

BEYOND THE BASICS

Inhalants

What are inhalants?

Inhalants are toxic substances found in a variety of readily available household or commercial products. Some people abuse them because, when the vapors are inhaled, they have a psychoactive effect.^{1,2} They are considered to be central nervous system depressants and are in the class of drugs known as sedative/hypnotics, which reduce or slow down the functions of the central nervous system (CNS).³

There are four categories of inhalants:

- *Volatile solvents* are liquid substances that evaporate when exposed to air. They are found in a variety of readily available household and commercial products, such as gasoline, glues, paint thinners, felt-tip markers, correction fluid and nail polish removers.³
- *Aerosols* are spray containers that use a pressurized liquid or gas propellant to enable the canned product to be expelled. These include an array of products available in a spray can, such as hair spray, cooking oil, paint, deodorant and air fresheners.³
- *Medical and household gases*, the most common being nitrous oxide (“laughing gas”), can be abused as inhalants. Nitrous oxide is used in whipped cream dispensers and in automotive industry products to enhance engine performance.³ Other gases that can be abused include butane in lighters and propane in barbecue tanks.²
- *Nitrites* (amyl nitrite, butyl nitrite) are abused for their ability to enhance sexual performance rather than to alter mood. They are found in video head cleaners, leather cleaners and room odourizers.²

How inhalants are used: The chemical fumes of inhalants are often “sniffed” directly from the container. Some products, such as glue or adhesives, can be put into a plastic bag and inhaled (known as “bagging”). If the product is a liquid, such as cleaning fluid, it can be inhaled from a soaked rag that is held to the user’s face (known as “huffing”).⁴ Nitrous oxide can be inhaled from balloons that have been filled with the substance.²

Street names for inhalants include “sniff” (volatile solvents) and “whippits” (nitrous oxide). Nitrites are known as “snappers” or “poppers.”⁴

Medical Use

Generally, the chemical agents in the products discussed above are designed for household or industrial use – they have no medical uses and they are not meant to be inhaled as recreational drugs for the “high” they might induce. Many of them are toxic to the human body, and some even have maximum limits over which people in the workplace cannot be exposed through fumes in the environment. One example is toluene, a commonly abused solvent present in many glues.¹

Aerosol solvents have no direct medical use, but they may be used in the medical industry in the packaging of some products, such as asthma medication.³

Nitrous oxide does have a medical use: it is used by the medical and dental professions for its analgesic properties. For example, it is administered

to women to control the pain of early labour and to patients undergoing dental surgery.³

Amyl nitrite is one of the nitrites mentioned above that is abused as a “popper.” This agent is a vasodilator, meaning it dilates blood vessels. Because of this property, it was once widely prescribed to relieve chest pain associated with angina.⁵ (Today it is not used as much for this purpose as it has been largely replaced by nitroglycerine preparations.)¹ This nitrite is used as a remedy in cyanide poisoning.³

Prevalence of Use

The 2004 Canadian Addiction Survey (CAS), 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 CAS sample included

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13,909 Canadians aged 15 and older. This survey reported 1.9% of males and 0.7% of females had used a volatile solvent such as glue or gasoline at some point in their lives. A large percentage of these (67%) said they had first used solvents when they were between the ages of 12 and 16. Thirteen percent first tried solvents before their 12th birthday.⁶

A 2007 student drug survey covering 55 schools and 4,992 students in Manitoba revealed that in the past year, 3.7% of students from grades 7 to senior 4 had used inhalants, while 5.4% reported using aerosol products.⁷ The 2009 Ontario Drug Use Survey also looked at inhalant use in students. It found, in the past year, 5.3% of students from grades 7 to 12 had used solvents, and 2.1% had used glue.⁸

A study completed in 2008 in the United States found 8.9% of grade 8 students, 5.9% of grade 10 students and 3.8% of grade 12 students had abused inhalants at least once in the past year.⁹

Pharmacokinetics

The method of administration of inhalants (by definition) is by breathing them into the lungs. Inhalation of a drug (including many other drugs of abuse, such as marijuana, cocaine and methamphetamine) enables it to reach the brain more quickly and efficiently than by ingesting, snorting or injecting because of the large surface area available for the chemical agents to be absorbed into the bloodstream. This is especially true if the molecules in the drug are lipid soluble, which facilitates crossing cell membranes and entering the bloodstream. By entering the bloodstream via the pulmonary circulation, inhalant molecules by-pass the liver in their initial distribution. Thus, the route of administration and lipid solubility combine to facilitate very rapid distribution of unchanged inhalant molecules to the brain. Therefore, inhalants reach the brain unchanged in their chemical structure.¹

Pharmacodynamics

Generally, it is difficult to ascertain exactly how inhalants work in the body because there are many different chemical agents in household and industrial products. Often, more than one agent (possibly dozens) may be present in a product and inhaled. Furthermore, each of these agents has a unique chemical structure. As the agents are not designed for human consumption, there is little research on their effects on the human body.¹

It is thought the effects of inhalants in the brain are similar to those of alcohol, another central nervous system depressant. Alcohol seems to

affect the synaptic activity of various neurotransmitters, especially the major excitatory (glutamate) and inhibitory (GABA) systems.¹⁰ The result of these receptor interactions is an enhanced inhibitory “tone” of the CNS, with accompanying sedation, muscle relaxation and impairment of cognitive and motor skills.¹¹

Volatile solvents also interact with dopamine systems in the brain, producing dependence and movement disturbances.¹²

Short-term Effects

A few minutes after inhalation users feel an initial rush, then become dizzy, disoriented and excitable.^{12,13} These effects, which are comparable to those experienced through the use of alcohol, may include slurred speech, lack of coordination, euphoria, talkativeness, emotional disinhibition and belligerence.^{2,3}

As well, users may feel numb and disconnected to their environment. They may also hallucinate or have delusional thoughts, leading them to engage in reckless activities.³

The psychoactive effects of inhalants last between 15 and 45 minutes if the user refrains from attempting to maintain the effects by continued use.³ If continued use occurs, the user will eventually become drowsy, fall asleep and may have a persistent headache.¹³ There is a risk the person could lapse into a coma as respiration becomes depressed and the cardiovascular system becomes compromised. Brain damage or death may occur.³

Short-term physiological effects include an increased or irregular heartbeat, nosebleeds, sneezing, nausea and vomiting, diarrhea, muscle pain and headaches.³

Short-term Effects of Nitrites: Nitrites, such as amyl nitrite and butyl nitrite, dilate blood vessels and cause the heart rate to increase. Users who inhale nitrites may experience a feeling of excitement and may become flushed. Other short-term effects include dizziness and headache.² Nitrites have become known as a method of making sexual experiences more intense: effects can include sensitive skin, throbbing and a sensation of floating, which start a few seconds after use and last for about five minutes.¹³

Long-term Effects

Some of the solvents users inhale have been found to damage the myelin in nerve fibres, and this damage may be permanent. Consequences include tremors, muscle weakness, gait disturbance and spastic movement in the legs, along with dementia and mood changes.¹³

Other long-term effects are intellectual impairment, loss of the senses of hearing and smell, liver damage, and kidney damage and/or failure.¹

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Sudden Sniffing Death

Sudden sniffing death (SSD) can happen to a healthy person after a single session of using inhalants. It occurs when the chemical in use causes cardiac arrhythmia (irregular heart rhythms), which can cause heart failure and death. Inhalants sensitize the heart to circulating catecholamines (adrenaline and noradrenaline). The SSD occurs when a user becomes startled or frightened (“fight or flight” reflex), causing a surge in adrenaline. The vulnerable heart can then go into arrhythmia or arrest.³

The chemical agents most associated with SSD are aerosols, butane and propane.²

Long-term consequences of using substances containing lead, such as gasoline, can cause lead poisoning in the user. Other toxic agents have been found to cause such long-term consequences as bone marrow deterioration, nerve damage and respiratory damage. Those who abuse aerosols on a long-term basis may experience chronic fatigue, loss of appetite and weight loss, depression and paranoia.³

Toxic Effects

Abusing inhalants can cause “sudden sniffing death” (see sidebar at top right). Death can also be caused by:

- asphyxiation after repeatedly inhaling fumes and leaving no room for oxygen in the lungs.²
- suffocation when the user administers the substance using a plastic bag, then passes out with the bag still in place over the mouth and nose.³
- poisoning from swallowing a toxic substance accidentally while inhaling.³
- aspiration of vomit if the user throws up when unconscious.¹³
- seizures or convulsions caused by aberrant electrical charges in the brain.²

Tolerance and Dependence

There is evidence people who use inhalants, especially long-term users, develop tolerance to the effects, and therefore require more of the solvent to achieve the effects they desire.³ People who use inhalants for prolonged periods have reported they strongly desire to continue using.² As well, a withdrawal syndrome has been identified (see next section) indicating physical dependence may occur.¹

Withdrawal Symptoms

After long periods of use, it has been found some inhalant users may experience a withdrawal syndrome comparable to delirium tremens (DTs) that occurs in individuals withdrawing from alcohol. Symptoms include muscle tremors and cramps,

anxiety, inability to sleep, hallucinations, nausea and excessive sweating. However, with inhalant users, there is much variability in the chemicals being used and the doses received; therefore, it is impossible to predict exact symptoms for each user undergoing withdrawal.¹

Illegal Production

The toxic substances found in products that are abused as inhalants are found in innumerable household and commercial products and are not controlled by Canada’s *Controlled Drugs and Substances Act*.

Legal Issues

Some jurisdictions in Canada have introduced provisions to limit the sale of common household products to those who may abuse them as inhalants. For example, the *Manitoba Public Health Act* allows authorities to “seize products from individuals and retailers who are knowingly selling these products as intoxicants.”¹⁴ Retailers are expected to identify products that can potentially be used as an inhalant (such as glue, paint thinners and gasoline), shelve them responsibly, and get to know their customers. If retailers suspect the product is being purchased for use as an inhalant, they can refuse to sell it; however, they must be careful to respect basic human rights in the process.¹⁴

In Alberta, it is illegal to sell inhalants to people who intend to use them to become intoxicated. People are also prohibited from inhaling these products to obtain their psychoactive effects.¹⁵

Some other countries are also using legislation to protect their citizens from the dangers of inhalant abuse. For instance, after it was found that many youth were inhaling the butane found in lighters, a law came into effect in the United Kingdom in 1999 banning the sale of butane lighter refills to anyone under the age of 18.¹³

Risks & Other Harms

Combining inhalant use with other drugs, especially other depressants, can dangerously suppress the central nervous system.¹³

Some volatile solvents are flammable and can cause burns if the user accidentally contacts fire.¹³

The use of nitrites to enhance sexual experience may contribute to the spread of sexually transmitted diseases, such as human immunodeficiency virus (HIV).¹

As is the case in any abuse of licit or 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 inhalants.

Pregnancy & Lactation

Studies and case reports have found expectant mothers who use repeated high doses of solvents can give birth to babies that are neurodevelopmentally delayed and have facial abnormalities such as those found in babies with fetal alcohol syndrome. As well, spontaneous abortion can occur.⁴ Animal studies suggest prenatal substance abuse may cause low birthweights and skeletal abnormalities. However, more research needs to be done in the area of prenatal exposure to inhalants to more precisely identify the effects on the fetus related to the chemicals being used by the mother.²

At this time, there is little information regarding the passage of inhalants into breast milk and the subsequent possible effects on a baby, as this topic has not been extensively studied. However, breastfeeding while using inhalants is not recommended.^{16, 17}

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.

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The Addictions Foundation of Manitoba (AFM) offers a broad range of prevention and treatment services for alcohol, other drugs and gambling. These are designed to meet the needs of all Manitobans and include harm reduction and abstinence-based programs.

For more information, contact your local AFM office or visit our website: www.afm.mb.ca.

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