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Readily Accessible Substances of Abuse

*“Boy, 12, dies after sniffing aerosol.”*¹ *“A bad trip that kills: Abuse of cough remedies can be lethal.”*² These news headlines highlight a significant problem: abuse of household products and over-the-counter (OTC) medications. Reasons for abuse of these substances can vary widely depending on the type of product used. Because these items can be readily found in pharmacies and stores, it is important for pharmacists to become familiar with the signs and symptoms of abuse, and street names by which these agents are known (see Table 1). Pharmacists, especially in the community setting, may be able to identify patterns of abuse since they are in contact with patients more frequently than other healthcare providers.

Inhalants are the most common type of household products abused. They are substances which produce chemical vapors or gases that can be intentionally inhaled to cause altered consciousness or behavior. Inhalants are often generalized into four categories: volatile solvents, aerosols, gases, and nitrites (see Table 2).

Volatile solvents are liquids that become vapor at room temperature in open containers. They are found in many products such as paint thinners and removers, gasoline, degreasers, correction fluid, felt-tip and permanent markers, nail polish and removers, glues and adhesives. Abuse of typewriter correction fluid by adolescents in the 1980s became widely publicized through the media. Correction fluid contains the solvents trichloroethylene and 1,1,1-trichloroethane.³ Aerosols are sprays that contain propellants and solvents. Toluene, the main solvent found in aerosols, is the most abused chemical of all inhalants.⁴ Commonly abused aerosols products include spray paints, nonstick cooking products, hair and deodorant sprays, and fabric protectors. Gases are often found in household or commercial propane tanks, butane lighters, and refrigerants like Freon. Nitrous oxide, also known as laughing gas and “whippets”,

is the most extensively abused gas.⁵ Although it is a medical anesthetic, nitrous oxide is also used in whipped cream dispensers and products used to increase performance in racecars. The fourth category of inhalants is nitrites. Nitrites contain such chemicals as amyl nitrite, cyclohexyl nitrite, and butyl nitrite. The street names “poppers” or “snappers” refers to illegally distributed amyl nitrite, which is available by prescription for treatment of angina and cyanide poisoning. Cyclohexyl nitrite can be found in room deodorizers often used in locker rooms. Nitrites, unlike other inhalants, are not used primarily for their euphoric effects. Instead, abusers use them to enhance sexual experiences and performance. Use of nitrites has been related to unsafe sexual practices and can increase the risk of sexually transmitted infections.⁶ The effects of nitrites on the body include vasodilation, tachycardia, sensation of warmth, and facial flushing. Other consequences associated with nitrite abuse are methemoglobinemia and hemolytic anemia.⁶

Adolescents who abuse inhalants have been shown to be at risk for higher rates of illegal drug abuse, school dropout, and co-morbid psychiatric problems.⁷ Inhalant abuse is prominent in the adolescent population, but is also seen in adults. In 2001, over 18 million Americans admitted to using inhalants.⁸ The National Household Survey on Drugs conducted in 2001, revealed a wide age distribution of people who have used inhalants: 8.6% of youths aged 12-17, 13.4% of adults aged 18-25, and 7.1% of persons greater than 25 years of age. The number of new inhalant users in 2001 was reported to be over 1 million, but consisted mainly of persons below 18 years of age.⁹ Abuse of inhalants can be deadly and has been associated with over 100 deaths annually.⁵ The Drug Abuse Warning Network (DAWN) also revealed 1,496 inhalant related emergency department cases in 2002, a dramatic increase of 187% from the previous year.¹⁰

Self-administration of inhalants is done by various techniques known as “sniffing,” “snorting,” “spraying,” “huffing”, and “bagging.”¹¹ Sniffing involves inhaling the vapors from an open container. Snorting and spraying implies spraying the substance into the nose and mouth, respectively. “Huffing” refers to the inhalation of vapors from a chemical soaked cloth, which is either placed over the nose and mouth or directly in the mouth.¹¹ “Bagging” entails placing the substance of abuse into a bag from which its fumes are inhaled. Inhalation rapidly supplies a large concentration of these substances to the lungs and brain to produce effects within minutes.⁸

The consequences of inhalant abuse differ with short- versus long-term use, and the substance of abuse. The central nervous system is immediately affected by inhalation of the chemicals found in solvents, aerosols, and gases. Neurological insult may manifest in a wide array of physiologic and psychiatric symptoms. Physiologic symptoms include slurred speech, dizziness, headaches, nausea, vomiting, and lack of coordination. Psychological manifestations can include visual, auditory, or tactile hallucinations and delusions.¹² Chronic abuse of solvents, gases, and aerosols can affect various organs such as the heart, kidney, lungs, and bone marrow.¹³ Physiological dependence following long-term abuse can also lead to withdrawal symptoms including irritability, tremor, sleep problems, and diaphoresis.¹² Abuse during pregnancy can lead to spontaneous abortion, premature delivery, or birth defects.¹⁴ In order to help decrease intentional inhalation and the dangers associated with their abuse, many products containing solvents, aerosols and gases have been reformulated or labeled with warnings.¹⁵

Inhalant abuse can also be deadly. Among first time abusers of inhalants there is a mortality rate of approximately 20%.¹³ Sudden sniffing death syndrome (SSDS) is one of the most attributable causes of inhalant-related fatalities.¹⁴ SSDS is associated most frequently with

aerosols and the gases butane and propane.¹⁶ The most common etiology of SSDS is cardiac arrhythmias. Other causes of deaths linked to inhalant abuse are chemical asphyxiation, mechanical suffocation (most often seen with “bagging”), and injury associated with impairment during activities such as driving and operating machinery.^{5, 11}

Inhalant abuse can be appealing for a variety of reasons. First, they can be easily acquired from pharmacies and retail stores or already exist in homes and workplaces. Secondly, they are legal to possess and purchase, with the exception of some substances that require persons to be 18 years or older, such as spray paint. Additionally, their use can be easily concealed. For example, inhalants can be sprayed or poured onto sleeves, cuffs or shirt collars. Finally, the euphoria produced is rapid, but also promptly diminishes after approximately 5 to 15 minutes thereby, reducing the chances of users being caught.⁸

Like inhalants, some nonprescription drugs, such as cold preparations, stimulants, and laxatives, are examples of products that are both readily available and potentially abused (see Table 3). Dextromethorphan, a levorphanol analogue found in varieties of cough and cold products, has been identified as a drug of abuse among adolescents and young adults.¹⁷ In 2002, 52 cases of intentional dextromethorphan abuse were reported to the poison control center in Michigan within a four and a half month time frame. Among these cases, young males and females represented approximately two-thirds of cases requiring hospitalization.¹⁸

While it is indicated for the symptomatic relief of cough, dextromethorphan has been used recreationally in large doses to elicit a euphoric phenicyclidine-type “high” and hallucinogenic effects.¹⁹ Oral ingestion of at least 4 ounces of cough syrup, or 240mg of dextromethorphan, may induce these CNS effects.²⁰ However, in a few cases, doses in excess of 100 times the usual adult dose have not been fatal.²¹ Unlike opiates, normal doses of

dextromethorphan have no analgesic, sedative, or respiratory depressant properties.²² However, massive overdose may cause confusion, excitation, respiratory depression, and toxic psychosis.²¹ Other symptoms of acute toxicity may include lethargy, ataxia, slurred speech, profuse sweating, hypertension, nystagmus²³ psychosis and mania.²⁴

Another type of agent found in cold remedies that are commonly abused by teenagers are antihistamines. Although there are various legitimate uses of antihistamines, recreational use including hallucinations have been identified.^{25, 26} Within a 3-year period, the Utah Poison Control Center identified 80 patients (89% were intentional) from 10 to 18 years of age who had orally ingested cyclizine.²⁵

In addition to the piperazine H1 antagonist cyclizine, ethanolamines such as diphenhydramine and dimenhydrinate have also been reported as OTC antihistamines of abuse.^{26, 27} Doses of dimenhydrinate doses ranging from 8 to 25 tablets, or 400mg to 1250mg, have been reported to produce intoxication.^{27, 28} Daily doses as high as 1,600mg of diphenhydramine have also been reported.²⁸ Other effects include confusion or disorientation, agitation, ataxia, slurred speech, tremor, anxiety, nervousness, tremor, insomnia, and irritability.²⁵ Antihistamine abuse is not without consequences, as dependence, tolerance²⁹ and fatalities³⁰ have occurred.

Antihistamine abuse has also been documented in opiate dependents, not only for inducing hallucinations, but also for potentiating opiate effects. One example is the combination of pentazocine with the antihistamine tripeleminamine known as 'T's and Blues.' This combination creates a 'rush' similar to heroin.³¹ Similar effects have been reproduced with over-the-counter antihistamines including cyclizine, diphenhydramine, and dimenhydrinate when used with other opiates. In one study patients used cyclizine, either orally or intravenously, in doses ranging between 50mg to 800mg to prolong effects of methadone. Acute effects lasted up to 6

hours long when used in combination, as opposed to using cyclizine alone which was estimated to be 30 to 120 minutes.³²

A third cold remedy of concern is pseudoephedrine. Although indicated as a decongestant, pseudoephedrine has been abused as an anorectic, stimulant, and amphetamine substitute by dieters, athletes, illegal substance abusers, and truck drivers.³³ Pseudoephedrine, an ephedrine alkaloid, is an indirect-acting sympathomimetic similar to amphetamine. CNS stimulatory effects such as euphoria, hyperactivity, insomnia and a feeling of increased energy have been well documented with amphetamine use, as well as with high doses of ephedrine-like substances.³⁴ However, even at therapeutic doses of 210mg, pseudoephedrine may induce toxic effects, including hypertension, tachycardia, arrhythmia, anxiety, psychosis or seizures.³⁵ Serious events have also been documented with pseudoephedrine abuse, such as intracranial hemorrhage and hypertensive emergency.^{36, 37}

Another concern with pseudoephedrine is its use for the illegal production of methamphetamines. As a result, the state of California adopted restrictions on the sales of pseudoephedrine to no more than three packages or no more than nine grams in a single transaction.³⁸ The FDA has also recently prohibited the sale of dietary supplements containing ephedrine alkaloids as of April 12, 2004 due to risks of serious adverse events including heart attack, stroke and death.³⁹ This ban has serious implications on the sales of pseudoephedrine, since patients may resort to pseudoephedrine as an alternative that may result in a commodity that is equally harmful.

Caffeine is one of widely used drugs contained in consumer beverages, analgesics and OTC stimulants. In 2002, there were 2,644 cases of intentional abuse of caffeine reported to the American Association of Poison Control Centers.⁴⁰ Some professionals or students who want to

reduce fatigue and stay alert may increase their caffeine intake, however some individuals may also be resorting to caffeine for abusive purposes. Some patients with eating disorders abuse caffeine not only for its appetite suppressing, and diuretic properties, but also for physiological effects such as increased metabolism, increased muscle work output for endurance activities, and delaying the onset of fatigue resulting from dieting.⁴¹⁻⁴³ Furthermore, caffeine has also been known to be abused athletes in attempt to improve athletic performance, alter body composition, and increase levels of energy.⁴⁴

Prolonged caffeine consumption can result in dependence, increased tolerance, and produce withdrawal symptoms, and death.^{45,46} In addition, excessive caffeine consumption may result in caffeine toxicity, or caffeinism. Caffeinism, defined as a single ingestion of caffeine doses greater than 250mg can produce symptoms mimicking anxiety, including nervousness, restlessness, insomnia, excitement, muscle twitching, gastrointestinal disturbances, rambling flow of thought and speech, agitation, and inexhaustibility.⁴⁷ In addition, arrhythmias, hypokalemia, hyperglycemia, myocardial infarction and death may result.⁴¹⁻⁴³ The minimum lethal dose for humans is estimated at 150-200 mg/kg.⁴⁸ In one case report, a 19-year old female had died after ingesting an estimate of 18 grams of caffeine from an over-the-counter appetite suppressant.⁴⁹

Abuse of other products have also been identified in dieters and patients with eating disorders, such as anorexia or bulimia. In 2003, nationwide, 6% of high school students had vomited or taken a laxative to keep from gaining weight. The prevalence of this occurrence was higher among female students, comprising of 8.4%, than 3.7 % of male students.⁵⁰ These individuals may seek over-the-counter products, such as laxatives or ipecac, for weight control. Eating disorders are often associated with devastating and medical and psychological

consequences. Signs and symptoms of eating disorders include fatigue, dizziness, or lack of energy, amenorrhea, sore throat, gastroesophageal reflux disease, abdominal pain, cold intolerance, constipation, polyuria, polydipsia, and palpitations.^{51, 52} Complications include growth retardation,⁵³ loss of dental enamel with chronic vomiting,⁵⁴ pubertal delay or arrest,⁵⁵ predisposition to osteoporosis and increased risk fracture.⁵⁶

Chronic use of laxatives for facilitating the passage and elimination of feces is often associated with the elderly, however, some adolescents, college students, and young adults, especially women, may use laxatives for weight control.⁵⁷ In 2002, the American Association of Poison Control Centers reported 880 cases of intentional abuse of laxatives.⁴⁰ Stimulant laxatives, such as senna, and bisacodyl, appear to be the most commonly abused agents compared to other laxative types, such as bulk, osmotic, surfactant and emollient laxatives.⁵⁸ Stimulant laxatives may be the preferred agents because these agents facilitate rapid high volume of fecal discharge, which patients may perceive as caloric intake that has been successfully nullified prior to the intestinal absorption process;^{59, 60} however, caloric absorption is actually reduced only minimally by approximately 12%.⁶¹

Chronic and excessive laxative abuse may cause diarrhea that alternates with constipation, nausea, abdominal pain, and other gastrointestinal symptoms. Loss of stool fluid and electrolytes, such as sodium, potassium and magnesium, may lead to dehydration and acid-base disturbances. Secondary complications may also result including lethargy, polydipsia, muscle weakness, worsening of constipation, renal damage, cardiac arrhythmias and increased risk of sudden death.⁶²

Ipecac is another nonprescription agent that is abused in some patients with eating disorders. It is indicated as an emetic for use in some poisonings, however, patients with eating

disorders use it inappropriately to remove food from the stomach for weight control. Chronic administration of ipecac may result in GI effects, such as grossly bloody stools, muscle weakness, and cardiomyopathy.⁶³ Several case reports have documented hospitalizations and deaths associated with ipecac abuse. Acute lethal doses for adults have been identified to be as low as 600-1200mg.⁶⁴ In one fatal case, a 26-year-old bulimic woman had been drinking three to four bottles of syrup of ipecac per day after meals to lose weight over a three-month period.⁶⁵

In conclusion, the abuse of over-the-counter products, such as household products and nonprescription drugs, is often overlooked. Abuse with these products may be more appealing than illicit drug use for several reasons, such as being legal to possess and purchase, highly accessible, and relatively low in cost. Since these products are readily available in the home or for purchase at a retail store, patients perceive their use as safe. Thus, community pharmacists can play a very important role in educating the public about the dangers of household products, and the safe and appropriate use of OTC products. Finally, pharmacists should be cautious in supplying large quantities of nonprescription agents that may have abuse potential.

Table 1: Street Names Associated with Products of Abuse

AGENT ABUSED	STREET TERMS	ASSOCIATED PRODUCTS
Dextromethorphan	Skittles, Triple C's (C-C-C), Robo, Robo-tripping, Red Devils, DXM, Tussin, Dex	Coricidin®, Coricidin HBP Cough & Cold® , Robitussin DM®
Volatile Solvents	Gluey	Model glue, rubber cement
Aerosols	Glading	Air fresheners
Gases	Toncho, Head cleaner, Whippets	Octane booster, video cleaner
Nitrites	Snappers, Poppers Rush, Climax, Amys, Pearls, Bolt	Butyl nitrite, Amyl nitrite, Isobutyl nitrite, Locker room deodorizers

Table 2: Description of Common Household Products of Abuse

Nonprescription agent	Desired Abuse Effects	Potential Overdose Effects	Example of Products
Volatile Solvents (Example of Chemicals: toluene, benzene, trichloroethylene, acetone, hexane)	Euphoria, intoxication, hallucination	Peripheral neuropathy, hepatic and renal toxicity, bone marrow suppression neurotoxic effects, cardiac arrhythmias, asphyxiation	Liquid Paper®, Wite-Out®, Marks-A-Lot® markers, Rubber Cement, paint thinners and removers, nail polish and remover
Aerosols (Example of chemicals: toluene, dimethyl ether, fluorocarbon, butane, propane, Freon)	Euphoria, intoxication, hallucination	Hepatotoxicity, asphyxiation, cardiac arrhythmias, hearing loss	Spray paints, deodorant sprays, hair sprays, nonstick cooking sprays, fabric protector sprays, air fresheners
Gases (Example of chemicals: Butane, propane, nitrous oxide)	Euphoria, intoxication, hallucination	Hypotension, neurotoxic effects, peripheral neuropathy, limb spasms, cardiac arrhythmias	Laughing gas, Freon, Lighter fluid, propane tanks, whipped cream dispensers
Nitrites (Example of chemicals: amyl nitrite, cyclohexyl nitrite, butyl nitrite)	Enhance sexual performance and experience	Orthostatic hypotension, tachycardia, immunosuppression	Locker Room, Climax, Rush,

Table 3: Description of OTC products of abuse

Nonprescription agent	Desired Abuse Effects	Potential Overdose Effects	Example of Products
Dextromethorphan	Euphoria, hallucination	Confusion, excitation, nervousness, hypertension, respiratory depression, psychosis, mania	Robitussin-DM®, Tylenol Cough®, Vicks NyQuil®, Coricidin®, Coricidin HBP Cough & Cold®
Antihistamines (ex: cyclizine, dimenhydrinate, diphenhydramine)	Hallucination, euphoria, potentiation of opiates	Confusion, disorientation, hallucinations, agitation, tremor, insomnia, irritability	Benadryl®, Dramamine®, Marezine®
Pseudoephedrine	Stimulant, anorectic, euphoria, illegal manufacturing of methamphetamines	Hypertension, tachycardia, arrhythmia, anxiety, psychosis, seizures, insomnia	Sudafed® Tablets, Dimetapp Decongestant Non-Drowsy Liqui-Gels®
Caffeine	Stimulant, anorectic	Insomnia, anxiety, nervousness, restlessness, headache, excitement, muscle twitching, tachycardia, psychomotor agitation	Vivarin®, NoDoz®, Enerjets®
Laxatives	Weight loss	Weakness, muscle cramps, sweating, arrhythmia, renal damage, dehydration, acid-base disturbances, nausea, vomiting, diarrhea, abdominal cramping	Metamucil®, Dulcolax®, Fleet®, Colace®
Ipecac	Weight loss	Diarrhea, grossly bloody stools, muscle weakness, bradycardia, cardiomyopathy	Ipecac® syrup

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