11.03 Special Circumstances – Chemical & Radiological Agents

GENERAL HAZARDOUS MATERIALS ASSESMENT

• Follow **Policy 8050 Hazardous Materials Incident Field Policy** to establish scene control and ensure rescuer safety. Notify SFFD Hazmat team for scene response.
• Attempt identification of hazardous materials from container signage, bystanders, etc. Activate additional resources as needed, including, but not limited to:
  ○ Fire Department
  ○ Police Department (traffic and crowd control)
  ○ Health Department
  ○ Hazardous Material Response Team
  ○ Local Industry Response Team; and/or other specialized detection or response teams
• For treatment of poisonings due to known medication overdose or exposures, refer to **Protocol 2.10 Poisoning and Overdose.**

Decontamination and Treatment
• Patients should be removed to a safe environment by emergency personnel wearing appropriate PPE prior to rendering medical care • If life-saving treatment is needed prior to removal of patient from Hazmat Zone, do simultaneous gross decontamination only if safe to do so (follow SFFD Hazmat team instructions), then initiate treatment. Identify containment areas for gross decon runoff. • For patients with no apparent immediate life-threatening conditions, decontaminate the patient prior to rendering care • Brush off dry powder • Remove any contaminated or wet clothing • Ambulatory patients leaving the “Exclusion Zone” are considered contaminated until formally decontaminated by trained personnel • Provide advance notice to receiving hospital about patient and decontamination procedures prior to arrival at facility • Decontaminate the patient BEFORE transport to reduce/avoid contamination of EMS personnel; ambulance and receiving facility (see **Policy 8050 Hazardous Materials Incident Field Policy**).

11.03 Special Circumstances – Chemical & Radiological Agents

CHLORINE
Example exposures: mixing household cleaners, swimming pool accidents, industrial accidents Chlorine as a gas may be greenish yellow in color with a pungent, acrid odor and is a strong eye, skin and respiratory tract irritant. Presentation: Mild exposures: cough, eye irritation & lacrimation, choking sensation Severe exposures: hoarseness, wheezing, severe cough, respiratory collapse due to laryngospasm, pulmonary edema
BLS Treatment
• O_2 as indicated for hypoxia • Eyes: Flush with copious amounts of water • Skin: Flush with copious amounts of water
ALS Treatment
• Establish IV/IO of **Normal Saline** TKO • For patients with bronchospasm administer ➔ Mild: **Albuterol** → Moderate/severe: Nebulized **Sodium Bicarbonate** • Advanced airway as indicated
Comments
• All patients who have had a moderate or high level of exposure (respiratory distress or airway symptoms upon exam by EMS personnel) should be referred to a medical facility for examination and treatment.

11.03 Special Circumstances – Chemical & Radiological Agents

ORGANOPHOSPHATES- CHEMICAL NERVE AGENTS

(Acetylcholinesterase Inhibitors)

Example exposures: VX, Sarin, Soman, Tabun

Presentation:

- Symptoms "**SLUDGE**" (**S**alivation, **L**acrimation, **U**rination, **D**iaphoresis/**D**iarrhea, **G**astric hypermotility, **E**mesis/**E**ye (small pupils, blurry vision).
- Symptoms that result in death are the **Killer B's: B**ronchorrhea, **B**ronchospasm, **B**radycardia
- Severe exposures may result in decreased level of consciousness, fasciculation/muscle weakness, paralysis, seizures

BLS MANAGEMENT

- Autoinjector formulations of DuoDote® may be administered to patients, to self or to other first responders exhibiting SLUDGE symptoms (See Table 1 below)
- Bronchospasm and respiratory secretions are the best acute symptoms to monitor response to Atropine/2-PAM therapy: Improved ventilation and decreased respiratory secretions = getting better.

ALS MANAGEMENT

- Administer **Atropine** until SLUDGE symptoms subside. May exceed 20mg
- Administer **Pralidoxime chloride** (2-PAM) as soon as possible to reactivate the enzyme (acetylcholinesterase) that is blocked by the organophosphate
- Midazolam (or equivalent available benzodiazepine) as indicated for seizures

Comments

- **DuoDote®** is a commercially available auto-injector of nerve agent/organophosphate antidote. It contains **2.1mg atropine** and **600mg pralidoxime chloride**
- **ATNAA ®** Antidote Treatment Nerve Agent Auto Injector is an auto-injector of nerve agent/organophosphate antidote that is typically in military supplies but may be seen in civilian supplies when Duodote® is unavailable. It contains the 2.1mg of atropine and 600mg of pralidoxime.
- **CHEMPACK** is a federal cache of nerve agent antidotes that is managed by the Center for Disease Control and Prevention (CDC) and offered to states that agree to maintain custody and security of CHEMPACK assets and is reserved for events exposures will deplete the local or regional supply of antidotes.

TABLE 1: ATROPINE/PRALIDOXIME DOSING FOR PATIENTS EXPERIENCING SYMPTOMS FROM NERVE GAS EXPOSURE

Patient (Weight)	Atropine Dose IM or via Auto-injector	Pralidoxime Chloride Dose IM or via 600 mg Auto-injector
Infant: 0–2 years of age	0.05 mg/kg IM or via auto-injector (i.e., *0.25 mg and/or 0.5 mg auto-injector)*	15 mg/kg IM
Child: 3–7 years of age (13–25 kg)	1 mg IM or via auto-injector (i.e., *one 1 mg auto-injector or two 0.5 mg auto-injectors)*	15 mg/kg IM **OR** One auto-injector (600 mg)
Child: 8–14 years of age (26–50 kg)	2 mg IM or via auto-injector (i.e., *one 2 mg auto-injector or two 1 mg auto-injectors)*	15 mg/kg IM **OR** One auto-injector (600 mg)
Adolescent/ Adult	2–4 mg IM or via auto-injector	600 mg IM **OR** One auto-injector (600 mg)
Pregnant Women	2–4 mg IM or via auto-injector	600 mg IM **OR** One auto-injector (600 mg)
Geriatric/Frail	2 mg IM or via auto-injector	10 mg/kg **IM** **OR** One auto-injector (600 mg)

Adapted from: *U.S. Department of Health and Human Services, ASPR, National Library of Medicine, Chemical Hazards Emergency Medical Management: Nerve Agents— Prehospital Management, https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=523&toxid=93*

MUSTARD (SULFUR MUSTARD)

Example exposure: human-made chemical warfare blistering agent. Sulfur mustard is a yellow to brown oily liquid with an odor resembling mustard, garlic, or horseradish.

Presentation:
Symptom severity is dose dependent and may develop 4–12-hours after exposure
Skin exposure: redness, itching may progress to blisters
Eyes exposure: irritation, pain, swelling, tearing, temporary blindness
Respiratory exposure: coughing, shortness of breath, pulmonary edema

Comments

- Liquid or vapor mustard penetrates the skin and mucous membranes and damages cells within minutes of exposure, so decontamination must be done immediately after exposure.
- Mustard agent can **penetrate** clothing and uniforms including fire turnouts. All surfaces with potential contamination must be carefully cleaned before considered decontaminated.

RADIATION

Example exposures: industrial plants, healthcare facilities that provide radiologic services, nuclear power plants, nuclear bombs, "dirty bomb"

Presentation:
Acute Radiation Syndrome (ARS):

1. Prodromal (hours to days): nausea, vomiting, diarrhea, fatigue. This phase is directly proportional to the dose. That is, the greater the dose received, the more rapid the onset of symptoms, and the longer their duration.
2. Latent: Apparent improvement of symptoms, during which time the patient appears to have recovered. It can last several days to several weeks, depending on the dose received.
3. Manifest illness: Usually begins in the 3rd to 5th week following exposure. This phase includes cerebrovascular syndrome (hyperthermia, ataxia, loss of motor control, apathy, lethargy, CV shock, seizures), pulmonary syndrome (pneumonitis, respiratory failure, pulmonary fibrosis), GI syndrome (GI mucosal cell injury, anorexia, nausea/vomiting, diarrhea, dehydration), hematologic syndrome (stem cell death, white cell depletion, pancytopenia), cutaneous syndrome (bullae, blisters, hair loss, ulceration).
4. Recovery: Occurs of patients survive the manifest illness phase but may take weeks to months before completed.

11.03 SPECIAL CIRCUMSTANCES: HAZARDOUS MATERIALS

Comments
• Follow facility radiation exposure plan for patient decontamination and disposal of all contaminated waste. • In the nuclear bomb scenario casualty load will be excessive. Utilize austere care protocol and strict triaging to maximize available resources. Access all available disaster resources.