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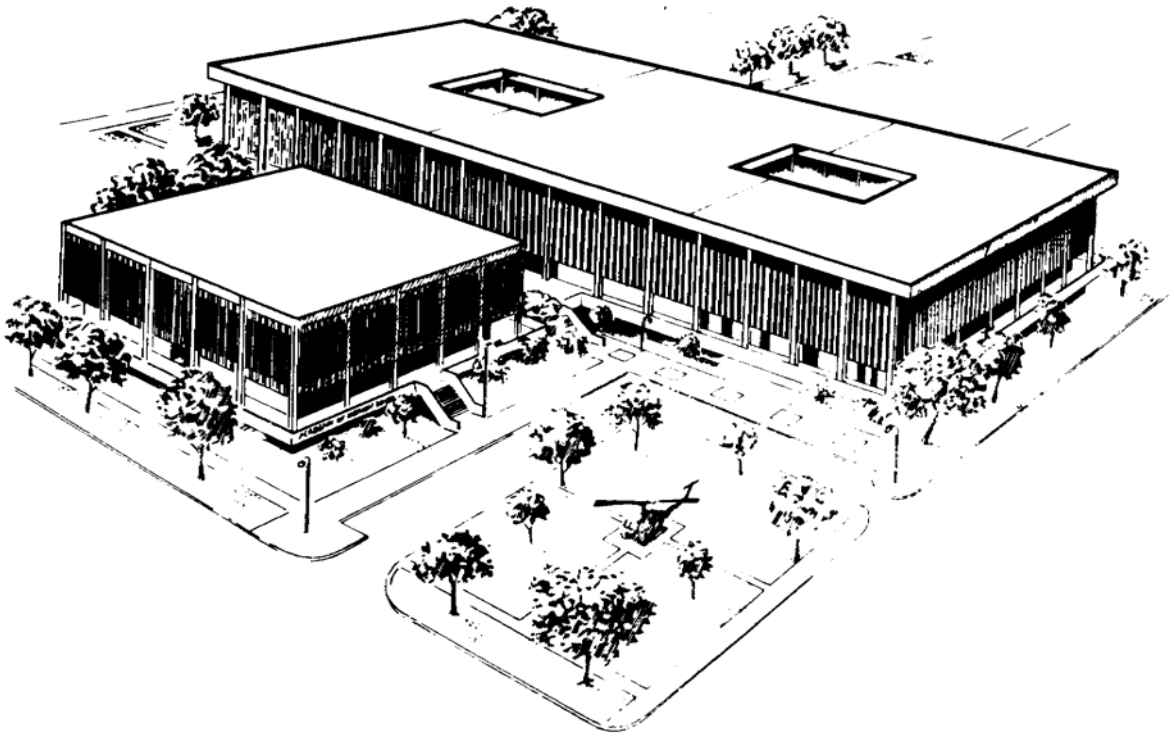

TREATING CHEMICAL AND BIOLOGICAL AGENT CASUALTIES

SUBCOURSE MD0534 EDITION 100

DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

ADMINISTRATION

For comments or questions regarding enrollment, student records, or shipments, contact the Nonresident Instruction Section at DSN 471-5877, commercial (210) 221-5877, toll-free 1-800-344-2380; fax: 210-221-4012 or DSN 471-4012, e-mail accp@amedd.army.mil, or write to:

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Approved students whose enrollments remain in good standing may apply to the Nonresident Instruction Section for subsequent courses by telephone, letter, or e-mail.

Be sure your social security number is on all correspondence sent to the Academy of Health Sciences.

CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.
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CORRESPONDENCE COURSE OF THE
U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL

SUBCOURSE MD0534

TREATING CHEMICAL AND BIOLOGICAL AGENT CASUALTIES

INTRODUCTION

In future conflicts, soldiers must be prepared to function in a field environment contaminated by chemical or biological agents. This subcourse is designed to provide instruction in protecting yourself from chemical and biological agents and in providing care in the field to soldiers who have been exposed to chemical or biological agents.

Chemical agents are fast acting. You must be prepared to quickly perform the necessary triage and treatment procedures in the event of a chemical agent attack. Biological agents usually act at a slower rate. The major emphasis of this subcourse is chemical agents and chemical agent casualties.

Protection against chemical and biological agents and self-aid procedures for exposure to nerve agents are presented in this subcourse for two reasons. One, you must know the procedures in order to protect yourself and to treat yourself in case of exposure to nerve agents. Also, you must make sure that other soldiers take proper precautions and know how to perform self-aid/buddy-aid procedures.

Subcourse Components:

This subcourse consists of four lessons. The lessons are:

Lesson 1, Chemical Agents and Protection from Chemical Agents.

Lesson 2, Treating Nerve Agent Poisoning.

Lesson 3, Treating Blood, Choking, and Blister Agent Poisoning.

Lesson 4, Biological Agents

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Section at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 8 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMENT

LESSON 1	Chemical Agents and Protection From Chemical Agents.
TEXT ASSIGNMENT	Paragraph 1-1 through 1-20.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

1-1. Identify the definition of chemical agents and their purposes.

1-2. Identify the functions of chemical agents and how they can be disseminated.

1-3. Identify the definition of persistent and nonpersistent chemical agents.

1-4. Identify the major categories of chemical agents and their characteristics.

1-5. Identify the chemical detector papers.

1-6. Identify the procedures for putting on IPE.

1-7. Identify the MOPP levels and what is worn at each level.

1-8. Identify procedures for chemical warnings.

SUGGESTION

After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

For additional information, refer to the following: FM 3-4, NBC Protection.

LESSON 1

CHEMICAL AGENTS AND PROTECTION FROM CHEMICAL AGENTS

1-1. TYPES OF CHEMICAL AGENTS

A chemical agent is a chemical substance intended for use in military operations to kill, seriously injure, or incapacitate personnel through its toxicological (poisonous) effects. Chemical agents may be inhaled as a vapor, ingested when food or water contaminated by the agent is consumed, or absorbed when the agent comes into contact with the skin or eyes. The four primary types of chemical agents are nerve agents, blood agents, blister agents, and choking (lung-damaging) agents. Incapacitating agents and vomiting agents are also considered to be chemical agents. All six types of chemical agents are deadly if the casualty is exposed to a sufficient concentration. A chemical agent may be used by itself or in combination with other chemical agents. Your protective mask and protective clothing provide good protection against all chemical agents. Chemical agents may be classified as being persistent or nonpersistent.

a. **Persistent.** Persistent chemical agents continue to present a hazard for a considerable period of time after delivery. They are usually released as solids or liquids. Persistent agents remain as a contact hazard or vaporize very slowly to produce a dangerous vapor.

b. **Nonpersistent.** Nonpersistent chemical agents present a hazard for only a short period of time after delivery. They can be aerosols, gases, vapors, liquids, or solids. Nonpersistent agents dissipate or vaporize rapidly after release and present an immediate, short duration hazard.

1-2. NERVE AGENTS

Nerve agents are among the deadliest chemical agents. These agents directly affect the human nervous system. If the person is exposed to a sufficient amount of nerve agent (either high concentrations for a short period of time or low concentrations over a longer period of time), the diaphragm and the intercostal muscles of the chest become paralyzed. The paralysis of these muscles results in the casualty not being able to inhale and exhale. Respiratory failure leads to cardiac arrest (heart ceases to pump blood) and death.

a. **Types of Nerve Agents**. Nerve agents are divided into two major groups: the G-agents and the V-agents. Examples of the G-agents are GA (Tabun), GB (Sarin), and GD (Soman). O-ethyl s-(2 diisopropyl amiono ethyl) methylphosphonothiolate [nerve agent](VX) is an example of a V-agent.

b. **Methods of Dissemination.** Nerve agents can be dispersed by artillery shell, mortar shell, rocket, aircraft bomb or bomblet, missile, spray, or land mine. Nerve agents can be disseminated as a vapor (spray or aerosol droplets) or liquid.

c. **Characteristics of Nerve Agents.** Liquid nerve agents range from colorless to light brown. Most nerve agents are odorless and tasteless. They range from nonpersistent to very persistent.

d. **Absorption of Nerve Agents.** Nerve agent in vapor form is primarily absorbed through the respiratory tract. Small droplets (spray or aerosol) can be absorbed through the skin or eyes or be inhaled. Liquid nerve agent can penetrate ordinary clothing rapidly, but significant absorption through the skin usually requires a few minutes.

(1) If liquid nerve agent is absorbed through the eyes, the effects are felt immediately.

(2) If the nerve agent is inhaled, the effects may take from less than a minute to several minutes to appear.

(3) If the nerve agent is absorbed through the skin in liquid form, there may be a delay of from 3 minutes to as long as 2 hours before the effects of nerve agent poisoning are felt.

e. **Physiological Effects.** Nerve agents interfere with the nerves' ability to carry information and control the body's functions. This results in respiratory difficulties, vision problems, headaches, loss of bladder and bowel control, convulsions, and mental confusion. Severe nerve agent poisoning leads to unconsciousness and death. The sign and symptoms present and the severity of nerve agent poisoning depend upon the amount of nerve agent absorbed by the body and the route by which the nerve agent entered the body.

1-3. BLOOD AGENTS

Blood agents (cyanogens) interfere with the normal exchange of oxygen between the red blood cells and the body's tissues. The central nervous system is especially susceptible to this type of interference.

a. **Types of Blood Agents.** The principle blood agents are hydrogen cyanide (AC) and cyanogen chloride (CK). Both are deadly and can produce immediate casualties.

b. **Methods of Dissemination.** Blood agents can be delivered by artillery shell, mortar shell, rocket, aircraft spray, and bomb. Hydrogen cyanide can be disseminated in either vapor or liquid form. Cyanogen chloride is disseminated as a vapor.

c. **Characteristics of Blood Agents.** Both AC and CK are colorless and are highly volatile in liquid form. AC smells somewhat like bitter almonds. Cyanogen chloride has a pungent, biting odor, but the odor may not be detected because of the irritation caused by CK when it is inhaled. All blood agents are nonpersistent, but CK is more persistent than AC.

d. **Absorption of Blood Agents.** Blood agents are primarily absorbed into the body through the respiratory system. They quickly enter the blood circulatory system where they interfere with oxygen exchange. In high concentration, AC may cause death after a few breaths.

e. **Physiological Effects.** Once the agent enters the circulatory system, it reacts rapidly with enzymes that are vital in the absorption and release of oxygen. The first organ to be impaired from the decrease in oxygen is the brain. These agents can cause unconsciousness, coma, and death. Death from AC leaves the blood well-oxygenated and the casualty's skin has a pinkish look similar to that of carbon monoxide poisoning. In addition to interfering with oxygen exchange, CK also attacks the respiratory system and causes eye irritation.

1-4. LUNG-DAMAGING (CHOKING) AGENTS

Lung-damaging (choking) agents attack lung tissue and cause irritation of the respiratory system. Damage can also result in secondary infection.

a. **Types of Choking Agents.** Lung-damaging agents include phosgene (CG), diphosgene (DP), chlorine (Cl), and chloropicrin (PS). Phosgene is the lung-damaging agent most likely to be used.

b. **Methods of Dissemination.** Lung-damaging agents can be delivered by artillery shell, mortar shell, rocket, aircraft bomb or bomblet, or missile. Lung-damaging agents are usually disseminated as gasses. Phosgene can be in liquid form when the temperature is below 46^{o}F (7.8^{o}C).

c. **Characteristics of Lung-Damaging Agents.** Phosgene is colorless both as a gas and as a liquid. Phosgene has an odor that resembles the smell of newly mowed hay, grass, or green corn. Chlorine has a characteristic odor and produces immediate irritation of the respiratory system. Lung-damaging agents are classified as nonpersistent.

d. **Absorption of Lung-Damaging Agents.** Lung-damaging agents are absorbed through the respiratory system. If the casualty has been exposed to a lethal concentration of CG, death usually results within 24 to 48 hours. Exposure to very high concentrations of CG can result in death within 5 hours.

e. **Physiological Effects.** Phosgene attacks the lungs by damaging the alveoli (air sacs) and capillaries and by scarring the lungs. Damage to lung tissue can cause blood plasma to seep into the lungs and result in pulmonary edema. This condition, sometimes called "dry land drowning," interferes with the exchange of oxygen and waste products between the air in the lungs and the red blood cells of the circulatory system. The trachea, bronchi, and other parts of the respiratory tract are irritated, but not significantly damaged.

1-5. BLISTER AGENTS (VESICANTS)

Blister agents are vesicants (chemicals which causes blisters). They attack the eyes, lungs, skin, mucous membranes, and blood-forming organs. Blister agents can be deadly when inhaled in sufficient quantities due to their destructive effect on lung tissue. Some blister agents do not produce immediate signs and symptoms. A soldier may be exposed to these agents for several hours before he realizes the danger. Blister agents can poison food and water and contaminate supplies, making them dangerous to handle.

a. **Types of Blister Agents.** The principle blister agents are mustard (HD), nitrogen mustard (HN), lewisite (L), and phosgene oxime (CX).

b. **Methods of Dissemination.** Blister agents can be delivered by artillery shell, mortar shell, rocket, aircraft bomb, and spray. The blister agents can be disseminated in either vapor or liquid form. The vapor is really tiny droplets rather than a true vapor.

c. **Characteristics of Blister Agents.** Mustard is an oily liquid ranging from dark brown (unpurified form) to colorless (purified form). Mustard smells like garlic or horseradish. Nitrogen mustard agents are oily liquids ranging from colorless to pale yellow. Some HN agents have a slightly fishy odor while others are odorless. Lewisite and related vesicants containing arsenic range from brown to colorless and have fruity to geranium-like odors. Phosgene oxime is colorless. It may be used as a liquid or in the form of a crystalline solid. Phosgene oxime has a disagreeable, penetrating odor. Blister agents are persistent, but HD is more persistent than others, especially in cold or wooded areas.

d. **Absorption of Blister Agents.** Blister agents are absorbed through the respiratory system, the eyes, and the skin. Although usually not fatal, exposure is cumulative in effect. Small, repeated doses of HD can cause lung damage severe enough to result in death. Mustard remaining on the casualty's skin can be a hazard to other personnel for up to 48 hours.

e. **Physiological Effects.**

(1) Mustard and HN are readily absorbed through the respiratory system and through exposed skin. When they come into contact with skin, they produce redness at the point of contact that is usually followed by blistering and ulceration. When inhaled, these agents produce inflammation of the lungs and the rest of the respiratory system. Death is rare and usually results from bacterial infection of the lungs. The effects on the skin and respiratory system may not be noticeable at the time of exposure and may be delayed for up to 12 hours. The eyes are affected even if exposed to an extremely low dosage. There may be no pain or signs at the time of exposure with redness and inflammation developing in about 20 minutes (HN) to an hour (HD) later.

(2) Lewisite is much more dangerous in its liquid form than in its vapor form. Liquid will cause severe burns of the eye and skin. Exposure can cause an immediate, searing sensation in the eyes. Severe exposure of the eyes to lewisite can result in permanent injury or blindness. Inhalation of vapor usually results in mild to moderate irritation of the upper respiratory tract. Lewisite contains arsenic, a poison that attacks the capillaries of the circulatory system, the liver, and the intestines. Acute poisoning can result in hypovolemic shock and death.

(3) Phosgene oxime is a powerful irritant that produces immediate irritation or pain upon contact. When the agent comes into contact with skin, the sensation ranges from a mild, prickling sensation to a pain resembling that of a severe insect sting. When the agent comes into contact with the mucous membranes of the eyes or nose, an immediate and painful irritation is felt.

1-6. INCAPACITATING AGENTS

Incapacitating agents are designed to reduce military effectiveness by interfering with the central nervous system without being fatal. Although the agents themselves are not deadly except in very high concentrations, the agents may cause the casualty to ignore dangers and accidentally injure himself and fellow soldiers. The effects of incapacitating agents are temporary, but may last for hours to days.

a. **Types of Incapacitating Agents.** Incapacitating agents include central nervous system depressants, such as 3-quinuclidinyl benzilate [incapacitating agent] (BZ) and cannabinols, and central nervous system stimulants such as d-lysergic acid diethylamide (LSD).

b. **Methods of Dissemination.** Incapacitating agents are most likely to be dispersed by smoke-producing munitions or aerosols.

c. **Characteristics of Incapacitating Agents.** Incapacitating agents may not have identifying characteristics.

d. **Absorption of Incapacitating Agents.** Incapacitating agents normally enter the body through the respiratory tract, but can also enter through the skin. The casualty may not show signs and symptoms of exposure for several hours (up to 36 hours if absorbed through the skin) after exposure.

e. **Physiological Effects**

(1) Central nervous system depressants interfere with the transmission of information by the nerves. Three-quinuclidinyl benzilate [incapacitating agent] disturbs the brain's higher functions of memory, problem solving, and comprehension. Cannabinols interferes with the casualty's motivation rather than his ability to think.

(2) Central nervous system stimulants cause excessive nerve activity by facilitating transmission of nerve impulses and flood the brain with so much information; the casualty cannot concentrate and does not act in a decisive manner.

1-7. VOMITING AGENTS

a. **Types of Vomiting Agents.** Vomiting agents include diphenylchlorarsine (DA), diphenylaminearsine chloride (DM, also called Adamsite), and diphenylcyanarsine (DC).

b. **Methods of Dissemination.** Vomiting agents are dispersed as aerosols (smoke).

c. **Characteristics of Vomiting Agents.** Diphenylaminearsine chloride, DA, and DC are crystalline solids that are usually dispersed by heat as fine particulate smoke. Diphenylaminearsine chloride smoke is yellow when concentrated. DA and DC smokes are white when concentrated. When diluted with air, all three smokes are colorless.

d. **Absorption of Vomiting Agents.** Vomiting agents are absorbed through the respiratory track and the eyes.

e. **Physiological Effects.** Vomiting agents produce strong irritation of the upper respiratory system, irritation of the eyes, nausea, and vomiting.

1-8. NERVE AGENT ANTIDOTES

Atropine and pralidoxime chloride 2-PAM Cl are the nerve agent antidotes used by soldiers in the field. These antidotes neutralize nerve agents that have already been absorbed into the body. Each soldier is issued three sets of nerve agent antidote automatic injectors (autoinjectors). Each Mark I nerve agent antidote kit (NAAK) consists of a plastic clip containing two autoinjectors: one autoinjector containing two mg of atropine and one autoinjector containing 600 mg of 2-PAM chloride. These kits are normally carried in the inside pocket of the protective mask carrier. When the temperature is below freezing, however, the autoinjectors must be carried in a location that will protect them from the cold. Always check your local standing operating procedures (SOP) to determine how the autoinjectors are to be carried in freezing weather. Procedures for administering these antidotes are discussed in Lessons 2 and 3.

1-9. CONVULSANT ANTIDOTE FOR NERVE AGENT

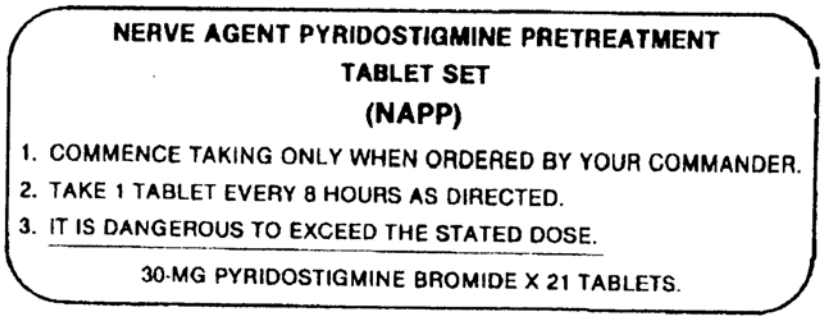
The convulsant antidote for nerve agent (CANA) is similar to existing auto injectors but modified to hold a 2-milliliter volume of diazepam. The exterior of the CANA auto injector is distinguishable from the NAAK kit by two flanges on the length of the barrel. Convulsant antidote for nerve agent (is a disposable device to be given by intramuscular

injection to a soldier who is incapacitated by nerve agent poisoning. It is an adjunct to the nerve agent antidote kit.

1-10. NERVE AGENT PRETREATMENT

The nerve agent pyridostigmine pretreatment tablet set (NAPP) consists of 21 pyridostigmine bromide (30 mg) tablets packed in a blister pack (figure 1-1). The tablets are to be taken only when the corps or division commander orders that pyridostigmine pretreatment be started. A soldier must swallow one tablet (with water) every eight hours for seven days unless directed to discontinue the medication sooner. Although the pyridostigmine itself does not provide protection against nerve agents, it does enhance the efficiency of the medications contained in Mark I nerve agent antidote set. If a dose of pyridostigmine is missed, do not try to make it up. Taking two tablets at once does not provide additional protection and can result in adverse side effects.

A-Sample outer wrapper



B-Sample pyridostigmine bromide tablet

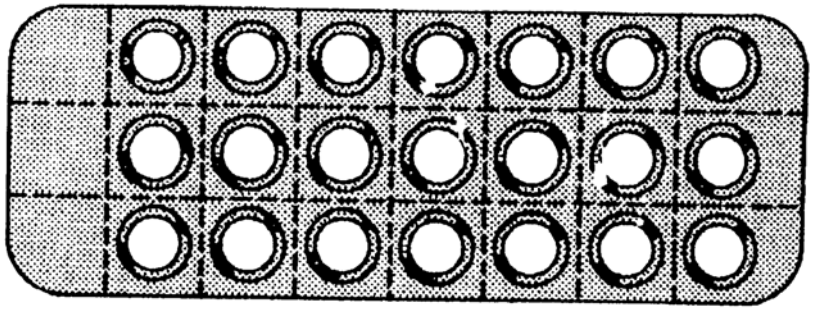


Figure 1-1. Nerve agent pyridostigmine pretreatment tablet set (NAPP).

1-11. PROTECTIVE ENSEMBLE

Each soldier has individual protective equipment including mask and hood, overgarment, battledress overgarment, chemical protective glove set, chemical-protective footwear covers, chemical-protective helmet cover, and protective mask. The MOPP gear also consists of an individual decon kit, detection equipment, and antidotes. Before soldiers can protect against NBC hazards, they must first know what individual protective equipment is available and how to use it.

1-12. PROTECTIVE MASK AND HOOD

Your field chemical-biological mask, when properly fitted and worn with the hood, protects against field concentrations of all known chemical and biological agents in vapor or aerosol form. It also provides protection against inhaling radioactive particles (fallout). The filter elements in the cheeks of the facepiece removes chemical and biological agents and most other contaminants from the available air, but it does not filter out carbon monoxide or ammonia vapors. The mask cannot increase the oxygen content of air and is not used when the problem is a low concentration of oxygen, such as rescue efforts in a cave where a fire has used up much of the available oxygen. Figure 1-2 shows the M17A2 mask, hood, and additional authorized items issued to every soldier. The protective masks used by tank and aircraft personnel allow for greater vision and attach to a filter system that filters the air and also controls the temperature of the air.

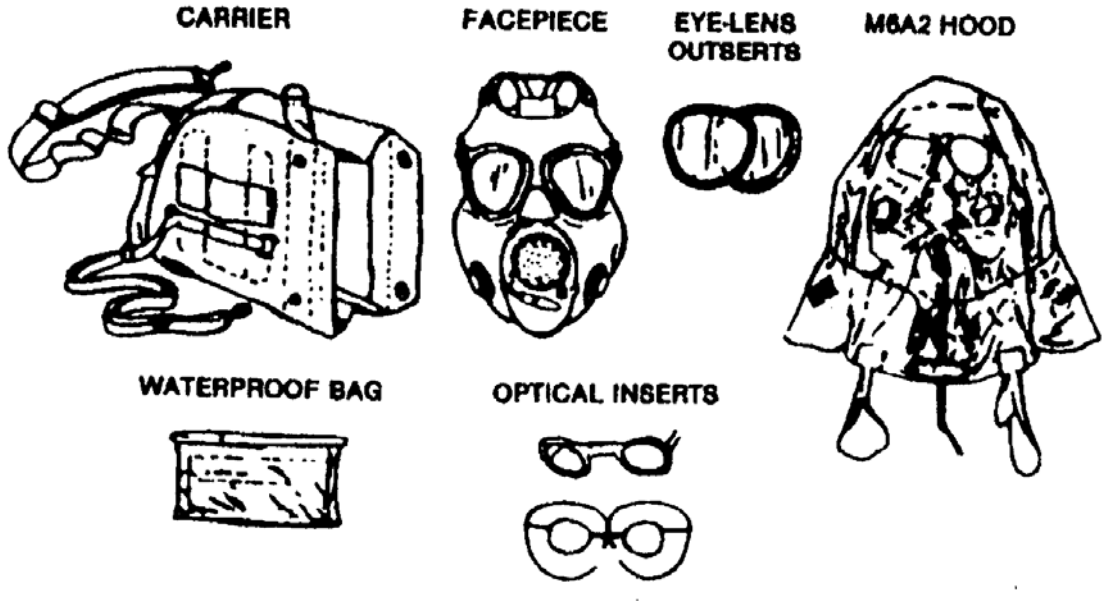


Figure 1-2. M17A2 mask and hood.

a. **M17A2 Mask and Additional Items.** The following information refers to the M17A2 mask and accessories.

(1) Facepiece. The facepiece covers the wearer's face. The filter elements protect against chemical and biological agents being inhaled or coming into contact with the eyes. The facepiece also contains a voicemitter to facilitate communication and a tube used in drinking water from a canteen while masked. Two outserts protect the eye lenses and prevents fogging in low temperatures.

(2) Hood. The ABC-M6A2 hood attaches to the mask and covers the casualty's head, neck, and shoulders from chemical agent vapor and droplets, biting insects (biological agents), and radioactive dust particles.

(3) Inserts. Optical inserts are used by soldiers who require vision correction (eyeglasses).

(4) Bag. The M1A1 waterproof bag is used to protect the mask, especially the filter elements, from damage by water.

(5) Winterizing kit. The M4 mask winterization kit is used when the temperature is below -20°F (-29°C). The kit prevents frost accumulation on the inlet valve caps. Using the kit makes breathing more difficult (increases breathing resistance).

(6) Carrier. The carrier is used to store the mask, accessories, and other items such as M8 detection paper and MARK I auto injectors.

b. **Putting on the M17A2 Mask.** You should be able to put on, clear, and check your M17-series mask (first 12 steps) within 9 seconds. You should be able to put on your hood (steps 13 and 14) within an additional 6 seconds. The following are procedures for donning your mask and hood (see figure 1-3).

(1) Stop breathing. Do not inhale prior to masking.

(2) Remove your helmet. Place it in a convenient location that is not contaminated, if possible.

(3) Take off your eyeglasses, if worn, and store them in a safe location such as a pocket of your overgarment.

(4) Open your mask carrier with one hand and grasp your mask just below the eyepiece with your other hand.

(5) Pull the mask out of the carrier, letting the hood hang inside out in front of the facepiece (figure 1-3A).

(6) Grasp the facepiece with both hands, slide your thumbs up and inside the mask, and open the head harness and faceplate as wide as you can.

(7) Put your chin in the chin pocket (figure 1-3B).

(8) Pull the head harness up over your head, making sure the head pad is centered at the top back of your head and the mask is smooth against your face and forehead. Do not put the head harness over the head first, and then pull the mask down over your face.

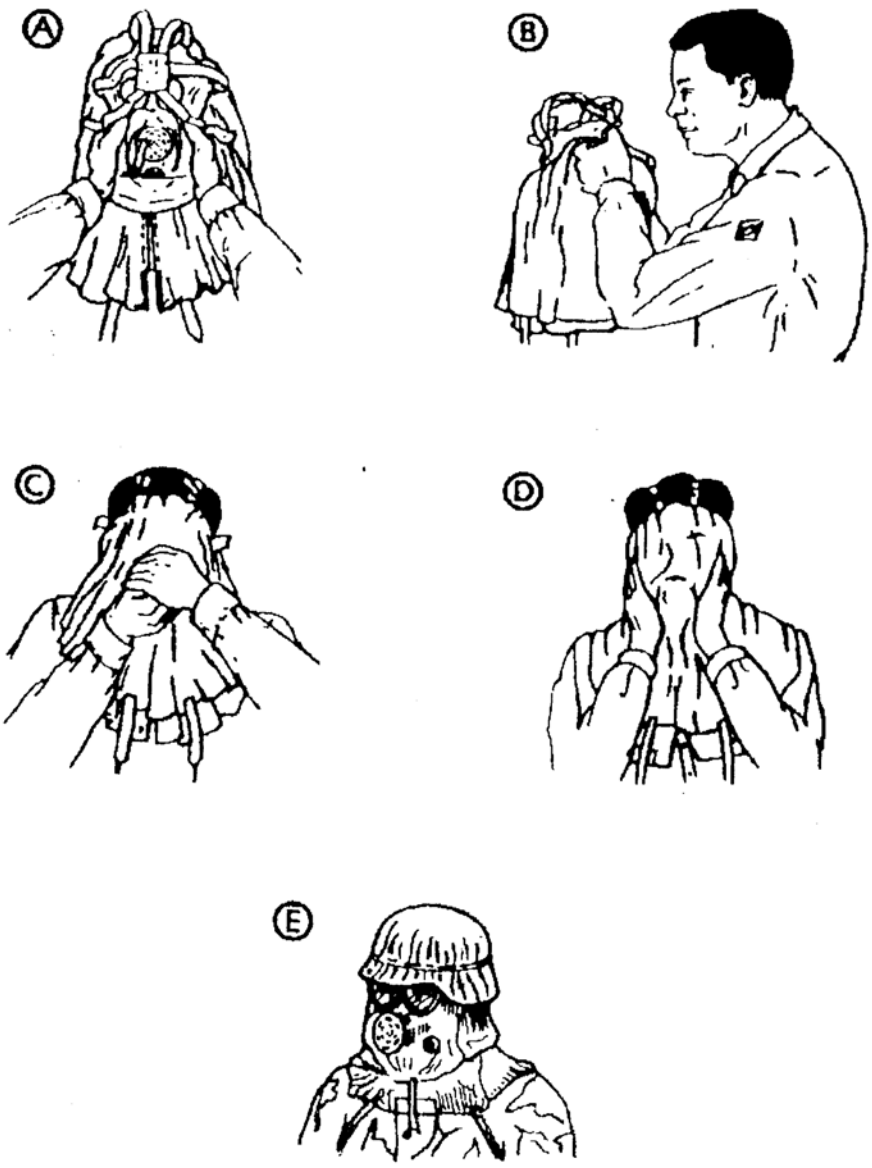


Figure 1-3. Putting on the mask.

(9) Grasp the cheek straps with both hands and adjust them with moderate jerks.

(10) Clear your mask.

(a) Cover the outlet valve with the heel of one hand and cover the voicemitter with the other hand. You can do this with your hands over the hood (hood between the hands and mask as shown in figure 1-3C) or under the hood.

(b) Apply pressure with both hands to seal the outlet valve and voicemitter.

(c) Blow hard to force air out around the edges of the mask. You should feel the air escaping around the edges of the mask.

(11) Check your mask for leaks.

(a) Place the palms of your hands over both inlet valve caps. You can do this with your hands over the hood (figure 1-3D) or under the hood.

(b) Apply pressure with both hands to seal the inlet valves.

(c) Inhale forcibly and hold your breath. If there are no leaks, your mask will collapse against your face and stay that way until you exhale.

(d) If your mask does not collapse, stop breathing and check to see if anything (hair, clothing, and so forth) is between your face and the mask. Also check the head straps and head pad to see if they are twisted. Remove anything between your mask and face and untwist any twisted straps. Tighten the head straps if needed. Then clear and check your mask again.

(12) Resume normal breathing.

(13) Pull the hood up and over your head and down onto your shoulders. If you have not yet put on your protective overgarment, delay step 14 until you have donned the overgarment.

(14) Zip the front of the hood. Make sure it is closed all the way. Make sure the edge of the hood does not get caught in the collar of the overgarment.

(15) Pull the draw cord slider snug.

(16) Fasten and adjust the underarm straps. Have another soldier assist you if possible (buddy-aid).

(17) Replace your headgear (apply helmet cover (figure 1-3E).

c. **M40 Field Protective Mask.** The M40-series chemical-biological mask (figure 1-4) is currently being issued to units and will replace the M17-series protective mask as it becomes available. It will become the standard Army field mask. The M40 mask consists of a silicone rubber face piece with in-turned periphery, binocular eye lens system, and elastic head harness. Other features include front and side voicemitters, allowing better communication, drink tube, clear and tinted inserts, and a filter canister with NATO standard threads. The M40 mask provides respiratory, eye, and face protection against CB agents, toxins, radioactive fallout particles, and battlefield contaminants. The canister filter cannot be changed in a contaminated environment. Instructions for care and maintenance of the M40 mask are found in TMs 3-4240-280-10-1 and 3-4240-300-20&P.

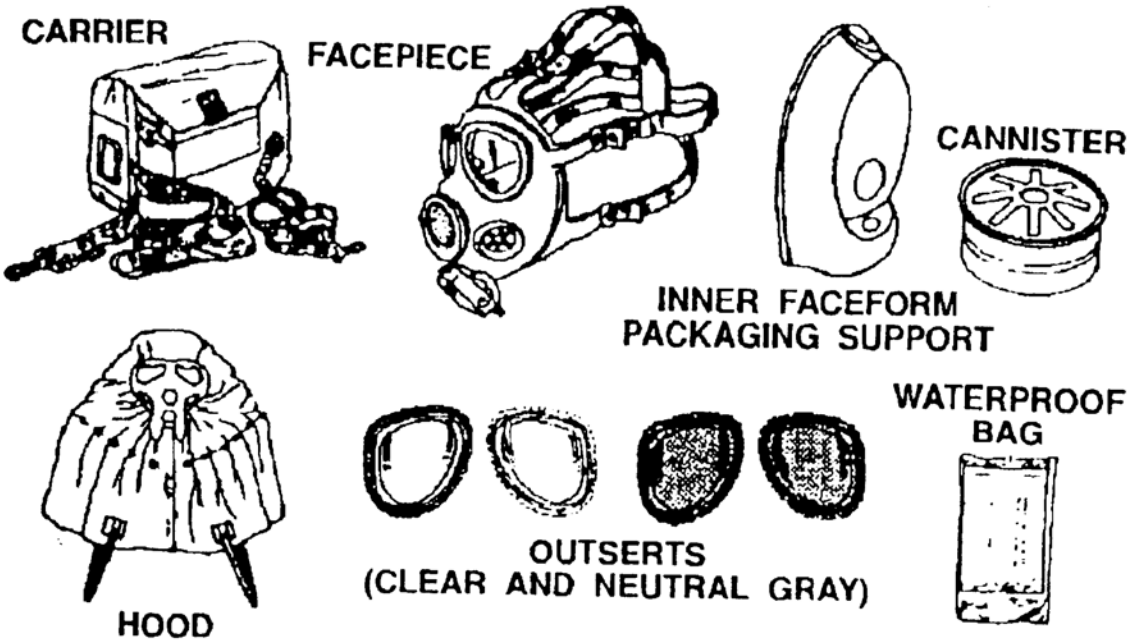


Figure 1-4. M40 mask and additional authorized items.

d. **Decontamination Kits.** If your skin or the interior of the mask is contaminated with nerve agent, decontaminate using a M258A1 (figure 1-5) or M291 (figure 1-6) decontamination kit.

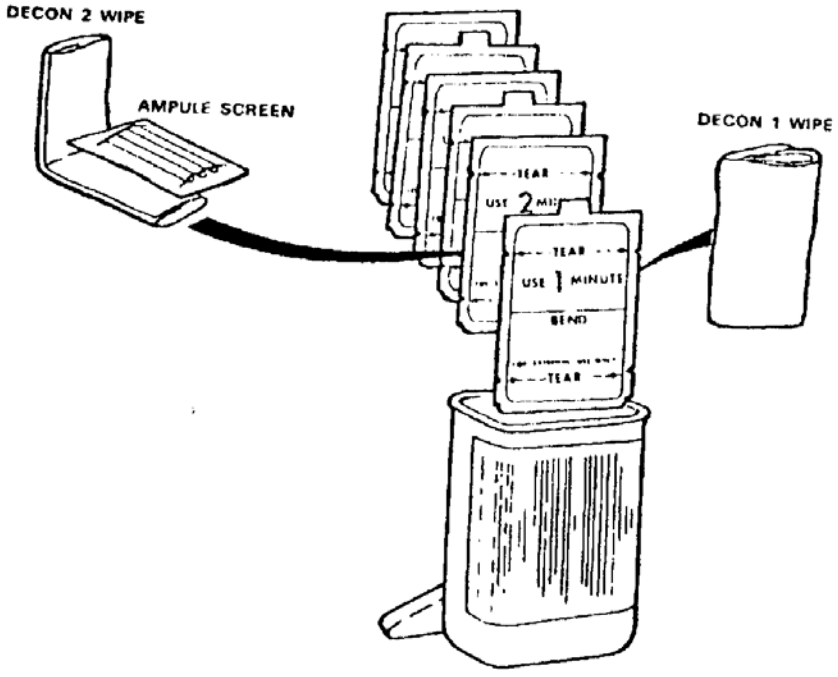


Figure 1-5. M258A1 skin decontamination kit.

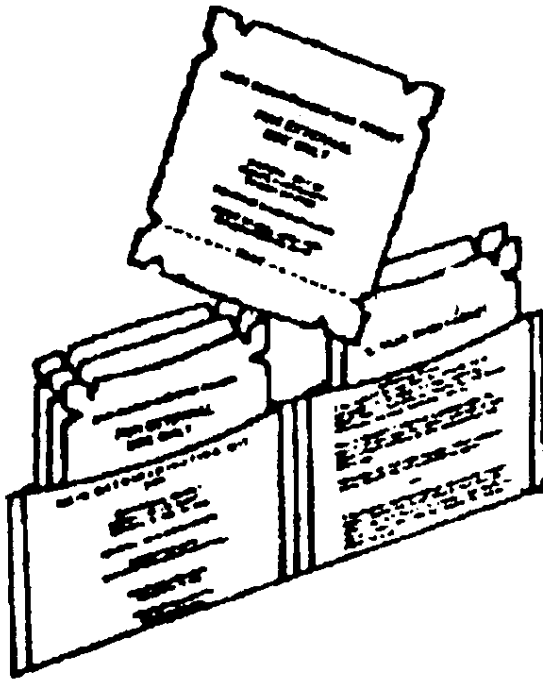


Figure 1-6. M291 skin/equipment decontamination kit.

1-13. DETECTION EQUIPMENT

Soldiers on the battlefield need to detect chemical agents. They may use detector papers to detect and identify liquid chemical agents. At squad, crew, or section level, the M256-series chemical agent detector kit has the ability to detect and identify field concentrations of nerve, blister, and blood agent vapors.

a. **Chemical Agent Detector Paper.** Two types of chemical agent detector paper are issued to soldiers. ABC- M8 VGH chemical agent detector paper, called M8, which detects and identifies liquid agents, and the M9 chemical agent detector paper that detects the presence of chemical agents. The M9 **DOES NOT** identify chemical agents.

(1) The M8 chemical detector paper (figure 1-7) comes in booklets of 25 sheets. It will detect and identify liquid V- or G- type nerve agents or H- type blister agents. These sheets are impregnated with chemical compounds that turn dark green, yellow, or red when they come in contact with a liquid chemical agent. Your booklet has a color chart that will help you determine which chemical agent has been contacted.

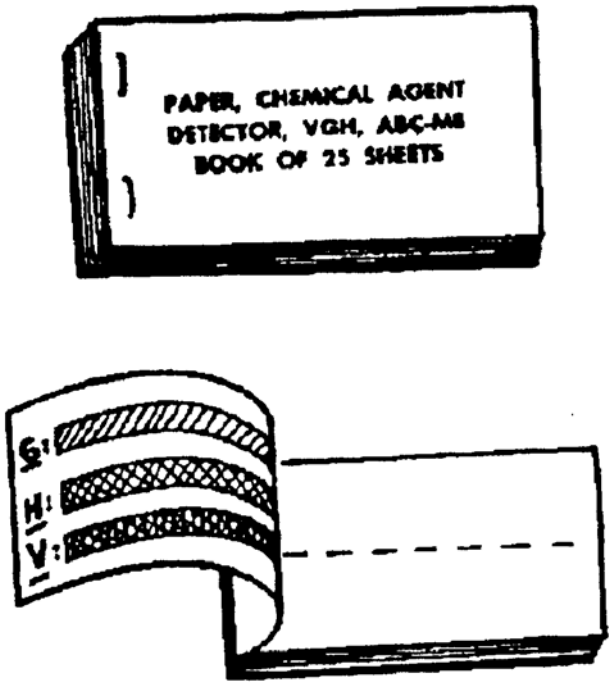


Figure 1-7. ABC-M8 chemical agent detector paper.

(2) M9 chemical detector paper (figure 1-8) is used to detect the presence of liquid chemical agents. It does not detect chemical agent vapor. When the paper turns red or reddish color, it indicates the presence of a nerve agent (G and V) or a blister agent (H and L). M9 paper should be read only with a source of white light.

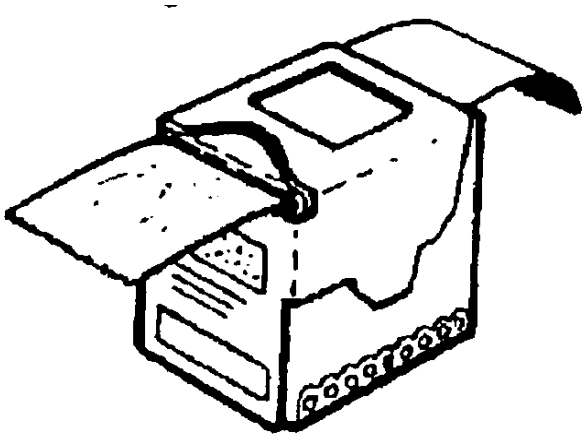


Figure 1-8. M9 chemical agent detector paper.

b. **M256-Series Chemical Agent Detector Kit.** The M256-series chemical agent detector kit (figure 1-9) is issued to squads, crews, or sections. The kit provides the squad level ability to detect and identify field concentrations of nerve, blister, or blood agent vapors. The kit can differentiate between classes of agents which helps unit leaders determine when unmasking may be safe after a chemical attack. The M256 consists of 12 individually packed samplers/detectors, a set of instruction cards, and a packet of ABC-M8 VGH chemical detector paper.

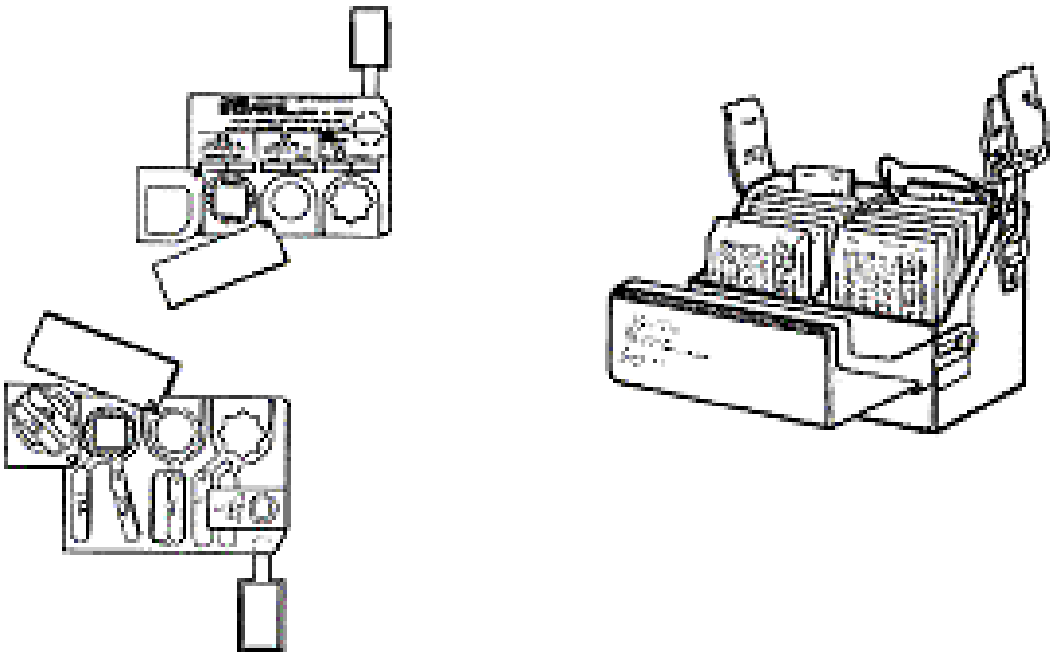


Figure 1-9. M256-series chemical agent detector kit.

1-14. CHEMICAL PROTECTIVE OVERGARMENT

The chemical protective overgarment (CPOG) protects the wearer against contact with chemical agent vapors aerosols, and liquid droplets. It also provides protection against live biological agents, toxins, and radioactive particles. The overgarment consists of a two-piece suit (figure 1-10). The jacket has a zippered front; the trousers have a fly front and zippered legs. The suit is designed to be worn over the soldier's uniform. The CPOG is not designed to be decontaminated or to be reimpregnated for reuse. When worn, the CPOG's protective qualities will last for 14 days if it does not become contaminated or become unserviceable (ripped, torn, or soaked with petroleum products). If the CPOG becomes contaminated with liquid chemical agent, exchange the overgarment for a new one within 6 hours, if possible. The exchange is usually performed during detailed troop decontamination. In rain, wear a poncho or rain gear to protect the CPOG.

Figure 1-10. Chemical protective overgarment.

a. The garment is sealed in a special protective bag that should not be opened until the garment is needed. Instructions for using the garment are printed on the bag label. In general, put on the overgarment trousers over your normal uniform and adjust the waistband for a tight fit. Then put on the jacket, zip it up, and fasten snaps, including the three snaps across the back of the jacket that connects the jacket to the trousers. Zip the legs closed, fasten the Velcro closures (if applicable), and tie the drawstrings.

NOTE: If you are going to put on your overboots at this time, do not close the trouser legs of the CPOG until the overboots have been put on.

b. If you are involved in hard physical labor and are in a hot environment where there is a risk of heatstroke, you may be allowed to wear the overgarment directly over your underwear.

1-15. CONTAMINATION AVOIDANCE AND LIQUID PROTECTIVE SUIT

The combination avoidance and liquid protective suit (SCALP) (figure 1-11) consists of four pieces. They are the jacket trousers, and two footwear covers. It is made of a base cloth material of high-density polyethylene fibers, and the footwear covers have embossed polyethylene soles for durability and slip resistance. The jacket is designed with a pullover hood, and covers the head;chest; and arms. It has an opening that provides for the facepiece of the individual protective mask. There are two drawstrings, each with a barrelock to secure the hood to the facepiece. It has latex bands to secure sleeves around the wrists. Trousers contain a drawstring with a barrelock at the waist and latex bands on the legs to secure them around the ankles. The footwear covers consist of polyethylene soles and latex bands in the upper portion to secure them to the legs. Since the sizing systems are independent of one another, the SCALP footwear is issued separately from the SCALP jacket/trousers.

Figure 1-11. Contamination avoidance and liquid protective suit.

1-16. CHEMICAL-PROTECTIVE HELMET COVER

This cover (figure 1-12) protects the personnel armor-system, ground troop (PASGT) helmet from chemical and biological contamination. The cover is a piece of butyl-coated nylon cloth gathered at the edge by an elastic web enclosed in the hem. It is an olive-green, one size-fits all cover.

Figure 1-12. Chemical-protective helmet cover.

1-17. CHEMICAL-PROTECTIVE FOOTWEAR COVERS (OVERBOOTS)

Protective footwear covers (overboots) protect the feet from contamination by chemical agents, biological vectors, and radiological dust particles. Put the footwear covers on over the standard leather combat boots. If the trouser legs are closed, loosen them. Then position and lace the overboots in accordance with the instructions provided in the package that contained the overboots (figure 1-13). Once you have put on the overboots, blouse the overgarment trouser legs over the overboots, close the zippers secure the velcro closures of the trouser legs, and tie the drawstrings firmly. Replace the overboots if they are punctured or torn.

NOTE: The green/black vinyl overboot (GVO)/(BVO) (figure 1-14) is replacing the chemical-protective footwear covers (overboots). Soldiers wear the green or black vinyl overshoe over their combat boots to protect feet from contamination of all known agents, vectors, and radiological particles for a period of 14 days. The GVO is a plain olive drab (OD) vinyl green overshoe with elastic fasteners. The GVO protects against NBC agents or rain, mud, or snow. The BVO is very similar to the GVO, except for the change in color, and black enlarged tabs on each elastic fastener.

Figure 1-13. Chemical-protective footwear covers (overboots).

Figure 1-14. Green vinyl overboot.

1-18. CHEMICAL-PROTECTIVE GLOVE SET

The gloves protect against liquid chemical agents and vapor hazards. They protect the hands from radioactive fallout and biting insect vectors. Figure 1-15 shows the protective gloves with cloth inserts.

Figure 1-15. Chemical-protective glove set.

NOTE: The new chemical-protective glove set comes in three thickness; 7, 14, and 25 mil. The 7 mil glove set is used by soldiers such as medical, teletypist, and electronic repair personnel whose tasks require extreme tactility and/or sensitivity and will not expose the gloves to harsh treatment. The 14 mil glove set is used by soldiers such as aviators, vehicle mechanics, and weapon crews whose tasks require tactility and sensitivity and will not expose the gloves to harsh treatment. Use of more durable 25 mil glove set is for soldiers who perform close combat tasks and other types of heavy labor.

1-19. MISSION-ORIENTED PROTECTIVE POSTURE

Working while wearing all of the individual protective equipment (IPE) (mask hood, overgarment, helmet cover, gloves, and overboots) decreases the soldier's ability

to perform normal work and increases the likelihood of heat injury. In addition, working while wearing a protective mask may give some soldiers a "closed in" feeling that can lead to mental distress. The need to balance protection with the threat, temperature, and urgency of the mission led to the development of the mission-oriented positive posture (MOPP) concept. Mission-oriented positive posture is a flexible system for protection against nuclear, biological, and chemical contamination that requires the soldier to wear only the individual protective equipment consistent with the threat and other conditions, including temperature, humidity, work rate, and mission. There are five levels, MOPP level zero through MOPP level 4 (figure 1-16). The higher the number, the greater the level of protection. However, as the level increases, the efficiency of the soldier decreases correspondingly.

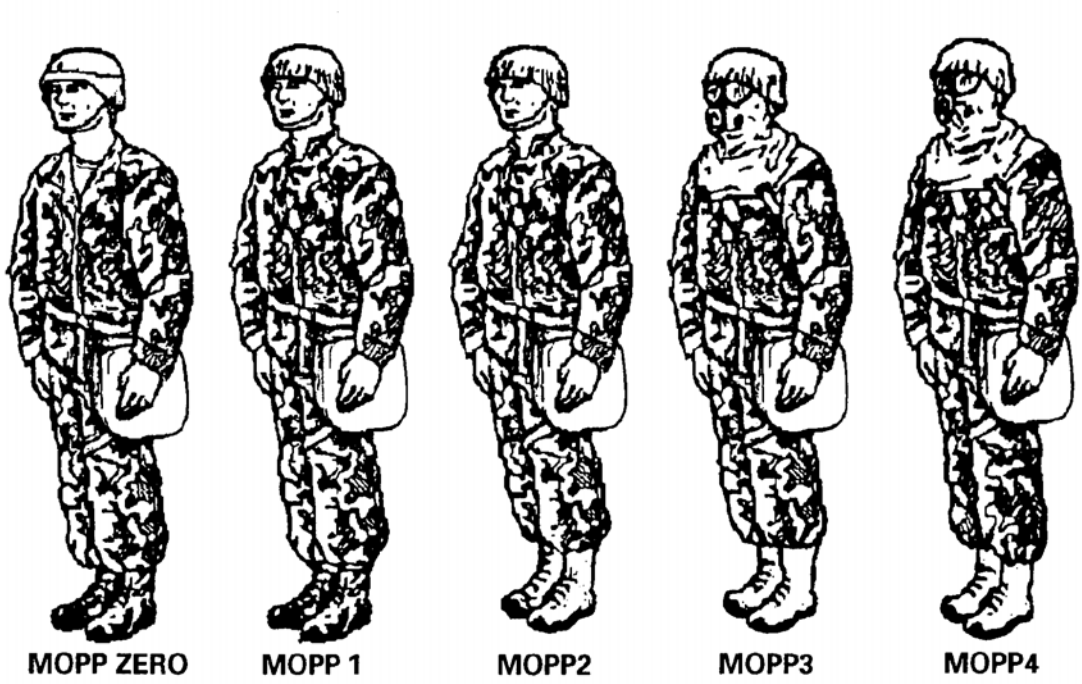


Figure 1-16. MOPP levels.

a. **Mission-Oriented Positive Posture Level Zero.** At the lowest MOPP level (MOPP zero), you do not wear any of the MOPP gear. You carry your protective mask and hood in your carrier and have your protective overgarment (in a sealed bag), overboots, and gloves readily available (within the work area or vehicle, for example). You should also have your M258A1 decontamination kit, M8 paper, M9 paper, and three Mark I kits in your carrier. MOPP zero may be used when the enemy has an NBC (nuclear, biological, chemical) employment capability, but chemical warfare has not begun. You should be able to go from MOPP zero to MOPP4 (put on all of your protective gear) within 8 minutes.

b. **Mission-Oriented Positive Posture Level 1.** To go from MOPP Level zero to MOPP Level 1 (MOPP1), remove your protective overgarment from their bag and put on the protective overgarment and helmet cover. Continue to carry the carrier containing your mask and hood. You will also carry your overboots and gloves. The

jacket may be kept open for ventilation in warm weather, but the trouser legs must be closed. Attach the M9 detection paper to your overgarment at this time. If you are at MOPP1, you should be able to put the rest of your protective gear (achieve MOPP4) within 4 minutes.

c. **Mission-Oriented Positive Posture Level 2.** To go from MOPP Level 1 to MOPP Level 2 (MOPP2), put on your protective overboots and continue to carry your gloves and the carrier. The overboots take about 3 to 4 minutes to put on and lace. Once you are at MOPP2, you can progress to full protection (MOPP4) in less than a minute. The jacket of the overgarment may remain open in warm weather.

d. **Mission-Oriented Positive Posture P Level 3.** To go from MOPP Level 2 to MOPP Level 3 (MOPP3), put on your mask and hood and continue to carry your gloves. The jacket of the overgarment may remain open and the hood may be rolled in warm weather. At this level, protection is almost complete but interference with work becomes significant. The mask and hood restricts vision and heat stress becomes a major factor.

e. **Mission-Oriented Positive Posture Level 4.** To go from MOPP Level 3 to MOPP Level 4 (MOPP4), put on your protective gloves (inner cotton gloves first, then the outer rubber gloves). Close the jacket to the overgarment, pull the hood down and secure it. This makes protection complete, but further interferes with individual efficiency and further increases the likelihood of heat injury.

f. **Mask Only Posture.** Although not a MOPP level, soldiers in a protected environment (inside a tank or shelter which protects them from direct skin exposure to liquid or solid agents) may be told to use mask-only posture. The mask provides protection against inhaling chemical agent vapor. Since there is no threat from liquid or solid agents, the overgarment, gloves, and overboots are not worn. A soldier operating a teletype inside a sealed communications van, for example, can work far more efficiently in mask-only posture. If the shelter is penetrated, the inside becomes contaminated, or the soldier leaves the shelter, the soldier must assume the appropriate MOPP level.

CAUTION: Mask-only posture is not used when a blister agent hazard exists.

1-20. ALARM FOR CHEMICAL ATTACK

If you suspect the presence of a chemical or biological agent and do not have your protective mask on, stop breathing and put on your mask and hood (do not zip or fasten the hood at this time). Once you are masked, give the alarm to warn other soldiers to put on their mask and hood immediately. The alarm can be given verbally by yelling "Gas!" or by giving the hand and arm signal (figure 1-17). Give the warning if one of the following occurs:

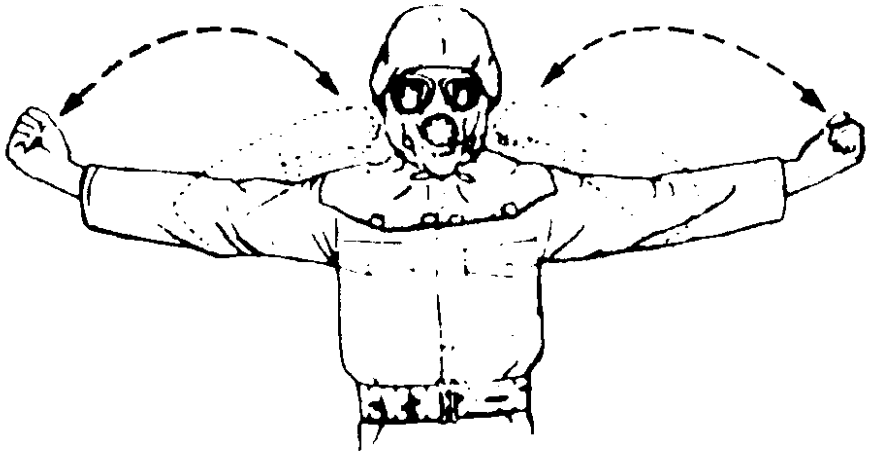


Figure 1-17. Arm and hand signal for chemical attack.

a. You detect signs and symptoms of nerve agent poisoning in yourself or another soldier.

b. The alarm on a mechanical, chemical agent detector device sounds.

c. Your M9 detector paper changes color.

d. Some artillery rounds explode less powerfully than they should.

e. Bomblets from an aircraft or a rocket pop rather than explode.

f. An aircraft sprays a mist or gas.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise, by completing the incomplete statement, or by writing the answer in the space provided at the end of the exercise.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. An agent that is odorless and tasteless is probably a:

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Nerve agent.

2. A chemical agent that is colorless and smells like grass or hay is likely to be a:

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Nerve agent.

3. A chemical agent that is colorless and smells like bitter almonds is probably a:

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Nerve agent.

4. A chemical agent that is brown, oily, and smells like garlic is likely to be a:

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Nerve agent.

5. Which chemical agent reacts with enzymes that aid in the task of absorbing and releasing oxygen and attacks the respiratory system?

   a. Blister.

   b. Blood.

   c. Choking.

   d. Nerve.

6. Which chemical agent damages lung tissue and blood vessels in the lungs that results in fluid accumulation in the air spaces of the lungs (pulmonary edema)?

   a. Blister.

   b. Blood.

   c. Choking.

   d. Nerve.

7. The chemical agent that causes inflammation of the respiratory system is:

   a. Blister.

   b. Blood.

   c. Choking.

   d. Nerve.

8. Which chemical agent damages the air sacs of the lungs and causes dry-land drowning?

   a. Blister.

   b. Blood.

   c. Choking.

   d. Nerve.

9. A chemical agent designed to reduce a soldier's military effectiveness by temporarily depressing or stimulating his central nervous system without being fatal is a(n):

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Incapacitating agent.

10. During an enemy attack, you observe a yellow smoke that becomes colorless when diluted in air. Soldiers who were not wearing their protective masks have sore throats, irritated eyes, and feel nauseous. The smoke was probably a(n):

    a. Blister agent.

    b. Blood agent.

    c. Choking agent.

    d. Vomiting agent.

11. When putting on your chemical protective footwear, you should:

    a. Remove your combat boots before putting on the protective footwear.

    b. Put the protective footwear on over your combat boots.

    c. Blouse the trouser legs inside the overboots.

    d. Replace the overboots if they are too large.

12. The combination avoidance and liquid protective suit consists of:

    a. Jacket, trousers, and footwear covers.

    b. Jacket, trousers, and gloves.

    c. Jacket, trousers, and helmet cover.

13. The CANA auto injector is designed to hold _____ ml of diazepam.

    a. One.

    b. Two.

    c. Three.

    d. Four.

14. The _____ mil protective glove is used by soldiers such as medical, teletypist, and electronic repair personnel.

    a. 7.

    b. 14.

    c. 25.

    d. 30.

15. You should be able to go from MOPP level 0 to MOPP4 (put on all of your protective gear) within _____ minutes.

    a. Two.

    b. Four.

    c. Six.

    d. Eight.

16. You should be able to go from MOPP level 1 to MOPP level 2, within _____ minutes.

    a. Two.

    b. Three to four.

    c. Six.

    d. Eight.

17. To go from MOPP 2 to MOPP 3, put on your:

    a. Mask and overgarment.

    b. Mask and hood.

    c. Mask and gloves.

    d. Mask and overboots.

18. To go from MOPP level 3 to MOPP level 4, you have to put on the protective:

    a. Gloves.

    b. Hood.

    c. Helmet cover.

19. Soldiers may be told to use mask-only posture when they are:

    a. Far enough from the enemy where immediate threat is not imminent.

    b. Not exposed to direct sunlight.

    c. In a protected environment, such as inside a tank or shelter.

    d. Not in darkness where they cannot see droplets.

20. When you suspect the presence of a chemical or biological agent, you should first:

    a. Give the alarm by verbally yelling "Gas!"

    b. Put on your mask.

    c. Stop breathing.

Check Your Answers on Next Page

SOLUTION TO EXERCISES: LESSON 1

1. d (para 1-2c)
2. c (para 1-4c)
3. b (para 1-3c)
4. a (para 1-5c)
5. b (para 1-3e)
6. c (para 1-4e)
7. b (para 1-4)
8. c (para 1-4a-e)
9. d (para 1-6e(1))
10. d (paras 1-7c, e)
11. b (para 1-17)
12. a (para 1-15).
13. b (para 1-9)
14. a (para 1-18 (**NOTE**))
15. d (para 1-19a)
16. b (para 1-19c)
17. b (para 1-19d)
18. a (para 1-19e)
19. c (para 1-19f)
20. c (para 1-20)

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2	Treating Nerve Agent Poisoning.
LESSON TEXT	Paragraphs 2-1 through 2-10.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

2-1. Identify the signs and symptoms of nerve agent poisoning.

2-2. Identify procedures for administering nerve agent pyridostigmine pretreatment (NAPP).

2-3. Identify and administer nerve agent antidote (Mark I).

2-4. Identify and administer convulsant antidote for nerve agent (CANA).

2-5. Identify signs and symptoms of atropinization.

SUGGESTION After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 2

TREATING NERVE AGENT POISONING

Section I. TREAT SELF

2-1. IDENTIFY SIGNS AND SYMPTOMS OF NERVE AGENT POISONING

a. **Identification.** Since nerve agents are quick acting, you must be able to detect the signs and symptoms of nerve agent poisoning in yourself and in another so that you can act quickly to protect yourself.

b. **Early (Mild) Signs and Symptoms.** Early signs and symptoms of nerve agent poisoning include the following:

(1) Unexplained rhinorrhea (runny nose with thin nasal mucus).

(2) Sudden headache.

(3) Excessive flow of saliva (drooling).

(4) Tightness in the chest causing difficulty in breathing.

(5) Wheezing during inhaling.

(6) Stomach cramps.

(7) Coughing.

(8) Nausea.

(9) Impaired vision due to miosis (contracted pupils).

2-2. PUT ON YOUR PROTECTIVE MASK

If you suspect that you have been exposed to a nerve agent and you are not wearing your mask, your first action is to stop breathing and put on your protective mask and hood using the procedures given in Lesson 1. Do not administer the nerve agent antidotes before you mask. If you administer the nerve antidotes before you mask, the time used to administer the antidotes could result in your becoming incapacitated to such a degree that you will no longer be able to mask yourself without assistance. The protective mask will protect your mouth, nose, and eyes while you continue to treat yourself and other casualties.

2-3. ADMINISTER NERVE AGENT ANTIDOTE KIT (MARK I) TO SELF

a. **Identify.** The Mark I nerve agent antidote kit (NAAK) (figure 2-1) consists of four separate components: the atropine autoinjector, the pralidoxime chloride autoinjector, the plastic clip, and the foam envelop (carrying case).

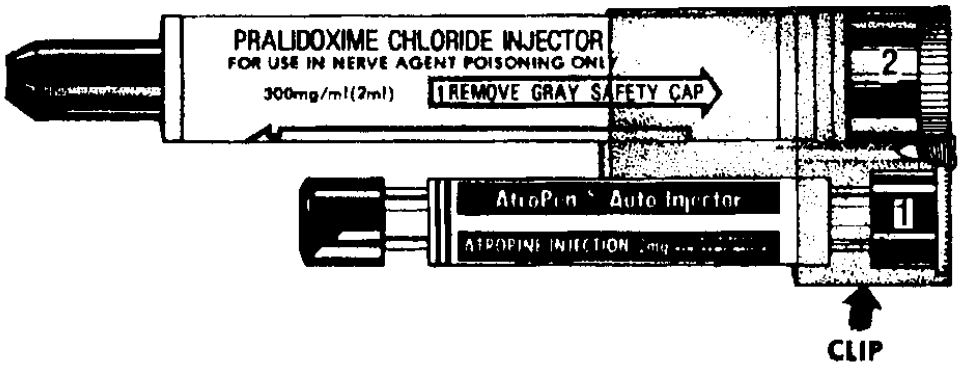


Figure 2-1. Nerve agent antidote kit, Mark I.

(1) The atropine autoinjector consists of a hard plastic tube that has 2 mg (0.7 ml) of atropine. Its pressure activated coiled spring triggers the needle for injection. The plastic container is white. It has green identification and direction labels with white lettering. It has a yellow plastic safety cap attached at the rear of the container. At the needle end is a green plastic cap. When pressure is applied, the spring mechanism is activated.

(2) The 2-PAM Cl autoinjector is a hard plastic tube that dispenses 600 mg/2 ml of 2-PAM Cl (300 mg/ml) solution when activated. The pressure activated coil spring is identical to that of the atropine autoinjector. This container is clear plastic. It has a light brown identification label with black lettering. The directions are in black letters on a white background. The gray plastic safety cap is attached to the clip at the rear of the container. The needle end is black plastic.

(3) The clip is clear hard plastic. It is constructed to hold the pair of autoinjectors together while attached to their safety caps.

(4) The foam envelope is a charcoal gray foam fitting case with pressed seams. It is designed to carry both autoinjectors, and is used for shipping purposes only. Remove the envelope prior to putting the injectors in your mask carrier.

b. **Administer.** If you are having signs and symptoms of nerve agent poisoning, STOP BREATHING AT ONCE, AND DO NOT INHALE UNTIL YOU HAVE MASKED. After you have masked, and if you have signs and symptoms of nerve agent poisoning, follow the steps for administering the nerve agent antidote.

(1) Reach into the inside pocket of your protective mask carrier and take out the injector set.

(2) With your nondominant hand, grasp the set of injectors by the plastic clip so that the larger injector is on top. Position the set of injectors in front of you at eye level (figure 2-2A).

(3) With the other hand, check the injection site for buttons or objects in pockets that may interfere with the injection.

(4) Grasp the smaller autoinjector (containing the atropine) with the thumb and first two fingers (figure 2-2B) and pull the injector out of the clip with a smooth motion (figure 2-C).

(5) Form a fist around the auto-injector without covering or holding the needle (green) end.

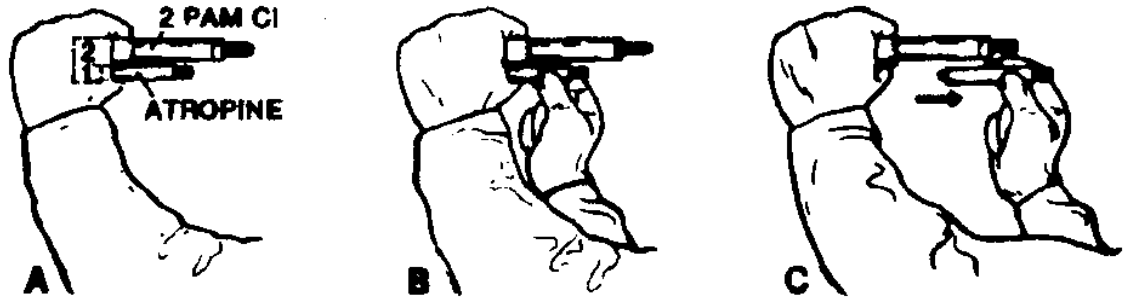


Figure 2-2. Removing the atropine autoinjector from the clip.

CAUTION: Holding or covering the needle (green) end of the autoinjector may result in accidentally injecting your hand or fingers. If this happens, give yourself another injection in the thigh or buttocks using another injector.

(6) Position the atropine autoinjector against the injection site and inject yourself.

(a) Place the green (needle) end of the injector against the outer thigh muscle (figure 2-3). Be careful not to inject close to the hip or the knee. If you have a thin thigh muscle, you should inject the atropine into the upper, outer quadrant of the buttocks to avoid injury to the thigh-bone (figure 2-4).

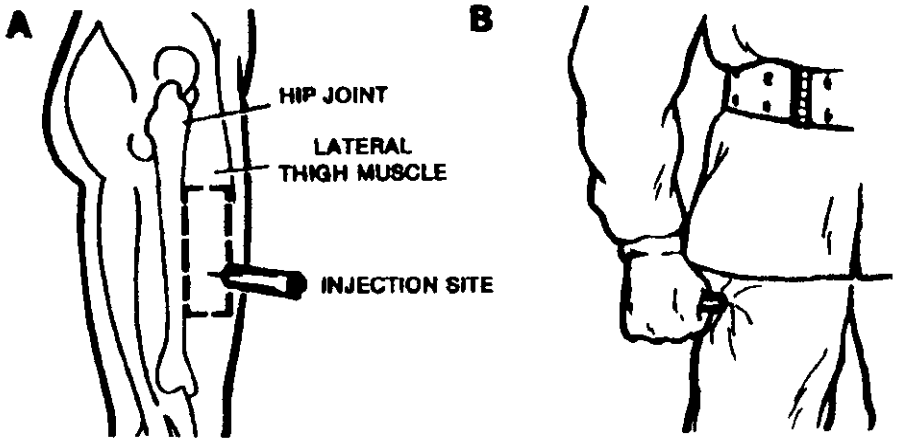


Figure 2-3. Injecting nerve agent antidote into your thigh.

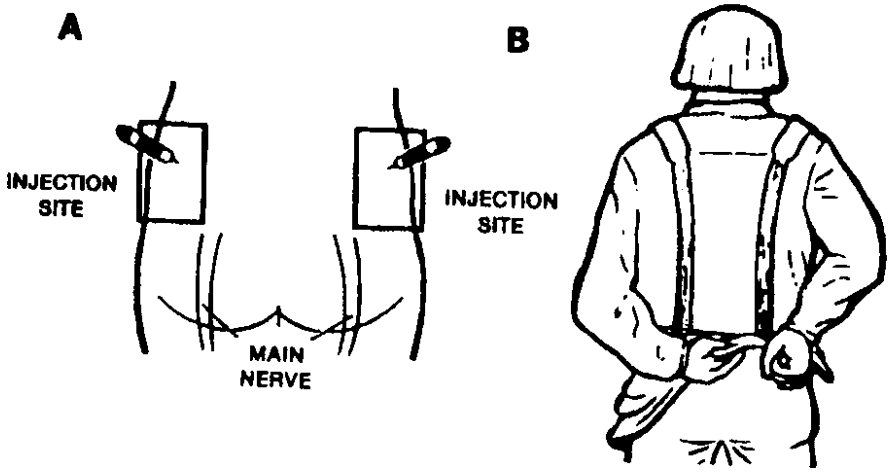


Figure 2-4. Injecting nerve agent antidote into your buttocks.

CAUTION: A nerve crosses the buttocks. It is important to inject into the upper, outer quadrant only in order to avoid injuring the nerve and possibly causing paralysis.

(b) Apply a firm, even pressure to the injector to activate the needle. This will cause it to penetrate both the clothing and the muscle.

CAUTION: DO NOT use a jabbing motion when injecting. This is not necessary and may result in an improper injection or injury to the thigh or buttocks.

(c) Hold the injector in place for at least 10 seconds. The 10 seconds can be estimated by counting, "One thousand and one, one thousand and two," and so forth.

(7) Carefully remove the 2-PAM Cl autoinjector and place it between the little finger and ring finger of the hand holding the remaining injector/clip. DO NOT STICK YOUR HAND WITH THE NEEDLE.

(8) Pull out the large injector (figure 2-5) the same way you pulled out the small one. Hold the black needle end against your outer thigh, or upper outer buttocks if you have a thin thigh, and inject yourself with the large autoinjector as you did with the small one.

(9) Drop the plastic clip that held the injectors without dropping the used injectors.

(10) Push the needle of each injector (one at a time) through the underside of the left flap of one of your undergarment's breast pockets (figure 2-6). The more recent overgarment will have the pocket on the sleeve.

(11) Bend the needle of each to form a hook.

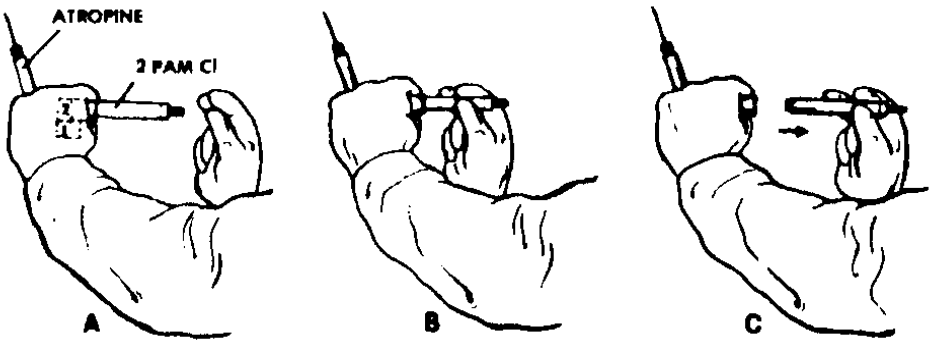


Figure 2-5. Removing the 2-PAM Cl autoinjector from the clip.

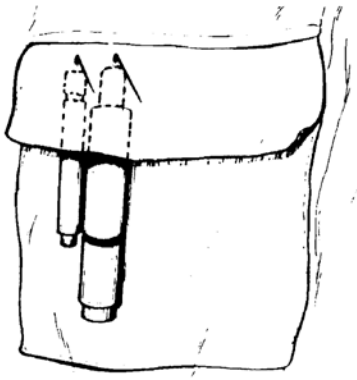


Figure 2-6. One set of autoinjectors attached to pocket flap.

CAUTION: It is important to keep track of all used autoinjectors, so that other medical personnel can determine how much antidote has been given and the proper follow-up treatment can be administered. Be careful not to tear protective glove/clothing when bending the needles.

(12) Seek buddy-aid or medical aid. Administration of second and third sets of injections, if needed, most likely will be done by another soldier buddy since you probably will not be able to administer them to yourself.

CAUTION: If no assistance is available and symptoms persist 10 to 15 minutes after the first set of injections, then self- administer a second set of injections.

Section II. TREAT CASUALTY

2-4. IDENTIFY A CASUALTY SUFFERING FROM NERVE AGENT POISONING

The signs and symptoms of nerve agent poisoning are divided into two groups: early (mild to moderate) and severe.

a. **Mild to Moderate.** A person showing signs of early nerve agent poisoning is probably capable of administering first aid to himself. These early signs and symptoms are given in paragraph 2-1 of this lesson. However, he may still require some assistance in decontaminating himself or putting on his protective gear. This can usually be done through buddy-aid. If the nerve agent is ingested or enters through the skin, the pupils do not become pinpointed. Therefore, the lack of pinpointed pupils is no proof that the casualty is not suffering from nerve agent poisoning.

b. **Severe.** A person with severe nerve agent poisoning will not be capable of helping himself and must rely on others to administer appropriate care. If a soldier is exposed to sufficient amounts of nerve agent poisoning when he is not wearing his uniform, mask or clothing, the nerve agent can produce death within minutes. Therefore, speed is essential in treating a nerve agent casualty. Signs and symptoms of mild nerve agent poisoning may or may not have been present prior to the appearance of severe signs and symptoms. Signs and symptoms of severe nerve agent poisoning are listed below.

(1) Red eyes with tears present (if agent gets into the eyes).

(2) Severe miosis (severely pinpointed pupils).

(3) Gurgling sounds while breathing, wheezing, dyspnea.

(4) Rasping cough.

(5) Vomiting.

(6) Severe muscular twitching.

(7) Convulsions.

(8) Strange or confused behavior.

(9) Weakness.

(10) Involuntary urination and defecation (loss of bladder or bowel control).

(11) Respiratory failure.

CAUTION: If you are not protected from the nerve agent, you must first put on your protective mask and hood, and if needed, administer one set of nerve agent antidote to yourself.

2-5. MASK THE CASUALTY

If the casualty is not wearing his protective mask, and is unable to mask himself, then you must put the mask on him. Masking the casualty will keep him from inhaling more nerve agent. The steps for masking the casualty are given below.

a. **Approach the Casualty.** If the person is moving or flailing about on the ground, approach him from the area of his head and left shoulder. This will help to protect you from accidental injury.

b. **Position the Casualty.** If the casualty is not lying on his back, roll the casualty onto his back and position his head so that his face is up. Do this by squatting next to the casualty, grasping his clothing at the shoulder and hip that is farthest from you, and rolling him toward you in a single motion.

CAUTION: DO NOT KNEEL when administering aid in a chemical environment. Pressing your knee against the contaminated ground may force the chemical agent into or through the protective clothing.

c. **Position Yourself.** Squat near the casualty's head and face him.

d. **Put the Protective Mask on the Casualty.**

(1) Hold the mask by grasping it with your thumbs outside the left and right cheek pouches and your fingers inside the left and right sides of the mask. When opened, the lens will be facing you and the mask will be in the proper position to put onto the casualty's head.

(2) Spread the mask open by pulling the sides apart. This will allow the hood to fall forward.

(3) Position the hood on the casualty's chin.

(4) Insert your thumbs through the two bottom straps on the head harness.

(5) Cup the casualty's head with the fingers of both of your hands and lift his head slightly.

(6) Slide the head harness over the casualty's head by moving your thumbs toward the back of his head and down behind his ears. The head harness should not need to be adjusted.

(7) Make sure that the two bottom straps of the head harness are placed below the casualty's ears and the head pad is centered in the middle of the back of his head.

e. **Tighten the Straps.** Tighten the straps so that a complete seal can be obtained.

(1) Place your hands on the head harness pad.

(2) Grasp the tips of one of the forehead straps with your other hand.

(3) Tighten the forehead strap with short, firm jerks, then release.

(4) Using the same hand, grasp the strip of the other forehead strap and tighten it with short, firm jerks.

(5) Release the forehead strap and remove your hand from the head harness pad.

(6) Using hands, tighten both temple straps simultaneously using short, firm jerks.

f. **Check Fit.** Make sure that the buckles are flat and that the straps form a straight line with the tabs. Make sure that the casualty's eyes are near the center of the mask lens.

g. **Check for a Complete Seal.** Check the mask to see that it is completely sealed on the casualty's face.

(1) If the casualty is conscious and can follow instructions, have him clear and check his mask.

(2) If the casualty is unconscious and cannot follow instructions, cover the mask's inlet valves. The mask will collapse if it is completely fitted and sealed. If it does not collapse, repeat the task.

h. **Hood the Casualty.** Pull the casualty's protective hood over his head, neck, and shoulders.

2-6. ADMINISTER THE FIRST NERVE AGENT ANTIDOTE

After the casualty is masked and hooded, you must administer injections of injections of atropine and 2-PAM chloride. A casualty with signs of severe nerve agent poisoning will be unable to administer antidote to himself. Administer all three kits of nerve agent antidote.

a. **Obtain Autoinjector Kit.** Remove one nerve agent antidote autoinjector kit from inside the pocket of the casualty's mask and carrier if the temperature is near or below freezing, the casualty may be carrying the autoinjectors in another location.

(1) If you cannot find the nerve agent antidote kits, look around the immediate area for unused autoinjectors. The soldier may have been trying to give himself an injection and dropped the autoinjectors when he was overcome by the nerve agent.

(2) If you do not find unused autoinjectors, look for used autoinjectors, attached to the casualty's clothing or lying near the casualty. The casualty may have been able to administer injections to himself before he was overcome by the agents. This is especially true if the casualty was masked when you found him. If he has already given himself one set of nerve agent antidotes, then administer the two remaining Mark I kits.

b. **Locate and Prepare Injection Site.** Normally, the injections are given in the casualty's thigh muscle. If the casualty is very thin, roll the casualty onto his chest so that his buttock is in position for the injection.

(1) Thigh. If you are going to inject the antidote into the casualty's thigh, position the casualty on his back and squat near his left thigh. Locate an area on the large muscle on the outer part of the casualty's right thigh. The site should be at least one hand's width above the hip joint and at least one hand's length above the knee. Do not inject in an area close to the casualty's knee or hip joint (figure 2-3A). Check the casualty's pocket to make sure that the needle will not hit anything in the pocket when you give the injection.

(2) Buttocks. If you are going to inject the antidote into the casualty's buttocks, position the casualty on his chest and squat near his left hip. Locate an injection site in the upper outer part of the casualty's left buttocks (figure 2-4A). If you inject the casualty in another part of his buttocks, you run the risk of hitting a major nerve or blood vessel. Check the casualty's pocket to see that the needle will not hit anything in the pocket when you give the injection. If the casualty's jacket is covering the injection site, lift the bottom of the jacket, since the needle may not penetrate the jacket.

c. **Remove the Atropine Autoinjector.**

(1) Grasp the autoinjector by the plastic clip in your left hand and make a fist around the clip. Hold the clip so that the larger (2- PAM chloride) autoinjector is on top and at eye level.

(2) Grasp the body of the smaller (atropine) autoinjector with the thumb and two fingers of your right hand.

(3) Pull the atropine injector out of the clip with a smooth motion. Do not cover or hold the green (needle) end of the autoinjector. This may cause the needle to function prematurely.

d. **Administer the Atropine Autoinjector.**

(1) Form a fist around the autoinjector. Do not touch the green end of the autoinjector. The autoinjector is now armed, and touching the green end could cause it to function prematurely.

(2) Place the green (needle) end of the autoinjector against the injection site (thigh or buttocks) so that the autoinjector is perpendicular to the muscle (figure 2-7).

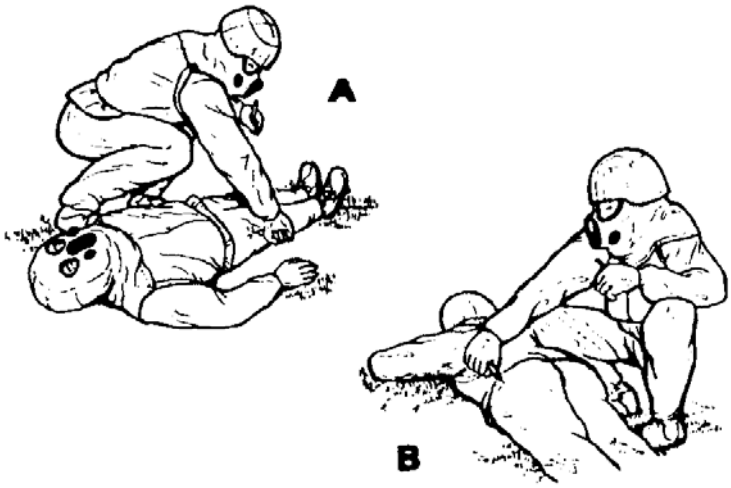


Figure 2-7. Administering nerve agent antidote to a casualty. (A) Thigh. (B) Buttocks.

(3) Apply firm, even pressure to the autoinjector until the needle functions (clicks). The coiled spring mechanism plunges the needle through the casualty's clothing and into the muscle. Do not use a jabbing motion to inject the antidote.

(4) Hold the autoinjector in place for at least ten seconds to ensure that all of the antidote has been injected.

(5) Remove the needle from the muscle by pulling the autoinjector away from the body in a smooth, straight motion.

e. **Remove the 2-PAM Chloride Autoinjector.**

(1) Carefully place the used atropine autoinjector between the little finger and ring finger of the hand holding the clip. Point the needle away from your hand. If you are not careful, the needle may puncture or tear your protective gloves.

(2) Grasp the body of remaining autoinjector in the clip (the 2-PAM chloride autoinjector) with the thumb and two fingers of your free hand).

(3) Pull the autoinjector out of the clip in a smooth motion. Do not touch or cover the black (needle) end of the autoinjector. This may cause the needle to function prematurely.

f. **Administer 2-PAM Chloride.**

(1) Form a fist around the autoinjector. Avoid touching the black end of the autoinjector.

(2) Place the black (needle) end of the autoinjector against the injection site (same muscle into which you injected the atropine) so that the autoinjector is perpendicular to the muscle.

(3) Apply firm, even pressure to the autoinjector until the needle functions and injects into the casualty's muscle.

(4) Hold the autoinjector in place for at least 10 seconds.

(5) Remove the needle from the muscle by pulling the autoinjector away from the body in a smooth, straight motion.

(6) Drop the clip without dropping the used autoinjectors.

(7) Carefully lay the used autoinjectors on the casualty's chest (if he is lying on his back) or on his back (if he is lying on his stomach). Point the needles toward his head.

g. **Administer Second and Third Mark I Kits.** Repeat the procedure immediately using the second and third sets of autoinjectors.

2-7. ADMINISTER CONVULSANT AGENT ANTIDOTE FOR NERVE AGENT

Take out the casualty's CANA autoinjector (figure 2-8). Administer the casualty's own CANA autoinjector when the casualty has received three Mark I kits, or is convulsing. If the casualty has not been given all three Mark I kits, administer the remaining kits. The CANA is not for use as self-aid.

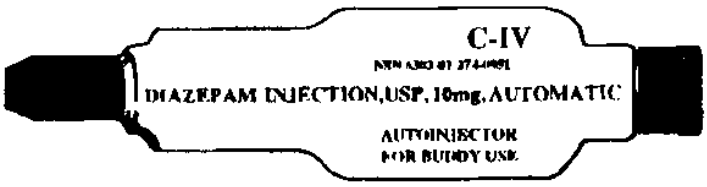


Figure 2-8. Convulsant antidote for nerve agent.

a. **Open Plastic Packet.** Tear open the protective plastic packet by pulling quickly at top (gray end) of the autoinjector.

b. **Determine Injection Site (Thigh or Buttocks).** Check the casualty's pockets for items that may interfere with injector. Check the size of the casualty's thigh muscle. If the casualty has a lateral thin thigh muscle, injection must be administered in the upper outer quadrant of the buttocks.

c. **Grasp Autoinjector.** With your dominant hand, grasp the autoinjector with needle extending beyond and index finger.

d. **Pull Safety Cap.** Use the other hand to pull the safety cap off the autoinjector base. DO NOT cover or hold the black (needle) end with your hand or fingers.

e. **Position Autoinjector.** Position the back end of CANA autoinjector against the injection site (thigh or buttocks). DO NOT inject the areas close to the hips, knee, or thigh bone. Inject the antidote only into the upper outer portion of the casualty's buttocks. This avoids hitting the nerve that crosses the buttocks. Hitting this nerve can cause paralysis.

f. **Administer Injection.** Inject the casualty by applying firm pressure to injector until it pushes the needle into the injection site. Hold the injector in place for at least 10 seconds. DO NOT use jabbing motion when injecting. It may result in injury to the casualty.

g. **Remove Injector.** Carefully pull the injector straight out from the injection site, and massage the site if time permits.

2-8. ATTACH USED AUTOINJECTORS TO CASUALTY'S CLOTHING

The used autoinjectors are attached to the casualty's clothing in a location where they will be quickly seen when the casualty receives treatment by other medical personnel. The autoinjectors will quickly indicate what kind of medication and how much medication the soldier has received. This information will help in providing additional care to the casualty. Be careful to avoid tearing or puncturing your protective gloves while sticking the needle through the flap and while bending the needle. Steps for attaching the used autoinjectors to the casualty's clothing are given below.

a. **Lift Flap.** Lift the pocket flap on the casualty's protective over-garment.

b. **Insert 2-PAM Chloride Needle.** Push the needle of the used 2-PAM chloride autoinjector through the flap. Penetrate the flap from the back so that the point of the needle will be pointing up and outside the flap.

c. **Bend Needle.** Bend the portion of the needle that penetrated the flap so that it forms a hook.

d. **Insert Atropine Needle.** Push the needle of the used atropine autoinjector through the flap in the same manner as the other autoinjector.

e. **Bend Needle.** Bend each needle to form a hook. Be careful not to tear protective clothing/gloves when bending the needles.

f. **Repeat Steps.** Repeat steps b through e for the second and third Mark I kits.

g. **Insert CANA.** Insert the used CANA injector side of the last used nerve agent antidote.

h. **Bend Needle.** Bend the CANA needle the same as the six autoinjectors (figure 2-9).

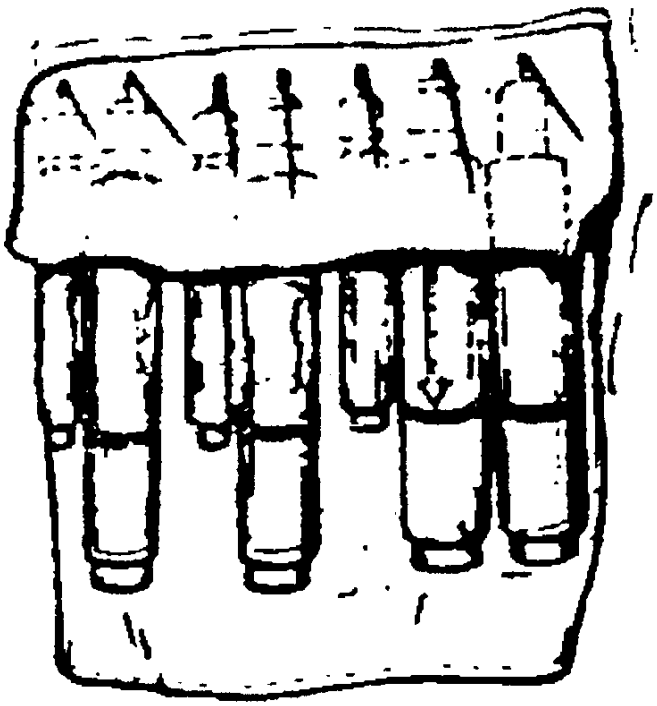


Figure 2-9. Pocket flap with used autoinjectors attached.

2-9. CHECK FOR ATROPINIZATION

Observe the casualty for signs and symptoms of atropinization. Mild atropinization indicates that the casualty has received sufficient atropine.

a. **Signs and Symptoms of Mild Atropinization.** Chemical operations have shown that if troops become alarmed, some of them may believe that they have been exposed to chemical agents when they actually have not been. That is why it is important that service members not give themselves more than one atropine injection (2 mg) if they do not have progressive signs of nerve agent poisoning and consequent incapacitation. Repeated atropine injections without nerve agent exposure produces progressive signs and symptoms of atropinization characterized as mild, moderate, and severe. If a soldier has absorbed little or no nerve agent, a single injection (2 mg) of atropine will produce mild atropinization symptoms. Mild signs and symptoms of atropinization include:

(1) Dryness of the skin, mouth, and throat with slight difficulty in swallowing.

(2) Feeling of warmth and slight flushing.

(3) Tachycardia (rapid pulse).

(4) Hesitancy of urination.

(5) Occasional desire to belch.

(6) Feeling of slowed body movements and mildly relaxed.

(7) Blurred near vision.

NOTE: Symptoms may vary with individual casualties. Since mental reactions may be slightly slowed, aviators must not fly after taking atropine until they have been cleared by a flight surgeon.

b. **Signs and Symptoms of Moderate Atropinization.** If the atropine injection of 2 mg is repeated within one hour, and the casualty has not been exposed to a nerve agent, the following moderate central nervous system symptoms develop in most individuals. They may include:

(1) Drowsiness and fatigue.

(2) Slowed memory and ability to recall.

(3) A feeling of slowed body movements.

(4) Blurring of near vision (near vision may be impaired for more than 24 hours). Soldiers with moderate symptoms can continue some ordinary activity with some loss of efficiency. The effects of the moderate symptoms may last three to five hours.

CAUTION: While an unchallenged dose of atropine may allow individuals to continue normal duties, they may be closely monitored for possible heat injury. This is particularly important when operation in MOPP4, as the individual's ability to perspire is reduced due to atropine.

c. **Signs and Symptoms of Severe Atropinization.** If a third atropine injection of 2 mg is repeated within an hour after the second nerve agent exposure and the casualty has not been exposed to a nerve agent, symptoms will be severe enough to interfere with activities. Additional administration of atropine at frequent intervals will result in severe incapacitating symptoms of overatropinization (nerve agent antidote poisoning). These severe symptoms are:

(1) A very dry mouth, swelling of the tongue and oral mucus membranes.

(2) Difficulty in swallowing, thirst, and hoarseness.

(3) Dry and flushed skin.

(4) Dilated pupils.

(5) Tachycardia (rapid pulse).

(6) Urinary retention (in older individuals).

(7) Constipation.

(8) Slowing of mental and physical activity.

(9) Restlessness.

(10) Headache.

(11) Disorientation.

(12) Hallucination.

(13) Depression.

(14) Increased drowsiness.

(15) Increased fatigue.

(16) Rapid panting respiration.

(17) Respiratory distress.

2-10. ADMINISTER FOLLOW-ON TREATMENT

a. **Administer Additional Atropine.** If all three sets of the casualty's Mark I have been given and severe respiratory distress or convulsions persist, relief does not occur, and bronchial secretions and salivation do not decrease, administer additional atropine autoinjectors as frequently as required to achieve atropinization. Maintain atropinization by administering an additional autoinjector every 10 to 30 minutes as long as needed.

b. **Administer Additional Convulsant Antidote For Nerve Agent.** If the casualty continues to convulse after the first injection of CANA, wait 10 minutes; then administer the second CANA. Observe the casualty for about 10 more minutes and administer the third CANA if needed.

CAUTION: The injections will be limited to three CANA prior to being evacuated to the medical treatment facility.

c. **Check Respiration.** Listen for breathing difficulties. Check for cyanosis (bluish coloring of skin caused by lack of oxygen due to respiratory difficulty). Check the skin around the casualty's eyes through the mask eyelets. Watch the rise and fall of the chest. Turn the casualty onto his side to facilitate breathing.

(1) If the casualty is unconscious and you cannot see the chest rising and falling, cover the mask's inlet valve. The mask will collapse if the casualty is breathing.

(2) If the patient is experiencing difficultly in breathing, evacuate him immediately.

d. **Document Treatment.** Initiate a field medical card (DD Form 1380) on the casualty, if time permits. Be sure to indicate the total amount of antidote the casualty received. Procedures for initiating the card are given in subcourse MD0920, Medical Records and Sick Call Procedures.

e. **Evacuate the Casualty.** If the casualty exhibits signs and symptoms of severe nerve agent poisoning or has difficulty breathing, evacuate the casualty to a medical treatment facility. Evacuate the casualty by litter if possible. Procedures for evacuation are given in subcourse MD0001, Evacuation in the Field.

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise, by completing the incomplete statement, or by writing the answer in the space provided at the end of the exercise.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. A soldier exhibiting signs and symptoms of nausea, runny nose, sudden headaches, and impaired vision is likely to have _____ poisoning.

2. A soldier having dryness of the skin, mouth, and throat, with difficulty in swallowing is exhibiting signs and symptoms of mild _____.

3. A soldier showing drowsiness and fatigue with slowed memory and ability to recall is likely to be suffering from _____ atropinization.

4. When the soldier's conditions are severe enough to interfere with activities and has a very dry mouth, swelling of the tongue and oral mucus membranes, he has signs and symptoms of _____ atropinization.

5. The atropine autoinjector has green identification and direction labels with _____ (color) lettering.

6. The 2-PAM Cl autoinjector is in a clear plastic container with light brown identification label and _____ (color) lettering.

7. The needle end of the 2-PAM Cl autoinjector is _____ in color.

8. The nerve agent antidote kit (Mark I) consists of _____ separate components.

9. With which hand should you grasp the set of injectors to administer the Mark I to yourself? _____

10. When treating an unmasked casualty for nerve agent poisoning, mask the casualty _____ (before or after) administering the NAAK.

11. The atropine autoinjector consists of a hard plastic tube that has _____ mg of atropine.

12. The 2-PAM Cl autoinjector is a hard plastic tube which dispenses _____ mg of 2-PAM Cl.

13. If you are having signs and symptoms of nerve agent poisoning, stop _____ at once and do not inhale until you have masked.

14. You should position the autoinjector against the injection site, and inject yourself either in the _____ or _____.

15. You should form a fist around the auto-injector without covering or holding the _____ (color) end.

16. To prevent damaging the nerve that crosses the buttocks, inject into the upper _____ quadrant only.

17. You should never use the _____ motion when giving an injection since the autoinjector is spring loaded.

18. After giving the injection, you should hold the needle in place for at least _____ seconds.

19. When you finish injecting yourself, push the autoinjector through the under side of the left flap of one of your undergarment's breast pockets to form a _____.

20. If the nerve agents symptoms persist, and no buddy is available, give yourself another set of injections after _____ to _____ minutes.

21. You should not assume a _____ position while in a chemical environment.

22. The combat medic should administer additional CANA injections up to _____ until the convulsions/seizures subside.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. nerve agent (para 2-1b)
2. atropinization (para 2-8a)
3. moderate (para 2-8b)
4. severe (para 2-8c)
5. white (para 2-3a)
6. black (para 2-3a)
7. black (para 2-3a)
8. four (para 2-3a)
9. nondominant (para 2-2b)
10. before (para 2-6)
11. two (para 2-3a) (1))
12. 600 (para 2-3a (2))
13. breathing (para 2-3b)
14. thigh or buttocks (para 2-3b(5))
15. needle (green) (para 2-3b (5))
16. outer (para 2-3b (6) (a))
17. jabbing (para 2-3b (6) (b))
18. 10 (para 2-3b (6) (c))
19. hook (para 2-3c (11))

20. 10 to 15 (para 2-3c (12))

21. Kneeling (para 2-3b CAUTION)

22. Three (para 2-10b CAUTION)

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3 Treating Blood, Choking, and Blister Agent Casualties.

LESSON ASSIGNMENT Paragraphs 3-1 through 3-11.

LESSON OBJECTIVES After completing this lesson, you should be able to:

3-1. Identify signs and symptoms of a casualty exposed to blood agents.

3-2. Identify the proper treatment procedures for a blood agent casualty.

3-3. Identify signs and symptoms of a casualty exposed to blister agents.

3-4. Identify the proper treatment procedures for a blister agent casualty.

3-5. Identify signs and symptoms of a casualty exposed to choking (lung damaging) agents.

3-6. Identify the proper treatment procedures for a choking (lung damaging) agent casualty.

3-7. Identify signs and symptoms of a casualty exposed to incapacitating agents.

3-8. Identify the proper treatment procedures for an incapacitating agent casualty.

3-9. Identify signs and symptoms of a casualty exposed to vomiting agents.

3-10. Identify the proper treatment procedures for a vomiting agent casualty.

3-11. Identify the proper treatment procedures for a vomiting agent casualty.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 3

TREATING BLOOD, CHOKING, AND BLISTER AGENT CASUALTIES

3-1. IDENTIFY SIGNS AND SYMPTOMS OF BLOOD AGENTS

Signs and symptoms produced by blood agents depend upon the concentration of the agent and the duration of exposure. Prolonged exposure to low concentrations may result in damage to the central nervous system resulting in irrationality, altered reflexes, and/or an unsteady gait. Central nervous system damage may last for a few weeks or longer. Sometimes, the damage to the central nervous system is permanent. Signs and symptoms of blood agent poisoning include:

a. Dizziness.

b. Nausea and vomiting.

c. Headache.

d. Increased respirations.

e. Redness of the lips, skin, and nail beds.

f. Irritating odor (CK) or the smell of bitter almonds (AC) prior to masking.

g. Irritation of the eyes and lacrimation (CK).

h. Irritation of the throat, coughing, choking, or gasping.

i. Irrational behavior.

j. Convulsions.

k. Coma.

l. Respiratory and cardiac arrest.

NOTE: Prolonged exposure to low concentrations of a blood agent may cause damage to the central nervous system (CNS) resulting in irrationality, altered reflexes, and/or an unsteady gait. The CNS damage may last for several weeks. Sometimes, the damage is permanent.

3-2. TREAT A BLOOD AGENT CASUALTY

Blood agent poisonings usually results in rapid death (from a few seconds to a few minutes) if the casualty is exposed to a high concentration. If the casualty is removed from the toxic atmosphere or masked before he is exposed to a fatal dose, recovery usually takes place within a few minutes.

a. **Mask the Casualty.** Immediately mask any casualty who is not masked if chemical agents are suspected of being present. This is especially true for blood agent casualties. The faster you mask the casualty, the better his chances for survival. Procedures for masking the casualty are given in Lesson 2.

b. **Ventilate, If Possible.** Administer positive pressure ventilation if the equipment is available.

c. **Evacuate.** Initiate a field medical card, attach it to the casualty's clothing, and evacuate the casualty to the nearest medical treatment facility as quickly as possible.

3-3. IDENTIFY SIGNS AND SYMPTOMS OF CHOKING (LUNG-DAMAGING) AGENTS

The signs and symptoms exhibited by a choking agent casualty occur in two stages, "early" and "late." The "early" stage usually occurs almost immediately after exposure to a heavy concentration. If a casualty is exposed in quick, small doses, however, the signs and symptoms may not appear for up to 6 hours following exposure. There is usually a period between the early and late stages when the casualty has few or no symptoms (asymptomatic). This period usually lasts for 2 to 24 hours, but may be shorter.

a. Signs and symptoms of the early stage include:

(1) Lacrimation (tears present).

(2) Dry throat.

(3) Choking cough.

(4) Tightness in chest.

(5) Nausea.

(6) Vomiting.

(7) Headache.

b. Signs and symptoms of the late (or delayed) stage include:

(1) Wheezing.

(2) Serious attacks of coughing which produces a white, yellow, or bloody, frothy fluid.

(3) Anxiety.

(4) Chest wall retractions (may not be observable if the casualty is wearing protective overgarment).

(5) Cyanosis (difficult to observe after the casualty is masked).

(6) Weak, rapid pulse.

(7) Pulmonary edema.

3-4. TREAT A CHOKING (LUNG-DAMAGING) AGENT CASUALTY

If the casualty has suffered a lethal exposure, death usually occurs within 24 to 48 hours after exposure. Exposure to very high concentrations can result in death within 5 hours of exposure. After 48 to 72 hours, the pulmonary edema is gradually absorbed and the prognosis becomes better.

a. **Mask the Casualty.** If the casualty is able, have him to put on and clear his mask. Mask the casualty if the casualty cannot mask himself. Do not secure the hood at this time.

b. **Keep Casualty Warm and at Rest (Symptomatic).** Keep a casualty with signs and symptoms of choking agent poisoning (either early or late) comfortably warm and have him rest quietly. If the casualty is conscious and is able to sit up, keep him in a sitting position. If the casualty is unable to sit up, have him lie on his back. Do not administer sedatives unless adequate oxygenation is assured and facilities for respiratory assistance are available.

NOTE: A soldier who was briefly exposed to a choking agent but who does not have signs and symptoms of choking agent poisoning may continue his combat duties. If early signs and symptoms develop, treat with warmth and rest; then evacuate the casualty.

c. **Restrict Activities (Asymptomatic).** A soldier in the asymptomatic phase (had signs and symptoms of early choking agent poisoning but now has no signs or symptoms of choking agent poisoning) can be assigned light duties that do not stress his respiratory system until he can be evacuated. Check the casualty periodically for the appearance of signs or symptoms of late choking agent poisoning.

d. **Evacuate.** Any soldier who has been exposed to a choking agent should be examined by a medical officer. Evacuate any casualty who has or has had signs and symptoms of choking agent poisoning to a medical treatment facility. If the casualty has difficulty in breathing, evacuate him by litter. If the casualty cannot lie flat on the litter (cannot breathe adequately lying down), evacuate him in a semi sitting position. Initiate a field medical card and attach the card to the casualty's clothing prior to evacuation.

3-5. IDENTIFY SIGNS AND SYMPTOMS OF BLISTER AGENTS

The signs and symptoms exhibited by a casualty exposed to blister agents may vary depending upon the type of agent used and the route by which the agent was absorbed. Moist areas of the body are highly susceptible to blister agent.

a. **Skin.**

(1) Pruritus (itching), erythema (redness), and blisters (in stated sequence).

(a) Low vapor concentration may only cause skin damage resembling a sunburn. Heavy vapor concentration or liquid agent cause blisters to form.

(b) Blisters may not form for several hours after exposure.

(2) Pain. Phosgene oxime (CX) and lewisite (L) cause immediate and intense pain. With mustard (HD), pain may be delayed 30 minutes to 6 hours.

b. **Eyes.**

(1) Photophobia (extreme sensitivity to light).

(2) Gritty feeling.

(3) Pain. (May range from very mild with mustard gas to severe with lewisite.)

(4) Tearing.

(5) Blepharospasm (involuntary spasm of the eyelids).

c. **Respiratory Tract.** Secondary pneumonia or pulmonary edema may result from damage to the respiratory system.

(1) Coughing.

(2) Sore or irritated throat.

(3) Frothy sputum.

(4) Phlegm.

d. **Systemic.** A drop in white blood cells may result in fever and infection. Lewisite may cause necrosis of the liver.

(1) Malaise ("punk" or weak feeling).

(2) Headache.

(3) Nausea.

(4) Vomiting.

(5) Severe burn from agent.

3-6. TREAT A BLISTER AGENT CASUALTY

a. **Mask the Casualty.** If the casualty is not already masked, tell him to put on his mask. If the casualty is unable to mask himself, assist him as needed. Do not secure the hood at this time.

b. **Irrigate Eyes, If Needed.** If the casualty's eyes have been exposed to liquid blister agent, have the casualty flush (irrigate) his eyes with water from his canteen immediately. If the casualty is unable to flush his eyes, perform the action for him using the steps given below. (The steps assume that both eyes have liquid blister agent present.) The process must be performed within 2 minutes of exposure in order to be effective. If possible, quickly move the casualty to a protected area or protect the casualty with a poncho while irrigating his eyes. Irrigate the casualty's eyes even if toxic vapors are present in the surrounding atmosphere.

(1) Obtain the casualty's canteen or other source of uncontaminated water.

(2) Position the casualty so you can pour water into his eyes once his mask is lifted. Tilt his head so one eye is higher than the other.

(3) Tell the casualty to take a deep breath and hold it. Also tell him to close his mouth and eyes. Closing his mouth and eyes reduces the amount of agent absorbed through mucous membranes.

(4) Quickly lift the casualty's protective mask.

(5) Tell the casualty to open his lower eye. Do not hold the casualty's eyelid open with your gloved hand since your glove is contaminated. If the casualty opens both eyes instead of one, continue with the irrigation.

(6) Slowly pour water from the canteen into the casualty's lower eye. Flush from the inner aspect (corner nearest nose) of the eye to the outer aspect (corner nearest the ear). Allow the contaminated water to run off the side of his face.

(7) After you have irrigated the eye, tell the casualty to shut his eyes.

(8) If the casualty's able to continue holding his breath, continue to step 9. If he cannot hold his breath until both eyes are irrigated, remask the casualty and let him take several breaths. Then position the casualty (step 9), have the casualty hold his breath, and lift his mask.

(9) Have the casualty tilt his head so the eye that has just been flushed is higher than the other eye. This will help to prevent the contaminated irrigation water from recontaminating the eye that has already been irrigated.

(10) Tell the casualty to open his other (unflushed) eye. Do not use your gloved hand to hold his eyelid.

(11) Slowly pour water from the canteen into the casualty's lower eye. Begin at the inner aspect and proceed toward the outer aspect. Do not allow water to flow or splash into the eye that has already been flushed. Let contaminated water run off side of face.

(12) After you have completed the irrigation, tell the casualty to close his eyes.

(13) Replace the casualty's mask and have him resume breathing.

c. **Decontaminate Face, If Needed.** If the casualty has liquid blister agent on his face have him decontaminate his face and the lower portion of his mask. If the casualty is unable to decontaminate his face and mask, have another soldier perform the decontamination procedures or perform them yourself. Have the casualty clear and check his mask after the decontamination has been performed.

d. **Initiate Field Medical Card.** Initiate a field medical card on the casualty.

e. **Evacuate, If Needed.** If the casualty can still perform combat tasks and the military situation is such that the casualty is needed, return him to duty. Otherwise, evacuate him to a medical treatment facility for further evaluation and treatment. Even if the casualty is returned to duty, he should be examined by a medical officer when the situation permits.

3-7. IDENTIFY SIGNS AND SYMPTOMS OF INCAPACITATING AGENTS

Signs and symptoms produced by incapacitating agents may not appear for up to 36 hours following exposure. Signs and symptoms of incapacitating agents include the following:

a. Restlessness, dizziness, or giddiness.

b. Confused, erratic, or inappropriate behavior.

c. Lack of coordination; stumbling or staggering.

d. Dryness of mouth.

e. Tachycardia.

f. Blurred vision; pupil dilation.

g. Stomach cramps; vomiting.

h. Headache.

i. Hallucinations.

j. Dry, flushed skin.

k. Fever.

l. Urinary retention.

3-8. TREAT AN INCAPACITATING AGENT CASUALTY

a. **Mask the Casualty.** Mask the casualty if he is not already masked and he is not capable of putting on his mask and hood himself.

b. **Reassure the Casualty.** Have a friendly, but firm, attitude toward the casualty. If the casualty is incoherent or cannot comprehend what is being said, do not try to carry on a conversation.

c. **Protect Casualty.** Keep the casualty as calm as possible. Remove the casualty from the chemical environment if possible. Restrain the casualty if needed.

d. **Decontaminate the Casualty.** After the casualty is removed from the chemical environment (protective shelter, and so forth), decontaminate the casualty using soap and water or an M258A1 skin decontamination kit. If possible, have another soldier perform the decontamination procedures (buddy-aid).

e. **Cool the Casualty, If Needed.** If the casualty's body temperature is above 102°F (39°C) and his mucous membranes are dry, begin immediate cooling procedures. Remove him from direct sunlight, spray him with cool water, and fan him to promote evaporation.

(1) Do not apply ice to the casualty.

(2) Do not begin an intravenous infusion or give the casualty anything to drink. Dehydration is not likely and the primary dangers are vomiting and temporary urinary retention.

f. **Position the Casualty, If Needed.** If the casualty is stuporous or comatose, turn the casualty onto his stomach with his head turned to one side. This will help to prevent aspiration of vomitus should the casualty vomit. Monitor the casualty for respiratory problems.

g. **Evacuate the Casualty.** Evacuate the casualty to a medical treatment facility. If the casualty's temperature is above 102°F or the casualty must be restrained, evacuate him as rapidly as possible.

3-9. IDENTIFY SIGNS AND SYMPTOMS OF VOMITING AGENTS

Signs and symptoms may not occur for several minutes following exposure. Once symptoms begin, they will increase in intensity even if the casualty has masked following exposure. Exposure to very low concentrations will produce signs and symptoms resembling a severe cold. Other signs and symptoms include the following:

a. Severe headache.

b. Painful, burning throat.

c. Irritation of the eyes and lacrimation.

d. Rhinorrhea.

e. Ropy saliva flow from mouth.

f. Tightness or pain in the chest.

g. Coughing and sneezing.

h. Nausea.

i. Vomiting.

j. Mental depression.

3-10. TREAT A VOMITING AGENT CASUALTY

a. **Mask Casualty.** Have the casualty mask if he has not already done so. Keep the casualty from removing his mask.

(1) Since the symptoms increase even though he is masked, the casualty may want to take his mask off since it does not appear to be working and he feels nauseous.

(2) If the casualty is going to vomit, have him lift his mask, vomit, and replace his mask.

b. **Have Casualty Continue Duties.** Exposure to field concentrations of vomiting agents will not prevent the casualty from performing his combat duties. Symptoms usually disappear within 20 minutes to 2 hours if the casualty keeps his mask on.

CAUTION: Exposure to high concentrations of vomiting agent in a confined space can result in severe pulmonary injury, which could be fatal without treatment. Evacuate such a casualty to a medical treatment facility.

3-11. IDENTIFY AND TREAT INHALED TOXIC SUBSTANCES

The preceding paragraphs have dealt with chemical agents used on the battlefield. Sometimes, soldiers may be accidentally exposed to toxic chemical vapors such as ammonia gas, nitrogen oxide, sulfur oxide, chlorinated hydrocarbons (petroleum distillates), and chlorine gas used to kill bacteria in water. Figure 3-1 gives signs and symptoms associated with inhaling these toxic gasses and treatment for the casualties. An intravenous infusion (IV) lifeline is usually established using D_5W (5 percent dextrose in water).

SIGNS AND SYMPTOMS	TREATMENT
AMMONIA GAS	
Irritation of eyes, respiratory tract Coughing, choking Abdominal pain	Flush eyes with water for 15 minutes Positive pressure oxygen Humidified support respirators
NITROGEN OXIDE	
Burning in eyes, nose, throat Fatigue Cough, dyspnea Pulmonary edema Bronchitis, pneumonia	Pure oxygen, humidified Absolute bed rest Suction, if needed Postural drainage
SULFUR OXIDE	
Respiratory tract irritation Sneezing Cough, dyspnea	Remove from contaminated area Positive pressure oxygen, humidified Support respirations
CHLORINATED HYDROCARBONS	
Euphoria Burning of chest Headache CNS depression Weakness, confusion	Oxygen, humidified Support respiration
CHLORINE	
Severe irritation of respiratory tract and eyes Glottal spasm Coughing Vomiting Pulmonary edema Cyanosis Choking	Oxygen, humidified Support respiration

Figure 3-1. Signs and symptoms associated with inhaling toxic gasses and treatments.

Continue with Exercises

EXERCISES, LESSON 3

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise, by completing the incomplete statement, or by writing the answer in the space provided at the end of the exercise.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. The basic treatment for a blood agent casualty is to make sure he is properly _____ and evacuated.

   a. Masked.

   b. Dressed.

   c. Informed.

   d. Secured.

2. In the field, a masked soldier is showing late signs and symptoms of exposure to a choking agent. What should you do to help the soldier?

   a. Administer atropine until his pulse rate returns to normal.

   b. Decontaminate the soldier's face using his M258A1 decontamination kit.

   c. Have the casualty sit down, keep him warm, and evacuate.

   d. Nothing. Stay away from him until the symptoms subside.

3. A soldier was masked in a chemically contaminated area, but accidentally lost one of his gloves. His exposed hand is red, itches, and hurts. Small blisters are beginning to form. This soldier was probably exposed to a:

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Nerve agent.

4. A dry mouth, rapid pulse, lack of coordination, mental confusion, and hallucinations are indications that a(n) _____ agent is being used.

   a. Blister agent.

   b. Blood agent.

   c. Choking agent.

   d. Incapacitating agent.

5. Which is the order of treatment for a blister agent casualty?

   a. Decontaminate, irrigate, and mask.

   b. Mask, irrigate, and decontaminate.

   c. Irrigate, mask, and decontaminate.

6. A soldier was exposed to a vomiting agent before he masked. After a few minutes, he states that his mask must be defective because he is starting to get sick at his stomach. What should you do?

   a. Tell him to remove the mask since it is not working.

   b. Trade masks with the soldier so you can evaluate the effectiveness of his mask.

   c. Tell him to keep his mask on until he needs to vomit. After he vomits, he should not put the mask back on.

   d. Tell him to keep his mask on. If he must vomit, he should lift the mask, vomit, and replace the mask.

7. Flushing the eyes for 15 minutes is a standard part of the treatment for a casualty exposed to:

   a. Ammonia gas.

   b. Chlorinated hydrocarbons.

   c. Chlorine.

   d. Nitrogen oxide.

8. Administration of pure oxygen and absolute bed rest are part of the treatment for a person exposed to:

   a. Ammonia gas.

   b. Chlorinated hydrocarbons.

   c. Chlorine.

   d. Nitrogen oxide.

9. What is the order of treatment for a blood agent casualty?

   a. Mask, ventilate, and evacuate.

   b. Ventilate, mask, and evacuate

   c. Evacuate, mask, and ventilate.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 3

1. a (para 3-2)
2. c (paras 3-4b, d)
3. a (para 3-5a)
4. d (para 3-7)
5. b (paras 3-6a-c)
6. d (para 3-10)
7. a (fig 3-1)
8. d (fig 3-1)
9. a (paras 3-2a-c)

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4	Biological Agents.
LESSON ASSIGNMENT	Paragraphs 4-1 through 4-9.
LESSON OBJECTIVES	After completing this lesson, you should be able to: be able to:

4-1. Identify the types of biological agents.

4-2. Identify signs and symptoms of a casualty exposed to biological agents.

4-3. Identify the effects of biological agents.

4-4. Identify treatment for a biological agent casualty.

SUGGESTION

After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

For additional information, consult following:

FM 3-9, Potential Military Chemical/Biological Agents and Compounds

FM 8-9, NATO Handbook on the Medical Aspects of NBC Defensive Operations.

LESSON 4

BIOLOGICAL AGENTS

4-1. BIOLOGICAL WARFARE

The term biological warfare (BW) may cause feelings of terror and horror. The mere threat of a biological attack can be a psychological weapon that could lead to collapse of morale and panic. In biological warfare, biological agents are used to weaken the opposing force. A biological agent is a microorganism that causes disease in humans, plants, or animals or which causes deterioration in material. Normally, the term is used to mean a microorganism or the toxin from a microorganism that produces disease in humans. A biological agent can be used to injure, kill, or weaken soldiers and reduce their ability to fight.

4-2. DISEASE IN WARFARE

Disease has played a very important part in warfare. In most wars, more soldiers died from disease than were killed by enemy action. Usually, these deaths resulted from inadequate sanitation and lack of personal hygiene, not from deliberate enemy planning. There have been a few cases reported in which disease was spread as a military tactic. Dead animals left in water wells and diseased human corpses thrown into a city under siege are two methods in which biological warfare has been conducted in the past. Some reports indicate that Indians in North and South America were given blankets contaminated by smallpox victims in order to spread the disease among local populations. Some reports indicate that biological weapons may have been used in modern wars.

4-3. TYPES OF BIOLOGICAL AGENTS

Bacteria, viruses, rickettsia, and toxins may be used as biological agents in modern warfare. Of these, toxins are probably the most effective.

a. **Bacteria.** Bacteria are living, one-celled organisms. Often, diseases caused by bacteria are carried by animals which transmit the disease to man. Examples of bacterial diseases include anthrax, cholera (actually caused by an enterotoxin produced by bacteria), dysentery, malaria, meningitis, plague, tularemia, and typhoid.

b. **Viruses.** Viruses are submicroscopic pathogens composed of nucleic acid that invade living cells, take over the cell's reproductive function, causes the cell to reproduce the virus, and eventually destroys the cell. Viruses are often transmitted to humans by arthropods, rodents, monkeys, and other humans. Examples of viral diseases include hemorrhagic fever, viral hepatitis, and smallpox.

c. **Rickettsia.** Rickettsia are very small microscopic organisms, considered to be a type of bacteria, that reproduce only inside a host cell. They are usually carried by ticks, lice, or fleas. Examples of diseases caused by rickettsia include typhus, spotted fever, and query fever (Q fever).

d. **Toxins.** Toxins are chemical compounds of biological origin. Their origin and their ability to affect the human immune system separate them from other poisons. The advent of biotechnology has changed the magnitude of the toxin threat. Toxins that are only available in small amounts in nature can be produced in large quantities using bioengineering techniques. Bioengineering may also allow subtle changes in the toxins that do not alter their toxic properties but decreases the body's natural ability to neutralize the toxins. The ability to produce large quantities of toxins, the ability to manipulate their structure, and the ability to target them for specific cells have greatly increased their potential as effective biological warfare agents.

(1) Mycotoxins. Mycotoxins attack and kill specific types of cells. They may affect the body's respiratory, circulatory, digestive, or integumentary systems.

(2) Neurotoxin. Neurotoxin interfere with nerve impulse transmission.

(3) Bacterial toxins. Bacterial toxins are derived from bacteria. Neurotoxin produced by certain species of bacteria are among the most poisonous substances known. These toxins produces diseases such as botulism and tetanus.

(4) Saxitoxin. Saxitoxin are neurotoxin which are produced by certain marine plankton. The neurotoxin can accumulate in shellfish, such as mussels and clams, which feed upon the plankton.

(5) Tetrodotoxins. Tetrodotoxins are neurotoxin which are present in several species of puffer fish.

(6) Phytotoxin. Phytotoxin are neurotoxin produced by certain species of higher plants, such as ricin produced by the caster bean which is 100 times more deadly than cobra venom.

(7) Mycotoxins. Mycotoxins are toxins produced by fungi. They are sometimes referred to as "yellow rain."

4-4. METHODS OF DISSEMINATION

Biological agents may be disseminated using arthropods carrying the disease bacteria or virus, by contamination of water systems and food processing centers (canneries, for example), or as a liquid sprayed from tanks or bursting munitions. The most likely method, though, is by aerosol distributed by an airplane or by missiles or bombs. In aerosol form, the agent can be quickly spread over a large area. The aerosol form is also more difficult to detect and diagnose. The aerosol form enters the human through the respiratory tract, which is the preferred route for military use.

4-5. INDICATIONS OF A BIOLOGICAL ATTACK

The following are indications that an attack using biological agents may have occurred.

a. **High Probability.**

(1) Many soldiers and civilians are sick for unknown reasons (mysterious illness, cause unknown).

(2) Large numbers of insects present (more than normal) or unusual insects detected.

(3) Large numbers of dead wild and domestic animals.

b. **Possibility.**

(1) Artillery shells with less powerful explosions than normal HE rounds.

(2) Area bombs that pop rather than explode.

(3) Mist or fog sprayed by aircraft.

4-6. SIGNS AND SYMPTOMS ASSOCIATED WITH A BIOLOGICAL ATTACK

Signs and symptoms of diseases produced by biological agents used in military operations are usually similar to the normal signs and symptoms of the disease. However, there may be unusual circumstances. For example, casualties may have signs and symptoms of two unrelated diseases or may have acquired the disease in an unusual way, especially if the casualty has respiratory involvement with a disease that usually does not attack through the respiratory system. The diseases may not be traceable to a normal source (common contaminated water source or food), but seem to be grouped in geographic areas and spread by wind (aerosol form being used). Also, the disease may not be normal for the area. Some of the casualties' signs and symptoms may help you to identify the type of biological agent being used.

4-7. EFFECTS OF BIOLOGICAL AGENTS

When used by an enemy, biological warfare is the intentional application of live agents or toxins to cause death and disease among personnel, animals, or plants or to cause deterioration of materials.

a. **Live Agents.**

(1) These are living organisms that can be delivered directly (artillery or aircraft spray) or through a vector such as a flea or tick.

(2) Only a few organisms are needed to cause infection by some agents. Being small enhances the ability of the agents to spread great distances, and float into places that are not airtight.

(3) Time is required for agents to become ingested and multiply enough to overcome the body's immune system. Depending on the organism, incubation period may take hours, days, or even weeks.

(4) Live agents have life cycles in which they grow, reproduce, age, and die. They usually require protection and nutrition from a host organism while they are alive. Weather conditions determine if they will be reduced in number or thrive successfully. Some bacterial agents produce spores that can form protective coats and survive for longer periods of time, however most live agents last for one day.

(5) Neither of the five physical senses can detect live agents, therefore the first indication of a biological attack is a sick soldier. Some of these diseases may spread either directly, or indirectly from soldier to soldier.

(6) Due to the incubation period and life cycle, likely areas for live agent use are in the combat service support (CSS) area.

b. **Toxins.**

(1) Toxins are by-products (poisons) produced by plants, animals, or microorganisms. Today's technology provides for the production of large quantities of many toxins. These are poisonous compounds that do not grow, reproduce, or die after they have been dispersed.

(2) Toxins are more easily controlled than live organisms.

(3) Field monitors to immediately detect the presence of toxins in the area are not available.

(4) Signs and symptoms from exposure to toxins are similar to those of a chemical attack, but the first aid treatment for chemicals will not work against toxins.

(5) Lethal or injury downwind hazard zones for toxins may be far greater than those of chemical agents.

(6) Toxins can be dispensed alone or with other carriers or agents.

(7) Some toxins have symptoms that mimic other illness or chemical casualty symptoms. They may include any of the following:

(a) Tingling of skin, numbness, paralysis, or convulsions.

(b) Dizziness, mental confusion, or double or blurred vision.

(c) Coughing.

(d) Fever, aching muscles, and fatigue.

(e) Difficulty in swallowing.

(f) Shock.

(g) Nausea, vomiting, and/or diarrhea.

(h) Bleeding from body openings, or blood in urine, stool or sputum (spit).

4-8. IMMEDIATE ACTIONS DURING AN ATTACK

a. Put on your protective mask immediately and keep clothing buttoned up. Agents can gain entry through clothing using two routes.

(1) First, through openings such as buttonholes, zipped areas, stitching, and poor sealing at ankles, wrist and neck.

(2) A second way is through minute pores in the fabric of clothing. Putting on one's protective ensemble greatly increases the protection level of the individual soldier. Toxins, however, require the same amount of protection as liquid chemical agents.

b. Since there is no rapid warning, soldiers should take the same action for a biological attack as that prescribed for a chemical attack. After a suspected biological attack, samples should be taken with the M34, M256 series, or CBASK.

4-9. TREATMENT OF BIOLOGICAL AGENT CASUALTIES

Appropriate self-aid, buddy-aid, and medical treatment will vary depending on the agent. Some symptoms may appear in minutes; others may not appear even hours after a toxin attack.

a. **Decontaminate.** Soldiers should decontaminate immediately. The M258A1, or M291 decontamination kits should be used. Another recommended cleansing agent is soap and water.

b. **Identify.** Identify the type of biological attack from samples taken and by observing the signs and symptoms exhibited by the casualties. Treating those symptoms. Early recognition of symptoms and their treatment will increase recovery time.

c. **Isolate.** Isolation of soldiers showing symptoms of disease is necessary. If the disease is communicable, isolation helps to prevent it from spreading to others.

d. **Treat.** Treat the casualties' signs and symptoms.

e. **Evacuate.** Treatment of live biological agent or toxic casualties requires medical assistance as soon as possible. Evacuate casualties to medical treatment facilities as needed.

NOTE: There are so many variables involved in predicting the persistency of biological hazards that each instance of contamination must be considered separately. Specially trained medical personnel at division level and higher can make estimates only after the contamination has been specifically identified.

Continue with Exercises

EXERCISES, LESSON 4

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise, by completing the incomplete statement, or by writing the answer in the space provided at the end of the exercise.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. The types of biological agents are:

   a. Bacteria, viruses, pneumococci, and toxins.

   b. Toxins, rickettsia, viruses, and bacteria.

   c. Viruses, bacteria, hepatitis, and toxins.

   d. Smallpox, malaria, bacteria, and dysentery.

2. Submicroscopic pathogens composed of nucleic acid that invade living cells, and take over the cell's reproductive functions are called:

   a. Bacteria.

   b. Viruses.

   c. Rickettsia.

   d. Toxins.

3. The origin and ability of _____ to affect the human immune system separate them from other poisons.

   a. Toxins.

   b. Rickettsia.

   c. Viruses.

   d. Bacteria.

4. _____ are living, one-celled organisms.

   a. Toxins.

   b. Rickettsia.

   c. Viruses.

   d. Bacteria.

5. _____ are very small micro-organisms, considered to be a type of bacteria, that reproduce only inside a host cell.

   a. Bacteria.

   b. Viruses.

   c. Rickettsia.

   d. Toxins.

6. The preferred method of dissemination of biological agents for military use is by:

   a. Arthropods.

   b. Munitions.

   c. Water systems.

   d. Aerosol.

7. Which of the following is NOT an indication of a biological attack?

   a. An explosion followed by shock waves.

   b. Soldiers having mysterious illnesses.

   c. Mist of fog from aircraft.

   d. Aerial bombs pop rather than explode.

8. Biological agents are live agents or toxins that cause death and disease among:

   a. Military and civilian personnel.

   b. Arthropods, personnel, and animals.

   c. Animals, plants, and personnel.

   d. Soldiers, plants, and arthropods.

9. Live agents can be delivered by vectors, such as:

   a. Artillery.

   b. Fleas.

   c. Aircraft.

   d. Missiles.

10. The first indication of a biological attack may be:

   a. Sick soldiers.

   b. Dead birds.

   c. Unusual insects.

   d. Any of the above.

11. The first action you should take when you suspect a biological attack is:

   a. Put on your protective overboots.

   b. Put on your protective overgarments.

   c. Put on your protective mask.

   d. Administer one Mark 1 kit to yourself.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 4

1. b (para 4-3)
2. b (para 4-3b)
3. a (para 4-3d)
4. d (para 4-3a)
5. c (para 4-3c)
6. d (para 4-4)
7. a (para 4-5)
8. c (para 4-7)
9. b (para 4-7a(1))
10. d (para 4-5)
11. c (para 4-8a)

End of Lesson 4