K27 A Review of Cases Analyzed for 1,1-difluoroethane

Lee M. Blum, PhD, Michael Keppel, BS, and Erik Flail, BA, NMS Labs, 3701 Welsh Road, Willow Grove, PA 19090*

After attending this presentation, attendees will learn the bodily fluid and tissue concentrations of 1,1-difluoroethane and understand the relationship of demographic information to 1,1-difluoroethane abusers.

This presentation will impact the forensic toxicological and pathological communities by presenting data on 1,1-difluoroethane concentrations in human fluids and tissues where there is currently a relative dearth of current information.

1,1-difluoroethane (DFE) is a colorless, odorless gas used as a refrigerant and as an aerosol propellant in many commonly used consumer products and electronic cleaners. Over the past few years it has been recognized as a substance of abuse that can lead to injury or death. In general, inhalation of fluorinated hydrocarbons may result in a feeling of light- headedness and disorientation; however, in higher concentrations abuse may lead to cardiac dysrhythmias and sudden death.

A review of cases from our laboratory database for the past two years revealed 48 cases for which DFE was analyzed. The analysis for these specimens was performed by headspace gas chromatography/mass spectrometry. All but three of the cases found DFE to be present. The specimens in which DFE was detected included blood (n=35) (while most did not identify the source of the blood some were identified as central, chest, iliac, inferior vena cava, femoral or peripheral); lung tissue (n=8), brain tissue (n=2); adipose tissue (n=1); and urine (n=1). The blood concentrations ranged from 0.14 to 300 mcg/mL, average (± SD) 51 ± 78 mcg/mL and median 23 mcg/mL. In most cases, our laboratory did not receive case histories with the accompanying specimens; therefore, it was difficult to determine if the blood tested was an investigation of a death (due to an over- dose or an accident), investigation of human performance involving an accident, or probable cause for substance abuse. However, based on the source of the specimen and/or the submitting client, 21 blood specimens were identified as postmortem blood that had DFE concentrations ranging from 0.74 to 300 mcg/mL, average (± SD) 79 ± 91 mcg/mL, and median 45 mcg/mL. The DFE concentration in the lung tissues examined ranged from 0.86 to 59 mcg/g, average (± SD) 20 ± 24 mcg/g, and median 11.3 mcg/g. The two brain tissues had concentrations of 26 and 100 mcg/g. The one adipose tissue and one urine sample had DFE concentrations of 6.8 mcg/g and 0.94 mcg/mL respectively. In three cases where multiple samples were analyzed, the DFE concentrations were blood 65 mcg/mL and brain tissue 100 mcg/g; blood 23 mcg/mL and lung tissue 0.94 mcg/g; and adipose tissue 68 mcg/g and lung tissue 24 mcg/g. It should be noted that DFE is a gaseous substance and may volatilize on handling; therefore, the reported values may be lower than the circulating concentrations.

In 37 of the cases where the gender was identified, 73% (27) were male and 27% (11) were female. The ages of the individuals were given in 35 of the cases and ranged from 15 to 55 years, average (± SD) 27 ± 10 years, and median 25 years. In cases were both gender and age were noted, the average (± SD) age of the males (n=24) was 29 ± 11 years (range 15 – 55 years), me- dian 27.5 years; and the average (± SD) age of the females (n=9) was 22 ± 6.6 years, (range 16 – 31 years), median 18 years. In conclusion, DFE can be found in a variety of bodily fluids and tissues in a forensic toxicological investigation and appears to be predominantly abused by men in their late twenties, but also can be found in women usually of a younger age. With the prevalence of this propellant in commonly used consumer products, the abuse of this substance will likely continue.

1,1-difluorethane, Toxicology, Inhalant Abuse

 ** Presenting Author*