

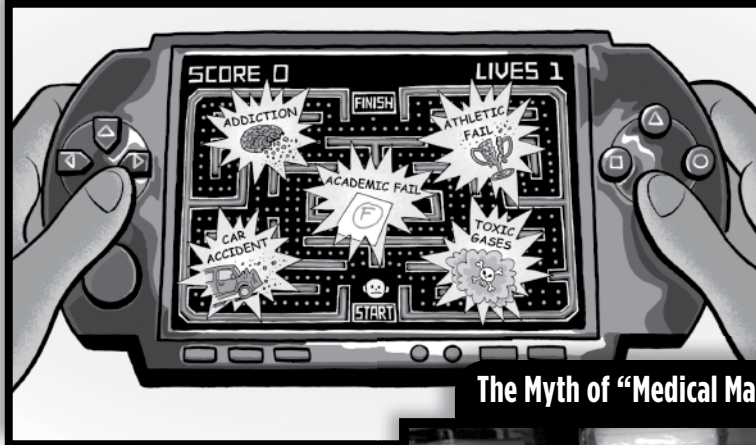


# Heads Up: Real News About Drugs and Your Body

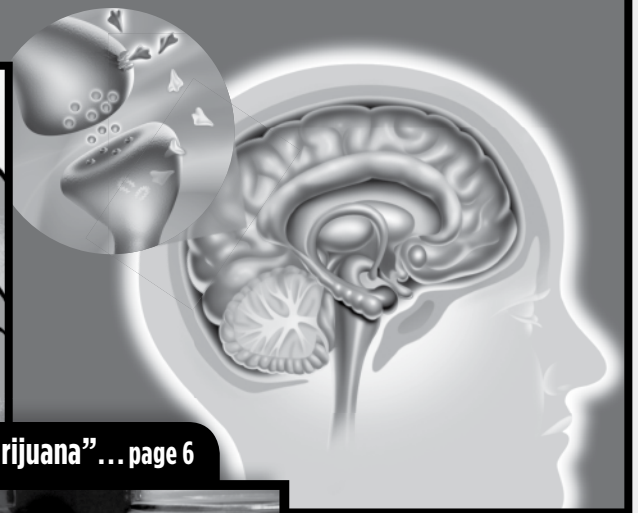
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- For this Heads Up **Teacher Edition Compilation** refer to **NIH Pub No. 12-7652**.
- For the accompanying Heads Up **Student Edition Compilation** refer to **NIH Pub No. 12-7651**.

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# MARIJUANA FACTS: BREAKING DOWN THE MYTHS

**Overview:** The lesson below and the reproducible student work sheet on the reverse side reinforce student comprehension of key facts and concepts in the article “Marijuana Facts.”

## Alignment With National Standards

- *Science (NSES):* Life Science: Structure and Function in Living Systems; Science in Personal and Social Perspectives: Personal and Community Health
- *Life Skills (McREL):* Self-Regulation; Thinking and Reasoning

## Lesson

### Before-Reading Questions:

- Do you think marijuana is addictive?
- What do you know about how marijuana affects your memory, motor skills, and judgment?

### After-Reading Questions

(factual responses in *italics*):

- Why is marijuana addictive? (*The main active ingredient in marijuana, THC, binds to receptors [proteins] in the brain that are located in areas regulating mood, sensation, memory, feelings, etc. Marijuana also indirectly increases dopamine—just as most drugs of abuse do—which contributes to the high users experience. These effects are why some people use marijuana again and again, which can lead to addiction.*)
- Why can abusing marijuana lead to lower grades? (*Marijuana affects attention and memory, making it difficult to learn, focus, or concentrate. These effects can lead to poor academic performance.*)
- Why is driving under the influence of marijuana dangerous? (*Marijuana use impairs motor coordination. It slows reaction times to signals and sounds while driving. These effects increase the likelihood of an accident.*)

### Critical Thinking:

- Research shows that the younger someone is when they start smoking marijuana, the more likely they are to become addicted. In fact, one in six people who start smoking marijuana in their teens will become addicted. How does knowing this and other facts in the article affect any decision you make about using marijuana?
- Imagine your friend is using marijuana, and you are trying to convince him or her to stop. Your friend says that the drug is not harmful and everybody does it. What would you say to him or her? (*Possible answer: Most teens DON'T smoke marijuana. The facts show that serious risks ARE associated with marijuana use, especially for teens.*)

## Student Work Sheet

Have students (individually or in groups) create a PSA and present it to the class. Evaluate students on their creativity and ability to include facts from the article in a comprehensive and interesting way.

*Extension:* Have students record their PSA and present it to the class. Students can also log on to <http://drugfactsweek.drugabuse.gov/contestwinners.php> to hear original songs and music videos created by teens about substance-abuse awareness.

## More Information

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## Dear Teacher:

The most recent *Monitoring the Future* survey showed an increase in daily marijuana use among high school students from 2009 to 2010. The survey also found that fewer teens consider marijuana to be harmful. This “softening” of teen attitudes may be attributed to mixed and even favorable messages about marijuana in popular culture and the media.

The fact is that marijuana use poses serious risks, and young people are the most vulnerable. The younger a person is when they start smoking marijuana, the more likely they are to become addicted. It is estimated that one in six people who start using marijuana in their teens will become addicted.

Experts at NIDA want to give your students the straight facts about the consequences of marijuana use on their bodies, brains, and futures. We hope you share this article with



your students so they will be well-informed about the risks associated with marijuana use.

Sincerely,

Nora D. Volkow, M.D.  
Director,  
National Institute on Drug Abuse

## In This Installment:

- **Student article:** Scientific facts about the risks associated with marijuana use
- **Student work sheet:** Students create a public service announcement (PSA) to inform their peers about the risks of marijuana use.

**Attention Teachers and Students!**  
Enter the: **NIH Lessons About Bioscience (LAB) Challenge**

Details at <http://lab.challenge.gov/>



Name \_\_\_\_\_ Date \_\_\_\_\_

# Marijuana Facts: Use Your Knowledge

Teens need the facts about the effects of marijuana use on their bodies and brains so that they can make smart choices about their health. Use the information you learned from the article to complete the activity below.

**Your Assignment:** Create a 20-second public service announcement (PSA) for TV or the Web that will give viewers facts about marijuana or important health information related to marijuana use.

**Your Goal:** Give your peers the information they need to make informed decisions based on facts.

**Use your answers to the questions below to outline the PSA. Use additional paper as needed.**

1. Focus your PSA on one main fact from the article “Marijuana Facts.” Which fact do you want to use in your commercial?

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2. Write a brief statement on why you chose this particular fact for your PSA and why you think it is the most persuasive.

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3. Do you want to use animation or actors in your commercial? Describe two characters you would use in your PSA, and why you would use either live actors or animation.

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4. Rather than using characters, you may choose to use a voice-over with pictures. Describe the type of voice you would use (for example: adult, teen, authoritative, friendly) and what kinds of pictures or illustrations you would include.

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5. On a separate sheet of paper, write a short script for either the voice-over or a dialogue between the characters in your commercial. The script should be no more than one page long.

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Illustration: © iStockphoto.

# THE SCIENCE OF MARIJUANA

**Overview:** The lesson below and the reproducible work sheet on the reverse side reinforce student comprehension of key facts and concepts in the article "The Science of Marijuana: How THC Affects the Brain."

**Alignment With National Standards**

- *Science (NSES):* Life Science: Structure and Function in Living Systems; Science in Personal and Social Perspectives: Personal and Community Health
- *Life Skills (McREL):* Self-Regulation; Thinking and Reasoning

## Lesson

**Before-Reading Questions:**

- What do you know about how brain cells communicate with one another, and how the brain controls body functions?
- What is THC?
- What are some of the effects of marijuana on the brain?

*The basal ganglia regulates planning and starting a movement. The neocortex regulates complex thinking and movements. The cerebellum regulates motor control and coordination.)*

2. Which areas of the brain are most in play when studying for a test? How would smoking marijuana affect these areas and a person's ability to study for a test? (*The hippocampus is important for memory and learning new information. THC impairs the ability to learn and store new information.*)

3. How might marijuana use affect a person's relationships with other people such as friends, teachers, or parents? (*THC affects the amygdala, an area important in emotions and anxieties, as well as the nucleus accumbens and the neocortex. Some people who use marijuana often may show a lack of motivation or drive, or they may seem depressed, which can in turn affect relationships.*)

**After-Reading Questions**

Distribute the student work sheet and discuss the answers as a class:

**Brain Activities—Amygdala:**

Emotions, fear, anxiety. **Basal Ganglia:** Planning/starting a movement. **Brain Stem:** Information between brain and spinal column. **Cerebellum:** Motor coordination, balance. **Hippocampus:** Learning new information. **Hypothalamus:** Eating, sexual behavior. **Neocortex:** Complex thinking, feeling, and movement. **Nucleus Accumbens:** Motivation and reward. **Spinal Cord:** Transmission of information between body and brain.

**Brain Stem:** Information between brain and spinal column.

**Cerebellum:** Motor coordination, balance. **Hippocampus:** Learning new information. **Hypothalamus:** Eating, sexual behavior. **Neocortex:** Complex thinking, feeling, and movement.

**Nucleus Accumbens:** Motivation and reward. **Spinal Cord:** Transmission of information between body and brain.

**Nucleus Accumbens:** Motivation and reward. **Spinal Cord:** Transmission of information between body and brain.

**"Think It Through" Questions**

(factual responses in italics):

1. THC disrupts the function of the endocannabinoid system in a person's brain. Which areas are critical to the ability to safely drive a car? How might THC impair driving ability? (*The basal ganglia, neocortex, and cerebellum can all affect a person's ability to drive.*)

**Follow-up Discussion:**

- Evaluate students on their ability to think through the scientific information presented on the work sheet.
- Discuss everyday situations that marijuana use can affect.

## Dear Teacher:

This year's *Heads Up* articles highlight myths versus facts about marijuana. Many youths and adults believe that using marijuana is no big deal. Mixed media messages—from popular music, TV, and the Internet—and efforts to legalize marijuana are contributing to this misperception. But contrary to such messages, the risks associated with marijuana use are real.

About 9 percent of people who use marijuana become addicted to it, and regular use increases the likelihood of academic and athletic failure. Even occasional use can lead to car accidents and lapses in judgment. In the accompanying article, students will learn the science of how THC—the active ingredient in marijuana—mimics natural brain chemicals, undermining a whole range of key functions, including critical thinking, memory, motor skills, and coordination.

I hope you will use this article, and the accompanying lesson and work sheet, to help your



students become knowledgeable about the real risks and dangers associated with marijuana use.

Sincerely,

Nora D. Volkow, M.D.  
Director,  
National Institute on Drug Abuse

## In This Installment:

- **Student article:** Scientific facts about how THC affects brain cells and activities controlled by the brain
- **Student work sheet:** Identifying the effects of THC on the brain

## More Information

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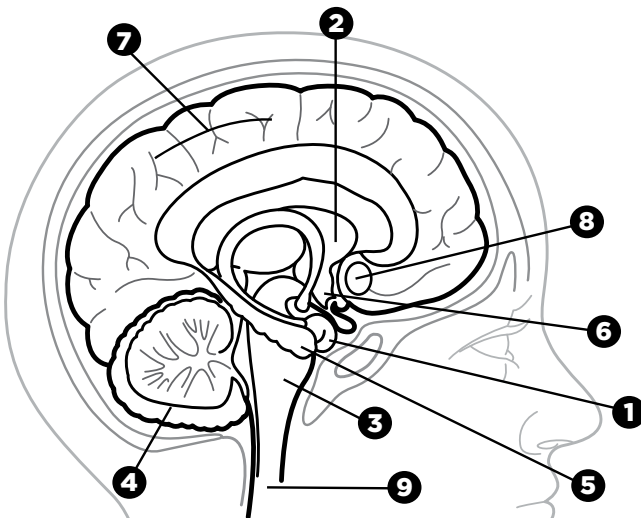


Name \_\_\_\_\_ Date \_\_\_\_\_

# The Effects of THC on the Brain



**Brain Activities:** Areas of the brain that have high levels of cannabinoid receptors are labeled in this illustration. Fill in the blanks with the activities that are regulated by the numbered parts of the brain. Then answer the “Think It Through” questions below.



- 1. Amygdala: \_\_\_\_\_  
\_\_\_\_\_
- 2. Basal ganglia: \_\_\_\_\_  
\_\_\_\_\_
- 3. Brain stem: \_\_\_\_\_  
\_\_\_\_\_

- 4. Cerebellum: \_\_\_\_\_  
\_\_\_\_\_
- 5. Hippocampus: \_\_\_\_\_  
\_\_\_\_\_
- 6. Hypothalamus: \_\_\_\_\_  
\_\_\_\_\_
- 7. Neocortex: \_\_\_\_\_  
\_\_\_\_\_
- 8. Nucleus accumbens: \_\_\_\_\_  
\_\_\_\_\_
- 9. Spinal cord: \_\_\_\_\_  
\_\_\_\_\_

**“Think It Through” Questions:** (Write your answers on separate paper.)

- 1. THC, the main active ingredient in marijuana, disrupts the function of the endocannabinoid system in a person’s brain. Which areas of the brain are critical to the ability to safely drive a car? How might THC impair driving ability?
- 2. Which areas of the brain are most in play when studying for a test and why? How would smoking marijuana affect these areas and a person’s ability to study for a test?
- 3. How might marijuana use affect a person’s relationships with other people, such as friends, teachers, or parents? Answer the question in terms of THC’s effect on brain function.

Marijuana leaf illustration: © iStockphoto.



## Dear Teacher:

This year's *Heads Up* articles highlight myths versus facts about marijuana.

This third and final article in the series focuses on the myth of "medical marijuana," a topic that is drawing debate across the country. Because marijuana has been legalized for medicinal use in more than a dozen states and the District of Columbia, students may think that it is indeed medicine and poses few health risks.

This article helps students understand why marijuana is not medicine by focusing on the criteria and process for approving medications in the United States.

I hope you will use this article, as well as the accompanying lesson plan and work sheet, to help your students become more knowledgeable about the facts surrounding this timely issue.



Sincerely,

Nora D. Volkow, M.D.  
 Director,  
 National Institute on Drug Abuse

# THE MYTH OF "MEDICAL MARIJUANA"

**Overview:** The lesson below and the reproducible work sheet on the reverse side reinforce student comprehension of key facts and concepts in the article "The Myth of 'Medical Marijuana.'"

### Alignment With National Standards

- *Science (NSES):* Life Science: Structure and Function in Living Systems; Science in Personal and Social Perspectives: Personal and Community Health
- *Life Skills (McREL):* Self-Regulation; Thinking and Reasoning

## Lesson

### Before-Reading Questions:

- What do you know about "marijuana as a medicine"?
- What is an ingredient in marijuana that has "medicinal" qualities? What symptoms can it help relieve?
- How do people know that the medicines they take are safe and effective?

- How does marijuana meet, or not meet, current FDA standards for prescription medications? (*Marijuana does not meet current standards because it is a plant, so its ingredients are inconsistent from plant to plant; it contains more than 400 different chemicals, many with unknown effects; it has not been shown to have clinical benefits that outweigh its risks.*)

### After-Reading Questions

Distribute the student work sheet, and discuss the answers to the following questions as a class (factual responses in *italics*):

- What U.S. government agency is responsible for approving medications? Why is this agency necessary? (*The Food and Drug Administration [FDA]. To protect citizens by making sure that drugs actually do what the drug manufacturers say they do; that the benefits outweigh any negative side effects; that medications are consistent from dose to dose.*)
- What are key stages involved in the approval process for prescription medications in the United States? (*Nonclinical testing in laboratories; applying to the FDA; clinical testing in humans; FDA approval*)
- How does Marinol® (synthetic THC) meet FDA standards? (*Marinol® is a synthetic version of THC that has been approved as a medication because its ingredients can be carefully measured and reproduced; Marinol® has proven effects in clinical trials for relieving nausea and vomiting from cancer chemotherapy and reversing severe weight loss in patients suffering from AIDS.*)
- What are some other differences between marijuana and THC in an approved form? (*Smoking marijuana causes health problems such as chronic cough and increased risk of bronchitis; prescription medications with THC do not have the same respiratory effects as smoked marijuana.*)

### WORK SHEET ANSWER KEY

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

### More Information

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## In This Installment:

- **Student article:** Why marijuana is not medicine, and how medications are approved in the United States.
- **Student work sheet:** Identifying key facts and concepts regarding the myth of "medical marijuana."

Name \_\_\_\_\_ Date \_\_\_\_\_

# What Do You Know About “Medical Marijuana”?



Answer the following questions to show what you learned in the student article.

1. Which of the statements below is **not true**?
  - (A) The FDA must approve any medicine before it can be sold in the United States.
  - (B) Marinol®, an FDA-approved medication, is a synthetic (i.e., human-made) version of THC.
  - (C) A new drug must pass only one phase of clinical testing to be approved by the FDA as a medicine.
  - (D) Drug companies must prove to the FDA that they can produce a medication of a consistent quality.
2. Phase 2 clinical testing of a drug involves testing the drug in \_\_\_\_\_.
  - (A) the general population
  - (B) teenagers
  - (C) the elderly
  - (D) patients with the disease or condition the drug is meant to treat
3. The process for getting FDA approval for a new medication can take more than \_\_\_\_\_.
  - (A) 15 years
  - (B) 15 months
  - (C) 15 weeks
  - (D) 2 years
4. Which of the following is a **true** statement?
  - (A) THC is the plant name for marijuana.
  - (B) THC stands for *top health concern*.
  - (C) THC is one of the active ingredients in marijuana.
  - (D) THC is a slang term used for marijuana.
5. Why hasn't marijuana been approved as a medicine by the FDA?
  - (A) Using marijuana in its raw plant form may pose more risks than benefits.
  - (B) Marijuana does not have well-defined and measurable ingredients that are the same each time it is used.
  - (C) Marijuana has not gone through the FDA approval process to show that it offers more benefit than harm.
  - (D) All of the above are correct.
6. Clinical testing of new drugs in humans is done on both healthy people and sick patients.
  - (A) True
  - (B) False
7. Drug companies must prove that the benefits of a drug outweigh any harmful side effects before it can be FDA-approved.
  - (A) True
  - (B) False
8. The first step toward approval of a new medication is testing it on several hundred people.
  - (A) True
  - (B) False
9. Marijuana contains more than 400 different chemicals, including THC.
  - (A) True
  - (B) False
10. Marijuana is not a medicine, but some of the chemicals found in marijuana are used in medicines.
  - (A) True
  - (B) False
11. The U.S. government recognizes marijuana as a legal medication.
  - (A) True
  - (B) False

# Compilation 2011-12

## Teacher Editions

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- For the **Spanish/English Poster**, refer to **NIH Pub No. AVD224S**.

