Don't Be A Victim

Medical Management of Patients Contaminated with Chemical Agents

This training video is intended for hospital emergency personnel responding to a chemical warfare agent release. It describes the triage process for mass casualties using the Simple Triage and Rapid Treatment (START) protocols, the decontamination of ambulatory and litter patients, the appropriate personal protective equipment (PPE) for protecting medical personnel from agent exposure. The program also describes the signs, symptoms, and treatment for patients exposed to blister (vesicant) and nerve agents, including the use of atropine and 2-pam chloride.

COURSE STUDENT GUIDE

Don't be a Victim!

Medical Management of Patients Contaminated with Chemical Agents

2003

Course Student Guide

Prepared for the

Chemical Stockpile Emergency Preparedness Program

Department of Homeland Security/ Federal Emergency Management Agency

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LIST OF ACRONYMS

cm	centimeters
CPR	Coronary and Pulmonary Resuscitation
CSEPP	Chemical Stockpile Emergency Preparedness Program
DNA	deoxyribonucleic acid
DMORT	disaster mortuary teams
GA	chemical nerve agent also called Tabun
GB	chemical nerve agent also called Sarin
HAZMAT	hazardous materials
HD	chemical blister agent called sulfur mustard
H_2O	water
IDLH	Immediately Dangerous to Life and Health
IM	intra muscular
IV	intravenous
JUMP S.T.A.R.T.	S.T.A.R.T. system for children ages 12 months to 8 years
m^3	cubic meter
MARK I kit	A kit containing 2 autoinjectors: an AtroPen with 2 mg of atropine and a ComboPen with 600 mg of 2-PAM cl.
mg	milligram
min	minute
OSHA	Occupational Health and Safety Administration
2-PAM Cl	2-pyridine aldoxime methyl chloride, also called pralidoxime chloride
PAPRs	powered air-purifying respirators
PPE	Personal Protective Equipment
RPMs	Respiratory status, perfusion and pulse, and mental status
SCBA	self contained breathing apparatus
S.T.A.R.T.	Simple Triage And Rapid Treatment
VX	chemical nerve agent

MODULE 1. INTRODUCTON

Every year emergency responders and medical facilities face unexpected hazards to themselves and their equipment when people potentially contaminated with hazardous chemicals seek medical assistance. Often without warning, medical personnel and emergency responders must respond to the event, providing care to victims while protecting themselves and their facility from secondary contamination. If that event occurs with a release or nerve or blister chemical warfare agents, medical personnel must know the signs and symptoms to provide effective and timely treatment.

This training, "*Don't Be a Victim: The medical management of patients contaminated with chemical agents ,"* was designed for the Chemical Stockpile Emergency Preparedness Program (CSEPP) to prepare hospital and emergency medical personnel to recognize and treat persons exposed to nerve and blister chemical warfare agents. Using some medical terminology, it describes the signs/symptoms and treatment of chemical warfare nerve and blister agents, the appropriate personal protective equipment (PPE), the triage process for large numbers of victims, decontamination of victims prior to admittance, mass decontamination procedures, and fatality management. Other topics include a discussion of differential diagnosis for chemical agent exposed victims and the debriefing of medical staff.

The training is designed as an accompaniment to other CSEPP-approved courses. It is recommended that the video/DVD and accompanying course student guide be used in a classroom setting with a trainer present, although some individual viewing in other situations may be appropriate.

1.1 TARGET AUDIENCE

The training is based on protocols developed by the CSEPP medical community and concurs with the best practices developed by Army physicians and civilian medical personnel to treat patients potentially contaminated with chemical warfare agents. Although the training is directed toward hospital personnel and emergency medical responders and technicians, planners and emergency managers as well as public health officials may also find the information useful.

The training was developed with the assistance of the University of Tennessee Hospital emergency room, actual fire and hazardous materials units, and emergency medical technicians. Additional input was provided by practicing emergency room physicians and experts from the CSEPP medical response community. The material is not intended to certify any medical responder in specific medical protocols; it is for information purposes only and responders should adhere to their local protocols.

1.2 GOALS

The goals of the training are to ensure that medical personnel and emergency responders in CSEPP communities have the most current information to decontaminate and treat large numbers of victims potentially exposed to a nerve or blister agent hazardous release. It is also critical that responders and health care providers understand the potential hazards of cross contamination and how to avoid secondary contamination.

At the conclusion of the training the participant will be able to describe the:

1. Protocols developed by CSEPP for handling patients potentially exposed to chemical warfare agents,
2. Appropriate types of personal protective equipment (PPE) for medical personnel to protect against secondary contamination,
3. Triage process,
4. Decontamination process for ambulatory and litter patients, and fatalities,
5. Mass decontamination,
5. Signs and symptoms of nerve and blister agent contamination,
6. Appropriate treatment for victims exposed to nerve and blister agents, and
7. Debriefing procedures.

1.3 TRAINING OBJECTIVES

At the end of the training, participants should:

1. Understand the importance of using personal protective equipment (PPE) for medical personnel.
2. Know the four levels of triage using S.T.A.R.T. - Simple Triage And Rapid Treatment
3. Know procedures for decontaminating ambulatory and litter patients and large numbers of victims or fatalities,
4. Know patient assessment and emergency medical treatment for patients exposed to nerve or blister agents.
5. Understand the importance of debriefing procedures.

1.4 HOW THIS TRAINING IS INTEGRATED INTO OTHER CSEPP TRAINING COURSES

The viewer should be aware that this training was developed for emergency medical personnel who already have extensive medical knowledge in treating patients in emergency situations. The training reviews material covered in Re-ACT FAST II (Refresher on Agent Characteristics and Toxicology, First Aid and Special Treatment) and the Standardized CSEPP Training Course on Hospital Management of Chemical and Biological Casualties developed by SAIC. In addition, some components of the training on Personal Protective Equipment (PPE) specific to medical personnel is included.

1.5 EXPLANATION OF MODULES

The information in this training is provided in modules. The materials in this course student guide are divided into sections that correspond with the modules. However, the section on PPE, includes all types of respirators, which have been separated into modules in the video/DVD presentation.

At the end of each module, the screen fades to black and there is a blank space of several seconds before the next image appears. This allows participants the opportunity to repeat the modules, fast forward to other modules if desired, or pause and engage in discussion with the facilitator or others if questions arise.

The modules are linked to sections in the course student guide by descriptive headings that are also noted on the table of contents for easy reference. Each module can also be identified by the "text on screen" descriptor provided in the second column of the text file.

1.6 HOW TO USE THIS COURSE STUDENT GUIDE

This guide is intended to facilitate participant understanding of the training and serve as a reference for future use. As such, it replicates the entire text of the training video/DVD, including both spoken narration and written text that appears on the screen. This permits the participant to review sections as necessary and to mark or add notes provided by individual site trainers that may be specific to the state or local area. The reader will note that additional text is provided in the notes field to enhance or further elaborate concepts the narrative or screen text describes. The DVD and the guide contain references and readily available web sources for additional information that are not included on the video format.

The guide is designed to be a user-friendly companion text to the video/DVD. The sections are organized as follows. Objectives as appropriate are outlined at the beginning of each section. This allows the participant to focus in the most important concepts in that module. The narration and on-screen text is then presented in column format. Narration text from the video/DVD is contained in column one, the screen text in column two, and the associated notes or additional material in column three. Column three has accompanying space for additional note-taking by participant.

MODULE 2: INTRODUCTION TO TRAINING CONCEPTS

This module introduces the concepts that will be discussed in the training. The initial scenario depicts a large number of victims arriving at a medical facility after a community alert warning residents that a chemical warfare agent may have been released was issued. The response graphic depicts the reception of a patient contaminated with a chemical warfare nerve agent near the point of release. The victim was exposed while removing personal protective equipment on the installation and was decontaminated in the field before placement into a clean ambulance by emergency medical technicians. The scenario shows a secure perimeter to control entry of vehicles and assumes a hospital lock-down, measures taken to prevent secondary contamination of medical personnel and equipment. Also shown is the initial reception of the patient by personnel using the appropriate level of personal protective equipment (PPE). Note that the patient has received preliminary treatment with atropine and pralidoxime chloride (2-pam chloride) from a MARK 1 kit, which will be discussed later in the training under treatment protocols for nerve agent exposure.

At the end of this module, the participant should understand the objectives of the training and why it is important that medical personnel need to protect themselves when treating persons potentially exposed to a hazardous chemical release.

<u>Further Discussion Points</u>

1. Why securing perimeters and establishing check-points for reception areas at medical facilities prevents cross contamination from hazardous chemicals.
   - Chemical cross-contamination of ambulances and hospitals due to a lack of preparedness, PPE, and decontamination capability could cripple capacity of local pre-hospital and hospital system.
   - Don't become a victim is first priority for medical and emergency responders.
2. How to identify patients previously decontamination and treated.
3. Who has authority to establish security perimeters and lock-down procedures at medical facilities.

VOICE	SCREEN	NOTES

2.1 OPENING SCENE

Medical personnel #2: Can everyone walk in here?

Adult Female: Yes – but dad's having trouble breathing!

Medical personnel #2: Okay-take him into the parking lot and someone will help you.

Adult Female: Thanks. It's okay, Dad – it's okay.

Medical Assistant: Having trouble breathing? Yes ma'm. Here we go. Right over her sir. Come on. There you go. All right! Here's his band.

How's your breathing sir? Having trouble? Difficulty in breathing?

All right ma'm-The three of you need to go to another line and then you can go through the decon line. We'll take care of him. He has to go through a special line.

You'll be all right sir. Hold on there sir.

Narrator: This scene may look chaotic but it has been planned with staff input- and exercised. In this video, prepared for the Chemical Stockpile Emergency Preparedness Program – or CSEPP, we will discuss hospital planning for - and response to - a chemical warfare agent release. In the scenario depicted in this video, we assume that a large number of victims using their own vehicles or transported by ambulance or other means – arrive at a hospital after being alerted that a

VOICE	SCREEN	NOTES

chemical warfare agent was accidentally released at a nearby Army installation. The vehicles are first met in the parking lot by emergency response personnel; the occupants are then triaged and decontaminated before entering the medical facility for treatment.

2.2 TRAINING OBJECTIVES

Narrator: Working with patients who are potentially contaminated increases the risk to healthcare providers during treatment efforts. There are three main ways that a person can be exposed to nerve and/or blister agents. They are inhalation, direct contact, and ingestion. The primary concern for the general public would be exposure to agent vapors. Victims of hazardous materials incidents present the potential to expose healthcare personnel as well as their patients. Hospital systems must prepare their personnel with training in contaminated casualty care and use of Personal Protective Equipment-or PPE- so that they may render the most efficient care of victims in such an incident.

At the end of the training the student should be able to describe:

- the protocols developed by CSEPP medical community for handling patients potentially exposed to nerve and blister chemical warfare agents;
- the requirements for the types of protective personal equipment – or PPE -that should be used by medical personnel to protect against secondary contamination;
- how to triage patients exposed to chemical warfare agents;

•Patient care protocols
•PPE requirements
•Triage
•Decontamination
•Signs and symptoms
•Treatment
•Debriefing

VOICE	SCREEN	NOTES

- the decontamination process;
- the signs and symptoms of nerve and blister agent exposure;
- the appropriate treatment for victims exposed to nerve and blister agents; and
- the need for debriefing procedures for staff.

This training is based on protocols developed by the CSEPP medical community and concurs with the best practices developed by Army physicians and civilian medical personnel to treat patients potentially contaminated with chemical warfare agents. Others – including planners and emergency management personnel – may also find the information useful.

2.3 SCENARIO: VICTIM ARRIVAL IN AMBULANCE

Emergency medical technician:
This is medic five. We're transporting emergency traffic to your facility with a 37 year old male patient. He has been exposed to liquid nerve agent on a military installation. He is showing Moderate signs of twitching. We have a blood pressure rate of 140 over 90, his pulse is 64, and respiration is 24 and labored. His skin condition is cool, diaphoretic, and pale. He is currently being put on 10 liters of 0_2. Patient has received two MARK-1 kits and states he is feeling better. Our ETA is 10 minutes.

VOICE	SCREEN	NOTES
Narrator: Communicating with patients and other responders while wearing a respirator will be difficult. It is important to remember that extra time may be required to repeat instructions or gather information from patients. *First responder:* Is this the patient from the installation? *Ambulance Driver:* Yes. *First responder:* He's gone through field decontamination, right? *Ambulance Driver:* yes - the patient was deconned at the installation right after the liquid spilled. He has a wristband to indicate this. All his contaminated clothing was removed and he's in a clean jump suit now. *First responder:* Is the ambulance potentially contaminated? *Ambulance Driver:* No – We've only transported patients that have been fully deconned in this ambulance. *First responder:* Good - proceed to the emergency room for patient examination.		

MODULE 3: PERSONAL PROTECTIVE EQUIPMENT (PPE)

This module describes the personal protective equipment (PPE) appropriate for medical and emergency responders. All workers designated as part of the emergency response (e.g., police, EMT/paramedics, firefighters, medical personnel) to a chemical agent release must be equipped with and trained in using the recommended PPE. Chemical protective clothing and respiratory protection enable responders to care for patients exposed to chemicals while protecting themselves from secondary contamination. Level C PPE, consisting of a powered air-purifying respirator (PAPR) and dermal protective ensemble complete with boots and gloves, is the approved equipment for healthcare providers.

At the end of the module the participant should be able to describe:

1. Types of protective respiratory equipment appropriate for medical response personnel.
2. The protocols associated with wearing powered air-purifying respirators (PAPRs).
3. Level C ensemble for medical response personnel.
4. Physical limitations when wearing PPE.

Additional discussion points:

1. Associated protocols for PPE for medical and emergency responders in your state.
2. CSEPP Planning Guidance for Medical Response for the Chemical Stockpile Emergency preparedness program is located in Appendix I. These guidelines for prehospital and hospital preparedness were developed by CDC and are published in the *Federal Register* (see 60FR 33308, 27 June 1995, and corrections published in 60 FR 38564, 27 July 1995).
3. Respiratory protection
4. OSHA levels of dermal protection are defined in Title 29 of the Code of Federal Regulations (CFD), Part 1910.120, Appendix B, Hazardous Waste Operations and Emergency Response.

VOICE	SCREEN	NOTES

3.1 PPE FOR MEDICAL PERSONNEL

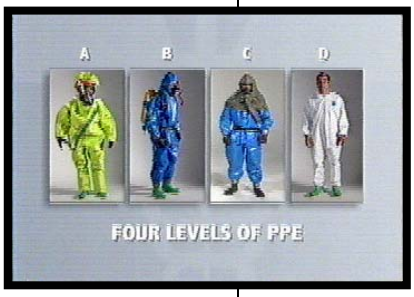
Narrator: Let's discuss the appropriate level of personal protective equipment – or PPE – for medical personnel treating victims. Remember – it is critical to protect yourself so you don't become a victim!

Although official protocols may differ from state to state, there are federal guidelines that must be followed when an employee works in a contaminated environment. Depending on the hazard, PPE may include dermal protective ensembles and respiratory protection devices.

The federal Occupational Safety and Health Administration, or OSHA, has developed standards applicable to those situations where respiratory protection is required for workers. Standards are described in Title 29 of the Code of Federal Regulations, Parts 1910.120 and 1910.134. How these standards apply to protecting CSEPP personnel from vapor or liquid exposure can be found in the CSEPP Planning guidance.

Note: See OSHA's CFR 29 1910.120 for a complete definitions of protection levels

There are 4 levels of PPE - A, B, C and D. The type of PPE used depends on whether the contaminant is known or unknown, the method of potential exposure – vapor, aerosol, or liquid, and the type of respiratory protection required.



3.2 TYPES OF RESPIRATORS

There are basically 2 types of respirators– air-purifying, and those that supply their own air-called atmosphere-supplying.

Types of Respirators

- Air-purifying
  - Negative pressure
  - Positive pressure
- Atmosphere-supply

Air-purifying respirators pass the ambient or outside air through a filter element or canister to remove gaseous or particulate contaminants from the outside air. Air flow across the filter may be generated by negative flow or inhalation, or through positive pressure from a blower from a powered air-purifying device.

VOICE	SCREEN	NOTES

Negative pressure full-facepiece respirators are used by the military to protect against chemical agent vapors and aerosols. Air is pulled across the gas particulate canister during inhalation.

Note: With negative pressure apparatus, taping is recommended around hood, front zipper, waist, and ankles.

Atmosphere–supplying respirators provide air to the wearer independent of the outside toxic atmosphere. Self-contained breathing apparatus – referred to as SCBA – provide air from a back-pack or a tank on the user's back.

Some medical facilities use a common source of uncontaminated air to supply several respirators at once. Atmosphere supplying respirators are used in Levels A and B PPE.

Types of Respirators

Air purifying
- Negative pressure
- Positive pressure

Atmosphere supplying
- SCBA
- Air-line

3.3 POWERED AIR-PURIFYING RESPIRATOR (PAPRs)

PAPRs, the term used for the powered air-purifying respirators that pass air through a filter, are classified by the size of the facepiece and by the type of filter cartridge used to remove contaminants.

Powered Air-Purifying Respirators (PAPRs) (classified by)

- Face piece size
- Type of filter

The PAPR uses a battery-operated blower that is designed to deliver decontaminated air at positive pressure into a facepiece. This means that if a leak occurs, air will flow from inside the facepiece to the outside.

VOICE	SCREEN	NOTES

Positive pressure PAPRs may be used by emergency responders when chemical agent concentrations do not exceed 50 times the allowable airborne exposure limits, which is the immediately dangerous to life and health – or IDLH – value.

The 2 types of PAPRs that you may encounter in CSEPP consist of:
a tight-fitting full-facepiece ensemble that is used with a protective hood, or a loose fitting hood with integrated facepiece,

The PAPR will also include a belt mounted turbo unit with a battery pack and filter cartridges and a breathing tube connecting the turbo unit to the facepiece. A battery charger is used to keep batteries fully charged when the respirator is stored.

Tight-fitting PAPR
Provides higher level of protection

The tight-fitting PAPR cannot be used with eyeglasses or facial hair because they can compromise the integrity of the seal around the facepiece.

The loose-fitting PAPR accommodates both – and does not require a fit test like the tight-fitting PAPR. However, the tight-fitting PAPR provides a higher level of protection than the hood type. PAPRs should not be used until all pre-operational checks are performed in accordance with the manufacturer's instructions.

Loose-fitting PAPR

And PAPRs require the wearer to be medically cleared, especially for conditions associated with increased airway resistance. CSEPP also requires appropriate training before personnel can wear a PAPR.

VOICE	SCREEN	NOTES

PAPRs are not for use in enclosed spaces containing less the 19 and a half percent oxygen, or for chemicals whose concentrations are unknown, or in atmospheres immediately dangerous to life or health.

They should not be used in flammable or explosive atmospheres when wearing, operating, repairing or when charging or replacing batteries.

It is also imperative the wearer return to a non-contaminated area immediately while wearing the respirator if:

- the person can smell or taste contaminants, or if the eyes, nose or throat becomes irritated,
- it becomes difficult to breathe,
- the air becomes uncomfortably warm,
- one feels dizzy or nauseous, or
- one notices a decrease in airflow.

Report to the Team Leader if:

- Smell or taste contaminants
- Eyes, nose, throat irritated
- Difficulty breathing
- Air uncomfortably warm
- Dizzy or nauseas
- Decrease in air flow

3.4 DERMAL PROTECTIVE ENSEMBLES

Dermal protective ensembles are used in combination with respirators to protect first responders from vapor and liquid chemical agents.

The combination of dermal and respiratory protection defines the four different protection levels—A, B, C, and D.

Levels A and B PPE are unnecessary for healthcare workers unless they are working in an environment where the hazardous substance or its concentration is unknown. Level C PPE is the approved level for healthcare workers responding to

Note: See OSHA's CFR 29 1910.120 for a complete definitions of protection levels

VOICE	SCREEN	NOTES

chemical agent incidents. Level D affords minimal protection – it's a work uniform used for nuisance contamination only.

3.5 CSEPP PPE

The Level C PPE approved for use in CSEPP includes a splash suit, butyl rubber gloves with cotton inserts, and vinyl overshoes or haz-mat boots – all worn over your normal scrubs or lightweight underclothes. The vinyl overshoes are not resistant to petroleum products. The clothing is a one-piece coverall with or without attached boots. It may have a hood attached at the neckline as well.

Latex or surgical gloves do not protect against chemical agents so medical PPE includes heavier rubber gloves that come in 2 thicknesses: 7 and 14 mil. Both protect from liquid chemical agents but the 7 mil protects for 6 hours while the 14 mil will protect up to 24 hours after exposure. These gloves should be issued to workers along with the standard 25 mil gloves.

The 7 mil gloves should be used by personnel requiring extreme tactile ability, such as triage officers, paramedics or computer operators. The 14 mil gloves should be used by workers who perform duties that require tactile ability but who will subject the gloves to harsher treatment.

Gloves

- 7 mil protects for up to 6 hours after exposure
  - Used by personnel requiring extreme tactile ability
- 14 mil protects for up to 24 hours after exposure
  - Tactile ability, but subjecting gloves to harsher treatment

VOICE	SCREEN	NOTES

3.6 PHYSICAL LIMITATIONS WHEN WEARING PPE

Workers outfitted in PPE should remember that the suit material restricts the body's heat loss mechanisms. The amount of heat accumulation and body fluid loss depends on several factors:

- the amount of physical activity the wearer engages in,
- the level of hydration,
- clothing worn under the suit,
- the load carried,
- the state of heat acclimatization,
- the terrain, altitude, and general climatic conditions, and
- the level of physical fitness and fatigue of the user.

Based on these factors OSHA has developed guidelines for allowable times to be suited in PPE.

So it's very important that workers wearing hazardous materials PPE take appropriate precautions to rest and rehydrate at frequent intervals as recommended in the CSEPP Planning Guidance.

Heat Accumulation and Body Fluid Loss

- Physical activity
- Level of hydration
- Clothing under suit
- Load carried
- Heat acclimatization
- Terrain, altitude, climatic conditions
- Level of physical fitness and fatigue

Note: OSHA recommends guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH). See *2003 TLVs® and BEIs®, Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices*.

MODULE 4: TRIAGE

Triage is the process of sorting and allocating resources to large numbers of victims according to a predetermined system of priorities. CSEPP recommends the S.T.A.R.T.—Simple Triage And Rapid Treatment—system for triaging patients because of its simplicity and speed. Patients are classified as: minimal (or minor), immediate, expectant, and delayed, which is identified by a color coded tag. During patient monitoring, change in patient's status will lead to reassessment and possible change to new status. The graphics include a picture of the triage tag and the identifying wristbands used in some CSEPP communities. Note that the medical responders are outfitted in level C PPE for initial observation of patients.

At the end of this module participants should be able to describe:

1. The S.T.A.R.T process: Minimal (or minor), Immediate, Expectant, Delayed
2. How respiratory status, perfusion and pulse, and mental status (the RPMs) are used to triage patients.

Further discussion points

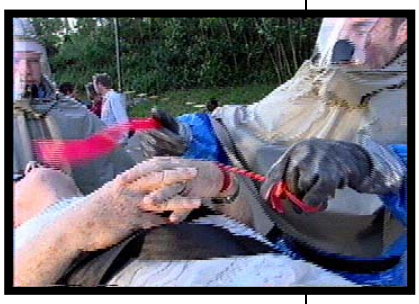
1. Modifications to S.T.A.R.T system (JUMP S.T.A.R.T.) for children 1 to 12 years (young children may not be able to respond to questions ascertaining mental status).

   Website for more information on S.T.A.R.T. is http://www.start-triage.com
   Website for JUMP S.T.A.R.T. is http://www.jumpstarttriage.com

VOICE	SCREEN	NOTES

4.1 TRIAGE SCENE AT HOSPITAL

Narrator: Let's discuss triage. Triage is the process of sorting and allocating treatment resources to large numbers of victims according to a pre-determined system of priorities.



This system was developed for battlefield use, and has since been incorporated into disaster response. The intent is to provide the greatest good to the largest number of casualties, given a limited amount of medical resources.

Triage is an important part of caring for victims of mass casualties incidents.

Simple Triage And Rapid Treatment (S.T.A.R.T.)

- Simplicity
- Speed

Note: S.T.A.R.T. see http://www.start-triage.com for more information

4.2 S.T.A.R.T: 4 STATUS LEVELS

CSEPP uses the Simple Triage and Rapid Treatment - or S.T.A.R.T. - system. S.T.A.R.T was developed by the Newport Beach Fire and Marine Department and the Hoag Hospital in California to sort and treat large numbers of casualties. The advantage of S.T.A.R.T. is its simplicity and speed – initial patient assessment should take less than a minute – ideally only 30 seconds - per patient.

No advanced life support intervention should be performed in the warm or hot zones. Rapid antidote administration is the only exception.

Simple Triage and Rapid Treatment System S.T.A.R.T.

- Decisions made objectively
- JUMP START (kids)

Caution is advised in using the S.T.A.R.T. system on children below 8 years old who haven't developed an adult airway. As a result of airway anatomy, the JUMP S.T.A.R.T. system

Note: Use JUMP S.T.A.R.T. for children 12 months to 8 years. See http://www.jumpstarttriage.com for further information.

VOICE	SCREEN	NOTES

was developed for children between the ages of 12 months and 8 years. This should be used on children who have been decontaminated if aggressive respiratory support is indicated.

Simple Triage And Rapid Treatment System
S.T.A.R.T.

- Classifications
- Expectant (deceased)
- Immediate
- Delayed
- Minimal (minor)

4.3 MINIMAL-WLAKING WOUNDED

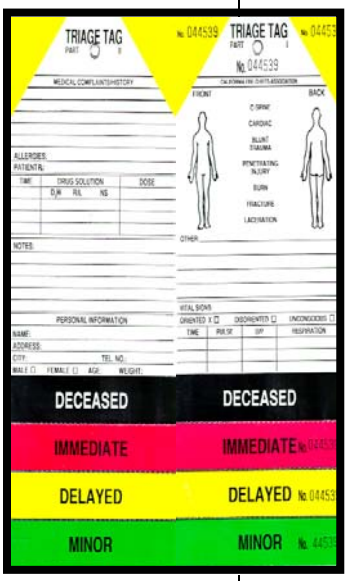
There are four status levels in S.T.A.R.T: immediate, delayed, expectant or deceased, and minimal or minor. Under S.T.A.R.T, all victims who are able to walk on their own (the walking wounded) are directed to a designated area upwind of the hazard, labeled as **minimal-or minor**–and given a green tag or wristband. This immediately reduces the number of victims to be evaluated. However, these victims will require continued supervision and might be detained for further assessment and possible decontamination.

4.4 ASSESSMENT OF RPMs

The remaining victims will be further triaged. This should take no longer than about 30 seconds per patient and focuses on three primary areas, called the RPMs:

- Respiratory status
- Perfusion and pulse, and
- Mental status–can the patient follow simple commands?"

This is one example of a standard triage tag–note the numbered identification section. Some tags are laminated so they survive the decon process better.



VOICE	SCREEN	NOTES

4.5 IMMEDIATE

Victims are classified as **immediate** if they require lifesaving care that can be performed in a minute or two. Treatment may be relief of an airway obstruction or administration of antidotes–but not CPR or intubation.

As a patient moves through each level of assessment, any condition that is deemed immediate stops the evaluation process. These patients receive a red tag or wristband.

Life-threatening injuries – such as bleeding - will be addressed, if necessary, during primary triage.

Victims tagged or banded **delayed** are those with severe injuries in need of major or prolonged surgery or hospitalization, but the delay of care will not adversely affect the outcome of the injury – fixing stable fractures is an example.

A delayed status may also include patients exposed to liquid agent but who are displaying no visible signs or symptoms – as might happen with mustard agent. Or conscious patients recovering from exposure after treatment who have an improved respiratory status.

Both will require future treatment and observation. These patients receive a yellow tag or wristband.

Simple Triage and Rapid Treatment System
S.T.A.R.T.

- Expectant (deceased)
- **IMMEDIATE**
- Delayed
- Minimal (minor)

Note: Patient with red-tagged wristband indicates a classification of **Immediate.**

Simple Triage and Rapid Treatment System
S.T.A.R.T.

- Expectant (deceased)
- Immediate
- **DELAYED**
- Minimal (minor)

VOICE	SCREEN	NOTES

If the patient is adequately breathing, the triage officer moves to the next step. If respirations are inadequate, the airway is cleared by either repositioning the victim or clearing debris from the patient's mouth. If attempts are unsuccessful, the victim is classified as follows:

Simple Triage And Rapid Treatment (S.T.A.R.T.) RPM's

- Respiratory status
- Performance and pulse
- Mental status

4.6 EXPECTANT

Expectant - No respiratory effort – receives a black tag

Immediate - Respirations greater than 30 per minute for adults and 40 per minute for children or with an unstable airway.

If respirations are normal, go to the next step, checking perfusion and pulse.

Initial evaluation is made by measuring capillary refill. If the patient's blood return is delayed – greater than 2 seconds – or the patient appears cyanotic, classify the patient as **immediate.**

If you can't obtain capillary refill due to either the patient's color, poor lighting conditions, or limiting environmental factors, check the radial pulse in adults or the brachial pulse in children. If the pulse is <u>not</u> detected, classify the patient as **immediate.**

If the casualty has normal capillary refill, less than 2 seconds, or if radial or brachial pulse <u>is</u> detected, proceed to third and final step, determination of mental status**.**

VOICE	SCREEN	NOTES

4.7 DELAYED

If the patient **can** follow simple directions or commands, such as “close your eyes” or “will you please squeeze my hand” - classify the patient as **Delayed**.

If they **cannot** follow simple directions or commands, classify as **Immediate.** Then move to the next patient.

During patient monitoring that occurs after the initial triage, a change in the patient’s condition would lead to a reassessment and possible change to a new status level. The priority status can change over time – thus requiring reassessment using the S.T.A.R.T. criteria.

MODULE 5: DECONTAMINATION

The purpose of decontamination for patients potentially exposed to chemical agents is to prevent the chemical agent from spreading and doing more harm to healthcare providers. Decontaminating victims as quickly as possible after exposure is important. The scenario depicted in this training shows one type of casualty receiving station. The patients move from the contaminated zone (sometimes referred to as the hot zone) through the decontamination line where they shower (or are showered if non-ambulatory), dry and don clean clothing. They then enter the decontamination area (or cold zone) where they may be processed before entering the medical facility for further treatment or observation. The scenario presented shows a litter patient being decontaminated and a patient with a severe leg wound decontaminated himself.

At the end of this module the participant should be able to describe:

1. How to site decontamination facilities for maximum effectiveness.
2. Decontamination of ambulatory and non-ambulatory patients.
3. Treatment of wounds for persons being decontaminated.
4. Modesty and privacy issues associated with patient decontamination.

Further discussion points

1. EPA guide "First Responders' Environmental Liability Due to mass Decontamination Runoff" is listed under Chemical Safety Alerts and Bulletins webpage: http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/ap-chsa.htm>.

   Or can be accessed directly at : http://yosemite.epa.gov/oswer/ceppoweb.nsf/vwResourcesByFilename/onepage.pdf/$file/onepage.pdf?OpenElement

   Text is also available on DVD resources.

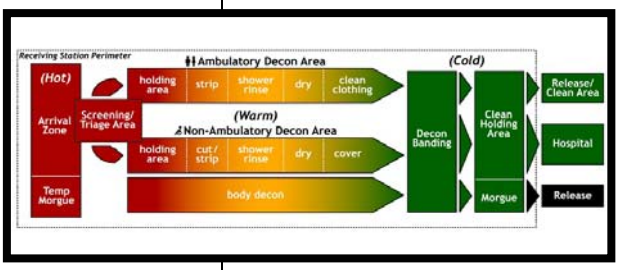
VOICE	SCREEN	NOTES

5.1 DECONTAMINATION

The purpose of decontamination is to stop the spread of contamination. Knowing when and how to decontaminate patients is critical. Decontamination usually requires multiple teams to fully decontaminate victims. Factors to be considered in planning for decontamination at hospitals include the number of personnel in PPE needed, the frequency of rotating those personnel, and the availability of PPE for rotating shifts. Most respirators are not disposable and cannot be shared with the exception of the hooded respirator.

5.2 CASUALTY RECEIVING STATION

This is one example of a casualty receiving station. The areas should be identified during the planning phase. If properly sited, this will permit drainage from the decontamination process to be directed into a sump or a holding pond that can be emptied later during the recovery phase. The hot zone is the area considered to be contaminated. The cold zone is free from contamination. Plan for the cold zone to be upwind, uphill and upstream from the hot zone.



Site location and layout for decontamination should be predetermined and well known to operators. Maintaining secure perimeter control and clean work areas is important. Everyone should be aware of the potential problems of cross or secondary contamination and should know how to exit through decontamination stations. All of this takes planning and exercising.

VOICE	SCREEN	NOTES

5.3 AMBULATORY PATIENT DECONTAMINATION

The decision as to who should process through the ambulatory line should be made by medical personnel. The "walking wounded" and others tagged minimal can usually be sent to the ambulatory decon area where a minimal amount of personnel are needed to supervise the self-decontamination process.

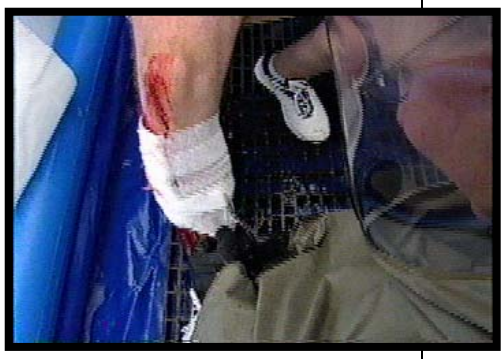
Medical personnel may decide to decon ambulatory victims' wounds and remove bandages before allowing victims to shower. Keep in mind that bandages can readily absorb liquid or aerosols, so passing a victim with bandages across the contamination control line to relatively unprotected personnel could create a secondary hazard.

Open wounds should never be deconned with a normal soap and water solution. First remove previously applied dressings and foreign bodies from the wound. Then flush the wound and surrounding areas with water and a tincture of green soap. Carefully decon around the wound by wiping outward, pack the wound, then seal with occlusive dressing prior to full body decon.

Ambulatory patients should be instructed to: remove all clothing and to bag personal effects; then shower with

The Decontaminant Process:

- Ambulatory
- Non-Ambulatory



VOICE	SCREEN	NOTES
copious amounts of soap and water from the head down, leaning the head back to reduce the chance of residue contacting the eyes, nose or mouth. Encourage careful cleaning of warm, moist areas such as under the armpits and the groin, followed by a thorough overall rinse with clean water. Once decontaminated, patients should don clean clothing–Tyvek disposables work well. Patients then receive a standardized wristband indicating the patient has been decontaminated and moves to the cold zone staging area for screening and medical treatment. The best assurance a victim is free of contamination is a thorough decontamination. It is recommended that people who are concerned about possible contamination, but who exhibit no signs or symptoms and have no potential for exposure, remove the outer layers of clothing and take a quick-3-4 minute shower. As long as it can be confirmed that a patient was never in the path of a plume nor in a contaminated area and are without signs and symptoms of exposure, they should not have to decon. Most ambulatory patients will be capable of processing through the ambulatory decon lines but some may need assistance. If possible, separate decon lines should be set up for males and females. When only two lines are possible, keep the second line for non-ambulatory cases - such as people with wheelchairs or walkers, those on stretchers or anyone else requiring assistance or supervision.	 Do not need to decon if it can be confirmed that patient • Never in path of plume • Never in contaminated area • Without signs and symptoms of exposure	

VOICE	SCREEN	NOTES

Privacy and modesty of all the victims being decontaminated should be given a high priority. This means keeping all media and other unofficial visitors away from the site – or from higher floor levels where victims could be viewed from windows or balconies.

5.4 NON-AMBULATORY PATIENT DECONTAMINATION

Non-ambulatory patients displaying serious signs and symptoms will be the first ones deconned in the non-ambulatory area.

Non-Ambulatory Patient Decontamination

- Rapid decontamination
- 5-10 minutes per patient

Rapid decontamination is employed, involving removal of clothing and a quick, high volume shower focusing on exposed areas –skin and hair. This should take a maximum of 5 to 10 minutes per patient. Since 85% of contamination is completely removed by discarding clothing– whether from liquid or vapor exposure–a rapid shower will likely eliminate 99 to 100% of the contaminant.

Note: The 85% reduction is derived from an assumption that 85% of the body is covered by clothing

Non-Ambulatory Patient Decontamination

- Follow universal precautions when treating victims

Health care providers should follow universal precautions when treating victims, and may decide to more thoroughly decon a patient if severe signs and symptoms continue.

Patients exhibiting moderate signs, or who have a confirmed liquid exposure, will be processed in the normal fashion once the rapid decon patients are completed. Those with minimal signs and symptoms, or vapor exposure, will follow those with moderate exposures.

VOICE	SCREEN	NOTES

Normal decon of non-ambulatory patients usually takes 2 to 4 staff and 10 to 20 minutes. The casualty's backboard or stretcher should be elevated to limit the amount of run-off exposure to the patient. Each staff member focuses on a quadrant of the victim's body - maybe using the waistline as a midline. Clothing is cut away or otherwise removed.

Starting at the midline, spray or wipe the victim laterally or to the side or back of the victim. The sponge or brush used to decon should be rinsed in the decon solution after each wipe. Once the front is finished, roll the victim to the side and proceed to decon the back - from the highest to lowest point.

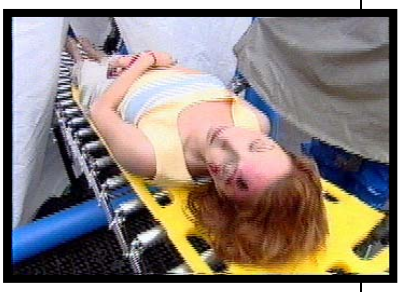
Once the actual wiping process is complete, a liberal amount of solution should be used to rinse the patient; then the patient is dried. The process requires 35 to 50 gallons per patient - and fresh decon solution should be used for each patient. Once cleaned, roll the victim onto a clean stretcher or backboard and transfer across the hotline into the clean- or cold - area.

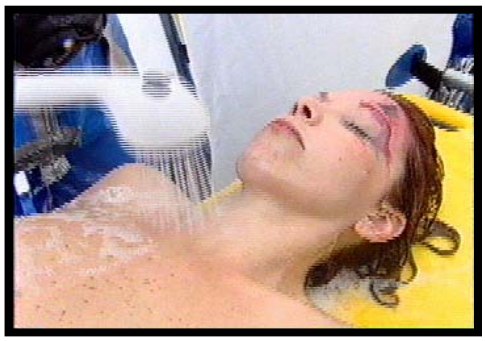
Non-Ambulatory Patient Decontamination Process Order:

1. Severe exposure
2. Moderate exposure
3. Minimal exposure

Normal Non-Ambulatory Decontamination

- Requires 2-4 Staff (one medically trained)
- 10 to 20 minutes per patient





MODULE 6: MASS DECONTAMINATION

This short module graphically depicts two types of mass decontamination procedures. One method employs cordoning off of a corridor and using water from fire department's deluge aerials to douse victims as they exit the corridor. The second method employs sprinkler heads that act as rudimentary showers in which victims remain for several seconds. Two issues broached are run-off containment and water temperatures, especially for more vulnerable populations.

At the end of the module the participant should be able to describe two methods for mass decontamination and two issues associated with mass decontamination in outdoor settings.

Further discussion points

1. If not addressed in previous module, see EPA guide "First Responders' Environmental Liability Due to Mass Decontamination Runoff." It is listed under Chemical Safety Alerts and Bulletins web page: http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/ap-chsa.htm>.

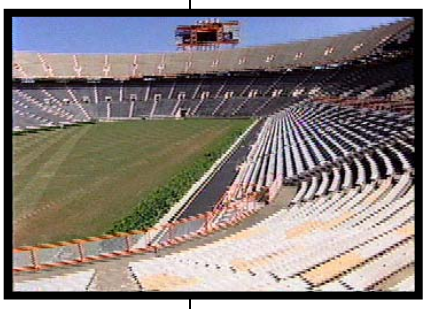
   Or can be accessed directly at:
   http://yosemite.epa.gov/oswer/ceppoweb.nsf/vwResourcesByFilename/onepage.pdf/$file/onepage.pdf?OpenElement

   Text is also available on DVD resources.

VOICE	SCREEN	NOTES

6.1 MASS DECON-TAMINATION METHODS

Managing the consequences of a chemical agent release may require mass decontamination that is outside the resources of any medical facility. Chemical weapons by their very nature can cause large numbers of casualties if dispersed in a vapor or aerosol. Such a situation could occur during a high profile event – at an airport, a concert… or a stadium.



NOTE: Equipment for mass decontamination would be prepositioned

6.2 CORRIDOR DECONTAMINATION

The simplest solution is to cordon off several exits where a decontamination corridor can be set up with fire department aerials and/or deluge guns.

The nozzles are set at low pressure and high volume so as not to inflict damage but which maximize the amount of water each victim is exposed to.

Responders staffing such sites should wear appropriate PPE to limit their exposure to aerosols.

6.3 SPRINKLER HEAD DECONTAMINATION

Another method is to set up a sprinkler head near the exit point as a rudimentary decon shower.

In this scenario water delivered at 500 gallons a minute will produce 8 gallons per second. If the victim remains in the shower for 3 seconds on average, and assuming the person is exposed to 50% of the water, this equals 12 gallons - the amount used in a normal shower.

500 gals./minute = 8 gals/second
8 gals./second × 3 seconds = 24 gals.
24 gals. × 50% = 12 gals.

VOICE	SCREEN	NOTES
In both scenarios some clothing may be left on, which reduces the effectiveness if vapor has penetrated to the skin. There is also the issue of run-off with possible contaminants which must comply with local or state environmental regulations. EPA has also published guidelines on this issue.	Run-off solutions should be contained for proper disposal	**Note:** See EPA Guidelines: "First Responder's Environmental Liability Due to Mass Decontamination Runoff"

6.4 TEMPERATURE CONSIDERATIONS

Normal fire hydrant water temperature is 55 to 65 degrees Fahrenheit. This is a particular issue with children and the elderly who may suffer additional cold-related complications, especially if the ambient air temperature is much cooler or it's windy and cloudy. And the outside decon process is more traumatic than in an enclosed environment.

MODULE 7: DECONTAMINATING MASS FATALITIES

Mass fatalities who have been exposed to a hazardous chemical present special considerations and potential difficulties for health care providers and emergency response personnel. Bodies will need to undergo decontamination by personnel in appropriate PPE before being released to a mortuary or morgue. The circumstances of exposure may also extend to including local and/ or federal law enforcement officials who may prescribe additional constraints and documentation. The scenario closes with summary of the important issues associated with decontamination.

At the end of the module the participant should be able to describe the issues associated with decontamination of mass fatalities, the importance of wearing PPE for all decontamination procedures, and the federal resources available.

Further discussion points

1. Obtain more information from the Disaster Mortuary Operational Response Team website: http://www.dmort.org

VOICE	SCREEN	NOTES

7.1 DECONTAMINATION OF MASS FATALITIES, ISSUES AND CONCERNS

Narrator: The presentation of mass fatalities after a chemical warfare agent release can quickly overwhelm a medical facility's resources. Local mortuaries, morgues and larger assets must be considered.

There are also ethical responsibilities - reverence for the dead, dealing with distorted or misinformed media representations of the incident, and religious considerations.

As a potential crime scene, the incident may involve law enforcement, coroners and medical examiners, and state and federal authorities and agencies. How to include these considerations in your medical planning will take coordination and should be done well in advance of an event. Staff should be informed in the planning stages how to interact with other agencies.

Other issues include preservation and documentation of evidence. Law personnel will want to collect and preserve evidence, including where bodies are located, personal effects, and notes on the surrounding environment. It's critical that the documentation on body bags include labels, where the body was located, and any identification information.

Decontaminating Mass Facilities

- May overwhelm local resources
- Ethical responsibilities
- Law enforcement and other authorities involved
- Preservation and documentation of evidence

VOICE	SCREEN	NOTES

7.2 DECONTAMINATION OF DECEASED

In some instances the deceased may have to be decontaminated before being admitted to a morgue or other facility. The purpose of decontamination of the deceased is two-fold:

- to protect those handling the fatality, and
- to prepare the body for transfer to the family or other entity that will handle the interment.

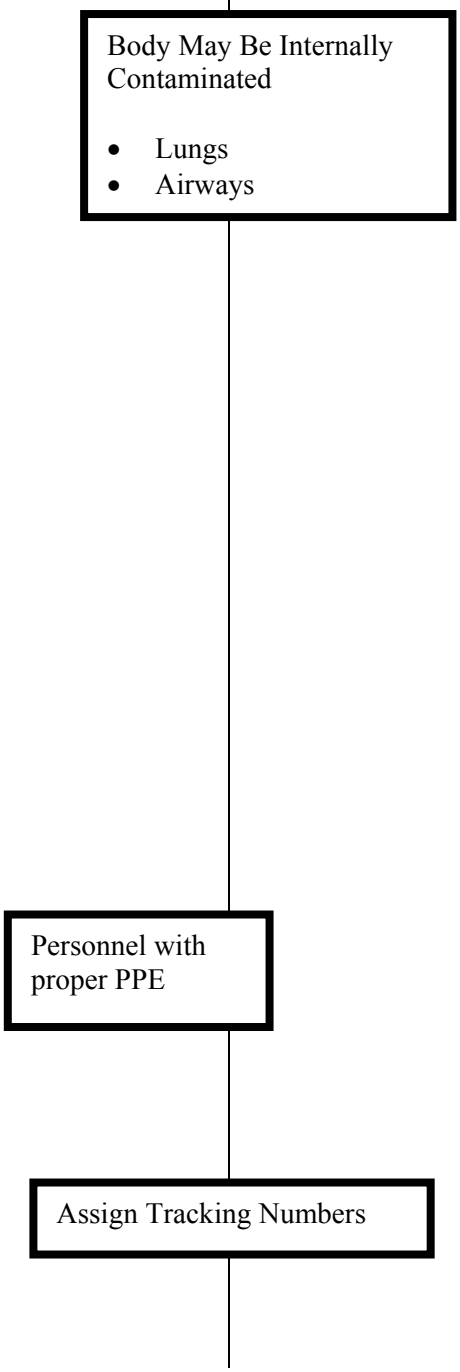
It is vital that not only the exterior of the body is decontaminated but also the areas of the internal body that could potentially be contaminated (lungs, airways, and so forth.) The latter is usually accomplished at the morgue or in the medical examiner's suite.

If the body is released to the medical examiner for autopsy, the potential for contamination MUST be relayed.

Personnel not in PPE can be exposed by direct contact or from off-gassing of the contaminant.

So only personnel with proper PPE should be tasked with the movement of the deceased, including the preservation of personal effects, documentation of body position, and photographing the scene, if necessary.

Prior to bagging and movement, numbered tags should be assigned for the body and the bag to assist the tracking process.



VOICE	SCREEN	NOTES

7.3 DEMORT TEAM RESOURCES

DEMORT TEAMS

DEMORT Logo

DMORT teams-the label given to disaster mortuary teams-are specialized teams equipped to deal with large numbers of fatalities. This resource must be formerly requested by local responders through the state level operations, to the federal government– which subsidizes DMORT operations. Response of such a large resource takes hours, but may be a critical asset in a large incident.

7.4 IMPORTANCE OF DECONTAMINATION

Decontamination is a vital process for all patients - live or deceased. Besides reducing health effects of victims, decon will assist in protecting responders, healthcare providers, and the general public. The decon process is not difficult - even among large numbers of victims - but it requires planning and resource management.

Multiple options exist for decontamination but the primary tasks are to remove clothing and shower or be wiped down as soon as possible with copious amounts of decon solution. The selection of decon solutions is up to the county or state but will usually consist of soap and water. The most effective decon is accomplished within minutes of exposure.

Medical personnel must practice wearing PPE when exercising decontamination procedures. Wearing PPE can be debilitating to users, delay treatment, and create communication difficulties among personnel and between patients and healthcare

VOICE	SCREEN	NOTES
providers. Fatalities must also be considered in decontamination drills, since they change hands multiple times and secondary contamination can be a problem. *Medical Personnel:* We're tagging you with green tags because you're not showing any signs or symptoms of chemical exposure. You can proceed to the decon entrance. We gave your dad a red wrist band (or tag) and he's in decon now. He needs immediate medical attention. Can one of you get him registered?		

MODULE 8: SIGNS, SYMPTOMS, AND TREATMENT OF NERVE AGENTS

This module describes the characteristics and chemical properties of nerve agents. Also described are the clinical effects from nerve agent vapor and liquid exposure and how nerve agent affects the muscarinic and nicotinic receptor sites. Appropriate treatment depending on the dose and age of patient is then depicted using atropine and 2-pam chloride as the preferred treatment in CSEPP communities.

At the end of the module, the participant should be able to describe:

1. The physical characteristics of nerve agents.
2. The clinical effects of nerve agents the human body.
3. The signs and symptoms of nerve agent exposure.
4. The importance of a differential diagnosis.
5. The appropriate treatment for patients of varying ages.

Further discussion points

1. Participants may want to review the Re-ACT FAST (Refresher on Agent Characteristics and Toxicology, First Aid and Special Treatment) video/DVD and accompanying facilitator guide for more information regarding nerve and blister chemical agent effects.

VOICE	SCREEN	NOTES

8.1 CHARACTERISTICS OF NERVE AGENTS

Narrator: In order to treat victims potentially exposed to nerve or blister agents, medical staff should clearly understand the clinical effects and accompanying signs and symptoms of exposure.

Signs, Symptoms and Treatment

- Nerve agents
- Blister (vesicant) agents

There are basically two types of nerve agents – the G agents and VX. The signs and symptoms of nerve agent exposure depend on the route of exposure, the level and duration of exposure, and the type of exposure – liquid or vapor.

Note: GA is also known as tabun
GB is also known as sarin

Nerve agents are clear, colorless, and tasteless liquids. The G type nerve agents GA, or tabun, and GB, commonly known as sarin, are chemically similar to organophosphate pesticides such as Malathion and Parathion. GA has a slightly fruity odor but GB has no odor. G-type agents are considered to be non-persistent chemical agents and primarily pose a vapor hazard.

Exposure to small amounts of the invisible vapors will usually affect the eyes, nose, and lungs within seconds and reach peak effects several minutes after exposure ceases. Effects from skin exposure to liquid G-type nerve agents are slower to develop and slower to reach their peak.

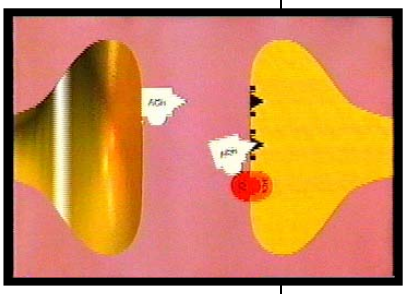
Nerve agent VX is an oily liquid that is also clear, colorless, odorless, and tasteless. Nerve agent VX poses primarily a liquid exposure hazard to skin and eyes, although small amounts of VX vapor may be generated under extremely high temperatures.

VOICE	SCREEN	NOTES

Nerve agent VX is considered a persistent, nonvolatile agent that penetrates the skin extremely well and may well be 100-200 times more toxic than a G-type agent.

8.2 CLINICAL EFFECTS OF NERVE AGENTS

Nerve agents affect the body by blocking the action of the enzyme acetycholinesterase. When this enzyme is blocked, large amounts of acetylcholine build up in critical areas of the nervous systems, causing hyperactivity of the organs stimulated by those nerves.



The clinical effects of nerve agents are in organs that have cholinergic receptors. These are divided into muscarinic sites and nicotinic sites. Organs with muscarinic receptors include smooth muscles and exocrine glands (post-ganglionic parasympathetic fibers).

Organs with Cholinergic Receptors

Muscarinic sites
Smooth muscles
Exocrine glands
Skeletal muscles
Pre-Ganglionic fibers

Those with nicotinic sites are the skeletal muscles and pre-ganglionic (sympathetic and parasympathetic) fibers.

The distinction between muscarinic and nicotinic receptor sites is significant because atropine, the major antidote to nerve agent poisoning, has its primary effect on organs with muscarinic receptor sites. Atropine is relatively ineffective on organs with nicotinic receptor sites.

Atropine primarily affects muscarinic receptors

VOICE	SCREEN	NOTES

Over-stimulation at muscarinic sites will increase secretions. The victim may experience increased saliva, tearing, runny nose, sweating, and copious secretions in the respiratory and gastrointestinal tracts. The accumulated acetylcholine also causes pinpoint pupils or (miosis), bronchoconstriction including shortness of breath, and hyperactivity of the gastrointestinal tract causing nausea, vomiting, and diarrhea.

The nicotinic receptors stimulated by acetylcholine result in skeletal muscle fasciculations, twitching, cramping, weakness, and may finally result in paralysis. Stimulation of the pre-ganglionic fibers may contribute to hypertension and tachycardia.

Bradyarrhythmias, heart block, tachyarrhythmias, and ventricular arrhythmias may also occur. Other acute severe effects include loss of consciousness, seizures, and apnea.

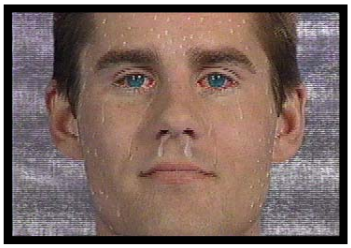
8.3 MILD VAPOR EXPOSURE TO NERVE AGENT

After a mild exposure to vapor of a volatile nerve agent like GB, the most common effects are miosis - often with pain in the eye or head, complaints of dim or blurred vision, possibly nausea and vomiting, conjunctival injection, rhinorrhea, and some degree of bronchoconstriction and bronchosecretions -with associated patient complaints of a "tight chest" or "shortness of breath".

Minor psychological symptoms such as nervousness, fatigue, minor memory disturbances, and irritability may also be present.

Over-Stimulation at Muscarinic Sites

- Increased secretions
- Miosis
- Bronchoconstriction
- Hyperactivity of gastrointestinal tract



Over-Stimulation at Nicotinic Sites

- Fasciculations
- Twitching
- Cramping
- Weakness
- Paralysis

Over-Stimulation of Pre-Ganglionic Fibers

- Hypertension and tachycardia
- Bradyarrhythmias
- Heart block
- Tachyarrhythmias
- Ventricular arrhythmias
- Loss of consciousness
- Seizures
- Apnea

Note: Vapor exposure is measured by the concentration time integral and expressed as milligram minutes per cubic meter or mg-min/m^3

Signs and Symptoms of Mild Exposure to Nerve Agent Vapor

- Pinpoint pupils
- Bain behind eyes
- Blurred vision
- Nausea and vomiting
- Conjunctial injection
- Running nose or drooling
- Tight chest

Note: Minor symptoms may last for 4 to 6 weeks after exposure

VOICE	SCREEN	NOTES

These effects may linger for 4 to 6 weeks after exposure. If the exposure has been mild and a victim is removed from the area of the exposure, shortness of breath may improve. In this situation, the immediate removal of clothing is often adequate decontamination.

Signs and Symptoms:
Mild Exposure to Nerve Agent

- Psychological symptoms
- May linger 4-6 weeks
- Shortness of breath may improve

8.4 MODERATE VAPOR EXPOSURE TO NERVE AGENT

A moderate exposure to the nerve agent vapor may bring on additional systemic symptoms, nausea, and vomiting.

Respiratory difficulty would also increase, and the patient could experience a sensation of general muscle weakness.

Signs and Symptoms:
Moderate Exposure to Nerve Agent

- Nausea and vomiting
- Increased shortness of breath, coughing, wheezing
- Muscle twitching and weakness

8.5 SEVERE VAPOR EXPOSURE TO NERVE AGENT

After a severe exposure to nerve agent vapor, the patient will almost immediately lose consciousness, and seizures will begin within 1 to 2 minutes. After several minutes of seizing, apnea and flaccid paralysis will occur followed by cessation of respiration.

Signs and Symptoms:
Severe Exposure to Nerve Agent

- Loss of consciousness
- Seizures
- Complete muscle weakness and paralysis
- Cessation of respiration

VOICE	SCREEN	NOTES

The effects of nerve vapor exposure appear almost immediately - within a minute or so after exposure - and generally do not worsen significantly once the victim is out of the contaminated area. Peak effects usually occur within the first 5 minutes following vapor exposure.

An ER patient who has exhibited no effects within 20 minutes after a possible vapor exposure most likely did not suffer a vapor exposure.

Nerve Agent Vapor Duration of Effects

- Appear almost immediately
- Peak effects within five minutes

8.6 LIQUID EXPOSURE

Persistent nerve agents like VX can present a liquid contact hazard.

However, the onset of effects following liquid exposure can be delayed from 10 minutes up to 18 hours after contact with the agent, depending on the dose.

A mild liquid contact could present as small fasciculations and diaphoresis on the skin at the site of the droplet.

Moderate liquid contact would not cause respiratory signs or symptoms, but might affect the GI tract and include nausea, vomiting, and diarrhea.

Severe liquid contact could cause sudden loss of consciousness, seizures, flaccid paralysis, and apnea - which will occur within minutes of exposure. Cessation of respiration follows.

Liquid Nerve Agent Exposure

- Localized twitching and sweating
- Weakness, generalized fasciculation
- Nausea, vomiting, and diarrhea

Note: Liquid exposure is measured by milligrams per kilogram or mg/kg.

Severe Liquid Nerve Agent Exposure

- Loss of consciousness
- Seizures
- Paralysis
- Apnea
- Cessation of respiration

VOICE	SCREEN	NOTES

8.7 DIAGNOSIS OF EXPOSURE

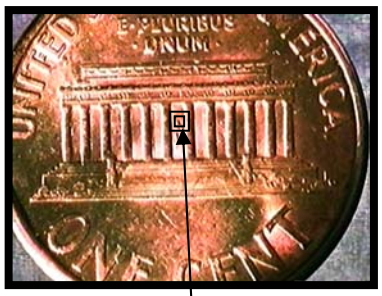
Diagnosis of persons exposed to nerve agent will be based primarily on observations of symptoms. Victims may exhibit indications of exposure to a specific organ system, such as miosis of the eyes, or they may be suffering from systemic effects - such as vomiting or seizures.

Although miosis by itself is not a reliable indicator of nerve agent exposure, any combination of nerve agent symptoms without a definite alternative cause should generate a high index of suspicion that poisoning with a nerve agent - or another type of organophosphate substance - has occurred.

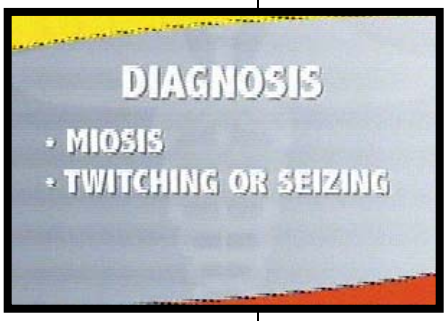
The combination of pinpoint pupils and muscle fasciculations is the most reliable clinical evidence of nerve agent poisoning.

Differential diagnosis—that is, differentiating between signs and symptoms of nerve agent exposure and other medical conditions—must be performed. Some signs and symptoms of nerve agent exposure are similar to more common medical conditions such as grand mal epileptic seizures, cerebrovascular accidents, emphysema, head trauma, or drug overdose.

Knowing the medical history of a person or, if the person is unconscious, looking for medic-alert bracelets or cards, may assist in deciding if he or she may have been exposed to nerve agent.



The dose that would be lethal to 50% of people exposed is 10 mg of liquid nerve agent VX on the skin of a 155-pound man. This is equivalent to a tiny drop about the size of Lincoln's head on a penny.

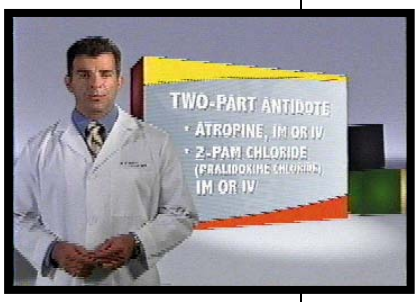


VOICE	SCREEN	NOTES

Two signs and symptoms of nerve agent poisoning should be identified before beginning treatment. This means you must perform a differential diagnosis.

8.8 TREATMENT OF NERVE AGENT EXPOSURE

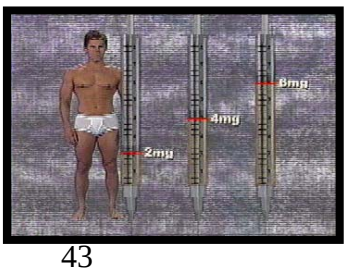
The initial treatment for nerve agent exposure is a two-part antidote. The first part is atropine, which is usually injected intramuscularly in the thigh or hip region. This stops the effect of the nerve agent by blocking the overstimulation of muscles, glands and nerves. Atropine also relieves the smooth muscle constriction in the lungs and GI tract and dries up respiratory tract secretions.



The second part is an injection of 2-PAM Chloride – which, when given early, may reactivate the enzymes and restore normal skeletal and respiratory muscle functions. The drugs may be administered intramuscularly or intravenously.

The military provides the drugs in two auto- injectors in the MARK I Chemical Agent Treatment kit that are administered consecutively. Auto-injector atropine and 2-PAM Chloride are also available commercially in kits - different doses for children and adults are available.

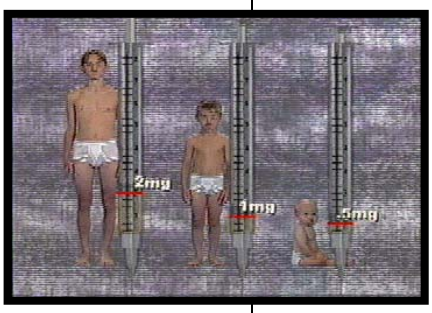
The recommended initial dosage of atropine is two, four, or six milligrams for adults depending on severity of exposure. The recommended atropine dosages differ for infants, children, and adolescents. The Army's medical experts recommend two milligrams as the maximum single dose for adolescents or children over ten. One



VOICE	SCREEN	NOTES

milligram is the maximum single dose for children between two and ten. Half a milligram is the maximum single dose for infants under two.

For all age groups, these doses may be repeated as clinically indicated. Treatment should be repeated every 5 to 10 minutes until the patient is atropinized - the term used to describe the noticeable signs that a patient has received enough atropine to reverse the muscarinic effects of nerve agent.



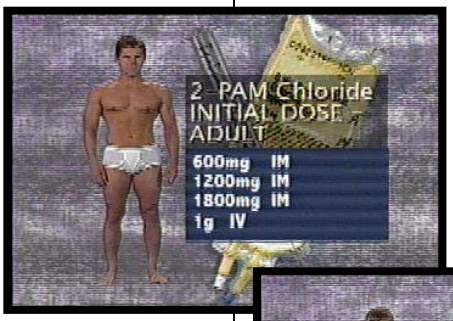
Atropinization decreases respiratory signs and bronchospasms, relieves sweating, dries respiratory secretions, and relieves diarrhea and abdominal cramping. An excellent sign that the patient has been atropinized is the drying of secretions from the nose and mouth, and improved respiratory function.

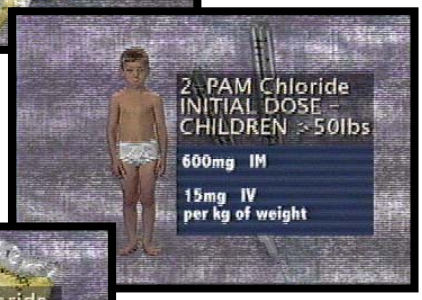
Atropinization

- Decreases respiratory signs and bronchospasms
- Relieves sweating, dries respiratory secretions, and
- Relieves diarrhea and abdominal cramping

Pupil size should <u>not</u> be used as a guide to atropinization as pupil size may not reverse for a period of up to 60 days following exposure.

Following the initial does of atropine, patients should receive an injection of 2-PAM chloride. For adults the recommended initial dosage for 2-PAM Chloride is 600, 1200, or 1800 milligrams IM - depending on the severity of exposure—or 1 gram IV delivered slowly.





For children and adolescents weighing more than 22 kilograms or 50 pounds, the recommended initial dosage for 2-PAM Chloride is six hundred milligrams IM or 15 milligrams per kilogram of body weight by slow IV. For children weighing less than 22 kilograms or 50 pounds, the recommended initial dosage for 2-PAM

VOICE	SCREEN	NOTES
Chloride is fifteen milligrams per kilogram of weight by slow IV. Incremental 2-PAM Chloride dosages may be repeated until the maximum dose based on body weight is achieved.		**Note: Commonly used anticonvulsants are ineffective**
For severe exposure, diazepam should be administered to patients who are experiencing convulsions and considered for non-convulsing patients who have signs of severe exposure. The dosage should be 10 milligrams IM or 5 milligrams slowly in an IV. Diazepam should also be administered to patients who initially received 3 Mark 1 kits. Other benzodiazepines commonly used in hospitals may work equally well. It is important that emergency department personnel be aware that commonly used anticonvulsants – including phenytoin, valproic acid, phenobarbital, and carbamazepine – are ineffective against nerve agent-induced seizures.	Additional Treatment Severe Exposure •Diazepam 10 mg IM 5 mg IV	
In addition to atropine and 2-PAM Chloride, respiratory support may be required and should be anticipated as part of the treatment for severe nerve agent poisoning.		
Respiratory failure is the main cause of death in cases of severe nerve agent poisoning. If the patient has been exposed to a moderate or heavy dose of nerve agent, it is likely that respiratory support will be necessary.	Additional Treatment for Severe Exposure • Respiratory support	
This may include supplying oxygen, assisting ventilation, and suctioning secretions as needed.	Respiratory Support • Supplying oxygen • Assisting ventilation • Suctioning secretions	

VOICE	SCREEN	NOTES
Because of the intense bronchoconstriction and secretions associated with nerve agent exposure, effective ventilation may not be initially possible due to high airway resistance–a pressure of 50 to 70 cm H_2O may be needed. Endotracheal intubation, followed by positive pressure ventilation with a bag-valve mask, should be performed.	Respiratory Support • Pressure of 50 to 70 cm H_2O may be needed.	

MODULE 9: SIGNS, SYMPTOMS, AND TREATMENT OF BLISTER AGENTS

This module describes the characteristics and chemical properties of blister (vesicant) agents. Two issues are associated with blister agents - the first is that there is no antidote and the second is that signs and symptoms can be delayed for several hours after exposure. The blister agents of concern in the CSPP communities are the sulfur mustard agents. The scenario at the end of the module summarizes treatment of a patient in emergency room for nerve agent (not blister agent) exposure.

At the end of the module, the participant should be able to describe:

1. The physical characteristics of blister agents.
2. The clinical effects of blister agents the human body.
3. The signs and symptoms of blister agent exposure, depending on dose.
4. The appropriate treatment for patients exposed to blister agents..

<u>Further discussion points</u>

1. Participants may want to review the Re-ACT FAST (Refresher on Agent Characteristics and Toxicology, First Aid and Special Treatment) video/DVD and accompanying facilitator guide for more information regarding nerve and blister chemical agent effects.

VOICE	SCREEN	NOTES

9.1 CHARACTERISTICS OF BLISTER (VESICANT) AGENTS

The types of blister - or vesicant - agents we are concerned with in CSEPP are the mustard agents.

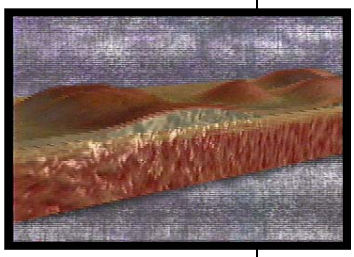
Lewisite is also a blister agent but it is stored in small quantities at only one installation in Tooele, Utah.

Upon direct contact with tissue, sulfur mustard agent causes severe chemical burns and blisters that can incapacitate a victim for weeks. These blisters can be caused by liquid or high concentrations of vapor and appear several hours after exposure.

In liquid form, sulfur mustard agents are colorless when pure but are normally observed as a yellow to brown oily substances.

Sulfur mustard agent vapor is also colorless but has a garlic-or mustard-like odor.

Sulfur mustard poses both a vapor inhalation and a liquid contact hazard. It is a potent alkylating agent that rapidly alkylates the purine bases of DNA, which in turn activates endonucleases which remove the alkylated bases. Removal of the bases creates places where the DNA rapidly breaks down.



- Eye irritations and damage
- Epidermal basal cell death
- Blister and inflammation appear
- Eyes, respiratory system more susceptible

VOICE	SCREEN	NOTES
9.2 CLINICAL EFFECTS OF BLISTER AGENT EXPOSURE		
Clinically, high exposures cause eye irritation, blepharospasm, blurring of vision, pain, and tissue damage.	• Cellular damage happens quickly • Clinical effects appear in 4-8 hours	
Contact of skin to vapor, mist, or droplets of HD results in the death of the basal cells of the epidermis. Separation and increased permeability produces edema and leads to the characteristic blisters. These blisters begin as vesicles and then coalesce into bullae with inflammation at the site. Higher temperatures and moisture of the skin impact absorption rates by the skin. The eyes and respiratory system are affected at lower doses than that necessary to elicit skin effects. The eye appears to require much more time to heal, and severe eye injury can occur before significant skin effects are seen.		
When sulfur mustard is absorbed it causes chemical cellular damage within 1 to 2 minutes, but clinical effects may not begin for hours. Generally there is no immediate pain or skin discoloration, nor immediate eye irritation. The onset time for clinical effects varies but most commonly occurs within 4 and 8 hours, but vapor-induced ocular effects may occur as early as 2 hours after exposure.		

VOICE	SCREEN	NOTES

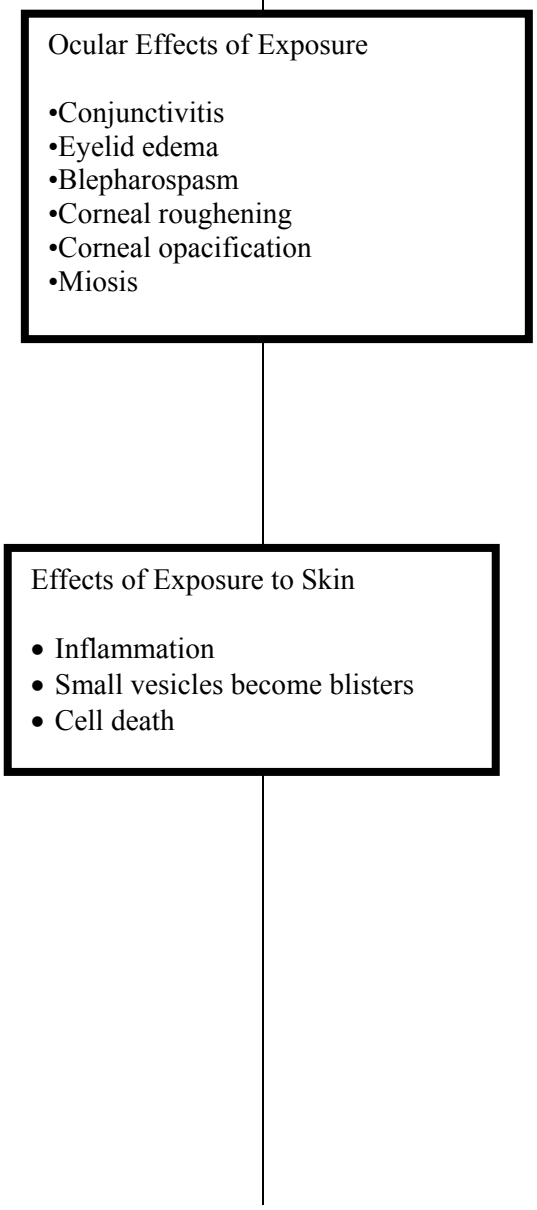
There is a spectrum of ocular effects. A small exposure to sulfur mustard may result only in mild conjunctivitis. A larger exposure will produce a more severe conjunctivitis, lid inflammation and edema, blepharospasm – that is, involuntary eye closure and corneal roughening.

These patients will be unable to open their eyes and will be temporarily without sight. A larger exposure, particularly if by liquid, may produce corneal opacification, corneal ulceration, or corneal perforation.

Miosis is sometimes observed after sulfur mustard exposure and is thought to be due to cholinergic effects.

Skin effects begin hours after exposure with erythema accompanied by burning and itching, followed later by the development of small vesicles. Still later these small vesicles coalesce to form blisters. The size and depth of the lesion depends on the amount of exposure and whether exposure was by vapor or liquid.

Coagulation from liquid to solid necrosis - or cell death - extending into the dermis may develop under blisters caused by liquid exposure. If these blisters are broken they could become infected. However, the fluid within a blister is not harmful and will not further contaminate the individual or others.



VOICE	SCREEN	NOTES

Sulfur mustard agent damages the mucous lining of the airways when inhaled. Damage begins in the upper airways and descends in a dose-dependent manner to the smallest bronchiole. The higher the concentration and exposure, the more severe the damage.

After a small exposure, or during the initial phase of a severe exposure, there may be epistaxis, sinus discomfort, and a mild to moderate pharyngitis with a hacking cough.

After a moderate exposure or in during the progressive phase of a severe exposure, there may be laryngitis with voice loss and a productive cough.

If the exposure is severe, the agent reaches the smallest airways causing dyspnea and productive cough. Sulfur mustard will damage not only the mucosa, but the underlying musculature as well. At this stage, there may be hemorrhagic pulmonary edema around the bronchioles but otherwise, pulmonary edema is rare.

Gastrointestinal effects within the first 24 hours following exposure include nausea and vomiting. These effects are thought to be in part due to cholinergic stimulation. There may be some added effects of mustard on the GI tract from the swallowed tracheal secretions.

Effects of Exposure to Respiratory System

- Damage occurs from upper airways to bronchioles
- Nose bleeds and sinus discomfort
- Pharyngitis
- Laryngitis
- Labored breathing
- Productive cough
- Hemoohagic pulmonary Edema is possible

Gastrointestinal Effects

- Nausea
- Vomiting

VOICE	SCREEN	NOTES

9.3 TREATMENT FOR SULFUR MUSTARD EXPOSURE

There is no antidote available for sulfur mustard agent exposure. The only immediate treatment is complete decontamination as rapidly and completely as possible. Sulfur mustard agents must be removed within one to two minutes after exposure to prevent cell injury. Because of the possibility of long periods of time passing before the patient comes into contact with a rescuer, injury will likely have already occurred where contamination is present on the patient's body. Hospital care will be necessary to manage patient injuries.

Intubation should be performed if there are signs of severe upper airway involvement, and it should be done early before laryngeal spasm or edema makes it difficult.

Bronchodilators may be needed. If these measures fail to relieve bronchospasms, steroids may be tried as an alternative course of medicinal care.

Upper or minor airway symptoms may be relieved by humidified air or oxygen inhalation and cough suppressants. The initial chemical pneumonitis should be treated by standard protocols but antibiotics should not be used until an organism is demonstrated - which usually occurs between the third and fifth day post-exposure.

Treatment

- Humidified air
- Oxygen and cough suppressants
- Antibiotics not helpful immediately
- Oxygen assisted ventilation
- Intubation before it becomes difficult
- Bronchodilators
- Steroids may be administered
- Flushing eyes becomes less effective with time

VOICE	SCREEN	NOTES

A patient with severe airway effects will benefit from oxygen and assisted ventilation, particularly positive end expiratory pressure or continuous positive airway pressure.

If the eyes have been exposed to sulfur mustard agent in any form, they must be flushed with large quantities of water within the first several minutes of exposure. Irrigating the eyelids of patients presenting with blepharospam 30 minutes or more after exposure should be limited, since there is limited benefit due to the absorptive nature of the eyes to agent.

With severe eye injuries, homatropine or other mydriatics should be applied topically to prevent synechiae or scar formation. Topical analgesics may be used for initial examination. However, oral pain medication is preferred to topical analgesics, which may allow damage to the cornea and delay healing.

Topical antibiotics should be applied several times a day and vaseline should be applied to lid edges to prevent them from adhering.

Soothing creams or lotions might be effective for alleviating irritation and itching. Large blisters should be unroofed and denuded areas irrigated several times a day followed by a topical antibiotic to prevent skin bacterial superinfection.

Oral or IV pain medications will likely be necessary. Fluid requirements should be assessed, but fluid replacement is less than is usually required with thermal burns. Care must be taken not to overhydrate. Rarely will burns be full thickness to require skin grafting.

- Apply pupil dilators (mydriatics) topically
- Oral analgesics preferred to topical administration
- Antibiotics applied topically
- Vaseline on eyelids
- Soothing creams for skin irritations
- Unroof blisters and irrigate
- Apply topical antibiotics
- Oral or IV analgesics
- Assess hydration

VOICE	SCREEN	NOTES
Most casualties of sulfur mustard exposure will require some form of medical care ranging from a few days to many weeks. Skin lesions take the most time to heal and may require hospitalization for months.		

MODULE 10: HOSPITAL PROTOCOLS

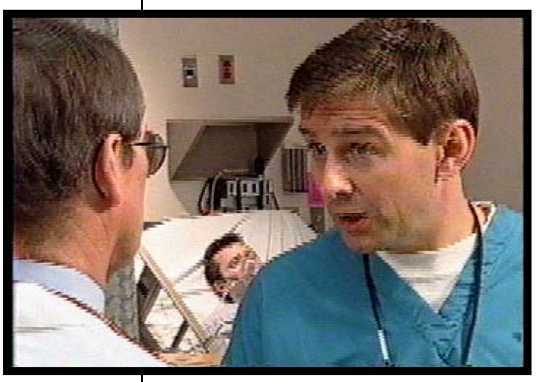
This module describes a scenario in an emergency room. One patient is being treated for exposure to liquid nerve agent. The second patient has difficulty breathing, a symptom related to nerve agent exposure, but on examination no miosis, cramping, or nausea is evident. The elderly patient, however, will be kept for further observation. The scenario is intended to reinforce the need for differential diagnosis. Note that no personnel are wearing PPE as this area of the hospital is considered clean; all patients have been thoroughly decontaminated before entering the medical facility.

Further discussion points

1. Treatment protocols for patients exposed to chemical warfare agents specific to your medical facility may be discussed here.

2. For further information the student should review:

   Managing Hazardous Material Incidents. Volume II - Hospital Emergency Departments: A Planning Guide for the Management of Contaminated Patients. Agency For Toxic Substances And Disease Registry.
   http://www.atsdr.cdc.gov/mhmi.html

VOICE	SCREEN	NOTES
Nurse: The patient was exposed to liquid nerve agent while removing his respirator on post. The chart indicates that the patient was immediately administered two Mark I kits in the field – which is confirmed with the wristbands he's wearing. Altogether that would indicate he received 4 milligrams of atropine and a 1200 milligrams of 2-PAM Chloride. He's still having difficulty breathing and has excessive secretions.		
Doctor: Administer an additional 2 milligrams of atropine every 5 minutes IV until the secretions dry, administer 600 milligrams of 2 Pam and continue to keep him under observation.		
Doctor: What's this patient's history?		
Nurse: "His family drove him to the hospital. They think he might have been exposed to agent vapor. He was in the yard when they heard about the release.		
Doctor: "What are his symptoms?"		
Nurse: "He has difficulty breathing.		
Doctor: "Ok – let's have a look at him. Mr. Sorensen, I'm Dr. McClean. I'm going to be examining you. There's no miosis. His lungs are clear. Have you had any cramping or nausea?"		
Patient: "No"		

VOICE	SCREEN	NOTES
Doctor: "Have you been sweating?" "Do you feel clammy?" *Patient:* "No–guess I'm kind of nervous though." *Patient:* "No" *Doctor:* "Well, Mr. Sorenson, you have not been exposed to nerve agent vapors, but I would like to evaluate you for your shortness of breath. So-we're going to keep you in here for a day or so, and if everything checks out, we'll send you home with your family. Okay? *Patient:* Nods assent.		

MODULE 11: DEBRIEFING

This short module concludes the training. Depicted is the debriefing of medical staff by a trained facilitator. It is important that health-care providers understand the signs of stress and that the stress of caring for and triaging large numbers of victims can be managed through support and understanding.

Further discussion points

1. Contact point for stress management in your medical facility.

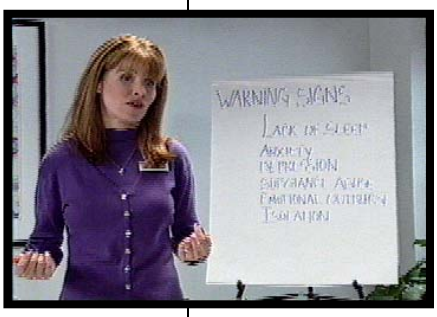
2. For further information see:

   The National Center for Post-Traumatic Stress Disorder (PTSD)
   http://www.ncptsd.org/index.html

   Critical Incident Stress Debriefing (CISD): Value and Limitations In Disaster Response. By Bruce Hiley-Young, L.C.S.W. and Ellen T. Gerrity, Ph.D.,
   NCP Clinical Quarterly 4(2): Spring 1994**.**
   http://www.ncptsd.org/publications/cq/v4/n2/hiley-yo.html

VOICE	SCREEN	NOTES

Medical Personnel: Hi - I'm Dr. Mack, a stress management specialist here at the hospital. The experience you had would certainly cause anyone stress. I would also want to say up front that what you say will not be taken out of this room. Let's all take some time to step back and reflect carefully on what you've all been through. "



Warning Signs

- Lack of sleep
- Anxiety
- Depression
- Substance abuse
- Emotional outburst
- Isolation

Narrator: Debriefing is a term applied to a structured process designed to help staff understand and manage intense emotions, identify effective coping strategies, and receive support from peers after a traumatic event.

Regardless of the techniques used and specific steps recommended, the key guideline is to use debriefing as a component in an integrated approach to providing victims and care-providers with appropriate education, and peer support. Debriefing provides an opportunity to consciously translate affectively-laden memories into a coherent and self-enhancing narrative understanding of a disaster experience.

Two types of protocols are commonly used: an initial debriefing protocol and a follow-up debriefing protocol.

Debriefing

- Initial
- Follow-up

The rationale for two debriefings is that early intervention often is not sufficient to enable pre-hospital responders and hospital personnel to verbalize and reflect upon their intense experiences. A follow-up debriefing enables them to more fully incorporate a coherent personal understanding of these experiences, with the additional benefit of catharsis, an educational structure, and group support.

MODULE 12: SUMMARY

This short module summarizes the concepts described in the training. It is important that health care providers:

- Protect themselves to avoid becoming victims,
- Wear the appropriate PPE they are trained to use,
- Take appropriate measures to avoid secondary contamination,
- Understand the necessity of decontaminating patients exposed to nerve or blister agent as quickly and thoroughly as possible,
- Understand the mass decontamination processes,
- Know the four levels of S.T.A.R.T. - Simple Triage And Rapid Treatment,
- Know the signs, symptoms, and treatment for patients exposed to nerve agent,
- Understand the importance of rapid treatment with appropriate antidotes for patients exposed to nerve agent,
- Know the signs, symptoms, and treatment for patients exposed to blister (vesicant) agent for Which there is no antidote,
- Understand the importance of continued observation of patients exposed to blister agent because of the potential for delayed effects, and
- Understand the importance of debriefing staff.

Further discussion points

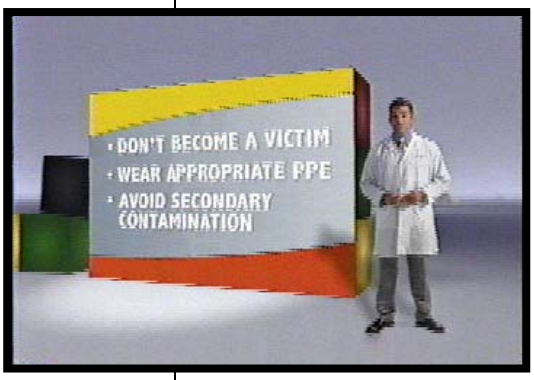
For further information or reference sources, please review the DVD resource section. Resources include complete texts of:

- CFR 1910 120, 132, and 134
- CSEPP Medical Resources
- CSEPP Planning Guidance
- CSEPP Training Materials on PPE
- EPA Decontamination Runoff Guidelines
- *Managing Hazardous Material Incidents: A Planning Guide For the Management of Contaminated Patients (ATSDR)*
- *Medical Management of Chemical Casualties Handbook*
- *Textbook of Military Medicine: Chemical and Biological*

VOICE	SCREEN	NOTES

Narrator: This medical facility was well prepared to meet the extraordinary demands of large numbers of patients potentially exposed to a nerve or blister chemical warfare agent. Personnel were able to secure the scene and keep cross contamination from occurring.

Remember – as a health care provider, the first and most important factor is to protect yourself. None of you can afford to put yourself or others in harm's way from secondary contamination. Wear the level of personal protective equipment you've been trained to handle. Don't allow victims' contaminated clothing or objects – even cell phones, pagers or handbags - to come inside your medical facility. Secondary contamination should always be avoided.



Although some signs and symptoms of blister agents are delayed for 2-8 hours or more, exposed patients still need to be decontaminated as soon as possible to prevent serious effects from occurring, especially since there is no current antidote for blister agents. Speed is equally essential in decontaminating victims of nerve agent exposure – victims should be decontaminated within minutes of exposure. There are antidotes for nerve agent poisoning – the recommended doses can save people's lives if administered immediately. And when the event is over, plan on debriefing patients. Finally, for your continuing mental health, consider talking about the event with a stress manager, your friends, and colleagues. Let's hope you never have to work such an event - but you can prepare to handle one now.