



H161 Fatal Nitrous Oxide Intoxication—Suicide or Accident?

Serge Schneider, PhD, Laboratoire National de Santé, Dudelange 3555, LUXEMBOURG; Martine Schaul, MD, Laboratoire National de Santé, Dudelange 3555, LUXEMBOURG; Thorsten Schwark, MD, Laboratoire National de Santé, Dudelange 3555, LUXEMBOURG*

Learning Overview: After attending this presentation, attendees will: (1) have been provided with an overview of Nitrous Oxide (N₂O) abuse and its—potentially fatal—risks, and (2) be acquainted with the toxicological analysis of N₂O.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by sensitizing crime scene investigators, forensic pathologists, and forensic toxicologists to the dangers of N₂O abuse, thus improving crime scene work, autopsy procedures, and subsequent toxicological analysis.

N₂O (“laughing gas”) is an odorless gas that is used as a (weak) anesthetic in clinical settings. Due to its dissociative and euphoric effects, and its easy availability, it is also widely abused in a recreational context. The gas is usually inhaled (e. g., out of filled balloons) and due to the short half-life of the substance, the effects wear off quickly. The toxicity of N₂O is low; however, if inhalation occurs in a limited space, displacement of oxygen may lead to hypoxia and, ultimately, death. In chronic users, N₂O is known to interact with vitamin B12 containing enzyme systems, and N₂O abuse may lead to hematological, immunological, and neurological symptoms. Even though some abuse-related fatalities have been reported, deaths caused by N₂O inhalation are rare events.

Here, the unexpected death of an 18-year-old boy is described. The deceased was found by his mother fully dressed in a prone position in his parents’ house. A 25L plastic bag, connected to a whipped cream steel siphon using a plastic tube, was pulled over his head and fixed around his neck. The police secured five used cream charger capsules originally containing 7.5g of N₂O each on a table close to the deceased; one additional empty capsule was found in the capsule holder applied to the empty siphon.

According to his parents, the boy had been in a depressed mood in the days prior to his death since his girlfriend had left him but had not expressed any suicidal thoughts. A school friend reported that the deceased had told him he had previously inhaled “laughing gas.”

Autopsy and histology results were unremarkable except for scattered conjunctival petechiae, congestion of the inner organs, and brain and lung edema. Toxicological analysis using static headspace Gas Chromatography/Mass Spectrometry (GC/MS) analysis proved the presence of N₂O in lung tissue and blood; a screening for alcohol and licit and illicit drugs was negative. Considering autopsy and toxicological findings, asphyxiation caused by oxygen depletion and N₂O inhalation was ascertained as the cause of death.

As previously described by Bäckström et al., N₂O concentrations in the inspired air of 25 % suffice to depress the sensation of dyspnea in the person inhaling the gas, thus leading to sudden unconsciousness due to hypoxia.¹ It is assumed that the administered N₂O volume in this case was at least 3.8L (7.5g N₂O equal 3.8L at 0°C); considering the five additional capsules found at the scene, it may even have been significantly more (up to 45g N₂O, equaling approx. 23L at 0°C). By introducing the gas into the reduced remaining space of the plastic bag, N₂O levels that are sufficient to explain a sudden unconsciousness and subsequent incapacity to act can easily be provoked. Further investigations in the peer group of the deceased confirmed that he had abusively used N₂O before so that the manner of death in this case was ruled an accident rather than a suicide.

The presented report illustrates a rare case of fatal N₂O inhalation, and clearly emphasizes the hazards accompanying “laughing gas” abuse.

Reference(s):

¹. Bäckström B., Johansson B., Eriksson A. (2015) Death From Nitrous Oxide. *J Forensic Sci* 60: 1662-1665. doi: 10.1111/1556-4029.12879.

Nitrous Oxide, Hypoxia, Substance Abuse