Hydrofluoric Acid (HF)

Dermal exposure produces severe pain and tissue damage. Ingestions and large dermal exposures produce potentially life-threatening systemic fluorosis.

Toxicity / Risk Assessment

HF: active ingredient in wheel cleaners / rust removers. Used in glass etching. Clinical toxicity is dependent on concentration (conc.) + mode of exposure

Dermal: Local tissue damage + extreme pain. Damage varies from nil visible -> full thickness burns.

Conc. >50% - rapid onset pain

Conc. <20% - onset of pain may be delayed > 24 hours

Systemic fluorosis: ↑ likely with ↑ HF conc. & ↑ total Body Surface Area (BSA) involved.

- Any HF conc, with > 5% BSA - risk of systemic fluorosis

- 50% HF conc. - risk of systemic fluorosis with BSA >1%

Inhalation: Cough, wheeze, dyspnoea, haemorrhagic pneumonitis, ARDS, respiratory failure

Ingestion: mouthful of concentrated HF can be fatal

- ***GI corrosion, systemic fluorosis*** (hypocalcaemia, hypomagnesaemia, hyperkalaemia), seizures, ↑ QT interval, arrhythmias, hypotension, cardiac arrest

Ocular: severe pain, tissue damage, visual loss

Management - Decontamination: Remove clothing, wash skin. Irrigate eyes - H_2O (at least 20 minutes).

DO NOT irrigate eyes with calcium. AC not indicated following ingestion.

Ingestion of HF or systemic fluorosis: Manage in resus with cardiac monitoring + regular ECGs

Hypocalcemia: ↑QT interval, arrhythmias, seizures, ↓ BP - indicates hypocalcaemia requiring urgent Rx:

Administer: 30 mL Ca^{2+} gluconate (3 grams, 6.6 mmol) IV over 5-10 minutes + 10 mmol IV $MgSO_4$ over 5-10 minutes + aggressive Rx of hyperkalaemia + discuss with toxicologist urgently

Cardiac arrest: ACLS protocols, IV Ca every 5 minutes (as above) + IV $MgSO_4$ until ROSC

Dermal Exposures: stepwise approach until pain is resolved (marker of tissue destruction)

1. Ca^{2+} gluconate gel (commercial product or mix 10 mL of 10% Ca^{2+} gluconate in 30 mL of lubricating gel). Place in latex glove for Rx of finger exposures. May be repeated 4-6 hourly. Rx may be required > 24 hours.
2. Subcutaneous infiltration (via 27G needle) 10% Ca^{2+} gluconate / 0.5 mL per cm^2 of skin (not for fingers)
3. Regional infusion via Bier's block technique for upper limb exposures (max cuff inflation time: 20 mins)
   - 10 mL of 10% Ca^{2+} gluconate diluted with 40 mL 0.9% saline
4. Intra-arterial infusion via radial / brachial / femoral artery cannulation for limb exposures
   - 10 mL 10% Ca^{2+} gluconate in 40 mL 0.9% saline infused over 4 hours (may be repeated)

Ca^{2+} chloride **should NOT** be used for dermal HF exposures. Removal of nails does not improve outcome. Do not use local anaesthetic as this removes therapeutic endpoint (pain resolution) of Ca^{2+} administration

Inhalational exposure: 1 mL of Ca^{2+} gluconate in 3 mL 0.9% saline via nebuliser

Disposition: Dermal exposure - discharge once pain-free, return if pain recurs. Monitor for 12 hours if at risk of systemic fluorosis. Plastic surgery referral for significant tissue damage.