



K70 A Rare Case of Criminal Poisoning by Means of Butane Gas: N-Butane Quantification in Biological Fluids and Tissues

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After attending this presentation, attendees will understand that the proof of a criminal poisoning with butane gas intoxication depends on the rapidity of collecting blood and tissues samples and butane determination using Headspace/Gas Chromatography-Mass Spectrometry (HS/GC/MS).

This presentation will impact the forensic science community by underlying the necessity of close collaboration between forensic physicians and toxicologists so that samples are analyzed as soon as possible after death. Moreover, forensic physicians will learn that this type of analysis must be carried out in a laboratory with an adequate method of detection and quantification by HS/GC/MS. Finally, this case broadens the literature concerning n-butane concentration in postmortem samples.

This study will present a rare case of criminal poisoning with n-butane as an example of the practical application of this necessary interdisciplinary communication and collaboration. It is recommended that medicolegal death investigators become familiar with the specificity of research of n-butane in postmortem samples.

There are some reports of fatal cases related after accidental or deliberate n-butane inhalation, but criminal poisoning with n-butane remains exceptional. N-butane determinations in biological samples can sometimes be of interest to confirm intentional or accidental fatal intoxications with this volatile aliphatic hydrocarbon.

This study reports the case of a 52-year-old woman found dead in a car next to her husband who was conscious, showed no sign of distress, and alleged an unsuccessful suicide pact. He explained that the couple had chosen to inhale n-butane together in their vehicle parked in the garage as the method of committing suicide. A gas bottle with an 8.5cm pipe was found in the car. Death examination at the scene revealed petechial haemorrhages to the upper eyelids and slight abrasions on the neck. An autopsy was requested. Before this was performed, the forensic physician contacted the toxicologist. Because of the volatile nature of n-butane, the toxicologist explained blood and tissues samples had to be extracted as soon as possible after the body was incised.

The autopsy showed a congestive aspect on the head, peri-ocular petechial hemorrhages, conjunctival hemorrhages, abrasions on the lips, and small semi-circular abrasions with bruises on the neck. The first step of internal examination consisted of cardiac blood sampling. Samples of blood, brain, lung, liver, and heart were removed 20h after the discovery of the body. Internal examination showed pulmonary and cerebral edema, congestion of the organs associated with bruises on the tongue and on the left side of the thyroid cartilage. No important injury was seen in the cervical area. The cause of death was noted as asphyxiation.

A large drug and toxic compound screening was performed on cardiac blood, brain, lungs, liver, and heart and a specific research for volatile substances was performed with HS/GC/MS. After having determined the presence of n-butane, quantitative determination was performed. Briefly, an external calibration (from 0.078 μ g to 3.9 μ g of n-butane) by means of volumetric dilutions from a supplied calibration gas mixture was achieved. A gas-tight sample lock syringe and a specific connecting device enabling direct sampling in the gas cartridge were used. Chromatographic separation was then performed using an RT-Q-Bond Column (30 m x 0.32 mm i. d.) and the detection of n-butane occurred in single ion monitoring mode: m/z 41 for quantitation; m/z 43 and 58 for qualification. In 1mL blood sample, the method is linear from 78 μ g/L Limit of Quantitation (LOQ) to 3,900 μ g/L. Precision was checked by inter-day CVs and associated relative bias (n=5), which were lower than 25%, and 20%, respectively. N-butane concentrations were 610 μ g/L (blood), 50ng/g (brain), 134ng/g (lungs), 285ng/g (liver), and 4,090ng/g (heart).

A rare criminal poisoning case of asphyxia associated with n-butane inhalation has been described in this study. Even if the exact time of death is unknown, due to close cooperation between the forensic physician and the toxicologist, rapid collection of blood and tissue samples during the autopsy and an adapted analytical method, the proof of intoxication as the cause of death was found. Collecting samples in properly sealed containers designated for volatile substances and analyzing the samples for the presence of volatiles solutions as soon as possible after collection is recommended.

N-Butane, Criminal Poisoning, HS/GC/MS

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