

YEAR 2 — STUDENT EDITION

HEADS UP

REAL NEWS

ABOUT DRUGS

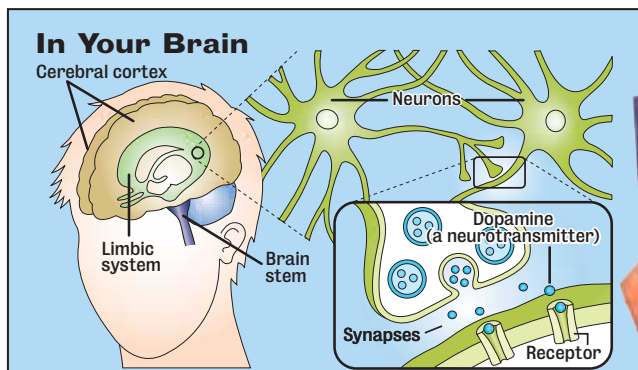
AND YOUR BODY

WELCOME TO *Heads Up: Real News About Drugs and Your Body*, a drug education program created by Scholastic Inc. and the scientists of the National Institute on Drug Abuse (NIDA). As always, our goal is to give you science-based facts about drugs, addiction, and the brain so that you can make smart, informed choices about your own life.

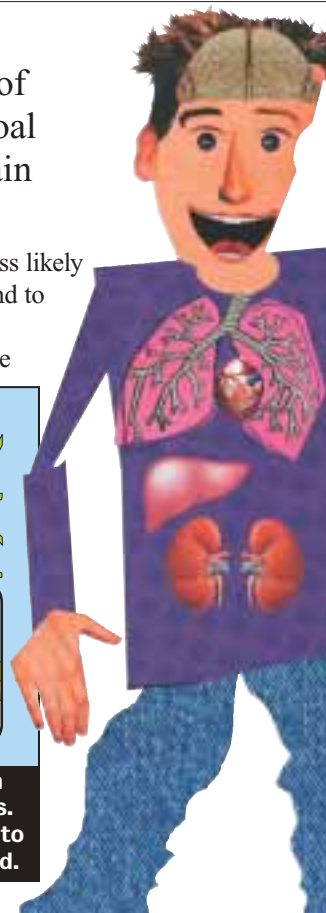
Research shows that teens with a realistic view of the dangers of drug abuse and addiction are less likely than others to become drug users later in life. In other words, **teens who know the truth about drugs** tend to stay away from them. We want you to be part of that group.

In the articles you're about to read, you'll meet real teens who have abused drugs. They describe the consequences of their choices, and discuss what it's like to battle addiction to LSD, cocaine, and prescription drugs such as OxyContin. We also give you cold, hard facts about the science of drugs, how drugs affect your brain, and how addiction develops. The final article in the book tackles the topic of teen brain development. This is **cutting-edge science!** As you'll learn, scientists at NIDA and elsewhere are discovering that the way teenagers' brains are wired makes them more susceptible than adults to the lure of drugs.

So, **heads up.** You're about to get a blast of powerful knowledge! ▶



Brain cells, or neurons, send messages to other brain cells by releasing chemicals called neurotransmitters. The chemicals fit into receptors, then are released into the gap, or synapse, between neurons and reabsorbed.





HEADS UP REAL NEWS ABOUT DRUGS AND YOUR BODY

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CLOSE-UP: COCAINE

By Gate Bailey

Big White Lies

At first, cocaine made Miguel feel powerful. But the drug's promises turned out to be lies.

If you'd met Miguel Flores when he was in junior high school, you'd have met a young man who listened to his mother and did

well in school. If you'd met him in high school, you'd have met a different person—a teenager who cut classes and got left back, a son who screamed obscenities at his mom. Drugs changed him.

When we talked to Miguel, he was a resident at Odyssey House, a drug treatment program in New York City's East Village. Now 19, he told Scholastic how he got there.

When Miguel started high school in Brooklyn, New York, he fell in with a new crowd—the wrong crowd. To make a long story short, he started smoking marijuana, drinking, and failing classes. Finally, he got arrested and spent a night in a crowded cell on Rikers Island, a New York City jail.

NOT READY TO STOP

Given a choice by a judge between jail and getting help, Miguel opted for an outpatient drug treatment program. But he clearly wasn't ready to commit to the challenge of staying off drugs. In fact, it was during the time he was legally bound to this program that he began using cocaine.

Cocaine is a stimulant and a

powerfully addictive drug. Derived from the leaves of the coca plant, it has many names on the street, including coke, C,



Cocaine in powdered form

snow, flake, and blow. Coke comes in the form of white powder and is generally inhaled or snorted.

Miguel joined only a small percentage of his peers when he snorted the potentially deadly powder. According to a 2002 NIDA-funded study, only 3.6 percent of 8th-graders, 6.1

COCAINE & YOUR BRAIN

Cocaine interferes with the brain's normal handling of dopamine, a brain chemical, or neurotransmitter, involved with feelings of pleasure.

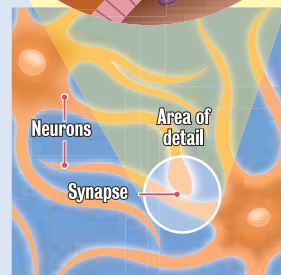
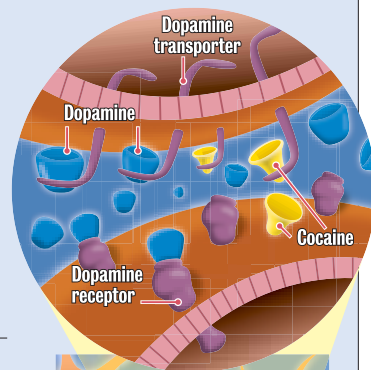
Like all neurotransmitters, dopamine travels from one brain cell, or neuron, to another by crossing a synapse, or gap, between cells. It then sends its message by binding to a dopamine receptor on the next cell. When finished, it returns into the synapse, where a transporter carries it back to the first brain cell for reuse.

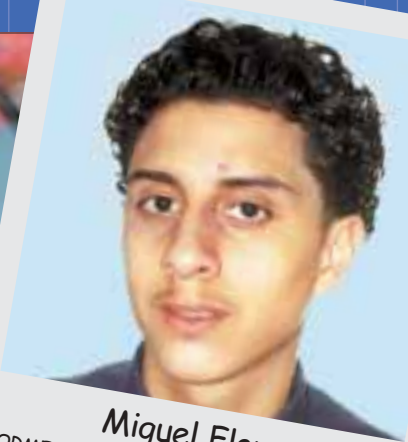
Cocaine binds to and blocks dopamine transporters, preventing them from picking up dopamine for recycling. "The transporter is like a pump in a swimming pool that recycles water to keep the water at a certain level," explains NIDA's Dr. Grant. "Cocaine clogs the pump, allowing dopamine levels to rise to abnormally high levels, just like a clogged water pump will make a swimming pool overflow and produce a flood."

Scientists believe that this dopamine "flood" is behind the cocaine high. And just like a literal flood, it can cause a lot of damage. With repeated exposure to cocaine, the brain becomes unable to process dopamine normally. "Many cocaine users report that they have less ability to experience pleasure in life,"

says Dr. David Gorelick of NIDA. To try to feel good, they return to the drug, again and again, while the joys of real life pass them by.

In the synapse, or space between neurons (area of detail), cocaine binds to dopamine transporters, causing a "flood" of dopamine in the brain.





Miguel Flores
FORMER COCAINE ABUSER/IN TREATMENT



Cocaine starts as coca leaves.

percent of 10th-graders, and 7.8 percent of 12th-graders have ever tried cocaine.

“I wanted to see how it felt,” he said. “It was a different kind of high. Cocaine makes you feel like you have a lot of power. It makes you feel invincible.”

“Feelings of being powerful and invincible are not only typical, but were some of the earliest reported effects of cocaine,” says Dr. Steven Grant of the National Institute on Drug Abuse [NIDA]. But such feelings are short-lived.

For Miguel, they only lasted about 20 minutes. The high faded away, and he began to feel like he was “nobody.” He vowed not to take cocaine again. He’d heard that cocaine could make him have a stroke. He’d also read articles about people dying of cocaine overdoses.

MOM’S TEARS

In other words, Miguel knew that cocaine was dangerous. But less than two months after he first snorted coke, his resolve weakened, and he snorted the white powder again—and then again and again.

The stimulant took its toll. Miguel’s heart pumped hard. He was nervous and paranoid. He even became violent.

“The more you use cocaine, the less high you will get, but it becomes more likely that you will experience these unpleasant effects,” says Dr. Grant. What Miguel experienced, he explains, is because of changes in the brain that happen in response to repeated exposure to cocaine.

But more painful to Miguel than any side effect is the memory of seeing his mom cry when she discovered the truth about his cocaine use.

REAL STRENGTH

Drug users often must go through several treatment cycles before they are successful. When Miguel’s mandatory urine tests repeatedly came up positive, he was again given a choice—this time between jail and a residential treatment program. He chose Odyssey House, and although it’s been difficult, he has stuck to his commitment. When we spoke, he’d been clean for 10 months.

If you meet Miguel today, you see a young man who feels “strong,” but not because there’s cocaine in his body. He feels strong because he’s resisted drugs. You also see that the respect for his mother has returned. In fact, he credits her with his recovery. “I did it for my mom,” he says. Someday, perhaps he’ll realize that he really did it for himself.



COCAINE KILLS

Remember Chris Farley? The *Saturday Night Live* comedian was found dead in his luxury New York City apartment on December 18, 1997. He was only 33 years old. The cause of death was a morphine- and-cocaine-induced heart attack.



Chris Farley

Cocaine played a role in the death of this talented comic, and the drug has had a hand in many other deaths. Cocaine can trigger fatal heart attacks and strokes—even in healthy young people.

Here’s how cocaine can cause a heart attack: “Cocaine increases the amount of oxygen needed by the heart because it stimulates the heart to beat faster and stronger,” explains NIDA’s Dr. Gorelick. “At the same time, cocaine is decreasing the amount of blood flowing to the heart muscle, or blocking blood flow completely.” This is because the drug constricts blood vessels.

Dr. Gorelick also explained how cocaine induces strokes. “In one type of stroke, blood flow is stopped because the blood vessel is constricted and/or blocked,” he says. “In another type, the blood vessel leaks or bursts, and blood no longer flows beyond the point of damage.”

In 2001, there were 193,034 hospital emergency-department cases involving cocaine nationwide, or 10 percent more than in 2000 (according to the Drug Abuse Warning Network, 2002). The irony is that some young people try cocaine for thrills and excitement. How exciting is it to end up in the emergency room . . . or dead?

Don’t Be “Shaky” on the Facts!

Cocaine is just one of many stimulants that can do a number on your head and heart. Stimulants are drugs that speed up activity in the central nervous system (brain and spinal cord). They make the heart beat faster and cause blood vessels to narrow—which can make you feel nervous and jittery. The caffeine that gives your latte its kick is a stimulant. Any stimulant—even caffeine, to a mild degree—can become addictive. Other dangerous stimulants:



- **Crack** is cocaine in a form that is smoked.
- **Amphetamines** are pills that have some legitimate medical uses only when prescribed by doctors. They’re also called “speed.”
- **Methamphetamine** is a long-acting and highly addictive stimulant. It comes in many forms including crystals (“crystal” or “ice”) and powder (called “crank”).
- **Ecstasy**, or methylenedioxymethamphetamine (MDMA), usually taken in pill form, is part stimulant and part hallucinogen. (Turn the page for an article on hallucinogens.)

CLOSE-UP: LSD

By Gate Bailey

"I'm Losing My Mind"

A young woman's experience with the hallucinogenic drug LSD

Sometimes when Amanda Contadino

moves her hand in front of her face, she sees trails behind it, like the mark of smoke a skywriter leaves. Sometimes when she's sitting perfectly still, the wind and birds seem to swirl around her at dizzying speeds.

But there are no trails and there is no whipping wind. These sensory bloopers may be related to the LSD Amanda took when she was 16.

LSD, also known as acid, is a hallucinogen, or drug that can cause hallucinations. In other words, it can make someone see, hear, and feel things that aren't really there. It is sold on the street in many forms, including capsules, liquid, treated sugar cubes, and gel wafers called windowpanes.

Often, it's added to decorated blotter paper and divided into small squares which are then chewed and swallowed.

We talked to Amanda, now 21 and a resident of the Phoenix Academy of Long Island drug treatment center in East Hampton, New York.



NEVER GOOD ENOUGH

It all started when Amanda was 13 years old. "I always had a problem being accepted," she said. So, when she saw some friends smoking a joint, she asked to try it, thinking that drugs were a way to bond.

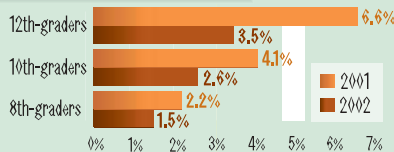
She also thought that her drug use—which soon included ecstasy and cocaine—would numb her pain. "I never felt like I was good enough," she says.

Not Worth It

Take a look at this trend. According to a NIDA-funded study, the percentage of teens using LSD dropped

significantly from 2001 to 2002. These are the lowest rates for high school seniors in 27 years. Maybe teens are getting the message that it's just not worth it.

ANNUAL USE OF LSD



MONITORING THE FUTURE, 2002

WHAT'S WHAT

With some drugs of abuse, it can be a little tough to tell what's what. LSD, psilocybin, and mescaline (see FAQs, right) cause hallucinations and are therefore classified as hallucinogens. The club drug MDMA (ecstasy) has both hallucinogenic and stimulant properties. That's a double whammy of potential dangers.

Some other drugs that are not technically hallucinogens have some similar effects. These include:

- PCP or angel dust. This drug changes perceptions of sight and sound and can make the user feel detached from the

One day when Amanda was 16 and home alone, she decided to take LSD, or drop acid. After about an hour, she started laughing hysterically.

That was the first of many trips, as the drug's highs are called. Amanda's LSD use ramped up from occasional weekend use, taking one or two doses, to daily use at school, taking six or seven doses.

Experts say that Amanda's daily use of LSD is rare. Because the drug isn't addictive like heroin or cocaine, people generally stop taking it after a few experiences. Perhaps it's bad trips that turn them off.

BAD TRIPS

The term bad trip refers to unpleasant—even terrifying—feelings and sensory experiences while high on LSD. Amanda told





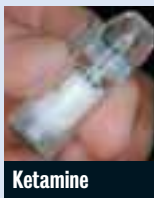
LSD is often sold in the form of treated blotter paper.

Amanda Contadino
FORMER LSD ABUSER

environment and the self. It's called a "dissociative" drug because of the sense of dissociation it creates. PCP, usually sold as a powder or liquid, is addictive and in high doses can kill.

● **Ketamine** or "vitamin K." This odorless, tasteless powder is a dissociative drug that can cause amnesia, depression, and learning problems.

Like LSD and ecstasy, both PCP and ketamine are associated with the young adult rave scene.



Ketamine

us about one particularly awful hour she spent tripping or "bugging out," as she put it.

It was the day before Easter and many family members were milling around her house. She had dropped acid with friends downstairs and was feeling panicked about getting caught. She sat behind her drum set rocking back and forth, holding a glow-in-the-dark star. That star "seemed like my only friend in the world," she says.

As it turns out, she may have been right. "The friends I got high with," she says now, "weren't my real friends." As soon as she left drugs behind, they dropped her.

Amanda and her so-called friends believed they'd reached "a higher plane," or some form of enlightenment, on acid. In reality, they were stagnant and


unproductive. "I went nowhere," says Amanda. "I did nothing but worry about getting acid."

NOT MENTALLY THE SAME

Today, Amanda isn't worried about getting acid but about the damage it may have done to her brain. The trails and other perception problems haven't gone away, and it's been three years since her last hit of LSD.

In a way, though, Amanda got lucky. She used to call tripping "losing my mind." For some of her friends, the made-up term may have turned out to be real. "I've had friends who've never come back from it," she says. "They're not mentally the same. They're in psychiatric units."

According to Dr. Geraline Lin of the National Institute on Drug Abuse (NIDA), psychotic breaks are associated with LSD use, but it's unclear whether or not the drug directly causes mental illness. In fact, scientists are still struggling with many unanswered questions about LSD and the brain.

Amanda now aspires to help others out of a life ruled by drugs. She wants to share what she says she has learned: "You can experience life in all its beauty without drugs." 

FAQs ON LSD

What are hallucinogens?

Hallucinogens are drugs that dramatically alter perceptions.

Some hallucinogens are produced solely by nature. These include **psilocybin**, found in certain mushrooms ("magic mushrooms" or "shrooms") and **mescaline**, the chemical found in the peyote cactus. LSD is semi-synthetic, or artificial.



Some mushrooms contain natural hallucinogens.



Where does LSD come from?

LSD (lysergic acid diethylamide) was invented by a chemist in 1938. Working in a lab in Switzerland, Albert Hofmann was trying to create medicine out of a fungus. He ended up with LSD. Five years after he created it, Hofmann accidentally ingested the drug and took the first bad trip: "A demon had invaded me," he said. "[It] had taken possession of my body, mind, and soul."

What are the short-term effects of LSD?

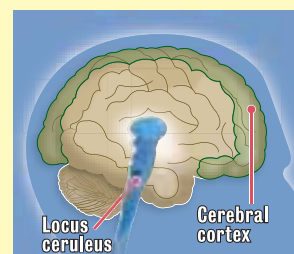
LSD and other hallucinogens powerfully distort the functioning of the five senses, as well as one's sense of time and space. Some users even report a blending of the senses—seeing sounds and hearing colors—known as "synesthesia." An LSD trip may include terrifying experiences and inspire dangerous behavior on a user's part.

What are the long-term effects of LSD?

Two long-term effects reported by former users are psychosis and hallucinogen persisting perception disorder (HPPD). Psychosis is a severe mental illness, in which a person loses contact with reality. HPPD (often but less accurately called "flashbacks") is a disorder that includes ongoing perception problems, like the nonexistent trails Amanda sees.

How does LSD work?

LSD binds to and activates a specific receptor for serotonin, a brain chemical involved in emotions and the senses. It especially affects two brain regions: the cerebral cortex—involved in mood, cognition, and perception—and the locus ceruleus, which receives sensory signals.



LSD strongly affects areas of the brain involved in sensory perception, mood, and cognition.

If LSD isn't addictive, why is it dangerous?

"The main reason LSD is dangerous is because it's unpredictable in its effects," says NIDA's Dr. Jerry Frankenheim. "The most dangerous thing that can happen is that someone has a complete break with reality and thinks they can fly or stop traffic."

CLOSE-UP: MEDICATIONS

By Laura D'Angelo

Crushed Dreams

Doctors use drugs to heal, but in the wrong hands, drugs can wreck lives.

While 17-year-old Ryan Curry

slept, visions of OxyContin danced in his head. Ryan was thrilled to see Oxy pills scattered under the bed, until unbearable cravings jarred him awake. Now, he could see that there were

no pills. Drenched in cold sweat, Ryan's body convulsed and he began a frantic search for more OxyContin.

Ryan never thought he'd become addicted to OxyContin, a powerful drug that's prescribed for people with severe pain. Like most prescription medications, when OxyContin is used for the medical reasons prescribed and taken in the dosage and form prescribed, it can ease suffering for millions of Americans. When abused, prescription

drugs can push people over the edge into addiction, injury, or even death.

"Medications can be dangerous. Prescription drugs need to be taken by people who are under medical supervision," says Jerry Frankenheim, Ph.D., a pharmacologist at the National Institute on Drug Abuse (NIDA). "Drugs that are abused can change the way your brain functions for a very long time."

OxyContin, whose active ingredient is oxycodone hydrochloride, was hailed as

revolutionary in 1996 when it appeared on the market. Like some other painkillers, oxycodone is an opioid. It works as heroin does, quieting pain messages by slowing the central nervous system. OxyContin is unique in that each pill releases medication over a 12-hour period. When crushed and snorted, however, the drug acts differently. Then, a day's worth of painkiller hits the user's brain at once, upsetting the normal flow of brain chemicals.

Ryan, who lives in Newport, Maine, had smoked marijuana for four years before experimenting with prescription drugs. "Pot didn't have the same kick that it used to," he says. "I



Free from Painkillers
RYAN CURRY

CAUTION: CENTRAL CONTROL PROBLEM

The brain controls everything the body does.

The spinal cord carries messages between the body and the brain. Together, they make up the central nervous system (CNS). Some prescription drugs slow down, or depress, the CNS. Others speed up, or stimulate, the CNS. People who abuse CNS stimulants or depressants give control of their bodies to the drug, sometimes with dangerous consequences.

DEPRESSANTS slow messages between the body and brain.

Signals from the eyes and other senses reach the brain slowly.

Heart rate drops, leaving the body with less energizing oxygen.

Breathing rate decreases; risk of lung infections rises.

Messages to muscles are slower; arms and legs can't move well.

RESULT: The body can't sense—or respond—danger quickly.

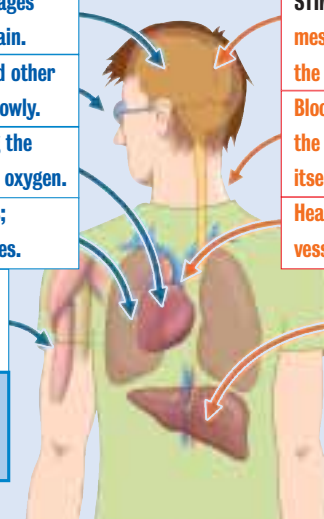
STIMULANTS create fake messages in the brain, telling the body that it's under stress.

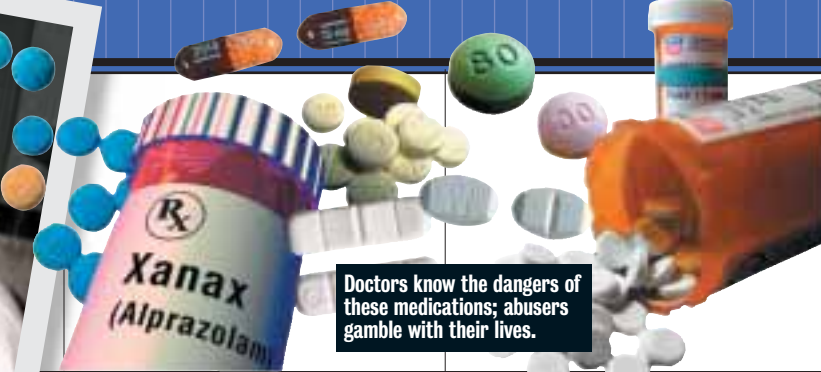
Blood to skin decreases; the body is less able to cool itself. Overheating is a risk.

Heart rate speeds up. Blood vessels to the heart constrict.

The liver releases sugar into the blood, reducing the body's energy stores.

RESULT: If real stress occurs, the body won't be able to respond.





Doctors know the dangers of these medications; abusers gamble with their lives.

HELPFUL WHEN NEEDED

People with attention deficit hyperactivity disorder (ADHD) have lots of trouble concentrating. For them, the CNS stimulant drugs Ritalin and Adderall have a calming effect, helping them focus. “When they are taken in the dosage and form prescribed by a physician, these are safe drugs that help a lot of kids,” says Dr. Cindy Miner, deputy director of the Office of Science Policy and Communications at NIDA.

Research shows that people with ADHD don’t get addicted when they take these drugs as prescribed. “The theory is that those kids have a brain chemistry imbalance that is stabilized by the medication,” says Dr. Miner. But some teens steal or buy the drugs on the street. “If you’re buying those drugs from other kids, you’re playing with potent drugs. You’re really putting yourself at risk,” warns Dr. Miner. Effects of high doses can include paranoia, convulsions, muscle twitching, and addiction. Withdrawal symptoms include depression.



Drugs like Ritalin are safe if prescribed by a doctor.

was bored, looking for a thrill, and trying to be cool.”

Ryan quickly got hooked on oxycodone. “I felt so euphoric—like I could be happy sitting in a trashcan in the dark somewhere,” Ryan says. He turned his girlfriend on and together they joined the small number of teens who abuse OxyContin. According to NIDA, 4 percent of high school seniors reported using OxyContin in 2002, along with 3 percent of 10th-graders and 1.3 percent of 8th-graders.

Ryan quit college to work for an electrician to earn cash to buy pills. He began to use more and more OxyContin. “When I had pills, I’d feel like a king,” he says. Ryan was building a physical tolerance for the drug and needed more to avoid going through withdrawal. “I’d wake up and snort 30 or 40 milligrams of Oxy—not to get high, but to feel normal, not sick.” Over the next two years, Ryan went from that first 20-milligram rush to a 240-milligram-a-day habit.

Opioids that are abused can take over the emotional center of the brain called the limbic system. Craving for the drug replaces other cravings for pleasures like food, friends, and achievement. “The drug becomes the most important

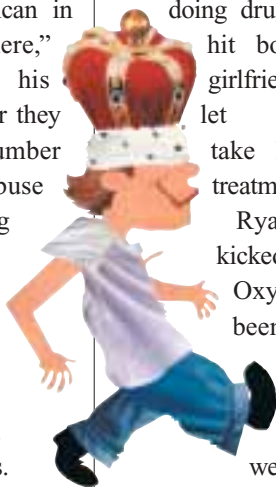
thing in people’s lives,” Frankenheim says.

Ryan’s mom had pleaded with him to get help, but Ryan denied he was doing drugs. Finally, Ryan hit bottom when his girlfriend left him. He let his mom take him to a drug treatment center.

Ryan has finally kicked his addiction to OxyContin. He has been drug-free for six months. As treatment, he attends weekly counseling sessions, where he deals with intense feelings that were turned off by Oxy. “Drugs short-circuit the brain,” Frankenheim explains. “When a person comes off the drug and the brain starts coming back to normal, it can feel like a rebirth.”

True, says Ryan, who sometimes feels like a beginner in his own life. “I cry at movies I’ve seen before. Yesterday, I put a grape in my mouth and spit it out because it tasted more bitter than I remembered.”

“I feel sad that I lost those years of my life and would give anything to get them back,” Ryan says. “But now I have a life other than drugs. I’m taking college classes. I have clean friends and support. . . . I actually *feel*. . . . That’s a big change.”

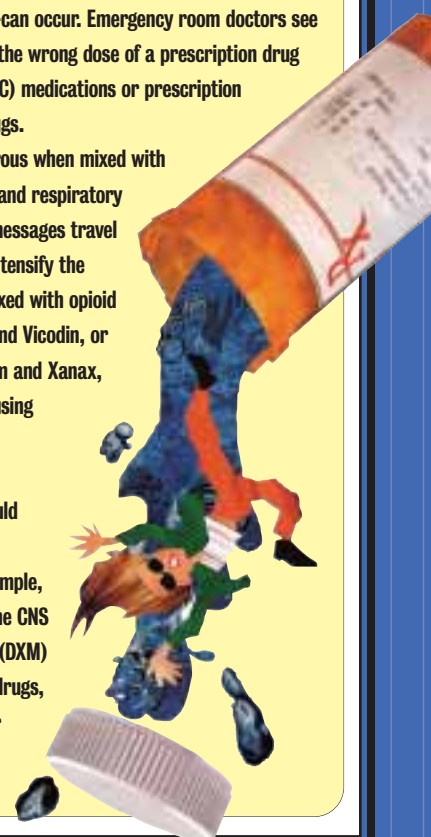


Dangerous Mix

When a doctor prescribes medications to treat disease, he or she knows the patient’s weight, warns of side effects, and prescribes a specific dose and form of the drug. When an abuser buys the medication on the street, he or she knows none of this, and problems—sometimes lethal—can occur. Emergency room doctors see many patients who have taken the wrong dose of a prescription drug or mixed over-the-counter (OTC) medications or prescription drugs with alcohol or other drugs.

Alcohol is especially dangerous when mixed with drugs. Alcohol slows the heart and respiratory system, and changes the way messages travel in the brain. Alcohol can also intensify the effects of drugs in the body. Mixed with opioid painkillers such as OxyContin and Vicodin, or CNS depressants such as Valium and Xanax, alcohol can slow breathing, causing respiratory failure and death.

Many OTC medications are combinations of drugs and should never be mixed with other medications or alcohol. For example, when cough syrup containing the CNS depressant dextromethorphan (DXM) is abused or mixed with other drugs, the syrup can contribute to car accidents when the abuser is slow or unable to react.





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CLOSE-UP: TEEN BRAIN

By Laura D'Angelo

The Thrills of a Lifetime

The teen brain is wired for thrills, chills, and adventure. Here's how to make the most of it.

"It's really scary," says 16-year-old Que Walker. "You're nervous and shaking. Then afterward, you get that same feeling you get coming off a roller coaster. You want to go again!"

Is Que talking about the effects of a drug? Other articles in this series have presented the stories of teens who've abused LSD, cocaine, and painkilling drugs. Although Que's intense feelings might sound like a drug high, she doesn't get her thrills from drugs. This teenager from Cleveland Heights, Ohio, is describing a poetry jam,

where she reads her own verses to other teens.

NOT YOUR PARENTS' BRAIN

There's a reason Que is attracted to something as terrifying as baring her innermost thoughts to a live audience. It's the same reason you might get a thrill from the latest hit radio song, a new friend, or a cool cell

phone: You're both teenagers. Your brains are different from an adult brain in many ways.

First, the emotional center of the brain develops early. The brain's limbic system is responsible for emotional reactions, especially those involving pleasure or excitement. When you think about a cheeseburger or a scary movie you don't make a decision to feel a certain way; your limbic system makes it happen. In teenagers, this system is highly active. Big emotions come easily to teens.

BRAIN CHANGE: TWO VERY DIFFERENT WAYS

Teens who experience real thrills often feel satisfied afterwards.

But in the search for a kick, some teens make the dangerous turn to drugs. People who use drugs may feel depressed and crave more drugs. To understand why, you have to look inside the brain.

During an actual thrilling experience, brain cells, or neurons, create feelings by sending and receiving chemicals called neurotransmitters.

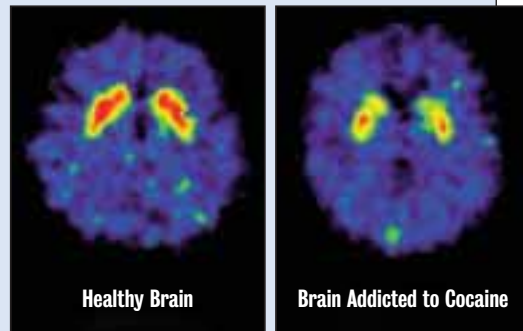
Teens who use drugs might experience a rush of feelings, too, but in their brains something very different is happening. Once in the brain, drugs of abuse are similar in size and shape to brain chemicals or neurotransmitters. Because of that, drugs can create fake messages. They may also cause floods of neurotransmitters. Most drugs of

abuse act on the brain's emotional center, so these fake messages and floods create intense feelings. That's how drugs, in a sense, trick the brain.

Neurons respond to the floods of neurotransmitters by altering their chemical message system. Now, the brain doesn't have enough, or can't use, its own natural chemicals to create normal feelings. The drug user feels flat and even depressed. "Kids who are using drugs may not find as much pleasure in hanging out with their friends, or swimming on a nice day," says Dr. Spear. "So much of their behavior is directed toward finding more drugs." When drug users search out drugs, even when they know it's

wrong, they are addicted. Addiction is a brain disease; the brain is changed and does not function normally. The way out of addiction is through the hard work of treatment and therapy.

In these brain scans, receptors that use the natural brain chemical dopamine show up as red. The cocaine-addicted brain has fewer dopamine receptors than the healthy brain.



Graphic courtesy of Nora D. Volkow, M.D., Director, National Institute on Drug Abuse, National Institutes of Health, U.S. Department of Health and Human Services.



Courageous Poet
QUE WALKER



Accomplished Climber
JEREMIAH COBB



TEEN DRIVE

Your teen brain helps you in the most important task of adolescence: becoming an accomplished, independent adult. The limbic system creates feelings of drive and motivation. You'll study harder and practice longer because your teenage brain is built for that.

Teenagers also seek out risky experiences that create big emotional reactions. "Adolescents are learning to become adults, and learning new things always involves risk," says R. Andrew Chambers, Ph.D., assistant professor of psychiatry at Yale School of Medicine in Connecticut. Of course, the same brain wiring that attracts teens to positive risks may also make truly dangerous experiences—like drug use—seem attractive. And negative consequences are not always easy for teens to process.

There's a reason teens may find it harder than adults to plan ahead and

consider consequences: the part of the brain responsible for those kinds of thought—the prefrontal cortex—is the last part of the brain to fully develop. "The prefrontal cortex is like the boss. It's very much about decision making, planning and regulating raw emotions," Dr.

Chambers says.

Compared to teens, the adult prefrontal cortex works more quickly to balance the emotional "gut" reaction of the limbic

system.



SHAPING YOUR BRAIN

Knowing about your teen brain is important. As you head into adulthood, your daily experiences shape your brain. Brain paths for skills you don't use often are trimmed away. Pathways for skills and experiences you repeat are made stronger. This "brain pruning" is one reason why it is important

Help When You Need It

For teens in emotional pain—feeling angry, hurt or depressed—drug use may seem like a way out. But using drugs makes every situation worse. Every teen should know that real relief is available. New research shows that psychotherapy can lift your spirits and actually change your brain. The brain's pathways can be weakened or damaged by many things in the environment, such as emotional trauma in childhood. But learning something new—like how to express anger or talk about feelings calmly—can help the brain process information and think more clearly. "The brain is a very plastic organ. It's changing all the time," says Dr. Joseph Frascella, NIDA's Chief of Clinical Neurobiology. For more information on the science behind drug abuse, visit www.teens.drugabuse.gov.

If you or someone you know needs help in finding therapy, ask a trusted adult, such as a parent, teacher, or religious leader. If the problem is drug abuse, visit www.findtreatment.samhsa.gov or call 1-800-662-HELP to find a drug treatment center near you.

for teens to have positive experiences.

Knowing this can help you seek out challenging experiences that don't put your brain or body at risk. "Anything a person finds challenging and interesting can have its rewards," says Linda Spear, Ph.D., distinguished professor of psychology at Binghamton University in New York.

Jeremiah Cobb, of Bolton, Massachusetts, climbed a 12,000-foot mountain in Wyoming last summer. "When we reached the top, it was a great feeling," the 16-year-old says. You might find satisfaction from cooking some spicy chili, or get a thrill from playing a new riff on your guitar. It's your teen brain: Enjoy it and use it wisely!





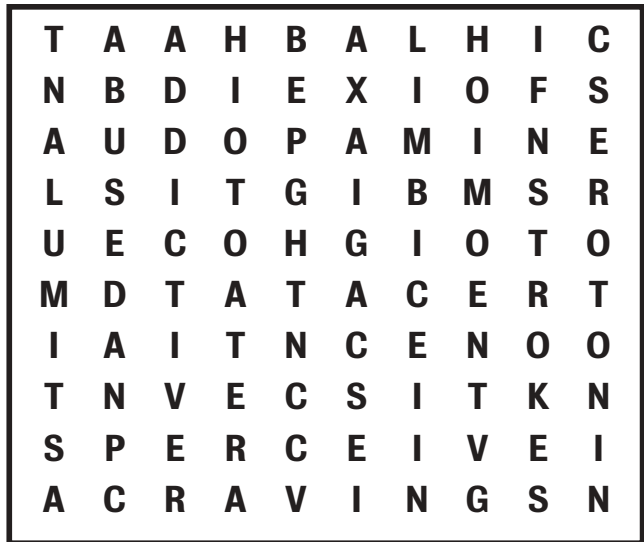
HEADS UP
REAL NEWS
ABOUT DRUGS
AND YOUR BODY

Heads Up Word Search

You've read the four articles in *Heads Up: Real News About Drugs and Your Body*. Now, try the activity below. First, fill in the words in the sentences with *Heads Up* vocabulary words from the list below. If you need to, flip back to figure out the answers. Then, find and circle each word in the puzzle. The words can run across, down, or diagonally.

- | | | |
|-----------|----------|-----------|
| abused | limbic | serotonin |
| addictive | perceive | stimulant |
| cravings | scans | strokes |
| dopamine | | |

- Cocaine interferes with the brain's normal handling of the neurotransmitter _____.
- Prescription medications save lives when used properly, but if _____ they can take lives.
- LSD binds to the receptor for the neurotransmitter _____.
- Cocaine can cause _____, even in healthy teens.
- A _____ is a drug that speeds up activity in the central nervous system and circulatory system.
- LSD is not _____, but it is dangerous nonetheless.
- The brain's _____ system is responsible for emotional reactions, and is highly active in teenagers.
- In people addicted to drugs, _____ for the drug often replace the desire for food, friends, and other pleasures.
- LSD can cause people to _____ things that aren't really there.
- Brain _____ show that drug addiction actually changes people's brains.



Write On!

Now, pick any two of the vocabulary words and write a sentence including each of them. The first sentence should describe an insight that you had while reading the articles in this book. The second should be a fact from the book that you found surprising or interesting.

- _____
- _____



Resources: Keep on Learning

If you'd like to find out more about the information discussed in these articles, or if you want to brush up on the brain and see how it is affected by drug abuse and addiction, check out these links and resources.

General Information

www.scholastic.com/headsup

At the Heads Up site, you'll find quotes from teens in recovery, pop-up activities, information about drugs, and more.

www.teens.drugabuse.gov

NIDA's Web site for teens focuses on the science behind all drugs of abuse. Find out how nicotine, prescription drugs, club drugs, and other substances act on the brain.

www.BacktoSchool.drugabuse.gov

NIDA's new site for science-based information on drugs of abuse is for teachers and students in all grades—and for parents, too.

www.drugabuse.gov/MOM/MOMIndex.html

Check out NIDA's online magazine series for teens. You can click on issues focusing on stimulants, hallucinogens, and more.

www.drugabuse.gov/consequences

NIDA's new site highlights the variety of medical consequences of drug abuse and addiction, and explains how individual drugs can lead to these often serious health problems.

Specific Drugs

www.thecoolspot.gov

Get the facts you need about alcohol at this Web site for teens, sponsored by the National Institutes of Health.

www.drugabuse.gov/ResearchReports/Cocaine/Cocaine.html

Visit this page to read NIDA's in-depth research report on cocaine abuse and addiction.

www.drugabuse.gov/ResearchReports/Hallucinogens/Hallucinogens.html

NIDA's research report on hallucinogens and dissociative drugs.

www.clubdrugs.org

NIDA's comprehensive site on drugs associated with the young adult rave scene.

www.marijuana-info.org

A compilation from NIDA of the latest research about marijuana, including sections for young people, teachers, and parents.

www.inhalants.drugabuse.gov

NIDA's research on inhalants, common household products that abusers inhale to get high—without being aware of the serious health consequences.

FRIEND IN NEED If you are concerned that someone you know is abusing drugs or alcohol, talk to a trusted adult (such as a parent, teacher, or guidance counselor) for advice. Or, if your friend is ready to seek help, you may wish to offer the following resource: www.findtreatment.samhsa.gov or 1-800-662-HELP.

Glossary

Power words to keep you in the know

Here are definitions of some terms that appear in *Heads Up: Real News About Drugs and Your Body*, as well as some other words that you may run across if you keep reading and learning about drug abuse, addiction, and the brain.

Addiction: A chronic, relapsing disease characterized by compulsive drug-seeking and abuse and long-lasting chemical changes in the brain.

Amphetamine: Stimulant drugs whose effects are very similar to cocaine.

Axon: The fiber-like extension of a neuron by which the cell carries information to target cells.

Axon terminal: The structure at the end of an axon that produces and releases chemicals (neurotransmitters) to carry the neuron's message to a neighboring neuron.

Central nervous system: The brain and spinal cord.

Cerebellum: A part of the brain that helps regulate posture, balance, and coordination.

Cerebral cortex: Region of the brain responsible for cognitive functions including reasoning, mood, and perception of stimuli.

Chronic: Refers to a disease or condition that persists over a long period of time.

Cocaine: A highly addictive stimulant drug derived from the coca plant.

Dendrite: The specialized branches that extend from a neuron's cell body and receive messages from other neurons.

Depressants: Drugs that relieve anxiety and produce sleep, including barbiturates and alcohol.

Dopamine: A brain chemical, classified as a neurotransmitter, found in regions of the brain that regulate movement, emotion, motivation, and pleasure.

Ecstasy (MDMA): A chemically modified amphetamine that has hallucinogenic as well as stimulant properties.

Hallucinogens: A diverse group of drugs that alter perceptions, thoughts, and feelings. Hallucinogenic drugs include LSD, mescaline, MDMA (ecstasy), PCP, and psilocybin (magic mushrooms).

Limbic system: A set of brain structures that generates feelings, emotions, and motivations. It is also important in learning and memory.

LSD (lysergic acid diethylamide): A hallucinogenic drug that acts on the receptor for the neurotransmitter serotonin.

Neuron (nerve cell): A unique type of cell found in the brain and body that is specialized to process and transmit information.

Neurotransmitter: A chemical produced by neurons to carry messages to other neurons.

Opioid: A class of drugs, including heroin and oxycodone, that is made from the opium poppy plant or is produced in a lab and has opium-like effects. Opioid drugs relieve pain, dull the senses, and depress the central nervous system.

Receptor: A molecule that recognizes specific chemicals (normally neurotransmitters and hormones) and transmits the message carried by the chemical into the cell on which the receptor is located.

Serotonin: A neurotransmitter that regulates many functions, including mood, appetite, and sensory perception.

Stimulants: A class of addictive drugs that speed up the body's central nervous and circulatory systems. Stimulants include cocaine, methamphetamine, and Ritalin.

Synapse: The space between neurons.

Withdrawal: Symptoms that occur after chronic use of a drug is reduced or stopped.

To order additional copies of this **Heads Up Student Edition** at no charge, call 800-729-6686 and refer to NCADI MS951.