



Round : Forensic Medicine

Group no : A4

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Chemical weapons General Types:

- (1) **Choking agents (Chlorine)**: attack respiratory system and cause a build-up of fluids (Dry-Land drowning) in the lungs
اغتتابة
leading to suffocation when inhaled.

* **Corrosive agents**: are chemicals that cause severe tissue damage through chemical burns

- **Eyes** : blurred vision and watering eyes .
- **Skin** : severe deep burns .
- **Inhalation** : choking / coughing / chest tightness / fatigue .

(2) **Blister agents (Sulfur Mustard)**: Causes chemical burns, resulting in painful Blister.

* By inhalation or contact or ingestion

* **Nettle agent (Urticants)**: a variant that only causes irritation, erythema, itching.

- **Skin & mucosa** : large blisters
- **Eyes** : conjunctivitis + corneal damage
- **Respiratory** : mild to severe damage: runny nose, bloody nose, etc...

(3) **Blood agents (Hydrogen Cyanide)**: chemicals that prevent O₂ and CO₂ exchange between the blood and the body's cells.

* Through inhalation or ingestion

- **Irritating** --> Cyanide based agent irritate the eyes and RS
- **Non-irritating** ---> Arsine

• (4) **Nerve agents (Sarin)**: Are Irreversible acetylcholinesterase inhibitors used as poisons.

G-agents: High volatility (easily dispersed in air) The exposure is likely to occur from breathing in its vapors resulting in the rapid onset of symptoms. (Inhalation / non-persistent).

V-agents: Low volatility (not easily dispersed in air) typically gets absorbed through the skin and has a delayed onset symptoms (Dermal/ persistent).

(5) **Riot control agents**: chemical compounds with very low toxicity, rapid onset, and a short duration of action. That temporarily (15-30 min) make people unable to function by causing irritation to the eyes, mouth, throat, lungs, and skin.

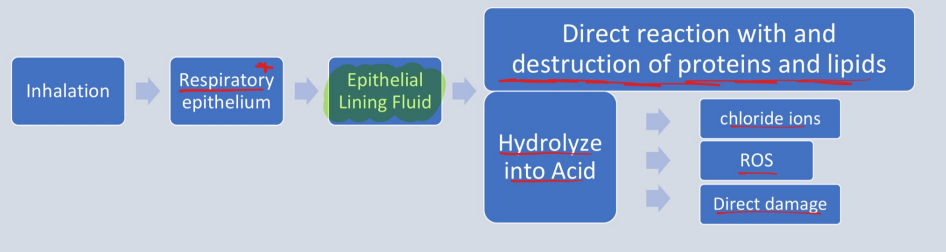
Eyes: excessive tearing, burning, blurred vision, redness

- **Nose:** runny nose, burning, swelling
- **Mouth:** burning, irritation, difficulty swallowing, drooling
- **Lungs:** chest tightness, coughing, choking sensation, noisy breathing (wheezing), shortness of breath
- **Skin:** burns, rash
- **Other:** nausea and vomiting

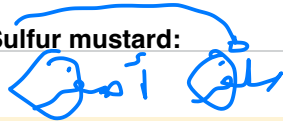
1. Chlorine:

- * Choking agent
- * Green-yellowish gas
- * pungent, irritating odor
- * density higher than air
- * Toxic only in high doses (> 10 ppm).
- * No antidote

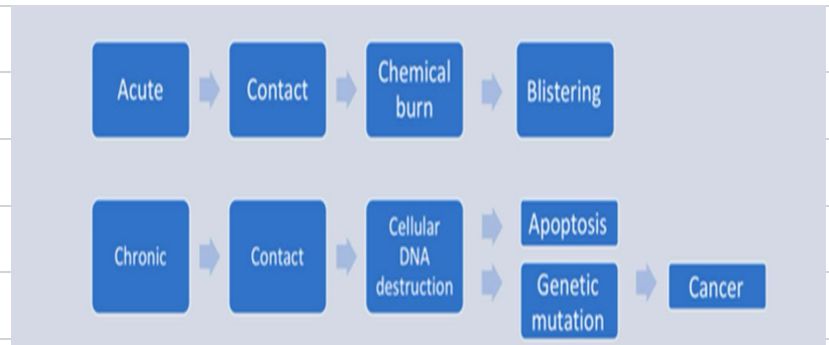
• Mechanism of action:



2. Sulfur mustard:



- **Type:** Synthetic **blister** agent.
- **Characteristics of the impure form:**
 - Liquid with a **yellow-brown** color.
 - **Odor** resembling mustard, garlic, or horseradish.
 - Higher than air in **density**.
- **Misnomer:** Not a gas but an **aerosolized liquid**.
- **Absorption:**
 - **Lipophilic**, absorbed primarily through the skin.
- **Lethality:** Rarely fatal with medical care (<5% mortality rate).
- **Antidote:** There is no Antidote
- **Persistence:** Long-lasting, contaminates areas for days or weeks.



3. Sarin gas:

- Type:**
 - Nerve agent (Synthetic organophosphorus compound)
- Physical Properties:**
 - Colorless, odorless, and tasteless liquid
 - Higher than air in density
 - Highly volatile, capable of penetrating skin
- Toxicity:**
 - Lethal in small doses (as low as 35 mg/m³)
 - Non-lethal doses can cause permanent neurological damage
- Contamination:**
 - Can contaminate water, food, and clothing

MOA

1. Inhibition of acetylcholinesterase

- Prevents the breakdown of acetylcholine (ACh).

2. Accumulation of acetylcholine

- Excess ACh in synaptic clefts overstimulates cholinergic receptors.

3. Cholinergic crisis

- Results in symptoms such as excessive salivation, muscle spasms, respiratory distress, and potential fatality if untreated.

Treatment:

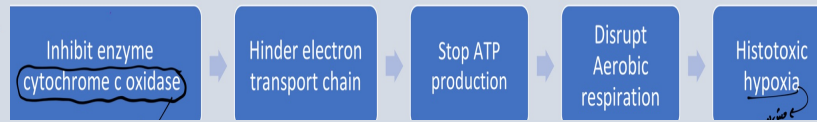
- administer antidote (atropine/pralidoxime/biperiden)

4.HCN

- **Synthetic Blood agent.**
- **Colorless** liquid compound.
- sometimes is described as having a "**bitter almond**" smell. *رائحة تبش جوز المطر*
- **less dense** than air.
- Need large **concentrations**.
- **Impractical** in field use.
- **affect** the body by:
 - ingestion (delayed onset)
 - inhalation (rapid onset)**
 - skin contact (delayed onset)

(Hydrogen Cyanide

- Mechanism of action: *stop ETC* *of aerobic*



Treatment:

Hydroxocobalamin (vitamin B_{12a})

Antidote Kit:

- **contains:**

- (1) **amyl nitrite**
- (2) **sodium nitrite**
- (3) **sodium thiosulfate**

HCN

counteract effect of cyanide.

5.White phosphorus

- **White phosphorus** is a **translucent waxy solid** that quickly **becomes yellow** when **exposed to light**, known as **willy pete**, with **pungent garlic like odor**.
- The form used by military as **energetics (active)** and is **highly flammable** (produce **yellow flame** and **white dense smoke**) and **pyrophoric** (self-igniting) upon contact with air.
- Continue to burn **unless deprived** from atmospheric **oxygen**.
- White phosphorus can be absorbed into the body by **ingestion, skin and eye contact, inhalation**.
- It is **toxic**, causing severe **liver damage** on ingestion and **phossy jaw** (phosphorus necrosis of jaw).
- WP is Highly **lipophilic**, the resultant **burn** is deep and painful (second and third degree).
- Necrotic area with a yellowish color.
- Burns on the skin are **deep and painful**, produce a firm scar surrounded by vesication.
- Absorption of phosphorus into the body through the burned area, **resulting in liver, heart and kidney damage, and in some cases multiple organ failure**.
- The accepted **lethal dose** when white phosphorus is ingested orally is **1 mg per kg of body weight**, the **ingestion of 15 mg** may be lethal.
- **Vomiting, stomach cramps, drowsiness, phosphorus-laden stool ("smoking stool syndrome")**. *⇒ stool has distinctive*

Terminate further oxidation of phosphorus by **irrigation or placement** of **saline-soaked** and/or **water-soaked pads** on areas of exposure.

Remove affected **clothing** and **rinse affected skin areas** with **cold sodium bicarbonate solution** or **cold water**.