

TOXIC ALCOHOLS:

METHANOL (MeOG)	<ul style="list-style-type: none"> Fuels, solvents Windshield washer & gas line antifreeze Lacquer thinner
ETHYLENE GLYCOL (EG)	<ul style="list-style-type: none"> Radiator antifreeze
TOXIC DOSE	<ul style="list-style-type: none"> One mouthful → serious toxicity in adult

BOTTOM LINE:

- Why "toxic"? because they make you more than drunk ...
 - Ethylene glycol causes renal failure
 - Methanol causes blindness and brainstem infarcts
 - Metabolites cause metabolic acidosis
- Toxic/lethal dose is very small
- Similar at-risk group
- Diagnosis is *critical !!!*

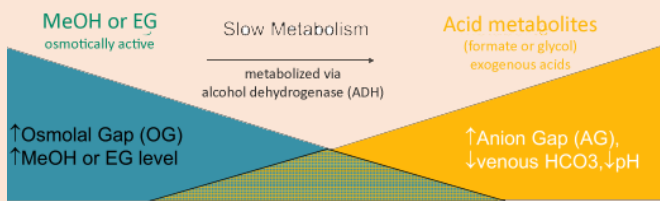
EXTENT OF PROBLEM IN BC:

- 30 – 40 hospital admissions/years → 5 deaths/year
- Variety of situations
 - Adults & adolescent: suicide, substance abuse, unintentional
 - Pediatric : unintentional

CALCULATE "THE GAPS"

- Calculate **anion gap (AG):** $Na - (Cl + HCO_3)$
 - Normal = 8-12 (or lower)
- Calculate **osmole gap (OG):** $Om - [2*Na + urea + glucose + 1.25*ethanol]$
 - Normal < 10

TOXIC ALCOHOL POISONING:



EARLY	ADVANCED	LATE
<ul style="list-style-type: none"> EG < 4-6 h MeOH < 10-12 h GI upset Intoxication (maybe) 	<ul style="list-style-type: none"> Looks really sick Non-specific 	<ul style="list-style-type: none"> MeOH: visual sx EG: renal failure Brain Injury

TREATMENT OF TOXIC ALCOHOL POISONING:

- MeOH or EG
 - ADH INHIBITOR:** Fomepizole or ethanol elimination $t_{1/2}$ ↑↑ (EG to 18 h; MeOH to 48 h)
- Acid metabolites (formate or glycolate)
 - HEMODIALYSIS** – enhances elimination, can correct acidosis
- Metabolic acidosis
 - IV SODIUM BICARBONATE**
 - For methanol: **IV FOLIC ACID** to enhance formate metabolism

TREATMENT GUIDELINES OF TOXIC ALCOHOL POISONING:

- SODIUM BICARBONATE** if pH < 7.25
- ANTIDOTE:** fomepizole or ethanol
 - EG > 3, MeOH > 6 mmol/L OR
 - OG > 10 and recent hx toxic alcohol ingestion OR
 - Clinical suspicion and at least 2 of:
 - $HCO_3 < 20$, $OG > 10$, $AG > 16$, $pH < 7.3$, oxalate crystals in urine
- HEMODIALYSIS:** EG > 8, MeOH > 15, pH < 7.25, ↑ SCr, very sick
- FOLATE:** for MeOH or if not sure
 - Leucovorin or folic acid 1 mg/kg (50 mg) q6hr

MeOH and EG COMPARISON:

SIMILARITIES	<ul style="list-style-type: none"> Both referred to as antifreeze Potentially toxic if > 1 big mouthful Produce ↑ OG with delayed onset ↑ AG Present with early non-specific symptoms Both treated with bicarb, fomepizole and HD
DIFFERENCES	<ul style="list-style-type: none"> End organ toxicity: MeOH eyes, EG kidney Metabolism: MeOH much more slowly Elimination during antidote: MeOH much slower

ALCOHOLIC KETOACIDOSIS:

- Chronic alcohol use, liver disease, binge drinking
- Starvation (reduced food intake)
- Abd. pain, N/V, dehydration common +/- altered mental status
- Increased anion and osmole gap

CAUSE:

- Decreased oral intake
- Depletion of glycogen stores
- Increased levels of NADH
- Breakdown of fatty acids to acetyl CoA
- Conversion of acetyl CoA to acetoacetate & **beta-hydroxybutyrate**

KETONE TESTS:

ROUTINE KETONE TESTS	<ul style="list-style-type: none"> Highly sensitive to acetoacetic acid Somewhat sensitive to acetone Not sensitive to beta-hydroxybutyrate (BHB)
WITH AKA	<ul style="list-style-type: none"> Routine ketones may result in low or normal Need specific test for BHB

ALCOHOL POISONING VS. AKA COMPARISON:

SIMILARITIES	<ul style="list-style-type: none"> Metabolic acidosis with ↑ AG, ↑ OG Non-specific sx (GI, CNS, sick) Similar at-risk patient group
DIFFERENCES	<ul style="list-style-type: none"> OG with AKA is rarely > 20 – 30 Serum EtOH usually low in AKA (post-binge) AKA usually improves with supportive care <ul style="list-style-type: none"> Toxic alcohol worsens Beta-hydroxybutyrate elevated with AKA

ISOPROPYL ALCOHOL (IPA):

- CNS depression → IPA has twice the intoxicating effects of ethanol
- Ketosis, fruity breath odor
- Abdominal pain
- Hypotension and respiratory failure after large ingestions

DIAGNOSIS:

- Osmole gap elevated (both IPA & acetone are osmotically active)
- No anion gap, no acidosis
- Specific IPA levels – limited availability
- Elevated SCr – acetone can interfere with some SCr assays

TREATMENT:

- Supportive care alone for most cases
- Hypotension – may require fluids and vasopressors
- Respiratory depression – may require intubation and ventilation
- Dialysis – almost never required

TOXIC ALCOHOL POISONING VS. IPA COMPARISON:

SIMILARITIES	<ul style="list-style-type: none"> Elevated OG (both IPA & acetone) Non-specific symptoms (GI, CNS, sick) Similar at-risk patient group Elevated SCr (similar to EG)
DIFFERENCES	<ul style="list-style-type: none"> No AG or acidosis with IPA IPA usually improves with supportive care Elevated SCr (IPA is lab interference, EG is actual renal injury)