

TOXICITY OF FLUORIDE

The term toxicity refers to the symptoms manifested as a result of over dosage or excessive administration.

Acute: Due to single ingestion of large amounts of fluoride.

Chronic: Due to long-term ingestion of smaller amounts.

Concentration	Medium	Effect
2 parts per million	Air	Injury to vegetation
1 ppm	Water	Dental caries reduction
2 ppm or more	Water	Mottled enamel
8 ppm	Water	10% osteosclerosis
20–80 mg/day or more	Water/air	Crippling fluorosis
50 ppm	Food/water	Thyroid changes
100 ppm	Food/water	Growth retardation
<125 ppm	Food/water	Kidney changes
2.5–5.0 g	Acute dose	Death

Acute Fluoride Toxicity

The acute lethal dose of fluoride for man is probably 5 g. The probable range is 2–10 g. Acute fluoride intoxication is rare and is not well described as the chronic intoxication. Acute fluoride poisoning have been recorded

- As a result of accidents.
- Deliberate attempts to suicide.

Certainly Lethal Dose (OLD)

A lethal dose is the amount of drug likely to cause death.

Adult lethal dose = 34–64 mg F/kg body wt.

Safely Tolerated Dose (STD)

STD = $\frac{1}{4}$ certainly lethal dose (CLD)

Symptoms

1. Vomiting, nausea, diarrhoea
2. Pain abdomen extremities
3. Difficulty in speech
4. Thirst
5. Perspiration
6. Weak pulse
7. Coma
8. Convulsions
9. Cardiac arrhythmia → death.

Death will occur within 4 hours. If the patient survives for 24 hours, the prognosis is good.

Pathological Changes

1. Corrosive changes
 - Mouth

- Throat
 - Oesophagus
 - Stomach
2. Haemorrhagic stomach contents
 3. Changes in
 - Duodenum
 - Small intestine
 - Large intestine

Treatment

1. Milk or egg can be given: This serves 2 purposes:
 - a. Protects upper gastrointestinal tract from chemical burns
 - b. Provides calcium that acts as a binder for fluoride.
 2. Lime water
 3. Aluminium hydroxide gels
 4. Vomiting
- Majority of ingested fluoride is expelled.

In an hospital

1. Cardiac monitoring.
2. Gastric lavage.
3. Oral or IV calcium gluconate (10 ml of 10%).
4. Urine output to be maintained.
5. General supportive measures.

Chronic Fluoride Toxicity

On Enamel

The influence of chronic fluorine intoxication is on the structure of enamel in the development of mottled enamel.

“Characterised by minute white flecks, yellow or brown spot areas, scattered irregularly over the tooth surface”.

- Thicker the enamel, higher the severity.
- Fluorosis occurs symmetrically with in dental arches.
- Premolar is the most affected.
- Permanent teeth are particularly affected although occasional mottling of primary teeth may also be seen.

Treatment of Mottled Teeth

1. Milder forms diminish with time.
2. Removing minor blemished stains by grinding or polishing and etching by acid.
3. Bleaching with H_2O_2 .
4. Use of composite.
5. Use of veneers.

Skeletal System

It has been reported in Madras (1937), Punjab (1962), Ceylon, and China.

Clinical features

Vague pains in small joints of hand and feet, knee joints, joints in the spine.

- Stiffness of spine
- Difficulty in walking
- Rigidity of thoracic cage (dyspnoea)

Radiographic Features

Stage 1: Spinal column and pelvis show roughening and blurring of trabecule.

Stage 2: Trabecule merge together and bone has a diffuse structure less appearance.

Stage 3: Bone appears as marble white shadows.

On Thyroid

Used in the treatment of Graves, disease.

On Kidney

May aggravate renal disease.