# Clearing the Smoke on Cannabis

## Cannabis Use and Driving
### – An Update

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*This is the third in a series of reports that reviews the effects of cannabis use on various aspects of human functioning and development. This report on the effects of cannabis use on driving provides an update of a previous report with new research findings that validate and extend our current understanding of this issue. Other reports in this series address the effects of regular cannabis use on cognitive functioning and mental health, maternal cannabis use during pregnancy, and respiratory effects of cannabis use. This series is intended for a broad audience, including health professionals, policy makers and researchers.*

## Key Points

- Driving after using cannabis is more prevalent than driving after drinking, particularly among young drivers.
- Cannabis impairs the cognitive and motor abilities necessary to operate a motor vehicle and doubles the risk of crash involvement.
- After alcohol, cannabis is the most commonly detected substance among drivers who die in traffic crashes.
- New legislation has expanded the tools police have at their disposal to detect and arrest drivers who are impaired by cannabis.

## Background

After alcohol, cannabis is the most widely used psychoactive substance in Canada. According to the National Cannabis Survey, about 5.3 million (17.5%) Canadians aged 15 years and older reported using cannabis at least once in the past three months significantly higher than the 14.0% who reported doing so a year before (Statistics Canada, 2019). The use of cannabis is generally more prevalent among younger Canadians, with 29.5% of those aged 15 to 24 reporting use in the three months prior to the survey. Approximately one-third of Canadians aged 15 and older who used cannabis in the past three months reported that they used cannabis "daily or almost daily" (Statistics Canada, 2019).

A growing body of evidence suggests that cannabis use can negatively impact several aspects of people's lives, including mental and physical health, cognitive functioning, ability to drive a motor vehicle, and pre- and postnatal development among children (Volkow, Baler, Compton, & Weiss, 2014). This report—one in a series reviewing the effects of cannabis use on various aspects of human functioning and development (see Gabrys & Porath, 2019; Kalant & Porath-Waller, 2016; Konefal, Gabrys, & Porath, 2019; McInnis & Plecas, 2016; Porath, Konefal, & Kent, 2018)—provides an update on the topic of cannabis use and driving.

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After over three decades of successful efforts to change behaviour and to increase social intolerance of driving while impaired by alcohol, drug-impaired driving has emerged as an increasingly important public health and road safety issue, particularly in light of the recent legalization of non-medical cannabis use in Canada. This report presents the evidence on the prevalence of driving following the use of cannabis, the impact of cannabis on driving performance and collision risk, and the detection of drivers who are impaired by this substance. This report concludes by discussing the implications for policy and practice.

*Cannabis is a greenish or brownish material consisting of the dried flowering, fruiting tops and leaves of the cannabis plant, Cannabis sativa. Hashish or cannabis resin is the dried brown or black resinous secretion of the flowering tops of the cannabis plant. Cannabis can be consumed by smoking, vaporization, ingestion (edibles) and oral application of tinctures, and by topical application of creams, oils and lotions. Cannabis consists of more than 100 cannabinoids, but delta-9-tetrahydrocannabinol (THC) is the main psychoactive ingredient responsible for the "high" feeling. Cannabidiol (CBD), another important cannabinoid, does not have psychoactive properties, but may interact with THC. The acute effects of cannabis include euphoria and relaxation, changes in perception, time distortion, deficits in attention span and memory, body tremors, increased heart rate and blood pressure, and impaired motor functioning. Over the past few decades, there has been an increase in the concentrations of THC (and decrease in CBD levels) in illicit cannabis, increasing from 4% in 1995 to 12% in 2014 (ElSohly et al., 2016). Canada legalized the use of cannabis for nonmedical purposes for individuals over 18 years of age (19 in some provinces) on October 17, 2018. A review of Canadian online cannabis retail outlets (e.g., ocs.ca, bccannabisstores.com, albertacannabis.org) revealed that dried cannabis products have up to 30% THC, and products in the 15% to 20% THC range are common.*

## What is Drug-impaired Driving?

Drug-impaired driving refers to the operation of a motor vehicle while one's ability is adversely affected by a drug, including illegal drugs, legal drugs, prescription drugs, over-the-counter medications and volatile inhalants such as toluene or nitrous oxide.

Drug-impaired driving is a criminal offence in Canada. According to the *Criminal Code* it is an offence to operate or have care and control of a motor vehicle while the person's ability to operate the vehicle is impaired to any degree by alcohol or a drug. The law applies to the operation of a "conveyance," which includes any type of motor vehicle (including snowmobiles, all-terrain vehicles [ATVs]), a vessel, aircraft or railway equipment. It also does not matter whether the vehicle is being operated on a public roadway or on private property. It is an equivalent offence to fail or refuse to comply with an officer's demand for a sample of breath, blood or oral fluid or to perform tests of impairment.

Amendments to the *Criminal Code* in 2018 also made it an offence to operate a conveyance with a blood drug concentration that is equal to or exceeds the concentration prescribed by regulation.[1] For cannabis, there are three limits for tetrahydrocannabinol (THC), the chemical primarily responsible for the psychoactive effects of cannabis:

- A low blood drug concentration of 2 ng, but less than 5 ng of THC per mL of blood;

- 5 ng or more of THC per mL of blood; and

- 2.5 ng/mL of THC and 50 mg/dL of alcohol.

The 2018 amendments also provided the police with the authority to demand drivers suspected of having a drug in their body to provide a sample of oral fluid to enable a proper analysis of it using approved drug screening equipment. The officer can also require drivers to submit to a Standardized Field Sobriety Test (SFST), to participate in an evaluation of drug influence by an officer trained in the Drug Evaluation and Classification (DEC) program (known as a Drug Recognition Expert) and to provide a sample of blood to determine the type and concentration of drugs in the person's body.

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[1] Besides cannabis, there are nine other substances for which there are blood drug concentration values prescribed in the regulations. For most of these substances (e.g., LSD, PCP, cocaine, methamphetamine) the threshold is "any detectable level." The level for gamma hydroxybutyrate (GHB, a depressant drug) is set at 5 mg/L of blood.

*The Standardized Field Sobriety Test consists of a set of three tests: walk and turn, one-leg stand, and an examination of eye movements known as nystagmus. This set of tests provides validated evidence of impairment and is widely used throughout the United States.*

*A Drug Evaluation and Classification assessment involves a systematic and standardized 12-step procedure to assess the common effects associated with various classes of drugs. It concludes with the demand for a sample of blood, urine or oral fluid for toxicological testing for drug content. Refusal to comply with any of these demands is a Criminal Code offence with penalties that are equivalent to those for an impaired driving conviction.*

## Prevalence of Cannabis Use and Driving

Data from the 2019 National Cannabis Survey reveal that 15% of individuals with a driver's licence who use cannabis admitted driving within two hours of using it at least once in the previous 12 months (Statistics Canada, 2019). Males were more likely than females to report driving after using cannabis (17.5% and 9.5%, respectively), but there was no difference according to age group.

Riding as a passenger in a vehicle with a driver who has used cannabis is a common behaviour as well, particularly among young Canadians (Beirness, 2014). The National Cannabis Survey reported that 4.1% of survey participants had been a passenger with a driver who had smoked cannabis within the previous two hours; 11.8% of those aged 15–24 had done so. Males were more likely to report having been a passenger of a driver who had used cannabis (4.9%) than females (3.3%). Of people who reported driving after using cannabis, 57% also reported being a passenger with a driver who had used cannabis (Statistics Canada, 2019). These data indicate that the risks are not restricted to those who drive after using cannabis, but also extend to those who choose to ride with these drivers.

Roadside surveys collect breath and oral fluid samples from drivers on the road at night, providing objective data on the extent of alcohol and drug use. In a survey of over 2,000 drivers in Ontario in 2017, 4.4% of drivers tested positive for alcohol and 7.8% tested positive for cannabis. Among drivers aged 16–24, 3.9% had been drinking but 16.1% were positive for cannabis. Males were significantly more likely than females to test positive for cannabis (10.0% and 4.3%, respectively) (Beirness & Beasley, 2018).

After alcohol, cannabis is among the most commonly detected substances among drivers arrested for impaired driving. In the United States, of more than 30,000 drug evaluations conducted on suspected impaired drivers in 2017, 43% involved cannabis. In Canada, cannabis accounted for 18% of officer opinions of drug use among suspected drug-impaired drivers (International Association of Chiefs of Police, 2018).

Cannabis use is not uncommon among drivers involved in collisions. In two studies of drivers treated at trauma centres in British Columbia for injuries sustained in motor vehicle collisions, blood samples were analyzed for THC as well as alcohol and a variety of other substances. The first of these studies found 7.3% of drivers tested positive for THC (Brubacher et al., 2016); the second reported 8.3% were positive for THC (Brubacher et al., 2019).

An examination of fatally injured drivers in Canada between 2000 and 2010 revealed that 16.6% of those tested were positive for cannabis (Beirness, Beasley, & Boase, 2013). Over this period, only about half of all fatally injured drivers were tested for drugs. Between 2011 and 2014, drug-testing rates increased substantially. In 2014, 81.9% of fatally injured drivers were tested for drugs; 18.9% of those who were tested were found positive for THC (Brown et al., 2017). Male drivers were more likely to test positive for drugs (44.2%) than females (35.0%).

## Effects of Cannabis on Driving Performance

Studies have assessed the nature and extent of the effects of cannabis on a wide variety of cognitive and motor tasks (e.g., Ashton, 2001; Berghaus & Guo, 1995; Hartman & Huestis, 2013; Hartman et al., 2015; Ramaekers, Robbe, & O'Hanlon, 2000). Performance deficits have been found in tracking, reaction time, visual function, concentration, short-term memory and divided attention. Studies of driving performance (both simulated and on-road) show increased variability in lateral position in the lane, following distance and speed as a function of cannabis use. Cannabis also impairs performance on divided attention tasks — those tasks that require the ability to monitor and respond to more than one source of information at a time. Cannabis also compromised the ability to handle unexpected events, such as a pedestrian darting out on the roadway. Combining cannabis with even small amounts of alcohol greatly increased the negative effects on driving skills (Downey et al., 2013; Hartman et al., 2015; Ramaekers et al., 2000). Although it is not uncommon to find drivers who have used cannabis in combination with other drugs (e.g., cocaine), the effects of such drug combinations and their interactions have not been the subject of very much study.

Among the effects of cannabis reported across various studies, a common finding is increased variability in performance. Although some of this variability can be attributed to differences in study design (e.g., cannabis dose, sensitivity of the task or equipment, time after smoking) (Hartman & Huestis, 2013), there also appears to be considerable variability among individuals. Whereas some people might show substantial impairment after relatively small amounts of cannabis, others show only moderate effects after the same dose. These differences could be related to task skill, prior experience with cannabis, the usual dose and frequency of cannabis use, and route of administration. These differences make it difficult to predict the extent to which a given amount of cannabis will have an impact on a particular individual.

Although the weight of evidence clearly reveals significant psychomotor impairment as a result of cannabis use, it has been suggested that individuals with more experience in using cannabis might be aware of their state of intoxication and impairment and attempt to compensate for it by employing behavioural strategies such as slowing down, increasing headway and reducing risk-taking behaviours (Smiley, 1986). These tactics, however, might not be sufficient to compensate for all the impairing effects of cannabis—especially unexpected events and higher-order cognitive functions such as divided attention tasks and decision making. Attempts to compensate may be at the expense of vehicle control—for example, speed control, lane position variability, reaction time—reflecting deficits in the ability to allocate attention. In summary, the research evidence leaves little doubt that cannabis has detrimental effects on driving performance, particularly when used in combination with other substances, most notably alcohol.

## The Risk of Collision after Using Cannabis

Several studies have examined the risk of crash involvement associated with cannabis use by comparing the extent to which drivers who have used cannabis are overrepresented in collisions compared to drivers who have not used cannabis. Although some studies report no significant increase in collision risk (Lacey et al, 2016), other research shows increased crash risk beginning at very low levels of cannabis use and that the risk escalates with dose (Drummer et al., 2004; Laumon et al., 2005; Mura et al. 2003). A meta-analysis of studies concluded that cannabis doubled the risk of crash involvement (Asbridge, Hayden, & Cartwright, 2012). It should also be noted that the research demonstrates that drivers who have been using cannabis

in combination with alcohol are at significantly greater risk of collision (Brault, Dussault, Bouchard, & Lemire, 2004; Drummer et al., 2004; Longo, Hunter, Lokan, White, & White, 2000; Williams, Peat, Crouch, Wells, & Finkle, 1985).

## Identifying Drivers Impaired by Cannabis

The detection and assessment of cannabis use among drivers are considerably more complex tasks than for alcohol. Whereas most people are familiar with the usual signs and symptoms of alcohol use (e.g., odour of alcohol, bloodshot eyes, slurred speech, motor incoordination), the same is not necessarily true for cannabis. However, drivers who have been using cannabis often display one or more telltale signs of use. These can include a distinct odour of cannabis in the vehicle or on the person, dilated pupils, lapses of attention and concentration, and reddened conjunctiva (the white part of the eye). These signs are often sufficient for police officers to form a reasonable suspicion that the driver has a drug in their body, which allows them to proceed with a demand for the driver to perform the three tests of the SFST (horizontal gaze nystagmus, one-leg stand, and walk and turn) or provide a sample of oral fluid to be screened using approved drug screening equipment or both.

Drivers who demonstrate impaired performance on the SFST or have a positive drug screen can be required to accompany the officer to the station for evaluation by an officer trained in the DEC program. The DEC procedure involves a series of tests of coordination and divided attention, eye examinations, measures of blood pressure and temperature, observations of the suspect, and an interview. The purpose of the procedure is to provide the officer with the necessary evidence to determine whether the suspect is impaired, whether the observed impairment is due to drugs, and which category or categories of drugs are most likely responsible for the observed impairment. Trained officers are able to identify the class of drugs responsible for the impairment with an accuracy rate of 95% (Beirness, Beasley, & LeCavalier, 2009).

Since it was first introduced over 30 years ago, the DEC program has grown substantially and is currently being used in all 50 U.S. states. The DEC program was first implemented in Canada in 1995. In 2008, new legislation made it mandatory for drivers suspected of drug use to participate in a drug evaluation, thereby providing the police with the tools required to aid in the detection and arrest of drivers whose ability to operate a vehicle is impaired by cannabis.

Cannabis has a unique DEC profile that includes poor coordination and balance, reduced ability to divide attention, elevated pulse and blood pressure, dilated pupils, inability to cross one's eyes, reddening of the conjunctiva, and eyelid and body tremors. The evaluation concludes with a demand for a sample of bodily fluid (blood, oral fluid or urine) to be sent to a toxicology lab for analysis. The results of the DEC evaluation, when combined with the findings from the toxicological analysis of the sample, are generally sufficient to proceed with impaired driving charges.

## Penalties for Drug-impaired Driving

Drivers convicted of an impaired driving offence involving either alcohol or drugs or both are subject to the same penalties. A first offence carries a fine of not less than $1,000, a mandatory driving prohibition of one to three years and a possible jail sentence of up to two years. A second offence leads to a mandatory minimum of 30 days in jail and a minimum two-year prohibition from driving. For third and subsequent offences, the penalty is imprisonment for a minimum of 120 days plus a minimum three-year driving prohibition. Impaired drivers who cause injury or death face longer periods of incarceration, including imprisonment for life.

In addition, provincial/territorial licensing authorities often impose longer periods of suspension for an impaired driving conviction and may require offenders to complete an alcohol/drug assessment, participate in an ignition interlock program, attend an educational program and/or participate in a rehabilitation program.

Many provinces also authorize the police to impose an immediate short-term suspension (e.g., three days) for driving after drug use, poor performance on the SFST or a positive drug screen. In most cases, these administrative sanctions are equivalent to those for driving with a blood alcohol concentration of at least 50 mg/dL and can include monetary penalties, recording the suspension on the driver's record and escalating sanctions for repeat violations (Canadian Centre on Substance Use and Addiction, 2019). Most jurisdictions have also implemented zero tolerance for alcohol and drugs for novice and young drivers.

## Conclusions and Implications

Drivers who have used cannabis are common on Canada's roadways. In fact, cannabis use by drivers exceeds that of alcohol among nighttime drivers and cannabis is among the most frequently found drugs in drivers involved in serious crashes.

The incidence of driving after cannabis use, particularly among young Canadians, may be attributable in part to the fact that they do not necessarily perceive their driving ability to be adversely affected. In addition, many young people believe it is difficult for police to detect and charge drivers for driving while impaired by cannabis (Porath-Waller, Brown, Frigon, & Clark, 2013; McKiernan & Fleming, 2017). Such beliefs are unfounded and greater efforts must be made to ensure that drivers understand the risks associated with driving after using cannabis.

Although there is much to be learned from years of efforts to reduce drinking and driving, societal attempts to control driving after cannabis use must recognize the substantial differences that exist and develop innovative and comprehensive approaches to deal specifically with this issue. Such approaches require a combination of research, prevention, enforcement, and treatment and rehabilitation. Research is needed to provide current estimates of the magnitude and characteristics of the problem and greater understanding of the factors that give rise to the behaviour. Awareness and education programs need to be developed for both the general population and specific high-risk groups—such as youth—to provide factual information and dispel common myths. Schools, driver licensing offices and driver education programs are among the potential targets for implementing such prevention activities.

Assessment and rehabilitation programs also play a role in an overall strategy. For those convicted of drug-impaired driving, the extent of their drug use should be assessed and, where warranted, treatment and rehabilitation programs made available to help ensure the behaviour does not recur or escalate. Together, these elements can be integrated to create a comprehensive and effective response to the issue of driving while impaired by cannabis.

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