

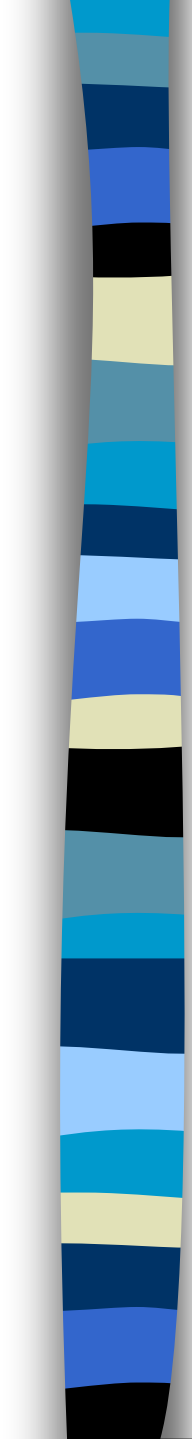


**MEDICAL UNIVERSITY – PLEVEN**  
**FACULTY OF PUBLIC HEALTH**  
**CENTER FOR DISTANCE LEARNING**

# **MODERN RIOT CONTROL COMPOUNDS**



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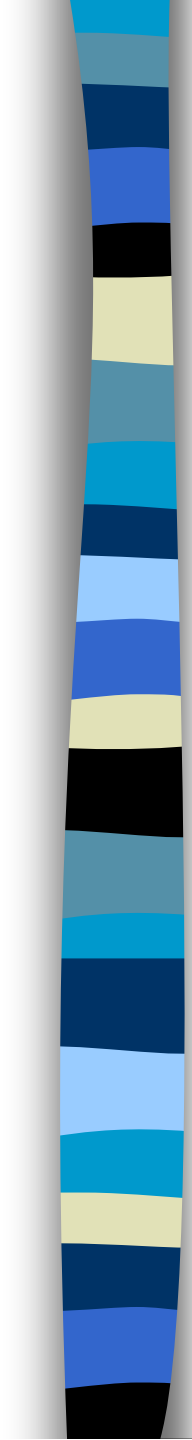


These compounds are used in **the police practice** for fight against the participants **in the riots.**

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**

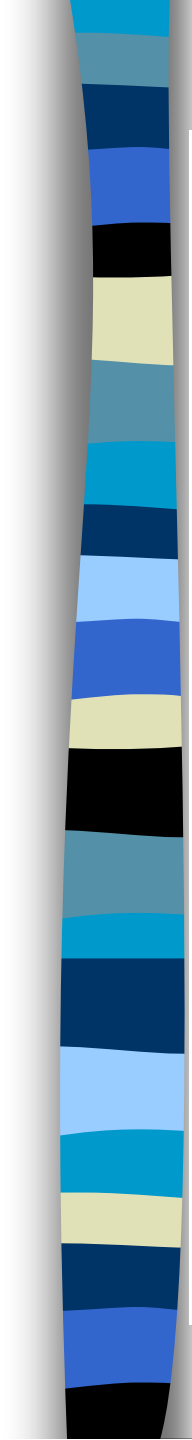
**OC - Capsaicin**

## 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
- Blepharconjunctivitis
- eye pain etc.

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



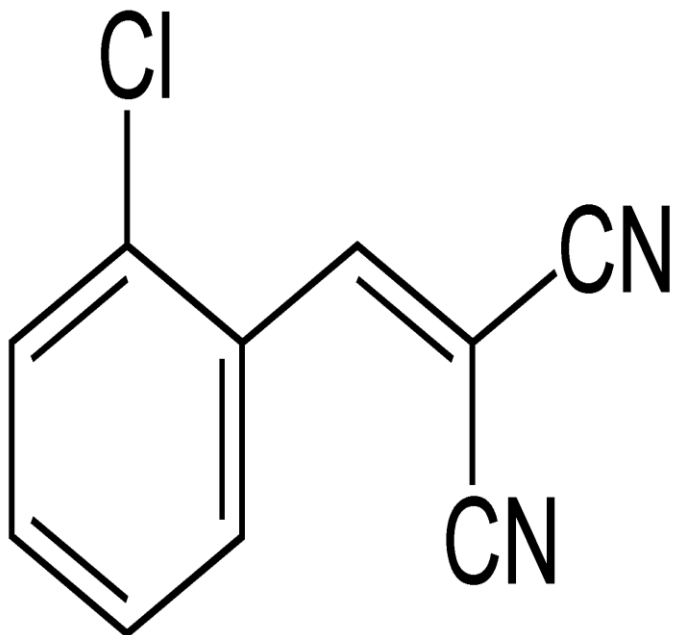
2. **Compounds**, which produce toxic effect mainly on the **respiratory system**:

- sneezing
- cough
- choke
- chest pain etc.

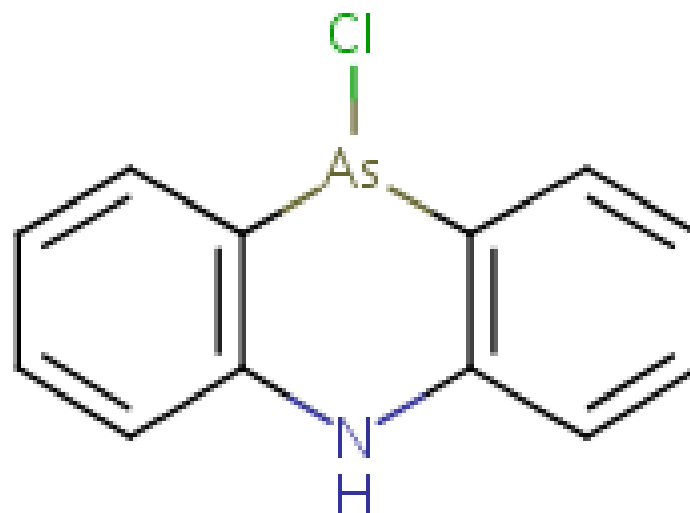
The compound "**DM**" belongs to this class.

Two of the most important compounds of the group are:

**CS**

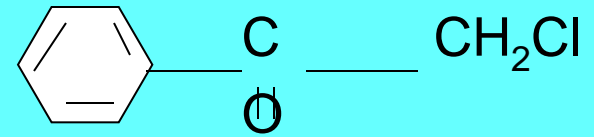


**DM**

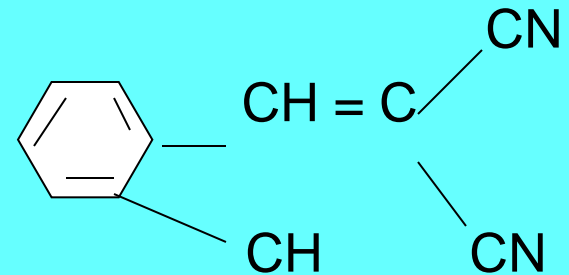


□ The lacrimators are aerosol-dispersed chemicals that produce **eye, nose, mouth, skin, and respiratory tract irritation**. Most of these symptoms resolve by **30** minutes post-exposure. Both ocular and mucous membrane symptoms may persist for **24** hours. The three currently used agents are:

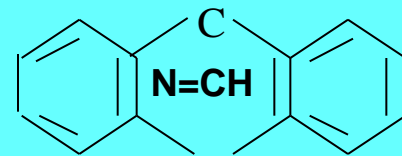
1 1-chloroacetophenone (CN)



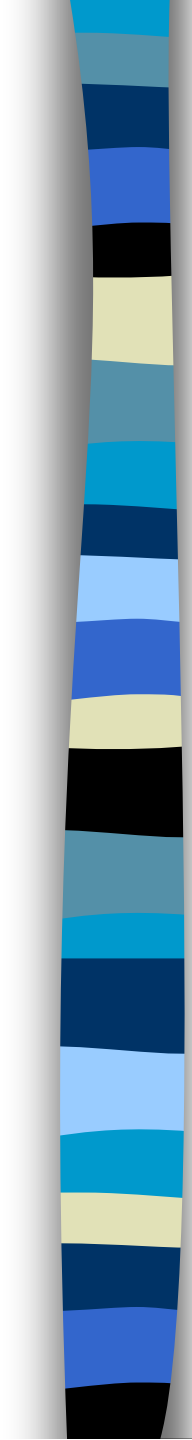
2-chlorobenzylidenemalononitrile (CS)



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 (CN)**.

# 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 **sulphydryl groups** and other nucleophilic sites. Tissue injury and necrosis probably results from the **biochemical inhibition** of **important enzymes** such as **pyruvic decarboxylase**.



# Pathology

- ❑ **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, etc.**



# Clinical presentation

## *Eyes*

- These compounds produce intense **blepharospasm, pain, lacrimation, conjunctival 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.

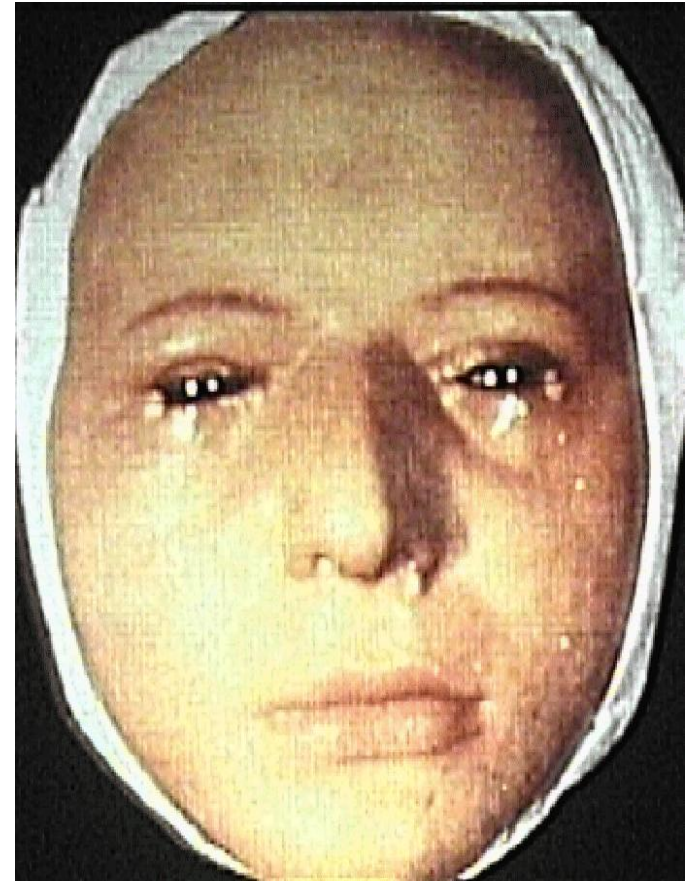


## *Upper Respiratory Tract*

- **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 dysfunction syndrome (RADS)** may follow a high level exposure to **CS** and other respiratory irritants.



# *Gastrointestinal Tract*

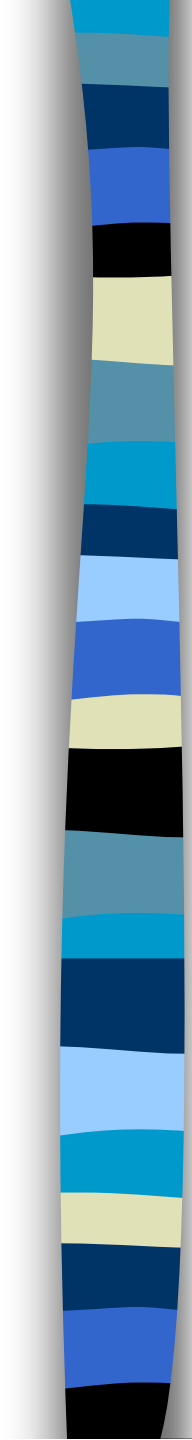
- ❑ Ingestion of **CS** will lead to repeated episodes of **abnormal cramping pain** and **diarrhea**.





# *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-vesicular 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, blepharoconjunctivities** 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.