

How Marijuana Works

Marijuana is the single most-used illicit drug in the United States. Despite being illegal, marijuana use rivals the popularity of browsing Internet. In 1998, more than 76.5 million Americans logged onto the Internet, according to Computer Industry Almanac. In that same year, more than 71 million Americans over the age of 12 admitted that they have used marijuana at least once in their lifetime.



Marijuana is the dried buds and leaves of the *Cannabis sativa* plant. This plant contains more than 400 chemicals, including delta-9-tetrahydrocannabinol (THC), the plant's main psychoactive chemical. THC is known to affect our brain's short-term memory. Additionally, marijuana affects motor coordination, increases your heart rate and raises levels of anxiety. Studies also show that marijuana contains cancer-causing chemicals typically associated with cigarettes.

Marijuana comes from the *Cannabis sativa* plant and is the most commonly used illicit drug in the United States.

Although banned by the U.S. federal government in 1937, there were 11 million current users of the drug in 1999, according to the Substance Abuse & Mental Health Services Administration, "current" meaning that they had used the drug within 30 days of the survey. In this article you will learn about marijuana, why this drug is so popular and what effects it has on your mind and body.

Cultivation of the *Cannabis sativa* plant dates back thousands of years. The first written account of cannabis cultivation is found in Chinese records dating from 28 B.C., according to the book "Buzzed: The Straight Facts About the Most Used and Abused Drugs from Alcohol to Ecstasy." However, the book's authors point out that the plant was likely cultivated long before then. They recount the discovery of a nearly 3,000-year-old Egyptian mummy containing traces of THC, the main psychoactive chemical in marijuana. It could be that cannabis was used as some type of medicinal herb during this time.



Cannabis sativa is perhaps the most recognizable plant in the world. Pictures of the ubiquitous green cannabis leaf show up in the news media, textbooks and drug-prevention literature, and the leaf's shape is made into jewelry, put on bumper stickers and clothing and spray-painted on walls. The leaves are arranged palmately, radiating from a common center like the fingers of a hand spreading apart. Although most people know what the cannabis plant looks like, they may know very little about its horticulture.

Cannabis sativa is believed to be a native plant of India, where it possibly originated in a region just north of the Himalayan mountains. It is a herbaceous annual that can grow to a height of between 13 and 18 feet (4 to 5.4 meters). The plant has flowers that bloom from late-summer to mid-fall. Cannabis plants usually have one of two types of flowers, male or female, and some plants have both. Male flowers grow in elongated clusters along the leaves and turn yellow and die after blossoming. Female flowers grow in spike-like clusters and remain

dark green for a month after blossoming, until the seed ripens. Hashish, which is more powerful than marijuana, is made from the resin of the cannabis flowers.

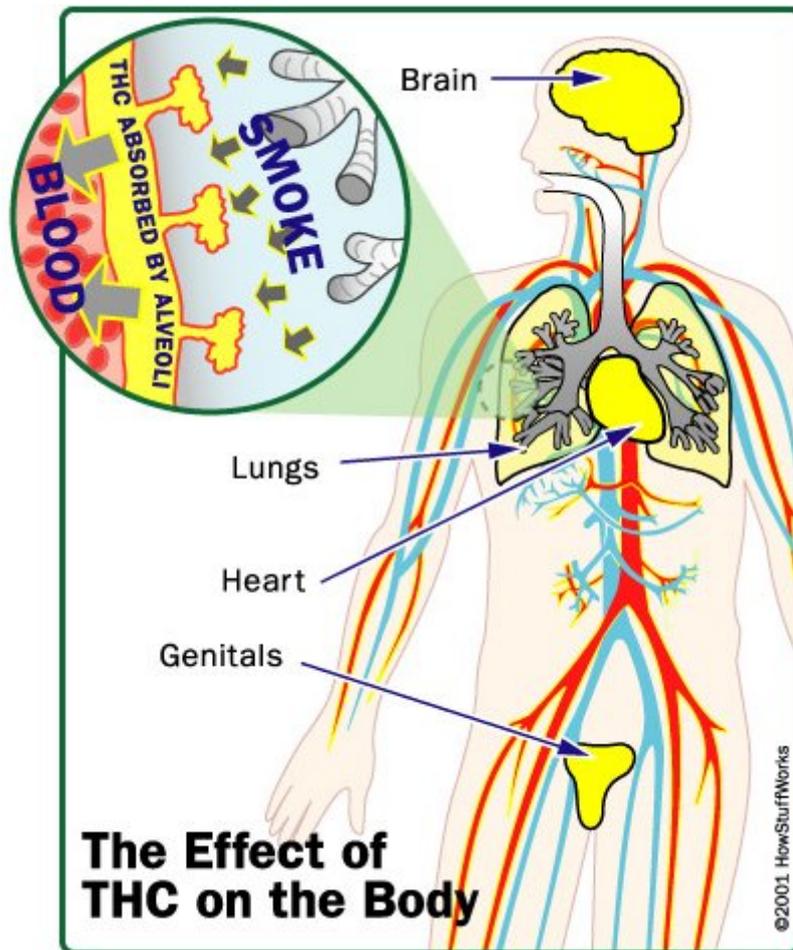
Marijuana plants contain more than 400 chemicals, 60 of which fit into a category called cannabinoids, according to the National Institutes of Health. THC is just one of these cannabinoids, but it is the chemical most often associated with the effects that marijuana has on the brain. Cannabis plants also contain choline, eugenol, guaicol and piperidine. The concentration of THC and other cannabinoids varies depending on growing conditions, plant genetics and processing after harvest. You'll learn more about the potency of THC and the toxicity of marijuana later.

Hemp Products

The Cannabis sativa plant has many uses. Its stiff, fibrous stalk can be used to make lots of products, from food to ship sails. The stalk is comprised of two parts — the hurd and the bast. The bast provides fibers that can be woven into many fabrics. These fibers (also called hemp) are woven to create canvas, which have been used to make ship sails for centuries.

The hurd provides pulp to make paper, oil to make paints and varnishes, and seed for food. Cannabis plants produce a high-protein, high-carbohydrate seed that is used in granola and cereals. Hemp oil and seed contain only trace amounts of psychoactive chemicals.

Owning hemp products, such as hemp rope or a hemp shirt, is legal. However, it is illegal to grow or possess marijuana in plant or drug form in the United States. Possession of the cannabis plant or marijuana is punishable by fines and possible jail sentences.

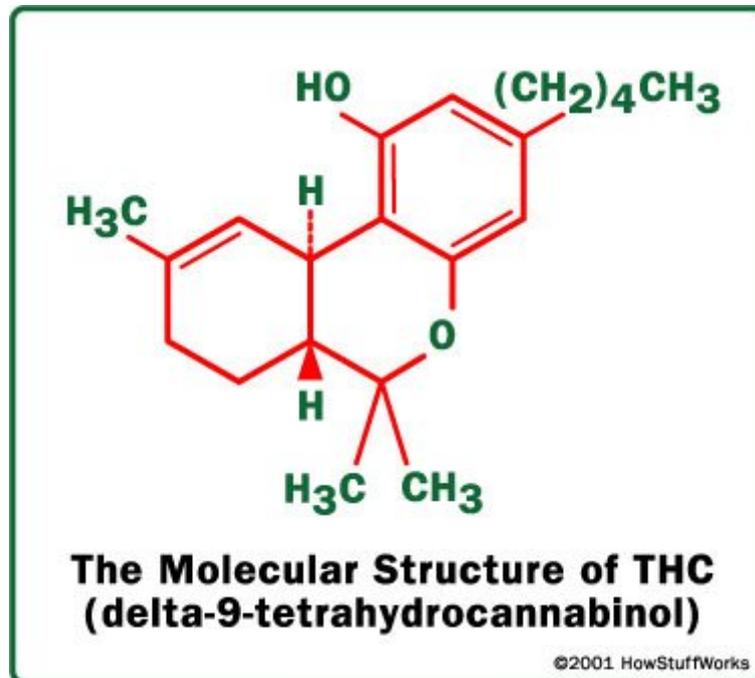


Every time a user smokes a marijuana cigarette or ingests marijuana in some other form, THC and other chemicals enter the user's body. The chemicals make their way through the bloodstream to the brain and then to the rest of the body. The most powerful chemical in marijuana is THC (delta-9-tetrahydrocannabinol), which is primarily responsible for the "high" associated with the drug.

The most common way of using marijuana is smoking. Smoking is also the most expedient way to get the THC and other chemicals into the bloodstream. When the smoke from marijuana is inhaled, the THC goes directly to the lungs. Your lungs are lined with millions of alveoli, the tiny air sacs where gas exchange occurs. These alveoli have an enormous surface area — 90 times greater than that of your skin — so they make it easy for THC and other compounds to enter the body. The smoke is absorbed by the lungs just seconds after inhaling.

You can also eat marijuana. In this case, the marijuana enters the stomach and the blood absorbs it there. The blood then carries it to the liver and the rest of the body. The stomach absorbs THC more slowly than the lungs. When marijuana is eaten, the levels of THC in the body are lower, but the effects last longer.

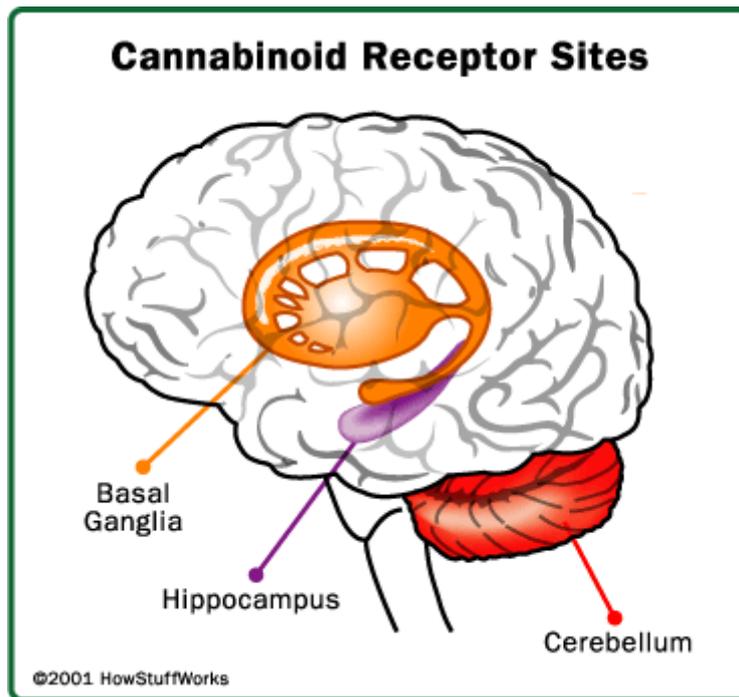
THC is a very potent chemical compared to other psychoactive drugs. An intravenous (IV) dose of only one milligram (mg) can produce serious mental and psychological effects. Once in your bloodstream, THC typically reaches the brain within seconds after it is inhaled and begins to go to work.



Marijuana users often describe the experience of smoking marijuana as initially relaxing and mellow, creating a feeling of haziness and light-headedness. The user's eyes may dilate, causing colors to appear more intense, and other senses may be enhanced. Later, feelings of a paranoia and panic may be felt by the user. The interaction of the THC with the brain is what causes these feelings. To understand how THC acts on the brain, you need to know about the parts of the brain that are affected by the chemical.

Here are the basics:

- Neurons are the cells that process information in the brain. Chemicals called neurotransmitters allow neurons to communicate with each other.
- Neurotransmitters fill the gap, or synapse, between two neurons and bind to protein receptors, which enable various functions and allow the brain and body to be turned on and off.
- Some neurons have thousands of receptors that are specific to particular neurotransmitters.
- Foreign chemicals, like THC, can mimic or block actions of neurotransmitters and interfere with normal functions.



In your brain, there are groups of cannabinoid receptors concentrated in several different places. These cannabinoid receptors have an effect on several mental and physical activities, including:

- Short-term memory
- Coordination
- Learning
- Problem solving

Cannabinoid receptors are activated by a neurotransmitter called anandamide. Anandamide belongs to a group of chemicals called cannabinoids. THC is also a cannabinoid chemical. THC mimics the actions of anandamide, meaning that THC binds with cannabinoid receptors and activates neurons, which causes adverse effects on the mind and body.

High concentrations of cannabinoid receptors exist in the hippocampus, cerebellum and basal ganglia. The hippocampus is located within the temporal lobe and is important for short-term memory. When the THC binds with the cannabinoid receptors inside the hippocampus, it interferes with the recollection of recent events. THC also affects coordination, which is controlled by the cerebellum. The basal ganglia controls unconscious muscle movements, which is another reason why motor coordination is impaired when under the influence of marijuana.

In addition to the brain, marijuana affects many other parts of the body. Marijuana is filled with hundreds of chemicals, and when it is burned, hundreds of additional compounds are produced. When marijuana is inhaled or ingested in some other form, several short-term effects occur.

Some of these effects are:

The Munchies

One peculiar phenomenon associated with marijuana use is the increased hunger that users feel, often called the “munchies.” Research shows that marijuana increases food enjoyment and the number of times a person eats each day, according to the National Institutes of Health.

Until recently, the munchies were a relative mystery. However, a recent study by Italian scientists may explain what happens to increase appetite in marijuana users. Molecules called endocannabinoids bind with receptors in the brain and activate hunger.

This research indicates that endocannabinoids in the hypothalamus of the brain activate cannabinoid receptors that are responsible for maintaining food intake. The results of the study were published in an April 2001 issue of the scientific journal *Nature*.

- Problems with memory and learning
- Distorted perception
- Difficulty with thinking and problem solving
- Loss of coordination
- Increased heart rate
- Anxiety, paranoia and panic attacks

The initial effects created by the THC wear off within an hour or two after using marijuana, but the chemicals stay in your body for much longer. The terminal half-life of THC is from about 20 hours to 10 days, depending on the amount and potency of the marijuana used. This means that if you take one milligram of THC that has a half-life of 20 hours, you will still have 0.031 mg of THC in your body more than four days later. The longer the half-life, the longer the THC lingers in your body.

Research shows that marijuana is not physically addictive, but it can be psychologically addictive. It's not considered physically addictive because users show few or no withdrawal symptoms during cessation. Psychological dependence usually develops because a person's mind craves the high that it gets when using the drug.

Beyond the psychological effects that marijuana has, marijuana smokers are susceptible to the same health problems as tobacco smokers, such as bronchitis, emphysema and bronchial asthma. Other effects include dry-mouth, red eyes, impaired motor skills and impaired concentration. Long-term use of the drug can increase the risk of damaging the lungs and reproductive system, according to the U.S. Drug Enforcement Agency (DEA). It has also been linked to heart attacks.

Although marijuana is known to have negative effects on the human body, there is a raging debate over the use of marijuana as a medical treatment. Some say that marijuana should be legalized for medical use because it has been known to suppress nausea, relieve eye pressure in glaucoma patients, decrease muscle spasms, stimulate appetite, stop convulsions and eliminate menstrual pain. Others claim that marijuana's negative effects outweigh its benefits. There are currently nine U.S. states that allow for the use of marijuana for medical purposes: Alaska, Arizona, California, Colorado, Hawaii, Maine, Nevada, Oregon and Washington.

Potency

Whether marijuana is more potent today than it was in 30 or 40 years ago is at the center of much debate. The U.S. federal government has released information saying that the levels of potency have risen anywhere from 10 to 25 times since the 1960s. Is this a myth or reality?

Testing for Marijuana

An estimated 20 million workers are drug-tested annually in the United States at a cost of more than \$1 billion. The body metabolizes THC into about five metabolites before passing it into the body's urine, so drug tests are designed to detect the metabolites instead of THC. Detectable amounts of these metabolites remain in the system for several days to several weeks following marijuana use, depending on the level of use.

The most common test for detecting marijuana or any drug is the immunoassay. In this test, the urine is mixed with a solution containing an antibody specific to certain metabolites. The antibody is usually tagged with a fluorescent dye or radioactive substance. The amount of fluorescent light or radioactivity is measured to determine the concentration of metabolites in the sample.

Gas chromatography/mass spectrometry may also be used to test for THC metabolites.

"There's no question that marijuana, today, is more potent than the marijuana in the 1960s. However, if you were to look at the average marijuana potency which is about 3.5 percent, it's been relatively stable for the last 20 years. Having said that, it's very important that what we have now is a wider range of potencies available than we had in the 1970s, in particular," Director of the National Institute on Drug Abuse Alan Leshner said in 1999 while testifying in front of the U.S. House Subcommittee on Crime.

Those who support the legalization of marijuana say that the data is skewed because testing was only performed on marijuana of specific geographic origins in the 1960s and 1970s, and therefore is not representative of marijuana potency overall. Officials obtained the samples from a type of Mexican marijuana that is known to contain low levels of THC — 0.4 to 1 percent. When these levels are compared to other types of marijuana, it looks as if potency levels have risen in the last 30 years.

Typical THC levels, which determines potency, range from 0.3 to 4 percent. However, some specially grown plants can contain THC levels as high as 15 percent. Several factors are involved in determining the potency of a marijuana plant, including:

- Growing climate and conditions
- Plant genetics
- Harvesting and processing

The time at which the plant is harvested affects the level of THC. Additionally, female varieties have higher levels of THC than male varieties. As a cannabis plant matures, its chemical composition changes. During early development, cannabidiolic acid is the most prevalent chemical. Later, cannabidiolic acid is converted to cannabidiol, which is later converted to THC when the plant reaches its floral maturation.

To determine the average potency levels of marijuana, researchers need to examine a cross section of cannabis plants, which wasn't done in the 1960s and 1970s. This makes it difficult to make accurate comparisons between the THC levels of that time period and the THC levels of today.

Marijuana is readily available in almost every corner of the United States, according to the Department of Justice. It's found growing in homes, on farms, in the suburbs and in the city. Cannabis is frequently found growing on public land, often in remote locations to prevent observation and identification of the growers. In 1999, the U.S. Forest Service seized almost 1 million pounds (453,592 kg) of cannabis plants and processed marijuana in 35 states. Marijuana is also smuggled into the United States from Mexico, Cambodia and Thailand, among other countries.



There is a growing trend toward indoor cultivation of marijuana in the United States because of the DEA's efforts to curtail outdoor cultivation. Indoor growers cultivate cannabis in closets, fish tanks and elaborate greenhouses. Some growers have even built structures that look like real homes but lack interior walls, all to hide their marijuana-growing operations. In 1998, drug law enforcement authorities seized 2,616 indoor marijuana-growing operations.

More than 71 million Americans over the age of 12 had tried marijuana as of 1998, which is more than 25 percent of the national population. Frequent usage is lower than it was in 1979, when 13.2 percent of the U.S. population over the age of 12 was using marijuana on a monthly basis. In 1999, it had declined to 5.1 percent.

Street Slang

There are hundreds of slang words that mean "marijuana" (some refer to specific types). Here are just a few:

- Airplane
- Astro turf
- Aunt Mary
- Black Bart
- Boom
- Bud
- Charge
- Chiba chiba
- Chunky
- Dagga

- Dinkie dow
- Endo
- Ganja
- Haircut
- Hay
- Mary Jane
- Matchbox
- Maui wauie
- Sezz
- Yellow submarine
- Zambi

Source: U.S. Drug Enforcement Agency (DEA)

There are several ways in which people use marijuana, and the way in which it is used determines the amount of chemicals transferred into the body, according to the authors of "Buzzed." Here are the most common methods of use:

- Cigarette - Also called a joint, dried marijuana buds are rolled into a cigarette. Approximately 10 percent to 20 percent of the THC is transferred into the body when smoking a joint.
- Cigar - Some users slice open a cigar, remove the tobacco and refill it with marijuana. The marijuana-filled cigar is often called a blunt.
- Pipe - You've probably seen people smoke pipes of tobacco, but these pipes are also used to smoke marijuana. About 40 percent to 50 percent of the THC is transferred into the body when using a pipe.
- Bong - These are water pipes that typically have a long tube rising out of a bowl-shaped base. Water pipes trap the smoke until it's inhaled, raising the amount of THC taken in.
- Food - Marijuana is sometimes baked into foods, such as brownies, or brewed as tea.

With millions of users, marijuana use is not limited to one demographic group. It cuts across all racial and economic boundaries. However, marijuana use is highest among younger people. The prevalence of marijuana use in teenagers doubled from 1992 to 1999: One out of every 13 kids aged 12 to 17 were current users of marijuana in 1999. The 1998 National Center on Addiction and Substance Abuse indicates that marijuana is very easy to obtain. Half of all 13-year-olds said that they can find and purchase marijuana, according to the study. Of teens surveyed, 49 percent said that they had first tried marijuana at age 13 or younger.

Buying, selling, using or growing marijuana is illegal in every part of the United States. Penalties vary from place to place, but usually consist of jail time, a fine or both. In some states, you can be arrested for just being in a place where you know drug activity is taking place. The severity of the penalty varies on several factors:

- Quantity - Penalties vary based on the amount of marijuana found in the person's possession.
- Selling - Penalties are more severe for those intending to sell.
- Growing - Penalties are also more severe for those cultivating cannabis.
- Location - A person arrested for selling marijuana near a school will often face harsher penalties.

This page from NORML includes a state-by-state guide to marijuana penalties. European visitors to this site can find out all about European laws as well. [Click here](#) to see the federal trafficking penalties for marijuana in the United States.

Jail sentences and fines have done little to suppress the use of marijuana in the United States. Despite the health and legal risks that come with using marijuana (or any illicit drug), it continues to be the illegal drug of choice for many Americans, as it has for decades.