



K29 Fatal Ethylene Glycol Intoxication in the State of Maryland for the Last Seven Years

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The goals of this presentation are to present the audience with the most recent trends in the state of Maryland regarding ethylene glycol (antifreeze) intoxication, and to describe the distribution of calcium oxalate crystals in different tissues.

The state of Maryland OCME has investigated ten deaths caused by ethylene glycol (EG) intoxication in the past seven years. This incidence, in a state with a population of about 6 million people, is comparable to that of the whole country, where 40 to 60 deaths caused by EG intoxication are recorded yearly. Most cases involved intentional ingestion by adults with psychiatric illnesses, mainly depression and ethanol dependence.

EG is a relatively nonvolatile (odorless), slightly sweet tasting liquid utilized for its thermal properties, in antifreeze and coolant solutions. It has a half time of three hours and is metabolized by the liver to three major compounds: glycoaldehyde, glycolic acid and glyoxilic acid. Oxalic and formic acids are formed in smaller amounts. Glycolic acid is the main compound responsible for the metabolic acidosis. Oxalic acid binds calcium and precipitates into calcium oxalate in tissues. As little as 100 ml EG are usually lethal in adult humans. EG has been responsible for fatal and non-fatal accidental poisoning of subjects following contamination of the water supply. An antidote for ethylene glycol poisoning, Fomepizole (Antizol, Orphan Medical Inc.) was approved by FDA in December 1997. It inhibits the formation of toxic metabolites.

Methods: The selected cases studied at the OCME were death was due to EG intoxication in a seven year period, and reviewed the clinical and demographic characteristics of the subjects, together with the scene investigation and autopsy findings, including toxicology and histology. Ethylene glycol may be determined in tissues by calorimetric method. The gas chromatographic method was used in the study. Both, the gas and liquid chromatography, such as High Performance Liquid Chromatography (HPLC) are more specific methods for quantitation of ethylene glycol and glycolic acid and confirmation of the diagnosis.

Results: There were eight men and 2 women, aged 13 to 73 years. Scene investigation suggested the possibility of EG ingestion, and this was confirmed by toxicologic analysis performed at the Medical Examiners Office or hospital (7 cases), and microscopic findings and scene investigation (3 cases). All cases indicated oral ingestion, and the manner of death was ruled as suicide in six cases. The manner of death was ruled as undetermined in four cases due to lack of a strong evidence for a suicidal attempt. Less than half of the suicide cases wrote a note of intent (comparable to the experience with other methods of suicide). Five subjects had clinical depression and four were ethanol abusers as well. One subject had schizophrenia. Autopsy showed nonspecific findings, with brain swelling present in some individuals. EG level in blood ranged from 0 mg/dl to 1700 mg/dl (mean = 266.91 mg/dl, median = 43.9 mg/dl). Calcium oxalate crystals were visualized in the histologic sections of the kidney in all subjects. Similar crystals were seen in sections of the brain and rarely of lung and other tissues in some individuals.

EG Intoxication is an uncommon but recurring method of suicide. EG is a toxic, inexpensive and easy to obtain material. In the experience, EG is rarely, if at all, involved in domestic accidental deaths in either adults or children. Although the presence of oxalate crystals in the kidney has been reported in the literature, the presence in the brain and other tissues has not been so widely recognized.

Ethylene Glycol, Calcium Oxalate, Intoxication