



PUMP THE BRAKES!

A Case of *Toxic Alcohol Ingestion*

Ishan A. Patel, MD; Riana Wurzbarger, MD; Ran Ran, MD

Oregon Health & Science University

Introduction

Ingestions of toxic alcohols occur every year which can include ethylene glycol, diethylene glycol, isopropyl alcohol, and methanol.

Prompt recognition and treatment limits mortality and morbidity, the most serious of which cause irreversible organ damage and death.

Case Presentation

38-year-old man was found by his mother having a generalized tonic-clonic (GTC) **seizure**. He was taken to the local, rural hospital where he was witnessed to have another GTC which was aborted with IV lorazepam.

His history was limited by his mental status but his mother later found an **empty bottle of brake fluid** near him at the time of his seizure.

PMH: Schizophrenia, Polysubstance abuse, prior multiple foreign body ingestions

Social history: Lives with mother in her backyard, in a tent.

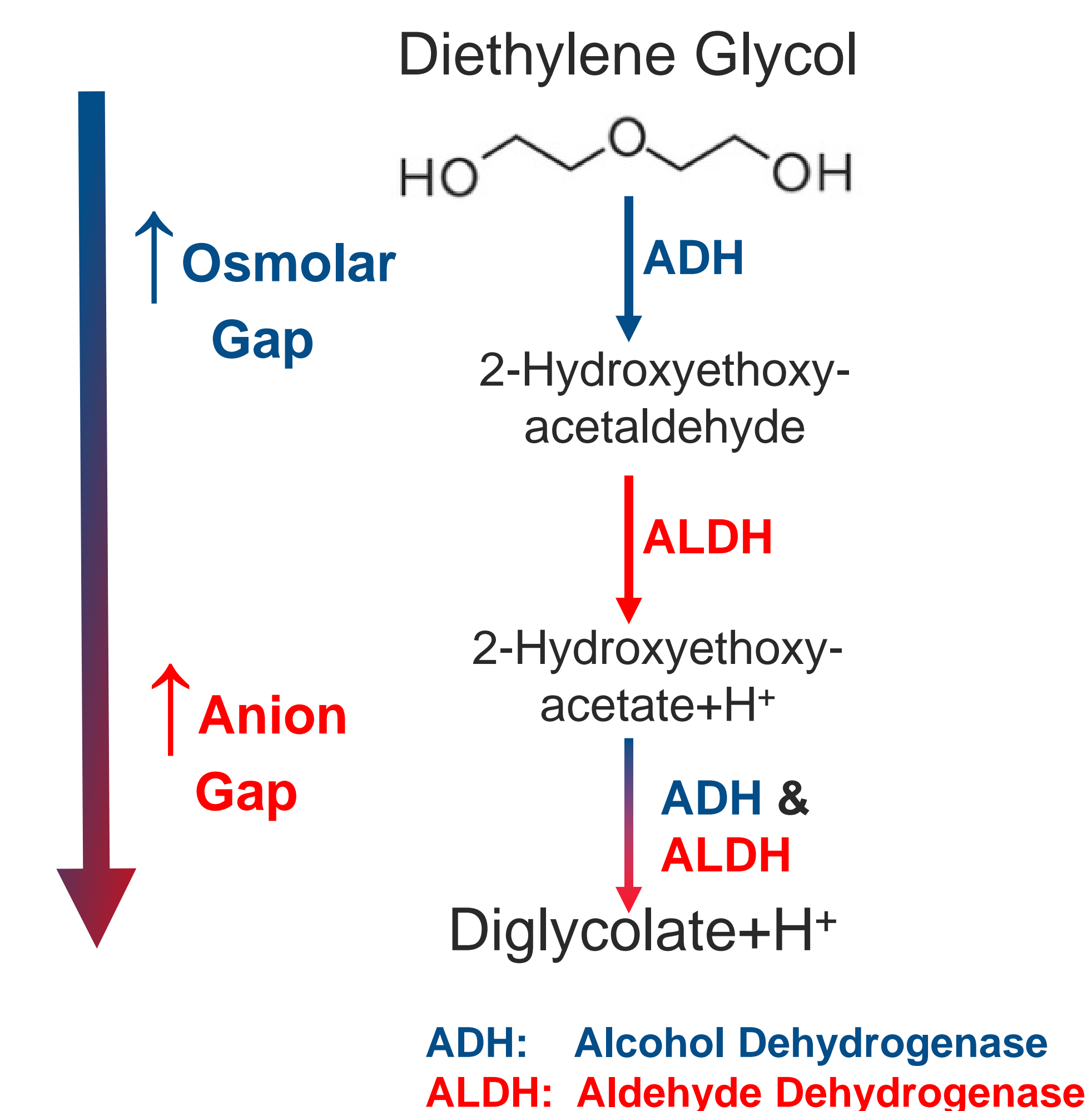
Vitals: **WNL**

Physical Exam: Alert, answering simple questions. Otherwise, **no** abnormalities detected.

Labs at Presentation: pH **7.19** | HCO₃⁻ **12** | AG **28** | Osm Gap **39**
 SCr **1.23** (bl ~0.7) | AST **647** ALT **875** | Lactate **5.4** | CK 4K
 UA negative | UDS (+)MJ, meth | **Toxic Alcohol Panel (-)**

Labs at Transfer: pH **7.24** | HCO₃⁻ **14** | AG **15** | Osm Gap **36**
 SCr **1.15** | CK **21,000** | ETOH 68

Labs at Discharge: pH **7.45** | HCO₃⁻ **26** | AG **9** | Osm Gap **10**
 SCr **0.7** | CK **12,000** | LFTs down-trending



Metabolism of Diethylene Glycol.

Metabolic conversion of diethylene glycol to diglycolate+H⁺ ultimately is responsible for generation of anion-gap metabolic acidosis (AGMA).

CRITICAL CARE TIMELINE

-Pre-Hospital-

- AMS
- Seizure activity
- Establish IV access
- IV **Lorazepam**

-Rural Hospital-

- **Consultation** with Oregon Poison Control
- Medical stabilization

-Transfer-

- LifeFlight to OHSU
- Begin **EtOH drip**
- NaHCO₃, Vit B₁, B₆

-Tertiary Hospital-

- Temporary HD Line Placed
- **Hemodialysis** x1
- **Fomepizole** x1

Discharge to Home from ICU

- Dx: Toxic ingestion of diethylene glycol, seizure, AGMA, High Osmolar Gap, lactic acidosis, ALI, AKI, rhabdomyolysis

- **No access** to urgent hemodialysis or fomepizole
 - Transfer to higher level of care required

- Electrolyte abnormalities improving

Discussion

This case illustrates the common clinical and laboratory findings of a severe toxic alcohol ingestion. This includes new-onset **seizure**, **AKI**, **ALI**, lactic acidosis, **severe anion-gap metabolic acidosis**, and **elevated osmolar gap**.

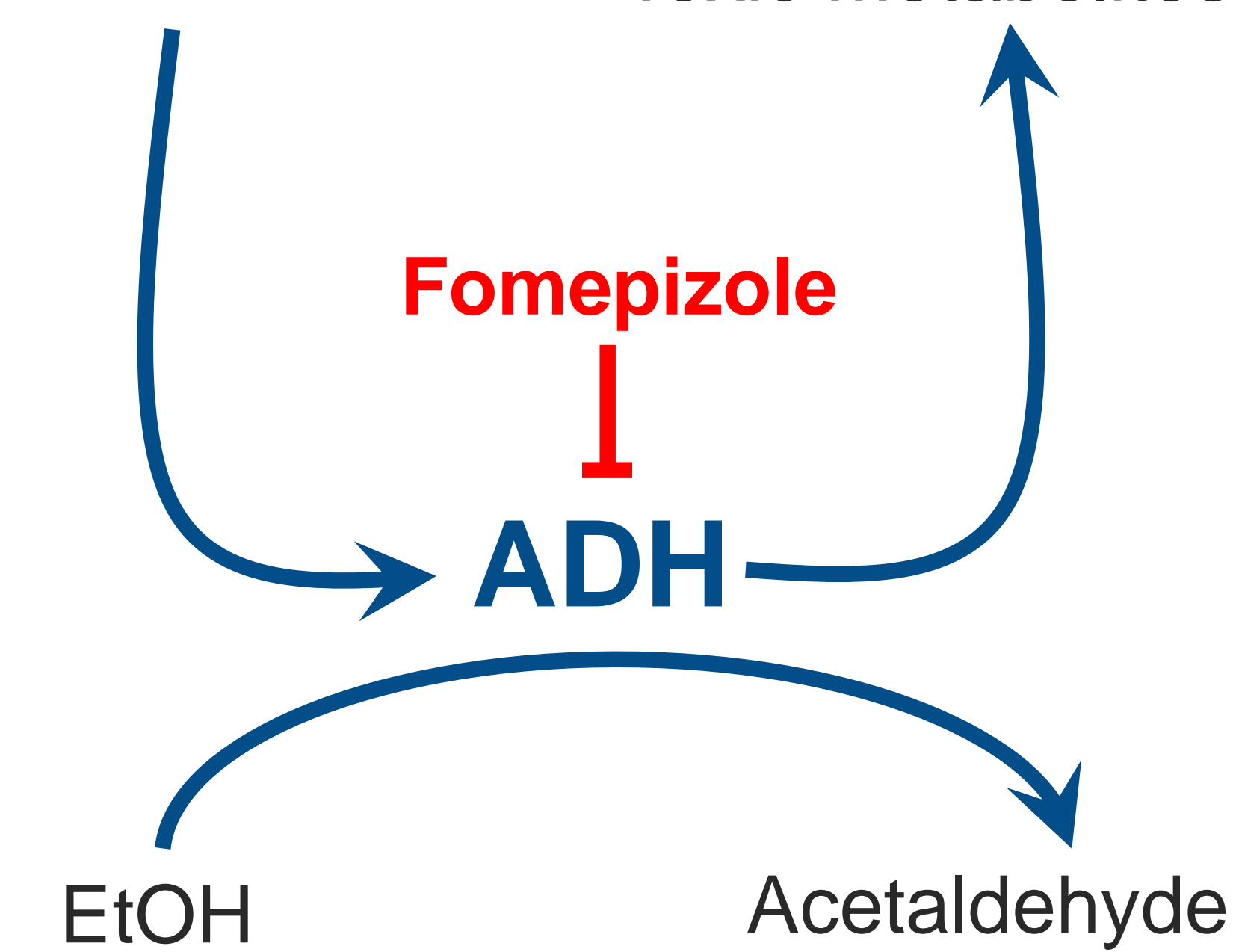
Prompt recognition of diethylene glycol as the cause of the elevated osmolar gap, in consultation with the Poison Control Center, yielded a positive outcome and reversal of severe organ damage, as diethylene glycol **is not identified routinely** in a toxic alcohol panel.

Third line treatment of **Ethanol (EtOH) by IV** can temporize the metabolism of toxic alcohols by direct, competitive inhibition of the causative metabolic pathway responsible for the generation of active, toxic metabolites.

References

1. Kraut JA, Mullins ME. Toxic Alcohols. N Engl J Med. 2018;378(3):270-280.
2. Burns, Edward. "Toxic Alcohol Ingestion." Life in the Fast Lane • LITFL, 18 May 2016, lifeinthefastlane.com/toxic-alcohol-ingestion/.

Toxic Alcohols Toxic Metabolites



Formation of toxic metabolites can be blocked by addition of **fomepizole**, which blocks the ADH enzyme, or by competitive inhibition from ethanol (EtOH).

Teaching Points

- Utilize the Oregon Poison Control Center.
- Suspect toxic alcohol ingestion in someone who has high AGMA and high osmolar gap.
- Diethylene glycol ingestion is not always identified in a toxic alcohol panel.
- Treatment Principles include:
 - 1) GI Decontamination
 - 2) Antidote (ethanol drip, fomepizole)
 - 3) Sodium Bicarb - if pH < 7.30
 - 4) Vitamin cofactors (B1, B6)
 - 5) Hemodialysis