K15 Inhalant Abuse Involving Difluoroethane

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After attending this presentation, attendees will learn of two cases of intentional inhalation involving a readily available compound and the methods used to identify this compound.

This presentation will impact the forensic community and/or humanity by providing examples of non-fatal and fatal inhalation of difluoroethane and increasing the awareness of inhalant abuse.

1,1-Difluoroethane (DFE) is a colorless gas with a slight ethereal odor used in aerosol preparations and coolants. DFE can produce headache, weakness, dizziness, nausea, confusion, labored breathing, lung irritation, loss of consciousness, and cardiac arrhythmia. Overexposure may result in fatality due to displacement of oxygen.

The first case involves the intentional abuse of DFE by a motorist. A 32-year-old white male was observed slumped over behind the wheel of a stopped vehicle. Several aerosol cans labeled Endust for Electronics® were observed lying on the floor of the vehicle. After the subject was roused, he admitted he had been "huffing", stating he had consumed one aerosol can and was starting on another. Subject's face was red with watering eyes. A rapid head movement from left to right was also observed. Subject was placed under arrest for DUID and transported to a medical center where blood was collected.

Qualitative headspace analysis of whole blood samples as well as one of the suspect aerosol cans by gas chromatography-mass spectrometry (GCMS) indicated the presence of DFE. A standard was prepared by introducing propellant from an Endust for Electronics® can into a 20 ml headspace vial rapidly sealed. Confirmation of DFE was accomplished by the comparison of blood sample spectra to DFE standard spectra. No other toxicology analyses were performed.

The second case involves the intentional inhalation of DFE by a high school student. The decedent was a 14-year-old white male found by his mother lying motionless in his bed with his legs crossed and his head leaning to one side. An aerosol can labeled Dust-Off® was found in his hands with the delivery tube still in his mouth. Further investigation revealed the decedent had previously inhaled Dust-Off® with friends who referred to the practice as "dusting". A subsequent search of a neighboring school yielded the discovery of another aerosol dust remover labeled Clean Safe® containing 1,1,1,2-Tetrafluoroethane (TFE) in the possession of a student.

The father of the decedent was a police officer, the mother a nurse. A German shepherd police dog trained in the detection of drugs lived with the family. The decedent's father revealed that his son had experienced one episode of vomiting the week before and complained once of a numb tongue. Specimens obtained at autopsy included cardiac blood and femoral blood collected in sealed polypropylene vials as well as lung tissue from each lung and a tracheal air sample collected in 20 ml headspace vials. Specimens were stored at 4º C until analysis.

Specimens were submitted for toxicology testing, including a volatile screen by headspace gas chromatography with flame ionization detection and a drugs of abuse screen utilizing an enzyme-linked immunosorbent assay. The volatile screen on femoral blood indicated the presence of DFE while the drugs of abuse screen were negative. Confirmation of DFE was accomplished by qualitative headspace analysis by GCMS. A standard was prepared by introducing propellant from a Dust-Off® can into a 20 ml headspace vial rapidly sealed. DFE was identified in the cardiac blood and both lung samples. The tracheal air sample was negative. The cause of death was determined to be chemical asphyxia and the manner of death accidental.

According to the American Academy of Pediatrics, the peak age of inhalant abusers is 14 to 15 years, with onset occurring in those as young as 6 to 8 years. Use of inhalants typically declines by 17 to 19 years.

Difluoroethane, Headspace, Inhalant Abuse

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