Background

- 1,4-butanediol (1,4BD) is metabolized to γ-hydroxybutyrate (GHB) by alcohol dehydrogenase and aldehyde dehydrogenase (Figure 1).
- GHB toxicity typically exhibits CNS depression with rapid recovery in 1-3 hours.
- Elimination half-life of 1,4BD and GHB has been reported as short (39 minutes).
- While the structure of 1,4BD indicates potential for osmotic activity, there are no published reports of such.
- This is the first report of iatrogenically prolonged coma and 1,4BD elimination half-life after fomepizole administration.

Case Report

- A 42-year-old woman presented unresponsive with myoclonic jerking and exaggerated startle response.
- She was intubated for airway protection.
- BP 152/89 mmHg, HR 59 bpm, Temp 97.7°F
- Anion gap (AG) was 19; osmolar gap (OG) 41.4 (corrected for ethanol level of 150 mg/dL).
- There was no response to flumazenil or naloxone.
- Received 15 mg/kg of fomepizole for suspected toxic alcohol ingestion.
  - Ethylene glycol, methanol, and isopropanol were undetectable, and β-hydroxybutyrate was normal.
  - Repeat AG was 17 and OG was 29, 6 hours after presentation.
- Urine GC/MS was positive for citalopram, ethanol, and nicotine.
- EEG = “burst suppression pattern throughout,” read by the neurologist as concerning for anoxic brain injury.
- 21 hours after presentation, the patient rapidly awoke and was extubated.
- She admitted to ethanol and “GHB” ingestion.

Follow up and Discussion

- On initial evaluation, patient’s AG and OG elevations were suspicious for toxic alcohol ingestion and empiric fomepizole was administered.
- Typical GC/MS analysis excludes the solvent peak.
- Upon targeted analysis, 1,4BD was uncovered (Figure 2).
- At the time of fomepizole infusion, serum 1,4BD was 133 mg/dL.
- 3 hours later, serum 1,4BD was 95 mg/dL (GC-FID).
- Calculated 1,4BD elimination half-life was 9.87 hours assuming a single compartment with linear kinetics.
- Reported elimination half-life for both GHB and 1,4BD is 39 minutes.
- Our analysis demonstrates a 15-fold increase in 1,4BD elimination half-life following fomepizole administration compared to reported values.

Conclusions

- 1,4-butanediol may be masked within the solvent peak on GC/MS analysis.
- Osmotic activity of 1,4-butanediol and presence of anion-gap acidosis in this patient suggested toxic alcohol poisoning and led to empiric treatment with fomepizole.
- Use of fomepizole in 1,4-butanediol intoxication may delay its metabolism and result in protracted coma.