# 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.



- sneezing
- cough
- choke
- chest pain etc.

The compound "DM" belongs to this class.

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

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

1 1-chloroacetophenone (CN)

2-chlorobenzylidenemolononitrile (CS)

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

In dilute concentrations these agents profuse **lacrimation** 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 pyruvic **enzymes** such as decarboxylase.

# **Pathophysiology**

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

# Clinical presentation

# **Eyes**

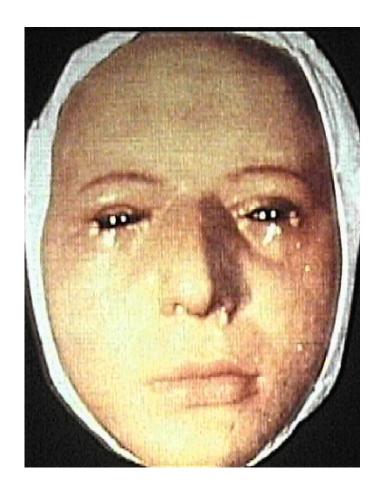
■ These compounds produce intense blepherospasm, pain, lacrimation, conjuctival erythema, periorbital edema, and a short-duration rise in intraocular pressure. Symptoms generally diminish within 30 minutes post-exposure, but the persistence of the symptoms depends on the concentration and duration of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