UNITED STATES MARINE CORPS

FIELD MEDICAL TRAINING BATTALION
Camp Lejeune, NC 28542-0042

FMST 308

Manage Chemical Agent Casualties

TERMINAL LEARNING OBJECTIVE

1. Given a casualty and the absence of a CBRN team, necessary medical equipment andsupplies, **manage CBRN injuries to prevent further injury or death within the scope of care**. (HSS-CBRN-2007)

ENABLING LEARNING OBJECTIVE

1. Without the aid of reference and in writing, **identify the procedures for managing chemical agent casualties**, within 80% accuracy, per the Medical Management of Chemical Casualties, current edition.(HSS-CBRN-2007a)

1. **TYPES OF CHEMICAL WARFARE AGENTS**

Nerve Agents - nerve agents are a class of phosphorus-containing organic chemicals (organophosphates) that disrupt the mechanism by which nerves transfer messages to organs. The disruption is caused by blocking acetylcholinesterase, an enzyme that normally relaxes the activity of acetylcholine, a neurotransmitter.

Examples

GA - Tabun
GB - Sarin
GD - Soman
VX

Nerve Agents:
Colorless/ Light Brown
Fruity Odor

Descriptions of Nerve Agents

- Colorless to light brown liquid
- Nonpersistent
- Faint fruity odor
- May be inhaled, ingested and absorbed through the skin
- Most toxic chemical agents

Signs/Symptoms of Nerve Agents

- Can appear in seconds to hours depending on the agent and amount of exposure
- Massive secretions (rhinorrhea, lacrimation, incontinence, diaphoresis, etc.)
- Chest tightness
- Headache above the eyes with blurred vision
- Localized muscle twitching (which can progress into convulsions)
- Constricted pupils
- Respiratory arrest
- Death will result if left untreated

Nerve Agent Treatment
MARK 1 Kit:
Atropine
2PAM-Chloride
Pretreatment:
Pyridiostigmine
30mg/PO/TID for 14 Days

Treatment of Nerve Agents

- Don protective mask
- Decontaminate exposed skin
- Intramuscularly, inject MARK I Kit:
  - The MARK 1 Kit includes two autoinjectors, one of 2mg Atropine Sulfate and the other of 600 mg 2 PAM-Chloride. The steps for administering the MARK 1 Kit are as follows:

a. Grasp the Atropine autoinjector like a pen. Remove yellow cap. Press green tip against the meaty portion of the thigh and hold in place for 10 seconds (See figure 1).

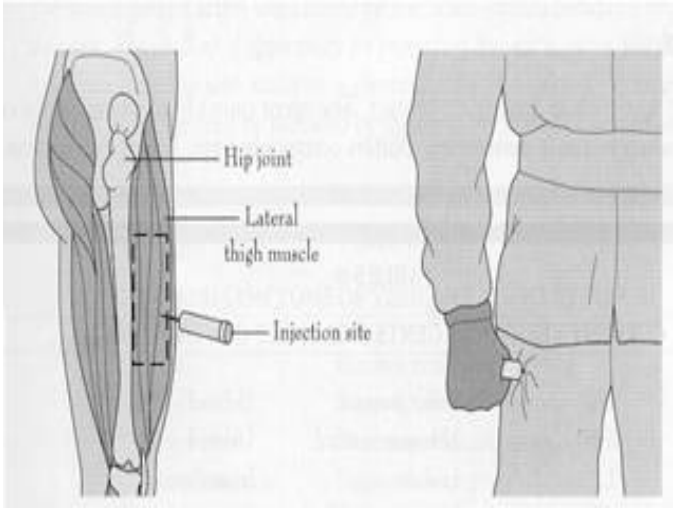

Figure 1. Injecting the MARK 1 Kit

b. Grasp the 2 PAM-Chloride autoinjector like a pen. Remove gray cap.
c. Press black tip against the meaty portion of the thigh and hold in place for 10 seconds.
d. If signs/symptoms are mild, member can administer their own kit.
e. One kit may be given every 10 minutes until improvement is seen or a total of three kits have been given.
f. If signs/symptoms are severe, (member is unable to inject themselve) give all three kits immediatley then inject 10mg Diazepam.
g. If symptoms continue after three kits have been administered, medical personnel may administer repeated Atropine (2mg) injections at three to five minute intervals and should be titrated to a reduction of secretions and to a decrease in respiratory distress.

<u>Prevention (Pretreatment) for Nerve Agents</u>

- Pyridiostigmine is a drug that inhibits nerve agents from binding to 20-40% of the enzyme acetylcholinesterase. (See figure 2)

- Dosage -30 mg every eight hours not to exceed fourteen days. Comes in a blister pack with 21 tablets, each 30mg.

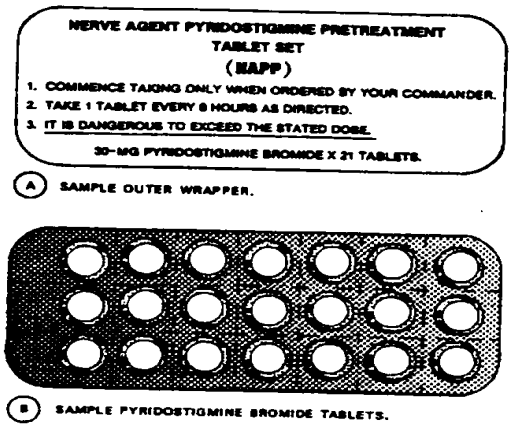

Figure 2. Pyridiostigmine Blister Pack

Vesicants (Blister Agents) - the exact mechanism by which they produces tissue injury is not known

Examples

HD - Distilled Mustard
HN - Nitrogen Mustard
Lewisite
Phosgene Oxide

Descriptions of Blister Agents

- Light yellow to brown oily liquid that becomes a vapor at high temperatures
- Persistent
- Odor:
  - Distilled Mustard (HD) – garlic or horseradish
  - Nitrogen Mustard (HN) - smells fishy
  - Lewisite (L) - smells like geraniums
  - Phosgene Oxide - smells pepperish/ pungent odor
- Heavier than water
- May be absorbed through the skin (especially moist areas)

Remember those "Fishy HNs"??? These memory tricks will help you! Be creative! Create your own!

Signs/Symptoms of Blister agents

- Appear any where from 2 - 48 hours after contamination
- Erythemic skin with blisters, and necrosis where the agent touches
- Nausea and vomiting
- Edema of the eyes, eyelids, and corneal scarring
- If ingested or systemic, intense pain in the GI tract and diarrhea

Treatment for Blister Agents

- Don protective mask
- Decontaminate exposed skin
- Flush eyes with copious amounts of water to prevent scarring of the Cornea
- Apply Vasoline to the eyes to prevent adhesions
- Apply Calamine lotion to reduce burning and itching of skin
- Consider giving Morphine for pain if needed
- Use antibiotics and IV fluid replacement as required

Blood Agents - blood agents react with metal complexes of body to prevent intracellular oxygen utilization.

Examples

- AC - Hydrogen Cyanide
- CK - Cyanogen Chloride

Descriptions of Blood Agents

- Colorless liquids dispersed in gas form
- Smells like bitter almonds or peach pits
- Must be inhaled

Signs/Symptoms of Blood Agents

- Hyperpnea (Rapid Breathing)
- Anxiety, agitation, vertigo
- Weakness
- Nausea / Vomiting
- Cherry red skin, may be streaked
- Unconsciousness and seizures within 30 seconds of exposure
- Respiratory arrest and death within two to four minutes if treatment is delayed

Treatment of Blood Agents

- Don protective mask
- Decontaminate exposed skin. Move to fresh air
- Vigorously treat symptomatically
- Administer IV **Sodium Nitrite** (10ml) followed by IV **Sodium Thiosulfate** (50ml)
- Second treatment with each of the two antidotes may be given at up to half the original dose, if needed

Choking Agents - break down the alveolar capillary membranes resulting in pulmonary edema.

Examples

- CG - Phosgene
- DP - Diphosgene
- CL – Chlorine

Descriptions of Choking Agents

- Colorless liquid to white cloud which turns into a vapor
- Smells like freshly mown hay, grass, or corn
- Must be inhaled
- Contaminated food is of little consequence. Agent has no effect on body when ingested.
- Rapidly becomes nontoxic in water

Signs/Symptoms of Choking Agents

- Headache and eye irritation
- Coughing and choking / shortness of breath
- Substernal ache with sensation of pressure
- Two to six hours after exposure the following may appear:
  - Dyspnea
  - Cyanosis
  - Pneumonia - late sign
  - Pulmonary edema, red frothy sputum may be observed
  - Hypoxia
  - Hypotension
  - Death

Treatment of Choking Agents

- Don protective mask
- Establish a patent airway
- Provide rest, warmth, and sedation
- No known antidote for choking agents
- Give oxygen, if available

Vomiting Agents

Examples

- DA - Diphenylchlorarsine
- DC - Diphenylcyanarsine
- DM – Adamsite

Descriptions of Vomiting Agents

- Color:
  - DA and DC have a white smoke color
  - DM has a canary yellow smoke color
- Odor of burning fireworks / shoepolish
- Crystalline solids, dispersed as a gas
- Must be inhaled

Signs/Symptoms of Vomiting Agents

- Appear 30 seconds to 2 minutes after exposure
- Severe headache
- Intense burning in the throat / salivation
- Chest tightness and pain
- Lacrimation / irritation
- Coughing, sneezing, nausea, and vomiting

Treatment of Vomiting Agents: Treatment is symptomatic.

- Don Protective Mask
- Get to fresh air as soon as possible
- Lift mask only to vomit
- Untreated symptoms usually subside within 30 minutes to 3 hours. - - Vigorous exercise will lessen and shorten the symptoms.

Lacrimators/Tear Agents

Examples

- CS - Ochlorobenzylmalonitrile
- CN – Chloracetophenone

'CS' gas is what you will be exposed to in the Gas Chamber!

Descriptions of Lacrimators

- Crystalline solids or liquids dispersed in the air as vapors or white smoke
- Strong pepper odor for CS and apple blossom odor for CN
- Absorbed through the eyes, nasal passages and skin pores

Signs/Sypmtoms of Lacrimators

- Pain and burning to the eyes
- Profuse tearing and photophobia
- Rhinorrhea (snotty nose), epistaxis (nose bleed)
- Chest tightness, coughing and dyspnea
- Blepharospasm (spasm around the eye)
- CS can cause severe burns starting with stinging sensation, erythema and then blister formation

Treatment of Lacrimators

- Don protective mask
- Get to fresh air as soon as possiable
- Heavy contaminants should be flushed from the eyes with copious amounts of water

Incapacitating Agents – These agents produce their effects mainly by altering or disrupting the higher regulatory activity of the peripheral nervous system and central nervous system

Examples
- BZ - Buzz Gas
- Agent 15

Descriptions of Incapacitating Agents
- Odorless and non-irritating
- Highly potent
- Rate of action – delayed by 30 minutes to 4 hours

Signs/Symptoms of Incapaciating Agents

Dry as a Bone, Hot as a Hare, Red as a Beet, Mad as a Hatter, Blind as a Bat

- Dry mouth and skin, “dry as a bone”
- Hyperthermia, “hot as a hare”
- Skin red from cutaneous vasodilation, “red as a beet”
- Slowing of mental activity with slurred speech. Disorientation and hallucinations, “mad as a hatter”
- Dilated pupils, “blind as a bat”

Treatment of Incapacitating Agents: treatment is supportive in nature
- Clear the airway as needed
- Treat for heat stroke
- Give PO fluids only if the victim can drink unassisted
- Approach with caution, the individual could become dangerous
- Remove all weapons
- Restrain as needed
- Physostigmine 45mcg / kg IM. After one hour, perform mental status exam and repeat dose as needed

2. **NATO CHEMICAL WARNING MARKER** - a triangular sign measuring 11"x 8" x 8" with yellow background, and red letters spelling " GAS". (See figure 3)

Figure 3. NATO Chemical Warning Marker

REFERENCE

Medical Management of Chemical Casualties, Current Edition

Chemical Agent Review

1. List four Nerve agents.

2. Describe how Blood agents effect the body.

3. List three Vomiting agents.

4. Describe the signs and symptoms associated with a lacrimator agent.