



Pathology Biology Section – 2011

G17 Butane Inhalation and Sudden Death: A Case Report

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After attending this presentation, attendees will have learned about a case of sudden death due to butane inhalation in a young inmate.

This presentation will impact the forensic science community by stressing the importance of combining autopsy data and the detection of volatile substances in blood and tissues in all cases of unclear death of young people.

This presentation will inform attendees of something they do not do correctly—the misdiagnosed problem of sudden death due to abuse of volatile substances, especially in adolescents and people living in remote communities. In the current practice, forensic pathologists don't often consider that volatile substances are very easily accessible, and lethal if abused. They should learn how to detect halogenated hydrocarbons, and when it is correct to analyze the concentrations of these volatile substances in blood and tissues. This kind of investigation should be performed in order to avoid mistakes, especially in cases of sudden death of young people with aspecific pathological findings or unremarkable histological examinations.

The deliberate inhalation of volatile substances has been reported from most parts of the world, mainly among adolescents, individuals living in remote communities, and those whose job gives easy access to these substances, with a higher incidence in Countries with large rural populations. Although it is less widespread than twenty years ago, inhalant use still remains a problem today ranging from 10% to 15% among U.S. teenagers and young people (M.R. Marsolek et al., 2010).

Solvents from contact adhesives, typewriter correction, dry cleaning fluids, cigarette lighter refills, petrol (gasoline), halogenated solvents, and aerosol propellants are commonly abused in this way, but cigarette lighter refills and butane-containing cans for portable cooking stoves are the most frequently abused ones. Although aliphatic hydrocarbons are considered safe as aerosol propellants, the acute inhalation of these substances, particularly n-butane, may potentially cause severe damage in healthy hearts (M. Ago et al., 2002).

Volatile substance abuse gives rise to dose-related effects similar to those of hypnosedatives. Small doses can rapidly lead to euphoria and other behavior disturbances similar to those caused by ethanol (alcohol), and may also induce delusions and hallucinations. Higher doses may produce life-threatening effects such as seizures, coma, and sudden death

(R.J. Flanagan et al., 1994). The mechanism of sudden death directly related to volatile abuse includes cardiac arrhythmia, hypoxia, and respiratory depression.

Butane is a gaseous aliphatic hydrocarbon, also called n-butane, with the "n" designating it as normal butane. Its other isomer is isobutene, but the name butane is used collectively to denote both n-butane and isobutane (R.L. Myers, 2007). N-butane and isobutane have an anesthetic or narcotic effect on the central nervous system, and induce fatal arrhythmia at 0.5–15% concentrations in the air (H. Sugie et al., 2004). It has been reported that many n-butane or isobutane abusers experienced fatal ventricular fibrillation immediately after a sudden fright or intense muscular exercise such as running and sexual activity (C. Jackowski et al., 2005. H. Sugie et al, 2004). A few cases of suicide by propane-butane inhalation have been reported too (A. Gross et al., 2002).

A case of sudden death of a 22-year-old male inmate is described. He had a history of drug addiction, depression, and multiple self-inflicted superficial incised wounds. His cellmates reported that the body was found in the bathroom of the cell. The bathroom smelled of gas. The body was lying on the bidet, with his back leaning against the wall; a butane-containing can and a portable cooking stove were found on the floor adjacent to the body. A complete medicolegal autopsy was performed. The external examination showed marked livor mortis, nosebleed, and some parallel linear scars on the forearms; no signs of recent injuries or trauma were observed. The internal examination revealed marked lung congestion; the other organs showed no pathological findings, but evidence of congestion. Histological examinations were unremarkable. Blood samples were collected and analyzed for halogenated hydrocarbons and drugs, using gas chromatography. A concentration of about 0.5 µg/ml for n-butane, with traces of isobutane and butene was measured; drug screening revealed

therapeutic concentrations of benzodiazepines and 0,5 g/L of ethanol in blood samples. The cause of death was ascribed to n-butane poisoning inducing fatal cardiac arrhythmia.

In conclusion, abuse of volatile substances is a serious problem because it is not illegal and agents are easily available and cheap. Thus, the risk of sudden death due to abuse of volatile substances in an



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environment with no witnesses should be taken into consideration in all cases of unclear death of young people. It is recommended that medicolegal death investigators become familiar with the principles of detection of volatile substances in blood and tissues, especially in those cases with unspecific macroscopic and histological findings.

Volatile Substance Abuse, Butane, Sudden Death