

Marijuana - How Safe is it Really?

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Summary

In light of recent political controversy regarding its legalization and regulation, the safety and health-related effects of marijuana have gained relevance in Canada. The known acute adverse effects, long-term adverse effects, and medicinal effects of marijuana are assessed and compared alcoholic beverages and tobacco cigarettes. Marijuana appears to have acute effects comparable to alcohol, relatively mild long-term effects, and some medically applicable effects. None of the three substances examined appears to be healthy if used regularly.

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One of the most controversial promises made by Prime Minister Justin Trudeau has been the legalization of marijuana. Trudeau and his party have promised to “legalize, regulate, and restrict access to marijuana” (Liberal Party of Canada, 2015), which could lead to marijuana being vended at Liquor Control Board of Ontario (LCBO) locations (Canadian Broadcasting Corporation, 2015). Like former Prime Minister Stephen Harper, current opposition leader Rona Ambrose insists that this is the wrong move. Ambrose cites health and safety concerns, especially for children (Lunn, 2015). The final policy decision should be based on a variety of factors beyond the scope of this publication, but in this article I review some of the known acute and chronic effects of smoking marijuana and evaluate their severity in relation to alcoholic beverages and tobacco cigarettes, popular substances that are legal but closely regulated in Canada.

Botany of *Cannabis*

Cannabis is a genus of dioecious flowering plant, consisting of three species and multiple subspecies. *Cannabis* plants are exceptionally fast growers, growing 5 cm in a day under the appropriate conditions, and up to a height of 6 metres. *Cannabis* is thus widely used for the production of fibres (known as hemp fibres). Some varieties, particularly *C. indica* and *C. sativa*, also produce pharmacologically significant amounts of Δ^9 -tetrahydrocannabinol (THC; Craker and Gardner, 2010). In the brain, THC binds to the CB₁ cannabinoid

receptor (a G-protein coupled receptor). This ultimately gives rise to the characteristic psychoactive effects of marijuana: euphoria, sedation, altered perception, analgesia, anti-emesis, appetite stimulation, and effects on motor function (Elphick and Egertová, 2001). Although marijuana is often used as a recreational drug for its euphoria, it is also used medicinally for its analgesic, antiemetic, and appetite-stimulating effects.

Acute Adverse Effects

Under the acute influence of marijuana, various psychological effects can impair judgement. Thus, the acute effects of THC are relevant to the safety of marijuana use. The psychoactive effects of marijuana smoking are immediate, and peak about 30 minutes after smoking (Crean, Crane and Mason, 2011). This is approximately the same time as required for alcohol concentrations to peak (Sutker et al., 1983). Among infrequent users, inhalation of marijuana smoke impairs attention and concentration. However, among frequent marijuana smokers, marijuana intoxication actually improves attention and concentration, suggesting that the effects of marijuana on attention and concentration is mediated by neurobiological adaptations in the brain (Crean, Crane and Mason, 2011). The same cannot be said for alcohol, which impairs attention even in frequent users (Howland et al., 2011). THC intoxication (Crean, Crane and Mason, 2011) and alcohol intoxication (MacDonald, Zanna and Fong, 1995) both impair decision-making latency and

accuracy, suggesting that either substance could impair users so that they are unable to safely drive a motor vehicle. THC also impairs the abilities to encode, consolidate, and retrieve short-term memories (Ranganathan and D'Souza, 2006). Although the mechanism differs, this is comparable to the amnesia that commonly results from alcohol intoxication (Goodwin et al., 1970). Thus, the acute effects of marijuana smoking (and THC in particular) are comparable to drinking alcohol, and seemingly less severe.

Long-Term Adverse Effects

However, much discussion has also surrounded the long-term effects of marijuana use, especially on children. No clinical trials have yet established that marijuana use causes dependence by a physiological or biochemical mechanism, but unfortunately psychological dependence on marijuana exists and is most prevalent among adolescents (Kandel et al., 1997). However, the rate of marijuana dependence seems to be similar to alcohol dependence and much lower than tobacco dependence (Kandel et al., 1997). Unlike marijuana, well-designed studies have found specific mechanisms for tobacco dependence (Benowitz, 2008) and alcohol dependence (Herz, 1997). Like tobacco, marijuana is typically administered through inhalation of smoke. Smoking can reduce the pulmonary alveolar macrophage population, and may have other immunological effects (Holt and Keast, 1977). The effects of tobacco smoking are well-documented, including increased cancer risk (Hecht, 1999), ischemic heart disease (Law, Morris and Wald, 1997), and other cardiopulmonary conditions. There is some indication that marijuana smoke can have negative pulmonary effects (Fligiel, 1997), but it appears that, in moderation, marijuana use has little or no adverse pulmonary effects, whereas tobacco does (Pletcher et al., 2012). Chronic marijuana smoking may also reduce decision-making abilities (Verdejo-Garcia et al., 2007), likely due to decreased activity in the prefrontal cortex (Hester, Nestor and Garavan, 2009). Further, smoking marijuana during the first or second trimester of pregnancy is associated with decreased intelligence at age three (Day et al., 1994). Interestingly, some studies have failed to find an

increase in mortality due to marijuana use (Sidney et al., 1997; Andréasson and Allebeck, 1990).

Medically Useful Effects

Unlike alcohol and tobacco, marijuana is sometimes prescribed for medicinal purposes. For example, the THC in marijuana has a potent analgesic effect and does not need to be injected. In treating postoperative pain, marijuana has a similar effect to common orally-administered analgesics, without frequent adverse effects (Holdcroft et al., 2006). Marijuana is also a potent anti-emetic. In chemotherapy patients, cannabinoids are more potent at reducing nausea and vomiting than conventional anti-emetic drugs. Although cannabinoids more frequently produced side effects, patients typically prefer them to conventional anti-emetics (Tramèr et al., 2001). Marijuana is also used to stimulate weight gain in medicinal contexts. THC in marijuana can cause increased appetite and weight gain (Foltin, Fischman and Byrne, 1988; Berry and Mechoulam, 2002). Additionally, the THC in marijuana has a sedative effect (Block, 1998). Although sedation can impair patient's cognitive abilities, sedative drugs are often useful for reducing the anxiety associated with some invasive medical procedures. In some cases, marijuana can serve a double purpose, as both an analgesic and a sedative, making it a potentially attractive alternative to methods involving separate analgesic and sedative drugs. Marijuana is thus a medically useful substance, in contrast with alcohol and tobacco.

Conclusion

Like alcohol and tobacco, marijuana can have serious undesirable side-effects but, unlike alcohol and tobacco, marijuana can also have useful effects. The acute adverse effects of marijuana smoking, while qualitatively different, seem comparable to alcohol in the safety risks that may be associated with their use. Chronic marijuana use can effect addiction, but seemingly not more so than alcohol or tobacco use. Chronic marijuana use may also have adverse immune or cardiopulmonary effects, but they appear to be minimal in contrast with the adverse effects of tobacco use. Chronic exposure to marijuana may also have adverse cognitive effects. Unlike alcohol and

tobacco, marijuana can be useful in some medical applications, including analgesia, anti-emesis, appetite control, and anti-anxiety (sedation).

Marijuana smoking, tobacco smoking, and alcohol drinking can all have serious long-term health effects if consumed in excess. However, it appears that none produce desirable long-term effects. Thus, while occasional consumption may not be harmful, regular consumption in substantial volumes of marijuana, tobacco, or alcohol is likely to produce adverse health effects and should be avoided.

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