

Toxic Alcohol Patient Care Resource Page

Recommended laboratory investigations required to calculate an anion gap and osmol gap:

ideally these labs are all drawn at the same time

1. Blood gas (venous or arterial)
2. Lactate
3. Chemistry: Na⁺, K⁺, Cl⁻, HCO₃⁻, creatinine, BUN, amylase, glucose
4. Serum osmolality
5. Serum ethanol (required for osmol gap calculation)
6. Toxic alcohol levels: methanol, ethylene glycol*, isopropanol, acetone, propylene glycol

***Note:** Ethylene glycol may need to be ordered separately in addition to a “Toxic alcohol” or “Volatile” screen – depending on the local laboratory

Calculations in SI units:

$$\text{Anion gap} = \text{Na} - (\text{Cl} + \text{HCO}_3) \\ (\text{abnormal} >12)$$

Note: A “normal” anion gap (i.e. ~ 12 mM/L) does NOT rule out a toxic alcohol ingestion. A patient presenting early after exposure will not yet have metabolized the toxic alcohol to an acid.

$$\text{Osmol gap} = \text{measured osmolality} - \text{calculated osmolality} \\ (\text{abnormal} >10)$$

$$\text{Calculated osmolality (SI units)} = 2(\text{Na}) + \text{urea} + \text{glucose} + (\text{Ethanol (mmol/L)} \times 1.25)$$

Note: A “normal” osmol gap (i.e. ≤ 10 mOsm/L) does NOT rule out a toxic alcohol ingestion. The toxic alcohol could be metabolized already (late presenter) OR the patient’s normal osmol gap could be in the negative range, so the toxic alcohol is hidden in an apparently “normal” osmol gap.

Laboratory Investigations should be repeated as follows:

IF methanol/ethylene glycol levels are not available AND the patient has a possible exposure (e.g. a child found in the vicinity of a container) AND fomepizole (or other ADH blocker) is NOT recommended: repeat lab frequency will be recommended on a case-by-case basis by the toxicologist on-call.

IF fomepizole has been recommended: measure blood gases, electrolytes, BUN, glucose, osmolality and methanol / ethylene glycol levels (if available) (IF now known to be methanol OR now known to be ethylene glycol, only do the relevant level) q12h to determine need for further dosing.

IF dialysis has been recommended: measure blood gases, electrolytes, BUN, glucose, osmolality and relevant toxic alcohol levels (if available), q4h to determine need for continued dialysis.

Interventions:

Alcohol Dehydrogenase (ADH) Blocker:

Fomepizole (4-methylpyrazole, or 4-MP) is the preferred antidote for toxic alcohol poisoning. Indications for antidote treatment with fomepizole are evaluated on a case-by-case basis by the toxicologist on-call. Ethanol (oral, IV, or in dialysate bath) is an alternative antidote that is only considered if fomepizole is not available.

Fomepizole Administration

Continue administration until stopping rules met using the following dosing.

***NOTE:** IF the patient has co-ingested ethanol, fomepizole administration can be delayed until the serum ethanol level approaches < 23 mmol/L.

Time	Dose
Time 0 (Loading Dose)	15 mg/kg in 100 mL D5W OR NS intravenously infused over 30 minutes
Time 12 hours	10 mg/kg in 100 mL D5W OR NS intravenously infused over 30 minutes
Time 24 hours	10 mg/kg in 100 mL D5W OR NS intravenously infused over 30 minutes
Time 36 hours	10 mg/kg in 100 mL D5W OR NS intravenously infused over 30 minutes
Time 48 hours	15 mg/kg in 100 mL D5W OR NS intravenously infused over 30 minutes

Any further doses are given 12 hours apart at 15 mg/kg in 100 mL D5W OR NS (infused intravenously over 30 minutes) until stopping rules are met.

Exceptions to above dosing intervals:

If the patient is receiving **intermittent hemodialysis**, the fomepizole dosing interval should be increased to **every 4 hours** to account for clearance of fomepizole in the dialysate. If fomepizole therapy is indicated beyond 48 hours, the dose should be increased as described in the table above.

If the patient is receiving **continuous renal replacement therapy (CRRT) or similar**, the fomepizole dosing interval should be increased to **every 8 hours** to account for clearance of fomepizole in the dialysate. If fomepizole therapy is indicated beyond 48 hours, the dose should be increased as described in the table above.

Fomepizole Stopping Rules:

- IF fomepizole was started AND the level of methanol OR ethylene glycol are available to the treating hospital, STOP fomepizole when [methanol] < 6.25 mmol/L OR [ethylene glycol] < 3.2 mmol/L respectively AND the acidosis is corrected.
- IF fomepizole was started for high suspicion of methanol OR ethylene glycol exposure, AND the osmol gap was elevated ≥ 10 mOsm/L, STOP fomepizole when the osmol gap is close to zero AND the acidosis is corrected.

Cofactors

Cofactors may help to metabolize toxic alcohol metabolites to less toxic end products. They may be administered when there is high clinical suspicion or confirmation of methanol (folinic acid/folic acid) or ethylene glycol (thiamine, pyridoxine) exposure. Since cofactors are also removed by dialysis; a dose of the cofactors should be given when dialysis is completed (if applicable).

Medication	Dose	Indications and duration
Folinic Acid * (Leucovorin ®) OR Folic Acid	Folinic Acid: All patients: 1-2 mg/kg IV (max 50mg/dose) over 30 minutes q4-6h *Folic acid 1-2 mg/kg IV (max 50mg/dose) q4-6h (adult or peds) may be used instead of leucovorin	<ul style="list-style-type: none"> For any potential toxic alcohol ingestion where methanol has not yet been ruled out Not required if there is no concern about methanol exposure Continue until methanol level < 6.25 mmol/L and acidosis has resolved Higher doses (i.e. 2 mg/kg) of folinic or folic acid may be considered for patients with acidosis and low bicarbonate in the context of possible methanol exposure
Thiamine	Adults: 100mg IV slow push q8h Peds: 50mg IV slow push q8h	<ul style="list-style-type: none"> Consider if patient chronic alcoholic or if toxic alcohol could be ethylene glycol and the level is not yet available Continue until the ethylene glycol level < 3.2 mmol/L and the acidosis is resolved
Pyridoxine	All patients: 50mg IV slow push q6h	<ul style="list-style-type: none"> If the toxic alcohol could be ethylene glycol or the level is not yet available Continue until the ethylene glycol level < 3.2 mmol/L and the acidosis is resolved

Correct acidemia:

NaHCO₃ boluses and infusions to correct serum pH > 7.2 minimum. Monitor blood gases (as well as electrolytes as needed) q2 hours for progress (as needed).

Dialysis: Recommendations to be made in consultation with the toxicologist on-call.

References:

- Canadian Antidote Guide. <https://www.ciusss-capitalenationale.gouv.qc.ca/en/antidotes/fomepizole>; accessed March 22, 2025.
- Kraut JA, Mullins ME. (2018). Toxic alcohols. NEJM, 378: 270-280.
- Ghannoum M, Gosselin S, Hoffman RS, Laverne V, Mégarbane B, Hassanian-Moghaddam H, Rif M, Kallab S, Bird S, Wood DM, Roberts DM; EXTRIP Workgroup. Extracorporeal treatment for ethylene glycol poisoning: systematic review and recommendations from the EXTRIP workgroup. Crit Care. 2023 Feb 10;27(1):56. doi: 10.1186/s13054-022-04227-2. PMID: 36765419; PMCID: PMC9921105.
- Lao YE, Vartdal T, Froeyshov S, Latimer B, Kvaerner C, Mataric M, Holm P, Foreid S, Jacobsen D, McMartin K, Hovda KE. Fomepizole dosing during continuous renal replacement therapy - an observational study. Clin Toxicol (Phila). 2022 Apr;60(4):451-457. doi: 10.1080/15563650.2021.1980581.