



SCHEDULED EVENTS:

Date and times for Grand Rounds
 October 9, 2002 11AM
 November 13, 2002, 11 AM
 December 11, 2002, 11 AM

Toxicology Case Conference
 CNYPC, 550 E Genesee Street
 Poison Center Conference Room
 Every Thursday 1:30 PM – 2:30 PM

PROGRAM ANNOUNCEMENT:

The Sixth Annual Toxicology Teaching Day will be held on October 30, 2002 at the University Sheraton. The brochure is out!! If you have not received one, please call 464-7078 or e-mail storkc@upstate.edu

CNYPC TIDBITS:

Inhalants - Matching

- | | |
|----------------------|---|
| A. Phosgene | 1. normal pO ₂ , false normal pulse oximeter reading |
| B. Carbon monoxide. | 2. normal pO ₂ , irrationally lowered pulse oximeter reading |
| C. Chlorine | 3. delayed irritant, smells like hay |
| D. Methemoglobinemia | 4. irritant, sodium bicarbonate may alleviate symptoms |

TOX TRIVIA: COLORS

1. Causes "blue/green emesis and lobster red skin"
2. Makes blood look "chocolate"
3. Orange tinged secretions

Case History

Contributed by: Tracey H. Reilly, M.D., Jeanna M. Marraffa, Pharm.D., Christine M. Stork, Pharm.D., DABAT

SUDDEN DEATH IN A HEALTHY THIRTEEN YEAR OLD ADOLESCENT AFTER ACUTE INHALATION OF GASOLINE

Case:

A 13-year-old previously healthy male was found sitting on his ATV (all terrain vehicle) with his face into the opening of the gas tank. His mother last saw him acting normally earlier that morning. He was unresponsive and emergency medical assistance (EMS) was contacted. Upon arrival of EMS, the patient remained unresponsive and cardiopulmonary resuscitation was initiated. The electrocardiogram revealed asystole despite 11 doses of epinephrine, 4 doses of atropine and 1 dose of sodium bicarbonate. After an hour of resuscitation, resuscitative efforts were terminated.

What is the likely etiology of the cardiopulmonary arrest in this patient?

The incidence of volatile substance use for abusive purposes is increasing along with the number of deaths occurring after use of these substances.

Inhalants are chemicals that vaporize at room temperature and are intentionally inhaled to achieve a mind-altered state. Any substance that exists in a gaseous form or rapidly evaporates at room temperature, is psychoactive and is not extremely irritating has the potential to be abused by inhalation.¹

The types of inhalants abused comprise a large and diverse group of chemicals that are mostly hydrocarbon derivatives. Fuels for engines, lighters and lamps as well as solvents for paints and adhesives are among the more common agents abused. Inhalation of volatile substances of abuse can be accomplished by "sniffing", "huffing", or variants of these methods. Advanced methods of inhalation abuse termed 'bagging' involve breathing in and out of a plastic or paper bag that contains a small amount of the substance to be abused.¹

The concentration of the inspired volatile substance of abuse increases from sniffing to huffing to bagging.

What is the epidemiology of inhalant abuse?

Volatile substance inhalation abuse (VSIA) is typically seen in older children and young adolescents. According to the National Institute on Drug Abuse approximately 6% of US children have experimented with inhalants by the time they reach fourth grade.² Abuse usually peaks during grades seven through nine with only a small percentage of children going on to become chronic abusers. The inhalation of volatile substances of abuse is reported in up to 13% of teenage

Continued on Page 2

populations. Males more than females tend to abuse inhalants. Children with poor school performance, volatile family environments and poor socioeconomic status appear to be at higher risk for abuse of inhalants.²

What are the dangers of inhalant abuse?

Hydrocarbons are central nervous system (CNS) depressants that initially cause euphoria, intoxication and a mind altered state similar to ethanol due to their inhibition of cortical function. Very little exposure is required, only 15 to 20 inhalations can produce euphoria or intoxication that can last 3 to 6 hours.³ All inhalational substances of abuse have the ability to cause neurologic dysfunction, pulmonary irritation, asphyxia, cardiovascular abnormalities and GI and dermal irritation.¹ Cardiac arrhythmias and death can occur with first time use. Irreversible CNS and peripheral nervous system (PNS) damage can occur after repeated exposure. Pulmonary asphyxiation can develop when vapors decrease the partial pressure of oxygen in inspired air to below 17 percent. Common gastrointestinal side effects include nausea and vomiting which can increase the risk of aspiration and pulmonary irritation especially when the abuser may have an altered mental status due to euphoria or hypoxia.

The mechanisms of death due to inhalant abuse include cardiac dysrhythmias, vagus-mediated cardiac inhibition, CNS respiratory depression, mechanical asphyxia, aspiration of gastric contents and trauma due to intoxication.³ Cardiac dysrhythmias with or without hypoxia appears to be the most common cause of death due to inhalant abuse. However, this conclusion is difficult to assess because post-mortem findings of proposed deaths due to VSIA are typically minimal.⁴ Sudden death typically occurs when an intoxicated patient performs some sort of physical exertion.

Volatile substances are thought to sensitize the myocardium to the effects of circulating catecholamines by stabilizing the myocardial cells to depolarization. Stabilization results in reduced irritability of myocardial cells. Cardiovascular depression is dose dependent and biphasic. Initially, there is peripheral vasodilation resulting in hypotension with a reflex tachycardia. This is followed by bradycardia, decreased cardiac contractility and decreased cardiac output. When the myocardium is sensitized through the use of inhalants, the variability of the irritability of the individual myocardial cells can lead to small blocks in electrical impulse that can increase the risk of ventricular arrhythmias and ectopic foci of pacemaker activity.⁴⁻⁶

Are there any considerations in the management of cardiopulmonary arrest in patients with acute intoxication of volatile substances of abuse?

Cardiac arrhythmias appear to be the most likely cause of the majority of acute deaths associated with volatile substances of abuse. Dysrhythmia induced sudden death is termed "sudden sniffing death syn-

drome". The mechanism of dysrhythmia appears to be sensitization of the myocardium to endogenous catecholamines.

Management of dysrhythmias should include management of electrolyte disturbances, hypoxemia, hypotension and hypothermia. Ventricular fibrillation poses a particular concern as common practice guide the use of epinephrine in this setting.

Since the myocardium is sensitized to the effects of catecholamines, sympathomimetic drugs should be avoided.¹¹ Beta adrenergic antagonists have been recommended to be administered to protect the sensitized heart from circulating catecholamines. However, these reduce the inotropy of the heart and should be used with care. Other drugs to consider are lidocaine and amiodarone.⁸ Several cases of successful treatment of cardiac arrhythmias from chloral hydrate toxicity with propranolol have been documented.¹⁰ Chloral hydrate sensitizes the myocardium to circulating catecholamines and induces ventricular arrhythmias resistant to standard catecholamine based antiarrhythmics. Literature reviews suggest that ventricular arrhythmias induced by chloral hydrate are resistant to lidocaine but responsive to beta blockers. Published case studies suggest a treatment regimen that involves an intravenous bolus of a beta blocker followed by an intravenous infusion to maintain a heart rate of 50 to 70 beats per minute.¹⁰ Selection of the beta blocker should be based on the half life of the beta blocker and the estimated half life of the toxic drug or metabolite.

REFERENCES

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2. National Institute on Drug Abuse. (2000, July). *NIDA Research Report-Inhalant Abuse*. Retrieved August 17, 2002 from the World Wide Web: <http://www.nida.nih.gov>
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8. Edwards, K. E., Wenstone, R. Successful resuscitation from recurrent ventricular fibrillation secondary to butane inhalation. *Br J Anaesth* 200;84:803-805.
9. Moritz, F., de La Chapelle, A., Bauer, F., Leroy, J. P., Goulle, J. P., Bonmarchand, G. Esmolol in the treatment of severe arrhythmia after acute trichloroethylene poisoning. *Intensive Care Med* 2000;26:256.
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SPI CORNER TOPIC

THE TERRORIST THREAT AND THE ROLE OF THE POISON SPECIALIST

Contributed by: Kathleen Groff, RN, CSPI

In the wake of the tragic events of 911 and the anthrax threats that followed, the nation is preparing for the worst, another attack. We all understand that domestic preparedness and medical readiness is key. The Poison center has a vital role during a WMD [weapons of mass destruction] incident. That role is to provide the most current toxicological information available. The specialists are highly qualified and will provide information on hazardous material exposures to both the general public and health care professionals. Throughout the anthrax crisis the call volume increased dramatically as the poison specialist remained a constant and credible resource able to provide concise and reassuring information to the public and health care community.

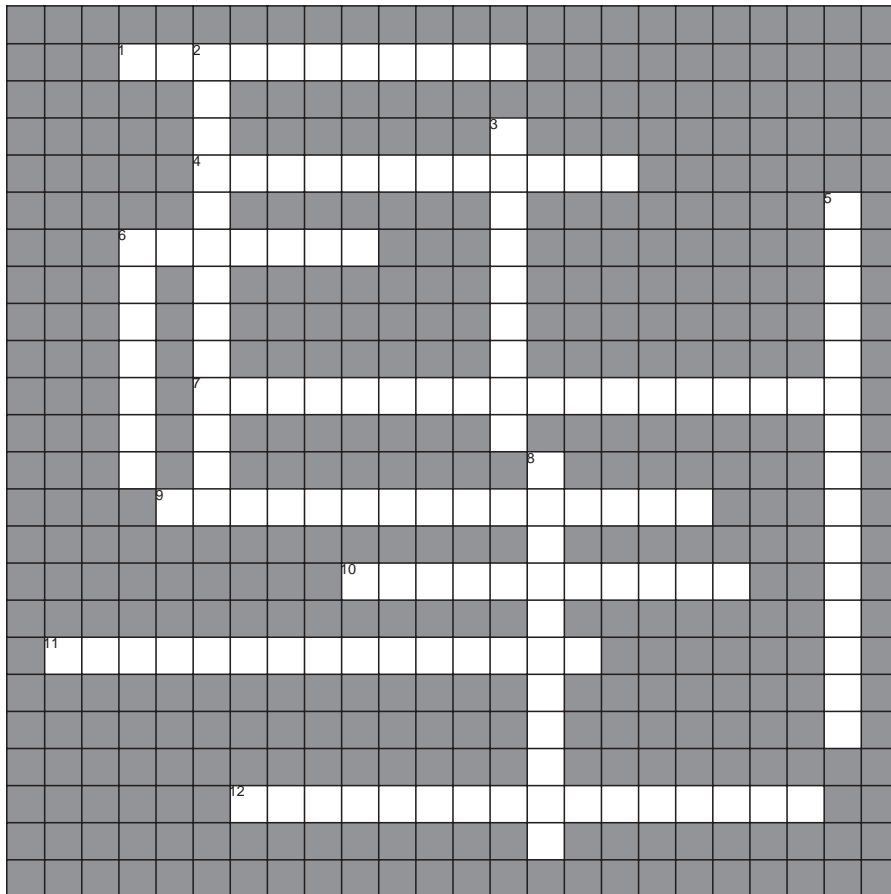
Many of the agents with potential for use as a weapon of mass destruction are found in every day life in which

the poison specialists already have some experience. An example is organophosphate pesticides, commonly used in commercial grades on large farms being similar in both presentation and management to a weaponized nerve agent exposure. The method of delivery may also be similar, for example delivered by ground tank dispersal or crop dusting plane.

Poison information specialists have the knowledge to assist healthcare providers in several ways; In determining the agent- creating a toxin related differential diagnosis, By reviewing toxicological effects, Providing decontamination and treatment recommendations, Describing contamination risks for healthcare providers, Reviewing indicated labs and tests, Identifying location of appropriate lab. facility, and by facilitating a toxicological consult with the on call toxicologist.

CROSSWORD PUZZLE COLD SEASON

Contributed by: Laureene Piwinski, RN, CSPI



DOWN:

2. Hepatotoxic drug in many OTC cough and cold remedies
3. Selective beta-2 adrenergic agonist used in asthma therapy
5. If you take too much of this, you may see "little people"
6. Cough suppressant that may cause respiratory depression, especially in children
8. Antitussive with local anesthetic properties

ACROSS:

1. Non-toxic expectorant in many OTC preparations
4. Methylxanthine that cause seizures refractory to standard anticonvulsant therapy
6. Mom rubbed this toxin on your chest
7. Banned by the FDA due to an increased risk of hemorrhagic stroke
9. Antihistamine toxidrome
10. Class of decongestants that resemble clonidine in oral overdose
11. Decongestant of choice
12. Cough suppressant commonly abused among teens

ANSWERS:
Down: 2 acetaminophen, 3 albuterol, 4 diphenhydramine, 6 codeine, 8 benzonatate
Across: 1 guaifenesin, 4 theophylline, 6 camphor, 7 phenylpropanolamine, 9 anticholinergic, 10 imidazole, 11 imidazole, 11 pseudoephedrine, 12 dextromethorphan

DID YOU KNOW?

- That the Poison Center offers programs for healthcare professionals on both biological and chemical exposures.
- The poison center has dedicated WMD- Hazardous materials coordinators.
- The poison center participates on a local and state level with emergency response planning.
- The Poison center will soon offer a WMD web page for health care professionals, to provide toxicological information quickly should conventional communication systems become overwhelmed.

The role of the Poison Specialist in the face of terrorism is that of an expert toxicological resource. The specialist can provide insight and support during the emergency planning phase. The specialist can provide reassuring information to a panicked public. The specialist can provide ongoing educational programs for both the public and the health care community. The specialist can provide essential toxicological information in an effort to reduce morbidity and mortality. Please call the Poison Center with any questions you may have, including interest in inservice/lectures.

CNYPCC Tidbits answers:

- A. 3
- B. 1
- C. 4
- D. 2

Tox Trivia answers:

- 1. Boric acid
- 2. Methemoglobinemia
- 3. Rifampin

