

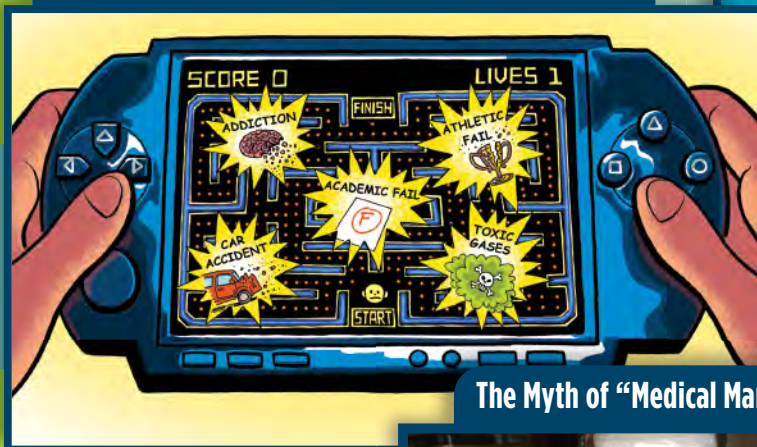


Heads Up: **Real News** **About Drugs** and Your Body

Brought to you by Scholastic and the scientists at the National Institute on Drug Abuse,
National Institutes of Health, U.S. Department of Health and Human Services

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MARIJUANA FACTS: BREAKING DOWN THE MYTHS



Marijuana use among teens had been on the decline since the mid-1990s—until now. According to the 2010 *Monitoring the Future* survey, teen marijuana use is no longer declining; in some cases, it is even increasing, particularly among eighth graders, the youngest group studied.

Why? One possibility is that some teens don't see marijuana as harmful . . . or at least *that* harmful. In fact, that same survey shows that in recent years, fewer teens think using marijuana regularly is risky at all.

Why are more teens so convinced that using marijuana isn't harmful? The answer to this question may be right in front of you—on your music player, your cell phone, your computer, or your TV. In fact, the myth that marijuana is no big deal is nearly everywhere.

"The messages getting to young people are very mixed and probably contributing to the misperception that marijuana isn't dangerous or harmful," says Dr. Susan Weiss, a scientist at the National Institute on Drug Abuse (NIDA). "We are concerned about this because we know that as teens' perception of risk goes down, their use goes up."

To make smart decisions about marijuana use and your health, you need to know essential facts about the effects of marijuana.

SCIENTIFIC FACT

Marijuana is addictive.

The main active ingredient in marijuana, THC (delta-9-tetrahydrocannabinol), stimulates brain cells to release the chemical dopamine, which creates a feeling of pleasure. This effect is partly responsible for the "high" a person feels when he or she smokes marijuana. It is one of the main reasons people use marijuana again and again, which can lead to addiction.

You may be surprised to know that 1 in 11 adults who use marijuana become addicted. And the younger someone starts smoking, the higher the risk. One in six people who start in their teens will become addicted.

SCIENTIFIC
FACT

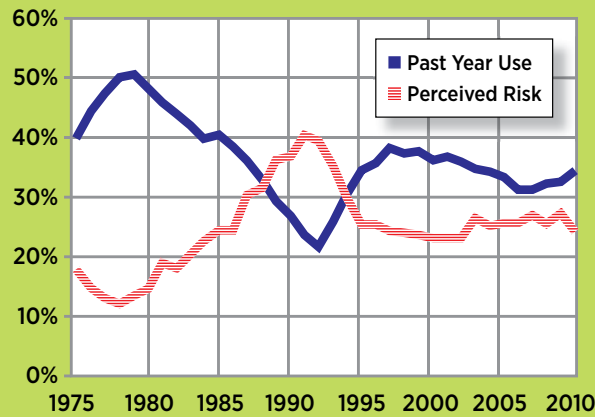
Marijuana use can negatively affect your performance in school and athletics.

THC affects a part of the brain called the hippocampus, which is critical for processing and storing new information, making it difficult to learn. THC also affects attention, impairing your ability to do complex tasks that require focus and concentration. These effects can last even after the high is long gone, especially for frequent users of marijuana, and that can make it harder for them to do well in school.

In fact, research has shown that compared with those who don't smoke marijuana, students who do are more likely to drop out.

What about sports? THC also affects parts of the brain that control timing,

Percentage of U.S. 12th-Grade Students Reporting Marijuana Use vs. Perceived Risk of Marijuana Use



Source: University of Michigan, 2010 *Monitoring the Future Study*

This graph shows that when more teens perceive marijuana use to be risky, marijuana use among teens decreases. When more teens believe marijuana use is *not* harmful, use of the drug increases.

Marijuana Facts: Now You Know

Q: Why do people say that marijuana is a "gateway" drug?

—Student, McCreary Academy, Kentucky

A: Most people who use other "harder" drugs used marijuana first, but not everyone who uses marijuana will go on to use other drugs. One reason may be that marijuana tends to be more available to teens, so it's often one of the first drugs they try. It may then put teens in contact with others who use drugs, perhaps increasing the availability of other drugs. But "gateway" drug or not, marijuana has its own risks.

—David Shurtleff,
Acting Deputy Director, NIDA

For more information on drugs, go to <http://teens.drugabuse.gov> or www.scholastic.com/headsup.

SCIENTIFIC
FACT

Driving under the influence of marijuana is dangerous.

The skills you need to drive safely—alertness, concentration, coordination, judgment, and reaction time—are controlled by the parts of your brain affected by THC. This means that smoking marijuana seriously increases the likelihood of a car accident.

Some people think they can compensate for the effects of marijuana by driving

Important Resources

- For immediate help with a crisis, call **1-800-273-TALK**.
- To locate a treatment center, call **1-800-662-HELP** or visit <http://findtreatment.samhsa.gov>.

SMOKING MARIJUANA CAN HURT YOUR ABILITY TO . . .

- concentrate
- remember what you learned
- focus on projects or tasks
- react quickly while driving
- perform in sports owing to effects on coordination

more slowly or paying closer attention to the road. But that does not work, especially when combined with even a small amount of alcohol.

In fact, marijuana (sometimes in combination with other drugs and alcohol) is the most common illegal drug found in the systems of drivers who die in car accidents (up to 14 percent). Bottom line: It's not safe to drive after smoking marijuana or to ride with a driver who has been smoking marijuana.



THE SCIENCE OF MARIJUANA

HOW THC AFFECTS THE BRAIN

Some people believe smoking marijuana carries no risks. But scientific research shows that there are risks, especially for teens. Marijuana affects a person's judgment and can impair his or her ability to drive. For those who use it regularly, it can lead to poor academic performance, or even addiction.

So how does marijuana have such a big impact on a person's ability to function?

Scientists have asked themselves that question for a long time. And after several decades of research they not only figured out how marijuana works, but scientists also discovered an important communications system in the brain and the body, which they called **the endocannabinoid system** after the cannabis plant from which marijuana comes.

"Endo"—what?

Understanding the science of marijuana began in the mid-1960s with the identification of THC (delta-9-tetrahydrocannabinol) as marijuana's main active ingredient. Twenty years later, scientists identified the sites in the brain and body where marijuana acts and called them cannabinoid (CB) receptors.

Scientists then discovered the body's own natural

chemicals—anandamide and 2-AG (2-arachidonoyl glycerol)—which also act on CB receptors. These chemicals (called cannabinoids), along with their receptors, make up the endocannabinoid (EC) system.

The EC system is found in many areas of the brain, which explains

why it affects so many different body functions. Cannabinoids exert their influence by regulating how cells communicate—how they send, receive, or process messages. Cannabinoids act like a type of "dimmer switch," slowing down communication between cells.

The Endocannabinoid System

Brain cells (neurons) communicate with each other by sending chemical messages. The chemicals (neurotransmitters) cross a gap between neighboring neurons before attaching to their specific receptors.

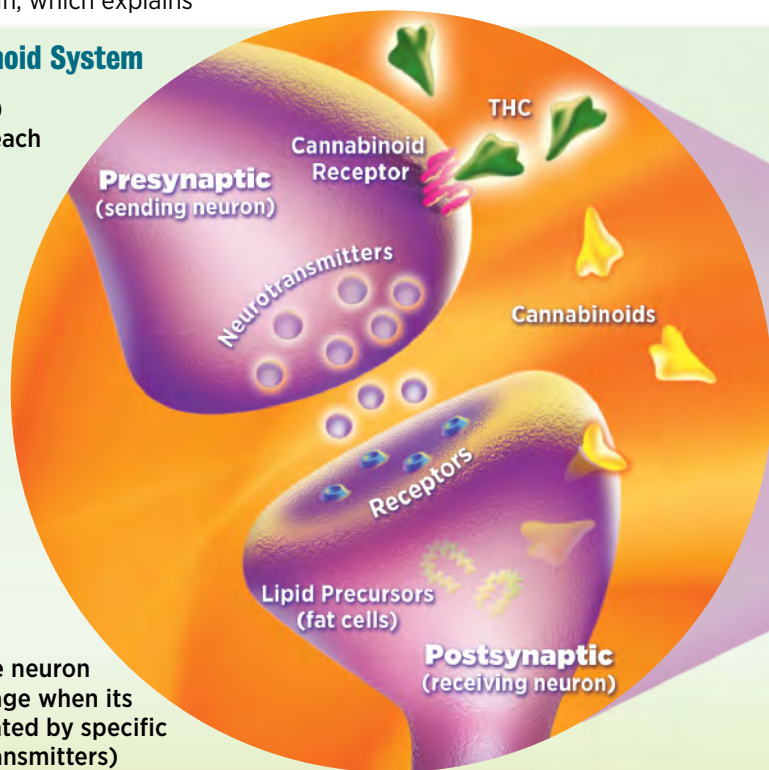
Presynaptic:

The neuron sending a message by releasing a chemical when signaled to do so

Postsynaptic: The neuron receiving the message when its receptors are activated by specific chemicals (neurotransmitters)

Neurotransmitters: The chemical messengers that travel from one brain cell to another

Receptors: Activated by neurotransmitters, receptors trigger a set of events that allows a message to be passed along to other neurons



Cannabinoids: Natural chemicals (anandamide and 2-AG) that bind to cannabinoid receptors in the brain and the body

THC: The main active ingredient in marijuana; THC, also a cannabinoid, interferes with the normal functioning of the endocannabinoid system

Visit scholastic.com/headsup/endocannabinoid to learn more about how cannabinoids can change how brain cells communicate.

Marijuana leaf illustration: © iStockphoto.

Marijuana Facts: Now You Know

Q: How can I help my brother? He smokes marijuana day and night.

—Student, Middlebury Union High, Vermont

A: Your brother is fortunate to have a strong supporter like you. You can't make him stop, but you can help him by showing your support, pointing out some of the consequences of his using drugs (including its effect on your relationship), and encouraging him to participate in nondrug-related activities (e.g., does he like to skate, bike, or go to the movies?). If you're worried that your brother's use is dangerous, talk to an older sibling or a trusted adult, like your parents, a teacher, or a counselor at school to get guidance.

If your brother is ready to stop smoking, or wants more information on how to find help, call 1-800-662-HELP or go to www.findtreatment.samhsa.gov anytime, 24 hours a day, 7 days a week, to find a treatment facility in your area.

—Michelle Leff, Intramural Research Program, NIDA

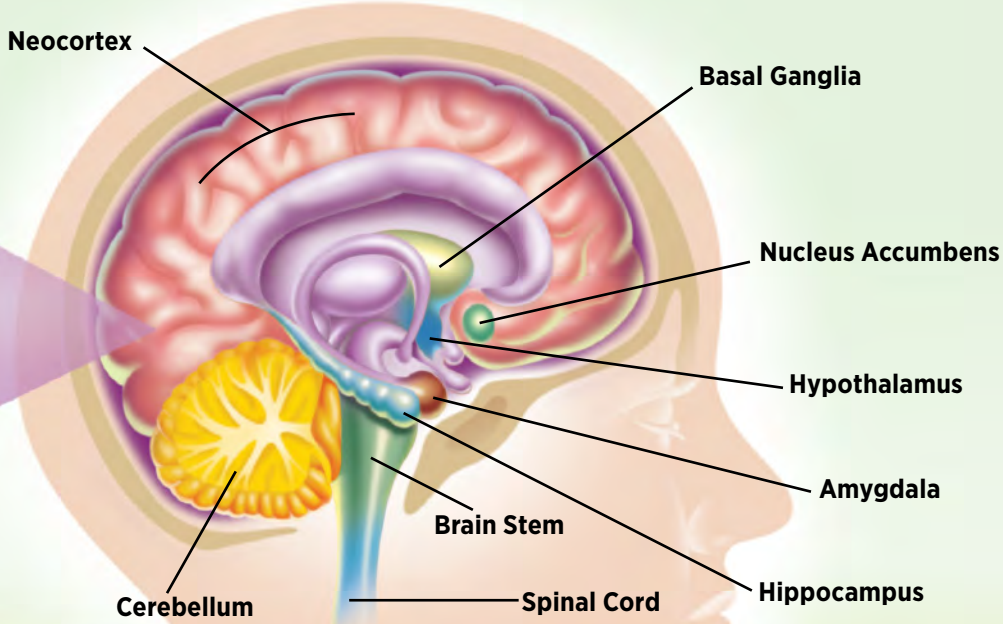
So how does THC affect the EC system?

When someone smokes marijuana, THC gets into the brain rapidly and attaches to cannabinoid receptors. The natural EC system is finely tuned

to react appropriately to incoming information. But THC overwhelms the EC system. It prevents the natural chemicals from doing their job properly and throws the whole system off balance.

For more facts about marijuana and other drugs, visit teens.drugabuse.gov or scholastic.com/headsup.

How does THC affect behavior? *It depends on where the CB receptors are in the brain.*



Brain Structure	Regulates	THC Effect on User
Amygdala	emotions, fear, anxiety	panic/paranoia
Basal Ganglia	planning/starting a movement	slowed reaction time
Brain Stem	information between brain and spinal column	antinausea effects
Cerebellum	motor coordination, balance	impaired coordination
Hippocampus	learning new information	impaired memory
Hypothalamus	eating, sexual behavior	increased appetite
Neocortex	complex thinking, feeling, and movement	altered thinking, judgment, and sensation
Nucleus Accumbens	motivation and reward	euphoria (feeling good)
Spinal Cord	transmission of information between body and brain	altered pain sensitivity

The brain structures illustrated above all contain high numbers of CB receptors.



THE MYTH OF “MEDICAL MARIJUANA”



In the United States, medications must be FDA-approved. Marijuana is not.

well-defined and measurable ingredients that are the same each time a person takes a dose. That means one pill has to have the same amount of medicine as the next. This way, a doctor can determine what dose to prescribe and how often a patient should take it.

Also, marijuana has harmful effects, especially when it is smoked, that must be considered. Smoking marijuana can cause a

chronic cough and increased risk of bronchitis and other lung infections. It can also interfere with learning and memory, affect driving (especially if combined with alcohol), make some people anxious and paranoid, and can lead to addiction.

Why Do Some People and States Consider Marijuana to Be Medicine?

Some of the *ingredients* in marijuana, such as THC (delta-9-tetrahydrocannabinol), have medicinal effects. And some people get relief from symptoms of their illnesses by smoking marijuana. **However, using marijuana as medicine does not make it medicine.** It has not gone through the FDA approval process to show that its benefits outweigh its risks.

More than a dozen states and the District of Columbia have legalized the use of marijuana for medicinal purposes, but under federal law, marijuana remains *illegal*. So—*is marijuana medicine*? The short answer is **NO**. However, some of the chemicals found in marijuana have been developed into medications, and more medications may be on the way.

To understand why marijuana is not medicine, it helps to know how medications are approved in the United States.

The FDA Testing Process

All medicines in the United States must be approved by the Food and Drug Administration (FDA). The FDA is the government agency that is responsible for making sure that medications are safe and effective **AND** that their likely benefits are greater than any possible harmful effects. This requires careful scientific testing. If a drug doesn't meet FDA standards, it will not be approved and cannot be prescribed or sold as medicine in the United States.

Why Isn't Marijuana an FDA-Approved Medication?

Marijuana comes from the plant *Cannabis sativa*. It contains more than 400 different chemicals—many with unknown effects—which differ from plant to plant. For something to be a medicine, it must have

Did You Know? There is no such thing as “medical-grade marijuana.” The marijuana sold as “medicine” in dispensaries is the same as marijuana sold on the street and carries the same health risks.

FDA-Approved Medications Made From THC

Although marijuana is not medicine, there are some medications that do contain THC. Marinol® is synthetic (i.e., human-made) THC made into a pill. It is FDA-approved to relieve nausea and vomiting in cancer patients undergoing chemotherapy. It is also used to reverse severe weight loss in patients with AIDS.

Another medication, Sativex®, is a mouth spray made from a combination of two ingredients from the marijuana plant (THC and cannabidiol). Sativex® has been approved in Canada and the United Kingdom to relieve cancer pain and symptoms of multiple sclerosis and is currently going through FDA testing in the United States.

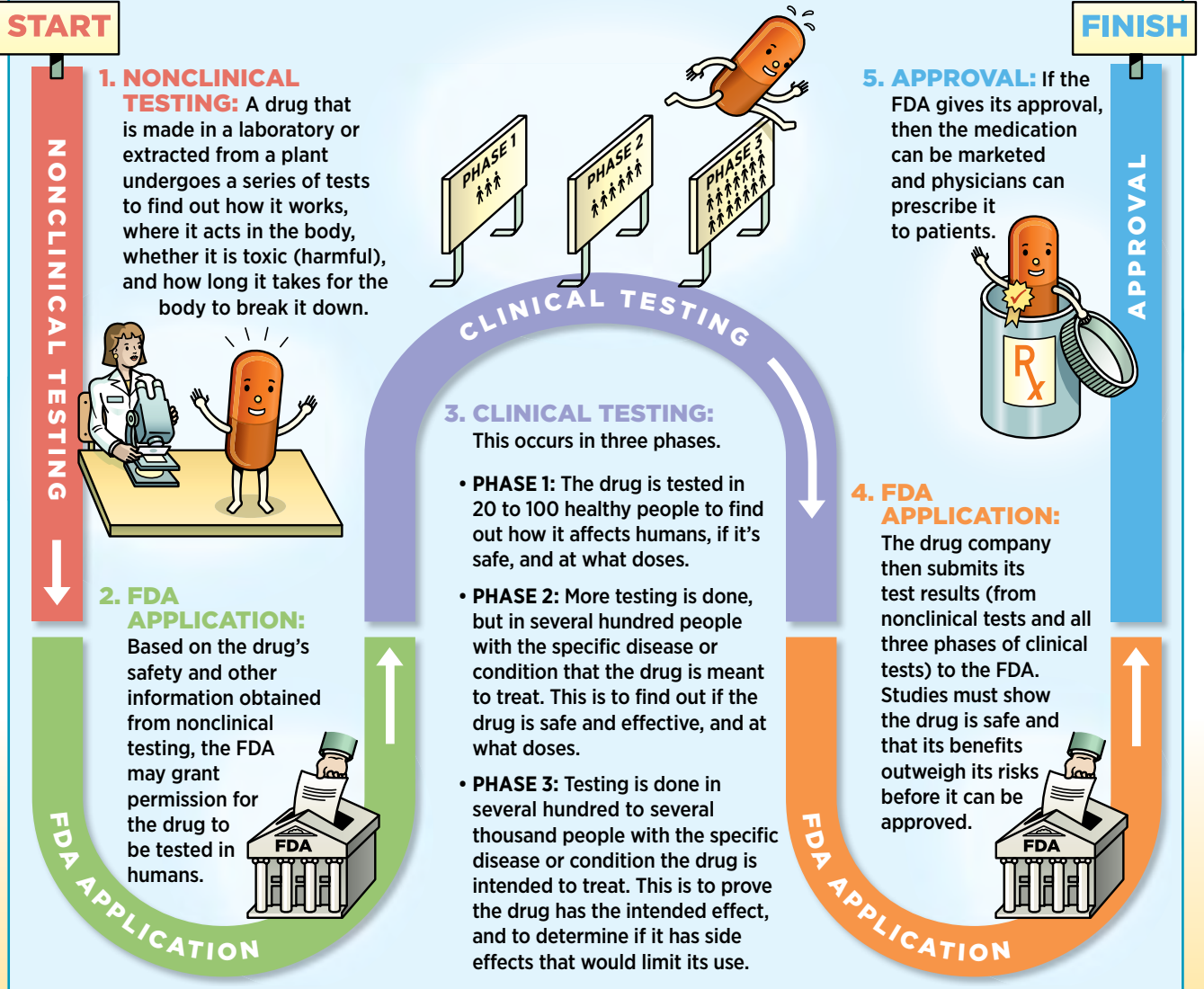
New medications that act on the

cannabinoid system (where the THC in marijuana acts) are being developed to treat a variety of symptoms, but with fewer side effects than smoked marijuana. For more on THC and the cannabinoid system, read “The Science of Marijuana” at scholastic.com/headsup/marijuana-science.

► For additional facts about marijuana and other drugs, visit teens.drugabuse.gov or scholastic.com/headsup.

HOW MEDICINE IS MADE: THE PATH TO APPROVAL

Almost everyone has used a prescription medication to help treat or cure an illness. In fact, about 4 billion prescriptions were filled in the United States in 2010. Few people, however, know that it can take more than 15 years and as much as \$2 billion for a new drug to go from the research lab to a patient’s medicine cabinet. So what’s the path from testing to approval?



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Student Edition

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