K51 Ethylene Glycol Fatalities: A New Look at Interpretation

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After attending this presentation, attendees will have learned from five interesting cases of fatal Ethylene Glycol (EG) poisonings, where levels were characterized in blood, clots, vitreous humor, and gastric contents.

This presentation will impact the forensic science community by offering unique aspects for understanding the complexities of acute ethylene glycol intoxication.

Analysis of several ethylene glycol (EG) fatalities that emphasize the key aspects of interpreting intoxication and death will be presented. Collateral data based on witnessed accounts, a suicide journal, vitreous electrolytes and chemistries, as well as pathological calcium oxalate crystal formation is discussed and compared with published accounts.

EG toxicity is expressed in three clinical phases during a suicidal poisoning. The first stage is characterized by central nervous system depression, which occurs shortly after ingestion and lasts for several hours. This period involves drowsiness, disorientation, and confusion, where affected individuals may appear drunk. Convulsion, stupor, and coma may develop in the next stage, when ethylene glycol metabolites cause severe metabolic acidosis, cardiopulmonary manifestations, and multisystem organ failure. In the third stage, a well-known pathological feature is the formation of microscopically visible calcium oxalate crystals from the metabolism of EG into oxalic acid and calcium oxalate.

Case #1: A 50-year-old white male who drank antifreeze and was found alive but unresponsive. He was transported to the hospital and received treatment for ethylene glycol toxicity, acidosis, and myocardial infarction. He survived three more days at the hospital, but ultimately died. Postmortem examinations on the hospital admission blood revealed 5622 mg/L EG. There was no evidence of EG in further characterizations of the postmortem vitreous humor. This finding is supportive of 150 mg/L/hr clearance rate while EG was metabolized and eliminated during the 60-70 hours before death.

Case #2: A 21-year-old white male who was observed to be “drunk and sleepy” by his roommate. The roommate left for several hours and found him unresponsive on the floor upon returning. A note was found, where the decedent expressed his intent to commit suicide by drinking EG. Tests later confirmed 588 mg/L in femoral blood, 940 mg/L in vitreous humor, and 1612 mg/L in gastric contents. Increased vitreous creatinine and glucose levels support the renal failure that often accompanies EG toxicosis.

Case #3: A 25-year-old white male who had a history of two suicide attempts; once eight months earlier by heroin, and EG only 3 months before the latest ingestion. Toxicology analysis showed the presence of alprazolam, fluoxetine, and dextromethorphan/chlorpheniramine in therapeutic amounts. However, EG was 2701 mg/L in blood, 3597 mg/L in vitreous, and 5057 mg/L in gastric contents. Prior attempts at suicide by EG were affirmed by numerous calcium oxalate crystals found, which correlates with cumulative exposure.

Case #4: A 56-year-old white male who tried to commit suicide by doxylamine pills, but recovered on his own. He told a friend that he planned to kill himself by drinking EG. Several days later, he was found in a wooded area with a suicide note in his pocket. The toxicology analysis showed that EG had reached 7974 mg/L in femoral blood, 12446 mg/L in vitreous humor, and 23296 mg/L in his gastric contents. However, the pathological examination exposed only a slight number of calcium oxalate crystals in the kidneys.

Case #5: A 38-year-old white male who ingested a cocktail of Gatorade and EG. He had a history of depression and at least three failed suicidal attempts. Lab results revealed EG levels of 4200 mg/L in a blood clot and 5300 mg/L in vitreous humor. A “suicide journal” was present on the scene, where he recorded his experiences as the intoxication progressed over a few hours. This timeline was analyzed to correlate the behavioral and physical disturbances reported by the victim prior to his death.

These cases offer unique aspects for understanding the complexities of acute ethylene glycol intoxication. From strange investigative findings to comprehensive toxicology results, this report provides new insight into ethylene glycol poisoning at the time of ingestion to the autopsy examination and interpretation.

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