



## Pathology & Biology Section – 2008

### G25 Ethyl Chloride Toxicity in a Case of Unsuspecting Abuse

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The goal of this presentation is to present a case study to increase the awareness about the compound ethyl chloride, its medicinal and industrial uses, its abuse and potential toxicity to those who choose to abuse it, and its postmortem detection in blood and tissue samples.

This presentation will impact the forensic community by emphasizing that ethyl chloride is a potentially harmful and fatal chemical when abused and can be mistaken for ethanol intoxication and may not be anticipated because of its uncommon association with death.

Ethyl chloride is a colorless gas with general anesthetic properties in humans and animals. Its use as a general anesthetic was discontinued because of its flammability, cardiotoxicity, and possible severe respiratory depression. Its major uses are for tetraethyl lead production and as a solvent, alkylating agent, refrigerant and topical anesthetic.

Ethyl chloride has gained increasing popularity since amyl nitrite and other volatile alkyl nitrite substances have been removed from the lay market because of their high abuse potential. The three most common means of inhalation of ethyl chloride are "sniffing", "huffing", and "bagging". Sniffing is perhaps the most popular means of inhalation in those who are episodic abusers. The individuals who chronically use inhalants prefer bagging because of the higher concentration of the substance being inhaled. Ethyl chloride can be purchased without prescription at underground establishments, on the internet and at places selling drug paraphernalia. It is sold as a video head cleaner, which is a legitimate use, but it is also marketed as a means of experiencing a euphoric feeling and enhancement of sexual pleasure. Many of the products containing ethyl chloride have provocative names such as Rush, Jungle Juice Plus, Maximum Impact, Black-Jac, and Macho and are generally referred to as "poppers". Acute exposure results in feelings of euphoria, drunkenness, ataxia, dysarthria, nystagmus, confusion, dizziness, hallucinations, impairment of short-term memory, and unconsciousness. The long term effects of ethyl chloride in humans are unknown.

The case presented is that of a 38-year-old Caucasian man found dead in an adult video store viewing room. Review of the store time records revealed that the man visited the store and returned to his vehicle six minutes later. After being at his vehicle for one minute, he returned to the store again. He was found alone in the viewing room approximately five hours later. No bottles or aerosol cans were found inside of the viewing room or on his person. Inspection of his vehicle revealed miscellaneous clothing, food containers, aerosol cans, construction equipment, and two child car seats. Several bottles of exercise supplements were in the center console of the car. It is unknown if any of the aerosol cans inside the vehicle contained ethyl chloride. There was no known prior illness or substance abuse history. His social history was unknown except the obvious visit to an adult video store.

An autopsy was performed approximately eight hours after death. His autopsy findings consisted of pulmonary congestion and edema (combined lung weight 1300 grams). The left ventricular wall of the heart was hypertrophied (1.4 – 1.5 centimeters in width). The major branches of the coronary arteries were without significant atherosclerotic change (less than 10% stenosis).

Ethanol, methanol, isopropanol and acetone were tested for by head space injection on a dual column gas chromatograph (Restek BAC-1, BAC-2). An unidentified peak with a set time of 1.156 minutes on the BAC-2 column eluted at 1.243 minutes on the BAC-1 column as an overlying peak with the same retention time as ethanol. Gas chromatographic/mass spectrometric analysis of blood and liver identified this substance as ethyl chloride. An alcohol dehydrogenase method (DRI Ethyl Alcohol Assay, Microgenics) was used for the quantitation of ethanol in the heart blood (0.09 g/dL), the urine (0.8 g/dL), and in the vitreous humor (0.07 g/dL). Cocaine metabolite(s), benzodiazepines, barbiturates, phencyclidine, amphetamine/methamphetamine, opiate(s), and methadone were not detected.

This case illustrates the importance of careful toxicological analysis and scene investigation in an instance where inhalant abuse was not suspected. Although ethyl chloride inhalation is not a common cause of death, it can be lethal when abused. The forensic community needs to be aware of its potential toxicity especially in cases such as this where there was no known history of "sniffing" or "huffing" and no obvious evidence of inhalant abuse at the scene.

#### **Ethyl Chloride, Inhalant, Poppers**