Corrosive poisons

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Types of corrosives

ACID

- Causes coagualative necrosis
- Eschar
- Formation of protien layer
- Prevent further penetration

EXCEPTION : Hydrofluoric acid
:liquefactive necrosis

ALKALI

- Causes liquefactive necrosis
- MORE dangerous than acid.

Corrosive substances:

- **Inorganic acids :** sulfuric acid , hydrochloric acid
- **Organic acids :** acetic acid , carbolic acid
- **Alkali :** sodium hydroxide , potassium hydroxide
- **Metal salts :** ferric chloride , zinc chloride , chromate
- **Non metal compound:** iodine , potassium permanganate , hydrogen peroxide

CARBOLIC ACID :

- Colourless , prismatic , needle like crystals that turns pink and liquefies when exposed to air .
- Sweetish burning taste

- **C**onstriction of pupil
- **O**live oil – used in gastric lavage of carbolic acid .
- **L**eathery gastric mucosa

Fatal dose : **1-2gm**

Fatal period : **3-4 hours**

Also known as **phenol** : an antiseptic , delays decomposition , causes PCT necrosis.

- 2 metabolites of phenol :
  - **Pyrocatechol**
  - **Hydroquinone**

- Metabolites :
  - Excretion through urine : **carboluria (green urine).**
  - Deposition in cartilage : **Ochronosis**

Clinical features :

- **Local :** applied to skin: burning pain , numbness , tingling , anesthesia.
- Causes corrosions and produce white eschar (scar), falls off in few days leaving brown stained area .
- SYSTEMIC :

➢ **GIT :** burning pain followed by tingling numbness and anesthesia . Nausea & vomiting .

➢ **RS :** respiration is slow and labored.

➢ **CNS :** headache , giddiness , unconsciousness , convulsions , coma.

➢ Oliguria and hepatic failure .

➢ **Urine :** Carboluria

➢ Oochronosis

Management :

- Skin : wash with undiluted polyethyelene glycol.
- Oxygen / ventilatory support
- IV fluids and vasopressors to support blood pressure .
- Ingestion : cautious stomach wash with sodium or magnesium sulfate solution.
- Lidocaine for ventricular arrhythmias .
- Benzodiazepines for seizures .
- Treat methemoglobinemia : if it is >30% ingest methylene blue (1-2mg/kg).
- If >70% - exchange transfusion may be needed .

Autopsy findings :

- Phenol smell
- Corrosion of skin , at angle of mouth ,chin. Corrosions are initially white but turns brown in color .
- Splashing may be noted .
- Tongue : white and swollen
- Mucosa of stomach is tough , white or gray , corrugated and arranged in longitudinal folds and looks leathery .
- Urine on exposure to air turns green.1

OXALIC ACID : salts of sorrel , acid of sugar

- Colorless ,transparent , odourless, prismatic crystals resembling the crystals of magnesium sulphate and zinc sulphate .
- Sour and slightly bitter acidic taste .
- Present in rhubarb leaves , beets and many other vegetables .
- Potassium oxalate , sodium oxalate and ammonium oxalate are toxic salts of oxalic acid .

Uses :

- Bleaching and cleansing agent
- Ink remover
- Rust remover
- Metal polishing
- Cleaning brass and copper articles .

Fatal dose : **15-20gms**

Fatal period :**1-2 hours**

Clinical features

- **LOCAL :** corrosions of mucosa with underlying congestion . The corroded area is referred as "scalded" in appearance.
- **SYSTEMIC :**
- Vomiting and diarrhea
- Hypocalcemia (**Tetany)**
- Muscle irritability , tenderness, cramps .
- Convulsions
- **Accoucher's hand** due to carpopedal spasm
- **Chavosteak's sign positive** .
- Metabolic acidosis
- Renal failure
- uremia

Management :

- Local exposure : wash the affected skin with copious water .
- Gastric lavage with calcium gluconate or calcium lactate .
- Calcium gluconate intravenously
- symptomatic

Autopsy findings:

- Scalded mucosa of GIT .
- Mucosa membrane of mouth , tongue , pharynx, esophagus may be bleached and has scalded appearance .
- Kidneys : edema , congestion with oxalate crystals in renal tubules with necrosis of proximal convoluted tubule.

SULFURIC ACID: Oil of Vitriol

- Heavy , oily, colourless, odourless, non fuming liquid .
- Hygroscopic
- Carbonizes organic substance .
- Strongest acid
- Gastric lavage contraindicated .

Treatment : **Magnesium oxide – best antidote** ,starch and milk product .

- Fatal dose :**5-10ml**
- Fatal period :**12-18 hours .**

Autopsy findings:

- Corrosion of chin , angle of mouth , lips , oral mucosa, tongue , throat .
- Corrosion over hands may be noted .
- **Teeth chalky white**
- The corroded area of skin or mucosa membrane appear brownish or blackish.
- Perforation of stomach may be seen .

Vitriolage :

- Throwing acid (on face /body): vitriolage .
- Under criminal amendment act 2013.
- Under IPC : and punishment

326A : acid attack --------> min. 10 years punishment .

326B : attempt to throw acid ------->min. 7 years punishment

- Plant products commonly used for vitriolage :

1. **semecarpus anacardium** (marking nut): most commonly used .
2. **calotropis**

Treatment : Alkali –**NaHCO3(sodium bicarbonate).**

NITRIC ACID : Aqua fortis , red spirit of nitre

- Clear , colourless, fuming fluid
- Pungent odour
- With organic substance , it causes yellowish discolouration due to **xanthoproteic reaction.**
- Fatal dose : **10-15ml**
- Fatal period : **12-24 hours**
- AUTOPSY FINDING :Corrosion of skin , angle of mouth ,lips,mucosa with **yellowish discolouration** .
- Stomach wall is soft and friable , ulcerated .
- Perforation is less common.

ACETIC ACID :ethanoic acid, ethylic acid

- Colourless , volatile liquid with pungent odour.
- Pure acetic acid is an ice like solid below 16degree celsius , hence it often described as glacial acetic acid . Above this temperature , it is colorless liquid.
- The dilute form of acid is called as **Vinegar .**
- FD :**50-100 ml (concentrated)**
- FP: **about 48 hours**

MOA:

- In concentrated form : acts as corrosive .
- In dilute form: acts as irritant .
- Systemic absorption causes : hemolysis, hemoglobinuria , renal failure , DIC, metabolic acidosis and liver dysfunction .

AUTOPSY FINDINGS :

Massive geographic liver necrosis .

Degeneration and swelling of renal tubular epthelium .

HYDROCHLORIC ACID: muriatic acid , spirit of salts .

- Colorless , odourless, volatile fuming liquid.
- May acquire yellowish tinge when exposed to air .
- FD: **15-20 ml.**
- FP: **18-30 hours.**

AUTOPSY FINDINGS :

- Skin or mucosa membrane shows corrosion.however , corrosion is less severe.
- Skin – brownish discolored & parchment like.
- Coagulation of surface of tongue & mucosa of pharynx & esophagus is seen.
- Stomach : soft , edematous , congested & desquamated or may be ulcerated .
- Inflammation & edema of respiratory passage .

Q1: Regarding the mechanism of action of corrosives , which of the following is false ?

a) Strong acids : coagulation necrosis
b) Strong alkalis : liquefaction necrosis
c) Hydrofluroic acid : liquefaction necrosis
d) Sodium hydroxide : coagulation necrosis

Q2:Which statement regarding sulphuric acid poisoning is false ?

a) Ingestion produces chalky white teeth
b) The mind remains clear till death
c) It is the most common acid associated with vitriolage
d) All tissues coming into contact with sulphuric acid turn yellow.

Q3:olive green colour urine is seen in poisoning with :

a) Organophosphate
b) Kerosene
c) Carbolic acid
d) Oxalic acid

Q4:boiled lobster appearance is seen in poisoning with _____

a) Formic acid
b) Hydrochloric acid
c) Boric acid
d) Carbolic acid