



K65 The Art of Embalming vs. the Science of Forensic Toxicology

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After attending this presentation, attendees will better understand the challenges unique to interpretation of toxicological findings in postmortem cases. Attendees will be provided with an overview of toxicology aspects of postmortem changes associated with the postmortem artifacts.

This presentation will impact the forensic science community by further delineating the interpretive aspects of toxicological findings in embalmed cases and the need for analysis of the embalming fluid whenever an unexpected analyte is detected to eliminate or confirm postmortem contamination.

Postmortem forensic toxicology is an important integral part of the medicolegal investigation of death. The complexity of postmortem toxicology testing and the nature of specimens submitted for analysis make the interpretation of forensic toxicology results a continuing challenge. In addition to evaluating laboratory methodologies for drug analyses, the condition of the body, drug characteristics, matrix, and site of specimen collection are among the factors that need to be considered in the proper interpretation of an autopsy specimen result. Chemical fixatives such as formalin or embalming fluids cause interference with toxicological analyses. Some funeral homes also add ethylene glycol and/or propylene glycol to the embalming fluid to increase the effectiveness of the arterial embalming process. Consequently, these substances added to commercially available embalming solutions are not included as components on material safety data sheets provided by the manufacturer.

The case involved an 81-year-old man who died at home under hospice care. His death was reported for cremation clearance with cause of death attributed to end stage renal disease due to diabetes mellitus. Following embalming and the wake, the family requested that an autopsy be performed based on their suspicion that the decedent was possibly poisoned with “antifreeze.” Ethylene glycol is used as a major component of antifreeze fluids. An oral dose of 100mL is believed to be fatal to most adults. Propylene glycol, a relatively non-toxic substance, is used extensively as a substitute for ethylene glycol in automotive antifreeze. Its pharmaceutical applications include use as a preservative, emollient, and vehicle for both oral and intravenous medications.

In addition to routine toxicological analysis, specimens were tested for the presence of ethylene glycol and propylene glycol. Analysis was performed using a gas chromatograph with a 5973 mass spectrometer equipped with a RTX-BAC1 column (30m x 0.32mm x 1.8µm film thickness). Acetonitrile was used as the protein precipitation solvent and 1,3-propanediol as the internal standard. The reporting limit was 50mg/L.

Ethylene glycol was not detected in any of the specimens. Results for propylene glycol were as follows: brain, 567mg/kg; liver, 122mg/kg; gastric content, 381mg/kg; vitreous humor, 432mg/L; and, urine, less than 100mg/L. Further investigation revealed the presence of propylene glycol in one of the embalming fluids used by the funeral home.

Specimens from an additional 27 embalmed cases were subsequently analyzed for the presence of ethylene glycol and propylene glycol. Ethylene glycol was detected in six cases, propylene glycol in 12 cases, and both were detected in three cases.

Propylene Glycol, Embalming Fluid, Postmortem Artifacts