

EVIDENCE-BASED PRACTICE RECOMMENDATIONS

Toxic Alcohols: Not Always A Clear-Cut Diagnosis

Patil N, Lai Becker M, Ganetsky M. November 2010, Volume 12; Number 11

This issue of Emergency Medicine Practice focuses on the diagnostic approach to methanol, ethylene glycol, and isopropanol poisoning, as well as the pathophysiology, management, and treatment specific for each toxic alcohol. For a more detailed discussion of this topic, including figures and tables, clinical pathways, and other considerations not noted here, please see the complete issue on the EB Medicine website at www.ebmedicine.net/topics.

Key Points	Comments
Flank pain or urinary complaints suggests ethylene glycol intoxication. Blurry vision, changes in vision, or blindness suggest methanol toxicity. Abdominal pain or hematemesis suggests isopropanol poisoning.	In each case, the parent compounds cause intoxication, but serious toxicity is caused by their metabolites. Toxic alcohols should be part of the differential diagnosis of any patient with an elevated anion or osmolar gap, as well as any inebriated patient with a nondetectable serum ethanol concentration.
Definitive diagnosis is verified by obtaining serum concentrations of methanol, ethylene glycol, or isopropyl alcohol. These levels are often not readily available and so the osmolar and anion gaps help in deciding treatment options. To properly interpret osmolar and anion gaps, these laboratory tests should be ordered at the same time and from the same blood sample: electrolytes, osmolality, ethanol level, and toxic alcohol concentrations.	Since the osmolar gap varies from person to person, its interpretation can often prove challenging. ^{36,37} There are no robust data on when to suspect toxic alcohol ingestion on the basis of the osmolar gap. Hovda et al proposed that an osmolar gap of greater than 25 mOsm in the setting of acidosis should suggest toxic alcohol ingestion. ³⁸
Decontamination methods are not recommended unless co-ingestions are suspected.	Methods for gastrointestinal decontamination after an ingestion of toxic alcohols have not been well studied. According to the AACT guidelines, toxic alcohols are rapidly absorbed, so such decontamination is of little value. ^{4,5}
Treatment for ethylene glycol and methanol intoxication includes an alcohol dehydrogenase inhibitor. Fomepizole (4-methylpyrazole) has a better safety profile than ethanol and has become the standard of care.	When compared with ethanol, fomepizole has 8000 times the affinity for ADH. ^{17,18} Its advantages over ethanol include easier dosing, more predictable kinetics, and fewer side effects. ¹¹ Its primary and significant disadvantage is its high cost (about \$1,000 per 1.0-g vial).
Hemodialysis should be considered when serum toxic alcohol concentrations exceed 50 mg/dL, regardless of renal functional status or the presence of acid-base abnormalities.	Recent studies and case reports suggest that hemodialysis may not be needed if treatment with fomepizole is started early after ethylene glycol ingestion and there is no evidence of acidemia or alterations in renal function. ^{12,17,68,69} However, this practice will probably not be efficient for patients with methanol intoxication, since methanol's half-life can reach to 54 hours.
Children who ingest more than a taste of ethylene glycol or any amount of methanol are referred by poison control centers to the ED for evaluation. ⁷⁵	In children 18 months to 4.5 years of age, a mouthful is between 5 and 10 mL and could potentially result in concentrations that exceed 20 mg/dL of either toxic alcohol. ⁷⁶

See reverse side for reference citations.

REFERENCES

These references are excerpted from the original manuscript. For additional references and information on this topic, see the full text article at ebmedicine.net.

4. Barceloux DG, Bond GR, Krenzelok EP, et al. American Academy of Clinical Toxicology practice guidelines on the treatment of methanol poisoning. *J Toxicol Clin Toxicol*. 2002;40:415-446. **(AACT review articles with recommendations)**
5. Barceloux DG, Krenzelok EP, Olson K, et al. American Academy of Clinical Toxicology practice guidelines on the treatment of ethylene glycol poisoning. *J Toxicol Clin Toxicol*. 1999;37:537-560. **(Prospective case series)**
11. Lepik KJ, Levy AR, Sobolev BG, et al. Adverse drug events associated with the antidotes for methanol and ethylene glycol poisoning: a comparison of ethanol and fomepizole. *Ann Emerg Med*. 2009;53:439-450 e10. **(Comparative, retrospective cohort study)**
12. Hovda KE, Andersson KS, Urdal P, et al. Methanol and formate kinetics during treatment with fomepizole. *Clin Toxicol*. 2005;43:221-227. **(Prospective case study; 8 patients)**
17. Sivilotti ML, Burns MJ, McMartin KE, et al. Toxicokinetics of ethylene glycol during fomepizole therapy: implications for management. For the Methylpyrazole for Toxic Alcohols Study Group. *Ann Emerg Med*. 2000;36:114-125. **(Case report; 1 patient)**
18. Baud FJ, Bismuth C, Garnier R, et al. 4-Methylpyrazole may be an alternative to ethanol therapy for ethylene glycol intoxication in man. *J Toxicol Clin Toxicol*. 1986;24:463-483.
36. Hoffman RS, Smilkstein MJ, Howland MA, et al. Osmol gaps revisited: normal values and limitations. *J Toxicol Clin Toxicol*. 1993;31:81-93. **(Prospective study; 321 patients)**
37. Krahn J, Khajuria A. Osmolality gaps: diagnostic accuracy and long-term variability. *Clin Chem*. 2006;52:737-739. **(Comparative study)**
38. Hovda KE, Hunderi OH, Rudberg N, et al. Anion and osmolal gaps in the diagnosis of methanol poisoning: clinical study in 28 patients. *Intensive Care Med*. 2004;30:1842-1846. **(Observational study; 28 patients)**
68. Megarbane B, Borron SW, Trout H, et al. Treatment of acute methanol poisoning with fomepizole. *Intensive Care Med*. 2001;27:1370-1378. **(Retrospective, multicenter study)**
69. Brent J. Fomepizole for ethylene glycol and methanol poisoning. *N Engl J Med*. 2009;360:2216-2223. **(Review article)**
75. Caravati EM, Erdman AR, Christianson G, et al. Ethylene glycol exposure: an evidence-based consensus guideline for out-of-hospital management. *Clin Toxicol*. 2005;43:327-345. **(AAPC guideline)**
76. Ratnapalan S, Potylitsina Y, Tan LH, et al. Measuring a toddler's mouthful: toxicologic considerations. *J Pediatr*. 2003;142:729-730. **(Prospective study)**

CLINICAL RECOMMENDATIONS

Designed for use in every-day practice

Use The Evidence-Based Practice Recommendations On The Reverse Side For:

- Discussions with colleagues
- Developing hospital guidelines
- Posting on your bulletin board
- Preparing for the boards
- Storing in your hospital's library
- Teaching residents and medical students

Emergency Medicine Practice subscribers: Are you taking advantage of all your subscription benefits? Visit your free online account at www.ebmedicine.net to search archives, browse clinical resources, take free CME tests, and more.

Not a subscriber to Emergency Medicine Practice? As a subscriber, you'll benefit from evidence-based, clinically relevant, eminently usable diagnostic and treatment recommendations for everyday practice. Plus, you'll receive up to 192 *AMA PRA Category 1 Credits*[™]; 192 ACEP Category 1 credits; 192 AAFP Prescribed credits; and 192 AOA category 2B CME credits and full online access to our one-of-a-kind online database. Visit www.ebmedicine.net/subscribe or call 1-800-249-5770 to learn more today.

Questions, comments, suggestions?

To write a letter to the editor, email: JagodaMD@ebmedicine.net

For all other questions, contact EB Medicine:

Phone: 1-800-249-5770 or 678-366-7933

Fax: 1-770-500-1316

Address: 5550 Triangle Parkway, Suite 150 / Norcross, GA 30092