



Clinical Pharmacology & Toxicology Pearl of the Week

~ Hydroxocobalamin ~

Hydroxocobalamin is the preferred antidote for cyanide toxicity. It binds to cyanide to make cyanocobalamin (Vit. B12).

Mechanism of Hydroxocobalamin

- ✓ Contains a central cobalt cation that acts as electrophilic moiety that undergoes nucleophilic substitution by the cyanide anion
- ✓ Combines with cyanide in an equimolar (1:1 molecular) ratio to form cyanocobalamin (Vitamin B12)
- ✓ Standard dose of 5g can combine with 96 mg of cyanide, or 111 mmol/L in an 80 kg adult
- ✓ Can also combine with structurally similar nitric oxide (NO)

Elimination

- ✓ Eliminated by the kidneys
- ✓ Half-life of hydroxocobalamin and cobalamin-complexes up to 31 hours
- ✓ Small fraction of cyanocobalamin decomposes, releasing free cyanide. However, released cyanide is metabolised by intrinsic rhodanese activity

Adverse Effects

- ✓ Anaphylaxis and allergic reactions
- ✓ **Hypertension** is a common adverse reaction likely due to combining with NO, preventing vasodilation
- ✓ Red discoloration of skin, serum, and urine common. Lasts 12 hours to several days
- ✓ Chromaturia (red urine) is near universal and can last 30 days

Laboratory Interference

- ✓ Intense red colour of serum and urine can affect colorimetric and spectrophotometric laboratory tests
 - Commonly affects co-oximetry. Increases total Hgb measured, **increases or decreases carboxyhemoglobin**, increases methemoglobin, and decreases oxyhemoglobin
 - Other labs often affected include liver enzymes, bilirubin, lipase, calcium, magnesium, phosphorus, glucose, triglycerides, uric acid, coagulation panel, lactate, and creatinine
- ✓ Can **interfere with pulse oximetry** decreasing saturation measurement up to 10 to 15%
- ✓ Red discoloration can trigger “blood leak” alarm on hemodialysis machines
- ✓ Effects on laboratory tests can last 2-3 days

References:

1. Lewis S. Nelson et al, Goldfrank’s Toxicologic Emergencies. 11th ed. New York: McGraw Hill Medical; 2019
2. Beckerman N et al. Laboratory interferences with the newer cyanide antidote: hydroxocobalamin. Semin Diagn Pathol 2009; 26: 49-52
3. Lee J et al. Potential interference by hydroxocobalamin on cooximetry hemoglobin measurements during cyanide and smoke inhalation treatments. Ann Emerg Med. 2007;49:802-805

4. Pamidi P. V. A., DeAbreu M., Kim D., Mansouri S. Hydroxocobalamin and cyanocobalamin interference on co-oximetry based hemoglobin measurements. *Clinica Chimica Acta*. 2009;401(1-2):63-67. doi: 10.1016/j.cca.2008.11.007
5. "Therapeutic Drugs and Antidotes." *Poisoning & Drug Overdose*, 7e Eds. Kent R. Olson, et al. New York, NY: McGraw-Hill, 2018

The Clinical Pharmacology (CP) physician consultation service is available Mon-Fri, 8am-5pm. The on-call physician is listed in ROCA on the AHS Insite page. CP consultations are also available through Netcare e-referral and Specialist Link. You can also find us in the [Alberta Referral Directory](#) (ARD) by searching "Pharmacology" from the ARD home page. Click [HERE](#) for more details about the service.

The Poison and Drug Information Service (PADIS) is available 24/7 for questions related to poisonings. Please call 1-800-332-1414 (AB and NWT) or 1-866-454-1212 (SK). Information about our outpatient Medical Toxicology Clinic can be found in [Alberta Referral Directory](#) (ARD) by searching "Toxicology" from the ARD home page.

More CPT Pearls of the Week can be found [HERE](#).

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