Body



Half life = 12-18 hours

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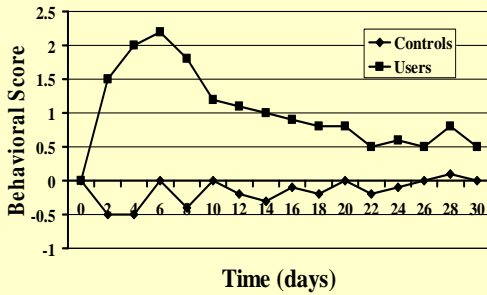
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## Marijuana Withdrawal



From Pope et al,

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## 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

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## Cocaine and Methamphetamine (Stimulants)

- **T**oxicity
  - 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)

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• **R**einforcement

- 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

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• **U**nderstanding how stimulants work

- Power
- Euphoria
- Focus
- Disinhibition
- Physical stimulation
- With continued abuse, mental changes, including paranoia

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• **T**ime

- 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

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## Opiates (Heroin and Pharmaceuticals)

- **T**oxicity

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

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- **R**einforcement

- 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

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- **U**nderstanding 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

- **T**ime: Hours

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## **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.

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## **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

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## **GHB Tolerance and Withdrawal**

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

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## **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

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

### **H**appiness

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

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### **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!

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**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

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**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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