Maryland Poison Center
University of Maryland School of Pharmacy

ToxTidbits: Antidote Facts

1-800-222-1222

Hydroxocobalamin (Cyanokit®)

Cyanide is a compound that is toxic through cyanide salt ingestion, hydrogen cyanide inhalation primarily in fires, and large skin exposure to cyanide solutions. Its danger comes from its ability to molecularly bind to the iron in mitochondrial cytochrome oxidase a-a3, a vital enzyme in the last step of oxidative phosphorylation, thus preventing the transfer of electrons to oxygen and the cell's ability to aerobically produce energy. This impairment of oxygen utilization then causes metabolic acidosis, cyanosis, seizures, hypotension, bradycardia, dysrhythmias, pulmonary edema, apnea, stupor, and coma, and can rapidly lead to death if not treated.

Mechanism/Indications: Hydroxocobalamin has a higher binding affinity for cyanide than cytochrome oxidase and is able to exert its antidotal effect by binding to cyanide to form cyanocobalamin (vitamin B12). The body then excretes cyanocobalamin renally.

Adverse Effects/Contraindications: No specific contraindications have been recorded and since cyanide poisoning is life-threatening, the benefit of hydroxocobalamin use often outweighs any risk. Probably the most notable adverse effects of hydroxocobalamin are red urine and dermal erythema, both of which can last for days. Transient hypertension can occur; blood pressure generally returns to baseline within four hours after the infusion without the use of antihypertensives. Other possible adverse effects include decreased lymphocyte count, nausea, headache, hypersensitivity reactions, rash, photosensitivity and injection site reactions. Due to the deep red color of hydroxocobalamin, it can interfere with colorimetric methods used in laboratory measurements such as aspartate aminotransferase, total bilirubin, creatinine, magnesium, and serum iron. It also may interfere with co-oximeter testing of carboxyhemoglobin, methemoglobin and oxyhemoglobin.

Dosing: Currently hydroxocobalamin is parentally administered as a suspension only. It comes in 2.5g vials, which can be found in a Cyanokit that offers 2 vials and an IV infusion set. Before administering, each vial should be inverted repeatedly for at least 30 seconds without shaking. It should not be administered if the final suspension is dark red or if particular matter is present. The dosing treatment is 5g IV over 15 min (approximately 15 mL/min). If needed, a repeat of 5g IV over 15 min to 2 hours can be used. Uncontrolled studies show that doses more than 10g have not improved survival rates. Although its use has not yet been well studied in children, the pediatric dose used in non-US marketing experience is 70mg/kg.

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For more on hydroxocobalamin:

- *DesLauriers C, Burda A, Wahl M. Hydroxocobalamin as a Cyanide Antidote. Am J Therapeutics 2006; 13:161-165.*
- *Shepherd G, Velez L. Role of Hydroxocobalamin in Acute Cyanide Poisoning. Ann Pharmacotherapy. 2008; 42:661-669.*
- *Howland MA. Antidotes in Depth: Hydroxocobalamin. In: Flomenbaum NE, Goldfrank LR, Hoffman RS et al, eds: Goldfrank's Toxicologic Emergencies. New York NY, 2006;1731-1733.*

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