K66 Detection of Volatiles in Postmortem Samples by Headspace Gas Chromatography With Mass Spectrometry

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After attending this presentation, attendees will become knowledgeable about the detection of toxic volatiles in postmortem specimens such as blood, lung, and brain using Headspace/Gas Chromatography with Mass Spectrometry (HS/GC/MS). Four cases of death caused by toluene, difluoroethane, difluorochloromethane, and nitromethane abuse will be discussed.

This presentation will impact the forensic science community by providing a more reliable method for the detection of volatiles in postmortem specimens.

Volatile inhalants have become a common and dangerous substance of abuse. These inhalants include a broad range of chemicals such as volatile organic solvents, aerosol propellants, and other gases which are readily available, easily purchased, and can be used without supervision or accessories. The mechanism of acute intoxication and death due to inhalant abuse is through fatal ventricular arrhythmia, asphyxiation, and pulmonary edema.

Undoubtedly, the ability to confirm these gases in autopsy specimens presents unique challenges to the forensic toxicologist. Headspace/Gas Chromatograph/Flame Ionization Detector (HS/GC/FID) is currently the most widely applied technique in determining the presence of volatile compounds. However, this method does not provide sufficient data for identifying poorly combustible gases. In these cases, HS/GC/MS is more advantageous because it provides spectral data specific to the volatile compound that can be matched with data stored in the NIST library for identification and confirmation. Postmortem samples such as blood, brain, and lung are collected by the medical examiners in a headspace vial and analyzed by HS/GC/MS. The analysis of these cases was performed using an Agilent 7890 GC equipped with Agilent 5975 inert, triple axis Mass Selective Detector (MSD) utilizing a split injection of 100:1. The column was DB-VRX (40m x 0.180mm x 0.100µm) and helium was used as the carrier gas. The oven was programmed for an initial temperature of 55°C that ramped to a final 80°C at a rate of 20°C/min and the entire run time was 11.25 min.

Case 1: Presents a 58-year-old White male found dead with evidence of spray paint on the fingers and face; spray paint cans were located at scene. Upon analysis, toluene was found in his blood sample. Toluene, or methylbenzene, is used in the production of benzene, solvent-based cleaning agents, household aerosols, nail polish, paints and paint thinners, lacquers, adhesives, and as a gasoline additive.

Case 2: Presents a 50-year-old female found with a spray can of Dust Off™ in her hand. Dust Off™, the main ingredient being difluoroethane, is becoming increasing favorable to inhale.

Case 3: Presents a 39-year-old White male found dead, lying prone beside an air conditioning unit, with his mouth against a pipe connected to the unit. Diflurochloromethane, also known as Freon, is growing in popularity because of its ease in being inhaled from outdoor units.

Case 4: Presents a 56-year-old White male that involves nitromethane, which is a component of airplane fluid. In this unique case, the decedent died as a result of consuming airplane fluid in an attempt to get drunk.

Volatiles, Headspace Gas Chromatography, Postmortem

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