



## STATE OF THE KNOWLEDGE

# Cannabis

### What is Cannabis?

Cannabis is the umbrella term for all the mind-altering substances that can be derived from the cannabis sativa plant. These include marijuana, which is the chopped up and dried flowering tops and leaves of the cannabis plant; hashish, which is its dried sticky resin; and hash oil, which is made by purifying hashish with a solvent. THC (delta-9-tetrahydrocannabinol) is the major mind-altering chemical in cannabis products.

Marijuana is usually smoked in hand-rolled cigarettes, cigars or pipes. It contains the lowest concentration (1-15%) of THC depending on the growing technique. Hashish (hash) is usually smoked in a pipe, water pipe or mixed in a tobacco or marijuana cigarette. In North America, it contains between 2-20% THC. And hash oil, which is usually smoked in a tobacco cigarette, can contain anywhere between 10-60% THC. All cannabis products can be eaten; the effects appear more gradually, last longer and are more difficult to control than when the substances are smoked.

### Prevalence and Trends

Surveys indicate that cannabis is the most widely used illicit drug in the western world (third most popular psychoactive substance after tobacco and alcohol), with a substantial proportion of young adults in these countries having used cannabis at some time in their lives. On a worldwide scale the United Nations estimated in 1999 that 141 million people (2.5% of the planet's population) use marijuana.

Canadian trends are difficult to determine due to the fact that there have only been two national surveys specific to drugs (1989,

and 1994) and only some provinces conduct regular surveys of the student population. The Canadian Senate Special Committee report on cannabis published in 2002 noted that in Canada the "knowledge of patterns and contexts of cannabis use verges on the abysmal." Extrapolating from the data available, the Senate Committee nonetheless concluded that approximately 10% of the Canadian population over the age of 18 years have used cannabis during the previous year.<sup>27</sup>

This finding is supported by a Leger Marketing poll conducted in April 2003. This poll also found that Canadians living in BC are most likely to have smoked marijuana, with 53% of British Columbians having smoked marijuana in their lifetime.<sup>20</sup>

Epidemiological research indicates a clear division in cannabis use by generation and gender: people under the age of 35 consume more than those over 35; and men are more frequent consumers than women. In addition, users are more likely to be single.<sup>1, 13, 22, 27, 30</sup>

In jurisdictions where cannabis is prohibited, its use is generally discontinued by individuals when they are in their mid-to-late twenties.<sup>4, 14</sup>

Continued cannabis use is most common among those who: 1) initiate use early; 2) are tobacco smokers and heavy consumers of alcohol; and 3) have used other illicit drugs.<sup>12, 13</sup>

Significantly, cannabis consumption rates vary widely from one country to another with no apparent relation to public policy.<sup>27</sup>

This State of the Knowledge paper has been produced by the Kaiser Foundation for the BC Partners for Mental Health and Addiction Information, with funding from the Ministry of Health Services.

It is one of a series describing the knowledge currently available on various key topics. We have collected the most current and accurate evidence available, and distilled it into an easily-digestible format designed to inform from a balanced perspective.

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**Who's Smoking Marijuana in Canada? 20**

	18-24	24-34	35-44	45-54	55-64	65 +
Never smoked	42 %	42 %	42 %	52 %	77 %	89 %
Smoked in past year	36 %	24 %	8 %	8 %	3 %	1 %
Smoked in past 10 years	18 %	18 %	9 %	6 %	4 %	3 %
Smoked, but not in past 10 years	2 %	15 %	39 %	32 %	16 %	7 %

the user. These include the quantity of marijuana used, the content of the THC in the marijuana being used, the expectations of the user, the context in which the using occurs, and the user's previous experience with marijuana.<sup>27</sup>

**Effects at lower doses**

At low doses, most people feel more relaxed, less inhibited, and euphoric (often accompanied by enhanced sociability or giddy behaviour). The enjoyment of music, food and sex can be enhanced, and other sensory phenomena are experienced as clearer and more distinct. These experiences are accompanied by impairment of some psychomotor skills, short-term memory, and concentration. The user experiences a dry mouth and may become very hungry and thirsty. As the euphoria passes the user may feel sleepy or depressed. Anxiety, fear, distrust, or panic has also been reported by some users even at lower doses.<sup>24</sup>

**Effects of high doses**

At very high doses there may be an increased risk of experiencing psychotic symptoms (auditory and visual hallucinations). This may occur at lower doses among those with a personal or family history of psychosis.<sup>11,22</sup>

Other factors that appear to be related to cannabis-induced psychosis include first use, oral ingestion, and multiple substance use. Noteworthy on this topic of induced psychosis is that heavy alcohol use and most other forms of drug use can also induce acute psychotic reactions. When cannabis-induced psychosis is experienced, recovery generally occurs within a week of abstinence. While there remains some

**Short Term Effects**

**Physiology**

Upon entering the blood stream (usually by smoking marijuana) the THC is carried throughout the body, including the brain. Within the brain THC bonds to specific sites on the nerve cells referred to as cannabinoid receptors and effects the way these cells function. Cannabinoid receptors are abundant in regions of the brain that are associated with movement, coordination, learning and memory, and higher cognitive functions such as judgement and pleasure.<sup>24</sup>

**Phenomenology (subjective experiences)**

From the user's perspective cannabis combines many of the properties of alcohol, tranquilizers, opiates and hallucinogens. As a result it can have anxiolytic (tension or anxiety-reducing), sedative, analgesic (pain reducing), and psychedelic properties.<sup>5</sup>

These effects are experienced immediately after the drug reaches the brain and last from 1 to 4 hours. When ingested orally (usually mixed into food) the effects take 1/2 to 1 hour to occur and last from 4 to 6 hours.<sup>24</sup>

However, there are a number of factors which influence the subjective experience of

**Where is Marijuana Smoked in Canada? 20**

	Maritimes	Quebec	Ontario	Prairies	Alberta	B.C.
Never smoked	58 %	56 %	60 %	53 %	56 %	47 %
Smoked in past year	11 %	13 %	10 %	12 %	8 %	14 %
Smoked in past 10 years	11 %	11 %	7 %	8 %	9 %	10 %
Smoked, but not in past 10 years	18 %	19 %	20 %	25 %	25 %	29 %

### *What is the endogenous cannabinoid system?*

*Endogenous* means produced within the body.

The *cannabinoid receptors* are places in the brain that are stimulated by the active ingredient in cannabis.

The *endogenous cannabinoid system* is the body's natural system that stimulates the cannabinoid receptors.

Consuming cannabis is a way of manipulating this natural function of the body, by controlling when and how intensely the cannabinoid system is activated.

controversy among researchers, there is at present no clear evidence that cannabis can lead to a persistent psychotic illness.<sup>17,18,22,26,29</sup>

At the same time cannabis is an extremely safe substance in terms of its immediate effects. Animal research has demonstrated a tolerance of up to 1,000 mg/kg doses of Delta 9 Tetrahydrocannabinol (THC). In order to approximate this level of the drug in a human subject, it would be necessary to ingest 5,000 times the amount required to produce a high.<sup>22</sup>

As further evidence of this point, a study that examined the official British government statistics on deaths in the period between 1993-1995 concluded that there were no deaths that could be directly attributed to cannabis.<sup>16</sup>

Overall, there appears to be a consensus that occasional use of cannabis is not a major hazard to health and well-being.<sup>22,27</sup>

### **Long Term Effects**

It is on the question of the long term effects of cannabis that there appears to be greater debate among researchers, as well as more gaps in the scientific knowledge. In part this arises out of the difficulty in studying chronic effects in isolation. For example, many people who smoke marijuana also smoke tobacco which makes it difficult to distill the contribution of each toward a later diagnosis of chronic bronchitis. At the same time there have been significant advances over the last several decades that have resulted in greater certainty in regard to some health related questions.

Two recent major reviews of the literature reported that the current data have not demonstrated any clinically relevant effects on any organ system apart from the lungs, aside from the cardiac problems for individuals suffering from a cardiovascular

condition or hypertension.<sup>22,27</sup>

However, one of these reviews also noted a precautionary distinction in terms of the chronic effects of cannabis use based on the developmental characteristics of youth. They observed that “due to the potential effects on the endogenous cannabinoid system and cognitive and psychosocial functions, any use in those under age 16 is at-risk use.”<sup>27</sup>

### **Is Cannabis Dangerous?**

If one were to answer the question of danger in a narrow manner — just looking at the acute and chronic effects of the substance itself — the best data available, at the present time, limits the danger associated with cannabis to the respiratory system (and the cardiovascular system for those with antecedent conditions). This is not an insignificant danger, and it frequently brings forth comparisons with tobacco smoking.

### **How does cannabis compare to smoking tobacco?**

While it is still unclear whether smoking cannabis affects the respiratory function to a greater extent than smoking tobacco, this is hardly a positive comparison. Direct comparisons of tobacco and cannabis are difficult, however, as there are differences in how they are consumed. Cannabis is smoked without filters, and smokers tend to inhale more smoke more deeply and for longer periods than cigarette smokers. In the tar phase of the smoke, cannabis contains about 50% higher concentration of carcinogens (cancer-causing agents) than a comparable quantity of unfiltered tobacco. In addition, THC has a broncho-dilator effect that is thought to promote tar retention in the upper respiratory tract.<sup>22</sup>

Not surprisingly, heavy cannabis smoking is associated with asthma, chronic irritation of

## **Potential Adverse Effects of Marijuana <sup>14</sup>**

<b>Acute Use</b>	Anxiety, dysphoria, panic, cognitive impairment, psychomotor impairment, increased risk of traffic accident, psychosis, low-birthweight infants.
<b>Chronic Use</b>	Chronic bronchitis, squamous cell carcinoma, dependence, mild cognitive impairment, exacerbation of psychosis, cancers in offspring, impaired immunity.

## Is Marijuana a “Gateway” Drug?

Some people believe that marijuana use (particularly in young people) increases the likelihood of going on to use more serious drugs like cocaine and heroin. Three facts are cited to support this theory:

- Almost all people who used both marijuana and so-called “hard” drugs used marijuana first;
- Marijuana users are more likely than non-users to try other drugs;
- The greater the frequency of marijuana use, the greater the likelihood of using more serious drugs later.

While this evidence demonstrates a co-occurrence of marijuana use and more serious drug use, it does not support the conclusion that using marijuana *causes* people to use drugs like cocaine and heroin. The same argument could be made for alcohol or tobacco.

The facts used to support the gateway theory may be explained by other factors. Recent research indicates that:

- Some individuals have a higher propensity to use drugs in general;
- Usually opportunities to use marijuana arise earlier in life than opportunities to use other drugs.

These findings support the suggestion some people are simply more likely to use drugs (any drugs), and that almost all these people have the opportunity to use marijuana before they have the opportunity to use other drugs.

Additionally, it is worthwhile to note that the majority of cannabis users do not progress to using so-called “harder” drugs such as cocaine and heroin.

The evidence provides no clear conclusion on the question of marijuana being a gateway drug to using more serious drugs. While the available facts are consistent with the gateway theory, there are also alternative explanations that are consistent with the evidence.<sup>25</sup>

the nose and throat, bronchitis, emphysema, lung disease, and lung cancer.<sup>7</sup> While smoking cannabis has similar effects to tobacco on the lungs, there is no evidence that cannabis contributes to the progression of coronary artery disease, as smoking cigarettes does.<sup>15</sup>

### Are there other ways that cannabis can be considered dangerous?

If one were to address the question of danger in a broad manner – taking into account factors that go beyond the effects of chronic exposure – it becomes necessary to consider broader issues. Most commonly cited dangers of this type involve the effects of cannabis on the operation of motor vehicles, and in particular, the combined effects of alcohol and cannabis.

The Senate committee conducted a wide review of studies on the effect of cannabis on the ability to drive. Lateral control over a vehicle (the ability to maintain a straight trajectory) was the variable that is most sensitive to the effects of THC, however only heavy doses significantly affected lateral control. While there were variable findings regarding the impact of cannabis use on decision time, drivers under the

influence of cannabis did not respond as quickly to unexpected obstacles. However, using cannabis also causes drivers to decrease their speed, and reduce or avoid risk taking behaviour (for instance, leaving a large gap between the vehicle in front and their own, and not attempting to pass or make dangerous manoeuvres). The effects of cannabis diminish over time, with the evidence indicating that after 3 hours there is no significant impact on driving.

The conclusion of the Senate committee was that cannabis alone has little impact on the skills required for driving. However, the combined effects of cannabis and alcohol were greater than alcohol alone. This issue warrants particular concern, particularly given the fact that 19% of drivers among Ontario high school students said they drove a vehicle within an hour of smoking marijuana.<sup>2</sup>

## Medical Marijuana

The medical use of marijuana goes back at least two centuries. The primary therapeutic uses of cannabis are to relieve pain, increase appetite or prevent vomiting, and to alleviate painful spasms and spasticity

**Criminalization** means that use, production, and/or distribution of cannabis is a criminal offence.

**Decriminalization** refers to removing legal sanctions either by changing the law, or by collectively agreeing not to enforce existing laws.

**Legalization** refers to changing the legal status of cannabis, so that at least under some conditions it would no longer be a criminal offence to possess, use, produce, and/or distribute cannabis.

(particularly in multiple sclerosis).<sup>5</sup> Despite its illegality in the 20th century, patients have continued to obtain marijuana through the black market for self-medication. While anecdotal evidence as to its medical benefits abounds, there have been no clinical trials to date that establish marijuana's therapeutic efficacy.

### Canadian Context

In Canada the Marijuana Medical Access Regulations came into force on July 30, 2001. They specify that people suffering from serious illnesses can use marijuana in cases where conventional treatments are not appropriate or are not effective in providing relief of symptoms, and where the benefits of using marijuana outweigh the risks. Medical specialists are charged with determining whether or not these criteria are met.

Individuals can apply for permission to possess marijuana for medical purposes, which generally involve improving appetite (in patients with anorexia, severe nausea, or wasting), alleviating neurological symptoms (for instance in cases of multiple sclerosis or epilepsy), and easing pain associated with conditions such as cancer, AIDS, severe arthritis, or other forms of chronic pain.<sup>5,22,27</sup>

While the Marijuana Medical Access Regulations allow successful applicants to use cannabis for the designated purposes legally, there are a number of "loose ends" that have not been resolved. The regulations do not specify appropriate dosages, largely due to the lack of clinical trials to establish optimum dosage levels. To address the lack of clinical research into marijuana, Health Canada has declared that it is committed to a medical marijuana research strategy.

Another question around the access regulations is the lack of a legitimate source for approved individuals to obtain marijuana. In July 2003 Health Canada established interim guidelines whereby it would supply marijuana to qualifying individuals. So far these guidelines have created controversy and confusion.

### New Directions in Research

The medical use of cannabis, to date, has largely focused on symptomatic relief of a variety of conditions described above.

However, researchers are actively studying the biology of the endogenous cannabinoid system. The potential usefulness of cannabinoids is described as huge, with some suggesting that cannabis could be the "aspirin of the 21<sup>st</sup> century." One promising area of study is in the realm of neurological disease, where cannabinoids are showing evidence for being able to slow the progression of neurodegenerative disorders. Neurodegeneration is the main cause of morbidity in several diseases such as Huntington's, Parkinson's, Alzheimer's, and motor-neuron diseases and stroke. In addition, there is increasing experimental evidence of a neuroprotective effect of cannabinoids on head trauma. A small-scale study has shown that oral THC can inhibit tics in Tourette's syndrome. While much remains to be determined and refined, it is clear that cannabis has a variety of potential applications in the medical field.<sup>5</sup>

### The Legal Status of Cannabis

Debates around the legal status of cannabis are often heated. It is important to inform such discussion with balanced, evidence-based information.

The evidence does not demonstrate that criminalizing the use of any drug (including cannabis) effectively reduces level of use or degree of availability.<sup>28</sup> Legalization, however, would enable society to regulate use, production, and distribution of cannabis. To assess the impact of regulation, we can extrapolate available evidence from the regulation of other substances. Raising tobacco prices decreases the prevalence of use, particularly among young people.<sup>31</sup> Findings from the US and UK on alcohol and opiate regulation indicate that a balanced regulation of the market — neither too lax nor too tight — is the most effective way to minimize demand.<sup>21</sup> It is also likely that appropriate regulation in a legal environment would disengage the marijuana market from organized crime.<sup>9,25</sup>

The cost of enforcing cannabis laws in Canada is estimated to be about \$300 million per year.<sup>27</sup> US and Australian jurisdictions that have decriminalized marijuana have experienced significant savings in drug enforcement and other social costs.<sup>28</sup>

People under the influence of cannabis are not at increased risk of harming others. The greatest societal harms arising from cannabis are those involved with the black market resulting from its illegal status. However,

there is some evidence that driving under the influence of cannabis is a potential hazard, most notably when combined with alcohol.<sup>2, 27</sup> This issue would need to be addressed in any legalization framework.

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