



Cyanide Exposure in Firefighting: A Pathophysiology Perspective

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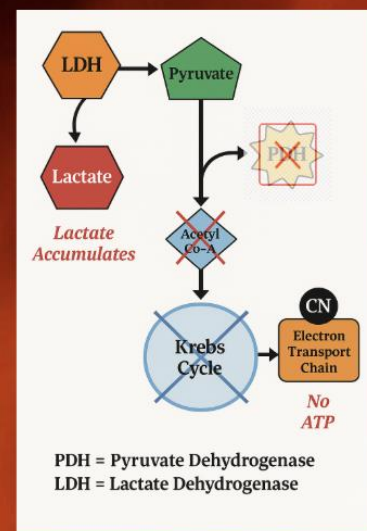
Research Question

- What is the established safety profile of hydroxocobalamin (CyanoKit) in the treatment of suspected cyanide poisoning?
- What specific considerations of adverse drug reactions warrant caution against using it?



Introduction and Background:

Cyanide poisoning is a lethal risk in enclosed fires, yet rapid diagnosis remains difficult. CyanoKit is a safe, fast-acting antidote, but its high cost and diagnostic uncertainty often delay treatment. This study evaluates the safety profile of CyanoKit, focusing on adverse effects, access barriers, and its role in empirical treatment. By understanding cyanide's pathophysiology and identifying key clinical triggers, we aim to support timely, life-saving intervention—especially in high-risk populations like firefighters.



Adapted from Everett et al., 2020

Limitations

- Lack of randomized trials:** Ethical constraints limit studies to observational data, reducing generalizability.
- Delayed diagnosis:** Cyanide levels are not rapidly available; surrogate markers like high lactate may be confounded.
- Challenges in burn victims:** Vascular damage can delay or distort serum sampling, requiring reliance on clinical suspicion.
- Treatment complications:** Hydroxocobalamin can interfere with lab assays (e.g., creatinine, bilirubin, oximetry), complicating post-treatment monitoring.

Methods

Fifteen articles were reviewed from the available literature, including case reports (n = 3), observational studies (n = 3), research articles (n = 1), systematic reviews (n = 2), non-systematic reviews (n = 6).

Key Findings: Safety and Use of Hydroxocobalamin (CyanoKit)

- Widely used for empiric treatment of suspected cyanide poisoning, especially in fire victims
- Efficacy supported: 67% survival in confirmed cases (Borron et al., 2007)
- Minimal common side effects: chromaturia, red skin discoloration
- Emerging concern: 60% increased risk of acute kidney injury (AKI)
 - Nearly 3 x risk of severe AKI requiring dialysis (Depret et al., 2019; Legrand et al., 2016) Likely due to oxalate crystal nephropathy
- Low adoption despite FDA approval: Only 31% of U.S. burn centers use CyanoKit empirically (Dumestre & Nickerson, 2014)
- Proposed clinical thresholds for safer use (Sheckter & Mandell, 2022):
 - GCS < 10
 - Lactate ≥ 10 mmol/L
 - HbCO ≥ 10%

Check out our references!



Conclusion

- Hydroxocobalamin is the preferred antidote** for empiric cyanide poisoning treatment, especially in emergency settings.
- Advantages:** Rapid action, safe profile, and no risk of methemoglobinemia (unlike sodium nitrite).
- Concerns:** Overuse in unconfirmed cases may lead to unnecessary risks and supply shortages.
- Future improvements:** Point-of-care diagnostics (e.g., portable lactate sensors, biosensors) could allow more targeted use.
- Current recommendations:** Use structured clinical algorithms, assess high-risk exposures, and implement triage systems to guide treatment.