



K68 Homicidal Paraquat-Induced Respiratory Failure: A Case Report and Overview of Paraquat Testing in the Forensic Setting

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Learning Overview: After attending this presentation, attendees will recognize clinical findings, classic autopsy gross and histologic abnormalities, and the potential need for expanded toxicology testing in deaths due to paraquat toxicity.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by emphasizing the importance of performing a complete autopsy and obtaining additional, non-routine specimens for toxicology testing during medicolegal autopsy examinations when the circumstances of death include suspected poisoning.

Paraquat is a water-soluble, highly toxic agent used in pesticides worldwide. Due to easy accessibility, it is commonly seen within the context of suicide in developing nations.¹ Complications of paraquat toxicity can mimic many respiratory diseases and be difficult to diagnose and treat, and subsequent mortality often ensues. Postmortem, pulmonary congestion, fibrosis, and glomerulosclerosis may be observed.² A combination of clinical history and findings at autopsy may suggest paraquat poisoning. However, both antemortem and postmortem testing of blood and urine can be negative. Preferential accumulation of paraquat in the lungs should be kept in mind, as paraquat testing of lung tissue can reveal the cause of death. Presented here is a medicolegal autopsy case of respiratory failure by homicidal paraquat poisoning after additional toxicology testing was performed on lung tissue.

A 69-year-old female who lived in Jamaica reported increased asthma-like attacks and generalized pain soon after she informed her husband that she wanted a divorce. Despite medical treatment, her symptoms persisted. One week later, she presented to the emergency room for worsening dyspnea and evidence of kidney and liver malfunction. Despite treatment for possible viral pneumonia with a superimposed bacterial infection, she ultimately died in the hospital due to respiratory failure, approximately one month after her initial symptoms. After death, the decedent's family was concerned that her husband might have poisoned her with paraquat (sold as Gramoxone® in Jamaica), given his increasingly abusive behavior. The decedent also messaged friends that her husband had made her food at the time she became sick, something that he had not done in years. Due to the allegations and clinical circumstances of respiratory failure over a relatively short period, a medicolegal autopsy was performed.

The autopsy was most significant for diffuse pulmonary fibrosis, a finding consistent with generalized lung injury that can be due to multiple etiologies. Review of the medical records included negative H1N1, influenza A, and influenza B testing. Paraquat testing on both antemortem blood and postmortem urine were negative. However, paraquat testing performed on lung tissue was confirmed at a concentration of 44ng/g by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). Given these findings and the circumstances provided, the cause of death was attributed to complications of paraquat toxicity, and the manner of death was homicide.

Paraquat toxicity can manifest in a number of ways according to paraquat's accumulation within tissues. Depending on the dose, initial symptoms may be vague and easily confused with infectious diagnoses. Due to the small amounts ingested over time, this case displayed progressive dyspnea and persistent non-specific symptoms. Both negative findings and the lack of improvement with antibiotics and antivirals may guide the clinician toward other diagnoses. Furthermore, contextual information is essential. In this case, the decedent lived in Jamaica, where paraquat is more widely available than in the United States.

Knowledge of factors that can influence the pharmacokinetics of paraquat and other potential toxins such as solubility are critical in suspected poison-related deaths. Toxicology testing for paraquat performed on blood and urine may come back negative due to rapid uptake into highly perfused tissues, such as the lungs and kidneys.³ Therefore, a negative result does not rule out paraquat toxicity. In this case, tissue samples were necessary to confirm paraquat as the causal agent. Furthermore, the use of a highly selective and sensitive analytical technique such as LC/MS/MS is required for a definitive determination of paraquat. LC/MS/MS is a preferred technique routinely used in the quantitative assessment of the severity of suspected poison-related intoxication. Though not routine, LC/MS/MS testing of lung tissue for paraquat is recommended if there is a strong suspicion of paraquat poisoning and diffuse lung injury is documented at autopsy.

Reference(s):

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2. Sun B., Chen Y.G. Advances in the mechanism of paraquat-induced pulmonary injury. *Eur Rev Med Pharmacol Sci*. 2016;20(8):1597-1602.
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Paraquat, Autopsy, Toxicology