

# A Case of Intentional Methanol Ingestion

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## Learning Objective

To understand the complications and management of methanol toxicity.

## Case Presentation

### History of Present Illness

- 41 year old female with depression, seizure disorder, alcohol abuse, and history of multiple suicide attempts presented to the emergency department reporting that she had ingested anti-freeze and alcohol and inhaled gasoline in an attempt to commit suicide.

### Physical Exam

- Normal vital signs
- Mild suprapubic tenderness
- Slurred speech and inappropriate affect but alert and answer questions

### Labs

- ABG – pH 7.27, PaCO<sub>2</sub> 13 mmHg, PaO<sub>2</sub> 117 mmHg, Bicarbonate 6 mEq/L
- CBC - WBC 7.57 K/uL, Hgb 10.8 g/dl, Platelets 392 K/uL
- BMP – Na 143 mEq/L, K 5.8 mEq/L, CO<sub>2</sub> < 10 mmol/L, BUN 10 mg/dl, Cr 0.71 mg/dl, Ca 8.7 mg/dl, Anion Gap > 32; osmolality 495 mOsm/kg (osmolar gap 188 mOsm/kg)
- Toxicology screen - Methanol >200 mg/dl but otherwise negative including ethanol and ethylene glycol
- EKG - sinus rhythm, PR interval of 108, otherwise normal

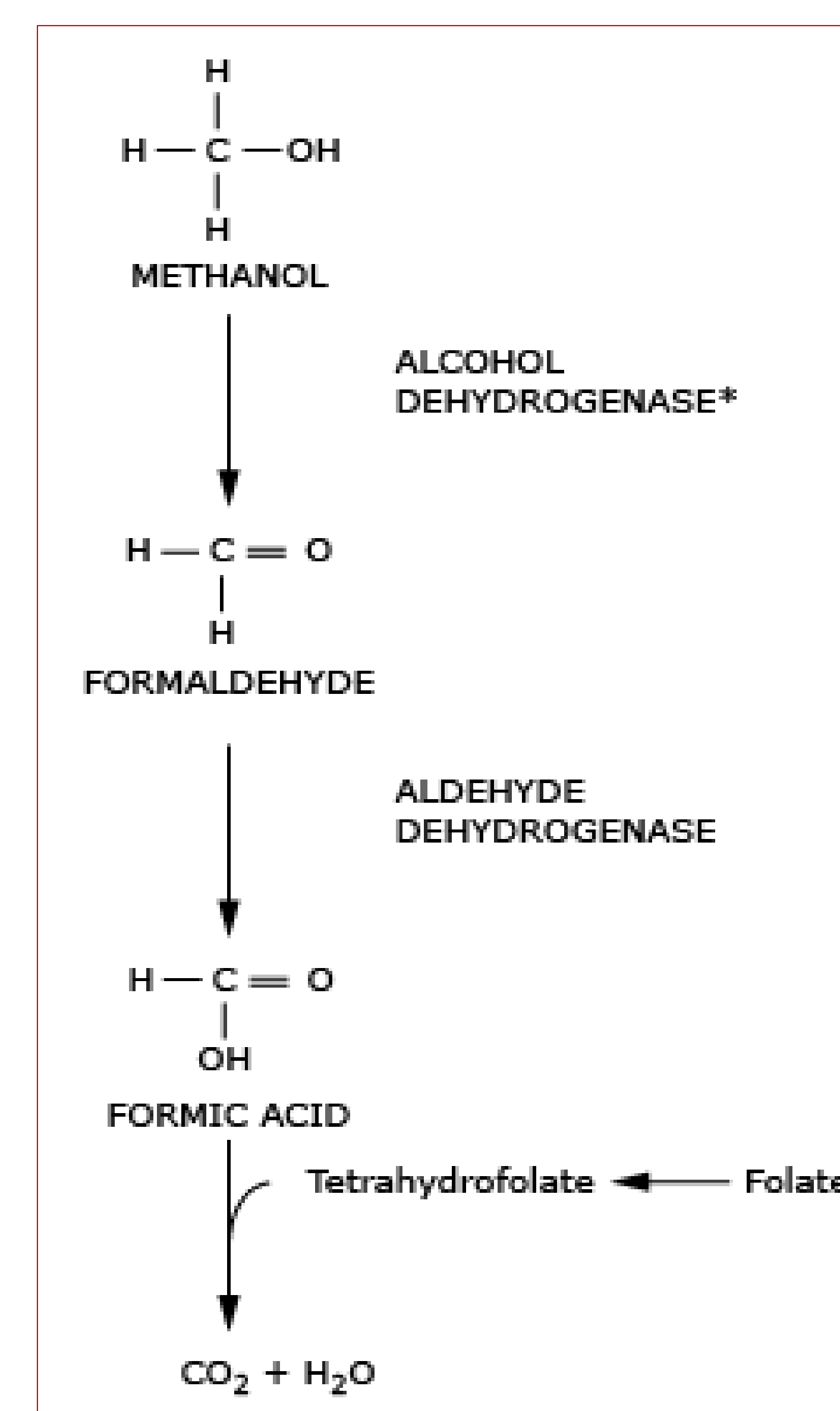
### Progress and Outcome

- She was started on sodium bicarbonate and fomepizole and admitted to the MICU.
- High dose folate was started and emergent hemodialysis was performed.
- Ophthalmology was consulted and recommended IV solumedrol followed by an oral prednisone taper to prevent toxic optic neuropathy.
- Patient improved quickly and was transferred to medicine then discharged home after psychiatry clearance.

## Discussion

- Any methanol ingestion of more than 1 mg/kg may be lethal.
- Methanol itself is relatively non-toxic, causing only CNS depression; the more severe manifestations of methanol toxicity are related to the breakdown product formic acid or formate.
- Metabolism of methanol: alcohol dehydrogenase oxidizes methanol to form formaldehyde which is then oxidized to formic acid. Formic acid is oxidized to non-toxic carbon dioxide and water by folate dependent reactions.
- Initial manifestations of methanol overdose can be mild confusion and the appearance of intoxication.
- Laboratory testing classically shows significant metabolic acidosis with extremely high anion gap and high osmolar gap.
- Following stabilization of airway, circulation, and breathing, initial management includes assessment of end organ damage, co-ingestions, and laboratory abnormalities.
- Initiation of sodium bicarbonate can reduce end organ damage, which can be worsened by systemic acidemia. An acidic environment promotes formic acid deposition, particularly in the eyes.
- Fomepizole is used to inhibit alcohol dehydrogenase.
- Leucovorin or high dose folate should also be used to stimulate formic acid metabolism.
- Indications for dialysis include severe metabolic acidosis and evidence of retinal damage.

- Ophthalmologic manifestations can include mydriasis, retinal edema leading to retinal sheen, afferent pupillary defect, and, most commonly, toxic optic neuropathy.
- Studies have shown the optimal treatment of toxic optic neuropathy is high dose solumedrol followed by a prednisone taper.
- It is important to assess the mental health of patients treated for methanol ingestion to determine intent and risk of additional self-harm.
- Successful treatment of methanol ingestion requires early recognition and aggressive multifactorial medical management aimed at decreasing the levels of methanol and its metabolites and preventing long-term end organ damage.



## References

- Shukla M, Shikoh I, Saleem A. Intravenous methylprednisolone could salvage vision in methyl alcohol poisoning. Indian J Ophthalmol. 2006;54:68-9.
- Sivilotti M. Methanol and ethylene glycol poisoning. UpToDate.com. 2018.