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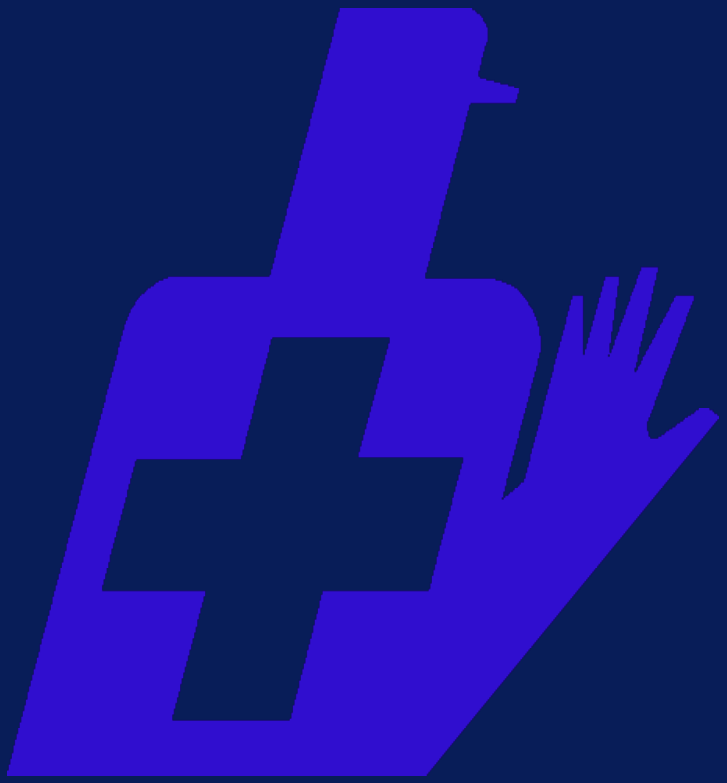

ACT FAST©

Instructor's Guide

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ACT FAST

Agent Characteristics and Toxicology
First Aid and Special Treatment
–Second Edition–

LESSON PLAN

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Prepared for

U.S. DEPARTMENT OF THE ARMY
Office of the Assistant Secretary
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and

FEDERAL EMERGENCY MANAGEMENT AGENCY
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Program Title: ACT FAST

Rev.: 001 **Time:** 7 hours

Date: 05/21/92

Terminal and Enabling Learning Objectives:

T.O.: Upon completion of this training program, the trainee will DEMONSTRATE the knowledge required to recognize signs and symptoms and to provide initial emergency treatment to patients injured by exposure to nerve and blister agents.

E.O.: The trainee will be able to:

1. DESCRIBE the initial first aid treatment for victims of nerve agent exposure.
2. DESCRIBE the initial first aid treatment for victims of blister agent exposure.
3. DESCRIBE the potential hazards of nerve agents: what they are; potential route of exposure; and how they work.
4. DESCRIBE the potential hazards of blister agents: what they are; potential route of exposure; and how they work.
5. IDENTIFY the signs and symptoms of nerve agent exposure.
6. IDENTIFY the signs and symptoms of blister agent exposure.

Trainee Preparation:

N/A

Presentation Method:

Lecture, guided discussion

Evaluation:

Self-checks
Final quiz

Instructional Aids:

Overhead projector and screen or slide projector
Book of overheads or slides
Instructor's guide
Flipchart, paper, markers
Study Guide
Pencils
Highlighters
Videotape: CSDP/CSEPP video

Additional thoughts on how this course may be conducted, including alternative instructional methods and possible schedules, are presented in the Appendix, if needed.

Relationship of this course to other training materials:

This course builds on several others that have been developed for CSEPP. Although these other courses contain information that is crucial to the student's ability to safely treat patients suffering from chemical agent exposure, their contents are not repeated in detail here. We recommend that, before beginning ActFast training, all students complete the following CSEPP programmatic training courses:

- Chemical Awareness,
- Response Phase Decontamination,
- Personal Protective Equipment, and
- Use of Auto-Injectors by Civilian Emergency Medical Personnel to Treat Civilians Exposed to Nerve Agent.

The ability to provide the best treatment to chemical agent casualties while protecting oneself from exposure depends on the successful completion of all of these courses.

In addition, state or local CSEPP offices may have identified other training courses or materials needed to prepare students for participating in the medical response to a chemical agent release. If so, the state or local CSEPP organizations will advise you of these additional training requirements.

Contents	INTRODUCTION Instructor Notes
I. Introduction	
A. Introduce yourself and welcome participants to the ACT FAST Training.	Display Overhead ACT001; Paper copies of each slide used in each module are included at the end of this module lesson plan. **[For guidance on using overheads, see page 17 in Techniques for CSEPP Instructors.]**
B. Chemical warfare agents act quickly. As an Emergency Medical Technician (EMT), the actions you take in the first few minutes can mean the difference between life and death. Treatment must be immediate: there is not time to transport and have a doctor or emergency room staff take the initial actions.	
Because of the requirement for such immediate treatment, this course uses the acronym, ACT FAST, as its logo. It stands for Agent Characteristics and Toxicology: First Aid and Special Treatment.	Display Overhead ACT002.
C. The intent of this course is to instruct emergency medical personnel on how to care for patients who may have been exposed to chemical warfare agents and assumed to have already been decontaminated. This course is designed primarily for Emergency Medical Technicians with basic life support credentials. These individuals are referred to as pre-hospital emergency medical personnel.	Display Overhead ACT002B.
D. Introduce the principal instructors.	
E. Ask the participants to introduce themselves if they are not already acquainted and state their reason for interest in the program.	

F. Describe the course schedule - when the class will meet, - the meal options and time, - when there will be breaks, etc. - locations of telephones, fire exits, bathrooms, and drinking fountains, - explain any building rules, if any, - designated smoking areas.	Review the schedule for the ACT FAST training program. No breaks are shown in the course outline. The instructor is responsible for deciding the appropriate place and time period for a break or breaks. Ask participants not to smoke in class.
II. Course Goal	Review the course goal with the trainees.
A. The goal of this program is: - To prepare you to recognize signs and symptoms, and to provide initial emergency response treatment to patients injured by exposure to nerve and blister agents.	Display Overhead ACT003.
B. Because of the nature of these agents and the training required to support such a goal, there are other coincidental training needs to which this program may contribute, such as: - To assist in preparing for hazardous materials emergencies.	Display Overhead ACT004
III. Instructional Objectives	Display Overhead ACT005; Instructional objectives are listed in the Student Manual. They are stated in action terms; they are things the trainees will be able to do at the end of the course. You should review the objectives with the trainees before you begin each module so that the trainees will know what will be expected of them at the end of the module.

A. The objectives of this training program are for you to be able to respond to an off-post scene involving an accidental release of one or more chemical warfare agents.	
B. Specifically, at the end of this training program you should be able to: - DESCRIBE the initial first-aid treatment for victims of nerve agent exposure. - DESCRIBE the initial first-aid treatment for victims of blister agent exposure	Display Overhead ACT006.
In order to master these objectives, you must be able to: - DESCRIBE the potential hazards of nerve agents: what they are, potential route of exposure, and how they work. - DESCRIBE the potential hazards of blister agents: what they are, potential route of exposure, and how they work. - IDENTIFY the signs and symptoms of nerve agent exposure. - IDENTIFY the signs and symptoms of blister agent exposure	Display Overhead ACT007.
C. Each objective is repeated at the beginning of each chapter where it is covered.	
IV. Review Student Manual	Display Overhead ACT008; Review the Student Manual with the trainees and explain how it will be used during this training program.
A. As you participate in this training program, you may use the Student Manual to follow along and take notes as necessary. We will refer to portions of the guide as the class progresses so that you can follow along. The presentations and the Student Manual have been designed to coincide so that your note-taking can be minimized.	
B. This guide may also be used for studying on your own because the book has been written to be used by an individual to study independently. For example, you may use the guide:	

- Before you attend the in-class session to do some pre-study on your own. - During the in-class session; as a guide for taking notes or to highlight information as the class progresses. - After you attend the in-class session; to keep as a reference and review resource. - In place of attending the in-class session; as a self-study resource.	
V. Evaluations	Display Overhead ACT009A; Turn to page 4-20 in the Student Manual and review the Self-Check.
A. Self-Checks To help you evaluate your progress, key chapters in your Student Manual are followed by a section called, "Self-Check." It consists of short answer questions pertaining to the information covered in that chapter. We will be completing some of these self-checks in class.	
B. Final Quiz 1. At the end of the training program, you will be asked to complete a final quiz. This quiz assesses your knowledge and understanding of the information presented in the key modules. 2. Like the self-checks, this quiz is designed to ensure you have a solid understanding of the essential material. Don't worry, if you do well on the self-checks, you'll do great on the final quiz. 3. Each state will determine if a final quiz will be given and what constitutes successful completion of the quiz.	
VI. Introduction of Course	If the videotape is available, include this section. If not, proceed to the next module.

A. This training program has been developed to prepare you to recognize signs and symptoms and to provide initial emergency response treatment to patients injured by exposure to nerve and blister agents. In the videotape we will view next, you will learn the history of the chemical stockpiles in the U.S., the effects of the chemical agents on the body and first aid treatments.	
B. As you watch the videotape, look for these key points: - symptoms of nerve and blister agent exposure - antidotes for nerve and blister agents	Show videotape. After videotape is shown, discuss with group using the key points as discussion points.

Content	BACKGROUND Instructor Notes
I. Introduction	Display Overhead ACT010.
	[This module is essentially a lecture. For tips in making lectures more effective, see page 5 in Techniques for CSEPP Instructors.] Much of this information is covered in the videotape. Use your own judgment as to the amount you choose to cover in class.
	Display Overhead ACT011.
The purpose of this module is to familiarize you with the background and perspectives of the chemical agents.	
II. General Information on the Chemical Stockpile	Display Overhead ACT012.
A. The U.S. Army currently has tons of chemicals stored that were designed and produced for the sole purpose of warfare. This storage is referred to as the "chemical stockpile."	
B. The chemical stockpile is stored at eight locations in the continental U.S. The composition of the stockpile varies from location to location. The types of chemicals stored include nerve agents and blister (or vesicant) agents.	Display Overheads ACT013 and ACT014.
C. More detailed information about the chemical stockpile can be found in the Student Guide for the CSEPP Chemical Awareness training course, which you should have completed before beginning ACTFAST training.	

NOTES TO INSTRUCTOR

To have the appropriate information available in the class for this module, each instructor will have to collect the information at his or her location. This should be done prior to the instruction so that you can guide the trainees through the exercise.

Contents	LOCAL Instructor Notes
I. Introduction	Display Overhead ACT015A. **[This module relies on the trainees to provide information concerning their sites through group activities. For help in conducting group activities, see page 8 in Techniques for CSEPP Instructors.]**
A. The purpose of this module is to provide you with a framework for the portion of the course that will be unique for your particular class.	Display Overhead ACT015B.
B. Community needs and resources vary a great deal from one storage location to the next. Therefore, your input on how the emergency care elements in your community could best respond to a release with off-post consequences is important to the success of the program.	Display Overhead ACT015C.
C. This module does not, and cannot, cover everything you need to know in preparation for your role. You need to find out: - who the local players are - the roles and responsibilities of each - the methods of response - what supplies and equipment are on hand - standard operating procedures - memorandum of understanding or agreement	Display Overhead ACT015D.
D. For general hazardous materials emergency planning, much of the information listed above may be included in a City/County Emergency Operations Plan (EOP); particularly relevant are the section of the EOP dealing with emergency response under CSEPP and the section developed to meet the requirements of the Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III: Emergency Planning and Community Right-to-Know (Public Law 99-499).	

Additional guidance on recommended supplies and procedures may be found in *Chemical Accident Incident Response and Assistance (CAIRA)*. *Operations*, (DA PAM 50-6), a U.S. Army publication developed to help Army installations respond to and recover from a chemical incident.	
E. There are also other sources of assistance: - Local emergency services - Fire department or other emergency responders - Ambulance service or other rescue services - Hospital emergency department - Local health department	Display Overhead ACT015E.
II. Local Community Response Procedures	
A. Let's begin building our framework by responding to some questions	Divide the group into teams. Ask teams to answer the questions concerning an emergency stemming from an accidental on-post release that is carried off-post. Each team should appoint someone to report their team's response to the entire group. Refer teams to Chapter 3, page 3-5, in the Student Manual. Their comments can be recorded here. Ask teams to complete the site-specific information also found in Chapter 3 in the Student Manual.
B. If an emergency occurs at the installation that could affect the off-post populations, there will be many decisions required of the local community. All of these should be addressed during the planning process. They include, but are not limited to:	
- Where is the first notification (identification) expected to come from? - Who, from the facility, is notified? - Who, from the local community, is notified? - Who is likely to be the first on the scene? - What are the duties of the pre-hospital emergency medical personnel?	Display Overheads ACT015F) and (ACT015G).

- What am I expected to do in this situation? - Am I authorized by my state to administer antidotal medications (atropine, 2-PAM chloride)? Under what circumstances?	Reassemble teams into one large group. Ask spokesperson to discuss findings from the teams. Discuss findings with group. **[For tips on leading group discussions, see page 5 in Techniques for CSEPP Instructors.]**
III. Since community needs and resources vary a great deal from one storage location to the next, you must develop a plan specific to your area before you need it.	

Contents	CHEMICAL AGENTS Instructor Notes
I. Introduction	Display Overhead ACT017.
A. Opening	
1. The information presented in this module is designed to familiarize you with the types of chemical agents that are located in your vicinity. This module is divided into three sections. The first two describe general characteristics of nerve and blister agents; the third discusses the important aspects of inhalation exposure via agents transported in air.	
2. By learning what the chemical agents are, what they look like, and how they act, you will be equipped with the knowledge you need to understand two very important procedures presented later in this training program: - protecting yourself, and - treating patients	Display Overhead ACT018.
B. Objectives for Module	
At the end of this module, you will be able to: - DESCRIBE the potential hazards of nerve agents: what they are, potential routes of exposure, and how they work. - DESCRIBE the potential hazards of blister agents: what they are, potential routes of exposure, and how they work. - DESCRIBE most likely route of exposure.	Display Overhead ACT019.
C. Review of the most important points of module.	Ask trainees to turn to page 4-3 in the Student Manual and review the most important points in this module.
II. Characteristics and Effects	Display Overhead ACT020.
A. Description of Nerve Agents	Display Overhead ACT021.
Toxic chemicals that are classified as “nerve agents” are so called because they are capable of attacking the body’s nervous system. You	

may also hear the term “organophosphate.” This is the scientific classification that describes compounds that inhibit cholinesterase, a naturally occurring enzyme that is important to normal nervous system function.	
1. Specific Names	Display Overhead ACT022.
a. While the term “nerve agent” refers to a particular form of toxic chemical, there are specific common and chemical names that are associated with this group. They are: VX, GB, and GA. (GA is in the stockpile only at Deseret)	
b. When the term “nerve agents” is used in this course, if refers to all of the agents (VX, GB, GA) unless an agent is specifically mentioned.	Refer trainees to the Material Data Safety Sheets in the Appendix C. They provide technical details on the chemical formulas, structure, names, and physical data.
2. Physical Properties	Display Overhead ACT023.
a. Liquid	
(1) In their normal state, nerve agents are liquids. These liquids are volatile—they generate vapors. It is the vapor form of an agent that has the greatest potential of being released in the event of an accident. There may also be some potential for an agent being released as an aerosol. Once in a vapor or aerosol form and mixed with the outside air, the agent may move from the storage location.	
	Note that Table 4.1 in your Student Manual provides a summary of the physical properties of the different nerve agents. More detail on physical characteristics of the agents can be found in the Student Guide for the CSEPP Chemical Awareness course, which the students should have already completed.

3. Mechanisms of Action	
A. In emergency first-aid training, emphasis is placed on learning the "why's" in addition to the "how to's." EMTs and other pre-hospital emergency medical personnel are accustomed to not only learning specific procedures but also (to some degree) how the injury or trauma affects the normal physiological functions of the human body. In most instances, this knowledge is fundamental or prerequisite to the level of understanding required for making critical, life-dependent decisions.	
B. Simplified Version of How Nerve Agents Work	Display Overhead ACT024.
(1) The nervous system controls body functions through the use of chemicals which act as "instructions" to the nerves and to the muscles and glands. These "instructions" come in two forms: * stimulate (move or work) and * relax (stop or rest)	
(2) When a nerve agent is present, it interferes with the normal chemical instructions that direct the muscle (or gland) to return to an un-stimulated state and relax or rest.	
(3) By interfering with the normal chemical check and balance, the action of the toxic nerve agent overstimulates the nerve endings and central nervous system. Over-stimulation of the nervous system causes muscles and certain glands to over-react and the various body organs to malfunction.	Display Overhead ACT025. If the videotape is available, use it in this section. Show appropriate sequences from videotape to help trainees visualize the destructive action of nerve agents.

C. Technical Version of How Nerve Agents Work	Display Overhead ACT026A. Ask trainees to turn to page 4-7 in Student Manual and discuss technical version of how nerve agents work. You can decide the amount of time needed to be spent in this section.
Nerves are connected to muscles and organs; but the nerve itself is made up of nerve cells that do not directly contact each other. Nerve impulses are relayed between nerve cells at a synapse (gap between the cells) by means of neurotransmitters. This is also how nerve impulses travel between nerves to a muscle or gland. In normal nervous system function, when the impulse is transmitted between nerve cells, a neurotransmitter (called acetylcholine) is released, which transmits the signal between cells.	
Once the neurotransmitter acts on the target cell receptor site, the enzyme acetylcholinesterase deactivates the acetylcholine. Stimulation of the target nerve, muscle, or gland cell stops with deactivation of the acetylcholine.	Display Overhead ACT026B.
However, nerve agents inactivate, acetylcholinesterase, allowing excess acetylcholine to accumulate and continue to stimulate receptor sites on the target nerve cell, muscle, or gland. If the affected nerve is stimulating a muscle, the muscle action becomes uncontrolled and a series of twitches or jerks may be seen. Eventually, if the process is not interrupted, the muscle can go into a prolonged contraction and become fatigued, or even collapse.	Display Overhead ACT027.

If the affected nerve is stimulating a gland, the result could be increased sweating, tearing, or mucus production in the respiratory passages.

4. Routes of Exposure — Display Overhead ACT028.

   a. Main Routes

      There are three main routes, or ways that a person can be exposed to a nerve agent. They are:

      * inhalation – breathing air that has been contaminated with nerve agent vapors
      * direct contact – absorption through the skin or eyes
      * ingestion – swallowing contaminated food or drink

      1. Inhalation — Display Overhead ACT029.

         Although the nerve agents begin as a liquid, they are easily changed into vapors. These gases mix freely with the air. If a person breathes in the contaminated air, the toxic chemical enters the body through the respiratory system.

         After the nerve agent has entered the lungs, it is generally absorbed rapidly and effectively into the blood stream. This is because of the large surface area of the lung tissue and the number of blood vessels in the lungs. The chief cause of death due to nerve agent exposure, from any route, is respiratory failure.

      2. Direct Contact — Display Overhead ACT030.

         Direct contact occurs when the skin or eyes come into immediate proximity with agent vapor or liquid. It is through this route that contamination from one patient to another is possible.

         Nerve agents have no effect on the skin; rather, the nerve agent is absorbed

through the skin. Once penetration has occurred, the nerve agent is circulated to the nervous system. Concentrated vapor or mist can also penetrate skin tissue in the same way the liquid does.

All of the nerve agents (VX and G-agents) can be absorbed through the skin; however, agent VX tends to be absorbed much more completely because it does not evaporate as quickly. The persistency of VX causes it to remain on the skin; thus allowing more absorption time. It penetrates slowly compared to GB; thus immediate decontamination is of potentially great importance. This is why, during the decontamination process, the patient's clothing must be removed completely.

VX is "highly persistent;" it does not volatilize or degrade rapidly. VX persistence is weather-dependent. At 99°F, 90% of a VX droplet will evaporate in approximately 24 hours; at 50°F, the passage of 45 days would be required before 90% of a VX droplet would evaporate.

The more watery G-agents, on the other hand, have a tendency to evaporate quickly. Agent GB, in particular, tends to evaporate off the skin quickly rather than penetrate it. Cases of GB poisoning have occurred from skin exposure to liquid agent. Skin exposure to GB vapor can also result in poisoning, but only at concentrations higher than those that produce severe inhalation effects.

Once absorbed through the skin, the agent begins to affect the normal chemical neurotransmission process that occurs between the nerves and muscles or glands. This is why chemical protective gloves must be worn to protect your hands while treating patients.

On normal, intact skin, the nerve agent must first pass through a layer of dead cells and the epidermis before reaching

the capillaries (bloodstream) and nerve cells found in deeper tissue layers. If a volatile G-agent is involved, evaporation may be complete before a significant dose can be absorbed. However, scrapes or cuts or other damage present immediate entry points for the nerve agent and facilitate direct access to the bloodstream and nervous system. Increased skin permeability is a concern for skin conditions that are not commonly thought of as "wounds." For example, freshly shaven skin, sunburn, insect bites, and rashes are all examples of immediate entry points for nerve agents. Agent also enters the body very effectively through the eyes. It is important to protect the eyes from exposure to vapors or aerosols. The eye is the most sensitive organ system for nerve agent effects. Threshold dose for miosis is the basis for both VX and GB exposure standards.	
3. Ingestion If an individual ingests contaminated food or drink, the nerve agent can enter the body through the digestive system. Incidental hand-to-mouth contact, smoking, and swallowing are all examples of potential sources of exposures by this route. Once the nerve agent has entered the body by way of the digestive system, access to the bloodstream can occur. Although the likelihood of the agent contaminating food or drink is extremely slim, you should be aware that it is possible for someone to become exposed through ingestion. Common sense precautions dictate that: * absolutely no food or beverages should be kept in or around treatment areas, and * when treating or caring for patients, do not give anything by mouth.	Display Overhead ACT031.

4. Critical route of exposure A chemical agent release is most likely to affect surrounding communities if agent vapors or aerosols are transported in an airborne plume. For this reason, experts have recommended that you be well prepared to handle exposures that have been caused through atmospheric transport of contamination. Therefore, you should be most concerned with the routes of exposure that can occur through air, especially inhalation of agent vapors or aerosols. It is much less likely that you will encounter casualties who have ingested chemical agent or come into direct contact with agent in liquid form.	Display Overhead ACT032.
B. Description of Blister Agents (Vesicants) Vesicants are poisons that destroy individual cells in target tissues. The most noticeable effect that these agents have is the "vesicles," or blisters, they cause. For this reason, these types of agents are also referred to as "blister agents." Since most people are familiar with the lay term, this program uses the term "blister" to describe this category of chemical agent.	Display Overhead ACT033.
1. Specific Names a. While the term "blister agent" refers to a particular action of chemical warfare agents, there are specific common names and abbreviations that are associated with this group. - Mustard, common name: H, HD, HT - Lewisite, common name: L	Display Overhead ACT034.
b. Although the Lewisite agent is in the blister agent family, there is very little of this chemical remaining and it is all stored at Deseret Chemical Depot.	Refer trainees to the Material Safety Data Sheets that are available in the Appendix C.

2. Physical Properties	Display Overhead ACT035.
a. Solid or Liquid	
In their normal state, mustard blister agents are either solids or liquids. They solidify at fairly high temperatures (13-15°C or 55-50°F). If they are heated, these liquids are volatile—they generate vapors. Mustard agent is an oily liquid that burns well once ignited.	Turn to Table 4.2 in your Student Manual. This table provides a summary of the physical properties of the different blister agents. More detailed descriptions can be found in the Student Guide for the CSEPP Chemical Awareness Course. The student should have completed that course before beginning ACTFAST training.
3. Mechanisms of Action	Display Overhead ACT036.
a. Blister agents can affect any skin tissue, but are especially harsh to warm, moist surfaces of the body and to delicate tissue such as the soft membrane surrounding the eyes, eyeball, lung tissue, and tissues of the mouth and throat. Both the liquid itself and the vapors generated from mustard create an extreme hazard. The greater the absorbed dose of either, the greater the damage.	
b. Damage to Cell Membranes	Display Overhead ACT037.
Mustard agent is a cellular poison; cell membranes are damaged within minutes after exposure. Severity of skin and tissue damage is highly dose-dependent.	
c. The delayed reaction is what makes mustard blister agents insidious. There is little or no pain at the time of exposure. The development of clinical signs such as burning, stinging, redness, or blisters is usually delayed between 2 and 24 hours, occasionally even up to 36 hours.	

4. Routes of Exposure

   a. A critical step in the treatment of patients of blister agent exposure is to decontaminate. Since mustards are also carcinogenic agents (capable of causing cancer), it is doubly critical that the patient be decontaminated quickly and thoroughly. In order to do this, you must understand how the blister agent is capable of entering the body. By knowing this, you are better able to treat the patient and provide protection for yourself and others.

   b. The warfare function of the blister agents is to decrease the opponent's ability to fight by producing chemical burns on tissues that come into contact with either vapors or liquid droplets/aerosols. Exposed skin surfaces, eyes, the respiratory tract, and upper gastrointestinal tract are all at risk. The moist surfaces of perspiring skin, conjunctiva of the eye, airway mucosa or mucous membranes preferentially absorb mustard agent and distribute it over a larger area. The unprotected eye is considered the most sensitive organ to the action of H-agents, and ambient temperature and humidity govern the degree of "casualty effect." Under hot, humid conditions when large areas of skin are likely to be wet with perspiration, much lower mustard concentrations generate debilitating effects.

   c. Main Routes

      There are three main routes, or ways that a person can be exposed to a blister agent. They are:

      - inhalation–breathing air that has been contaminated by vapors or droplets of blister agents
      - direct contact–agent contact with skin, mucous membranes, or eyes
      - ingestion–swallowing contaminated food or drink

Display Overhead ACT038.

(1) Inhalation

Although the blister agents may be stored as liquids, they are easily changed into vapors which may be inhaled. These vapors mix freely with the air. If a person inhales the contaminated air, the toxic chemical enters the body through the respiratory system.

Once inhaled, the blister agents also have direct access to the lining of the nose, the throat, and the bronchial tubes. These warm, moist membranes are particularly vulnerable to the effects of the mustard agent. With prolonged exposure, the mustard agent destroys the mucous membrane lining—just as skin blisters damage the outer layer of skin—causing internal inflammation and hemorrhage and allowing the airways and lungs to become infected. Blister agents do most damage to the upper airways, but with a heavy exposure, the air sacs in the lungs can be injured and filled with fluids.

Display Overhead ACT039.

(2) Direct Contact

Direct contact occurs when any skin surface or the eye touches the liquid agent or touches a surface on which the agent has been deposited. It is through this method that contamination from one patient to another is highly possible unless strict decontamination procedures have been followed.

Unlike nerve agents, blister agents are highly damaging to the skin. This is one reason that chemical protective gloves must be worn to protect your hands while treating patients. Blister fluid is non-irritating and does not cause vesication upon contact with skin.

Display Overhead ACT040.

Warm, moist membranes are very susceptible to the effects of blister agents. These membranes include the lining around the eyelids, the inside of the mouth and nose. Since warmth and moisture increase the blister agent's effect, other body areas are particularly susceptible to severe blistering. Examples of these areas are: between the toes, behind the knees, the buttocks, in the groin, the elbows, the arm pits, folds of the neck, and behind the ears.

(3) Ingestion

Display Overhead ACT041.

If blister agent has deposited on or in food items, drink, or anything that a person may place in the mouth (e.g., cigarettes), the agent can injure the warm, moist tissues of the mouth, throat, and esophagus. Incidental hand-to-mouth contact, smoking and swallowing airborne contaminants are examples of potential exposure routes. Although the likelihood of the agent contaminating food or drink is small, you should be aware that it is possible for someone to become exposed through ingestion. As with nerve agent precautions, common sense dictates that:

* absolutely no food or beverages should be kept in or around treatment areas, and
* when treating or caring for patients, do not give anything by mouth.

(4) Critical route of exposure

Display Overhead ACT042.

A chemical agent release is most likely to affect surrounding communities if agent vapors or aerosols are transported in an airborne plume. For this reason, experts have recommended that you be well prepared to handle exposures that have been caused through atmospheric transport of contamination.

Therefore, you should be most concerned with the routes of exposure that can occur through air, especially inhalation of agent vapors or aerosols. It is much less likely that you will encounter casualties who have ingested chemical agent or come into direct contact with agent in liquid form.	
(5) Lewisite	Display Overhead ACT043.
a. Lewisite (L) is a different type of blister agent that exists in the stored chemical stockpile only at Deseret Chemical Depot. It is chlorovinyldichloroarsine, an organic arsenical, which causes immediate pains upon skin or eye contact. Thus, Lewisite is unlike the mustards that cause little or no pain at the time of exposure. Lewisite is a suspected carcinogen.	
III. Summary	Turn to page 4-23 in Student Manual. Review "Summary" section.
The most important points for you to learn in this module are:	
- Nerve agent characteristics:	Display Overhead ACT044A.
* are stored as liquids (VX oily) that emit extremely toxic vapors * can be absorbed through the skin and spread by direct contact (touch), inhalation (breathing of contaminated air), and ingestion (eating or drinking)	
- Blister agent characteristics:	Display Overhead ACT044B.
* are stored as solids or liquids (thick and oily), but can generate toxic vapors * can be absorbed through the skin and spread by direct contact (touch) inhalation (breathing of contaminated air), and ingestion (eating or drinking)	

- Most likely route of exposure: * inhalation of contaminated air	Display Overhead ACT045.
IV. Self-Checks Let's check how well you have learned the information in this module. Complete the self-check in your Student Manual, then we will review.	Turn to page 4-20 in the Student Manual.

Contents	SIGNS AND SYMPTOMS Instructor Notes
I. Introduction	Display Overhead ACT046.
A. The most important part of medical treatment given to patients of nerve and blister agents is first aid and special treatment. As an EMT, you must be prepared to act fast. The decisions made during the first few seconds, especially in cases of severe nerve agent exposure, are extremely critical and can make the difference between life and death.	
B. In order to make correct decisions, you must have the required knowledge upon which to base those decisions. In the case of patients of agent exposure, where first-responder treatment is so critical, you must be able to size up the situation based on – the known information regarding an accidental release, and – recognition of the event based on signs and symptoms	Display Overhead ACT047.
C. While standard procedure allows for full disclosure and wide-spread notification in the event of an accidental release, we must also allow for the possibility of an unknown accidental release or time lags in communicating important information. For this reason, you must be prepared to act based on present indications. This is only possible if you are fully knowledgeable of the signs and symptoms produced by exposure to nerve and blister agents.	
D. In addition, as with any first aid rendered for poisoning, the specific treatment and/or antidote depends on the chemical inflicting the illness or injury. You must be able to identify the agent involved before beginning treatment.	
E. Objectives of this Module At the end of this module, you will be able to: – IDENTIFY the signs and symptoms of nerve agent exposure – IDENTIFY the signs and symptoms of blister agent exposure	Display Overhead ACT048.

F. Review Most Important Points

Review the most important points in the module

Ask trainees to turn to page 5-3 in the Student Manual and review the most important points in this module.

II. Signs and Symptoms of Nerve Agent Exposure

The signs and symptoms of nerve agent exposure differ from those that result from blister agent exposure.

Refer trainees to Appendix C to the Material Safety Data Sheets (MSDS) for nerve agents which contain additional information on nerve agent signs and symptoms. (See "Addendum A" in the MSDS.)

A. Specific Signs and Symptoms

Signs are objective evidence of a medical condition or disease (e.g., drooling), while symptoms are subjective evidence of physical disturbance or disease (e.g., headaches). The health care worker can see or measure signs, while symptoms usually have to be verbally communicated by the patient. There are several physical signs to look for in determining if someone has been exposed to a nerve agent. Some signs are caused by local effects of the vapor on the organ (eye or skin) and may or may not correlate with the effects of the agent on the central nervous system. Other signs are the direct result of the chemical effect.

Note that not all signs and symptoms may appear. Amount exposed to, duration, and route of entry make a difference.

Display Overhead ACT049.

1. Miosis

Display Overhead ACT050.

Miosis, or pinpointing of the eye's pupil, is one of the initial effects if the person is exposed to a nerve agent vapor. This sign is a direct effect of nerve agent vapor in the eye.

Miosis may appear in one eye, but most often appears in both eyes.

2. Dim Vision

   If the person has had mild exposure, he or she may complain of general eye pain, describing the pain as “somewhere deep in my eye” or “somewhere deep in my head.” The patient may complain of dim or blurred vision. He or she may squint often in an attempt to clear up the blurred vision. You may notice that the patient blinks more often than usual; this is a sign that the eyes are affected. The patient may also complain of the sensation of pressure in the eyes.

3. Respiratory Trouble

   Watch for these signs and symptoms as indicators that the agent may be contributing to respiratory failure.

   – difficulty in breathing
   – runny nose
   – coughing, frothy secretions, and drooling
   – wheezing

   a. Difficulty in Breathing

      The patient shows signs of labored breathing and may complain of a tight chest feeling. Remember that the muscles can be severely affected by the nerve agent’s ability to overwork the muscle cells to exhaustion.

      Such an effect on the respiratory muscles makes breathing difficult.

      Pay particular attention to this sign. Adequate ventilation must be maintained since respiratory failure is the chief cause of death following severe exposures. Without adequate atropinization, ventilatory support, and airway management, a severely exposed person may stop breathing.

b. Increased Oral/Nasal Secretions

Another indication that the agent is interfering with respiratory function is an abundance of mucous secretions from the respiratory passages. The patient drools at the mouth and has a very runny nose.

4. Localized Sweating

If the nerve agent has affected nerves that are connected to sweat glands, the patient may sweat profusely. Again, this is due to the over-stimulation caused when nerve agent interferes with the normal function of nerves that control the glands.

5. Gastrointestinal Symptoms

a. Nausea and Vomiting

If exposure was through the skin or by swallowing, gastrointestinal effects of nausea, vomiting, and diarrhea may be the first systemic effects to appear. These GI effects can also occur after moderate to severe inhalation exposure.

b. Abdominal Cramping

Increased activity of the intestines may lead to cramps or pain in the abdomen.

c. Involuntary Urination or Defecation

The bladder and bowel, normally controlled through sphincter muscles, may become incontinent. The patient may also exhibit diarrhea.

6. Heartbeat Irregularities (Arrhythmias)

Because the heart is a muscular organ, it too is susceptible to over-stimulation by the nerve agent.

7. Generalized Weakness

   Because the nerve agent also affects that portion of the nervous system that controls the skeletal muscles, the patient may have an overall weak feeling that increases with exertion.

Display Overhead ACT051.

8. Twitching or Muscle Spasms

   If the affected nerve is connected to a muscle, the muscle action becomes uncontrollable and repetitive. You may notice this effect as twitching or muscle spasms. Spasms of local muscle groups, usually at the site of exposure, resemble what has been likened to "a bag of worms." The term "fasciclation" is used to describe this type of motion. Muscle twitching and cramps may become more generalized.

9. Convulsions and Coma

   If severe cases, nerve agent patients may convulse, become comatose, and stop breathing.

10. Other Symptoms

    Other signs and symptoms, also caused by accumulation of acetylcholine, result from effects on the central nervous system (brain and spinal cord). These are seen with early or mild exposure. The result may be:

    – headache
    – anxiety
    – restlessness
    – giddiness
    – irritability

B. Factors that Affect Nerve Agent Exposure Signs and Symptoms

Display Overhead ACT052.

1. Time Factor (Onset)

   a. While the signs and symptoms of nerve agent exposure often begin immediately, they may also be delayed. In addition,

some particular signs may appear much sooner than others. Onset time, and whether or not the symptom shows up at all, depends on several factors:

* type of agent
* amount of agent to which the patient has been exposed
* dose (how much patient has absorbed)
* duration of the exposure
* route of exposure (inhalation, direct contact, ingestion)
* sensitivity of the patient's system (depends on general state of health, age, gender, etc.)

b. However, as a general rule, the reaction time to a nerve agent is:

Display Overhead ACT053.

* immediate if moderate to large amounts (relative to LD_{50}) are inhaled
* immediate if moderate to large amounts (relative to LD_{50}) are spilled onto the skin
* delayed if small amounts (relative to LD_{50}) are involved
* delayed if agent has been absorbed through the skin in a small localized area (takes time to absorb and take action)

2. Peak Effect

Display Overhead ACT054.

a. Exposure through inhalation

If the exposure route is inhalation of air with a high concentration of agent, the effects can occur after a single breath. This "immediate" response occurs within seconds. After the patient has been removed from the exposure, look for the effects to peak within 15-20 minutes. Generally, you can be reasonably certain that if the exposure was through air (only) and the time lapse has been 15 minutes or later, the effects have maximized—they will not worsen after this time.

b. Exposure through Skin/Absorption If the exposure route is dermal (droplet or liquid or vapor that touches the skin), absorption may continue for hours. This is likely to continue even after decontamination is completed since the absorption occurs within the skin layers and from fatty deposits. In contrast to the air route (where the worst can be expected within 15-20 minutes), the effects of direct skin contact may not occur for hours after exposure (range 1-18 hours). On the plus side, however, effects that occur many hours after exposure are usually non-lethal.	Display Overhead ACT055.
3. Toxicity The lethal dose (LD_{50}) of liquid nerve agent VX is 10 milligrams on the skin of a 70-kg man. This is approximately equivalent to a small droplet being absorbed through the skin of a 155-pound person. By the inhalation route, VX vapor (considered the most potent nerve agent) is 50 times more toxic than cyanide gas (LCt_{50} of 30 mg-min/m^3). The LD_{50} of GB agent is approximately 1.7 gram on the skin of a 70-kg man. The median lethal dose (LCt_{50}) from inhalation of GB vapor is 70 mg-min/m^3.	Display Overhead ACT056.
4. Lethality The chief cause of death due to nerve agent exposure is respiratory failure. The contributing biological effects are bronchoconstriction and secretions in the airways, weakness of the muscles that force the lungs to expand and contract, and inhibition of the respiratory center in the brain	Display Overhead ACT057. *Ask class: Will a person exhibit all of the signs and symptoms of nerve agent poisoning after being exposed? Response should be: No. Some of the signs and symptoms are dependent on several different factors. Some patients may exhibit only one or two signs; others may experience several symptoms*

	at the same time. In addition, the time factor for when these signs and symptoms begin to appear may also differ from person to person. Remember, there are large differences in sensitivity between persons.
C. Signs and Symptoms By Degree of Severity	
Although any and all of the signs and symptoms mentioned in this module may appear, they are more likely to appear according to the severity of the exposure by route.	Turn to page 5-12 and page 5-13 in the Student Manual. Review tables with trainees.
1. Review Table 5.3. Table 5.3 indicates the degree of severity of the exposure to nerve agent vapor, the part of the body affected, and the symptoms you will see.	
a. Mild Exposure (may also be effects of an initial reaction leading to a more serious reaction). – Eyes - miosis, pain (deep in eye or head); dim or blurred vision – Nose – runny – Lungs – tightness in chest, bronchoconstriction, secretions in airways, cough, moderate difficulty in breathing.	Display Overhead ACT058A.
b. Moderate Exposure (may also include symptoms seen as “Mild”) – Eyes - miosis, pain, dim or blurred vision – Nose - runny (severe), nasal congestion – Lungs – tightness in chest, breathing more difficult, secretions more abundant – Muscles - feeling of generalized weakness, generalized twitching of large muscle groups – GI - nausea, vomiting, diarrhea, cramps	Display Overhead ACT058B.

c. Severe Exposure (may develop from symptoms seen as “Mild” and “Moderate”, or go directly to these symptoms) – Muscles - convulsions, weakness with eventual flaccid paralysis – Lungs - cessation of respiration – (All) - loss of consciousness, coma, death	Display Overhead ACT058C.
d. Course of Time (for symptoms to appear) The onset time may be seconds to several minutes. Symptoms may occur after little more than one breath of nerve agent vapor; large amounts may cause reactions within seconds. Effects do not worsen appreciably after 15-20 minutes following the cessation of agent exposure.	Display Overhead ACT058D.
2. Review Table 5.4. Table 5.4 indicates the degree of severity of the exposure to nerve agent vapor through the skin, the part of the body affected, and the symptoms you will see.	
a. Mild Exposure (may also be effects of an initial reaction leading to a more serious reaction). – Skin - sweating at exposure site – Muscle - localized, unorganized fasciculation at exposure site (bag of worms)	Display Overhead ACT058E.
b. Moderate Exposure (may also include symptoms seen as “Mild”) – Muscle - generalized (at random, all over) fasciculation and twitching; generalized weakness that increases with any form of activity – GI – nausea, vomiting, diarrhea	Display Overhead ACT058F.

c. Severe Exposure (may develop from symptoms seen as "Mild" and "Moderate", or go directly to these symptoms) – Muscle - extremely weak; convulsions (seizures) with eventual flaccid paralysis – Lung - cessation of respiration – (All) – sudden loss of consciousness and collapse, death	Display Overhead ACT058G.
d. Course of Time (for symptoms to appear) The onset time may be minutes to several hours. The larger the exposure the shorter the onset time. After a large exposure (lethal amount or greater), the effects may occur within minutes; after an asymptomatic period, the first effect may be loss of consciousness. Onset time may be as long as 18 hours after exposure; however, in such cases the effects are usually not lethal.	Display Overhead ACT058H.
D. Differential Diagnosis - Nerve Agent	Display Overhead ACT059.
1. The symptoms we have just described may be caused by health problems other than exposure to a nerve agent. It is important to determine whether or not a person is suffering from actual nerve agent exposure before any nerve agent antidote is given.	
2. Differential diagnosis refers to distinguishing one disease from another when two or more diseases produce the same or similar effect. One of the first steps in providing treatment to patients of any agent exposure is the verification of the type of agent that is involved.	
3. In some cases, you will know what agent is involved before arriving at the scene. If an accidental release occurs at the storage location, authorities are notified. In such a situation, agent identification is through a "known release."	

E. Other Possible Causes of Symptoms

Display Overhead ACT060.

1. The signs and symptoms described as nerve agent effects (taken in isolation) may also be attributed to:

   – epilepsy
   – gastroenteritis
   – exposure to agricultural insecticides (organophosphates and carbamates)
   – emphysema
   – stroke
   – head trauma
   – drug overdose
   – heat illnesses

2. Examine and question the patient closely for other signs and symptoms of what may or may not be nerve agent poisoning. Gaining medical history from the patient or, if patient is unconscious, looking at medic alert bracelets or cards may assist in making the correct diagnosis.

III. Signs and Symptoms of Blister Agent Exposure

The signs and symptoms of blister agent exposure are different from those that are produced as a result of exposure to a nerve agent.

Refer trainees to the Material Safety Data Sheets (MSDS) in Appendix C for blister agents which contain additional information on blister agent signs and symptoms. (See "Addendum A" in the MSDS.)

A. Specific Signs and Symptoms

In this module, we will cover information and illustrations for sulfur mustard blister agent only; Lewisite is present at only one site and is addressed separately at the end of this module.

While liquid deposition of agent or high concentrations of vapor are not expected off the installations, it is important to recognize the signs and symptoms of more severe exposure.

Display Overhead ACT061A.

The severity of the symptoms and the rapidity with which they develop are greatly influenced by weather conditions as well as degree of exposure. Hot, humid weather significantly increases the action of mustard.

Following mustard exposure, the onset of clinical signs and symptoms is characteristically delayed for a period of hours. However, there are several physical signs to look for in determining if someone has been exposed to mustard agent.

1. Eye Irritation/Inflammation

   Display Overhead ACT061B.

   a. The eyes are extremely susceptible to mustard agent vapors due to the sensitivity of the mucous membranes of the eyelid and surrounding tissue. Effects include tearing, itching, blinking, reddening of eye tissue, and a sensation of "grit" in the eye. These effects occur at lower doses more often than any other effect. For this reason, this particular set of signs is the most sensitive indicator of a mustard agent exposure.

   b. The eyelids may swell to the extent that the eyes are completely closed. Burning pain can be severe. In severe cases, the cornea can become ulcerated. Patients may be alarmed and think they are blind.

      However, it is only the swelling that obstructs vision.

2. Photophobia

   If the eyes are exposed to mustard agent vapors, the person may experience photophobia, or pain caused by light. Light may also cause general discomfort, and not necessarily pain.

3. Erythema (Reddening of Exposed Skin)

    a. One of the earliest signs of dermal exposure is a skin rash or reddening (erythema) that resembles sunburn. Itching and/or burning pain often accompany erythema. With mustard, erythema typically occurs between 4 and 6 hours after exposure; the range of onset time is 2 to 24 hours.

    b. Because the mustard agents are absorbed faster in warm, moist areas of the body, certain areas are more likely to be affected much quicker. Such body areas include the armpits, anal-genital area, between fingers and toes, membranes surrounding the eyes, lungs, skin folds of the neck, and creases of elbows and knees.

4. Blisters

    Display Overhead ACT061C.

    a. If not immediately decontaminated or if exposure has been severe, the reddened skin develops into fluid-filled blisters. These blisters, if crudely broken, could become infected.

    b. The blisters, like serious chemical burns, may not be painful initially. However, pain and itching may occur not long after blisters develop, then subside, then reoccur a few days later as healing progresses.

    c. Care must be taken to avoid introducing infection into the blister wounds. Because of the damage to the skin tissues and the immunosuppressive action of the sulfur mustard, the person's ability to fight infection has been diminished. This same precaution is used for any type of massive surface injury (such as thermal burns).

    d. Blisters may appear two hours after exposure, however, they often do not appear for at least six hours. In some cases, blisters may not appear for as long as 36 hours after exposure.

5. Inflammation of the Respiratory Tract

a. If inhaled, the mustard agent can be extremely devastating, although not necessarily fatal. It causes edema (swelling) and necrosis of the mucus membrane of the airways, resulting in internal inflammation and blistering of the throat and lungs. Tracheobronchitis in the first 12 hours after mustard exposure is characteristic; and can be identified by hoarseness, hacking non-productive cough, chest tightness, and increased respiratory rate.

b. Depending on the severity of the exposure, the inflammation can cause a substantial amount of fluid to build up in the lungs. The combined effect of fluids and inflammation can obstruct the respiratory tract. Mustard agents do the most damage to the upper airways, but with a heavy exposure, the air sacs in the lungs can be injured.

c. First signs of respiratory tract damage from mustard usually appear within 2 hours after exposure; severity of response may increase for up to 24-48 hours later. For low-dose cases, initial symptom onset may be delayed for up to 36 hours after exposure.

d. A mild exposure to mustard agent can cause slight to moderate irritation of the lining of the nose and mouth. It has been likened to a “very sore throat feeling, even without swallowing” that extends from the mouth, nose, and all the way down the back of the throat.

6. Systemic and Gastrointestinal Effects of Mustard

   Ingestion of food or water contaminated by liquid mustard produces nausea and vomiting, pain, and sometimes diarrhea or constipation. Mustard vapor does not significantly contaminate food or water. Exposure of only the skin to mustard may cause systemic symptoms such as malaise, nausea, vomiting, and fever at about the

time the skin reddens. Exceptional cases of severe systemic mustard poisoning may also present central nervous system symptoms such as cerebral depression and other effects such as cardiac irregularities. Shock may occur. Severe systemic effects do not occur with lesser mustard exposures.

b. With lesser skin or respiratory exposures to mustard, no apparent systemic lesions develop. However, with amounts approaching a lethal dose, injury to the blood-forming tissues (bone marrow, lymph nodes, and spleen) may result.

B. Factors that Affect Mustard Agent Signs and Symptoms

Display Overhead ACT062.

1. Time Factor (Onset)

a. Although the signs and symptoms of mustard agent exposure are characteristically delayed, they may appear quickly if the person has been exposed to a large quantity. Depending on these factors, some signs may appear much sooner than others. Just as with nerve agent exposure, the onset of symptoms depends on:

* type of agent
* amount of agent to which the patient has been exposed
* dose (how much patient has absorbed)
* duration of exposure
* route of exposure (inhalation, contact, ingestion)
* sensitivity of the patient's system (depends on general state of health, age, gender, etc.)

If the mustard agent has been inhaled, it causes a much quicker reaction than exposure through skin contact. This is because the agent is absorbed much faster in warm, moist areas (in this case, the respiratory tract) and is not as easily removed once inhaled. The soft membranes inside the nose, mouth, throat

and bronchial tubes are extremely susceptible to the harsh effects of the mustard agent vapor.	
2. Peak Effect	Display Overhead ACT063.
a. Exposure through Inhalation If the exposure route is inhalation, the effects can occur after a few hours of latency. The onset is usually accompanied by sneezing, coughing, and tracheobronchitis.	
b. Exposure through Skin Absorption If the exposure route is dermal (droplet or liquid or vapor that touches the skin), the effects are usually delayed and absorption may continue for hours. This is likely to continue even after decontamination since the absorption may continue deep within the skin layer.	
c. Toxicity The median lethal dose (LD_{50}) of mustard agent is 7 grams per 70 kilogram man (liquid on skin). This is equivalent to about 1 teaspoon. Between 4 and 32 micrograms are enough to cause erythema and blistering. By the inhalation route, mustard vapor is three times more toxic than cyanide gas.	Display Overhead ACT064.
d. Lethality The chief causes of death from blister agent exposure are usually (1) respiratory failure due to damage caused to lungs and airways and (2) infections due to the combination of airway damage and suppressed immune response mechanisms (e.g., pneumonia, etc.).	
However, mustard exposures are rarely lethal; with the massive numbers of soldiers exposed in World War I, approximately 3% died.	Ask class: Will a person exhibit all of the signs and symptoms of mustard agent poisoning after being exposed? Response should be: No. Some of the signs and

	symptoms described are very dependent on the dose received, the sensitivity of that individual, and the route of exposure (inhaled, direct skin contact).
C. Signs and Symptoms by Degree of Severity	
Although any and all of the signs and symptoms mentioned in this module may appear, they are more likely to appear according to the severity of the exposure by route	Turn to page 5-22 and page 5-23 in the Student Manual. Review tables with trainees.
1. Review Table 5.6.	
Table 5.6 indicates the degree of severity of the exposure through direct contact to mustard agent, the part of the body affected, and the symptoms you will see.	
a. Mild Exposure	Display Overhead ACT065A.
– Skin - no immediate clinical effects (no burning, stinging, or redness); becomes fixed to the tissue within minutes, blisters appear about 2 to 36 hours later – Eyes - within 4-12 hours after exposure, itching, tearing, conjunctivitis (reddening of tissues surrounding the eyeball), sensation of grit in the eye, burning and photophobia (sensitivity to light), some swelling of eyelids.	
b. Moderate Exposure	Display Overhead ACT065B.
– Skin - no immediate clinical effects; blisters appear sooner and are more severe than in cases of mild dose Eyes - within 3-6 hours after exposure, increased intensity of mild symptoms, edema (swelling) of lids to the point of near closure; spasms of the muscles surrounding the eye; increased photophobia; blurred vision; possible discharge; miosis may also occur; severe inflammation of conjunctiva and cornea.	

c. Severe Exposure – Skin - no immediate clinical effects; blisters appear sooner and are large; necrosis; skin charring may be evident later – Eyes - severe pain, increased swelling of lids to point of closure, discharge; possible damage to cornea – Muscles - large amounts may affect nerve endings	Display Overhead ACT065C.
2. Review Table 5.7. Table 5.7 indicates the degree of severity of the exposure through inhalation/ingestion to mustard agent, the part of the body affected, and the symptoms you will see.	
a. Mild Exposure – Nose, throat, windpipe - burning sensation, sinus pain, cough – GI - nausea and vomiting.	Display Overhead ACT065D.
b. Moderate Exposure – Nose, throat, windpipe - burning sensation – Lungs - chest tightness, severe cough – GI - nausea and vomiting, stomach pains	Display Overhead ACT065E.
c. Severe Exposure – Nose, throat, windpipe - severe burning – Lungs - difficulty breathing due to airway damage – GI - nausea vomiting, bloody diarrhea, stomach pains – Muscles - large amounts may affect nerve endings	Display Overhead ACT065F.
d. Course of Time (for symptoms to appear) The onset of symptoms may be delayed 2 to 36 hours; initial signs and symptoms are those of acute tracheobronchitis. Approximate time course for moderate	Display Overhead ACT066.

exposure: 2-4 hours, chest tightness, hacking cough, hoarseness, sneezing; 4-16 hours sinus pain, increased respiration rate; 16-48 hours, severe cough, unable to speak, very rapid breathing; 24-48 hours, severe dyspnea, lung tissue hemorrhage, bronchopneumonia.	
D. Lewisite Signs and Symptoms	Display Overhead ACT067A.
1. Although Lewisite differs from the mustard agents in its chemical composition and method of action, it too destroys individual cells in target tissues.	
2. When inhaled, Lewisite vapor may produce mild to moderate irritation of the upper respiratory tract. It may also cause sneezing. This is similar to mustard effects, except in the most severe cases, when excess fluid may accumulate in the lungs and fluid may ooze into spaces between the pleural membranes lining the chest cavity.	Display Overhead ACT067B.
3. Lewisite does not exhibit the latency period of mustard; liquid Lewisite causes immediate severe pain upon contact with the eyes and skin. The eye can be severely damaged, with immediate stinging pain and twitching of the muscles around the eyes; swelling of the conjunctivae and lids that may close the eye within 1 hour; inflammation of the iris and corneal damage. Within hours the swelling subsides, Mild conjunctivitis may heal in a few days without specific treatment, but severe exposure may cause permanent injury or blindness. Contact with liquid Lewisite produces more severe skin lesions than does mustard. Erythema is followed by blistering over the entire area of erythema. There is also deeper injury to connective tissue and muscle, greater vascular damage, and more inflammation. The pain is immediate and becomes deep and aching. Itching and irritation persist for a day, and blisters develop fully in one-half of that time.	Display Overhead ACT067C.

5. Lewisite is also known to be systemic poison (liver and kidneys) at the sufficiently large doses and has induced Bowen's disease, a relatively slow-growing and usually nonfatal form of skin cancer, among exposed soldiers and poison gas factory workers

Display Overhead ACT067D.

6. Table 5.8 outlines the signs and symptoms of Lewisite and the site of the action:

Display Overhead ACT067E.

- Eye – Prompt redness, swelling, irritation, immediate burning sensation, may cause inflammation of iris, corneal injury
- Nose – Prompt irritation
- Respiratory tract - Rapid irritation, hoarseness, loss of voice, cough. Pneumonia, fever, accumulation of fluid in lungs (in severe cases), fluid between pleural membranes
- Skin - Prompt burning redness within 30 min, blisters on 1st or 2nd day. Pain more severe and necrosis deeper than mustard.

Display Overhead ACT067F.

- GI Tract – Diarrhea, nausea, vomiting, liver failure
- Cardiovascular system - Shock after severe symptoms, anemia due to
- destruction of red blood cells, concentration of blood due to loss of body fluid or plasma
- Bladder – Kidney Failure
- Central Nervous System - Malaise, prostration, depression after severe symptoms

Display Overhead ACT067G.

E. Differential Diagnosis – Blister Agents

1. The signs and symptoms described in this module may be caused by health problems other than exposure to a blister agent. It is important to determine whether or not a person is suffering blister agent exposure in order to take decontamination precautions.

2. As mentioned earlier, differential diagnosis refers to distinguishing one disease from another when two or more diseases produce the same or similar effect. One of the first steps in providing treatment to patients of any agent exposure is the verification of the type of agent that is involved. In some cases, you will know what agent is involved before arriving at the scene. If an accidental release occurs at the storage location, authorities are notified. In such a situation, the agent identification is through a "known release." In other cases the release is, for some reason, not discovered until after the fact, and the identification of the agent must be done according to the patient's signs and symptoms.

F. Other Possible Causes of Symptoms

Display Overhead ACT068.

1. The signs and symptoms described as blister agent effects may also be attributed to:

   – hay fever (red eyes)
   – burns - thermal, sun or other chemicals (erythema and/or blisters)
   – large amounts of tear gas exposure (all signs/symptoms)
   – poison ivy, poison oak, other contact allergies

2. As with potential nerve agent exposure, examine and question the patient closely for other signs and symptoms of what may or may not be blister agent poisoning. Gaining medical history from the patient may assist in making the correct diagnosis.

IV. Summary

The most important points that you should have learned from this key module are:

Turn to page 6-3 in the Student Manual.

– The specific signs and symptoms of nerve agent vapor or aerosol exposure: * miosis (pinpointing of the pupils) * increased secretions * respiratory difficulty	Display Overhead ACT069A.
– The specific signs and symptoms of blister agent vapor or aerosol exposure: * eye irritation and inflammation * erythema (reddening of the skin) * blisters * respiratory irritation and distress	Display Overhead ACT069B.
– Fact: Not all signs and symptoms may appear; dose, duration, and route of entry (among other factors) can make a difference	
V. Self-Check	Turn to page 5-27 in the Student Manual.
Let's check how well you have learned the information in this module. Complete the self-check in your Student Manual, then we will review.	

Contents	FIRST AID Instructor Notes
I. Introduction	Display Overhead ACT070.
A. The most important part of medical treatment given to patients of nerve and blister agents is first aid and special treatment. As a first responder, you must be prepared to act fast. The actions taken during the first few minutes, especially in cases of severe nerve agent exposure, are extremely critical and can make the difference between life and death.	
Perhaps when you received your basic EMT training, you were taught the "ABCs of emergency care": – Airway (establish airway), – Breathing (artificial respiration), – Circulation	Display Overhead ACT071.
The initial treatment for patients exposed to nerve and blister agent ranks just as high on this priority list. Just like the ABCs, there is no time to transport or wait for help. You must be prepared to act decisively and immediately.	
B. Objectives for this Module	Display Overhead ACT072.
At the end of this module, you will be able to: – DESCRIBE the need for self-protection when providing treatment for nerve or blister agent exposure. – DESCRIBE the initial first-aid treatment for patients of nerve agents. – DESCRIBE the initial first-aid treatment for patients of blister agents.	
C. Review Important Points	
Review important points in this module.	Ask trainees to turn to page 6-3 in Student Manual and review the most important points in this module.

II. Protecting Yourself: Zones, PPE, and Decontamination

Display Overhead ACT073.

A. Number 1 Rule

1. The first rule in treating of any patient of a toxic agent is to protect yourself. Do not become a patient too. This rule may seem too obvious to even mention, but a short discussion is definitely warranted. For some individuals, especially those who have been in life-saving situations where, with the welfare of the patient foremost in mind and the adrenaline level high, the welfare of "self" is temporarily put aside.

2. However, when treating patients of toxic agent exposure, never forget the cause of the injury you are treating: the chemical agent. It was designed to spread and cause multiple injuries. All of your skill and training are useless to the patient if you are exposed to the agent; not to mention the unnecessary trauma you face as a patient yourself.

3. You can protect yourself by:

Display Overhead ACT074A.

– recognizing the area with exposure potential and the zones set up to operate safely during the emergency.
– ensuring the exposed person is completely decontaminated.

4. If a chemical accident with potential off-post consequences should occur at one of the disposal locations, the general public and all local authorities would immediately be notified. Emergency response and medical treatment would be established at one or more central locations, where people with agent symptoms could be screened and treated.

5. Once a chemical plume from an accident is expected to cross the borders of the installation, and initial hazard prediction will be given that identifies the expected pattern and path of off-post exposure. Emergency response and treatment teams will be established to assist with the treatment of

Display Overhead ACT074B.

Persons exposed. The area expected to be affected by the plume will be restricted, as in other hazardous materials emergency response situations.	
6. It is assumed that patients will have been decontaminated before being brought to EMS personnel in the cold zone (unrestricted or clean area). Information regarding decontamination or removal from contaminated areas should not be interpreted as encouraging EMS personnel to go into the hot zone (the area expected to be under the plume or the contaminated area. It may be necessary for civilian responders, including EMTs, to wear protective clothing and breathing devices to ensure that they are not exposed to chemical agent. The CSEPP training course, *Personal Protective Equipment* (revised in year 2000), identifies the specific clothing and breathing equipment that is approved for use in the program along with associated training, medical, and maintenance policies. The CSEPP policies meet, and in some cases exceed, OSHA regulations.	Display Overhead ACT074C.
B. Decontamination	Display Overhead ACT075.
An essential part of any treatment provided for a patient of a nerve or blister agent is the decontamination, or removal of the agent, which should have been accomplished before the patient is brought to the treatment area. This crucial process not only prevents the agent from doing any further damage, but also, if done correctly, prevents the agent from spreading to others and thereby producing other patients.	Specific instructions for step-by-step contamination reduction measures are covered in the training course, *Response Phase Decontamination for CSEPP*, which the students should have already completed.
C. Administering Drugs	Display Overhead ACT076.
The laws concerning drug administration differ from state to state. Some states require that any administration of atropine and/or 2-PAM chloride be under the orders of a physician. You should be familiar with the laws of your state governing drug administration in emergency situations.	

When you learn the specific provisions for your state regarding emergency drug administration, be sure to complete Section 3.4 in the Student Manual.

III. Initial First Aid Treatment for Nerve Agent Exposure

Treatment for a severe nerve agent exposure must be immediate. Depending on the severity of the exposure, seconds can make the difference between life and death. Patients should be treated only if they have at least two signs and symptoms of nerve agent poisoning.

The first aid treatment for symptomatic patients of nerve agents includes antidote administration, airway management, and decontamination.

A. Antidote

Display Overhead ACT077.

The initial treatment for nerve agent exposure comes as a two-part antidote: (1) **atropine** to counteract the cholinergic effect of the nerve agent, and (2) **2-PAM chloride** which acts by removing agent from cholinesterse and restoring normal control of skeletal muscles.

1. Atropine

Display Overhead ACT078.

Atropine is the first drug used to treat nerve agent exposure. It stops the effect of the nerve agent by blocking the effects of over-stimulation. The antidote relieves the smooth muscle constriction in the lungs and GI tract and dries up respiratory tract secretions. It cannot reverse respiratory muscle paralysis. Atropine is a drug that has long been used in medicine as a pre-anesthetizing agent.

After the initial dose, the need for additional atropine is re-evaluated every few minutes. In cases of severe exposure, additional doses of atropine may be required during the entire trip to the emergency room.

	CAUTION trainees that atropine should not be administered without clear indications of nerve agent poisoning.
2. 2-PAM Chloride (Protopam chloride) The follow-up drug to atropine is 2-PAM chloride (also called Pralidoxime). 2-PAM chloride complements, or completes, the action of atropine by restoring normal functions at the nerve synapse by removing organophosphate from cholinesterase. This antidote is effective at re-establishing normal skeletal muscle contraction (relieves twitching and paralysis of respiratory muscles). The drug, 2-PAM chloride, has side effects if administered too much too rapidly. It should be administered slowly and carefully. Side effects include hypertension, blurred vision, and vomiting.	Display Overhead ACT079.
B. Action of Antidotes	If the videotape is available, show appropriate portions of the videotape at this point.
1. In a patient suffering from nerve agent exposure, the target muscle is overstimulated because of the agents interference with the normal chemical “stop and go” process between the nerve cell and the muscle cell.	
2. If the overstimulation is not interrupted, the muscle can eventually go into a prolonged contraction and become fatigued, or go limp.	
3. When atropine is administered, it blocks the action of the accumulated acetylcholine from stimulating the adjacent muscle cell. The atropine prevents part of the nerve agent action that had overstimulated the muscle cell.	
4. Atropine does not free up acetylcholinesterase to restore normal control of target muscle cells. That is why 2-PAM chloride is given in addition to atropine—it restores the activity of the inhibiting enzyme, acetylcholinesterase. 2-PAM chloride also reduces the need for assisted ventilation since it restores normal control of respiratory muscles.	

C. Recommended Dosages of Atropine/2-PAM Chloride.

The appropriate dosages of atropine and 2-PAM Chloride to administer after an exposure to nerve agent vary depending on the age and body weight of the patient and the severity of the signs and symptoms. Because of the extreme toxicity of nerve agents, the required doses are much higher than those normally administered following exposure to pesticides that are chemically similar to nerve agents.

Display Overhead ACT080.

The recommended doses listed in this section may be repeated as clinically indicated. Atropine treatment should be repeated until the patient is "atropinized" (discussed later in this chapter). Incremental 2-PAM Chloride dosages may be repeated until the maximum dose based on body weight has been given. The treatment lists in this module sometimes indicate that 2-PAM Chloride may be given by a "slow IV." This means that the recommended dosage should be administered over a 20- to 30-minute period in 250 ml of normal saline or 250 ml of 5% dextrose/water solution.

Experience has revealed two common problems with the administration of nerve agent antidotes. The most common problem is underdosage, when too little antidote is administered to relieve the effects of the nerve agent. The second most common problem is the administration of antidotes to patients who have not actually been exposed to nerve agent. Atropine, one of the key antidotes, can produce adverse effects when administered to someone who has not been exposed to organophosphates. The most serious problem would be failing to administer atropine when it was needed.

Display Overhead ACT081.

Nerve agent antidotes may be administered intramuscularly (IM), intravenously (IV), or with a MARK I Chemical Agent Treatment kit. The MARK I kit is an Army product that includes two auto-injectors, one containing 2 mg of atropine, and the other containing 600 mg of 2-PAM Chloride. Auto-injectors containing the two vaccine components are also available commercially. The qualifications

of emergency workers and state and local regulations will determine how the drugs are administered in a specific event.

In addition to the two–drug antidote, diazepam should be administered as an anticonvulsant to patients who are experiencing convulsions and considered for other patients who display signs of severe exposure. The recommended dosages of diazepam vary depending on the patient's age.

Display Overhead ACT082.

1. Adult Dosages

   Adults who have been exposed only to nerve agent vapors and are exhibiting mild signs and symptoms, such as pinpoint pupils and runny nose, should be observed only. For adults experiencing stronger effects, dosages of nerve agent antidotes are based on route of exposure and the severity of signs and symptoms.

Turn to pages 6-9 and 6-10 of the Student Manual and review Tables 6.1 and 6.2. Table 6.1 lists the recommended antidote treatment for adults suffering from exposure to nerve agent vapor. Table 6.2 presents similar information for adults who have come into direct contact with liquid nerve agent.

2. Dosages for Adolescents, Children, and Infants

   A different antidote treatment regimen is recommended for non-adults suffering from nerve agent intoxication. The prescribed dosages of atropine for these people are based on age, while dosages of 2-PAM Chloride are based on body weight.

Turn to page 6-11 of the Student Manual and review Table 6.3 which lists the recommended dosages for non-adult patients

D. Amount to Administer

We have mentioned that atropine treatment tends to be underdosed rather than overdosed. While there is an optimum dosage, that exact amount is often difficult to determine because the exact amount of nerve agent exposure is often impossible, or difficult at best, to determine. To help answer the question, "How much atropine is enough?", follow these guidelines:

– Guidelines

Display Overhead ACT083.

- Make sure atropine is warranted before it is given. The second most common error is giving atropine when the only sign is miosis.

* Administer dosage of atropine recommended in Table 6.1, 6.2, or 6.3 of your Student Manual. Follow up with the recommended dosage of 2-PAM chloride.
* Continue administering the recommended dosage of atropine as recommended in Table 6.1, 6.2, and 6.3 until signs of "atropinization" appear.
* If needed, repeat dosage of 2-PAM chloride as recommended in Table 6.1, 6.2, and 6.3 until maximum total dose is given.

E. Atropinization

"Atropinization" is the term used to describe the noticeable signs that a nerve agent patient has received ample amounts of atropine—the effect of treating with sufficient atropine to decrease respiratory symptoms, relieve bronchospasm, stop sweating, and relieve diarrhea and abdominal cramping under the influence of atropine. Recognition of "atropinization" helps to determine that the patient is not underdosed.

Watch for these signs and symptoms to determine that enough atropine has been given:

Display Overhead ACT084.

– secretions are dry (eyes, nose, bronchi, and mouth are no longer runny)
– breathing is easy

F. Supplies of Atropine

A severely affected patient may need up to 20 mg of atropine the first day. A single patient may require up to four injections, if symptoms dictate, on the way to the hospital.

G. Atropine Overdose

Display Overhead ACT085.

Adverse side effects can result if atropine is given to a person who has not been exposed to a nerve agent. Although the most common mistake in providing atropine treatment (when nerve agent exposure is positive) is to **underdose** rather the **overdose**, an overdose of atropine can result in undesirable effects. Most likely, however, atropine poisoning is caused when it is given but was not needed at all. In comparing the consequences of

both mistakes regarding atropine administration, overdosing is far less serious. Atropine overdose is not usually life-threatening.

1. Signs and Symptoms of Atropine Overdose

   Display Overhead ACT086.

   The following signs and symptoms help to identify atropine effects:

   a. Dilated (Large) Pupils

      The patient's pupils are dilated. Notice that this effect is directly the opposite effect of the nerve agent. The nerve agent causes miosis, or pinpointing of the pupils. When too much atropine is introduced, the pupils are opened almost completely.

   b. Dry Mouth and Skin

      The patient's mouth and skin are dry. Notice that this effect is also the direct opposite of the nerve agent effect. While the nerve agent induces sweating and copious salivation, atropine overdose causes dryness.

   c. Other symptoms

      – rapid pulse
      – red (flushed) skin
      – difficulty urinating
      – confusion; visual hallucinations; delirium
      – temperature control is diminished, resulting in high fever and hot skin
      – intense thirst
      – restlessness

2. Differential Diagnosis of Atropine Overdose

   Display Overhead ACT087A.

   Other causes have been known to produce similar signs:

   – heat stroke
   – locoweed
   – atropine-like medicines used in treating ulcers or other conditions

3. Treatment for Atropine Overdose – Keep cool. – Protect from irrational actions. – Transport to hospital as soon as possible.	Display Overhead ACT087B.
H. Alternate Method of Administration of Antidotes	Display Overhead ACT088.
1. Pre-measured amounts of atropine (2 mg) and 2-PAM chloride (600 mg) antidotes are available in commercially available auto-injectors. Auto-injectors have been approved for civilian use by the Food and Drug Administration in instances involving nerve agents and organophosphorus insecticides. Auto-injectors are simple, compact injection systems that come equipped with a pre-measured amount (dose) of antidote. Atropine auto-injectors are approved for adults and children, but not for infants; 2-PAM chloride auto-injectors have only been approved for adults. The shelf life or atropine and 2-PAM chloride in auto-injectors is approximately 5 years. Detailed practical information on the administration of antidotes via autoinjectors is available in the CSEPP training course. *Use of Autoinjectors by Civilian Emergency Medical Personnel to Treat Civilians Exposed to Nerve Agent.*	
2. Each state has its own laws and regulations governing the services extended by medical personnel, and can make its own determinations regarding method of administration.	
I. Respiratory Support	Display Overhead ACT089.
1. Respiratory support may be required, and should be anticipated as part of the treatment for nerve agent exposure if exposures are severe. Remember that the chief cause of death due to severe nerve agent exposure is respiratory failure. Difficulty in breathing is also one of the major symptoms of nerve agent poisoning.	

2. If the patient has been exposed to a moderate to heavy dose of nerve agent, it is quite likely that respiratory support will be necessary. This support may range from administering oxygen (if breathing is difficult) to providing ventilation, airway management, and suctioning secretions, as needed.

3. In severe nerve agent poisonings, it may not be possible to correct respiratory trouble until enough atropine is given. This is because of the intense bronchoconstriction and heavy secretions that are characteristic of severe poisoning.

4. Ventilation

   Display Overhead ACT090.

   In some cases, ventilation may be required. If the patient must be ventilated, the insertion of an endotracheal tube by a qualified person is recommended. High pressure is required to overcome the resistance of the narrowed airways and increased secretions.

   Some respirating devices, including some that are common on ambulances "pop off" at about 40-45 cm H_2O and will not deliver the pressure needed. If this is true of your equipment, and if you are treating a severely poisoned adult who is "un-atropinized," this will not be enough pressure to ventilate. Check the pressure relief rating of your manual or powered respirator. Up to 70^+ cm H_2O pressure may be needed to ventilate severely poisoned patients.

5. Resuscitation

   If breathing has stopped, give artificial respiration using an approved mask-bag oxygen delivery systems.

IV. Initial First Aid Treatment for Blister Agent Exposure

Display Overhead ACT091.

Treatment for a blister agent exposure must be immediate. There is no available antidote for blister agent poisoning. The best first aid treatment that can be offered consists of immediate removal and decontamination, use of sterile technique, and airway management as necessary.

A. Treatment Details

1. Sterile Technique

   If the blister agent patient is suffering from severe blistering, take precaution after decontamination is complete to protect the injured skin area from infection.

2. Treatment for Eye Contact

   Display Overhead ACT092.

   a. If the agent has gotten to the eyes, speed in decontamination is especially critical. Irreversible damage may be done to the eyes and skin very quickly, even though the effects of this damage may not begin to appear for several hours.

   b. To the patient, the effects of blister agent are first evident in the eyes, though onset may take 1-3 hours. Flush the eyes immediately with water by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages. Make sure that hands and fingers used in this procedure are not contaminated with agent.

   c. If the eyes have been exposed to a blister agent, the person may experience photophobia (sensitivity to light). Dark or opaque glasses help shield the eyes from the light and provide relief from photophobia.

3. Treatment for Skin Contact

   Display Overhead ACT093.

   a. When performing decontamination procedures for blister agents, pay special attention to skin creases (groin, armpits, behind ears, between fingers, etc.). These are the areas where the agent is most likely to cause severe blistering.

b. Once at the hospital, additional treatment of the blisters may be given, as determined by the attending physician. This may include, administration of antibiotic (including application of topical antibiotics) and other treatments common for burn injuries. Calamine or other soothing lotion to relieve burning may be all that is needed if the only effect is a rash.

4. Treatment for Inhalation

Display Overhead ACT094.

a. Respiratory support may be required if the patient has inhaled significant amounts of the blister agent. If blisters have formed in the respiratory tract, breathing may be difficult. Administer oxygen as needed.

b. If breathing has stopped, resuscitate the person. Additional intravenous fluid may be needed, but fluid replacement is not as serious a problem as it would be for thermal burns effecting the same area. Do not overload with intravenous fluids.

V. Initial First Aid Treatment for Lewisite

Display Overhead ACT095.

A. Decontamination of the exposed person should occur immediately, particularly in cases of liquid exposure, in order to avoid deep burns.

B. British Anti-Lewisite (BAL) ointment was developed by British toxicologists prior to World War II to be used as an antidote for Lewisite and arsenical poisoning. However, the antidote is not manufactured at this time.

VI. Summary

Display Overhead ACT096.

The most important points that you should have learned from this key chapter are:

1. The Number 1 Rule in providing treatment for nerve or blister agent exposure is: PROTECT YOURSELF.

2. The initial treatment (first-aid) for nerve agent patients: – Give atropine; followed by 2-PAM chloride – As necessary, support airway management 3. The initial treatment (first-aid) for blister agent patients: – Ensure that patient is decontaminated – If necessary, take precautions for sterile technique and support airway management 4. Atropine overdose can occur if given when there has been no exposure to nerve agent.	
VII. Self-Checks Let's check how well you have learned the information in this module. Complete the self-check in your Student Manual, then we will review.	Turn to page 6-18 in the Student Manual.

Contents	SUMMARY Instructor Notes
I. Review the training objectives for the ACT FAST training program. Upon completion of this training program, the trainee will DEMONSTRATE the knowledge required to recognize signs and symptoms and to provide initial emergency treatment to patients injured by exposure to nerve and blister agents. In order to accomplish this objective, the trainee will be able to: – DESCRIBE the initial first aid treatment for victims of nerve agents exposure. – DESCRIBE the initial first aid treatment for victims of blister agents exposure. – DESCRIBE the potential hazards of nerve agents: what they are, potential route of exposure, and how they work. – DESCRIBE the potential hazards of blister agents: what they are, potential route of exposure, and how they work. – IDENTIFY the signs and symptoms of nerve agent exposure. – IDENTIFY the signs and symptoms of blister agent exposure. II. Review the materials in the Appendices – Appendix A – Source Documents – Appendix B – Glossary – Appendix C – Materials Safety Data Sheets – Appendix D – Self Check Answers III. Administer Final Quiz A. Hand out Final Quizzes. B. Ask trainees to complete without using Study Guide.	

ACT FAST FINAL QUIZ

Multiple Choice

1. The specific nerve agents currently in the U.S. Army's chemical stockpile inventory are:

    a. VX and mustard
    b. VX, mustard and Lewisite
    c. VX, GB, and GA
    d. Lewisite and GB

2. Toxic chemicals that are categorized as "nerve agents" are so called because

    a. they attack the body's nervous system
    b. the agent is essential to the nervous system
    c. they send "electrical" shooting pains throughout the nervous system
    d. the blisters they cause are extremely painful to the nerve endings in the skin tissue

3. Nerve agents affect the nervous system by

    a. killing off the nerve cells
    b. making the central nervous system shut down
    c. blocking the messages sent to the muscle and gland cells
    d. causing the nerve endings to stimulate the connected muscle/gland into a state of over-stimulation

4. A person can be exposed to a nerve agent through all of the following routes EXCEPT:

    a. touching a surface that has the nerve agent on it
    b. inhalation of air that has been contaminated by a nerve agent
    c. eating or drinking anything that has been contaminated by a nerve agent
    d. touching the fluid that seeps from a blister of a person who has been exposed to a blister agent

5. Which of the following skin descriptions presents the most critical condition for nerve agent exposure?

    a. hairy chest
    b. sunburned calf
    c. hand wearing a glove
    d. forearm with cuts and abrasions

6. Toxic chemicals that are categorized as "blister agents" are so called because

    a. an inevitable side-effect caused by the drug antidote for this agent has been known to cause blisters in most people
    b. the most noticeable effects are blisters and the destruction of cells in target tissues
    c. they cause the body to break out in painless sores that resemble tiny chicken pox-like blisters

d. it was named after the chemist who discovered its potential wartime use

7. It is often difficult to detect an exposure to a mustard agent immediately because

   a. the reaction is delayed
   b. the blister does not form for several weeks after exposure
   c. pain is felt immediately but it is difficult to know what the cause of it is
   d. once the blister agent has contacted the skin, the victim no longer has any sensation in that area

8. A person can be exposed to a blister agent through all of the following routes EXCEPT:

   a. touching a surface that has the blister agent on it
   b. inhalation of air that has been contaminated by a blister agent
   c. eating or drinking anything that has been contaminated by a blister agent
   d. touching the fluid that seeps from a blister of a person who has been exposed to a blister agent

9. Lewisite is different from the mustard blister agents in that it

   a. does not cause blisters
   b. it smells like garlic
   c. causes immediate pain upon skin or eye contact
   d. it is made of sulfur

10. Although any form of public exposure during the chemical stockpile destruction process is highly unlikely, the route of exposure that civilian EMTs are recommended to be familiar with is

    a. ingestion through contaminated food
    b. skin exposure through direct contact
    c. spill caused by accident while in transportation
    d. inhalation of contaminated air

Matching

Identify the probable cause of the following signs and symptoms by matching the Sign/Symptom in Column A with the correct Cause in Column B. Notice that your choices in Column B also include: either and neither. This means that—in addition to the choices (a)

nerve agent or (b) blister agent— some of the signs/symptoms may be caused by both agents, or are not caused by either agent.

	Column A Signs/Symptoms	Column B Cause
___ 11.	Miosis	a. nerve agent
___ 12.	difficulty in breathing	b. blister agent
___ 13.	increased oral nasal secretions	c. either; may be caused by both nerve and blister agents
___ 14.	sudden hair loss	
___ 15.	twitching spasms	
___ 16.	Blisters	
___ 17.	localized sweating	d. neither; is not a sign/symptom of nerve nor blister agent
___ 18.	Convulsions	
___ 19.	temporary hearing loss	
___ 20.	burning sensation in mucous membranes around eyes, in nose and mouth	
___ 21.	giddiness	
___ 22.	high blood pressure	
___ 23.	skin rash	
___ 24.	severe burn-like, blisters	
___ 25.	Irregular heart beat	

26. Reaction to a nerve or blister agent, and whether or not a particular sign/symptom shows up at all, depends on several factors which include:

    a. route of exposure; dose concentration; duration of exposure
    b. the duration of the exposure; the common name of the agent
    c. common name of the agent; altitude of the terrain at the time of exposure
    d. the duration of the exposure; whether the agent is classified as unitary or binary

27. The chief cause of death due to nerve agent exposure is

    a. cerebral hemorrhage
    b. respiratory failure
    c. severe bilateral miosis
    d. severe gastroenteritis

28. After being exposed to a nerve agent, a victim will not necessarily display all of the signs/symptoms described in this study guide.

    a. true
    b. false

29. The FIRST step in providing treatment to a victim of nerve or blister agent exposure is

    a. protect yourself
    b. stop the bleeding
    c. decontaminate the victim
    d. transport to the hospital

30. The FAST steps for nerve agent exposure patients must be done

    a. immediately
    b. within 48 hours of exposure
    c. by licensed EMTs under official supervision of the U. S. Army

31. The antidote for victims of nerve agent exposure consists of the following drug/drug combination

    a. atropine only
    b. 2PAM chloride only
    c. both atropine and 2PAM chloride
    d. either atropine or 2PAM chloride

32. The standard initial dose of atropine for adults is

    a. .5 mg
    b. 1 mg
    c. 2 mg
    d. 4 gm

33. The best indicator used to ensure that adequate amounts of atropine are given is

    a. signs of atropinization
    b. the disappearance of miosis
    c. blood pressure of 110/90 or lower
    d. the disappearance of the skin rash

34. In order to determine if additional atropine is needed after the initial dose, an adult exposed to nerve agent vapor and exhibiting severe signs and symptoms is reevaluated:

    a. continually, every 30 minutes
    b. continually, every 3-5 minutes
    c. at the scene, before transport, at the receiving hospital
    d. once at the scene and then again, if necessary, at the receiving hospital

35. The signs and symptoms of atropinization include

a. dry secretions; miosis
b. dry secretions; easy breathing
c. blood pressure of 110/90 or lower; miosis
d. blood pressure of 110/90 or lower; easy breathing

Questions 36 and 37 pertain to First Aid and Special Treatment. Use the treatment choices below to answer each question.

Treatment Choices

1. Ensure that patient is decontaminated
2. Administer atropine/2-PAM chloride
3. Support airway management as necessary

36. The First Aid and Special Treatment protocol for a victim of a nerve agent is

a. 1 and 2
b. 1 and 3
c. 1, 2, and 3
d. 1

37. The First Aid and Special Treatment protocol for a victim of a blister agent is

a. 1 and 2
b. 1 and 3
c. 1, 2, and 3
d. 1

38. The most common mistake made when administering atropine is

a. overdosing
b. underdosing
c. giving atropine when the victim's symptoms are very mild
d. giving atropine when there has been no nerve agent exposure

39. By far, the Most common mistake when treating nerve agent patients is:

a. atropine underdosing
b. atropine overdosing
c. not giving atropine when it is needed
d. giving atropine without giving 2 PAM chloride

40. It is critical that decontamination be done quickly and correctly in order to

    a. minimize adverse effects to the exposed person and prevent secondary contamination
    b. prevent the agent molecules from multiplying and causing uncontrolled, widespread injuries
    c. keep the contamination centralized on one person instead of spreading to several others
    d. reverse the effects of the agent and prevent secondary contamination

41. The EMT should ensure that decontamination occurs

    a. at back door of the ambulance
    b. before patient is brought to initial treatment area
    c. hospital
    d. during transport to hospital

42. When treating a blister agent exposure patient, sterile precautions may be necessary because

    a. the fluid in the blisters can spread the agent
    b. sterile technique accomplishes the same results as decontamination
    c. damage done to the skin can permit infection if the blisters are severe
    d. treatment provided later, at the hospital, requires that the blisters be as sterile as possible for testing

Short Answer

43-44. List 2 main FAST (first aid and special treatment) steps required for nerve agent exposure patients.

a. _____

b. _____

45-46. List 2 main FAST (first aid and special treatment) steps that may be necessary for blister agent exposure patients.

a. _____

b. _____

47-48. List 2 specific signs that sufficient atropine has been administered.

a. _____

b. _____

ACT FAST Final Exam Grading Key

1. c
2. a
3. d
4. d
5. d
6. b
7. a
8. d
9. c
10. d
11. a
12. c
13. a
14. d
15. a
16. b
17. a
18. a
19. d
20. b
21. a
22. d
23. b
24. b
25. c
26. a
27. b
28. a
29. a
30. a
31. c
32. c
33. a
34. b
35. b
36. c
37. b
38. b
39. c
40. a
41. b
42. c
43. (1) administer atropine 2-PAM chloride or (2) support airway management as necessary
44. (1) administer atropine/ 2-PAM chloride or (2) support airway management as necessary
45. (1) take sterile precautions or (2) support airway or (3) decontaminate patient management as necessary
46. (1) take sterile precautions or (2) support airway or (3) decontaminate patient management as necessary
47. (1) secretions are dry or (2) breathing is easy
48. (1) secretions are dry or (2) breathing is easy

INSTRUCTOR SUGGESTIONS

After conducting this course, you may provide direct comments on the course and course materials by using this form if you wish.

1. List any questions from the participants that you could not answer:

2. List any additional information that participants would have liked to have covered in the course:

3. List any information that instructor or participants believed to be incorrect or inadequate:

4. List those features of the training course package that you found to be most useful:

5. Any other comments:

Name _____ Course _____

Phone Number _____ Date Taught _____

Address _____

_____

Return to CSEPP State Training Officer to be forwarded to the CSEPP Training Management Team, FEMA Headquarters.

FEDERAL EMERGENCY MANAGEMENT AGENCY
CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM

PARTICIPANT COURSE EVALUATION FORM

Course Title: _____

Course Code: _____

City: _____ State: _____ FEMA Region: _____

Course Dates: _____ to _____, 19 _____ Instructor: _____

Part 1. The information will be used to compare responses provided in the overall assessment of content and delivery. Please check the appropriate response.

1.a. Indicate the type of organization in which you are employed:

Government	Private Sector
____ Federal	____ Business/Industry
____ State	____ Volunteer Service
____ Local	____ Other _____

b. If you work in a local government, indicate the population size:
___ Below 10,000 ___ 10,000-49,999 ___ 50,000-149,999 ___ Over 150,000

2.a. Indicate the type of agency in which you are employed:

___ Emergency Management	___ Social Service
___ Fire Service	___ Education
___ Law Enforcement	___ EMS/Health Care
___ Public Works/Utilities	___ Other _____

b. Years of experience in this service:
___ Less than 1 ___ 1-5 ___ 6-10 ___ 11-15 ___ 16-20 ___ Over 20

Part 2. This information will be used to assess the effectiveness of the course and to improve the course content.

On a scale of 1 to 5 with 5 being the highest, please mark the response which best reflects your opinion.

	Strongly Disagree 1	2	3	4	Strongly Agree 5	No Opinion
1. Course						
a. Requirements and objectives were clear	_____	_____	_____	_____	_____	_____
b. Activities supported course objectives	_____	_____	_____	_____	_____	_____
c. Printed materials were complete and well organized	_____	_____	_____	_____	_____	_____

	Strongly Disagree 1	2	3	4	Strongly Agree 5	No Opinion
d. Audio/Visual materials were appropriate, visible and effective						
e. Contributed to my knowledge and skills						
f. Was worth recommending to others						

2. What would you do to improve the course? _____

Part 3. This information will be used to assess and improve the quality of individual modules of the course.

On a scale of 1 to 5 with 5 being the highest, please rate each module or unit of instruction. Please use the space provided in item 21 for comments about the modules or units.

	Module	**Quality of Content**
1	Introduction	1 2 3 4 5
2	Background Information	1 2 3 4 5
3	Local Response Information and Procedures	1 2 3 4 5
4	Chemical Agents: Characteristics and Effects	1 2 3 4 5
5	Signs and Symptoms	1 2 3 4 5
6	First Aid and Special Treatment	1 2 3 4 5

21. Comments: _____