K47 An Accidental Death Due to Paraquat Poisoning: An Unusual Case Requiring Toxicologist, Pathologist, and Investigator Collaboration

Erin E. Walsh, MS, Miami-Dade County Medical Examiner Department, 1851 NW 10th Avenue, Miami, FL 33136; Elisa N. Shoff, BS, Miami-Dade Medical Examiner Department, 1851 NW 10th Avenue, Miami, FL 33136; Sean Hurst, MD, District 21 Medical Examiner Office, 70 S Danley Drive, Fort Myers, FL 33907; George W. Hime, MS, Miami-Dade Medical Examiner Department, 1851 NW 10th Avenue, Miami, FL 33136; and Diane Boland, PhD, Miami-Dade Medical Examiner Department, 1851 NW 10th Avenue, Miami, FL 33136*

After attending this presentation, attendees will better understand the toxicological and pathological findings that indicate death due to paraquat toxicity and how knowledge of the circumstances of death can aid in differentiating between a possible diquat toxicity case and a paraquat toxicity case.

This presentation will impact the forensic science community by demonstrating the necessity of a seamless working relationship between the forensic pathologists, forensic investigators, and toxicologists to understand unusual postmortem cases.

In December 2015, a 38-year-old White female presented to the hospital after accidently drinking from a water bottle that contained weed killer and vomiting twice. The decedent and her husband owned a cleaning business and had obtained the weed killer from the landscaping company at their apartment complex and stored it in a water bottle. The decedent and her husband advised the hospital staff that they believed the liquid to be diquat dibromide and were unsure how much the decedent had consumed before spitting out the liquid.

The hospital staff consulted the Poison Control Center who recommended that the decedent be observed for nine hours before she could be safely discharged. The decedent was treated and discharged later that day. Two days later, the decedent presented to a different hospital after continuing to vomit and complaining of nausea and a burning sensation. Despite medical intervention, her condition deteriorated, and she expired in January 2016, four weeks after the initial ingestion.

Autopsy findings were significant for consolidation of the lungs (right lung weight: 700 grams, left lung weight: 710 grams) with necrosis and purulent exudate. Microscopically, the section of lung exhibited dense pulmonary fibrosis with associated intraparenchymal and intra-alveolar hemorrhages. Delayed pulmonary fibrosis is a characteristic pathological finding in paraquat poisoning that is not seen in diquat poisoning.

A sample of the unknown liquid the decedent drank was submitted to the Miami Dade County Medical Examiner Department (MDME) Toxicology Laboratory for analysis in addition to antemortem samples taken during the decedent's second hospital visit. Toxicological screening of the unknown liquid by Gas Chromatography/Mass Spectrometry (GC/MS) indicated that 4,4-bipyridine was present in the sample. No other analytes were detected in the unknown liquid. 4,4-bipyridine is used as a precursor to paraquat. This finding caused the MDME Toxicology Laboratory to question if the decedent had consumed diquat, as she thought, or if she had consumed paraquat.

Due to the fact that paraquat and diquat could not be distinguished from one another by GC/MS, a fit-for-purpose method was developed by high-performance Liquid Chromatography/Ion Trap/Mass Spectrometry with MS^n capability (LC/Ion Trap/MS^n) to differentiate these two analytes. Analysis of an antemortem urine sample, dated five days after the initial ingestion, by LC/Ion Trap/MS^n indicated that paraquat was present in the sample. The detection of paraquat in a urine sample five days after ingestion is consistent with the literature, which indicates that paraquat can be detected in the urine for up to 26 days after an acute ingestion.

Based on the decedent's history, the sequence of terminal events, autopsy findings, and toxicology findings, the forensic pathologist determined that the cause of death was complications of paraquat toxicity and the manner of death was an accident. This case is a prime example of the necessary working relationship and the ability to share information between the forensic pathologists, forensic investigators, and toxicologists to allow the forensic pathologist to determine a cause of death.

Paraquat, Diquat, Postmortem