

BEYOND THE BASICS

Methamphetamine

What is methamphetamine?

Methamphetamine, a type of amphetamine, is a powerful stimulant that increases central nervous system activity.¹ It is an illegal, synthetic drug produced in clandestine labs using ingredients in products that are readily available, such as anti-freeze, batteries and cleaning supplies.² Two of the precursor ingredients needed to make methamphetamine – ephedrine and pseudoephedrine – are found in some cold medicines.³

A few of the many street names for methamphetamine include “speed,” “chalk,” “meth” and “rock candy.” In pill or powder form, the drug can be taken orally, smoked or snorted through the soft tissue in the nasal cavity. It can also be injected by needle directly into the bloodstream.⁴

Crystal methamphetamine, which comes as a chunk that looks like a crystal, is another form of the drug. It is produced by recrystallizing the powder form of methamphetamine.⁵ Known as “ice,” “crystal,” “crank” and “glass,” crystal methamphetamine can be 90 to 100% pure.⁶

Medical Use

Amphetamine was first synthesized in 1887. Methamphetamine, a derivative of amphetamine, was discovered in 1919 by a Japanese researcher.^{7,8}

The vasoconstricting and bronchodilating effects of amphetamine were discovered in the 1930s, and over-the-counter inhalers were developed and marketed.⁷ It was found that amphetamine had stimulant properties similar to that of cocaine, and for this reason it was widely used during WWII to help soldiers fight fatigue. However, mounting evidence concerning negative side effects, such as agitation and depression, as well as the potential for the drug to be abused for its euphoric and stimulant properties, caused it to fall into disfavour.⁹

Today, amphetamines have a limited role in the medical field. Amphetamines have anorexiatic (appetite suppressant) properties and have been marketed as a treatment for obesity. Stimulant properties have been used in medications to treat narcolepsy – a chronic neurological disorder caused by the brain's inability to regulate sleep-wake cycles normally.⁷ Amphetamine is also well-known as a treatment for attention deficit hyperactivity disorder (ADHD), as it works to enable ADHD children to concentrate on a task.¹⁰

While other amphetamines do have medical uses, methamphetamine is not used medically in Canada. In the United States, however, there is a tablet form that is licensed for the treatment of ADHD, narcolepsy and exogenous obesity (obesity caused by overeating). The brand name is Desoxyn®, but there is also a generic alternative.

However, this drug is not indicated for patients with a history of drug or alcohol abuse.^{11,12}

Prevalence of Use

The 2009 Canadian Alcohol and Drug Use Monitoring Survey (CADUMS), a collaborative initiative led by Health Canada and involving national and provincial alcohol and drug agencies, was one of the country's most extensive surveys on addiction. The CADUMS sample included 13,082 Canadians aged 15 and older. Methamphetamine use was not specifically surveyed, but respondents were asked about the use of “speed,” a slang term for all amphetamines, including methamphetamine. Results indicated that 0.4% had used speed during the past year.¹³

A 2007 Manitoba student drug survey with 4,992 respondents in grades 7 to senior 4 specifically asked about methamphetamine use. Survey results indicated less than 1% of high school students had used this drug in the past year, which is a significant drop from 3% in the 2004 survey.¹⁴ The 2009 Ontario Drug Use Survey also looked at methamphetamine use in students. It found, in the past year, 1.4% of respondents had used methamphetamine, while 0.5% had used crystal methamphetamine.¹⁵

A study completed in 2008 in the United States found 850,000 people age 12 and older had used methamphetamine at least once in the past year. Another study reported 1.2% of grade 8 students, 1.5% of grade 10 students and 1.2% of grade 12 students had used it at least once in the past year.¹⁶

Pharmacokinetics

If methamphetamine is inhaled or smoked, it enters the bloodstream quickly and the user feels the effects in a few seconds, resulting in an immediate high.⁴ Over the next four hours, the drug will continue to be absorbed, after which the blood level will progressively decline. Once the methamphetamine has been distributed to the brain, about 60% will go to the liver to be slowly metabolized, with the end products excreted renally. About 40% of methamphetamine is not metabolized and leaves the body unchanged via the urine.⁶

If methamphetamine is snorted, the effects will be felt within three to five minutes. Ingested methamphetamine will take up to 20 minutes before effects are apparent.⁴

Because the half-life (the time required for the body to eliminate one-half of the drug in the body) of methamphetamine is more than 11 hours, it is a desirable drug for abusers because the effects last a long time.⁶ After smoking methamphetamine, the user can feel “high” for 10 or 12 hours.⁴ A typical dose is 125–250 mg.¹⁷

Amphetamine metabolites can be detected in the urine for up to 48 hours following use.¹⁸

Pharmacodynamics

Like other amphetamine-type drugs, methamphetamine exerts its effects in the central nervous system by increasing the release of the neurotransmitter dopamine from nerve terminals in the brain, as well as by inhibiting its re-uptake.¹⁹ This results in a high level of dopamine in specific regions of the brain associated with reward, motivation and the experience of pleasure.

As an amphetamine, methamphetamine also stimulates the release of other neurotransmitters, including norepinephrine, epinephrine and serotonin from neurons in various regions in the brain.²⁰

Short-term Effects

Methamphetamine users experience the short-term effects of increased energy and alertness, euphoria, a feeling of well-being and heightened sensation.¹⁸ If smoked or injected, they feel an intense rush almost immediately after taking the drug.²¹

Effects of short-term use of low doses of amphetamines include restlessness, insomnia, confusion, reduced appetite, dilated pupils and increased heart rate and blood pressure.⁷

The initial feelings of exhilaration and enhanced self-confidence can motivate users to go on a “run,” meaning that they may repeatedly take

doses of the drug over several days in order to maintain these effects. At the beginning of a run, users may experience:

- rapid and decisive thought patterns.
- alternating periods of talkativeness and preoccupation with their own actions and thoughts.

Later on in the run, the user may experience:

- increasing agitation that replaces the feelings of euphoria.
- racing thoughts that cause difficulty in the person’s ability to concentrate.
- pseudohallucinations.
- more rarely, true hallucinations of a visual, auditory, tactile or olfactory nature.⁷

Long-term Effects

Long-term effects of methamphetamine use include:

- difficulty sleeping/sleep that is of poor quality.
- anxiety.
- poor appetite leading to overall poor nutrition and its related problems.
- high blood pressure and a heartbeat that is rapid and irregular.
- paranoia and prolonged psychosis.⁷

People may also experience these alarming long-term effects from chronic use:

- psychotic behaviour (paranoia, visual and auditory hallucinations).
- rages that may be out-of-control and may result in violent incidents.
- the development of infected sores on the body caused by repeated scratching. (Users often have delusions of bugs crawling under their skin, so they scratch in an attempt to get rid of the sensation.)²¹
- a condition known as “meth mouth” characterized by severe tooth decay.⁴

Methamphetamine is believed to be neurotoxic, thus long-term use may permanently damage areas of the brain related to cognition and memory, leading to long-term cognitive and psychological problems.¹⁷

Chronic high dose users may exhibit repetitive acts that are continual and purposeless. They lose weight, neglect their health care and become disinterested in their social life, personal affairs and their work world.⁶

Toxic Effects

A lethal dose of amphetamine varies widely depending on the type of amphetamine being taken.⁶ With amphetamine itself, a dose as low as 120 mg has caused death, but people have survived doses as high as 400 to 500 mg.⁷

Methamphetamine is a potent form of amphetamine, so lower doses could be fatal.⁶ Actual causes of death attributed to amphetamine overdose are heart failure, high fever, seizures, coma and ruptured blood vessels in the brain.⁷

Tolerance and Dependence

Users rapidly develop tolerance to the euphoria and mood altering effects of methamphetamine, requiring progressively higher doses to get the desired euphoric effects. However, with amphetamines, a plateau can be reached whereby no further doses will produce the effects the user craves.⁷

As a type of amphetamine, methamphetamine causes physical dependence. Research has revealed that in both laboratory animals and humans, physical dependence to amphetamines occurs through classic positive conditioning.⁶ This means a positive reward will lead to more use of the drug. Positive reinforcement and tolerance combine to make amphetamines both physically and psychologically addictive.

Withdrawal Symptoms

If users abruptly stop taking doses of amphetamines, withdrawal symptoms will occur. These include extreme fatigue and an extended period of disturbed sleep, from which the person will awake extremely hungry. Other typical symptoms include irritability, tiredness and depression, which can range from moderate to severe.⁷

The person may also be unable to experience pleasure (anhedonia), a state that may last for weeks or months.⁷ This can occur because, while methamphetamine initially causes the brain to produce more dopamine, chronic use will, over time, lead to decreased dopamine production. This situation is thought to be the reason people experience intense craving for methamphetamine.²² Often, if users can't get the drug, they panic and become extremely distressed.⁷

Illegal Production

Methamphetamine is illegally produced in clandestine labs. These labs are hard to detect and are often of a "mom and pop" nature, meaning they are set up in private homes or other locations (such as motels) to produce enough of the drug for a small group of users. Another type of lab is the "economic-based lab," which is a more organized operation used to produce larger amounts of the drug for more widespread distribution.³

Meth labs, even small ones in a residence, are hazardous because of the flammable liquids and corrosive chemicals used to make methamphetamine. As they are illegal, these labs have no safety standards, and dangers include fires, explosions, burns, exposure to poisons and toxic fumes, property damage and environmental damage caused by toxic by-products that are discarded or spilled.³

Legal Issues

In Canada, methamphetamine use, production and distribution are regulated under the *Controlled Drug and Substances Act* (CDSA). The Department of Justice Canada website states: "Production, possession, trafficking for the purpose of trafficking/exportation, and importation/exportation (with certain exceptions) are illegal in Canada."¹⁷

In August 2005, methamphetamine was moved from Schedule III of the CDSA to Schedule I due to concern about the devastation this drug can wreak. Schedule I carries a higher level of maximum penalties; for example, the maximum penalty for possession is seven years, while trafficking or producing the drug could bring a life sentence.¹⁷

There are also laws in Canada to control the sale, import, export, production and packaging of the Class A precursors used to make methamphetamine. These include ephedrine and pseudoephedrine (which can be found legally in small amounts in some pharmaceutical products), as well as red phosphorus and white phosphorus.¹⁷ Only licensed dealers are allowed to sell these precursors, and anyone else who imports, exports or possesses them for the purpose of exporting could be jailed for up to 10 years.¹⁷

Rules issued in 2006 by The National Association of Pharmacy Regulatory Authorities prohibits the sale of many non-prescription allergy and cold products containing precursor chemicals (ephedrine and pseudoephedrine) by corner and grocery stores that do not have an in-house pharmacy.²³

Risks & Other Harms

As well as the possible health related problems discussed earlier, people who choose to use methamphetamine should be aware of other risks.

- People who inject methamphetamine expose themselves to other risks, including contracting human immunodeficiency virus (HIV), hepatitis B and C and other blood-borne viruses.²¹
- Those who chronically inject methamphetamine can end up with damaged blood vessels and abscesses at the sites of injection.²¹
- Lead poisoning is a risk because lead acetate is commonly used as a reagent in the production of methamphetamine.²¹
- As is the case in any abuse of licit and illicit drugs, there are potential adverse consequences related to the law, a person's financial situation, family relationships, and generally putting oneself at risk by participating in unsafe behaviours while under the influence of methamphetamine.²⁴

Pregnancy & Lactation

There is limited research looking into the effects of methamphetamine on the fetus, and more work needs to be done in this area. However, studies so far indicate prenatal complications can occur, such as placental abruption, heart and brain abnormalities and retardation of the growth of the fetus.²⁵

As one of the effects of methamphetamine use is decreased appetite, chronic use can lead to maternal malnutrition, which in turn can affect the development of the fetus, leading to low birth weight.⁴

Amphetamines pass into breast milk, so use during breast feeding is not recommended.

Remember: A person's experience with any drug can vary. Here are a few of the many things that may affect the experience: the amount and strength of the drug taken, the setting, a person's mood and expectations before taking the drug, gender, overall health, past experience with that drug and whether more than one drug is being used at the same time. Using alcohol and other drugs at the same time can also be dangerous.

Substance Use & Mental Health

- Substance use and mental health problems can often occur together. This is commonly referred to as a co-occurring disorder.
- Substance use may increase the risk of mental health problems.
- People with mental health problems are at higher risk of developing substance abuse problems:
 - Sometimes they use alcohol and other drugs in an attempt to relieve themselves from mental health symptoms.
 - For most people alcohol and other substance use only covers up the symptoms and may make them worse.

Sources

1. Public Health and Regulatory Policy Research Unit, Centre for Addiction and Mental Health. *eBulletin*, Vol. 7(2), 2006.
2. Centre for Addiction and Mental Health website: www.camh.net/About_Addiction_Mental_Health/Drug_and_Addiction_Information/methamphetamine_straight_talk.html
3. Department of Justice Canada. *Methamphetamine Report for Federal-Provincial-Territorial Ministers Responsible for Justice, Section III – National Concerns Around Methamphetamine Use*, July 2007, p. 4-5. Available at www.justice.gc.ca/eng/deptmin/pub/meth/p3.html#a7
4. *Health Concerns: Methamphetamine*. Health Canada website: www.hc-sc.gc.ca/drugs-drogués/learn-reseigne/meth-eng.php#tphp
5. *Street Drugs: A Drug Identification Guide*, Publishers Group, LLC, Plymouth, MN, 2005, p. 41.
6. Julien, Robert M. *A Primer of Drug Action*, New York: Henry Holt and Company, 2001, p. 133-136.
7. Brands, Bruna, Sproule, Beth & Marshman, Joan. *Drugs & Drug Abuse*, Addiction Research Foundation, Toronto, 1998, p. 138-161.
8. AddictionSearch: The Latest Addiction Information, *The History of Crystal Meth*. Available at www.addictionsearch.com/treatment_articles/article/the-history-of-crystal-meth_58.html
9. Doweiko, Harold E. *Concepts of Chemical Dependency – 5th Edition*, Wadsworth Group, Pacific Grove, California, 2002, p. 124-125.
10. *Neuroscience of Psychoactive Substance Use and Dependence*, World Health Organization, 2004, p. 95.
11. HealthyPlace: America's Mental Health Channel, *Methamphetamine (Desoxyn) Full Prescribing Information*, January 2009. Available at www.healthyplace.com/other-info/psychiatric-medications/methamphetamine-desoxyn-full-prescribing-information/menu-id-72/
12. eMedTV, *Generic Desoxyn*, 2010. Available at adhd.emedtv.com/desoxyn/generic-desoxyn.html
13. *Canadian Alcohol and Drug Use Monitoring Survey: Summary of Results for 2009*, Health Canada, 2009. Available at www.hc-sc.gc.ca/hc-ps/drugs-drogués/stat/_2009/summary-sommaire-eng.php
14. Friesen, K., Lemaire, J. & Patton, D. *Alcohol and Other Drugs: Students in Manitoba 2007*, Addictions Foundation of Manitoba, November 2008, p. 39.
15. Paglia-Boak, A., Mann, R.E., Adlaf, E.M. & Rehm, J. *Drug Use Among Ontario Students, 1977-2009: Detailed OSDUHS Findings*. (CAMH Research Document Series No. 27). Toronto, ON: Centre for Addiction and Mental Health, 2009, p. i.
16. *Methamphetamine*, National Institute on Drug Abuse, U.S. Department of Health and Human Services, 2009, p. 1. Available at www.drugabuse.gov/DrugPages/Methamphetamine.html
17. Department of Justice Canada. *Methamphetamine Report for Federal-Provincial-Territorial Ministers Responsible for Justice, Section II – Overview of the Methamphetamine Problem*, July 2007, p. 1-2. Available at www.justice.gc.ca/eng/dept-min/pub/meth/p2.html#a2
18. Fandrey, S. L. *Applied Aspects of Pharmacology*, Addictions Foundation of Manitoba, 2005, p. 188-189.
19. *Neuroscience of Psychoactive Substance Use and Dependence: Summary*, World Health Organization, 2004, p. 19.
20. U.S. Congress, Office of Technology Assessment. *Biological Components of Substance Abuse and Addiction*, OTA-BP-BBS-1 17, Washington, DC: U.S. Government Printing Office, September 1993, p. 24.
21. Lloyd, Jennifer. *Drug Policy Information Clearinghouse Fact Sheet: Methamphetamine*, Office of National Drug Control Policy, Rockville, MD, November 2003, p. 1-4.
22. *EMCDDA Monographs – Addiction Neurobiology: Ethical and Social Implications*, European Monitoring Centre for Drugs and Drug Addiction, Luxembourg, 2009, p. 37.
23. Picard, Andre. *Sales of Cold Remedies Limited to Stop Crystal Meth Production*, Media Awareness Project, January 2006. Available at www.mapinc.org/drugnews/v06/n081/a10.html
24. *NIDA InfoFacts: Methamphetamine*, National Institute on Drug Abuse, U.S. Department of Health and Human Services, 2009, p. 2. Available at www.drugabuse.gov/infofacts/methamphetamine.html
25. *Research Report Series – Methamphetamine Abuse and Addiction*, National Institute on Drug Abuse, U.S. Department of Health and Human Services, 2008. Available at www.drugabuse.gov/ResearchReports/methamph/methamph5.html

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