

Overview

Importantly methanol (MeOH), ethylene glycol (EG) & less commonly diethylene glycol (DEG). Deliberate ingestion often lethal. Isopropyl alcohol discussed further below.

Toxic mechanism

CNS effects similar to EtOH. Metabolites cause severe AG met acidosis and:

MeOH (formic acid): inhibits cellular cytochrome oxidase. Retinal injury/oedema→blindness.

EG (glycolic acid, lactate & oxalic acid): Ca oxalate crystals in kidney, heart, muscle & brain.

DEG (diglycolic acid, ethoxyacetic acid): bilat cortical necrosis, sensorineural polyneuropathy.

Toxicokinetics

Rapidly abs orally & penetrates CNS. Met by alcohol dehydrogenase & aldehyde dehydrogenase to toxic metabolites. Renal elim. $T_{\frac{1}{2}}$ =24h (MeOH) or 3h (EG). EtOH increases these to 45 & 17h.

Clinical features

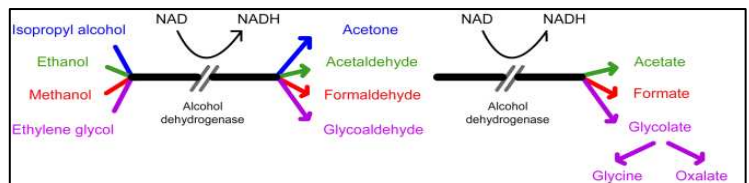
Initial intoxication (1-2hr): euphoria, nystagmus, drowsiness, N&V. Then:

MeOH:

- *Latent period* (up to 24hrs or longer if EtOH co-ingested)
- *Late*: CNS: Dizziness, headache, confusion, fits, coma, eye signs - loss of visual acuity, photophobia, fixed, dilated pupils, retinal oedema and hyperaemia of optic disc.
- *Other*: ↓BSL, ↓K⁺, ↓Mg²⁺, ARF, cardiac failure, ↓BP, pulmonary oedema, pancreatitis.

EG: (More rapid clinical course of CNS, cardiopulmonary & renal effect.)

- *Progressive toxicity (4-12hr)*: SOB, ↑RR, ↑HR, ↑BP, ↓LOC → shock, coma, seizures, death
- *Renal failure* ± flank pain & oliguria.
- *Late CN neuropathies (5-20d)*



Investigations

Screening: BSL, ECG, paracetamol

Specific bloods: ABG, UEC, AG, osmolality (±↑osmolar gap from MeOH or EG not metabolites), CMP (↓Ca²⁺ EG), EtOH/MeOH/EG levels

Urine (EG): Ca oxalate crystals or UV fluorescence (fluorescein in some antifreezes)

Risk assessment

Ingestion >0.5ml/kg (MeOH) or >1ml/kg (EG) potentially lethal. May ~halve doses for children. Co-ingestion of EtOH complicates toxicokinetics.

Management

Resus: ABCs. O₂. If intubated maintain hyperventilation or acidosis↑. Treat seizures with BDZs.

Supportive care: Monitor fluid balance. Seek/treat ↓BSL. Consider HCO₃⁻ as temporising measure before dialysis. If EG ingestion seek/treat ↑K, ↓Mg²⁺, and also ↓Ca²⁺ if ↑QTc.

Enhanced elimination: Haemodialysis is definitive Mx. Indicated if:

- Potentially lethal ingestion (& osmolar gap>10)
- Acidosis pH<7.30 (MeOH) or 7.25 (EG)
- ARF
- MeOH level (rarely available) >16mmol/L or EG level (rarely available) >8mmol/L
- Deterioration with supportive care only
- Visual symptoms with MeOH

Antidotes: **Ethanol**, **fomepizole** (N/A in Aus.) as temporising measures before dialysis. Others: **folinic acid** for MeOH, **thiamine** & **pyridoxine** for EG to help met formate & glyoxalate resp.

Disposition

Trivial ingestion and $\text{HCO}_3^- \geq 20\text{mmol/L}$ & asymptomatic at 8hr (MeOH) or 4hr (EG) → D/C. Otherwise admit.

Notes

Co-ingestion of EtOH delays onset of MeOH or EG toxicity (incl changes in bicarbonate).

MeOH

Found in remote-control model fuels (primary ingredient), windscreen wash (up to 95%), methylated spirits (overseas 5-10%, removed in Aus), moonshine, anti-freeze, shellac, industrial solvents, petrol.

Poor prognostic signs: comatose at presentation, bradycardia, resistant acidosis, formic acid $>15\text{mmol/l}$. **Cx:** Permanent visual impairment $> 20\%$, polyneuropathy, Parkinsonism.

EG

Found in radiator coolants & antifreeze, de-icers, solvents & braking fluid.

Isopropyl Alcohol (Isopropanol)

Overview

Similar but more potent effects to ethanol. Doesn't produce AG acidosis.

Toxic mechanism

CNS effects similar to EtOH. Metabolised to acetone. Ketosis but not severe AG acidosis.

Toxicokinetics

Rapidly abs orally & also dermally and penetrates CNS. 60% met by alcohol dehydrogenase to acetone & excreted unchanged with other 40% via lungs & kidneys. Renal elim. $T_{\frac{1}{2}} \approx 16$.

Clinical features

More rapid & longer lasting intoxication than with EtOH: euphoria, nystagmus, drowsiness, N&V.

Ketosis

Haemorrhagic gastritis

Dose-dependent cardiovascular depression

Investigations

Screening: BSL, ECG, paracetamol

Urinalysis: ketones

Specific bloods: ABG, UEC, AG (not sev ↑), Osmol (\pm ↑osmolar gap), EtOH level, acetone level

Risk assessment

Ingestion $>1\text{ml/kg}$ of 70% solution may cause inebriation. 4ml/kg may → coma/resp depression. In children, use as a dermal antipyretic ('rubbing' alcohol) can cause toxicity.

Management

Resus: ABCs. O_2 . Treat seizures with BDZs.

Supportive care: Monitor fluid balance. Seek/treat ↓BSL.

Enhanced elimination: Haemodialysis indicated only if profound coma/refractory hypoBP.

Disposition

ICU if req intubation, otherwise discharge when clinically sober.

Notes

Found in disinfectants, solvents, window cleaners.