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U.S. Department of Health and Human Services
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DrugFacts

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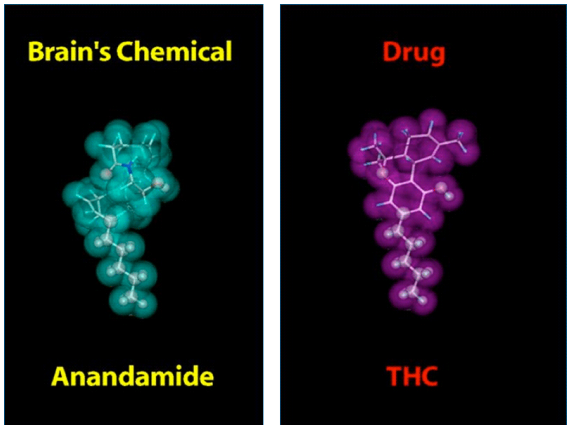
Marijuana

Marijuana refers to the dried leaves, flowers, stems, and seeds from the hemp plant *Cannabis sativa*, which contains the psychoactive (mind-altering) chemical delta-9-tetrahydrocannabinol (THC), as well as other related compounds. This plant material can also be concentrated in a resin called *hashish* or a sticky black liquid called *hash oil*.

Marijuana is the most common illicit drug used in the United States. After a period of decline in the last decade, its use has been increasing among young people since 2007, corresponding to a diminishing perception of the drug's risks that may be associated with increased public debate over the drug's legal status. Although the federal government considers marijuana a Schedule I substance (having no medicinal uses and high risk for abuse), two states have legalized marijuana for adult recreational use, and 21 states have passed laws alo lowing its use as a treatment for certain medical conditions (see "Is Marijuana Medicine?", below).

How Is Marijuana Used?

Marijuana is usually smoked in hand-rolled cigarettes (joints) or in pipes or water pipes (bongs). It is also smoked in blunts—cigars that have been emptied of tobacco and refilled with a mixture of marijuana and tobacco. Marijuana smoke has a pungent and distinctive, usually sweet-and-sour, odor. Marijuana can also be mixed in food or brewed as a tea.



THC's chemical structure is similar to the brain chemical anandamide. Similarity in structure allows drugs to be recognized by the body and to alter normal brain communication.

How Does Marijuana Affect the Brain?

When marijuana is smoked, THC rapidly passes from the lungs into the bloodstream, which carries the chemical to the brain and other organs throughout the body. It is absorbed more slowly when ingested in food or drink.

However it is ingested, THC acts on specific molecular targets on brain cells, called cannabinoid receptors. These receptors are ordinarily activated by chemicals similar to THC that naturally occur in the body (such as anandamide; see picture, above) and are part of a neural

communication network called the endocannabinoid system. This system plays an important role in normal brain development and function.

The highest density of cannabinoid receptors is found in parts of the brain that influence pleasure, memory, thinking, concentration, sensory and time perception, and coordinated movement. Marijuana overactivates the endocannabinoid system, causing the "high" and other effects that users experience. These effects include altered perceptions and mood, impaired coordination, difficulty with thinking and problem solving, and disrupted learning and memory.

Marijuana also affects brain development, and when it is used heavily by young people, its effects on thinking and memory may last a long time or even be permanent. A recent study of marijuana users who began using in adolescence revealed substantially reduced connectivity among brain areas responsible for learning and memory. And a large long-term study in New Zealand showed that people who began smoking marijuana heavily in their teens lost an average of 8 points in IQ between age 13 and age 38. Importantly, the lost cognitive abilities were not fully restored in those who quit smoking marijuana as adults. Those who started smoking marijuana in adulthood did not show significant IQ declines.

What Are the Other Health Effects of Marijuana?

Marijuana use may have a wide range of effects, particularly on cardiopulmonary and mental health.

Marijuana smoke is an irritant to the lungs, and frequent marijuana smokers can have many of the same respiratory problems experienced by tobacco smokers, such as daily cough and phlegm production, more frequent acute chest illness, and a heightened risk of lung infections. One study found that people who smoke marijuana frequently but do not smoke tobacco have more health problems and miss more days of work than those who don't smoke marijuana, mainly because of respiratory illnesses. It is not yet known whether marijuana smoking contributes to risk for lung cancer.

Marijuana also raises heart rate by 20-100 percent shortly after smoking; this

Is Marijuana Medicine?

Many have called for the legalization of marijuana to treat conditions including pain and nausea caused by HIV/AIDS, cancer, and other conditions, but clinical evidence has not shown that the therapeutic benefits of the marijuana plant outweigh its health risks. To be considered a legitimate medicine by the FDA, a substance must have well-defined and measureable ingredients that are consistent from one unit (such as a pill or injection) to the next. As the marijuana plant contains hundreds of chemical compounds that may have different effects and that vary from plant to plant, and because the plant is typically ingested via smoking, its use as a medicine is difficult to evaluate.

However, THC-based drugs to treat pain and nausea are already FDA approved and prescribed, and scientists continue to investigate the medicinal properties of other chemicals found in the cannabis plant—such as cannabidiol, a non-psychoactive cannabinoid compound that is being studied for its effects at treating pain, pediatric epilepsy, and other disorders. For more information, see http://www.drugabuse.gov/publications/drugfacts/marijuana-medicine

effect can last up to 3 hours. In one study, it was estimated that marijuana users have a 4.8-fold increase in the risk of heart attack in the first hour after smoking the drug. This risk may be greater in older individuals or in those with cardiac vulnerabilities.

A number of studies have linked chronic marijuana use and mental illness. High doses of marijuana can produce a temporary psychotic reaction (involving hallucinations and paranoia) in some users, and using marijuana can worsen the course of illness in patients with schizophrenia. A series of large studies following users across time also showed a link between marijuana use and later development of psychosis. This relationship was influenced by genetic variables as well as the amount of drug used, drug potency, and the age at which it was first taken—those who start young are at increased risk for later problems.

Associations have also been found between marijuana use and other mental health problems, such as depression, anxiety, suicidal thoughts among adolescents, and personality disturbances, including a lack of motivation to engage in typically rewarding activities. More research is still needed to confirm and better understand these linkages.

Marijuana use during pregnancy is associated with increased risk of neurobehavioral problems in babies. Because THC and other compounds in marijuana mimic the body's own endocannabinoid chemicals, marijuana use by pregnant mothers may alter the developing endocannabinoid system in the brain of the fetus. Consequences for the child may include problems with attention, memory, and problem solving.

Additionally, because it seriously impairs judgment and motor coordination, marijuana contributes to risk of injury or death while driving a car. A recent analysis of data from several studies found that marijuana use more than doubles a driver's risk of being in an accident. The combination of marijuana and alcohol is worse than either substance alone with respect to driving impairment.

Rising Potency

The amount of THC in marijuana samples confiscated by police has been increasing steadily over the past few decades. In 2012, THC concentrations in marijuana averaged close to 15 percent, compared to around 4 percent in the 1980s. For a new user, this may mean exposure to higher concentrations of THC, with a greater chance of an adverse or unpredictable reaction. Increases in potency may account for the rise in emergency department visits involving marijuana use. For frequent users, it may mean a greater risk for addiction if they are exposing themselves to high doses on a regular basis. However, the full range of consequences associated with marijuana's higher potency is not well understood. For example, experienced users may adjust their intake in accordance with the potency or they may be exposing their brains to higher levels overall, or both.

Is Marijuana Addictive?

Contrary to common belief, marijuana is addictive. Estimates from research suggest that about 9 percent of users become addicted to marijuana; this number increases among those who start young (to about 17 percent, or 1 in 6) and among people who use marijuana daily (to 25-50 percent).

Long-term marijuana users trying to quit report withdrawal symptoms including irritability, sleeplessness, decreased appetite, anxiety, and drug craving, all of which can make it difficult to abstain. Behavioral interventions, including cognitive-behavioral therapy and motivational incentives (i.e., providing vouchers for goods or services to patients who remain abstinent) have proven to be effective in treating marijuana addiction. Although no medications are currently available, recent discoveries about the workings of the endocannabinoid system offer promise for the development of medications to ease withdrawal, block the intoxicating effects of marijuana, and prevent relapse.

How Does Marijuana Affect a User's Life?

Research shows marijuana may cause problems in daily life or make a person's existing problems worse. Heavy marijuana users generally report lower life satisfaction, poorer mental and physical health, more relationship problems, and less academic and career success compared to non-marijuana-using peers. For example, marijuana use is associated with a higher likelihood of dropping out of school. Several studies also associate workers' marijuana smoking with increased absences, tardiness, accidents, workers' compensation claims, and job turnover.

Learn More

For additional information on marijuana and marijuana abuse, please see http://www.drugabuse.gov/publications/research-reports/marijuana-abuse