Cannabis (Marijuana)
Information for Health Professionals

Introduction

Cannabis is the general term used to describe marijuana, hashish, and hashish oil. Each of these substances is derived from the hemp plant, *Cannabis sativa*, which grows in almost any climate. There are over 500 chemical components identified in cannabis. Over 100 of these are cannabinoids, which are unique to the plant genus *Cannabis*, have a terpenophenolic structure, and act on the cannabinoid receptors. The cannabinoid delta-9-tetrahydrocannabinol (THC) is the major psychoactive chemical in cannabis products and produces the "high" associated with cannabis use. Another cannabinoid, cannabidiol (CBD), has little to no psychoactive effects, and counteracts the effects from THC. The amount of each cannabinoid found in cannabis is highly dependent on the strain.

Cannabis does not fit into the usual classification of drug groups. It generally has depressant effects, yet it increases the user's heart rate like a stimulant. It can also produce hallucinations in large doses, but this is not a usual side effect.

Although cannabinoids have potential therapeutic uses (e.g., pain, anti-nausea, anti-seizure, muscle relaxation, decreased intraocular pressure for glaucoma), there is a lack of current evidence to support using cannabinoids instead of conventional treatments. A prescription formulation of THC plus CBD is marketed in Canada for the treatment of spasticity and/or neuropathic pain in multiple sclerosis and cancer pain. Prescription synthetic cannabinoids are also available to treat nausea.

Cannabis preparations

Marijuana ("pot", "dope", "grass", "weed", "ganja", "MJ")

Marijuana is the dried, chopped-up flowering tops and leaves (usually including seeds and stems) of the cannabis plant. It ranges in colour, from grey-green to greenish-brown, and in texture, from a fine powder to a coarse substance resembling tea. Hydroponic marijuana is obtained from plants that have been grown in nutrient-enriched water, rather than soil.

Traditionally, marijuana is usually smoked in hand-rolled cigarettes (joints or reefers), in cigars (blunts), or in pipes. Alternatively, hookah pipes (bongs) can be used to smoke cannabis; recently, electric vaporizers have also become a method of ingestion. Cannabis products can also be eaten, usually when cooked into food such as brownies or cookies; however, eating cannabis is less efficient than smoking since there is incomplete absorption from the intestine.

Levels of THC in marijuana has risen, with anywhere from 1-30% THC content in a given sample.

Hashish ("hash")

Hashish is the dried, sticky resin of the cannabis plant. It comes in solid pieces ranging in colour from light brown to black, and in texture from dry and hard to soft and crumbly.

Hashish sold in North America generally contains 2 – 20% THC, but can contain upwards of 60% THC. It is usually smoked in a water pipe (bong), or cigarette with tobacco or marijuana.

Hash oil ("oil", "honey oil")

Obtained by purifying hashish with a solvent, hash oil is a thick, greenish-black or reddish-brown oil. The THC concentration is generally 15 – 50%. Hash oil is usually dropped into a tobacco cigarette or rubbed into tobacco and smoked.

Cannabis edibles

Cannabis edibles are food or drink products made with cannabis flower or extract. They can contain entire leaves or very finely ground material; semi-refined material like hashish, sinsemilla or resin; or moderately to highly refined cannabis extracts and concentrates such as hash oil.

As many of the compounds have been removed and THCA has been converted into a psychoactive cannabinoid, edibles may contain high levels of THC and only a small amount of the cannabis plant's other constituents. As a result, there can be substantial variation in the amount and homogeneity of cannabinoids included in an edible product, which makes it difficult to control how much THC is consumed.

How cannabis works

When marijuana is inhaled, THC is passed from the lungs into the bloodstream. Blood then carries cannabinoids to the brain and other parts of the body. The effects of smoking are felt within a few minutes, take about one hour to fully develop, and last two to four hours; however, performance of complex tasks may be impaired for as long as 24 hours. When cannabis is ingested, the body absorbs cannabinoids at a slower rate, causing the effects to appear more gradually, last longer, and be more difficult for the user to anticipate as the dosage taken is harder to control once ingested. Because many compounds are removed from the flower to edible process, edibles may also contain high levels of THC. THC and other cannabinoids are distributed into body fat, and peak concentrations in fatty tissues are reached in 4-5 days. Low levels of cannabinoids can be excreted into urine for several days, even after a single dose, where complete elimination of THC from a single dose may take up to 30 days.

Endocannabinoids like anandamide are naturally produced by the body to activate cannabinoid receptors. These compounds play a role in intracellular signaling that affects the release of certain neurotransmitters. The cannabinoid receptor CB1 is primarily located in the brain while the CB2 receptor is located primarily in the spleen and other immune system cells, with limited expression in the brain.

Both THC accumulation and CB1 receptors are concentrated in the motor and limbic regions of the brain. The binding of THC to the CB1 receptor alters the user's perceptions and mood and disturbs motor coordination, pain sensory perception, memory function, learning, and judgement. It also stimulates the release of dopamine, activating the reward system in the brain. When THC binds to CB2 receptors, immune system function decreases. CBD weakly binds to the CB1 and CB2 receptors and reduces the binding of THC to these receptors. CBD also interacts with other receptors.

The effect a person experiences when using drugs depends on a variety of circumstances. Factors such as how the drug is being taken, the amount of drugs consumed, expectations and mood of the user, previous history of drug use, and the setting all influence how the drug will impact the user. A user can experience the effects of cannabis even in two or three milligram doses of THC. For an occasional user, a brief, pleasurable "high" can result. A regular heavy user on the other hand, may smoke five or more 500 mg joints each containing 5 mg or more of THC per day.

Short-term effects

The most common effect of cannabis use is the "high", a sensation similar to mild alcohol intoxication. The user experiencing a high feels calm, relaxed and talkative, and sensory perception seems enhanced. Colours may appear brighter and sound may seem more distinct. The user may misjudge the passage of time so minutes seem like hours, and appetite often increases.

The physical effects of cannabis use include rapid heartbeat, red eyes, and dry mouth and throat. The increased heart rate and effects on blood pressure can be dangerous in people who are older, or who have heart disease or high blood pressure.

Cannabis use impairs perception, judgment, balance, motor coordination and reaction times. It makes driving or operating machinery particularly dangerous. Driving tests have found that definite, dose-related impairment occurs with marijuana use, presumably because of impairment in attentional processes (tracking behaviour) and perceptual abilities; however, the impairment of driving behaviour by cannabis is less than predicted from laboratory testing. Drivers are aware of perceived impairment, and compensate by slowing down and driving more cautiously; therefore, drivers using cannabis tend to underestimate their driving ability. This contrasts with drivers using alcohol, who tend to overestimate their driving performance die to alcohol- induced impairment of judgment.

Data from the 2012 Canadian Alcohol and Drug Monitoring Survey (CADUMS) revealed that 2.6% of drivers in Canada admitted driving within two hours of using cannabis at least once in the previous 12 months. Driving under the influence of cannabis has shown to increase the likelihood of a collision. Those who drive while impaired by cannabis are at risk of being involved in a seriously injuring or fatal collision by two or three times. Research has shown that users who drive while under the influence of cannabis also show greater variability in maintaining a steady position in the lane, consistent distance behind cars and a steady rate of speed. Although drivers may take compensatory precautions when driving under the influence of cannabis, they experience a decreased ability to handle unexpected events. Reaction times, tracking performance and ability to divide attention are all compromised.

Some people also drink alcohol while using cannabis. Driving under the influence of both cannabis and alcohol has shown to significantly increase the risk of a collision.

Memory, attention span and learning are impaired while the user is intoxicated. The more cannabis is used, the longer the effects may last. Cannabis use during the school years can cause significant problems for students.

Some cannabis users withdraw from others, or experience fearfulness and anxiety. Panic, terror, or paranoia may occur at high doses; however, those who are afflicted with psychiatric illness may be more susceptible to the effects of THC at lower doses. Very large doses can produce effects similar to those of LSD and other hallucinogens, paranoid delusions, disorientation, and severe agitation. People who have

suffered head trauma, or are cognitively or developmentally delayed tend to be more prone to such reactions.

Long-term effects

Smoking cannabis damages the lungs and contributes to respiratory problems, like chronic coughing and lung infections. The levels of tar, hydrogen cyanide, and nitrosamines in cannabis are similar to those in tobacco. Heavy marijuana users have lung damage similar to the kind that precedes lung cancer in tobacco smokers. There are also reports suggesting that people who smoke both marijuana and tobacco may develop lung, neck, and head cancers at an earlier age than those who smoke only tobacco.

Heavy marijuana use can lead to anxiety, personality disturbances and depression. Long-term users are less able to focus attention and filter out irrelevant information. These problems are subtle, but last for many years after use has stopped.

Cannabis use has also been associated with increased levels of psychotic illnesses and experiences. Recent research has shown that cannabis use contributes to the development of schizophrenia in people who are vulnerable to it, and may cause relapses in those who have schizophrenia.

Long-term cannabis use is sometimes associated with lack of ambition and motivation, and reduced communication and social skills.

People who use drugs to avoid dealing with difficulties generally make their problems worse. When young people frequently use mood-altering substances, they often fail to learn many of the normal lessons of maturing. They may not learn how to handle their own emotions, how to take on responsibilities, and how to make thoughtful and considered decisions. The substance becomes an emotional crutch, even if it is not physically addicting. This period of time has been labeled "emerging adulthood".

Research has shown that chronic marijuana use in adolescence is associated with sleep, memory, thinking, attention and emotional difficulties, and can have a negative effect on brain development. Chronic cannabis users in high school are more likely to use other illicit drugs and have poor school performance and education outcomes. Those who transition from chronic users in high school to non- or infrequent-users in early adulthood show similar development patterns as their non-user counterparts.

Cannabis and pregnancy

Women who may be pregnant should avoid using marijuana, as THC is passed on to the baby via blood vessels in the placenta. Regular cannabis use during pregnancy is associated with increased risk for premature delivery and low-birth weight infants. Using cannabis during pregnancy is also associated with a variety of major birth defects, including abnormal development of the brain and heart. Children exposed to cannabis prenatally may have mild withdrawal symptoms at birth and subtle behavioral and learning problems as they get older. They are also more likely to start using cannabis as well. Women who are breastfeeding should avoid using cannabis, as concentrated THC is passed on to the baby through breast milk.

Tolerance and dependence

Regular heavy users of cannabis develop tolerance, which is a need for more of the drug to produce the same effect. Heavy long-term use of cannabis can cause dependence. Users who are dependent on cannabis often feel unable to quit. They may have problems with friends and family, unstable finances, low life satisfaction and difficulties with sleeping and remembering things.

Data from the 2012 Canadian Community Health Survey — Mental Health reported that 1.3% of Canadians aged 15 and older that year met the criteria for cannabis abuse or dependence. Males were found to have higher rates of abuse/dependence issues with cannabis than females (1.9% vs. 0.7%).

Withdrawal and treatment

A cannabis user may experience cravings for the mood-altering effects of the drug, and withdrawal occurs if drug use is abruptly stopped. Symptoms, which usually last less than a week, include troubled sleep, irritability, sweating, anxiety, upset stomach and loss of appetite. Withdrawal may increase drug-seeking behaviour and contribute to continued drug use.

Heavy users often require considerable support, and possibly admission to a rehabilitation centre to overcome their dependence on cannabis. Unlike withdrawal from alcohol dependence, it is generally considered less dangerous to go through marijuana withdrawal unsupervised.

Between 2006 and 2011, the costs associated with hospitalization due to cannabis increased 52%, from approximately 9 million to 14 million during this time. This increase was mainly due to the increase in cannabis-related disorders among youth aged 15–24. Among Albertans receiving treatment services in 2013, 49% reported using cannabis in the previous year. The majority (75%) of services used were outpatient programs.

Who uses cannabis?

The use of cannabis in Canada is not restricted to any particular geographical region or part of society. Cannabis users are found in all age groups and at all education and income levels.

After alcohol, cannabis is the most commonly used substance in Canada. The national prevalence of cannabis use in the past 12 months based on survey data is 20.1%; this is double the global prevalence. In Alberta, cannabis use is lower than the national average. The province also has the second lowest provincial user rate, with 8.9% of residents reporting use within the last 12 months. With this being said, Alberta has amongst the highest lifetime use (37.3%).

According to the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS), 17% of students in grades 7-12 between 2016 and 2017 had reported using cannabis in the previous 12 months. The average age of initiation for cannabis use among Canadian youth is 14.2 years. The World Health Organization found that past 30 day cannabis use by Canadian youth was the second highest of countries surveyed.

Legalization and regulation

In April 2017, the Government of Canada introduced legislation to legalize and regulate cannabis. The federal legislation would:

- set the minimum age for purchase and use at 18 years of age, with the option for provinces to increase the age limit
- enable a regulatory regime for the licensed production of cannabis, which would be controlled by the federal government
- enable a regulatory regime for the distribution and sale of cannabis, which would be controlled by the provincial government
- establish new provisions to address drug-impaired driving, as well as making several changes to the overall legal framework to address alcohol impaired driving

Federal and provincial governments share responsibility for overseeing the new system. Provinces are responsible for certain activities, such as workplace safety, distribution and wholesaling, and public consumption.

In October 2017, the Government of Alberta unveiled its proposed Cannabis Framework. The Cannabis Act (Bill C-45) was passed in June 2018 and enforced on October 17, 2017, making adults 18 years of age or older able to legally:

- possess 150 grams of fresh, legally produced cannabis
- possess and share (with adults) up to 30 grams of legally-produced cannabis in public
- buy dried or fresh cannabis and cannabis oil from a provincially-licensed retailer
- grow up to four cannabis plants from licensed seed per household
- make cannabis products, such as food and drinks, as long as organic solvents are not used to create concentrated products

Commercially available cannabis edibles are to be available by October 2019.

The current program for accessing cannabis for medical reasons has continued under the new legislation. The *Access to Cannabis for Medical Purposes Regulations* (ACMPR) permits Canadians to access cannabis for medical purposes after being authorized by their health care practitioner. Canadians that have been authorized have the option of purchasing cannabis from a producer licensed by Health Canada, and can grow a limited amount of cannabis for their own use, or designate someone to grow cannabis on their behalf.

Cannabis and the law

Possession of cannabis over the limit, illegal distribution, and production beyond limits or with combustible solvents are illegal and penalties can range from small tickets to up to 14 years in prison.

Taking cannabis across Canada's borders, giving or selling cannabis to a person under 18, or using a youth to commit a cannabis-related offence can all result in up to 14 years in prison.

References

Abramovici, H. (2013). *Information for health care professionals: Cannabis (marihuana, marijuana) and the cannabinoids.* Ottawa, ON: Health Canada. Retrieved from http://www.hc-sc.gc.ca/dhp-mps/alt_formats/pdf/marihuana/med/infoprof-eng.pdf

Barrus, D. G., Capogrossi, K. L., Cates, S. C., Gourdet, C. K., Peiper, N. C., Novak, S. P., … Wiley, J. L. (2016). Tasty THC: Promises and challenges of cannabis edibles. *Methods Rep RTI Press*. Manuscript. doi: 10.3768/rtipress.2016.op.0035.1611

Canadian Centre on Substance Use and Addiction. (2017). *Canadian Drug Summary: Cannabis*. Ottawa, ON: Author. Retrieved from http://www.ccsa.ca/Resource%20Library/CCSA-Canadian-Drug-Summary-Cannabis-2017-en.pdf

Canadian Centre on Substance Use and Addiction. (2017). *Clearing the smoke on cannabis*. Retrieved from http://www.ccdus.ca/Eng/topics/Marijuana/Marijuana-Research/Pages/default.aspx

ElSohly, M., & Gul, W. (2014). Constituents in Cannbis Sativa. In R. G. Pertwee (Ed.), *Handbook of Cannabis* (pp. 3–22). Oxford, UK: Oxford University Press.

Fischer, B., Russell, C., Sabioni, P., van den Brink, W., Le Foll, B., Hall, W., … Room, R. (2017). Lower-risk cannabis use guidelines (LRCUG): An evidence-based update. *American Journal of Public Health*, *107*(8), e1-e12. doi: 10.2105/AJPH.2017.303818

Government of Canada. (2016). *Information for health care practitioners: Medical use of cannabis*. Retrieved from https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-use-marijuana/information-medical-practitioners.html

Government of Canada. (2016). *Understanding the new access to cannabis for medical purposes regulations*. Retrieved from https://www.canada.ca/en/health-canada/services/drugs-health-products/medical-use-marijuana/medical-use-marijuana.html

Government of Canada. (2017). *Legalization and regulation of cannabis*. Retrieved from https://www.canada.ca/en/services/policing/justice/legalization-regulation-marijuana.html

Government of Canada. (2018). *Bill C-45: Cannabis Act*. Retrieved from http://www.parl.ca/DocumentViewer/en/42-1/bill/C-45/royal-assent#enH861

Government of Canada. (2018). Cannabis legalization and regulation. Retrieved from http://www.justice.gc.ca/eng/cj-jp/cannabis/

Health Canada. (2013). *Canadian Alcohol and Drug Use Monitoring Survey (CADUMS)*. Ottawa, ON: Author. Retrieved from https://www.canada.ca/en/health-canada/services/health-concerns/drug-prevention-treatment/drug-alcohol-use-statistics/canadian-alcohol-drug-use-monitoring-survey-summary-results-2012.html

Heather, C. (2001). Pharmacology and effects of cannabis: a brief review. *The British Journal of Psychiatry*, *178*, 101–106. doi: 10.1192/bjp.178.2.101

Klein, R. F. X. (2017). Analysis of "marijuana edibles"—food products containing marijuana or marijuana extracts—an overview, review, and literature survey. *Microgram Journal, 14*(1-4), 9-32. Retrieved from https://www.dea.gov/documents/2017/01/01/analysis-marijuana-edibles-food-products-containing-marijuana-or-marijuana

McKiernan, A., & Fleming, K. (2017). *Canadian youth perceptions on cannabis*. Ottawa, ON: Canadian Centre on Substance Use and Addiction. Retrieved from http://www.ccsa.ca/Resource%20Library/CCSA-Canadian-Youth-Perceptions-on-Cannabis-Report-2017-en.pdf

National Institute on Drug Abuse. (2018). *Marijuana*. Retrieved from https://www.drugabuse.gov/publications/drugfacts/marijuana

Pertwee, R. (2008). The diverse CB1 and CB2 receptor pharmacology of three plant cannabinoids: Δ^9-tetrahydrocannabinol, cannabidiol and Δ^9-tetrahydrocannabivarin. *British Journal of Pharmacology*, *153*, 199–215. doi: 10.1038/sj.bjp.0707442

Statistics Canada. (2016). *Canadian Tobacco, Alcohol and Drugs Survey: summary of results for 2015.* Ottawa, ON: Author. Retrieved from https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2015-summary.html

Statistics Canada. (2018). *Canadian Student Tobacco Alcohol and Drugs (CTADS): 2017 summary*. Ottawa, ON: Author. Retrieved from https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2016-2017-summary.html

University of Calgary (Health Technology Assessment Unit). (2017). *Cannabis evidence series: An evidence synthesis*. Calgary, AB: Author. Retrieved from https://open.alberta.ca/dataset/cannabis-evidence-series-an-evidence-synthesis

World Health Organization. (2014). *Health Behaviour in School-aged Children (HBSC)*. Retrieved from www.hbsc.org/

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