RIOT CONTROL AGENTS: WHAT HEALTHCARE FACILITIES NEED TO KNOW

AEHP WEBINAR SERIES – OCTOBER 27-2020
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OUR SPEAKERS

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No conflicts of interest to disclose
After attending this webinar, participants will be able to:

- Describe chemicals used in tear gas and crowd-control agents
- Discuss the injuries that can result from tear gas and the emergency management of exposed victims
Here Are the 98 U.S. Cities Where Protestors Were Tear-Gassed

By K.K. Rebecca Lai, Bill Marsh and Anjali Singhvi  June 16, 2020

PROTESTERS REACT TO TEAR GAS AT GEORGE FLOYD PROTESTS IN WASHINGTON, D.C.

Tear Gas Use During COVID-19 Pandemic Irresponsible; Moratorium Needed, Says American Thoracic Society

11-Jun-2020 4:50 PM EDT, by American Thoracic Society (ATS)
IN THE US, NPDS DATA FROM 2017

- 4,007 total reported of exposures to lacrimators
  - 83% from OC
  - 12% from CN
  - 0.2% from CS
  - 4% from other or unknown
- 25% of these cases saw evaluation in a healthcare facility, and most had minor effects.
- There were no deaths reported.
DESCRIPTION OF INJURIES DURING PROTESTS IN BEIRUT, LEBANON – DR. THARWAT EL ZAHARN

12. Lebanese protesters are sprayed with water during a protest against corruption and against the government’s failure to resolve a crisis over rubbish disposal, near the government palace in Beirut on August 23, 2015. 🏴‍‍
Riot Control Agents “Sharing the Lebanese experience”

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DEPARTMENT OF EMERGENCY MEDICINE
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On August 22nd, 2015, Lebanese people protested in Beirut due to a garbage crisis.
The police used RCA including fired rubber bullets and tear gas canisters in attempts to disperse the crowds.
On October 17th, 2019 another wave of protests began due to the impending economic collapse in Lebanon and police again used tear gas to disperse crowds.
**SYSTEM OPERATION**

The TL1 Riot Launcher provides a light weight and easy to operate launcher for crowd control. This single shot weapon is designed to accept all 37/38mm ammunition. Models are available with folding and fixed stocks.

**SPECIFICATIONS**

- Weight: 
- Dimensions: 
- Range: 
- Capacity: 
- Ammunition: 37/38mm
Examples of the Teargas Canisters Used for Riot Control
It is crucial to have a prepared disaster plan whether for natural disasters or riot-related injuries as you never expect when your hospitals get flooded with casualties.
A hollowed-out grain silo and charred boat the day after twin blasts in Beirut’s port.

PHOTO: AGENCE FRANCE-PRESSE/GETTY IMAGES
We received ~400 pts in 4-5 hrs

6000 injured
162 dead
300,000 homeless
Lessons learned from our experience

- Although promoted as less than lethal weapons, RCA can lead to severe and permanent injuries.
- It is crucial to have a predetermined disaster management plan tailored to your institution capabilities in order to deal with mass casualties.
- Maintain stockpiling of medications and supplies and train all medical, surgical, nursing, pharmaceutical, and information technology teams on disaster preparedness.
- Proper coordination with EMS is crucial in order to disperse the load of patients instead of overwhelming single emergency departments.
- Improper use of RCA can lead to a huge financial burden on any institution.
WHAT ARE THEY?

Powder
Not Gas!

Commonly referred to as “Tear Gas”

Chemical Irritant

Carron PN, Yersin B. BMJ. 2009;19;338:b2283.
## Commonly Used Chemicals

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Chemical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN</td>
<td>Chloroacetophenone</td>
</tr>
<tr>
<td>CS</td>
<td>Chlorobenzylidene-malononitrile (Corson and Stoughton)</td>
</tr>
<tr>
<td>CR</td>
<td>Dibenzoazepine</td>
</tr>
<tr>
<td>DM</td>
<td>Adamsite or Diphenylaminochloroarsine</td>
</tr>
<tr>
<td>OC</td>
<td>Pepper Spray Oleoresin capsicum</td>
</tr>
<tr>
<td>PAVA</td>
<td>Pelargonic acid vanillylamine</td>
</tr>
</tbody>
</table>

Carron PN, Yersin B. BMJ. 2009;19;338:b2283.
Victim Characteristics

Agent: Chemical, Device, Trauma?

Environment
CLINICAL EFFECTS

- Dermal
- Respiratory
- Occular
## PHYSICAL AND CHEMICAL CHARACTERISTICS OF TEAR GASES

<table>
<thead>
<tr>
<th>Name</th>
<th>Characteristics</th>
<th>Time to activation</th>
<th>Duration of action (minutes)</th>
<th>Relative potency*</th>
<th>ICT 50 (mg/min per m³)†</th>
<th>LCt 50 ‡ (mg/min per m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroacetophenone</td>
<td>Apple odour; powder or emulsion; aerosol</td>
<td>3-10 seconds</td>
<td>10-20</td>
<td>1</td>
<td>20-50</td>
<td>8500-25 000</td>
</tr>
<tr>
<td>Chlorobenzylidene malononitrile</td>
<td>Pepper odour; microparticles; dispersing effect (grenades)</td>
<td>10-60 seconds</td>
<td>10-30</td>
<td>5</td>
<td>4-20</td>
<td>25 000-100 000</td>
</tr>
<tr>
<td>Dibenzoazepine</td>
<td>Odourless; aerosol; persists for prolonged periods in the environment or on clothes</td>
<td>Instantaneous</td>
<td>15-60</td>
<td>20-50</td>
<td>0.2-1</td>
<td>&gt;100 000</td>
</tr>
<tr>
<td>Diphenylaminochloroarsine</td>
<td>Odourless or slightly bitter almond odour; emetic</td>
<td>Rapid</td>
<td>&gt;60</td>
<td>0.5-2</td>
<td>50-100</td>
<td>10 000-35 000</td>
</tr>
<tr>
<td>Oleoresin capsicum</td>
<td>Pepper odour; persists for prolonged periods in the environment or on clothes; short distance spray</td>
<td>Rapid</td>
<td>30-60</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>&gt;100 000</td>
</tr>
</tbody>
</table>

*Refers to the irritant effect.
†ICT 50= the concentration that causes incapacitation in 50% of individuals after one minute.
‡LCt 50= the concentration that causes death in 50% of individuals after one minute.
VICTIM CHARACTERISTICS

- Asthma
- Chronic obstructive pulmonary disease
- Cardiovascular disease
- Severe hypertension
- Young children
- Patients over 60 years
- Ocular diseases
- Contact lenses
RESPIRATORY EFFECTS

- Irritation of the nose, throat, and chest
- Coughing and difficulty breathing
- Exacerbation of existing asthma or chronic lung disease
- Rare severe complications
- Potential long term complications: Reactive Airway Dysfunction Syndrome
CUTANEOUS EFFECTS

- Burning sensation increases with presence of moisture, and higher temperature
- Rashes, blisters, and burns
- Heavy exposures produce vesicles and reddening that resemble a second-degree burn 14-16 hours postexposure, if exposed skin left without decontamination
- Delayed dermal manifestations (12-24 h); allergic contact dermatitis and acute generalized pustulosis
OCULAR EFFECTS

- Lacrimation, eye burning
- Blepharospasm, transient conjunctivitis, lid swelling
- Corneal epithelia defects
- More severe eye injuries are possible but not frequent with CS and OC
- Long term complications are possible, especially with CS:
  - Scarring of the conjunctiva, and glaucoma
OCULAR EFFECTS

- Lacrimation, eye burning
- Blepharospasm, transient conjunctivitis, lid swelling
- More severe eye injuries are possible but not frequent
- Remove contact lenses
- Blow air or irrigate with saline or water
- Slit lamp exam with possible topical antibiotics and mydriatics
- Oral analgesics but not topical analgesics
OCULAR EFFECTS

- Remove contact lenses
- Irrigate with saline or water
  - Morgan’s lens
- Slit lamp exam
- Visual acuity
MANAGEMENT

- Remove victims from the scene
- Prevent secondary exposures
  - Decontamination
  - Personal protective equipment
- Decontamination
  - Dry and Wet
- Supportive care
PREHOSPITAL MANAGEMENT CONSIDERATIONS

- Coordination with law enforcement
  - Staging area and safe zones.
- Internal communication and rumor control
- Prevent secondary exposures to prehospital personnel
  - Personal protective equipment
  - Decontamination
PREHOSPITAL MANAGEMENT CONSIDERATIONS

- Remove victims from the exposure area
- Supportive care
- Transport decision
WHAT KIND OF TEAR GAS WAS USED IN BANGKOK?
TEAR GAS WAS EMPLOYED FOR THE FIRST TIME IN THAILAND

- August 29th, 2008
- None of us knew what it was
- Little knowledge on how to manage patients and how to prepare our ED
SECONDARY CONTAMINATION – 2008 EVENT

-Nearby EMTs carried 19 contaminated victims who were most symptomatic to Vajira Hospital by ambulances without decon


http://www.osknetwork.com/modules.php?name=News&file=article&sid=3073&mode=thread&order=0&thold=0
- 5-8 minutes from the scene to Vajira Hospital
- No emergency department notification
- Porters and EMT brought them into the triage area.
- Male patients ➔ dry decontamination
- Female patients ➔ wet & dry decontamination

Health care providers wore plastic aprons, gloves, surgical masks and protective glasses (some with goggles) (level D PPE).
## SECONDARY CONTAMINATION CATEGORIZED BY PROFESSION

<table>
<thead>
<tr>
<th>Profession</th>
<th>Number (%)</th>
<th>Number of contamination (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMT</td>
<td>12 (26.1)</td>
<td>12 (100)</td>
</tr>
<tr>
<td>Nurse</td>
<td>10 (21.7)</td>
<td>10 (100)</td>
</tr>
<tr>
<td>Clerk</td>
<td>8  (17.4)</td>
<td>6  (75)</td>
</tr>
<tr>
<td>Public relation</td>
<td>6  (13.0)</td>
<td>6  (100)</td>
</tr>
<tr>
<td>Porter</td>
<td>6  (13.0)</td>
<td>6  (100)</td>
</tr>
<tr>
<td>Physician</td>
<td>3  (6.5)</td>
<td>3  (100)</td>
</tr>
<tr>
<td>Nurse aide</td>
<td>1  (2.2)</td>
<td>1  (100)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>46 (100)</strong></td>
<td><strong>44 (95.7)</strong></td>
</tr>
</tbody>
</table>
# Healthcare Providers' Symptoms of Secondary Contamination by Tear GAS

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number = 44 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye burning and lacrimation</td>
<td>44 (100)</td>
</tr>
<tr>
<td>Nose irritation or rhinorrhea</td>
<td>30 (68.2)</td>
</tr>
<tr>
<td>Skin burning</td>
<td>24 (54.5)</td>
</tr>
<tr>
<td>Cough</td>
<td>15 (34.1)</td>
</tr>
<tr>
<td>Chest tightness or shortness of breath</td>
<td>7 (15.9)</td>
</tr>
<tr>
<td>Dizziness</td>
<td>7 (15.9)</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
<td>7 (15.9)</td>
</tr>
<tr>
<td>Sore throat</td>
<td>2 (4.5)</td>
</tr>
<tr>
<td>Myalgia</td>
<td>1 (2.3)</td>
</tr>
</tbody>
</table>
LESSONS LEARNED AND AREAS OF IMPROVEMENT

- Tear gas is not a gas, it’s a solid particle
- Dry decon is not adequate
- Set up a decon facility outside the ED
- One-way traffic for patient transfer
- Took several days or weeks for turmoil to escalate to the climax and tear gas would be employed
- Pre-set up the decon facility while situation escalating
Emergency Department

Triage (for non-mass casualty)

Yellow

Red

Green

Pt drop off

Decon

Cold zone

Hall way

ED Front Door
WET DECONTAMINATION NEEDED?

- CS
  - Insoluble in water
  - But hydrolyzed in water at a pH of 7, with a half-life of 15 minutes at room temperature
  - Extremely rapidly hydrolyzed in alkaline solution with a pH of 9, with a half-life of 1 minute
  - Water and soap may transiently worsen burning sensation, which should dissipate with continued water flushing
Sorting victims regarding their roles

(Gov supporters VS Anti-gov protesters VS Law enforcement officers)
Level C PPE for personnel assisting victims with wet decon
OK TO BE USED?
RESPIRATORS

- Particle size (mass median diameter) of CS aerosol by spraying melted CS or firing thermal grenades is in the range of 0.5 - 2 µm
- N95 – filters particle size of > 0.3 micron, non-oil
- R95- filters particle size of > 0.3 micron, oil and non-oil

http://www.ndltca.org/documents/FAQ.pdf
<table>
<thead>
<tr>
<th></th>
<th>CN</th>
<th>CS</th>
<th>OC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>154.59</td>
<td>188.6</td>
<td>305.41</td>
</tr>
<tr>
<td>At room temperature</td>
<td>White crystalline solid, apple blossom like odour</td>
<td>White crystalline solid with pepper-like odour</td>
<td>Off-white solid, odourless, pungent tasting</td>
</tr>
<tr>
<td>Melting point</td>
<td>54°C</td>
<td>93°C</td>
<td>65°C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>244–245°C</td>
<td>310°C</td>
<td>210–220°C</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Water solubility</td>
<td>Insoluble</td>
<td>Sparsely soluble</td>
<td>Insoluble</td>
</tr>
</tbody>
</table>
Fighting Protesters With Colored Water

We have all seen photos of protesters being doused with water cannons by the police. But why would the police spray protesters with colored water? Simple: to identify and arrest them later.

posted on May 19, 2012, at 1:02 p.m.

Indian policemen fire purple colored water from a water cannon on Kashmir government employees during a protest on April 06, 2011 in Srinagar.

Police spray Ugandan opposition party leaders with colored water during demonstrations in the capital Kampala. President Yoweri Museveni has vowed to crush the protests and blamed rising food and fuel costs on drought and global increases in oil prices.

A man holding a Palestinian flag is sprayed by Israeli police during a protest in the West Bank village of Bilin.
- Royal Thai Police Bureau of Investigation
- FTIR Spectrometer and Gas Chromatograph Mass Spectrometer
  * Chlorobenzylidenemalononitrile (CS)
  * Methylene chloride
  * Methyl violet
- pH = 7

http://www.thairath.co.th/content/387695
## TEAR GAS MASS EVENTS AT VAJIRA HOSPITAL

Since Aug 29, 2008

There were no reports of secondary contamination to our ED personnel after system improvement and team education.

<table>
<thead>
<tr>
<th>Date</th>
<th>Total</th>
<th>Tear gas</th>
<th>Trauma only</th>
<th>Youngest (y)</th>
<th>Oldest (y)</th>
<th>Time of event</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-Aug-08</td>
<td>OPD 23</td>
<td>19</td>
<td>4</td>
<td>13</td>
<td>79</td>
<td></td>
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<tr>
<td>7-Oct-08</td>
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<td>8-Oct-08</td>
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<td>10-Apr-10</td>
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<td>24-Nov-12</td>
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<tr>
<td>26-Nov-12</td>
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<tr>
<td>27-Nov-12</td>
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<tr>
<td>28-Nov-12</td>
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<tr>
<td>1-Dec-13</td>
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<tr>
<td>2-Dec-13</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>514</td>
<td>300</td>
<td>214</td>
<td></td>
<td></td>
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</tbody>
</table>
The rare occurrence of delayed pulmonary oedema in patients with pulmonary symptoms has led to some experts recommending a 24-48 hour stay in hospital for observation or a discharge home with detailed information about potential complications.

IN-PATIENT ADMISSION

- Admitting each group according to their roles in different wards is advised
  - Police officers
  - Protesters
  - Government supporters
FOR PROTESTERS AND GENERAL PUBLIC

- Provide basic knowledge to publics
  - What tear gas is
  - Health effects
  - How to protect themselves from tear gas exposure

- First aids provided at scene in case of exposure to reduce ED visits and to prevent ED overcrowding
First Aid Instructions for Tear Gas Exposure

For Medical Personnel

1. Leave scene immediately, be above wind, and at higher place
2. Take off contaminated clothing, put them in plastic bag and seal it
3. Take off your ornament
4. Take off contact lens
5. Rinse water to wash out residue from eyes, mouth, body at least for 15 min. (Don’t use lime juice or milk)

For General Public

1. Wear long sleeve shirt and pants; bring another set of clothing for change
2,3,4,5: Bring swimming goggles, a face mask, water and a plastic bag
6: If you have asthma, bring your inhaler

For Medical Personnel

1. Obtain the history of the patient and note any conditions 
2. Keep those who are not cuffed at the top of the wind
due to the tear gas
3. Take off contaminated clothing, put them in plastic bag and seal it
4. Take off your ornament
5. Take off contact lens
6. Rinse water to wash out residue from eyes, mouth, body at least for 15 min. (Don’t use lime juice or milk)

Tear gas causes irritation such as tearing, red eyes, sore mouth and throat. If all do not go way in 30 min, seek medical care.
Thank You for Your Attention!