"What'a ya drinkin'?"

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Matt's presentation

- Matt, 43, presents to the emergency department intoxicated.
- He has slurred speech, but is able to answer questions (Glasgow Coma Scale 13).
- He states he ingested "windshield wiper fluid" about 12 hours prior.
- Physical exam is unremarkable.

Vital signs

- Heart rate: 98 beats/minute
- Respiratory rate: 24 breaths/minute
- Blood pressure: 110/56 mmHg
- Oxygen saturation: 96% on room air
- Temperature: 35.9 C

Lab results

Serum electrolytes

- Sodium (Na^+): 149 mmol/L
- Potassium (K^+): 5.3 mmol/L
- Chloride (Cl-): 104 mmol/L
- Bicarbonate ions (HCO_3^-): 8 mmol/L
- Urea: 8.0 mmol/L
- Creatinine: 166 mmol/L
- Glucose: 9 mmol/L

Arterial blood gas

- pH: 7.18
- HCO_3: 7 mmol/L
- Partial pressure of oxygen in arterial blood: 155 mmHg
- Partial pressure of carbon dioxide: 18 mmHg

Questions & Answers

1. What are the "toxic alcohols"?

Methanol, ethylene glycol and isopropyl alcohol are the most common toxic alcohols. Ingestion may be intentional—either as a suicide gesture or as an ethanol substitute—or unintentional. Toxic alcohols are widely available in most households. Methanol and ethylene glycol ingestions result in serious and sometimes fatal toxicities, while isopropyl alcohol causes a relatively benign poisoning.

2. How do you diagnose toxic alcohol ingestion?

The key to diagnosis is a good clinical history from the patient and any other sources, as well as a high index of suspicion. Common clues include unexplained inebriation and acid-base abnormalities. Calculation of the anion gap [(serum Na - (Cl + HCO_3)] and the osmolar gap (calculated osmolarity - measured osmolarity, where the calculated osmolarity = 2 Na + urea + glucose + ethanol) provide useful clues.

An elevated anion gap > 10 mEq/L and an osmolar gap > 10 are suspicious for either methanol or ethylene glycol ingestion.

Serum methanol and ethylene glycol levels should also be determined. In addition, toxic metabolites of each can also be measured. A methanol level > 6.2 mmol/L or an ethylene glycol level > 3.2 mmol/L require active management.

3. How should we manage patients?

The management of patients with either methanol or ethylene glycol ingestion includes:

- correction of acidosis with sodium bicarbonate administration,
- inhibition of the enzyme alcohol dehydrogenase (ADH) so that toxic metabolites are not formed by the breakdown of the toxic alcohols and
- hemodialysis for toxin removal.

Back to our patient...

Matt's test results

- Matt's anion gap is calculated to be 37 mmol/L.
- His osmolar gap is 81 after his serum osmolarity is measured at 396 mEq/L.
- Ethanol level is 0.9 mmol/L.
- Serum ethylene glycol is undetectable, but methanol level is 19.6 mmol/L.
- Matt has significant increased anion gap metabolic acidosis.

Managing Matt

- Matt receives two ampules of sodium bicarbonate upon diagnosis of methanol ingestion.
- Critical care and nephrology services are immediately consulted and the patient is admitted to the intensive care unit for emergent hemodialysis.
- He is discharged less than 24 hours after admission and, after post-dialysis, methanol levels and arterial blood gases are within normal limits.

***This department covers selected points to avoid pitfalls and improve patient care by family physicians in the ED. Submissions and feedback can be sent to* diagnosis@sta.ca.**

4. *How do we limit toxicity in patients in the ED?*

Patients require expert and aggressive resuscitation in the emergency deparment (ED). Because neither methanol nor ethylene glycol are absorbed by activated charcoal, it should not be administered unless other co-ingestants are suspected.

Both ethanol and a newer antidote, fomepizole, inhibit ADH metabolism of toxic alcohols. Either should be started in the ED when the diagnosis is strongly suspected, based on local resources. Fomepizole has theoretic advantages, as it does not cause additional inebriation and is relatively simple to administer; however, it is expensive.

5. *What is the treatment?*

Definitive treatment of severe methanol and ethylene glycol is emergent hemodialysis. Hemodialysis not only removes the toxic alcohol and its toxic metabolites, but also definitively corrects acid-base abnormalities. Often, patients require only one hemodialysis treatment. Emergent hemodialysis for toxic alcohol poisoning requires admission to an intensive care unit. Dx

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