



Methamphetamine, the Respiratory System and COVID-19

Key Messages

- Regular methamphetamine use may adversely affect the health of the lungs and heart.
- Animal studies show that methamphetamine can decrease immune system function, which can increase susceptibility to infections and severity of diseases, potentially including COVID-19.
- Using more than one substance regularly is common among people who use methamphetamine and can compound health problems.

Introduction

Methamphetamine is a synthetic drug classified as a central nervous system stimulant and a controlled Schedule 1 substance in the *Controlled Drugs and Substances Act*. Methamphetamine use in Canada is growing, especially in the Western provinces and among populations who also use other illicit drugs. A survey conducted in British Columbia among clients of harm reduction supply distribution sites showed that 69% of clients surveyed regularly used methamphetamine (BC Centre for Disease Control, 2018). In the general Canadian population, data from the 2015 Canadian Tobacco, Alcohol and Drugs Survey* showed that 0.2% of people aged 15 and over reported they had used methamphetamine at least once in the past year (Health Canada, 2016). Enforcement agencies in some jurisdictions have reported increased possession rates and seizures in recent years, as well as increased violence and crime associated with methamphetamine (HESA, 2019).

Some Indigenous communities are increasingly reporting significant health and safety issues related to methamphetamine use (HESA, 2019). There have also been reports of increases in methamphetamine-related visits to emergency departments, hospitalizations and overdose deaths (Brohman, 2018; HESA, 2019). The number of individuals accessing treatment or harm reduction services related to methamphetamine

About Methamphetamine

Methamphetamine is synthesized in illegal laboratories, either with commonly available precursor chemicals such as ephedrine and pseudoephedrine or through synthesis using phenyl-2-propanone. Methamphetamine can be produced in tablets, powder or rock-like chunks or crystals. Depending on its form, it can be smoked with a glass pipe, injected, snorted or swallowed. The route of administration determines the onset and duration of the psychoactive effects (the “high”). These effects generally last 6 to 12 hours and are produced by widespread increases in brain chemicals, including dopamine, noradrenaline (or norepinephrine) and serotonin. Compared to cocaine, methamphetamine use results in higher levels of dopamine in the brain, which can lead to more prolonged effects.

* An estimate for 2017 data is not available due to high sampling variability.



use have also begun to rise (Canadian Centre on Substance Use and Addiction, 2020; Canadian Community Epidemiology Network on Drug Use, 2019; HESA, 2019).

With the global concern over the spread of COVID-19, experts warn that people who regularly use drugs, including methamphetamine, may be at higher risk of COVID-19 infection (National Institute on Drug Abuse, 2020; European Monitoring Centre for Drugs and Drug Addiction, 2020; Volkow, 2020). The higher risk is due to environmental, social and other risk factors associated with methamphetamine use. People who regularly use methamphetamine often have pre-existing health problems, and impaired judgment and decision making, and may also engage in risky behaviours that could increase their risk for developing COVID-19. Additionally, regular methamphetamine use[†] can have a direct impact on the lungs and could make people using it more susceptible to infection. Among individuals who contract COVID-19, the use of methamphetamine might result in breathing problems and other life-threatening health complications.

Availability of Methamphetamine

Methamphetamine is becoming more available in the illicit drug market in Canada. From 2016 to 2018, methamphetamine was the third most seized substance by Canadian law enforcement agencies, after cannabis and cocaine. In 2017, the United Nations Office on Drugs and Crime reported that 379 kilograms of methamphetamine were seized in Canada, an increase of 186% from 2015. Rates of law enforcement violations related to methamphetamine also increased from 2010 to 2018, for possession (626%), trafficking (339%) and, importation and exportation (4,200%) (Canadian Centre on Substance Use and Addiction, 2020).

This evidence brief outlines potential health risks and complications that can be associated with using methamphetamine during the COVID-19 pandemic. It is intended to be a resource for those working with and providing services for people who use substances. The effects of methamphetamine on the immune system, lungs and heart are discussed. The final section provides tips on how to reduce the risks of methamphetamine use during COVID-19.

Effects of Methamphetamine on the Immune System

Studies evaluating the effects of methamphetamine in animal models have shown that it can have negative impacts on the immune system (Harms, Morsey, Boyer, Fox, & Sarvetnick, 2012; Prakash et al., 2017; Salamanca, Sorrentino, Nosanchuk, & Martinez, 2015). Methamphetamine has been shown to inhibit processes of the innate immune system, including phagocytosis and antigen presentation. In phagocytosis, immune cells called phagocytes remove pathogens by ingesting them.[‡] In antigen presentation, immune cells called macrophages “show” pathogen fragments to other immune cells to trigger a targeted response (Salamanca et al., 2015). More broadly, methamphetamine reduces the number of several important cells in the immune system, including dendritic cells, natural killer cells, monocytes and macrophages (Harms et al., 2012; Martinez, Mihu, Gácsér, Santambrogio, & Nosanchuk, 2009; Prakash et al., 2017; Salamanca et al., 2015; Saito et al., 2008; Tallóczy et al., 2008).

Methamphetamine also affects the adaptive immune system. It alters the production of antibodies and reduces the ability of highly specialized cells, known as lymphocyte T-cells, to fight off pathogens. It can also interfere with cytokines, which are chemical messengers that regulate interactions between cells of the innate and adaptive immune systems. This disruption can alter the response to

[†] Regular use refers to a pattern of weekly or more frequent use over periods of months and poses a risk for adverse health effects.

[‡] A pathogen is any infectious microorganisms or “germs” such as virus, bacteria, parasite, prion, fungus, etc. that can produce disease.



pathogens (Burns & Ciborowski, 2016; Lawson, Prasad, & Groopman, 2020; Martinez et al., 2009; Peerzada, Gandhi, Guimaraes, Nosanchuk, & Martinez, 2013).

Taken together, the effects of methamphetamine on both innate and adaptive immune systems can increase susceptibility to a range of pathogens, including COVID-19. The effects on immune cells can also affect the development and severity of diseases. For example, regular use of methamphetamine may facilitate the progression from HIV to AIDS (Lawson et al., 2020; Liang et al., 2008; Potula & Persidsky, 2008; Salamanca et al., 2015; Toussi, et al., 2009), although the underlying mechanisms for this effect are still under investigation. While the available evidence from animal studies tends to support the idea that methamphetamine affects immune functioning, more studies are needed to confirm these effects in humans. However, because of its potential negative impact on the immune system, people who regularly use methamphetamine may be more prone to develop infections and to have more severe symptoms associated with these infections, potentially including COVID-19.

Innate and Adaptive Immune Systems

The **innate immune system** is present from birth and represents an immediate non-specific immune response that provides the first line of protection against viruses and bacteria. Innate immunity – also called non-specific immunity – involves a wide range of immune cells that play an essential role in fighting and eliminating pathogens and preventing infection. These include eosinophils, monocytes, macrophages, natural killer cells, dendritic cells and granulocytes.

Adaptive immunity, in contrast, is acquired over time and refers to the development of antibodies that recognize specific virus or bacteria markers called antigens. This system includes specialized immune cells, such as T and B lymphocyte cells. These cells become active when they recognize antigens that they have “seen” before. It takes time and experience for T and B cells to develop an “immune memory” for specific antigens and to develop specific antibodies against a disease. For that reason, adaptive immunity is slow to respond, but will protect the body for a long time. Vaccines activate adaptive immunity to protect the body against specific diseases.

Effects of Methamphetamine on Lung and Heart Function

The adverse effects of methamphetamine on the heart and blood circulation are well documented. Regular methamphetamine use increases the risk of heart disease and related conditions, including build-up of plaque in the arteries, irregular heartbeat and decreased ability of the heart to pump blood (Kaye et al., 2007; Kevil et al., 2019). Long-term methamphetamine use may also increase the risk of heart attack and death (Kaye et al., 2007, Kevil et al., 2019; Darke, Kaye, McKetin, & Duflou, 2008).

The effects of methamphetamine use on lung health are less documented. However, growing evidence from studies in animals show that methamphetamine can induce lung inflammation as well as abnormalities in lung morphology and function (Gu, Wang, Bai, Liu, & Wang, 2017; Liang et al., 2020; Wang et al. 2017). In humans, a study showed that when methamphetamine is used and distributed in the body the lungs absorb more methamphetamine than any other organ, including the brain and heart (Volkow et al., 2010). It is believed that the ability of methamphetamine to accumulate in the lungs can make lungs more vulnerable to infections and other negative effects (Martinez et al., 2009; Megarbane & Chevillard, 2013, Salamanca et al., 2015; Tallóczy et al., 2008). In line with this belief, case studies in humans have reported methamphetamine-induced lung infections, respiratory failure, pneumonia, fluid in the lungs and high blood pressure in the artery that carries blood to the lungs (Chin, Channick, & Rubin, 2006; Tsai, Lee, Hedlin, Zamanian, & de Jesus Perez, 2019; Zamanian et al., 2018). Methamphetamine has also been shown to worsen existing conditions like chronic obstructive pulmonary disease (COPD) and asthma (Zamanian et al., 2018). Although it is not entirely understood how methamphetamine use can contribute to these illnesses, the effects on the



immune system described previously are believed to play a role (Peerzada et al., 2013). In addition to the immune system, studies in animals are also investigating the role of toxic molecules (free radicals) and oxidative stress (an imbalance between free radicals and antioxidants) in the lungs (Huang et al., 2002; Liang et al., 2020; Wells, Buford, Braseth, Hutchison, & Holian, 2008). While these findings from both animal and human studies suggest that regular methamphetamine use can adversely affect lung health, more research is needed to better understand this relationship.

Taken together, the studies suggest a negative impact from regular methamphetamine use on both the heart and lungs, which may put individuals who regularly use methamphetamine at greater risk of becoming infected with COVID-19 and of developing more severe symptoms.

Impacts of Polysubstance Use

Polysubstance use or the regular use of more than one type of substance is common among people who use methamphetamine and is associated with poorer physical health outcomes (Timko, Han, Woodhead, Shelley, & Cucciare, 2018). Using methamphetamine with other substances may put people who use methamphetamine at even higher risk of contracting COVID-19 and experiencing negative consequences. Moreover, there is evidence that using different substances together has more severe health consequences than using any given substance alone. For example, combining alcohol and methamphetamine increases heart rate and blood pressure much more than methamphetamine alone (Darke et al., 2008; Kirkpatrick, Gunderson, Levin, Foltin, & Hart, 2012; Mendelson, Jones, Upton, & Jacob, 1995). Similarly, the combination of heroin and methamphetamine may lead to sudden irregular heartbeat, increased blood pressure and other serious heart problems that can contribute to heart failure (Darke et al., 2008). Finally, combining methamphetamine and depressants, such as alcohol or opioids, can increase the risk of using toxic amounts of methamphetamine (Darke et al., 2008; Kirkpatrick et al., 2012), since depressants can mask some of the physiological effects of methamphetamine, leading the person to take more.

How To Reduce the Risks of Methamphetamine Use During COVID-19

The following tips, including recommendations for people who use drugs, are intended to help guide service providers who may be working with people who use drugs. This includes harm reduction providers (e.g., syringe services), homeless service providers, peer navigators (e.g., recovery coaches or community health workers) and primary care providers (e.g., clinicians and pharmacists).

For Service Providers

1. Maintain, encourage and provide access to hand hygiene.

Wash hands and wrists often with soap and water for at least 20 seconds. If soap and water are not available, use hand sanitizer with at least 60% alcohol. (See the [handwashing guidelines](#) from the Public Health Agency of Canada.)

2. Encourage physical distancing between individuals, whenever possible.



3. Prioritize staff and client safety.

Frequently wash (with soap and water) and disinfect surfaces and high-touch areas (with diluted bleach solution, hydrogen peroxide or alcohol-based wipes), and offer extra supplies if possible. Wear gloves when manipulating disinfecting products and do not mix bleach with other acids as this can produce toxic gases

4. Replace illicit drugs with prescribed or regulated substances.

Replacing illicit drugs, including methamphetamine, with prescribed or regulated substances is currently recommended where possible. This may reduce the risks of exposure to an adulterated drug supply, withdrawal, overdose deaths and COVID-19. (See also the [class exemption](#) granted under subsection 56(1) of the *Controlled Drugs and Substances Act*.)

5. Consider a client's cardiac and respiratory history when prescribing stimulants.

6. People who use drugs can benefit from harm reduction education and supplies, as well as any other available supportive services, including drug checking.

For People Who Use Drugs

1. Practice hygiene.

Hands should be vigorously washed every time you have contact with other people and before preparing, handling or using drugs. Wash hands and wrists often with soap and water for at least 20 seconds. If soap and water are not available, use hand sanitizer with at least 60% alcohol. (See the [handwashing guidelines](#) from the Public Health Agency of Canada.)

2. Practice safer drug use.

Use clean equipment: Materials used to smoke methamphetamine should be thoroughly cleaned before every use. If snorting or injecting methamphetamine, use a new nasal tube or a new sterile syringe and needle every time.

Avoid sharing equipment: Keep your own injecting equipment, pipes, straws or other nasal tubes. If you must share your equipment, thoroughly clean it or use new mouthpieces.

Avoid mixing methamphetamine with alcohol or other drugs as this can lead to serious negative effects, particularly on the cardiovascular system.

Try to avoid using methamphetamine multiple days in a row. Give your lungs and body time to rest and recover. Regular hydration with water is also important.

3. Use methamphetamine around known and trusted people, while maintaining physical distancing.

4. Use methamphetamine in places that provide a safe and clean environment (e.g., supervised consumption sites, overdose prevention sites).

5. You may lose access to methamphetamine during an outbreak in your region. Prepare for this and consider alternative drugs or medications that could help.



Complementary Resources

- **British Columbia Centre on Substance Use**, Risk Mitigation in the Context of Dual Public Health Emergencies: <https://www.bccsu.ca/wp-content/uploads/2020/04/Risk-Mitigation-in-the-Context-of-Dual-Public-Health-Emergencies-v1.5.pdf>
- **Canadian Addiction Counsellors Certification Federation**, Virtual Addiction Counselling: <https://caccf.live.clinic/>
- **Canadian Centre on Substance Use and Addiction**, Impacts of COVID-19 on Substance Use: <https://ccsa.ca/Impacts-COVID-19-Substance-Use>
- **CRISM Prairies**, Guidance Document on the Management of Substance Use in Acute Care: <https://crismprairies.ca/wp-content/uploads/2020/02/Guidance-Document-FINAL.pdf>
- **Government of Canada**, Subsection 56(1) class exemption for patients, practitioners and pharmacists prescribing and providing controlled substances in Canada during the coronavirus pandemic: <https://www.canada.ca/en/health-canada/services/health-concerns/controlled-substances-precursor-chemicals/policy-regulations/policy-documents/section-56-1-class-exemption-patients-pharmacists-practitioners-controlled-substances-covid-19-pandemic.html>
- **Harm Reduction Coalition**, COVID-19 Guidance for People Who Use Drugs and Harm Reduction Programs: <https://harmreduction.org/miscellaneous/covid-19-guidance-for-people-who-use-drugs-and-harm-reduction-programs/>
- **INPUD**, COVID-19 Crisis: Harm Reduction Resources for People Who Use Drugs: <https://www.inpud.net/en/covid-19-crisis-harm-reduction-resources-people-who-use-drugs>
- **Wellness Together Canada**, Mental Health and Substance Use Support: <https://ca.portal.gs/>



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