



INFORMATION FOR PROFESSIONALS

Solvent/Inhalants

Introduction

Inhalants comprise a wide variety of volatile substances including aerosol sprays, certain kinds of gases, and liquids which give off chemical vapours that can be inhaled to induce a psychoactive (mind-altering) effects. These volatile substances can be found in a wide variety of commercial products, including nail polish remover, hair sprays, lighter fluid, cleaning fluids, and spray paints. These chemicals can be inhaled because they are volatile at room temperature, (i.e., they evaporate when exposed to air). Because they are sniffed or inhaled, these substances are called inhalants. "Inhalant" is a general term that includes all chemicals used in this way.

Most inhalants are volatile solvents, which are liquids that can dissolve many other substances. The majority of solvents are produced from petroleum and natural gas. They have an enormous number of industrial, commercial and household uses, and are found in automobile fuels, cleaning fluids, toiletries, adhesives and fillers, paints, paint thinners, felt-tip markers, and many other products. A product may contain two or more solvents as well as other toxic chemicals. For example, paint thinner may contain methanol, which, when inhaled, can result in serious additional toxicity.

In addition to volatile solvents, aerosols (hair spray, vegetable frying pan lubricants, spray paint) can be abused as inhalants.

Other inhalants that are not solvents include the nitrites (amyl and butyl nitrite, "poppers," "Rush," "Locker Room") and anesthetics such as nitrous oxide (laughing gas) and ether.

Inhalants can be breathed in through the nose or mouth in a variety of ways, including spraying aerosols directly into the nose or mouth, "sniffing" or "snorting" fumes from containers, inhaling from balloons filled with nitrous oxide, "huffing" from an inhalant-soaked rag stuffed in the mouth, or "bagging"—pouring the substance over a cloth or into a plastic bag and breathing in the vapours.

When inhaled, volatile nitrites (amyl nitrite, butyl nitrite and isobutyl nitrite) dilate blood vessels and cause a brief drop in blood pressure. The effects last approximately 30 seconds and cause the user to experience a "rush" and mild euphoria. Effects can include severe headache and dizziness.

Like the depressant drugs, the chemicals found in solvents, aerosol sprays and gases slow down the nervous system, and so are often

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AADAC Alberta Alcohol and Drug Abuse Commission
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included with sleeping pills and alcohol in the sedative/hypnotic class of drugs. Along with other depressant drugs, including tranquilizers and painkillers, these inhalants can cause drowsiness and, in large doses, loss of consciousness. Inhalants can have adverse effects on many systems of the body. Cardiac toxicity is pronounced; in addition, unconsciousness as a result of intoxication can result in asphyxiation.

Solvent abuse (sometimes referred to as “glue sniffing”) is of special concern because of the young age of many abusers. For some, solvent abuse may be their first non-medical use of drugs. In addition to being particularly vulnerable to toxic chemicals because of their age, youth who abuse solvents may be prone to further drug abuse.

Chemical ingredients of inhalants

<i>Abused Products</i>	<i>Major toxic ingredients</i>
correction fluid	toluene
cleaning fluid, spot remover	trichlorethylene
lighter fluid	butane, propane
gasoline	toluene, benzene
paint, lacquer and varnish thinners	toluene, naphtha, acetates, methylene chloride
marking pens	toluene, naphtha
aerosols (paint sprays, hair sprays, air fresheners, cookware coating agents)	toluene, butane
household cements, plastic cement, airplane glue	toluene, acetone, ethyl acetate
liquid shoe polish	toluene
nail polish remover	acetone, ethyl & methyl acetate
pure solvents	toluene, acetone, ethyl ether

Drug Effects

The effect of any drug the user depends on the amount, how it is taken, what the person expects, previous exposure of the body to this and other drugs, the physical and social setting, the user’s mental state and other drugs being used.

When inhaled, inhalants enter the bloodstream directly from the lungs and rapidly reach the brain and other body organs. Some are broken down and excreted through the kidneys; many are exhaled unchanged through the lungs. As a result, the odour of inhalants may remain on the breath for several hours following inhalation.

Effects of short-term use

Although the chemical substances in inhalants can produce a variety of effects, most inhalants produce symptoms similar to those of alcohol intoxication, but more rapid in onset and briefer in duration. The effects of inhalant use last for 30 to 60 minutes after cessation of exposure. However, the pleasurable high usually lasts no longer than four or five minutes. The experienced user may prolong the effects for several hours by increasing the dose.

A user will usually experience an initial excitation followed by depression. Depending on the inhalant used, he or she may have feelings of euphoria, disinhibition, exhilaration, ringing in the ears, dizziness, and blurred vision. Physical symptoms include poor co-ordination, slurred speech and impaired judgment, followed by lethargy and increased sleepiness. Telltale signs of inhalant abuse may include chemical odours on the breath, glue or other stains on the hands and clothes, and a facial rash.

With increasing intoxication, the user may become agitated, or disoriented and may experience headaches, abdominal cramps, nausea, vomiting and chest pain. Extreme intoxication may cause general muscle weakness, difficulty speaking, hallucinations (visual, and less commonly, auditory), disruptive behaviour and, rarely, convulsions.

Several hours after using inhalants, (and especially if they have slept), the user is usually lethargic and hung over, with a mild to severe headache. Some degree of amnesia about the event is common on recovery.

The short-term effects of inhalant abuse can be serious, and may even result in death. Some users' feelings of being very powerful may lead to reckless and bizarre behaviour, such as stepping off an apartment balcony or walking into traffic. Death from suffocation can occur if the user falls asleep or passes out with a plastic bag over their nose or mouth. "Sudden sniffing death" can occur if the user is startled or engages in strenuous activity while intoxicated. Other hazards include explosions, burns, and aspiration of foreign objects into the lungs.

Effects of long-term use

Inhalants are among the most toxic drugs of abuse. In addition to the dangers associated with acute use, long-term use can cause irreversible damage to the body. The specific effects of inhalants have been difficult to determine because abusers frequently use a variety of other drugs, including alcohol and tobacco, and their lifestyles often do not include good nutrition or medical care. However, there is increasing evidence that inhalant abuse has significant toxic effects.

Rehabilitation programs for inhalant abusers are especially important, because early reversible toxic effects often become irreversible with continued inhalant use. In planning programs, more attention to medical care may improve success rates. Patients are more likely to engage in therapy if intoxication and withdrawal are recognized and managed appropriately. Also, adequate assessment of patients' physical and mental capabilities should facilitate the treatment process and improve chances of a successful outcome.

Toxicity of chronic inhalant abuse

Nervous system

Effects on the nervous system can include brain damage resulting in movement disorders and possible intellectual impairment, and damage to the peripheral nerves causing numbness, weakness and muscle paralysis. Although growing evidence indicates that chronic solvent abuse causes brain damage, the extent and permanence, and the influence of other factors, remain to be determined. Toluene is especially toxic to the brain.

Gasoline-related

In addition to toxicity from the inhalant ingredients (toluene and benzene), gasoline sniffing can result in lead poisoning, which in extreme cases can cause dementia and muscle paralysis.

Butyl nitrite-related

There is evidence that even with a relatively small number of exposures, butyl nitrite can deplete the immune system and increase the risk of the development and progression of infectious diseases and tumours.

Kidneys

Chronic inhalant abuse can cause severe kidney damage resulting in acute kidney failure. Serious electrolyte imbalances can occur, and in severe cases patients have generalized muscle weakness, nausea, vomiting and mental confusion. A more chronic form of kidney disease, glomerulonephritis, can also occur. Pregnant women may be particularly prone to kidney damage.

Liver

Abnormal liver function frequently occurs in chronic inhalant abusers. Tests usually return to normal after several weeks of abstinence, but if abuse continues the liver abnormalities persist. Heavy alcohol use, which also causes liver toxicity, may be an added problem as the users become older.

Lungs

Chronic solvent abusers frequently have lung inflammation, pneumonia, and other infections. Also, deaths associated with inhalant abuse often result from asphyxia.

Heart & blood vessels

Abnormal rhythms of the heartbeat have been associated with the abuse of a variety of inhalants. These abnormalities can result in sudden death—the sudden sniffing death syndrome—if the individual exercises or becomes excited.

Bone marrow & blood

Benzene, a solvent that is very toxic to the bone marrow, can cause severe anemia and leukemia. Another solvent, methylene chloride, is converted in the body to carbon monoxide, which prevents the normal transport of oxygen by the blood. Brain damage may result. Heart patients and cigarette smokers are at particular risk.

Inhalants and pregnancy

Little is known about the effects of inhalants on pregnancy and the growth of the fetus. However, the possibility that a “fetal inhalant syndrome” can occur has been suggested. Because of potential serious effects, pregnant women should avoid exposure to inhalants.

Tolerance and dependence

Regular, heavy users of inhalants develop tolerance (that is, they need more drug to produce the same effect). For example, after regular use for a year, a glue sniffer may use eight to ten tubes of plastic cement to attain the high that one tube originally produced.

Both psychological and physical dependence can develop. Users who have experimented with inhalants a few times, or only used them occasionally, may not experience withdrawal when they stop using. However, chronic heavy users find it particularly difficult to stop. At least part of the problem may be a psychological need to continue taking the drugs.

Physical dependence can also develop when the body adapts to the presence of the inhalant, and withdrawal symptoms occur if use is stopped abruptly. Withdrawal generally begins within a few hours to a few days after cessation of use, but may not begin for as long as a week. Symptoms of withdrawal include irritability, aggressive behaviour, restlessness, depression, lethargy, and drug (inhalant) seeking behaviour. In extreme cases, a delirium tremens-like (DTs) syndrome has been described, and includes increased irritability, tremors, sleeping difficulties, and hallucinations.

The general treatment of withdrawal from inhalants is similar to that for alcohol: calm reassurance in an

area of low-level sensory stimuli. Drug treatment is not usually required. Detoxification from inhalants, however, takes much longer than from alcohol; short-term detoxification requires from two weeks to 30 days. By this time, mental function starts to return to normal and participation in conventional treatment programs may become possible. Long-term detoxification then occurs over a period of about six months, during which time a major emphasis of treatment is to keep the client substance-free.

Who uses inhalants?

Inhalant abuse has been reported in people from countries as diverse as Japan and Sweden. In Canada, inhalant abuse occurs all across the country, in a variety of ethnic and socio-economic groups, and in both urban and rural areas.

Most commonly, users are young (between eight and 16 years old), although some heavy users are in their late teens or older. A 2002 survey of students (under age 18) in Alberta found that 5.6 per cent had used inhalants in the previous 12 months.

Among AADAC clients receiving treatment services in 2003/2004, one per cent reported using inhalants during the previous year. Most young people who use inhalants do so only on an occasional or experimental basis. Heavy users are often socially disadvantaged, do poorly in school, and come from unstable home environments.

Inhalants and the law

The possession or use of inhalants is not prohibited under federal law. In Alberta and some states in the U.S., recreational use is prohibited. The Alberta Public Health Act makes it an offence to use inhalants and to assist or cause another person to use inhalants.

Under the Act it is also an offence to give, sell, manufacture or otherwise distribute a product for this purpose. The penalty for a first offence is a fine of between \$500 and \$1500 and/or six months' imprisonment.

ADDITIONAL READING:

1. Alberta Alcohol and Drug Abuse Commission. (2003). *The Alberta Youth Experience Survey 2002* [Technical report]. Edmonton, AB: Author.
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4. Soderberg, L. S. (1999). Increased tumor growth in mice exposed to inhaled isobutyl nitrite. *Toxicology Letters*, 101(1-2), 35-41.
5. Wild, T. C., Curtis, M., & Pazerka-Robinson, H. (2003). *Drug use in Edmonton (2001-2002): A CCENDU report*. Edmonton: University of Alberta.