

Overview

Uncommon but potentially life-threatening. Often a chronic exposure.

Toxic mechanism

Competes with Ca or Zn to bind with enzymes/proteins (often via -SH groups). Interferes with cell membrane integrity & causes demyelination, ↓haem & steroid synthesis, neurotransmitters.

Toxicokinetics

Abs through skin, inhalation or ingestion (esp prox small bowel, active transport with $\text{Fe}^{2+}/\text{Ca}^{2+}$, so ↑ in Fe/Ca def, high fat diet, ↑ acidity). Children abs 2-3x orally > adults. 3 compartment model: blood (<5% [99% in RBCs], $T_{1/2}=30\text{d}$ [child 10m]) ↔ soft tissue (liver, kidney, marrow & brain, $T_{1/2}=1-2\text{m}$) ↔ bone (95% [70% child], $T_{1/2}$ up to 10y). Min renal excretion w/o chelation. Crosses placenta.

Clinical features

Acute: metallic taste, abdo pain, N&V, black diarrhoea, haemolytic anaemia & hepatitis, renal impairment, lethargy, myalgia. Cerebral oedema, encephalopathy, seizures & coma.

Chronic: vague GI (anorexia, constipation, abdo pain) & CNS (headache, impaired conc/co-ord) symptoms, ↓wt, motor peripheral neuropathy, blue gum margins, renal fn, HT, subfertility, ↓IQ.

Investigations

Screening: ECG, paracetamol, BSL

Specific: Whole blood lead level, FBC, UEC, LFT, zinc protoporphyrin (surrogate measure of total body lead burden), blood film (basophilic stippling), AXR, limb XR (metaphyseal bands of arrested growth - "lead lines", nerve conduction/psychomotor studies), endoscopy

Lead level	Effects
≤10 μg/dL (0.48 μmol/L)	Minor dose-dependent ↓IQ in children
>10 μg/dL (0.48 μmol/L)	Subtle developmental, learning, motor & intellectual abnormalities in children
>30 μg/dL (1.4 μmol/L)	Non-specific symptoms, peripheral neuropathies, renal & fertility problems
>100 μg/dL (4.8 μmol/L)	Severe GI symptoms, encephalopathy, seizures & coma

Risk assessment

Acute severe OD → encephalopathy, cerebral oedema & death. Chronically → vague multi-organ disorder with GI, CNS sequelae. Teratogenic. Impairs child intellectual development.

Management

Resus: Rarely req. Mannitol & dexamethasone if cerebral oedema.

Supportive Care: Investigate /correct iron/zinc deficiency + hypocalcaemia

Decontamination: Remove source/FB. Wash skin if dermal exposure. Ingested FB removed endoscopically/flushed with oral high residue diet+PEG or WBI. Peri-jt/CSF shrapnel.

Enhanced Elimination: N/A.

Antidote: Chelation - IV/IM **sodium calcium edetate** if acute encephalopathy or BLL >100 μg/dL (child 70 μg/dL) or PO **succimer** if other symptoms or BLL >60 μg/dL (child >45 μg/dL).

Prevention: ↓Re-exposure (seek & remove lead sources-see below)

Disposition

Depends on severity.

Notes

Sources: old houses with lead water pipes & lead paint, petrol, occupations (e.g. smelting, battery manufacture, solder), scrapping, traditional remedies, cosmetics, soil (pica), industrial & car emissions, or occasionally foreign bodies (lead weights).