Chemical exposure

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Chemical Attacks Preparedness Syrian Manual

CBRN-TF

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فريق المنظمات الطبية لمواجهة المخاطر الكيميائية وغير الاعتيادية

Introduction

Brief History of Chemical Weapons Use:

- 22 April 1915 at Ieper in Belgium with chlorine gas
- By the end of World War I:
  - 90,000 deaths and over one million casualties
  - 124,000 tons of chemical agents had been expended
- By 1988, Nerve agents had been used against Kurdish Iraqis in the north killing up to 5,000 Kurds in a single chemical attack at Halabja.
- 1994 – 1995 Japan: 6000 casualties, 16 deaths.

Introduction

Chemical Weapons :

- In Syria:
  - Over 15.000 casualties
  - Over 1500 Deaths (10%)
  - Sarin, Chlorine, and other Chemical Agents.

Lessons Learned From the Syrian Sarin Attack: Evaluation of a Clinical Syndrome Through Social Media

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- Identified and analyzed 210 YouTube videos, but The analysis included only 67 original videos.
- Two physicians, both of whom were (CBRN) specialists
- Both were blinded to the exact purpose of the study and to each other's findings

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- Most of the victims in the videos were children.
- Most victims (90.0%) were classified as moderately injured or worse.
- The victims were brought to provisional facilities, not fully equipped hospitals
- Lack of medications, such as atropine autoinjectors, oximes, and benzodiazepines, probably increased the mortality rate
- Patients were intubated but not connected to a mechanical ventilator
- The caregiver mentioned the use of steroids and furosemide

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- The efficient diagnosis of nerve agent exposure resulted from increased awareness by health care providers of the nerve agent's effects and the possibility of their use as a result of previous alleged chemical attacks.
- Decontamination was done with insufficient amounts of water.
- Complete removal of contaminated clothes was uncommon.
- Water did not drain through a proper sewage system
- Severe cases of secondary exposures occurred, including death among medical teams

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Variable	YouTube Video Analysis, *n* (%)	United Nations Report, *n* (%)*
Demographic characteristic		
Men	48 (37.0)	25 (69.0)
Women	4 (3.0)	11 (31.0)
Infants	78 (60.0)	0 (0.0)
Total	130 (100.0)	36 (100.0)

The key points are:

- **<u>Recognize</u> as soon as possible:**
  - Activate the emergency code
  - Define the causal agent
- **<u>Response</u> adequately:**
  - Self Protection
  - Facility Protection
  - Decontamination
  - Victims Management and treatment

Recognition (Activate the emergency code):

The same Signs & Symptoms appear in a crowd come from the same area and at the same time, include:

- ✓ Respiratory symptoms
- ✓ Eyes irritation
- ✓ Salivation, nausea, vomiting, headache, and behavioral disorders

Recognition (Activate the emergency code):

Others to consider:

- ✓ Presence of unexpected dead people, animals and plants.
- ✓ Presence of strange odor and/ or strange colored smoke

Recognition (Define the causal agent)

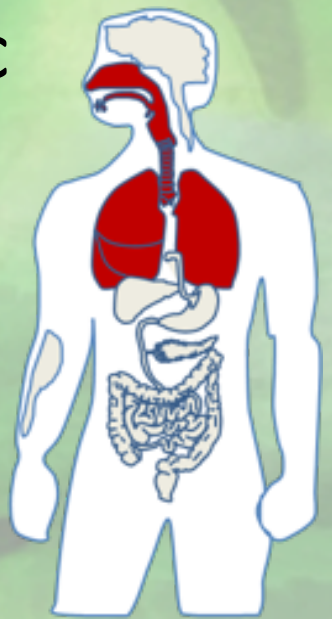
Main types of chemical agent:

- Blood agents
- Nerve agents
- Blister agents
- Choking agents

Recognition (Define the causal agent)

Blood agents:

- ***Common name***: Arsine, Hydrogen cyanide
- ***Mode of action:*** Cyanide binds with iron in cytochrome a3 preventing intracellular oxygen utilization. The cell then uses anaerobic metabolism, creating excess lactic acid and metabolic acidosis.



Recognition (Define the causal agent)

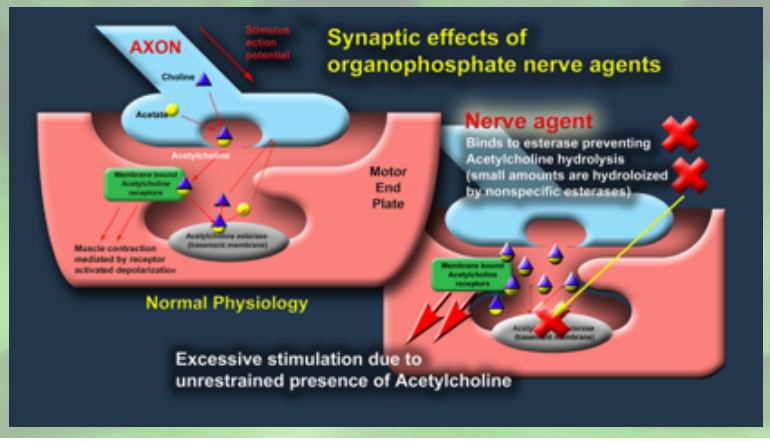
Blood agents: Signs & Symptoms

Signs & Symptoms	Contamination Severity		
Headache & Dizziness	**Mild**	**Moderate**	**Severe**
Nausea			
Confusion & Agitation			
Gasping & Coma			
Seizures			
Death			

Recognition (Define the causal agent)

Nerve agents:

- ***Common name***:
  - Agent G: Sarin, Soman, Tabun
  - Agent V: VX
- ***Mode of action:*** Inactivate acetylcholinesterase enzymes, causing both muscarinic and nicotinic effects



Recognition (Define the causal agent)

Nerve agents: Signs & Symptoms

Signs & Symptoms	Contamination Severity		
Miosis, Dim vision	**Mild**	**Moderate**	**Severe**
Muscle twitching, Over secretion			
Nausea, vomiting, diarrhea			
Bronchospasm & Dyspnea			
Respiratory Failure, Seizures Loss of consciousness			
Coma & Death			

Recognition (Define the causal agent)

Nerve agents: Signs & Symptoms

Recognition (Define the causal agent)

Blistering/Vesicant agents:

- ***Common name***: Mustard, Lewisite
- ***Mode of action:*** Exact mechanisms of biologic activity are unknown.

Recognition (Define the causal agent)

Blistering/Vesicant agents: Signs & Symptoms

Respiratory System	Skin	Eyes
Hoarseness	Skin erythema	Tearing
Productive Cough	Itching	Conjunctivitis
Mild respiratory distress	Blistering	Corneal damage
Marked airway damage	Secondary infection	

Recognition (Define the causal agent)

Choking agents

- ***Common name***: Chlorine, Phosgene
- ***Mode of action:*** Acids or acid-forming agents which react with cytoplasmic proteins and destroy cell structure

Recognition (Define the causal agent)

Choking agents: Signs & Symptoms

Respiratory System	Skin	Eyes
Airway irritation	Skin erythema	Tearing
Cough	Itching	Eyes irritation
Dyspnea	Possible frostbite	Blepharospasm
Chest tightness		
Pulmonary Edema		

Recognition (Define the causal agent)

Choking Agents	Blood Agents	Blistering Agents	Nerve Agents	
			X	Convulsions
			X	Miosis
			X	Sweating
			X	Rhinorrhea
			X	Salivation
X		X	X	Chest Pain
X		X	X	Wheezing
X		X		Foamy Sputum
X	X		X	Cyanosis
	X		X	Bradycardia
	X		X	Tachycardia
	X			Dyspnea
	X		X	Urination Defecation
		X		Vesicles

Chemical Exposure in Children:

- ✓ Acute respiratory failure is an important cause of morbidity and mortality in children.
- ✓ Cardiac arrests in children frequently result from respiratory failure.
- ✓ Clinical effects of Sarin depend on dose, duration and route of exposure
- ✓ Severity of effects of choking agents depends on concentration and duration of exposure

Chemical Exposure in Children:

Response:

Decontamination

- ✓ Initial triage
- ✓ Primary decontamination
  - Powdering
  - Remove patient clothing
- ✓ Secondary decontamination
  - ✓ Wash patient skin with soap and water
  - ✓ Dry & warm patient.

Response:

Victims Management and treatment:

- ✓ *Decontamination*
- ✓ A: Airways
- ✓ B: Breathing
- ✓ C: Circulation
- ✓ Antidote (if available)
- ✓ Symptomatic treatment.

Choking Agents	Blood Agents	Lewisite	Mustard	Nerve Agents	
				X	Atropine
				X	Oximes
X		X	X		Salbutamol
X			X		Corticosteroids
	X				Cyanide specific antidote
		X			British Anti–Lewisite
	X				Amyl nitrite
	X				Sodium nitrite
	X				Sodium thiosulfate
				X	Diazepam
X	X			X	IV access set
X	X			X	Intubation Set
X	X			X	Ambo bag
X	X	X	X	X	Pulse oximeter
X	X	X	X	X	Oxygen
		X	X		Morphine

Victims Management and treatment:

Nerve agents:

- Maintain airway, suction secretions
- Establish IV access For severe or moderate symptoms to give **ANTIDOTES**
- Intubation is indicated earlier

Nerve agents:

Patient	Mild/Moderate Effects[1]	Severe Effects[2]	Other Treatment
Child	Atropine: 0.05 mg/kg IM or IV (minimum 0.1 mg, maximum 5 mg); and 2-PAM chloride: 25 mg/kg IM or IV (maximum 2 g IM or 1 g IV)	Atropine: 0.1 mg/kg IM or IV (minimum 0.1 mg, maximum 5 mg); and 2-PAM chloride: 50 mg/kg IM or IV (maximum 2 g IM or 1 g IV)	Assisted ventilation after antidotes for severe exposure. Repeat atropine at 2-5 minute intervals until secretions have diminished and breathing is comfortable or airway resistance has returned to near normal. Repeat 2-PAM chloride once at 30-60 minutes, then at one-hour intervals for 1-2 doses, as necessary. Diazepam for seizures: Child - 0.05 to 0.3 mg/kg IV (maximum 10 mg); Adult - 5 mg IV Other benzodiazepines (e.g. lorazepam, midazolam) may provide relief. Phentolamine for 2-PAM chloride-induced hypertension: 1 mg IV for children; 5 mg IV for adults.
Adult	Atropine: 2 to 4 mg IM or IV; and 2-PAM chloride[3]: 600 mg IM, or 25 mg/kg IV slowly	Atropine: 6 mg IM; and 2-PAM chloride[3]: 1,800 mg IM, or 50 mg/kg IV slowly	

1. **Mild/Moderate effects of nerve agents** include localized sweating, muscle fasciculations, nausea, vomiting, weakness, dyspnea.
2. **Severe effects of nerve agents** include unconsciousness, seizures, apnea, flaccid paralysis.
3. Dose selection of 2-PAM chloride for elderly patients should be cautious (usually starting at 600 mg IM, or 25 mg/kg IV slowly) to account for the generally decreased organ functions in this population.

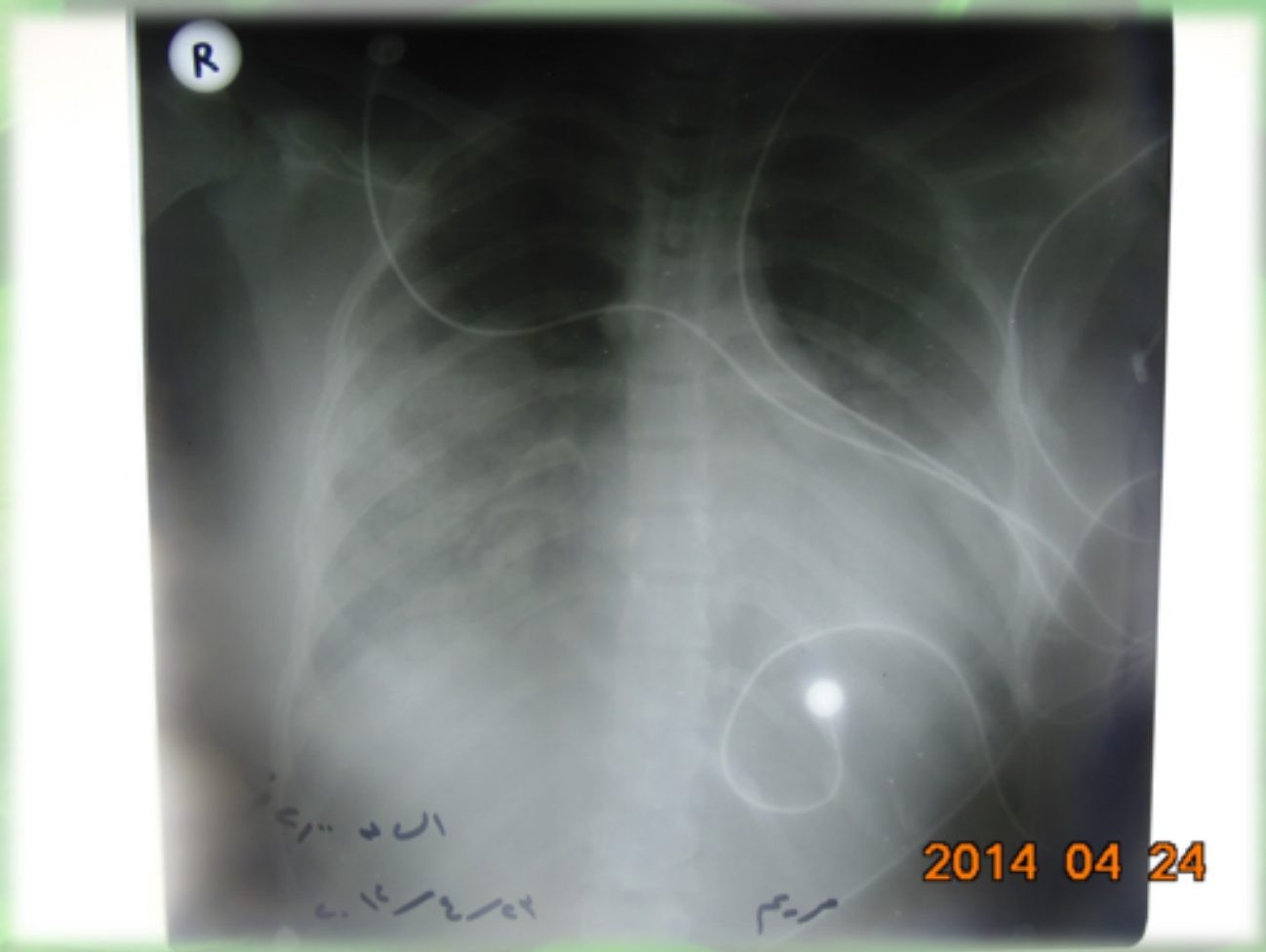
Victims Management and treatment:

Choking agents:

- Maintain airway, inhaled salbutamol +/- inhaled steroids for bronchospasm
- Ventilation may be needed
- **No Antidote available for Choking Agents**
- **No evidence that systemic steroids are of benefit**
- Treat burns symptomatically
- Monitor for secondary infection and ARDS and treat appropriately.

Victims Management and treatment:

Choking agents:



Conclusion:

- ✓ Recognition, as a main step, is a responsibility of population and medical staff, using the clinical presentation.
- ✓ Acute respiratory failure is an important cause of morbidity and mortality in children, and it's the main cause of death in chemical exposure.
- ✓ Severity of effects depends on concentration, duration, and rout of exposure.
- ✓ Decontamination process is the main step in management especially in children.