H10 Isopropanol in Postmortem Vitreous Humor Due to Body Preparation for Tissue Procurement: A Report of Six Cases

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Learning Overview: The goal of this presentation is to demonstrate that isopropanol present in postmortem samples could also be attributed to body preparation for tissue harvesting prior to autopsy.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing that body preparation for tissue donation is a possible cause of the presence of isopropanol in postmortem vitreous humor.

Volatile chemicals can be relevant in the determination of cause and manner of death by forensic pathologists. Isopropanol is a volatile chemical that is occasionally reported in the vitreous humor at autopsy, and its presence can be due to a variety of different causes. Isopropanol can originate from ingestion or may arise endogenously in cases of hypothermia, starvation, and diabetes mellitus.[1,2] There has also been a report of postmortem contamination from either embalming or tissue procurement.[3] This case series illustrates that isopropanol in postmortem samples can be attributed to the body decontamination process used for tissue harvesting, and this is an origin that should be considered by forensic pathologists when found at autopsy.

Six autopsy cases in which isopropanol was identified postmortem in the vitreous humor originating from decontamination of the body in preparation for tissue harvesting are presented. In these cases, organ and/or tissue harvesting was performed through Gift of Life Michigan (GOLM) between 2016 and 2020. Autopsies were performed at the Kent County Medical Examiner's Office or the McLaren Northern Michigan hospital morgue. All of the toxicology samples were analyzed at the Spectrum Health Laboratory in Grand Rapids, MI.

In these six cases, all toxicology samples were collected after tissue harvesting was completed. In four of the cases, the medical examiner collected all of the toxicology samples prior to autopsy. In one case, the medical examiner collected the vitreous humor, urine, liver, and gastric and chest cavity blood while GOLM obtained the cardiac blood prior to autopsy. In the last case, the medical examiner collected the vitreous humor and GOLM collected the femoral blood. The median vitreous isopropanol concentration in these six cases was 100mg/dL (range was 38mg/dL to 250mg/dL). In three of the cases, all other postmortem samples (i.e., blood, urine, tissue) tested were negative for volatile chemicals. One case reported an ethanol of 130mg/dl in the vitreous humor and 250mg/dL in the femoral blood, and one case had a femoral blood ethanol of 14mg/dL. The remaining case had a vitreous acetone of 6mg/dL, cardiac blood acetone of 3mg/dL, isopropanol of 3mg/dL, and a urine acetone of 18mg/dL. The liver, chest cavity blood, and gastric contents were negative for volatile chemicals. The median age was 19 years (range was 17 months to 56 years). The tissues recovered included heart valves (n=4) and skin, bone and cartilage (n=2), but not vitreous humor. Causes of death included gunshot wound to the head, acute fentanyl toxicity, drowning, positional asphyxia, multiple blunt force injuries, and sudden unexplained death in childhood. The manners of death included accident (n=4), homicide, and natural.

The presence of isopropanol in postmortem toxicology can be a result of ingestion or the endogenous formation in the body. One study showed that median vitreous humor isopropanol in cases of acute isopropanol toxicity was 240mg/dL (range of 130–244mg/dL).[3] Given that the standard procedure for body preparation is to spray and wipe down the body with isopropanol prior to recovery, another consideration for forensic pathologists is that the presence of volatile substances is a result of the body preparation process. It is hypothesized that the surface contamination of the skin and mucous membranes by chemicals used in body preparation can lead to the passive absorption into the body resulting in the presence of volatiles in postmortem toxicology samples. A recommendation to avoid this spurious result would be for postmortem samples to be routinely collected prior to body preparation, but further research is needed to elucidate the exact mechanism of transfer.

Reference(s):

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2. Aleksandra Borowska-Solonynko, Agnieszka Siwinska-Ziolkowska, Michal Piotrkowicz, Marta Wysmolek, and Marta Demkow. Analysis of the Origin and Importance of Acetone and Isopropanol Levels in the Blood of the Deceased for Medico-Legal Testimony. *Archives of Forensic Medicine and Criminology* no 64 (2014): 230-245, Doi 10.5114/amsik.2014.50528.
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