# MODERN RIOT CONTROL COMPOUNDS

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These compounds are used in **the police practice** for fight against the participants **in the riots**.

They have rapid and strong **irritant effects on eyes, upper airways** and **skin**. For this reason in toxicology these compounds are known as **irritants**.

**Characteristics:**

- **rapid incapacitating effect**;
- capacity for **easy dissemination**;

- These poisons belong to the group of the **sensory irritant compounds**. They are also known as **riot-control agents**. Similar toxic effects have also the mineral acids: hydrochloric acid, nitric acid, sulfuric acid etc.

## Incapacitants

## Lacrimatory compounds

CN - 2-chloroacetophenone
CR - dibenz[b,f]1:4 oxazepine
CS - chlorobenzylidene malononitrile
OC - Capsaicin

## Sternutators (vomiting agents)

DA - Dyphenylchloroarsine
DC - Dyphenylcyanoarsine
DM (Adamsite) – Dyphenylaminochloroarsine

According to the **leading toxic effect** the compounds of the group may be divided into **two groups**:

1. **Compounds**, which produce toxic effect **primarily on the eyes**:

- Lacrimation
- Blepharospasm
- Blepharoconjunctivitis
- eye pain etc.

**The substance "CS"** belongs to this class.

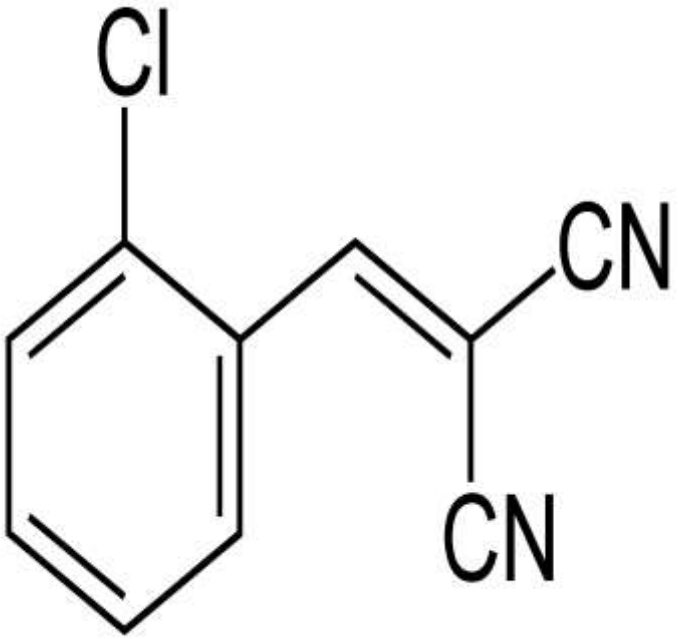
2.**Compounds**, which produce toxic effect mainly on the **respiratory system:**

- sneezing
- cough
- choke
- chest pain etc.

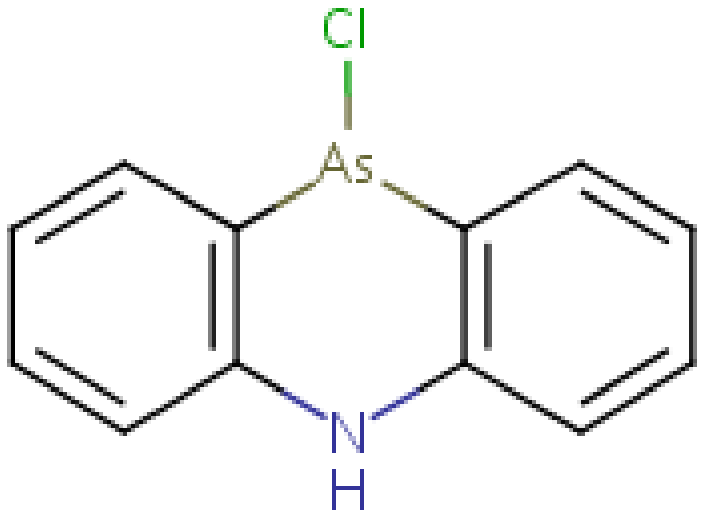
**The compound "DM"** belongs to this class.

# Two of the most important compounds of the group are:

**CS**

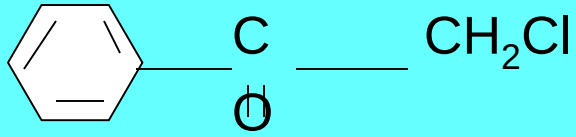



**DM**

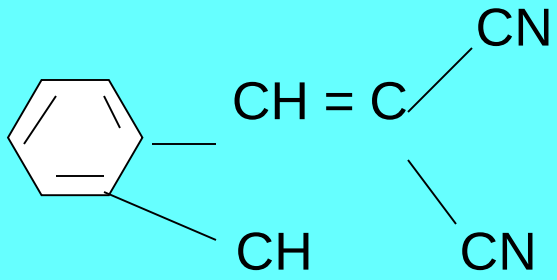


- The lacrimators are aerosol-dispersed chemicals that produce **eye, nose, mouth, skin,** and **respiratory tract irritation**. Most of these symptoms resolve by **30** minutes post-exposure. Both ocular and mucous membrane symptoms may persist for 24 hours. The three currently used agents are:

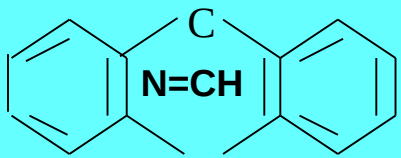
1 1-chloroacetophenone (CN)




2-chlorobenzylidenemolononitrile (CS)




dibenz(b,f)-1,4-oxazepine (CR)



- In dilute concentrations these agents cause profuse **lacrimation** and **blepharospasm**, as well as **cutaneous erythema** and **pain**. Serious systemic toxicity is rare and occurs only when these chemicals are used in high concentrations within confined spaces. **Delayed cutaneous sensitivity** can develop after exposure to **chloroacetophenone**.

# Pathophysiology

- The **lacrimators** are strong **mucous membrane irritants** and **chemical activators** of the **lacrimal glands**. Both **CS** and **CN** are **alkylating agents** that react with **sulphhydryl groups** and other nucleophilic sites. Tissue injury and necrosis probably results from the **biochemical inhibition** of **important enzymes** such as **pyruvic decarboxylase**.

# Pathophysiology

- **Postmortem findings** associated with **chloroacetophenone** (**CN**) include **acute tracheobronchitis** with **necrosis** of the **respiratory mucosa** and **pseudomembrane formation, focal intraalveolar hemorrhage, early bronchopneumonia, pulmonary edema, cerebral edema etc.**

# Clinical presentation

## *Eyes*

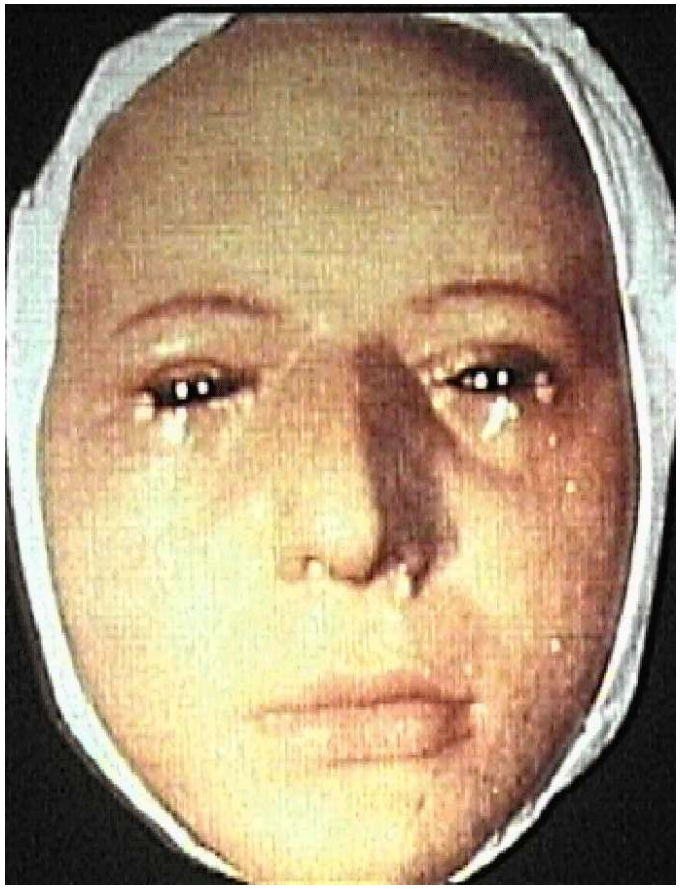
- These compounds produce intense **blepherospasm, pain, lacrimation, conjuctival erythema, periorbital edema**, and a short-duration **rise in intraocular pressure**. Symptoms generally **diminish within 30 minutes** post-exposure, but the persistence of the symptoms depends on the concentration and duration of exposure.

# *Upper Respiratory Tract*

- **Rhinorrhea, nasal irritation and congestion, bronchorrhea, sore throat, cough, sneezing, unpleasant taste**, and **burning** of the mouth occur immediately after exposure and rapidly resolve within minutes post-exposure.

# Lacrimators (tear gas)

- Cause reaction in:
- Eyes: burning, tearing, eyelid spasm, redness
- Airways: burning, coughing, dyspnea
- Skin: burning, erythema



# *Lungs*

- Prolonged concentrated exposure can produce:
- acute **laringotracheobronchitis**
- **Reactive airways disfunction syndrome (RADS)** may follow a high level exposure to **CS** and other respiratory irritants.

# *Gastrointestinal Tract*

- Ingestion of **CS** will lead to repeated episodes of **abnormal cramping pain** and **diarrhea**.

# *Skin*

- **Burning** and sometimes **erythema** occur after exposure to lacrimators. Prolonged exposures particularly those associated with wet clothing can cause **second-degree chemical burns**. Cutaneous erythema usually resolves within 3 hours. **Chloroacetophenone** is a **skin sensitizer** and may produce **an allergic contact dermatitis** (**pruritus, weeping, papulo-vesucular rash**) within 72 hours of exposure.

**Exposure to very high levels**, for example in closed area produces significant toxic effects.

**DM** in large doses may produce **corneal necrosis** and **pulmonary damage**;

**CS** in large doses may result in **pulmonary edema;**

All irritants may produce transient **elevations of blood pressure**;

Each of the compounds of the group can produce **contact sensitization**;

# Treatment

- The first priority is **the removal of casualties from the risk** of further contamination. Contaminated **clothing** should be **removed** and placed in **polyether bags**.
- **Lacrimation, blepharospasm, blepharoconjuctivities** and eye pain disappear quickly after removal from a contaminated area.
- Patients with respiratory distress should receive oxygen.

# Treatment

- **Irrigation** of the **conjunctival sacs** with **saline solution** for 15 - 20 minutes brings **rapid**, sometimes temporary **relief**.
- **Skin** should be decontaminated with **soap and water**.
- **Erythema** generally subsides **without treatment.**
- Primary contact dermatitis may require **treatment with corticosteroids**.

# *Supportive care*

- The eyes should be examined for **corneal abrasions** and treated with oral **analgesics, topical antibiotics**, and **mydriatics** as needed. **Vesiculated skin** is treated like a second-degree chemical burn. Patients with respiratory distress should be observed for the development of **bronchospasm** and **pneumonia** (e.g. serial chest x-rays, arterial blood gases). Prophylactic antibiotics and steroids probably are not effective.