

IRRITANT POISON

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Metallic Irritant

Arsenic

Arsenic Poisoning

Causes:

✓ **Occupational exposures**

✓ **Drinking water**

0.01 mg/L (10ppb) of arsenic
in drinking water.

✓ **Intentional**



Arsenic

Chemical name	Synonyms	Physical properties	Uses
Ar. Trioxide	White Ar.	White powder form	Insecticide, Rodenticide, Fowler`s solution
Copper Arsenite	Scheele's green	Greenish powder	Colour agent for toys , wall paper
Arsine	Arseniuretted hydrogen	Gas , Garlicky odour	Lead plating, soldering
Sulphide of arsenic	Red Realgar	Red powder, yellow powder	Depilatory, Colouring pigment
Copper aceto Arsenite	Paris green, emerald green	Greenish powder	Insecticide
Organic Arsenicals			Use in therapeutic

Mode of Action & Toxicokinetics

- ✓ Arsenic is absorbed through all portals of entry including oral, inhalation, and cutaneous routes.
- ✓ After absorbed it is distributed to the liver, lung, intestinal wall and spleen, where it binds to $-SH$ group of tissue proteins.
- ✓ Arsenic interferes with cellular respiration by combining with $-SH$ group of mitochondrial enzymes, like pyruvate kinase.
- ✓ Its particular target is on vascular endothelium leading to increased permeability, edema and hemorrhage especially in the intestinal canal.
- ✓ Locally it causes irritation of the mucous membrane.
- ✓ Remotely it depresses the CNS.

Fatal Dose & Fatal period

- ✓ Pure metallic form is Nontoxic.
- ✓ Metal salts are more toxic.
- ✓ Pentavalent less toxic compare to trivalent because it is less water soluble.
- ✓ The most toxic form is **ARSINE GAS**
- ✓ Fatal dose :
 - Ar. Trioxide 200to 300 mg
- ✓ Fatal Period
 - 1 to 2 days

Signs & Symptoms (Acute)

1. Fulminant Type :

- ✓ Due to heavy dose of arsenic abt . 3-5 g
- ✓ Death occurs in 3- 5 hrs
- ✓ Cause of the death is Shock & PVF .
- ✓ All the capillaries are markedly dilated with a markedly fall BP .
- ✓ Arsenic direct act on Heart muscle.
- ✓ GIT Symptoms are absent

Signs & Symptoms (Acute)

2. GIT Type

- Most common type of acute poisoning.
- It resembles like Bacterial food Poisoning.
- Sym. Usually appear half to one hr after ingestion. But sometime delayed for many hrs due to it taken with food.
- Constriction in the throat ,Difficulty in swallowing
- Burning & colicky pain in Oeso. , Sto., Bow,
- Intense thirst and severe projectile vomiting constant sym.
- Purging within 1-3 hrs
- Stool dark then colorless and watery like **RICE WATER**

Signs & Symptoms (Acute)

2. GIT Type

- ✓ Garlicky odour present
- ✓ Hepatics: Fatty infiltration
- ✓ Renal : Oligouria, Uremia, Urine contain albumin, red cell
- ✓ CVS : Acute circulatory collapse, VT , VFI
- ✓ CNS : Headache, Vertigo, Hyperthermia, tremors, Coma, General paralysis
- ✓ Skin : delayed loss of hair, Skin eruption

Cause of Death : Circulatory failure

No	Points	Arsenic Poisoning	Cholera
1	Pain in Throat	Start before vomiting	Not usual
2	Voice	Normal	Rough and whistling
3	Conjunctiva	inflamed	normal
4	Vomiting	Start before purging and vomitus contain mucus, bile, blood	Not always present, if present ,start after purging and usually watery
5	Purging	Start after vomiting , stool is not exactly Rice watery , contain blood ,offensive smell associate with tenesmus	Start before vomiting , stool is Rice watery , and passed involuntarily in jet.
6	Investigation	Detection of Arsenic	Vibrio cholera bacteria present

Signs & Symptoms (Acute)

3.Narcotic Type

- ✓ This form GIT symptoms very Slight .
- ✓ Giddiness, Formication, Tenderness of the muscles, Delirium , Coma and death.
- ✓ Late sequelae of acute exposure Hematuria , Atn, Anemia, Leucopenia.
- ✓ Aseniuretted hydrogen , when inhaled act as direct poison to Hb to produce hemolysis, hemoglobinuria, renal failure, and death.

Signs & Symptoms (Chronic) ^{KartiknhImmc}

Dermal :

Melanosis (Neck, eyelid, Nipples)

Rain drop Pigmentation seen at skin flexure, temples.

Hyperkeratosis of palm and sole with irregular thickening of nail and development of transverse White line **Aldrich mees line**

GIT : Anorexia, Nausea, vomiting, diarrhoea, Weight loss

Liver : Hepatomegaly, jaundice, Cirrhosis

Kidney : Nephritic changes

Neurological : Encephalopathy, Polyneuritis (Glove & Stocking type)
Tremor

Hematological: Pancytopenia, Basophilic Stippling

Signs & Symptoms (Chronic)



Signs & Symptoms (Chronic)



Diagnosis

- **Blood** : less reliable because short half life.
- **Urine**: > 100 mg in 24hrs urine excretion.
- **Hair** : Most important criterion , it cant discriminate between external deposition and toxic accumulation
- **AAS** : Best analytic method. To detect Arsenic from Biological samples as well as contaminated water
- **Radiography**: X- ray abdomen

Treatment

- Supportive measures
- Gastric lavage with warm water and milk
- Freshly prepared Hydrated ferric oxide
By mixing -
 - a. 45 ml of Tr. Ferric chloride
 - b. 15 gm of sodi.carb
 - c. ½ glass of water
- Chelating agent :
- Hemodialysis

Chelating Agent

Mechanism of action :

Supply sulphydryl groups for the heavy metals

To attach

Eliminated from the body



Chelating Therapy

- BAL :
3-5mg/kg deep im /4hrs until urine arsenic level dips
below 50mg/24hrs
Usual duration 7-10 days
- PENICILLAMINE:
100mg/kg/day oral for 5 days
- DMSA
- DMPS

PM FINDINGS

- GIT : Red velvet Mucosa, focal hemorrhage
- Intestine : Rice water like contents & inflamed
- Heart: Subendocardial hemorrhage
- Fatty degeneration : Liver, Heart, kidneys

MLI

- Ideal homicidal
- Suicide very rare
- Accidental
- Chronic poisoning
- Abortifacient
- Cattle poison

Thanks