



### H103 Active Duty United States Military Deaths Due to 1,1-Difluoroethane Intoxication

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**Learning Overview:** After attending this presentation, attendees will understand the prevalence of active duty military deaths due to intentional inhalation of difluoroethane and discuss possible preventative measures.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by discussing that all forensic autopsies performed should have routine testing for difluoroethane, especially in circumstances suggestive of its use, such as the presence of numerous cans of compressed air on scene.

Huffing, sniffing, or bagging of compressed air is a common method to “get high,” especially in teenagers and young adults, due to ease of access and difficulty in detecting its abuse. Compressed air contains 1,1-difluoroethane, a halogenated hydrocarbon gas; intentional inhalation can result in central nervous depression and cardiotoxicity, including sudden death, which is believed to be due to cardiac arrhythmias. Routine workforce drug screening, including the Department of Defense (DoD) Drug Testing Program, does not currently screen for volatiles such as difluoroethane; thus, abuse can go undetected (although some military services do require a breathalyzer test at the time of urinalysis to detect the presence of ethanol).

A retrospective review of all autopsies performed by the Armed Forces Medical Examiner System (AFMES) from 2010 until 2018 revealed 20 active duty service member deaths that were directly attributed to 1,1-difluoroethane intoxication. Four deaths of civilians (either military dependents or federal employees) due to difluoroethane were also noted but are not discussed further in this abstract. Scene investigation typically revealed numerous cans of compressed air. Autopsy findings were non-specific, and the most common finding was pulmonary edema. Although frostbite on the hands and face has been reported in the literature, this finding was not documented in any case. Histology was performed in about one-third of cases and again showed non-specific findings, with pulmonary edema the most common histology finding. Specimens submitted for toxicology testing (if able to be obtained) included peripheral blood (submitted in gray, purple, and red top blood tests), urine, vitreous fluid, gastric contents, bile, brain, heart, lung, liver, spleen, kidney, and adipose tissue. No special handling or unusual specimens, such as tracheal aspirates, were required for testing. Full postmortem toxicological testing was performed in all cases to include analysis via headspace gas chromatography with a flame ionization detector for volatiles. All positive findings were confirmed on at least two different bodily fluids and/or tissues using headspace gas chromatography/mass spectrometry.

A query of AFMES’ mortality data revealed an additional 12 deaths certified as difluoroethane intoxication by civilian jurisdictions over the same time period. Autopsy findings, other than cause and manner of death, and toxicology testing results were not available for the 12 cases performed by civilian jurisdictions. Demographics of all 32 decedents included predominantly men (91%), with an age range of 20 to 44 year (average age: 30 years). The decedents served in all branches of the United States Armed Forces and were predominantly in the enlisted ranks, although two officer deaths were noted.

Several years ago when difluoroethane deaths became more recognized in the United States, bitterants were added to the cans of compressed air, with the goal of reducing abuse. This office recommended that all cans of compressed air available at military shopping facilities have the bitterant. However, this data shows that deaths due to difluoroethane continue to be detected. Clearly, inhalant abuse is significantly underrecognized in the public and in active duty service members. This study identified 32 deaths of active duty service members over the past ten years that possibly could have been prevented if antemortem abuse was detected.

#### **Huffing, Difluoroethane, Military**