



### K71 I'll Huff and I'll Puff: Dust Off™ Canister Abuse

Theresa M. Hippolyte, MS\*, Miami-Dade Medical Examiner, Number One on Bob Hope Rd, Miami, FL 33136-1133; Diane Boland, PhD, Miami-Dade Medical Exam Dept, Toxicology Laboratory, Number One on Bob Hope Rd, Miami, FL 33136; and Wilmo Andollo, BS, Dade County, Medical Examiner's Office, Number One on Bob Hope Rd, Miami, FL 33136

After attending this presentation, attendees will be aware of the potential for abuse of Dust Off™ in combination with other drugs and the challenges of potentially misleading crime scene evidence.

This presentation will impact the forensic science community by illustrating how simple household products can be abused in conjunction with other drugs.

This presentation discusses a number of inhalant deaths that have occurred in Miami-Dade and Collier County, Florida, since 2010. The Medical Examiner's Department has investigated six cases during this time period in which the decedents were engaged in inhaling, or "huffing," 1,1-difluoroethane found in commercial products.

In addition to 1, 1-difluoroethane, the cases presented included other drugs such as benzodiazepines, opiates, anti-depressants, diphenhydramine, or synthetic cathinones and tryptamines.

The decedents were mostly Caucasian, three males and three females, ranging in age from 26 – 37 years. In all cases, the decedents were declared dead at the scene with no resuscitative efforts employed. All decedents were surrounded by multiple canisters of products containing 1,1-difluoroethane. The propellant, 1, 1-difluoroethane, typically found in products such as Dust Off™, is readily absorbed by the lungs when inhaled, and causes alcohol-like intoxication including drowsiness, lightheadedness, and loss of inhibition. At toxic levels, effects can include asphyxiation and cardiac arrhythmias. Typical users engage in the inhaling of these vapors by expelling the aerosol into a bag that is held over the head or mouth. Death can occur from either an acute episode or chronic abuse of these inhalants. The manufacturer now includes a bitterant agent in their products to deter or discourage huffing practices.

Blood samples collected during the autopsy that were used for the analysis of 1, 1-difluoroethane were stored in glass screw-top tubes. Initial volatile screening for ethanol, methanol, acetone, and isopropanol by headspace gas chromatography indicated an unknown peak on the chromatograms later identified as 1,1-difluoroethane. Follow-up confirmation was performed using solid phase micro-extraction followed by Gas Chromatography Mass Spectrometry (GC/MS). A commercial Dust Off™ product was used as reference standard for the identification of 1,1-difluoroethane. A working stock solution was prepared by spraying the aerosol into a headspace vial and capping immediately. A working control was prepared by taking a 100µL aliquot of the headspace with a gas-tight syringe from the working stock solution and infusing it into a sealed headspace vial containing internal standard (n-propanol, 15mg/L in de-ionized water). Samples were prepared by adding 1mL of blood to a vial containing 1mL of internal standard. All samples and controls were heated at 65°C for a period of 15 min prior to analysis. The analysis was performed by solid phase micro-extraction using a 75µm Carboxen-PDMS fiber (Supelco, Inc). The fiber was exposed to the samples and controls for 5 min prior to injection into the GC/MS. A 60m x 0.25mm I.D. x 1.4µm Rtx-VMS column (Restek, Inc.) was employed. Analysis was performed in the full scan electron ionization mode, with identification based on spectral library matching. The primary ions used for identification are m/z 51 (base peak), m/z 65 (major ion), and m/z 47 (major ion).

Despite the presence of multiple canisters at each scene, the cause of death is still in question. Toxicology findings in these cases indicated the decedents were abusing more than just Dust Off™. Initial interpretations based on the scene alone could be misleading without extensive toxicology follow-up. In only one of the presented cases was the cause of death solely attributed to 1,1-difluoroethane toxicity. The remaining cases are still pending the pathologist's findings due to the presence of other drugs.

Case	1, 1-difluoroethane	Other Drugs Present	Date
1	Detected	Buprenorphine, Norbuprenorphine, Diazepam, Nordiazepam, Temazepam	July 2010
2	Detected	Diphenhydramine, Clomipramine, Norclomipramine	October 2010
3	Detected	Alprazolam, Citalopram, Norcitalopram, Diphenhydramine	May 2011
4	Detected	MDPV, MDMA, BZP, TFMPP, 5-MeO-DiPT, Dextromethorphan	November 2011
5	Detected	Diphenhydramine	September 2011
6	Detected	Alprazolam, Oxycodone, Tramadol	February 2012

#### Inhalant, 1, 1-Difluoroethane, SPME