Case Report

Fatal Cyanide Poisoning via Coffee Ingestion: A Forensic Case Report and Diagnostic Challenges

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ABSTRACT

Background: Cyanide is a highly toxic compound that can cause rapid death by inhibiting cellular respiration at the mitochondrial level. Although uncommon, cyanide poisoning presents a significant challenge in forensic medicine due to its fast onset, diagnostic difficulties, and legal implications.

Case Presentation: We report the case of a 24-year-old male who was brought to a hospital with sudden shortness of breath and was declared dead upon arrival. External postmortem examination revealed livor mortis, generalized rigor mortis, cyanosis of the lips and extremities, and dilated conjunctival vessels. Internal examination showed vasodilation in multiple organs, a wrinkled capsule in the spleen, and pulmonary congestion. A rapid screening using a food safety test kit yielded a positive colorimetric result for cyanide in the urine, with an estimated concentration of 0.007–0.010 mg/dL. Biological samples were collected and submitted for confirmatory toxicological analysis. Postmortem toxicological testing confirmed the presence of cyanide in the brain and gastric contents. A rapid screening test indicated cyanide in urine, though this was not confirmed on subsequent laboratory analysis.

Conclusion: The findings support a diagnosis of acute oral cyanide poisoning. This case highlights the importance of timely forensic investigation, proper sample handling, and the utility of rapid screening tools in suspected poisoning deaths. Confirmatory laboratory analysis remains essential for accurate diagnosis and legal interpretation.

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Introduction

Cyanide poisoning is a well-recognized cause of sudden death with profound forensic and legal implications. Cyanide exerts its toxic effects by inhibiting cytochrome c oxidase (complex IV) in the mitochondrial respiratory chain, resulting in impaired oxidative phosphorylation, histotoxic hypoxia, and rapid cellular death [1, 2].

Although relatively rare, several high-profile cases of fatal cyanide poisoning have occurred in Indonesia and garnered significant public and forensic attention. These include the infamous "cyanide coffee" case in 2016, in which a young woman died after consuming a beverage allegedly laced with cyanide [3]; the "cyanide-laced satay" case in Bantul in 2021 [4]; and a more recent incident involving a police officer in 2023 [5]. Such cases underscore the importance of early detection, systematic forensic investigation, and prompt toxicological analysis in suspected cyanide-related fatalities. Previous high-profile cyanide poisoning cases in Indonesia (2016, 2021, and 2023) illustrate the medico-legal significance of this toxic agent, particularly regarding public attention, diagnostic challenges, and evidentiary issues. These cases underscore the importance of accurate and timely forensic investigation, which is also reflected in the present case.

This case report presents a sudden death in which postmortem toxicological testing confirmed the presence of cyanide in the brain and gastric contents. At the same time, a rapid screening test indicated cyanide in urine that was not confirmed on subsequent laboratory analysis. The objective is to document the forensic investigative approach and highlight the diagnostic challenges related to cyanide, including its volatile form, hydrogen cyanide (HCN), and its solid salts, such as potassium cyanide (KCN).

Case Report

On June 16, 2025, a 24-year-old male was found unconscious and brought to Baiturrahim Hospital in Jambi by a friend, following complaints of shortness of breath. He was declared dead upon arrival and subsequently referred to the Department of Forensic Medicine at Bhayangkara Police Hospital, Jambi, for further examination.

External examination revealed postmortem lividity on the back that disappeared with pressure, rigor mortis affecting all extremities that was difficult to overcome, and cyanosis of the mucous membranes of the lips, fingertips, and toenails. Dilation of the conjunctival vessels was also observed (Figure 1).

On June 17, 2025, the Jelutung Police Sector issued an official request for a postmortem examination (visum et repertum). The internal examination was conducted on the same day at 13:00 WIB. Findings included vascular dilation in the brain, heart, stomach, and intestines; a wrinkled capsule of the spleen; and pulmonary congestion (Figure 2).

A preliminary screening test for cyanide was performed using a food safety test kit. The result showed a positive colorimetric change in the urine sample, with an estimated cyanide concentration ranging from 0.007 to 0.010 mg/dL (Figure 3).

Figure 1. External examination revealed cyanosis of the fingertips (a) and toenail beds (c), as well as bluish discoloration of the mucous membranes of the lips (b).

Subsequently, biological specimens—including samples of the brain, lungs, liver, urine, blood, and gastric contents—were collected for further

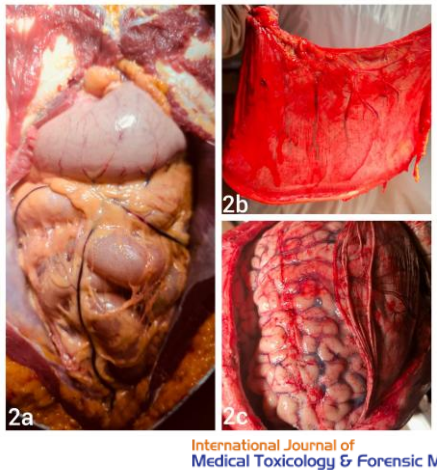

Figure 2. Internal examination revealed vascular congestion was observed in the large intestine (a), stomach (b), and brain ©.

Figure 3. Additional examination revealed a color change was observed in the urine sample using a cyanide food safety test kit.

toxicological analysis. All samples were sent to the Forensic Laboratory in Palembang for confirmatory toxicological testing.

Confirmatory toxicological analysis was performed by the Indonesian National Police Forensic Laboratory (LABFOR) of Palembang on biological specimens collected during autopsy. The examination utilized validated analytical methods for cyanide detection, specifically targeting potassium cyanide (KCN). Among the samples tested, the brain tissue and gastric contents (including the remaining stomach fluid and ingested material) were found to be positive for potassium cyanide, confirming the localized presence of the toxin in key target areas. In contrast, samples from the lungs, liver, blood, and urine yielded negative results for cyanide, possibly due to its rapid metabolism and volatility postmortem. In addition, the coffee bottle was collected by police investigators, sealed, and submitted to the forensic laboratory following standard chain of custody protocols to preserve its evidentiary value. This ensured the reliability of toxicological analysis linking the beverage to the decedent's exposure. These findings, taken together, are consistent with acute oral cyanide poisoning and reinforce the forensic conclusion of homicidal cyanide ingestion.

Discussion

Cyanide is an extremely potent toxin capable of causing death within minutes due to its inhibition of cellular respiration. It targets the cytochrome c oxidase enzyme complex (complex IV) in the mitochondrial electron transport chain, thereby halting oxidative phosphorylation and inducing histotoxic hypoxia [1, 6]. This mechanism renders tissues unable to utilize oxygen despite its adequate availability, resulting in rapid multi-system organ failure and death.

In this case, the decedent exhibited classic signs of acute cyanide poisoning: a sudden onset of dyspnea, rapid progression to unconsciousness, and death shortly thereafter. Postmortem examination supported this suspicion, revealing intense livor mortis, generalized rigor mortis, cyanosis of the mucous membranes and extremities, and widespread vasodilation across multiple internal organs. These findings are consistent with systemic hypoxia and impaired cellular oxygen utilization [7].

A field screening test for cyanide was conducted using a commercially available Food Safety Test Kit provided by the Indonesian National Police (POLRI). This kit employs a colorimetric chemical reaction that enables rapid detection of cyanide in biological or food-related samples. The test is based on the reactivity of cyanide ions (CN^-) with specific reagents contained in the kit. When a sample—such as urine, gastric contents, or a food extract—is introduced into the reagent mixture, a color change occurs in the presence of cyanide.

The reaction typically involves the formation of a colored complex, such as a Prussian blue-type compound or a pyridine–barbituric acid derivative, depending on the chemical formulation of the test kit. The procedure was performed in accordance with the manufacturer's instructions. A positive result was indicated by a visible color change within a few minutes, corresponding to an estimated cyanide concentration of 0.007–0.010 mg/dL in the urine sample. This outcome was interpreted as presumptive evidence of cyanide exposure.

Although the test kit is primarily designed for detecting cyanide in food matrices, previous reports have demonstrated its utility in emergency and field forensic settings where conventional laboratory equipment is not readily available [8, 9]. The detection of cyanide in urine—even at low concentrations—supports the likelihood of exposure, particularly when consistent with clinical presentation and autopsy findings. However, it is important to note that this test is not confirmatory and is subject to limitations, including potential cross-reactivity and the risk of cyanide loss due to volatilization if samples are not properly preserved.

Confirmatory toxicological testing was subsequently performed on biological specimens, including urine, blood, brain, lungs, liver, and gastric contents samples. Given cyanide's short in vivo half-life, rapid distribution, and swift metabolic conversion, the accuracy of postmortem toxicological interpretation hinges upon timely sample collection and proper handling [6, 10]. Preservation and transport conditions must prevent cyanide degradation, as improper storage may lead to underestimation or false-negative results.

In this case, all specimens were stored in airtight containers and maintained at low temperatures to minimize volatilization and chemical breakdown [8].

The distribution of cyanide positivity across biological matrices—limited to the brain and gastric contents—reflects the toxin's pharmacokinetics. Cyanide is known for its rapid absorption, distribution, and detoxification, primarily via enzymatic conversion to thiocyanate in the liver, followed by renal excretion [1, 9]. The discrepancy between the rapid urine screening and the negative confirmatory analysis may be explained by cyanide's short half-life, rapid postmortem degradation, and the possibility of false positives inherent to non-specific colorimetric food safety kits. This underscores the importance of immediate confirmatory testing in accredited forensic laboratories to avoid misinterpretation. Such findings highlight the importance of immediate confirmatory testing to avoid misinterpretation. The presence of cyanide in the gastric contents and brain, however, remains a strong forensic indicator of acute ingestion and central nervous system involvement prior to death. Although the toxicological analysis conducted by the Forensic Laboratory was not quantitative in nature, the detection of cyanide in brain tissue holds significant forensic value.

Nevertheless, the presence of cyanide in brain tissue alone is highly indicative of a fatal exposure, as the central nervous system is susceptible to cyanide due to its dependence on aerobic metabolism. Even small amounts of cyanide reaching the brain can rapidly disrupt cellular respiration, leading to sudden death. This highlights the critical importance of brain tissue evaluation in suspected cyanide poisoning, particularly when other biological matrices return negative or inconclusive results. The positive cyanide result in the coffee bottle provides a critical link between the decedent's exposure and the suspected source of poisoning, strengthening the evidentiary value in both toxicological and legal contexts. Similar patterns have been observed in previous cyanide homicide cases, where gastric content and scene evidence provided the most reliable indicators of ingestion origin [7, 8, 11].

Based on the confirmed toxicological results, the presence of cyanide was identified in both the brain tissue and gastric contents, while blood, urine, liver, and lung samples tested negative. In addition, a coffee beverage recovered from the scene tested positive for cyanide. These findings, in conjunction with the clinical presentation and autopsy results, confirm acute lethal cyanide ingestion via a beverage, most likely administered with homicidal intent. This case highlights the importance of timely sample collection, proper preservation, and comprehensive toxicological investigation. Similar multidisciplinary forensic approaches have been applied in previous high-profile poisoning cases, reinforcing the critical role of standardized toxicology protocols in suspected cyanide-related fatalities [7, 10].

Conclusion

In summary, this case demonstrates the forensic diagnostic challenges of cyanide poisoning, with confirmatory evidence in the brain and gastric contents. While the findings raise strong suspicion of homicidal poisoning, definitive attribution requires integration with investigative data such as motive, opportunity, and chain of custody. Details of the criminal investigation, including suspect history and motive, were beyond the scope of this case report and are not discussed here.

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Conflicts of Interest

The authors report there are no competing interests to declare.

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