K60 Rapid Determination of N_2O in Postmortem Biological Samples: A Case of Serial Fatal Poisoning

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After attending this presentation, attendees will be briefed on eight cases of fatal poisoning which occurred during general anesthesia.

This presentation will impact the forensic community and/or humanity by demonstrating the presence of N_2O in forensic biological samples by headspace- gas chromatography analysis using ECD detector (HS-GC/ECD).

Case History: In a public hospital during anesthesia, eight accidental deaths occurred due to an erroneous replacement of O_2 with N_2O. Four were females and four were males with a mean age of 77.75 years (range 67-85). Five of the decedents showed cardiovascular diseases, two had lung disease and one had gastrointestinal disease. During anesthesia, all were exposed to N_2O for a mean period of 58,25 min (range 25-125 min) until they expired.

Goal: It is known that Nitrous oxide (N_2O) is an asphyxiant at high concentrations [ACGIH 1991]. Determination of the cause of death in gaseous asphyxiation cases is very difficult due to the variation in circumstances during the event. To clarify the cause of death and identify the factors involved in asphyxia, gases from different lines were characterized and N_2O concentrations in postmortem biological samples (air and tissue samples), collected after 19 days postmortem (range 6 – 31) were analyzed.

Methods: Analyses, carried out on the gas samples both from the O_2 and the N_2O lines in the surgery room, confirmed the incorrect connection of the lines. In fact, gas samples from O_2 lines showed the presence of pure N_2O, while in those collected from the air lines there was pure O_2 with a low percentage of N_2O (less then 0.1%). Analysis of gas samples from the lines supplying each bed, produced the same results.

The analyses performed on the postmortem biological samples, showed an abnormal concentration of N_2O. Particularly, air samples collected from the stomach of all patients during autopsy revealed concentrations from 0.12 mM to 1.9 mM N_2O corresponding to 0.30 % and 4.55%, respectively. All samples were collected in duplicate and stored in 100 ml syringes until analysis. Calibration was carried out using air samples with a known amount of N_2O.

The presence of high levels of N_2O was found in urine, blood, kidney and liver. Results showed a variation in the distribution of the gas consistent with its solubility in the different tissues.

Results confirmed that the air supply lines were indeed switched. The data also indicate that N_2O could be detected in biological samples 31 days postmortem due to the high exposure concentrations.

Therefore, this report presents valuable findings for the correct diagnosis of the cause of death and helps to clarify the true nature of the cause of death.

Nitrous Oxide, Anesthesia, Accidental Death

 ** Presenting Author*