



From: Ron Kirschner, MD, Medical Director  
To: ALL HEALTH CARE PROFESSIONALS  
Subject: Suspected toxic alcohol ingestion  
Date: 3/16/16

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- Ingestion of ethylene glycol (EG) from antifreeze, or methanol (MeOH) from windshield washer fluid or other sources, leads to anion gap metabolic acidosis (AGMA) from the acidic metabolites.
- Early presenters may have a normal AG but an increased osmole gap (OG) with measured > calculated osmolality. Calculated osmolality can be estimated using the formula  $2 \times \text{Na} + \text{BUN}/2.8 + \text{glucose}/18 + \text{ethanol}/4.25$ . If using the OG, it's essential to check ethanol, which can significantly affect osmolality.
- The OG is an inexact test. If intentional toxic alcohol ingestion is suspected, we recommend serum EG and MeOH levels as both can cause a similar AGMA, and histories may be unreliable. Samples are typically sent to a reference lab so that results are not available immediately.
- Fomepizole and ethanol inhibit metabolism of EG and MeOH. If intentional ingestion is suspected, we recommend starting fomepizole while EG and MeOH levels are pending.
- Because the half-life of MeOH is long (~52 hours) in patients receiving fomepizole, hemodialysis (HD) is usually recommended. Fomepizole dosing is typically adjusted during HD as it is cleared by dialysis.
- EG is cleared more efficiently by the kidneys, but HD is still recommended in cases of decreased kidney function, acidemia (pH <7.25) indicating presence of toxic metabolites, or EG >100 mg/dL (Davey).
- In patients with AGMA of unclear etiology, it may be reasonable to consider empiric fomepizole while EG and MeOH levels are pending – please call the poison center to discuss specifics of the case.
- Isopropyl alcohol (IPA) ingestion can cause CNS and respiratory depression, and increased OG, but without AGMA. Alcoholics will sometimes drink IPA as an ethanol substitute.
- The Nebraska Public Health Lab at University of Nebraska Medical Center can now run MeOH and IPA levels. The lab can be contacted 24/7 at 1-800-334-0459. They hope to offer EG later this year.
- Both EG and MeOH levels can be performed at Denver University Hospital (720-848-4401), ARUP in Salt Lake City (800-242-2787) or Children's Mercy Hospital in Kansas City (816-234-3230).

#### References

Carstairs S. Contribution of ethanol to the osmol gap: a prospective volunteer study. *Clin Toxicol* 2013; 51: 398.  
Davey MP. Cost-effectiveness analysis of hemodialysis and fomepizole versus fomepizole alone in toxic alcohol toxicity without acidosis. *J Med Toxicol* 2015; 22: 6 (abstract 9).  
*Goldfrank's Toxicologic Emergencies* 10<sup>th</sup> edition 2015, pages 1346-1368.

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