

**HEADS UP
REAL NEWS
ABOUT DRUGS
AND YOUR BODY**

Prescription Drug Abuse: Teens in Danger



—A message from Dr. Nora D. Volkow,
Director of NIDA

In This Installment

- What is prescription drug abuse?
- How does prescription drug abuse cause harm?
- Dangerous myths about prescription drugs
- Sports and steroid abuse

Coming Up in the Next Installment

- Drugs in social settings

Assessment Opportunities

Look inside for creative science-based lessons and to see how you can test what your students are learning about prescription drug abuse.

Dear Teacher:

A serious threat to your students may be lurking in their families' medicine cabinets. New research by the National Institute on Drug Abuse (NIDA) and other federal agencies is revealing a troubling rise in prescription drug abuse among young people—and among adults as well. The increase in abuse of prescription painkillers by teens has been slight but at a persistent level of high use.



This installment of *Heads Up: Real News About Drugs and Your Body* gives students essential science-based information about prescription drug abuse and the harm posed by the most commonly abused medications. The article explains what prescription drug abuse is—and isn't—and dispels harmful myths.

In addition to sharing and discussing the article with your students, be mindful that parents and other adults should use prescription drugs as directed, then discard any leftover pills. Medications with potential for abuse—particularly pain relievers, antianxiety medications (benzodiazepines), and stimulants—should not be kept in easy-access locations such as medicine cabinets. Your assistance in delivering this important information to students is invaluable; it *does* make a difference.

Thank you for joining me and the team of NIDA scientists in our efforts to bring students the facts about drug abuse. Together, we can all look forward to a day when students across the country understand that abusing drugs—any drugs, whether prescription or street drugs—is never the right decision.

Sincerely,

Nora D. Volkow, MD
Director of NIDA

For printable past and current articles in the **HEADS UP** series, as well as activities and teaching support, go to www.drugabuse.gov/parent-teacher.html or www.scholastic.com/HEADSUP.

Lesson Plans for Student Activities

PREPARATION: Before beginning the lessons, make these photocopies: two copies for each student of Reproducible 1 for a pre-reading and post-reading quiz, and one copy for each student of Reproducible 2.

Lesson 1 Heads Up: What Do You Know About the Dangers of Prescription Drug Abuse?

OBJECTIVE

To give students science-based facts about prescription drug abuse; to educate students about the most often abused prescription drugs and the harm they can cause; to help students understand that using medicines prescribed for someone else can be dangerous or deadly; and to assess students' knowledge of the topics before and after reading the article.

NATIONAL SCIENCE EDUCATION STANDARDS

Life Science; Science in Personal and Social Perspective

LESSON STRATEGY

Introducing the Topic

- Before the lesson begins, hold a class discussion based on these questions: *What is a prescription drug? What does it mean to abuse a prescription drug? Is it ever OK to take a prescription drug that was not prescribed specifically for you? Can prescription drugs be as dangerous as illegal drugs?*

- Tell students that they are going to see how much they know about prescription drug abuse and what the latest research is teaching us about it. Distribute copies of Reproducible 1. Tell students to write their names on the paper and label it No. 1. Then have them answer the questions. Collect and grade the papers.

READING, DISCUSSION, AND ASSESSMENT

- Have students read the article "Prescription Drugs: Their Use and Abuse." Next, hold a discussion based on questions that the article may prompt, such as: *What are some possible reasons that prescription drug abuse is on the rise? List some myths about prescription drug abuse. How do you think people came to believe the myths? What can be done to dispel them? What do you think should be done to stop the abuse of anabolic steroids by professional athletes?*

- Next, tell students it's time to see how much they've increased their knowledge. Give them a second copy of Reproducible 1. Tell them to write their names on the paper and label it No. 2. When students have finished, collect the papers, score them, and compare the results before and after the lesson.

WRAP-UP

- Conclude the lesson by asking students what they think ought to be done to end prescription drug abuse in their community. Does the answer lie in education, better control of the distribution of drugs, or tougher law enforcement? What could be done in each of those three realms that would help lower abuse rates among adults and teens?

ANSWERS TO QUIZ QUESTIONS:

1. b; 2. d; 3. d; 4. a; 5. b; 6. a; 7. c; 8. d; 9. d; 10. b; 11. c.

Lesson 2 Heads Up: Understanding Social Neuroscience

OBJECTIVE

Students gain an understanding about how social environment affects brain chemistry and susceptibility to drug abuse.

NATIONAL SCIENCE EDUCATION STANDARDS

Science as Inquiry; Science in Personal and Social Perspective

LESSON STRATEGY

Introducing the Topic

- Discuss with students what they know about the brain chemical dopamine: it is a neurotransmitter that causes feelings of pleasure when it binds with dopamine receptors in the brain. Review how drug abuse can interfere with the dopamine system. (See Reproducible 2 for details.)

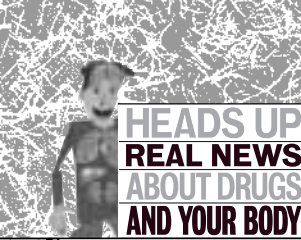
- Ask students if they think a person's environment can affect how likely he or she is to abuse drugs. Ask if they think the effect is totally psychological, or if environment could actually affect brain chemistry.
- Tell students they are going to read about a NIDA-sponsored experiment with monkeys that investigated how and why being in a socially stressful or enriched environment can affect susceptibility to drug abuse. Explain that this line of research is called *social neuroscience*. Discuss what they think the term might mean. Break it down by discussing the meaning of the individual words—"social" and "neuroscience."
- Hand out Reproducible 2. Have students read the sheet and answer the questions at the end.

ANSWERS TO QUIZ QUESTIONS:

1. The monkeys in the enriched environment had 20 percent more dopamine receptor function.
2. The monkeys that experienced a stressful environment. A possible reason may be that being in an enriched environment had a positive influence on whether the monkeys took drugs.

Answers to questions 3 and 4 will vary.

- Wrap up the lesson by discussing the following questions: *What is social neuroscience? How can findings from social neuroscience help scientists find new ways to prevent drug abuse? Can you think of any social neuroscience experiments that could be conducted with humans?*

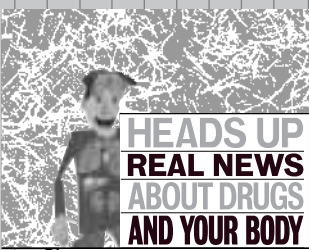


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Heads Up: Prescription Drug Abuse—A Quiz

Test your knowledge of prescription drug abuse by answering the questions below.

1. **A prescription drug cannot legally be bought or sold without**
 - a. a safety cap.
 - b. a doctor's permission.
 - c. a pharmacist's permission.
 - d. a parent's permission.
2. **Which of the following is safe to do if you're in serious pain?**
 - a. take a pain medication prescribed for your mother
 - b. take a pain medication prescribed for a friend
 - c. take double the dose that is prescribed for you
 - d. none of the above
3. **Opioids are prescription drugs used to treat**
 - a. viruses.
 - b. obesity.
 - c. infection.
 - d. pain.
4. **When abused, opioids can result in death by**
 - a. stopping one's breathing.
 - b. stroke.
 - c. speeding up the heartbeat.
 - d. causing the body to overheat.
5. **Certain prescription stimulants are used to treat**
 - a. sleeplessness.
 - b. attention-deficit/hyperactivity disorder.
 - c. pain.
 - d. autoimmune disorders.
6. **Abuse of prescription stimulants can result in**
 - a. high body temperature.
 - b. infection.
 - c. depressing respiration.
 - d. liver cancer.
7. **Benzodiazepines are also known as**
 - a. stimulants.
 - b. steroids.
 - c. antianxiety medications.
 - d. painkillers.
8. **Which drug has been in the news because of its abuse by athletes who want to build strength and endurance?**
 - a. Ritalin
 - b. opioids
 - c. OxyContin
 - d. anabolic steroids
9. **Abusing steroids can result in**
 - a. facial hair growth in women.
 - b. premature heart attacks.
 - c. psychiatric problems.
 - d. all of the above.
10. **Two of the most commonly abused opioids are**
 - a. Valium and Adderall.
 - b. OxyContin and Vicodin.
 - c. Xanax and Librium.
 - d. Oxandrin and Anadrol.
11. **A recent survey of Americans ages 12 and older found that _____ abused a prescription drug at least once in 2004.**
 - a. 1.3 percent
 - b. 4.3 percent
 - c. 6.1 percent
 - d. 9.3 percent



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Heads Up: Social Neuroscience—A New Frontier in the Study of Drug Abuse

Introduction: Drug Abuse and Dopamine

Under normal circumstances, dopamine (a brain chemical) is released in your brain when something pleasurable happens. When a drug abuser takes a drug, it causes an unnaturally large flood of dopamine in the brain. Over time, the brain gets used to having all the extra dopamine around. As a result, the number of dopamine receptors in the brain starts to drop. Because of that, the abuser can't feel pleasure without the huge flood of dopamine that only drugs can provide.

By studying the dopamine system, NIDA scientists have discovered that people who happen to have fewer dopamine receptors in their brains are more likely to feel pleasure when exposed to drugs that enhance the

dopamine system. That may in turn make them vulnerable to abusing drugs.

Now, NIDA researchers are trying to find out what causes variation in dopamine receptors. It is turning out that environment can actually influence brain chemistry, including the number of dopamine receptors in the brain. This has led to a new field of research called **social neuroscience**. This research examines how neurobiology and the social environment interact in the processes of initiation, maintenance, relapse, and treatment of abuse and addiction. Read below about a social neuroscience experiment involving monkeys, their environment, and drug use, then answer the questions below.

The Experiment: Social Environment and Dopamine Receptors

Description

- Researchers measured the number of dopamine D₂ receptors in a group of monkeys' brains using positron-emission tomography (PET). At this time, the monkeys were housed individually.
- Researchers then housed the monkeys in groups of four, and social hierarchies formed naturally. Some monkeys became dominant and some became subordinate. For those that became dominant, the new environment modeled "environmental enrichment," but for those that became subordinate, it modeled "socially derived stress."
- After the social hierarchies were formed (3 months), the researchers again scanned the monkeys' brains using PET. They discovered that the monkeys that

had experienced a socially enriched environment had 20 percent more dopamine receptor function than when they had been housed individually. The dopamine receptor levels of the monkeys that were experiencing socially derived stress, however, were unchanged.

- After the last PET scan, the monkeys were taught to operate machines that dispensed cocaine. They could take cocaine whenever they wanted it.

Findings The dominant monkeys took much less of the drug than the subordinate monkeys.

Implications These findings suggest that, regardless of an individual's past, positive environmental change may result in biological changes that "protect" the individual from the pleasurable or motivational effects of drugs.

	Dominant Monkeys	Subordinate Monkeys
Environment →	Enriched	Stressed
Dopamine receptor function →	20% higher	Unchanged
Response to available cocaine →	Took a little	Took a lot

You're the Scientist

Imagine that you're a scientist trying to understand and interpret this experiment. Answer the following questions on the back of this page.

1. How did experiencing an enriched environment affect the concentration of dopamine receptors in the monkeys' brains?
2. Which monkeys took more of the drug—those that experienced an enriched environment, or those that experienced a stressful environment? What is a possible reason for this?
3. What are some stressful environments for humans? What are some examples of enriched environments?
4. Based on this research, what can people do to protect themselves from drug abuse and addiction?