

### Summary

The dangers of drug abuse make headlines all over the world: from methamphetamine labs in rural homes to “club drugs” being used in parties and bars to world-class athletes abusing steroids. The goal of this module is to help students identify and understand different messages about drugs that are present in the media, and to increase their knowledge about the possible dangers, harmful effects, and consequences of all types of substance abuse.

This module will focus on illegal drugs that have made recent headlines:

- **Steroids:** Performance-enhancing drugs that are injected or taken orally by athletes to increase strength and endurance.
- **Methamphetamine:** Stimulants that are synthetically created, often in small home-based labs.
- **GHB, Rohypnol, Ketamine, MDMA:** These are some of the more popular “club drugs,” or drugs that can cause feelings of disorientation and memory loss.

Students will learn about the effect that each drug has on the brain and body, and how use of these drugs affects individuals and our society as a whole.

### Learning Objectives

At the end of this module:

- Students can explain the effects that methamphetamine, steroids, and many common “club drugs” can have on the brain and body.
- Students understand the relationship between the effects of these drugs on the brain and body and addiction.
- Students understand the dangers of these drugs and are aware of their presence in our society.
- Students can identify and critically analyze media information about methamphetamine, steroids, and “club drugs.”

## Background

### STEROIDS

Anabolic steroids are artificial versions of testosterone, a hormone that all individuals have naturally in their bodies. Anabolic steroids, the most frequently abused of all steroids, are taken orally or injected to enhance athletic performance, increase stamina, and improve physical appearance. Anabolic means “muscle-building.” Steroids are often taken in cycles of weeks or months rather than continuously.

This is called “cycling.” “Stacking” refers to the use of several different types of steroids successively; this practice is thought to maximize their benefits while minimizing negative effects. Users think this will have a greater effect, but there is no scientific evidence for this.

Slang terms for steroids include Arnolds, gym candy, pumpers, stackers, weight trainers, and juice.

## Effects of Steroids on the Body

Steroids have very dangerous side effects, including damage to the liver and kidneys as well as risk of high blood pressure and heart problems. In some cases, steroid use has led to death. Although steroids are effective in building lean muscle, strength, and endurance, no studies have documented that they enhance athletic performance.

While anabolic steroids can make some people look stronger on the outside, the immune system—the body’s defense against germs and diseases—is significantly weakened. Aggression and other psychiatric side effects may also result from abuse of anabolic steroids. Although users may report feeling good while on anabolic steroids, extreme mood swings can occur, with the potential for violence (this is often referred to as “roid rage”). Users may also suffer from paranoid jealousy, irritability, delusions, impaired judgment, and depression.

In addition, steroid use can impact sexual development (cessation of menstruation in girls, shrinking of the testicles and impotence in boys), and cause severe acne, loss of scalp hair, and hair growth on the body and face. Liver cancer and heart disease are among other serious side effects of steroid use that can occur in both males and females of all ages. Steroids can permanently stop the bones from growing, meaning that a teenage steroid user will not grow to full adult height. Although more boys than girls abuse steroids, these drugs are equally dangerous for both genders. People who inject anabolic steroids put themselves at higher risk of contracting HIV/AIDS or hepatitis, a disease that seriously damages the liver.

## Steroids and Neurotransmission

After a person takes steroids, the drugs are distributed to many regions of the brain, including the hypothalamus. Testosterone is naturally produced in the hypothalamus, which controls appetite, blood pressure, moods, and reproductive ability. Steroids alter the normal functioning of the hypothalamus, resulting in changes in the amount of testosterone that is sent throughout the body. Because testosterone plays a role in many body functions, this can result in the many effects seen with steroid abuse.

Steroids can also disrupt the functioning of neurons in the limbic system, the part of the brain responsible for emotional regulation. This disruption can lead to aggressive behavior, mood swings, violent behavior, impairment of judgment, and even psychotic symptoms like personality changes or paranoia.

## METHAMPHETAMINE

Methamphetamine is an illegal stimulant that speeds up the brain's functioning. It can be smoked, snorted, injected, or taken orally. Methamphetamine is produced as pills, powders, or chunky crystals. The crystal form, nicknamed "crystal meth," looks like small fragments of glass or shiny, blue-white rocks. When swallowed or snorted, methamphetamine gives the user an intense high. Injections cause the person to feel a quick high called a "rush" or "flash" that lasts an especially long time.

Slang terms for methamphetamine include speed, uppers, meth, crystal meth, ice, and crank.

### Methamphetamine and Neurotransmission

Methamphetamine acts by altering levels of the neurotransmitters dopamine and norepinephrine in synapses in various brain regions. Because methamphetamine has a similar chemical structure to dopamine and norepinephrine, it can be picked up by neurons that normally recycle these neurotransmitters. It can also enter neurons by passing directly across the cell membrane. Once methamphetamine enters a neuron, it causes the neuron to release large amounts of both dopamine and norepinephrine into the synapse. The high concentrations of dopamine result in feelings of euphoria and pleasure. Norepinephrine most likely causes the alertness seen with methamphetamine use. When a person stops using methamphetamine, the reduction of dopamine in the synapse results in intense cravings for the drug.

### Effects of Methamphetamine on the Brain and Body

Methamphetamine can cause addiction, stroke, violent behavior, nervousness, confusion, paranoia, auditory hallucinations, mood disturbances, and delusions. Some of these effects may be long-lasting. Research has also shown that even several years after methamphetamine abuse has stopped, users may still have a reduction in their ability to transport dopamine from the synapse back into the neuron, indicating that there can be long-term impairment following the drug abuse. The damage to the dopamine system from methamphetamine is similar to the damage seen in Parkinson's disease, where it occurs naturally.

### Methamphetamine Withdrawal

Although methamphetamine is a highly addictive drug, no acute symptoms are evident at the time of methamphetamine withdrawal. Withdrawal symptoms can often take 30 to 90 days to occur, and can include depression, cravings, lack of energy, and even suicidal thoughts. New research suggests that brain abnormalities similar to those seen in people with depression and anxiety disorders can occur when a person stops using methamphetamine. Methamphetamine abuse has a very high relapse rate; more than 90 percent of individuals in treatment return to drug abuse.

## The Impact of Methamphetamine on Communities

Dramatic increases in the production and use of methamphetamine have led to broad media coverage of this drug. Methamphetamine is made illegally with fairly inexpensive and readily available ingredients, such as drain cleaner, battery acid, and antifreeze. As a result, a majority of the methamphetamine produced in the United States is made in home labs. Methamphetamine is highly addictive, creating a high demand for the drug and the labs that supply it. These labs are a major problem for the community. Methamphetamine labs have the potential to contaminate drinking water, soil, and air. In addition, methamphetamine use often increases crime and violent acts, such as domestic violence or child abuse, in affected individuals and communities.

See the “Science in the Spotlight” article in the Module 6 magazine for more on the impact of methamphetamine on society.

### GHB, ROHYPNOL, MDMA, AND KETAMINE (“CLUB DRUGS”)

Four club drugs are GHB (gamma hydroxybutyric acid), flunitrazepam (Rohypnol), MDMA (3-4 methylenedioxymethamphetamine), and ketamine. These drugs are called club drugs because of their association with use in party situations (note: methamphetamine is also considered a club drug).

GHB has three forms: a colorless, odorless liquid, a white powder, and a pill. Rohypnol is a pill that dissolves in liquids.

#### Slang terms:

**GHB:** Georgia home boy

**Rohypnol:** roofies

**MDMA:** ecstasy, XTC, e, x, adam

**Ketamine:** special K

Some forms of Rohypnol are undetectable in liquids, while newer Rohypnol pills cause color changes in the liquid. MDMA, often known as ecstasy, comes in a tablet or capsule form. Ketamine is a white powder.

GHB and Rohypnol are also known as “date rape drugs” because of their effect on memory and their use in sexual assault situations. Student materials do not offer this terminology. Determine whether your students are ready for this level of discussion before presenting this terminology to them, if you decide to at all.

- **GHB** can cause memory loss, relaxation, drowsiness, dizziness, nausea, difficulty seeing, unconsciousness, seizures, breathing problems, tremors, sweating, vomiting, decreased heart rate, a dreamlike feeling, coma, and possible death.
- **Rohypnol** can cause memory loss, lower blood pressure, sleepiness, muscle relaxation or loss of muscle control, a drunk feeling, nausea, slurred speech, difficulty with motor movements, loss of consciousness, confusion, problems seeing, dizziness, and stomach problems.
- **MDMA** can cause increases in heart rate and blood pressure, muscle tension, involuntary teeth clenching, nausea, blurred vision, faintness, and chills or sweating. In high doses, MDMA can lead to a sharp increase in body temperature (hyperthermia) that results in liver, kidney, and cardiovascular system failure.

- **Ketamine** can cause hallucinations, lost sense of identity and time, distorted perceptions of sight and sound, feeling out of control, impaired motor function, problems breathing, convulsions, vomiting, out-of-body experiences, a dreamlike feeling, numbness, loss of coordination, aggressive or violent behavior, and slurred speech.

### GHB, Rohypnol, MDMA, and Ketamine in the Brain

GHB and Rohypnol affect the neurotransmitter GABA (gamma amino butyric acid). Normally, GABA inhibits the ability of neurons to send messages to neighboring neurons; in other words, it stops or slows the communication between neurons. When a person abuses GHB or Rohypnol, the drugs enhance the effects of GABA, further decreasing communication between neurons. This decreased communication, or depressant effect, causes drowsiness and confusion, and can have even more serious effects such as sleep, coma, or death.

MDMA causes an increase in activity associated with the neurotransmitters serotonin, dopamine, and norepinephrine. It does this by preventing the reuptake of the neurotransmitters. MDMA can also cause the reuptake sites to work in reverse, so they release even more serotonin into the synapse. Serotonin plays an important role in the regulation of mood, sleep, pain, emotion, and appetite. The excess serotonin found in synapses as a result of MDMA use likely causes the euphoric effects of the drug. Because the drug depletes large amounts of this important neurotransmitter, it also contributes to the negative aftereffects that users often experience days after use.

Ketamine disrupts the functioning of receptors for the neurotransmitter glutamate, known as NMDA (N-methyl-D-aspartate) receptors. This can cause the stupor observed in a person who has abused ketamine as well as problems with learning, memory, awareness, and judgment. Ketamine can also disrupt the actions of the neurotransmitter dopamine.

- Read the Background section of this module for more information about drugs in the news.
- Provide students with the Module 6 magazine *Drugs in the News* for background knowledge.
- Determine which activities you want the class to complete.
- Arrange for computer lab time or prepare the classroom computer for students' Internet and CD-ROM use.
- Photocopy and pass out the Drugs in the News Fact Sheet for students to complete during the lecture.
- Prepare transparencies and photocopies for the lesson.

Before giving students time to review the magazine, begin with the following activity. Lead a discussion about drugs in the news and other media outlets. Ask students what they've read and seen in the media about substance abuse and addiction. Specifically mention the drugs included in this module and see whether students are familiar with these three substances. List students' responses on the chalkboard.

Tell students that one goal of this lesson is to help them learn how individuals, families, and the community are affected by drugs of abuse. A second goal is to give students the skills to critically analyze how the media covers information about drugs of abuse.

**Time:**

15–20 minutes

**Handouts:**

Module 6 magazine

Drugs in the News  
Fact Sheet

**Reading:** Give students adequate time to read the student magazine. Have them pay particular attention to the following sections: Background, Stats and Facts, and Science in the Spotlight.



**Discussion:** In small groups, have students discuss the information using the following questions. Then, bring the groups together and discuss as a class. Review the effects of the drugs, how the drugs are used, how the drugs act in the brain, and why these drugs appear so often in the media.

### *Drugs in the News*

- Why are these drugs illegal?
- What parts of the brain are affected by steroids? Methamphetamine? Other club drugs?
- What are the risks to an individual who may use these drugs?
- What is the impact of these drugs on communities?
- Why do these drugs appear so often in the media?
- Is the media coverage of drugs balanced? Have students seen both positive and negative information presented when drugs are discussed?
- How does the information they have read in the media compare to the information in the fact sheet?



### Activity 1: Eye on the News

After presenting the information on the fact sheet, announce the sixth and final activity of the competition. Remind students which groups they are in. Have students sit with their groups.

In this activity, students will earn points for their groups by monitoring the media—newspapers, TV, and magazines—for information about legal and illegal drugs that have been covered by the *Brain Power!* curriculum. Encourage students to bring in information they find about drugs in the news to share with the rest of the class. Award points for both the amount and the quality of the information the groups find. Develop your own plan for awarding points, or use this one:

- One point per article (or description of TV commercial or show) that discusses drug abuse.
- Two points if the article discusses the impact of the drug on the brain and body.
- Three points per article if the student can identify an imbalance in the presentation of the information, as in a media piece that lacks scientific background or presents false or sensational information.

Use the Media Chart provided to track the teams' progress as they gather this information and present it to their classmates. Run the competition for a few days or a week. Encourage conversation about the topics that the students present to support the integration of all the information covered in the *Brain Power!* curriculum. Do students realize that accurate information can support healthy decision-making? Are they aware of the role of the media in disseminating this information?

Record group points on the Group Scorecard.



### Activity 2: Ripple Effects

Methamphetamine abuse, like the abuse of other drugs, impacts both individuals and society. For this final activity, students will explore how methamphetamine abuse has a ripple effect throughout society.

Using the Web sites provided as a starting point, have students research the prevalence of methamphetamine and the consequences of its production, distribution, and use. Have students complete the diagram on the Ripple Effects handout, listing ways in which methamphetamine affects multiple layers of society—from individuals to families to communities. Students

#### Time:

Over a few days or a week

#### Supplies:

Media Chart

#### Time:

45 minutes

#### Supplies:

Computer for research

Pen or pencil

#### Handouts:

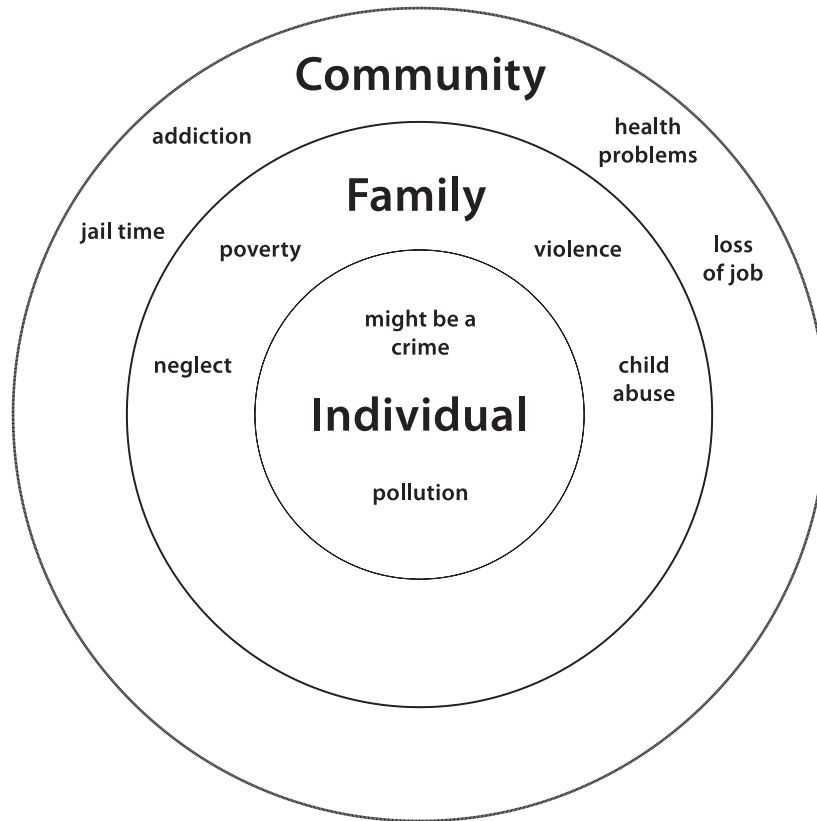
Ripple Effects handout

should use information from the Web sites below and others to justify their responses. Then, have students brainstorm ways to prevent or improve the problems on each tier. The image below represents the Ripple Effect.



Prior to the activity, add these sites to the classroom computer's "Favorites" drop-down menu. If need be, the activity can be spread across a few day's time by having one group at a time access the computer for research time while the rest of the class completes other work.

[http://teens.drugabuse.gov/mom/mom\\_meth1.asp](http://teens.drugabuse.gov/mom/mom_meth1.asp)  
[www.intheknowzone.com/meth/community.htm](http://www.intheknowzone.com/meth/community.htm)



Example: for the individual, responses may include addiction, health problems, loss of job, and jail time; for the family, responses could include violence, poverty, child abuse, and neglect; for the community, responses might be crime and pollution.









The CD-ROM includes games and materials to supplement the information presented in the module. The room labeled “6” contains the following activities and specific information pertaining to this module:

- **Learning Objectives:** these are presented at the beginning of each CD-ROM module
- **Brain Scan Files:** in this activity, students view brain scan images to see the damaging effects of various drugs on the brain
- **Methamphetamine and Sports News Daily Article:** inspired by news headlines, the articles discuss the broad impact of methamphetamine and steroid abuse
- **Memory Game:** students match vocabulary words from the module in this memory-based game
- **Beat the Clock:** in this game, students race to select the terms that correctly relate to the drugs discussed in the module
- **Module Quiz:** this quiz is the final part of the module, intended to assess students’ learning

## Extensions

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Some professional athletes have ruined their reputations and careers when routine drug testing revealed that they had been using anabolic steroids. Have students decide if they support (pro) or disagree with (con) routine drug tests for athletes. Have each side (pro and con) present their main points to the class. Make sure students emphasize the brain and body effects of the drug and how this information should be considered in the debate.
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Have each student access the data from the Monitoring the Future national survey online.

[www.drugabuse.gov/infofacts/HSYouthtrends.html](http://www.drugabuse.gov/infofacts/HSYouthtrends.html)

Ask students to record at least one teen drug fact obtained from the site; observe what information students were able to pull from the text and charts that are at a higher reading level.

### Key to Icons



Art



Science



History



Business



Social Studies



English



Math

As students complete the activities in the module, observe whether they have mastered the following:

1. Can students explain the effects of methamphetamine in the brain? Can they explain how these changes can result in addiction?
2. Can students explain the effects of steroids in the brain? Can they explain the dramatic effects the drug can have on the body?
3. Can students list the serious effects of MDMA abuse?
4. Can students list the types of date rape drugs and their effects on the brain and body? Do they realize the prevalence of these drugs in society?
5. Do students recognize the prevalence of information on drugs in the news? Can students articulate why drug abuse is such an important topic for the media?
6. Have students become more critical consumers of information about drugs of abuse? Are they able to recognize inaccuracy or imbalance in news coverage, if present?

## RESOURCES FOR TEACHERS

### **National Institute on Drug Abuse (NIDA)**

[www.drugabuse.gov](http://www.drugabuse.gov), 301-443-1124

This Web site contains information about drug abuse as well as a section designed specifically for parents, teachers, and students.

### **Mind Over Matter Teacher's Guide**

[http://teens.drugabuse.gov/mom/tg\\_intro.asp](http://teens.drugabuse.gov/mom/tg_intro.asp)

This printable/downloadable teacher's guide accompanies NIDA's Mind Over Matter series. The series is designed to educate teens about the biological effects of drug abuse on the body and brain. Also available for free by calling 1-800-729-6686.

### **National Clearinghouse for Alcohol and Drug Information (NCADI)**

<http://ncadi.samhsa.gov>, 1-800-729-6686

NCADI is the world's largest resource for information and materials concerning substance abuse. Many free publications are available here.

### **NIDA Anabolic Steroid Abuse Web site**

[www.steroidabuse.gov](http://www.steroidabuse.gov)

This NIDA site contains research, news, and additional information about steroid abuse.

***Buzzed: The Straight Facts About the Most Used and Abused Drugs from Alcohol to Ecstasy.*** Kuhn, C., Swartzwelder, S., and Wilson, W. New York: W. W. Norton & Company, 2003. A highly informative, detailed review of widely abused drugs.

## RESOURCES FOR STUDENTS

### **Mind Over Matter**

<http://teens.drugabuse.gov/mom>

Designed for teens, this site includes information about how different drugs, including methamphetamine and steroids, affect the brain. The site also includes a teacher's guide. Also available for free by calling 1-800-729-6686.

### **NIDA for Teens**

<http://teens.drugabuse.gov>

Designed for teens, this site provides information on several drugs, including steroids, as well as quizzes and real-life stories.

### **Free Vibe**

[www.freevibe.com](http://www.freevibe.com)

Designed for teens, this site covers the risks and consequences of various drugs and provides news, advice, and real-life stories.

***Date Rape Drugs.*** Kehner, G.B. Philadelphia, PA: Chelsea House Publishers, 2004. Part of the "*Drugs: The Straight Facts*" series. Discusses the history, effects, usage trends, and other information about GHB, Rohypnol, and ketamine.

***Body Enhancement Products.*** Santella, T.M. Philadelphia, PA: Chelsea House Publishers, 2005. Part of the "*Drugs: The Straight Facts*" series. Discusses the health risks of steroids and other body enhancement products.