H152 An Unusual Case of Suicide Due to a Gas Mixture Poisoning

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Learning Overview: After attending this presentation, attendees will understand the role of ethanethiol in acute poisoning by suicide.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by describing the chemical characteristics of the substance and its role in the putrefactive process.

The inhalation of volatile substances as a suicide method is rare, while the use of the same as abuse substances is quite common worldwide and is called Volatile Substance Abuse (VSA). In the majority of cases, the use of these substances as a suicide method is practiced by adult prisoners; the use of the same as abuse substances is more common in adolescents representing an important cause of mortality and morbidity in the young population. The most common types of volatile substances are aliphatic (butane, propane), aromatic (glues, lacquers, solvents), and halogenated hydrocarbons (spray paint, propellants). The methods of a substance's intake are: direct inhalation of the substance ("sniffing," inhalation by nose or the mouth), the inhalation through a cloth that is impregnated ("huffing"), and inhalation through a plastic bag. Liquified Petroleum Gas (LPG) (CH_3 CH_2 CH_3 + CH_3 CH_2 CH_2 CH_3) is an odorless volatile substance and usually it is added with ethanethiol (CH_3 CH_2 SH), a harmful gas with a bad odor (garlic). Ethanethiol has causes a neurological action on the central nervous system causing fatal respiratory depression. From the analysis of the literature, the main causes of death by acute poisoning are cardiac arrest (Sudden Sniffing Death Syndrome) and asphyxia, while the main causes of death due to chronic abuse are cardiomyopathy, myocardial infarction, and central nervous system toxicity.[1,2] Postmortem analysis on biological fluids and tissues is performed by the gas chromatography method.

A Belarusian boy (weight 100kg, height 185cm) was found dead in his home (ambient temperature: 26°C). The boy was in the kitchen in a supine position with a black plastic bag wrapped around his head with a hole from which he passed a gas hose connected to a domestic LPG tank. A judicial inspection was conducted to exclude any signs of a scuffle or break-in. At home, antipsychotic drugs were found. The analysis of the witnesses among the family members showed that the boy was suffering from psychosis with hallucinations and a history of drug addiction. The psychological autopsy showed his sister's suicide from height fall. The boy and his sister were both adopted by an Italian family. An autopsy was performed. The corpse appeared in a putrefaction state (12 hours after death). The hypostasis were abundant in red-bluish color at the back, chest, and neck. The lungs showed edema with anthracosis areas. The heart revealed small sub-epicardic petechiae. The buccal cavity showed a mucous hyperemia. A toxicological and histopathological investigation was carried out. The organs' analysis was limited by the presence of putrefaction, in particular on the brain and pancreas. The toxicological analysis showed an increase of blood glucose and the presence of antipsychotic drugs due to pharmacological therapy. Butane and propane concentrations were found in the blood, bile, and adipose tissue. Ethanethium's concentration was detected in peripheral blood and urine.

The analysis of this case shows that the gas mixtures used as suicide methods can be lethal even at low concentrations. In the case of LPG, the chemical analysis shows that the most lethal or responsible gas in the genesis of death is ethanethiol. The lethal effect of ethanetiol can be due to the -SH chemical group, which has a high biological toxicity with potential affinity for hemoglobin. The lethal effect is also due to the mixture of gas with the known toxicity of butane and propane.[3] From the forensic point of view, in the analysis of the postmortem interval, it is crucial to underline that, in cases of gas mixture poisoning, the presence of ethanethiol speeds up the putrefaction due to the -SH chemical group for the composition of sulfuric methemoglobin responsible for the putrefactive process.

Reference(s):

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3. Sironi L., Amadasi A., Zoja R. Recreational Inhalation of Butane and Propane in Adolescents: Two Forensic Cases of Accidental Death. *Forensic Sci Int.* 2016 Sep;266:e52-e58.

Forensic Science, Ethanethiol, Acute Poisoning