

# Spotlight on ... Drugs

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## IN THIS ISSUE:

Joining "Club" Not Worth  
the Cost of Membership:

- "Club Drugs"
- Methamphetamine
- Steroids
- Heroin

Abusing Your Brain

I Get No Kick  
From Cocaine

Caught in the Web

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**NIDA**  
NATIONAL INSTITUTE  
ON DRUG ABUSE

## Joining "Club" Not Worth the Cost of Membership

### Emerging Trends

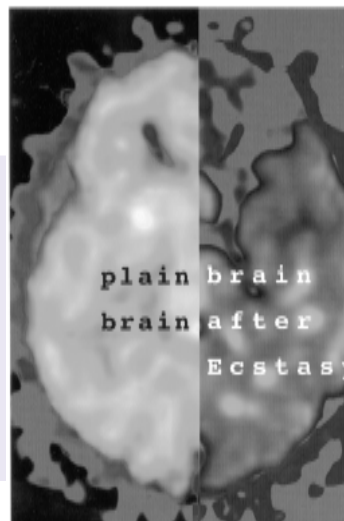
"Club drugs," quite the rave, can be **odorless** and **tasteless** and **produce amnesia**, can be administered to a person without his or her knowledge and have been associated with **date rape** and other **sexual assaults**. "Club drugs" are used primarily at all night parties such as raves, dance clubs and bars. These parties are attended by teenagers and young adults, who heighten their ability to party all night with a variety of psychedelic stimulants (such as Ecstasy) and psychedelic anesthetics (such as Ketamine). These "club drugs," also known by names such as Roofies, Liquid G, Clarity, XTC, and Special K, are extremely popular because they provide users with an instant high, the equivalent of which would require hours of drinking alcohol. Two drugs that are tranquilizers and sedatives, GHB and Rohypnol, are also called "date rape drugs." They can be taken without a person's knowledge and cause the user to black out, not remembering the events that transpired under the influence.

"Club drug" is a vague term that encompasses a wide variety of drugs. Combined with alcohol, these drugs become even more dangerous.

**Methamphetamine** research shows that those who use the drug risk **long-term damage** to their brain cells, **similar to** the damage caused by **strokes** or **Alzheimer's** disease. This drug, also known as "speed," "meth," "crystal-meth," or "crank," is a central nervous system stimulant which produces alertness and elation, like cocaine. However, the effects of methamphetamine last longer than the effects of cocaine. Therefore, it is alternatively known as the "poor man's cocaine." It provides a six to 14 hour high at half the price of cocaine. Various routes of administration may include snorting, smoking, or injecting the drug, which is highly addictive.

Although methamphetamine is legally available in the United States for treatment of attention deficit disorder, its illegal use as a stimulant has reached crisis proportions in some areas of the country. Illegal "meth" labs have cropped up in many states. All a producer needs is a recipe, easily found on the internet, and a host of legal ingredients. These ingredients combine to create a neurotoxic substance that may cause significant reductions in dopamine transporters.

Continued on page 2



The brain scans to the left illustrate the sharp difference in human brain function for an individual who has never used drugs and one who has used ecstasy many times, but had not used any drugs in the three weeks prior to the scan.

Source: National Institute on Drug Abuse (NIDA)  
For more information call (888)NIH.NIDA  
<http://www.nida.nih.gov>



## Emerging Trends, continued

### Potential Consequences of Steroid Use

#### Among possible side effects for males:

- shrinking testicles
- impotence
- baldness
- development of breasts
- enlarged prostate

#### For females:

- growth of facial hair
- changes in or cessation of the menstrual cycle
- deepened voice
- breast reduction

#### For males and females:

- acne
- jaundice
- reduction in HDL, the "good" cholesterol
- high blood pressure
- liver tumors

#### For adolescents:

- growth halted through premature skeletal maturation and accelerated puberty changes.

Individuals who use methamphetamine generally buy the drug through networks, as it is not as easily accessible on the street as other substances.

Methamphetamine abusers typically display signs of agitation, excited speech, decreased appetite, and increased levels of physical activity. Use is associated with serious health consequences, including memory loss, aggression, violence, psychotic behavior, and potential cardiac and neurological damage.

*Anabolic steroids* is the familiar name for synthetic substances related to testosterone, the male sex hormone. These drugs have medical uses such as treating delayed puberty, some types of impotence, and deterioration of the body caused by HIV infection or other diseases. However, when abused, anabolic steroids have serious health consequences. In **boys and men** the abuse of anabolic steroids can **reduce sperm production, shrink the testicles,** and cause **impotence** and irreversible **breast enlargement.** **Girls and women** can develop more masculine characteristics such as **deepening of the voice** and **excessive body hair.** In addition, abuse of anabolic steroids can stunt bone growth in adolescents and result in potentially permanent damage to the heart, liver, and kidneys. Additional side effects include liver tumors, high blood pressure, wild mood swings, and violent behavior. Individuals who inject anabolic steroids with nonsterile needles also risk contracting HIV and other blood-borne infections.

Steroid use is escalating among the country's adolescent males. Middle school and high school youth have increased their use of the drug for a variety of reasons. Many young men still use steroids to bulk up and improve athletic performance. Increasingly, steroid use is no longer limited mainly to boys. A Massachusetts survey found that three percent of girls between the ages of 9-13 have used performance-enhancing drugs.

A recent study of 45,000 students by the University of Michigan for the Department of Health and Human Services uncovered a second reason for steroid use -- "improvement

in physical appearance." Experts cite a variety of factors causing adolescent males to think they need to use steroids to enhance their appearance. Students feel that an improved body will not only provide them with sex appeal, but also protect them from being bullied by stronger, more aggressive peers.

Anabolic steroids are used to promote muscle growth, enhance athletic performance and improve physical appearance. Many young adults may only hear about the benefits of using steroids and are unaware of the potential negative side effects of using these substances. Regular use of anabolic steroids can lead to severe physical and emotional consequences. Additional side effects that can occur in both males and females are premature skeletal maturation and accelerated puberty leading to stunted growth.

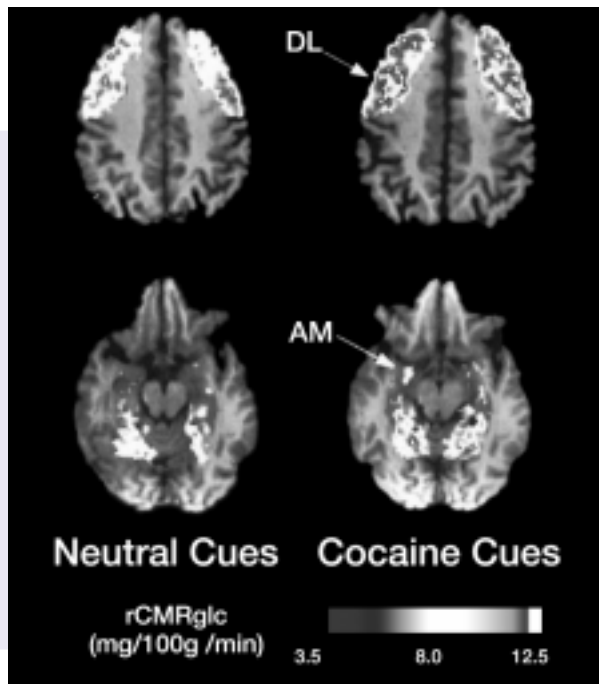
*Heroin* took a back seat to cocaine and crack in the 80's, but has seen a resurgence of use in the past decade. The number of heroin users has grown as prices have fallen and the product has become more pure. Young people and middle class adults represent the primary groups of new heroin users. Individuals who don't want to use needles are "chasing the dragon" -- heating the drug and inhaling the fumes. Others tend to smoke or snort heroin, believing that it is less addictive than when injected. The reality is that heroin is highly addictive regardless of the route of administration used to get high.

After injecting heroin, a user will experience a surge of pleasurable sensation -- a "rush." This rush is generally accompanied by a warm flush, dry mouth, and a heavy feeling in the extremities, and may also be accompanied by **nausea, vomiting,** and **severe itching.** After the initial effects, abusers will usually be drowsy for several hours, with slowed breathing and cardiac functions.

All addictive substances, including club drugs, methamphetamine, steroids or heroin, play a part in the destruction of normal functioning. Whether an individual is experimenting with a drug for the first time or just trying to escape the stressors of daily life, the use of the substance can lead to addiction. ■

For many years, the neurology of addiction was a mystery to researchers. Studies showed that no matter what addictive substance was used, they all activated a single circuit for craving in the brain. Today, drug addiction is known as a treatable and preventable disease.

Drug use affects important sectors of the brain, as well as neurotransmitters essential to normal brain



function. The specifics on how any one drug affects a user may differ; however, the brain usually bears more than its share of the burden. Modern science has allowed us to study the metabolic brain functions using PET scans that show when an addict is experiencing a craving for a drug.

**Stimulants**, including cocaine/crack, amphetamines, and methamphetamines, alter the action of one of the brain’s neurotransmitters -- dopamine. Dopamine is essential to the brain’s “reward system” and affects a person’s sense of contentment. It is released by neurons in the limbic system, which controls feelings of pleasure. Normal progression is for dopamine to attach itself to a nerve receptor, alter it, and return it to the neuron from which it came. However, this pumping action is obstructed by cocaine. Rather than it being sent back, the

dopamine keeps altering the nerve cell, which results in the drug’s extra impact on the nerves. Over the long term, stimulants limit the amount of dopamine and dopamine receptors, and become essential components for creating feelings of pleasure and even normalcy. When an addict stops using, he or she doesn’t feel the same level of pleasure. The result is extreme drug craving and depression.

**Club drugs** affect the brain in different ways. Rohypnol and Gammahydroxybutyrate (GHB) impact the part of the brain responsible for memory. They cause “ret-

PET Scans conducted at NIDA’s Brain Imaging Center reveal selective activation of brain circuits during cocaine craving. Scans from volunteers who experienced a high level of cue-induced cocaine craving show activation of brain regions implicated in several forms of memory. The scans at right show activation of the dorsolateral prefrontal cortex (DL), which is important in short-term memory, and the amygdala (AM), which is implicated in emotional influences on memory. When these volunteers were exposed to neutral (non-drug related) cues, this activation was not seen (scans at left).

rograde amnesia.” GHB also depresses the central nervous system. Ecstasy destroys neurons that react to dopamine, as well as serotonin neurons. Serotonin is a neurotransmitter that affects body temperature and sleep, as well as appetite, mood, aggression, and sexual activity. Ketamine alters the action of several neurotransmitters, particularly NMDA. The drug induces a stupor similar to drunkenness and can cause panic, rage and paranoia.

**Heroin**, an opiate, is highly addictive. The use of opiates affects the limbic system, the center of emotional control, by heightening feelings of pleasure, relaxation, and satisfaction. Some symptoms of continued use are euphoria and respiratory depression. When the withdrawal symptoms occur, an individual may experience tremors, severe muscle cramps, nausea and insomnia. Opiate use can

stop or slow down the automatic reactions of the brainstem -- coughing and breathing. They can also interfere with the spinal cord's transmission of pain signals.

**Inhalants** are legal household products that are inhaled to get high. There are more than 1,000 household products that can be used this way and they are readily available compared to illegal or prescription drugs. Therefore, many users of inhalants are young adolescents. Inhalant abuse is known as the "silent epidemic." According to the Monitoring the Future study, the third most abused substance among 12 to 14 year-olds are inhalants.

The use of inhalants can affect several areas of the brain:

1. Frontal cortex, where complex problems are solved.
2. Cerebral cortex, cerebellum, and brain stem, which control movement and coordination.
3. Hippocampus, which controls memory.

Constant use of inhalants can result in the slowing or cessation of nerve cell activity in the brain. Depending on the level of useage, the user can become violent, experience hallucinations or suffer from heart dysfunction. Since inhalants truly hinder the activity of the nerves that control breathing, it is possible for unconsciousness or even death to occur.

Long term use can lead to reduced physical coordination and ability to think and learn, as well as nervous system damage that results in severe nervous ticks.

Researchers suggest that there is a common biological connection that relates to all levels of addiction. Each drug that affects the dopamine system through the neural routes creates a major activity of craving in the addict's brain. In general, an addict's brain is changed by their addiction in a fundamental and long lasting way. ■

## Say what...?

### **Anabolic Steroids:**

a.k.a. Rhoids, Juice

### **Cocaine:**

a.k.a. Coke, Crack, Nose Candy, Flake, Rocks, Blow, Big C, Snow, Lady, Snowbirds, White

### **Gamma-hydroxybutrate (GHB):**

a.k.a. Grievous Bodily Harm, G, Liquid Ecstasy, Georgia Home Boy, Co-pilot, Doctor, Truck Driver, Scoop, Goop

### **Heroin:**

a.k.a. Bomb, Smack, H, Skag, Junk, Horse, Mud, Brown Sugar

### **Inhalants:**

a.k.a. Laughing Gas, Whippets, Sniffing, Glue, Toluene, Poppers, Boppers, Snappers, Army, Liquid Incense, Amy, Rush

### **Ketamine:**

a.k.a. Special K, K, Vitamin K, Cat Valiums

### **Lysergic Acid Diethylimide (LSD):**

a.k.a. Acid, Boomers, Yellow Sunshines, Microdot, Trips, Sugar Cubes, Tabs, Hits

### **Methamphetamine:**

a.k.a. Speed, Chalk, Ice, Meth, Crystal, Crank, Fire, Glass, Croak, White Cross, Crypto

### **Methylenedioymethamphetamine (MDMA):**

a.k.a. Ecstasy, XTC, X, Adam, Clarity, Lover's Speed

### **Rohypnol:**

a.k.a. Roofies, Rophies, Roche, Forget-me Pill

“**If addiction means the brain has changed, then the task is to change the brain back to normal. We know more about how drugs act in the brain than we do about anything else in the brain.**”

**Dr. Alan I. Leshner**  
Director,  
National Institute on Drug Abuse

## I Get No Kick From Cocaine

A **cocaine vaccine** is currently being tested at Daytop, a residential treatment facility in Newton, Connecticut operated by the Apt Foundation. Developed under the National Institute on Drug Abuse (NIDA) Medications Development Program, the vaccine stimulates antibodies to attack the foreign substance in the body -- the cocaine -- and keep it away from the brain, body organs, and tissues. Until now, the immune system was not capable of responding to cocaine as a foreign substance because its molecule was too small to be detected. The vaccine attaches the cocaine molecule to chemical carriers, which retard its release into the bloodstream and enlarge it so it can be identified by the immune system.

A **"catalytic antibody"** that eats up the cocaine in a person's system may also play a key role in future treatment of cocaine addicts. Biochemist Donald W. Landry has been working on the concept for ten years and has tested it on laboratory animals. The antibody works like the old Pac Man game, gobbling up the cocaine in the addict's system. If successful, the antibody would be able to clean up the cocaine in the addict's bloodstream

for a month. This means that if an addict is having difficulty staying clean and uses cocaine to alleviate the craving, there would be no physical setback to the recovery process. The cocaine will not have satisfied the craving nor posed the risk of overdose inherent in drug use. In addition, emergency rooms could use the antibody to break down cocaine in the system of an emergency room patient quickly in preparation for emergency medical procedures.

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**NIDA plans to test both pharmacological and behavioral therapies for drug addiction. According to Dr. Alan I. Leshner, Director of NIDA, "a vaccine is different for something you want than for something you don't want. People want cocaine," and they can always wait for the vaccine to wear off.**

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As a person addicted to drugs begins the recovery process, there is much for them to consider. Non-pharmacological supportive services are pivotal to successful treatment. Ongoing substance abuse counseling and other psychosocial therapies, vocational rehabilitation, and other needed

medical and social services are essential for program retention and positive outcome. Establishing a therapeutic support system that includes Cocaine or Narcotics Anonymous, as well as an elective mix of other recovery methods, are key components for maintaining sobriety. One main goal for all addicts is to first face the reality that *they* are powerless to the drug and that treatment can work. ■

# Caught in the Web

Drug trafficking has entered the information age. The Internet has become the source of drug recipes, sales and misinformation.

ITEM: Two men were arrested in South Carolina for using their web site to sell the chemicals used in making the club drug GHB. Sold as a kit of "computer-cleaning solvents," the web site owners provided purchasers with five pages of instructions on how to mix this dangerous drug.

ITEM: GHB has become *the* Internet drug. So many Internet sites extolling GHB exist on the web that the National Institute on Drug Abuse (NIDA) has created its own site, [www.clubdrugs.org](http://www.clubdrugs.org) to get out the truth about club drugs.

ITEM: Recipes for mixing methamphetamines can be found on the Internet. One expert has said, "It's like baking a cake."

ITEM: Anabolic steroids can be purchased on the Internet via credit card.

ITEM: The FDA has warned prescription drug buyers about the dangers of drug purchase on the Internet. People are now buying off-label brand products on the Internet without a doctor's prescription.

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