U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
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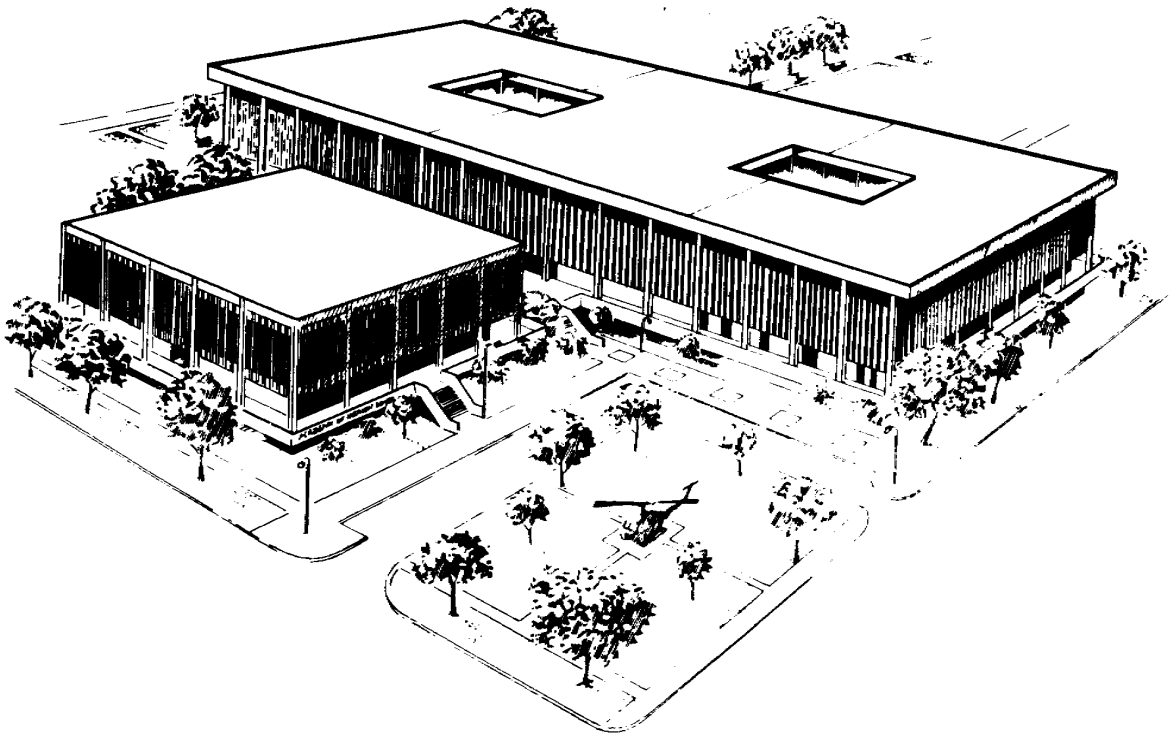

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE

SUBCOURSE MD0534 EDITION 200

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

Students who desire credit hours for this correspondence subcourse must enroll in the subcourse. Application for enrollment should be made at the Internet website: http://www.atrrs.army.mil. You can access the course catalog in the upper right corner. Enter School Code 555 for medical correspondence courses. Copy down the course number and title. To apply for enrollment, return to the main ATRRS screen and scroll down the right side for ATRRS Channels. Click on SELF DEVELOPMENT to open the application; then follow the on-screen instructions.

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CLARIFICATION OF 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

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE

INTRODUCTION

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

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:

The subcourse instructional material consists of five lessons as follows:

Lesson 1, Introduction to CBRNE
Lesson 2, Chemical, Biological, Radiological, Nuclear, Explosive Equipment.
Lesson 3, Recognizing and Treating Nerve Agent Casualties.
Lesson 4, Biological Agents Overview
Lesson 5, Vesicant and Cyanide Agents.

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.

--Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

Upon successful completion of the examination for this subcourse, you will be awarded 8 credit hours.

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas.

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	Introduction to Chemical, Biological, Radiological, Nuclear, and Explosive
TEXT ASSIGNMENT	Paragraphs 1-1 through 1-10
LESSON OBJECTIVES	Given the potential for a CBRNE attack,

1-1. Identify the different threats that may be used by terrorists.

1-2. Identify agencies who may react to those threats.

1-3. Identify the AMEDD's role in support of CBRNE defense.

1-4. Identify threats, methods of dissemination, and collective defensive agencies that may support and react to an attack.

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 1

INTRODUCTION TO CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE

1-1. INTRODUCTION

The purpose of this lesson is to familiarize you with recent events involving the potential or actual use of CBRNE materials by terrorists and to familiarize you with all aspects of CBRNE agents; the sources and the hazards associated with CBRNE agents, and the outcomes of such an attack. By the end of this instruction, you should be able to recognize when a terrorist CBRNE event has occurred and know the potential impacts of that event.

1-2. CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE DEFINED

a. Chemical agents are natural or manufactured chemicals that can be used as weapons.

b. Biological agents are agents that are harvested to be used as weapons to kill or incapacitate soldiers and/or civilians.

c. Radiological agents are weapons that can be made from medical radiation waste and other sources of radiation that can be used to make “dirty” bombs to contaminate an area or population with radiation.

d. Nuclear devices are low or high yield devices that can be used by terrorists or larger countries as weapons.

e. Explosive devises are any type of manufactured or improvised explosive.

1-3. CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE THREATS AND AVAILABILITY OF AGENTS

a. What is the hardest type of CBRNE threat to detect?

(1) The lone individual, such as the "Unabomber," is by far the most difficult to detect. This type of terrorist is a wild card, striking without a predictable motive or pattern, copying a previous event for the publicity, or just acting on a whim. Fortunately, individual terrorists have been the least successful. Lacking the funding, organization, and sophistication of larger groups, they account for many of the recently failed attempts and hoaxes.

(2) Local terrorist groups and non-aligned groups form the larger threat of domestic CBRNE terrorism, as they have the funding, organization, and ability to build or purchase CBRNE agents. The primary differences between them are the cause, the home base, and the source of their funding. Local terrorist groups have one distinct advantage over foreign organizations -- the members fit into the local society and are often unnoticed until they strike.

b. What do we know about the availability of CBRNE agents?

(1) Chemical, biological, radiological, nuclear, explosive agents agents are available and relatively easy to acquire or manufacture. Although not quite "high school" science, chemical and biological agents can be made from readily available components by individuals with knowledge gained at the college level.

(2) Radiological materials are found in many facilities, such as research labs, hospitals, and in industry. In fact, almost every home has radioactive material (in smoke detectors). Toxic chemicals and the materials to make chemical warfare agents are readily available in school laboratories. Such materials are legitimately used in industry and are employed in various research facilities. Libraries contain the “recipes“ required. Biological pathogens may be obtained from nature, hospital labs, university research facilities, and other places.

c. What is the impact of Chemical, biological, radiological, nuclear, explosive agents in enclosed spaces?

(1) Large amounts are not needed in enclosed spaces. Chemical, biological, radiological, nuclear, explosive agents are extremely toxic at very low doses. If these agents were released into an enclosed space, their lethal effects would be magnified. For comparison purposes, a fragmentation hand grenade has an effective casualty radius of 5 meters. The same quantity of chemical agent (about 1.7 pounds) disseminated in a practical way could fill a 600-foot long subway platform with a concentration that would injure or kill every person who remained on the platform for two minutes.

(2) In addition, the facility might have to be shut down until it could be thoroughly decontaminated. A radiological agent, spread in the same location, would likely not cause immediate injury, but would have the potential to shut down the facility until thoroughly removed.

(3) One study indicates that the same quantity of the most toxic biological material, disseminated under ideal conditions, could cause deaths or injuries over an area of more than nine square kilometers.

d. While knowledge of the capabilities and characteristics of chemical, biological, and radiological agents is useful in the remediation effort after an incident, the ability to recognize both the potential for an event and the tools of a CBRNE terrorist may enable responders to anticipate and prevent or mitigate the effects of the attack.

(1) In a lot of cases, security is often an issue regarding those that spray insecticide and crop dusting.

(2) Unclassified sources show an increase of actual terrorist activity involving CBRNE agents. This increase does not include hoaxes, such as the letter which was alleged to contain anthrax, sent in April 1997 to B'nai B'rith headquarters in Washington, D.C., and letters claiming to contain anthrax which have been sent to institutions such as clinics and media organizations.

(3) Since Sept 11, 2001, we now know that there have been actual letters containing anthrax received in the United States, exposing some and killing a few. The concern over the hoaxes is that they require the same initial response as an actual terrorist attack.

e. Some significant incidents are listed below.

(1) In 1972, members of a US fascist group called Order of the Rising Sun were found in possession of 30 to 40 kilograms of typhoid bacteria cultures, with which they planned to contaminate water supplies in Chicago, St. Louis, and other large Midwestern cities.

(2) In 1984, two members of an Oregon cult cultivated salmonella (food poisoning) bacteria and used it to contaminate restaurant salad bars in an attempt to affect the outcome of a local election. Although some 751 people became ill and 45 were hospitalized, there were no fatalities.

f. Terrorist weapons may include nuclear devices, radiological material, and chemical and biological agents. This contrasts the likelihood of the materials being used by terrorists with their potential impact. The conventional wisdom is that a nuclear weapon will be very difficult for a terrorist group to acquire; however, radioactive material, chemical agents, and biological agents are relatively easy to obtain and thus pose a greater threat.

g. Note that both the availability and the impact of chemical and biological threat materials are high, with potentially devastating consequences. This subcourse will focus on the most likely terrorist weapons--radioactive material, chemical agents, and biological agents, and will touch on the potential result of terrorist use of nuclear devices as well.

1-4. CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE DISSEMINATION METHODS

a. The method used to disseminate CBRNE will vary greatly on the dispersing device, the downwind hazard and the agent used. Some examples follow.

(1) Breaking devices (light bulbs, vacuum bottles)--minimal hazard, used for chemicals.

(2) Bursting devices--moderate hazard, used for all agents.

(3) Exploding devices--moderate hazard, used for radiological (chemical or biological possible).

(4) Spraying devices--chemical or biological

b. Different methods will be used based on the desired effect of the device and substance used. Breaking and bursting devices may be used for a small attack focused on a specific person or small group. The greater the desired effect, the larger the device needed to spread the agent.

(1) Line source (significant downwind hazard)--potential for larger dispersal area and greater effect.

(a) Moving vehicles.

(b) Airplanes.

(2) Point source (moderate/significant downward hazard)- smaller area of effect.

(a) Aerosol can

(b) Garden hose

c. Vectors are used to create unpredictable, biological, or chemical effects. A specific person or group would be hard to target with this method, but the effect of fear or “terror” would be widespread due to the undiscriminating nature of the attack.

(1) Letters/packages.

(2) Insects/animals.

(3) Contaminated clothing.

(4) Contaminated food.

(5) Contaminated water.

1-5. CHEMICAL AGENTS

a. Chemical warfare agents can be persistent, that is, to continue to be a threat for a long period of time after release. Agents can also be non-persistent presenting a hazard for only a short period of time after the release of the agent.

(1) Nerve agent summary.

(a) Volatile nerve agents, such as **Sarin**, are non-persistent chemicals that pose primarily an inhalation hazard.

(b) Symptoms of exposure develop within seconds, but tend not to worsen if the victim can be evacuated from the area.

(c) Individuals who either inhale a toxic dose or are unable to be evacuated from the release site will experience the highest mortality rates.

(d) First responders and medical personnel are at risk of becoming secondarily contaminated from agent off-gassing. This occurs if the victim's clothing is not properly handled and responders fail to wear appropriate respiratory protection.

(e) Symptomatic individuals require immediate treatment, including airway management and antidote therapy.

(f) Persistent nerve agents such as **VX** continue to present a hazard for a considerable period of time, do not readily vaporize, and pose primarily a liquid threat.

(g) Symptoms from such a contamination may be delayed for minutes to hours depending on the concentration, dose, and location of the contaminant on the skin.

(2) Mustard**--**properties.

(a) Sulfur mustard is both a vapor inhalation and liquid contact hazard. Mustard causes injury to the eyes, skin, airways, and some internal organs.

(b) There is no specific therapy beyond supportive care. Mustard is absorbed and causes chemical cellular damage within 1 to 2 minutes.

(c) The onset time for clinical effects ranges from 2 to 48 hours; most commonly between 4 and 8 hours.

(3) Industrial chemicals.

(a) Phosgene.

1 Has the odor of newly mown hay and becomes a gas at 47 degrees Fahrenheit. It primarily damages the lungs and must be inhaled to cause this damage.

2 At high concentrations, the chlorine part of the molecule irritates the eyes, nose, and upper airways, and may cause fatal laryngospasms.

3 Phosgene is a common industrial chemical and was also formerly used as a warfare agent.

4) Dyspnea at exertion worsens to dyspnea at rest after a severe exposure. This is accompanied by a cough productive of frothy, clear sputum.

(b) Chlorine.

1 Chlorine was the first chemical used on a large scale in modern warfare. It was used in 1915 in World War I. It is commonly stored at water treatment plants and is also widely used in industry.

2 Chlorine causes irritation to the eyes both as a gas and in solution in swimming pool water. If chlorine gas is inhaled, it causes airway irritation with cough and a feeling of shortness of breath.

3 Chlorine injures cells by reacting with water to produce hydrochloric acid and oxygen free radicals.

4 A high concentration will cause more severe pulmonary damage with both airway and parenchymal damage.

5 After an exposure to a high concentration or a prolonged exposure, chlorine can cause non-cardiac pulmonary edema.

b. Recent terrorist use of chemical weapons.

(1) Early on the morning of March 20 1995, the poisonous gas Sarin, which was developed by Nazi Germany during World War II, was used on subway lines in the very heart of Tokyo. Ten people died from poisoning and over 5,000 people were reported injured. The affected subway lines intersected at Kasumigaseki station, the office quarters of the Tokyo government. Poisonous gas was found on five trains heading for the station and the entire city was thrown into terror and confusion.

(2) This incident demonstrated the potential of a new and insidious form of terrorism, with which few in government, public safety, or medical community were prepared to cope.

1-6. BIOLOGICAL AGENTS

A brief discussion of the history and development of biological warfare (BW) agents is given below.

a. **Biological Agents.** Biological agents are the oldest of the nuclear, biological, and chemical triad of weapons of mass destruction.

b. **Anthrax**. Anthrax is caused by the spore-forming bacterium, *Bacillus anthracis*. Zoonotic disease in herbivores (for example, sheep, goats, and cattle) follows ingestion of spores in soil. Human infection is acquired through contact with anthrax-infected animals or animal products or through intentional exposure. There are three clinical forms--cutaneous, inhalational, and gastrointestinal.

c. **Smallpox.**

(a) Smallpox is caused by the *Variola* virus, an orthopox virus, which caused both a major and minor form of the disease. The smallpox virus only causes overt clinical disease in humans; no animal reservoirs of the virus exist in nature. This was the major reason why the disease was selected for global eradication.

(b) Smallpox was declared eradicated in 1980. It is the only disease to date that has earned this distinction. The US stopped its civilian vaccination program in 1981. Despite eradication, concerns over clandestine stockpiles of smallpox still remain. The issue for destruction of US laboratory stocks of the virus is under review.

d. **Salmonella**.

(1) In 1885, pioneering American veterinary scientist, Daniel E. Salmon, discovered the first strain of Salmonella from the intestine of a pig. This strain was called *Salmonella choleraesuis*, the designation that is still used to describe the genus and species of this common human pathogen.

(2) Salmonella is a type of bacteria that causes typhoid fever and many other infections of intestinal origin.

1-7. RADIOLOGICAL DEVICES

a. Experts say there is enough material and know-how out there for terrorist to mount a lethal radiological attack with a "dirty bomb," turning a US downtown into a death zone.

b. Potential terrorist attack methods could include explosively dispersing a radioactive source, spreading radioactive material on the ground, dispersing the materials in the air, or adding the radioactive material to food or water.

1-8. NUCLEAR

Nuclear weapons have only been used on human targets twice - Hiroshima and Nagasaki. These cities had been spared the scourges of the firebomb raids so they could be used as test beds of nuclear weapons effects.

1-9. HIGH EXPLOSIVES

a. High explosives or bomb blasts may be used as the prime mechanism to disseminate NBC materials.

b. After the explosion occurs, a mass movement of air (blast and wind) that was originally displaced by the explosive products follows the explosion at speeds that can reach hurricane proportions. This blast wind may be as damaging as the original explosion.

1-10. SUMMARY

In this lesson, you have learned the meaning of CBRNE, how it relates to homeland security and some of the various agents used in CBRNE. In subsequent lessons, you will learn more specific actions and treatments for the various types of agents and how to deal with casualties and mass casualty situations that can be caused by these agents.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise or best completes the incomplete statement or by writing the answer in the space provided.

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. What do the letters CBRNE stand for?

   C. _____

   B. _____

   R. _____

   N. _____

   E. _____

2. Which of the following is the most difficult CBRNE threat to detect?

   a. Local terrorist groups.

   b. Larger non-aligned groups.

   c. Foreign para-military groups.

   d. Lone terrorists.

3. List four types of dissemination devices and their probable use.

   _____-_____

   _____-_____

   _____-_____

   _____-_____

4. Why are vectors effective?

   a. Easy to target specific groups and create a terror effect.

   b. Hard to target a specific group but cause a large number of casualties.

   c. Hard to target a specific group but create a very effective terror effect.

   d. Easy to target a specific group and cause a large number of casualties.

5. Chemical agents include all of the following except:

   a. Nerve agents.

   b. Phosgene.

   c. Mustard agents.

   d. Anthrax.

6. _____are the oldest form of CBRNE.

7. What is the most likely method of dispersing radiological material?

   a. Dirty bomb.

   b. Nuclear warhead.

   c. Murky bomb.

   d. Mustard gas.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1. C--Chemical
   B--Biological
   R--Radiological
   N--Nuclear
   E--Explosive
   (para 1-2)

2. d (para 1-3a(1))

3. Breaking devices--used for chemicals
   Bursting devices--used for all agents
   Exploding devices--used for radiological (chemical and biological possible)
   Spraying devices--chemical or biological
   (para 1-4a)

4. c (para 1-4c)

5. d (paras 1-5a(1), (2), (3)(a), 1-6b)

6. Biological agents (para 1-6a)

7. a (para 1-7a)

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2	CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, EXPLOSIVE EQUIPMENT
LESSON TEXT	Paragraphs 2-1 through 2-12.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

2-1. Identify the use of the Joint Service Lightweight Integrated Suit.

2-2. Identify the use of the protective mask--M40A1.

2-3. Identify the use of the M291 Skin Decontamination Kit.

2-4. Identify the use of the M295 Individual Equipment Decontamination Kit.

2-5. Identify the use of the patient protective wrap (PPW).

2-6. Identify the use of the M8 chemical agent detector paper.

2-7. Identify the use of the M9 chemical agent detector paper.

2-8. Identify the use of the M256A1 chemical agent detector kit.

2-9. Identify the use of the Improved Chemical Agent Monitor (ICAM).

2-10. Identify the use of the M8A1 Automated Chemical Agent Alarm.

2-11. Identify the use of the M22 ACADA.

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

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR EQUIPMENT

2-1. THE JOINT SERVICE LIGHTWEIGHT INTEGRATED SUIT

The Joint Service Lightweight Integrated Suit (JSLIST) is the product of a four-Service effort to field a common chemical protective clothing ensemble including a lightweight chemical and biological (CB) protective garment, multi-purpose overboots, and gloves. Each component is based on state-of-the-art materiel technologies that have undergone extensive user evaluation and field and laboratory testing. JSLIST program objectives included reduced heat stress, compatibility with all interfacing equipment, longer wear, and washability. The JSLIST replaces the battle dress overgarment (BDO).

a. The JSLIST overgarment (see figure 2-1) is a universal, lightweight, two-piece, front-opening suit that can be worn as an overgarment or as a primary uniform over underwear. It has an integral hood, bellows-type sockets, high-waist trousers, adjustable suspenders, adjustable waistband, and a waist-length jacket that enhances system comfort, improves system acceptance, and maximizes compatibility with the individual user equipment.

Figure 2-1. The JSLIST.

b. Apart from the integral hood, on the waist-long coat, a flap fastened with Velcro covers the zipper. The sleeves also have Velcro wrist-closure adjustment tabs, and the left sleeve has an outside expandable pocket with flap.

c. The JSLIST liner consists of a non-woven front laminated to activate carbon spheres and bonded to a knitted back that absorbs chemical agents.

d. The JSLIST has a selectively permeable membrane that is lighter and will block harmful substances rather than absorb them. More perspiration will also be able to escape. Weighing just less than six pounds, the new suit is about half the weight of the BDO. It is available in four-color Woodland or a three-color Desert Camouflage pattern. It can be worn in an uncontaminated environment for 45 days with up to six launderings or for over 120 days with no launderings. The JSLIST can be worn in a contaminated environment for 24 hours. Each soldier is issued two JSLIST.

e. The Multipurpose Rain/Snow/CB Overboot (MULO) replaces the older black vinyl overboot/green vinyl overboot (BVO/GVO). The MULO is made by injection molding an elastomer blend, compounded to provide the characteristic chemical and environmental protection required. It incorporates two quick-release side buckles and is designed to be worn over the standard issue combat boot, jungle boot, and intermediate cold/wet boot. The MULO provides 60 days of durability and 24 hours of protection against liquid chemical agents. The MULO is capable of being decontaminated to an operationally safe level using standard field decontaminates. Environmental protection is provided against water, snow and mud, in addition to petroleum, oil, and lubricant (POL) and flame resistance.

f. The JSLIST Block 1 Glove Upgrade Program is seeking an interim glove to replace the current butyl rubber glove.

2-2. PROTECTIVE MASK--M40A1

a. **Characteristics**.

(1) The M40A1 protective mask (figure 2-2) is designed to protect the wearer from all known chemical and biological agents and riot control agents. When worn correctly, the mask will provide protection for the face, eyes, and respiratory tract.

(2) The mask uses a North Atlantic Treaty Organization (NATO) standard external filter canister that may be positioned on the soldier's right or left cheek to allow him to fire the M16A2 rifle. The filter cannot be exchanged in a contaminated environment.

(3) A drinking tube positioned around the outlet valve assembly allows soldiers to drink from their canteen with an M-1 cap while in a chemical environment.

Figure 2-2. M40A1 protective mask.

b. **Wear Time**. While in the theater of operations, filters must be replaced at least every 30 days.

c. **Filters**. The filters must be replaced whenever any of the following occurs:

(1) The elements are immersed in water.

(2) The elements are crushed, cut, or damaged.

(3) Excessive breathing resistance is encountered.

(4) After exposure to hydrogen cyanide.

(5) After 30 days in a theater of operations.

(6) When ordered by the unit commander.

d. **Other Masks**.

(1) Protective masks designed for use in tanks, combat vehicles and aircraft are issued as required.

(2) The small M17A1 protective mask will only be assigned to soldiers who cannot be correctly fitted with a small M40 mask.

2-3. CHEMICAL PROTECTIVE GLOVES

a. **Characteristics**.

(1) Butyl rubber with an inner glove made of thin white cotton

(2) No protection against cold weather injuries

(3) There are three types of gloves.

(a) 0.025 inch thick--used by soldiers who perform combat tasks

(b) 0.014 inch thick--used by aviators and vehicle mechanics

(c) 0.007 inch thick--used by medical personnel. Allow excellent tactile (perceptible to the touch) ability.

b. **Wear Time**.

(a) Uncontaminated environment--can be worn as long as they remain serviceable.

(b) Contaminated environment--wear 24 hours, inspect; if serviceable, decontaminate and reuse. You may repeat process every 24 hours.

(c) The 0.007 inch gloves must be inspected and decontaminated within six hours. After inspection (if found serviceable), they may be reused.

NOTE: If chemical overboots or gloves come in contact with petroleum products, they must be wiped clean and allowed to air dry within two minutes. If this is not possible, they must be replaced immediately.

2-4. M291 SKIN DECONTAMINATION KIT

M291 Skin Decontamination Kit (figure 2-3) is the standard Army skin decontamination (decon) kit.

a. **Purpose**. The M291 kit is used to decontaminate the skin.

b. **Characteristics**.

(1) Each kit contains six applicator packets that utilize a mixture of activated resins to absorb and neutralize liquid chemicals on the skin. One applicator pad will decontaminate both hands and the face if necessary.

Figure 2-3. M291 Decontamination kit**.**

(2) While decontaminating oneself, a black resin powder is left on the skin to provide visual confirmation of the thoroughness of the application. See figure 2-4.

Figure 2-4. M291 being used to decontaminate skin.

(3) The resin does not irritate the skin, but use precautions to keep the powder away from wounds, the eyes and the mouth.

2-5. M295 INDIVIDUAL EQUIPMENT DECONTAMINATION KIT

a. **Purpose**. The M295 Individual Equipment Decontamination Kit is used to decontaminate personal equipment.

b. **Characteristics**.

(1) Each kit contains four packets, with one mitt each, that are utilized to remove chemical agents from personal equipment (for example, M16A2, Kevlar helmet, load bearing equipment (LBE), and M40 mask). See figure 2-5.

(2) Each mitt contains the same substance found in the M291 kit.

(3) Two packets are normally required to completely decontaminate all of a soldier's personal equipment, to include his weapon.

Figure 2-5. M295 Equipment Decontamination Kit in use.

2-6. PATIENT PROTECTIVE WRAP

a. **Purpose**. The patient protective wrap (PPW) is used to protect the patient during evacuation after the BDO has been removed and the patient has received medical treatment.

b. **Characteristics**.

(1) The PPW (figure 2-6) is designed as onetime use for only one patient

(2) The protective mask is not needed while the patient is in the PPW, but should be evacuated with the patient.

(3) A patient can remain in the PPW for up to six hours.

(4) The PPW has one continuous zipper around the outer edge for ease of patient insertion.

(5) An impermeable, transparent window is located at the head of the wrap for patient observation. Two protected sleeves next to the window permit the passage of IV tubing.

(6) A transparent pocket below the window holds the field medical card.

(7) The PPW can be carried either by the handles on the side or by inserting poles into the side sleeves.

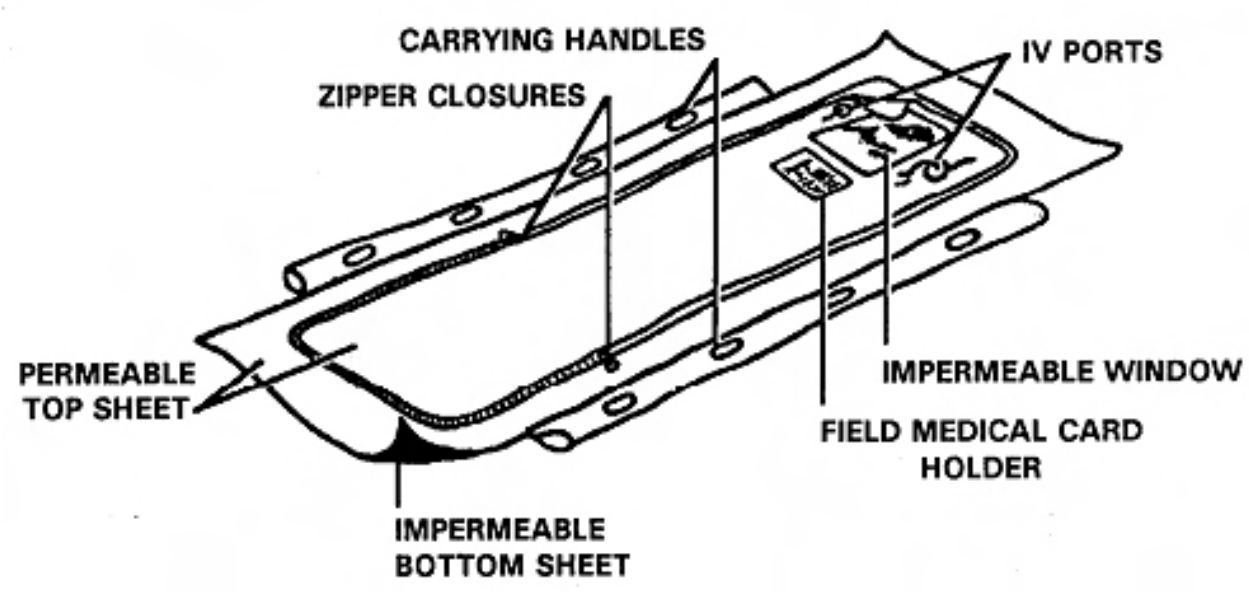

Figure 2-6. Patient protective wrap.

2-7. M8 CHEMICAL AGENT DETECTOR PAPER

a. **Purpose**. The M8 Chemical Agent Detector Paper (see figure 2-7) is used to detect both the presence and specific type of liquid chemical agents.

b. **Characteristics**.

(1) Each soldier carries one booklet of M8 paper in the interior pocket of the protective mask carrier.

(2) To use the M8 paper, one-half sheet is blotted onto an unknown liquid. After waiting for 30 seconds, the color change is compared to the colors inside the front cover of the booklet. The colors are as follows:

(a) Yellow--G (nerve)

(b) Red--H (blister)

(c) Olive green or black--V (nerve)

CAUTION: False positive may be seen if the M8 paper is exposed to liquid insecticide, antifreeze or petroleum products, and contamination should be confirmed with other detection equipment.

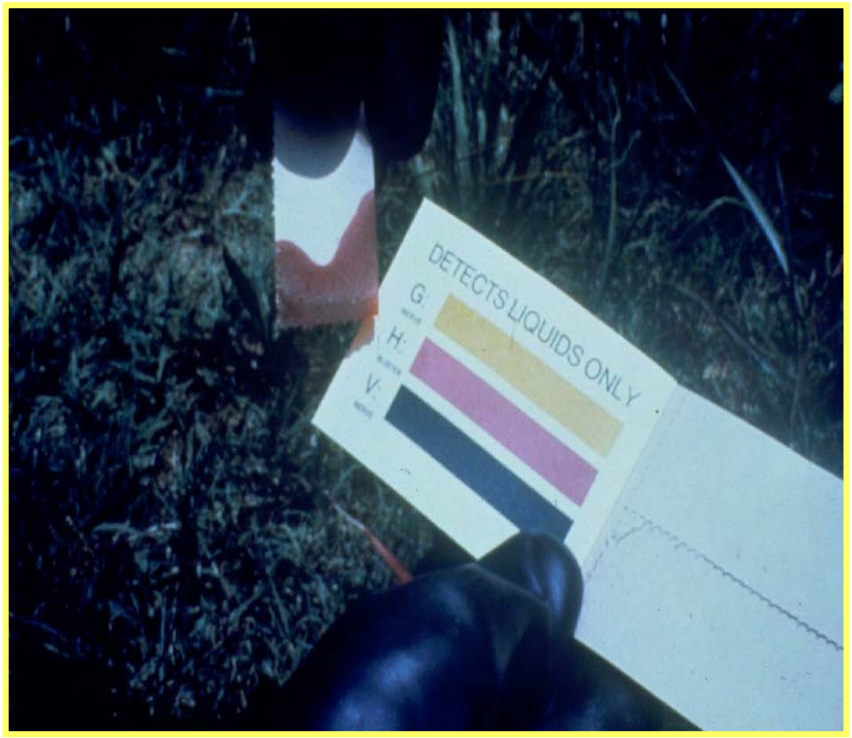

Figure 2-7. M8 Chemical Agent Detector Paper.

2-8. M9 CHEMICAL AGENT DETECTOR PAPER

a. **Purpose**. The M9 Chemical Agent Detector Paper is used to detect the presence of a liquid chemical agent; however, it will not identify the specific type of agent.

b. **Characteristics**.

(1) Each soldier carries one thirty-foot long by two-inch wide roll of M9 paper.

(2) While wearing gloves, one strip is wrapped around the upper arm, the opposite wrists (see figure 2-8), and ankle of the same side as the upper arm, creating a V-shape.

WARNING

M9 paper is potentially carcinogenic. It should not be allowed to come into direct contact with the skin.

(3) Once the M9 paper comes in contact with a liquid agent, it turns a reddish or pinkish color.

(4) After seeing the color change, the soldier must immediately mask, alert others and, if warranted, proceed with skin decontamination.

CAUTION: False positive may be seen if the M9 paper is exposed to liquid insecticide, antifreeze or petroleum products. Confirm contamination with other detection equipment.

Figure 2-8. M9 Chemical Agent Detection Paper.

2-9. M256A1 CHEMICAL AGENT DETECTOR KIT

a. **Purpose**. The M256A1 Chemical Agent Detector Kit is used to detect and identify chemical agents (blood, blister, and nerve) present in either liquid or vapor form. It is also used after a chemical attack to determine if it is safe to unmask.

b. **Characteristics**.

(1) The M256A1 kit (figure 2-9) consists of the following items:

(a) One booklet of M8 paper, which detects chemical agents in liquid form.

(b) Twelve detector tickets, which detect chemical agents in vapor form.

(c) One set of instruction cards.

(2) A complete test using both the M8 paper and the detector ticket takes approximately 20 minutes to perform. The test kit should not be performed in direct sunlight, as this speeds the evaporation of the reagents.

(3) The actual detector tickets for the M256A1 are possibly carcinogenic; therefore, trainer kits are provided for practical exercises. The vapors from the actual kit are also toxic, a mask and gloves should be worn when using this kit.

Figure 2-9. M256A1 detector kit.

2-10. IMPROVED CHEMICAL AGENT MONITOR

a. **Purpose**. The Improved Chemical Agent Monitor (ICAM) (figure 2-10) is a post attack device used to detect chemical agents on personnel and equipment. It starts up more rapidly and is more reliable than the older Chemical Agent Monitor (CAM).

b. **Characteristics**.

(1) Detects G and H agents.

(2) Instantaneous feedback of chemical hazard level.

(3) Reduces need for decontamination operations. Real-time detection of nerve and blister agents. Operators of these devices should be in mission-oriented protective posture (MOPP) 4.

(4) Once the detector has been saturated with an agent, it will take a significant reset time to enable it to begin accurate detection again.

Figure 2-10. ICAM.

2-11. M8A1 AUTOMATED CHEMICAL AGENT ALARM

a. **Purpose**. The M8A1 Automated Chemical Agent Alarm is used to sample the air for the presence of nerve agent vapors only.

b. **Characteristics**.

(1) The M8A1 is the only remote continuous air sampling alarm that the U.S. Army currently possesses.

(2) The M8A1 can be located within a fixed facility. The M43A1 detectors are placed facing into the wind no more than 150 meters outside the unit perimeter, with no more than 300 meters between detectors and (when possible) no more than 400 meters between the detector cells and the alarm units.

(3) The M8A1 has two components.

(a) M43A1 detector.

1 The M43A1 is the portion that actually detects the vapor agent.

2 One M43A1 can have as many as five M42 alarms attached.

(b) M42 alarm.

1 It is connected by WD-1 telephone wire to the M43A1 detector unit.

2 The alarm can be set to give an audible, and visual, warning.

2-12. The M22 AUTOMATIC CHEMICAL AGENT DETECTOR ALARM

a. **Purpose**. The M22 Automatic Chemical Agent Detector Alarm (ACADA) is an "off the shelf" automatic chemical agent alarm system capable of detecting and identifying standard blister and nerve agent vapors. It can provide simultaneous detection and reporting of these agents.

b. **Characteristics**. The MWW ACADA consists of an M-88 detector and up to 5 M42 alarm units. It is deployed in the same manner as the M8A1.

(1) The M22 system is man portable.

(2) Operates independently after system start up. It can operate in both hot and cold climates (-30ºF to +125ºF).

(3) Provides an audible and visual alarm, significantly more sensitive than the M8A1 alarm. Also it is much less responsive to interference.

(4) The following items can interfere with the normal operation of the M22 ACADA and will sound a false alarm:

(a) CS tear gas.

(b) JP 8 fuel.

(c) Brake fluid.

(d)) Aqueous fire fighting foam (AFFF).

(e) M18 marking grenade (red and violet).

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise or best completes the incomplete statement or by writing the answer in the space provided.

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. What is the maximum time the JSLIST can worn in an uncontaminated environment if it is not washed?

   a. 45 days.

   b. 120 days.

   c. 24 hours.

   d. 24 days.

2. The JSLIST liner consists of a non-woven front laminated to activate _____

   _____and bonded to a knitted back that absorbs chemical agents.

3. All of the following are reasons to replace the M40A1 protective mask filter EXCEPT:

   a. After 15 days in a theater of operations.

   b. After exposure to hydrogen cyanide.

   c. When excessive breathing resistance is encountered.

   d. The element has been submersed in water.

4. The M40A1 is designed to protect the wearer from all known _____

   and _____ agents and _____ agents.

5. The M291 Decontamination Kit is used to decontaminate:

   a. Food and other consumable products.

   b. The skin.

   c. Personal equipment.

   d. Organizational equipment.

6. The filters of the M40A1 protective mask must be replaced whenever any of the following occurs:

   a. _____

   b. _____

   c. _____

   d._____

   e._____

   f._____

7. The M8A1 chemical agent alarm detects:

   a. Blood agent vapor only.

   b. Biological agent vapors.

   c. Nerve agent vapors only.

   d. Radiation.

8. Each M291 kit contains six applicator packets that utilize a mixture of activated resins to _____ and _____liquid chemicals on the skin.

9. You have received an artillery attack that released and unknown liquid. The M9 paper you have properly placed on yourself and you vehicles has turned a reddish color. What does this indicate?

   a. Mustard gas.

   b. Nerve gas.

   c. Biological agent.

   d. The presence of some type of liquid chemical agent.

10. Why should M9 detection paper be handled with gloves?

   a. A false positive result can be caused by skin oils.

   b. M9 paper is potentially carcinogenic.

   c. A false negative result can be caused by skin oils.

   d. M9 paper can cause impotence.

11. What are the uses of the M256A1 detector kit?

   a. _____

   _____

   b. _____

   _____

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. b (para 2-1d)

2. carbon spheres (para 2-1c)

3. a (para 2-2c)

4. chemical, biological, riot control (para 2-2a(1))

5. b (para 2-4a)

6. The elements are immersed in water.
   The elements are crushed, cut, or damaged.
   Excessive breathing resistance is encountered.
   After exposure to hydrogen cyanide.
   After 30 days in a theater of operations.
   When ordered by the unit commander.
   (para 2-2c)

7. c (para 2-11c)

8. absorb and neutralize (para 2-4b(1))

9. d (paras 2-8a, b(3))

10. b (para 2-8 Warning)

11. To detect and identify chemical agents (blood, blister, and nerve) present in either liquid or vapor form.
    Used after a chemical attack to determine if it is safe to unmask.
    (para 2-9a)

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3	Recognizing and Treating Nerve Agent Casualties.
LESSON ASSIGNMENT	Paragraphs 3-1 through 3-8.
LESSON OBJECTIVES	After completing this lesson, you should be able to:
	3-1. Identify nerve agents.
	3-2. Identify the characteristics of nerve agents.
	3-3. Identify the effects of nerve agents.
	3-4. Identify self-aid procedures for nerve agent exposure.
	3-5. Identify procedures for treating nerve agent casualties.
SUGGESTION	After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you achieve the lesson objectives.

LESSON 3

RECOGNIZING AND TREATING NERVE AGENT CASUALTIES

3-1. OVERVIEW OF NERVE AGENTS

a. Nerve agents were first developed in pre-WWII Germany. Germany had stockpiles of nerve agent munitions during WWII, but did not use them for reasons that remain unclear. In the closing days of the war, the United States and its allies discovered these stockpiles, developed the agents, and manufactured their own nerve agent munitions. The United States' chemical agent stockpile contains the agents Sarin (GB) and VX.

b. Nerve agents are considered "military threat" agents. The only known battlefield use of nerve agents was during the Iran-Iraq conflict. Intelligence analysts indicate that many countries have the technology to manufacture nerve agent munitions. A recent terrorist use of nerve agents was in Japan (1994 and 1995) when a terrorist cult dispersed Sarin nerve agent in a Tokyo subway. These incidents produced thousands of casualties.

c. Nerve agents are the most toxic of known chemical agents. They are hazards in their liquid and vapor states and can cause death within minutes after exposure.

d. Nerve agents are divided in to two major groups--G and V.

e. Nerve agents can be dispersed from missiles, rockets, lower explosive bombs, howitzer shells, spray tanks, land mines, and other large munitions.

3-2. EFFECTS OF NERVE AGENTS

a. Nerve agents inhibit the enzyme acetylcholinesterase (AChE), (an enzyme present in various body tissues-muscles, nerve cells, and red blood cells), resulting in excess acetylcholine in the body. Acetylcholine is a neurotransmitter present at neuromuscular junctions.

b. Nerve impulses originate from the brain and travel as an electrical signal to a target organ to result in a specific action. For example, a motor nerve that innervates skeletal muscle such as the biceps muscle will cause it to contract. The nerve that stimulates the biceps muscle ends just before reaching the muscle. This electrical signal from the brain stimulates the release of acetylcholine at the end of the nerve. Acetylcholine travels across the synapse (or gap) between the nerve and the targeted muscle (the biceps in this case) and binds to receptor sites on the muscle. This chemical bond results in the continuation of an electrical impulse across the nerve of the bicep muscle causing the muscle to contract. For the muscle to stop contracting, the acetylcholine must be removed from the receptor sites. That is the job of the enzyme acetylcholinesterase (AChE). Acetylcholinesterase removes the acetylcholine from the receptor site and, as a result, prevents further stimulation of the bicep muscle. What normally occurs is illustrated in figures 3-1 and 3-2.

c. Nerve agents bind to part of the acetylcholinesterase molecule. This makes AChE inactive and blocks the action of AChE; therefore, there is no way to stop the action of acetylcholine. Acetylcholine then builds up in the nerve endings and acetylcholine continues to act. In the case of skeletal muscle, the muscles continue to contract because of continued stimulation (convulsions). In the case of smooth muscles, the targeted organs continue to contract, such as sweat glands and salivary glands that continually secreting their fluids. The smooth muscles of the bowels and urinary tract are continually stimulated, causing them to overact. This is why casualties from severe nerve agent exposure have convulsions and fluids are released from every possible location (urine, feces, sweat, saliva, bronchi). The heart rate in these casualties will decrease due to overstimulation of the vagus nerve. (You can research the parasympathetic nervous system to learn why vagus nerve stimulation results in a lowered heart rate). See figure 3-3.

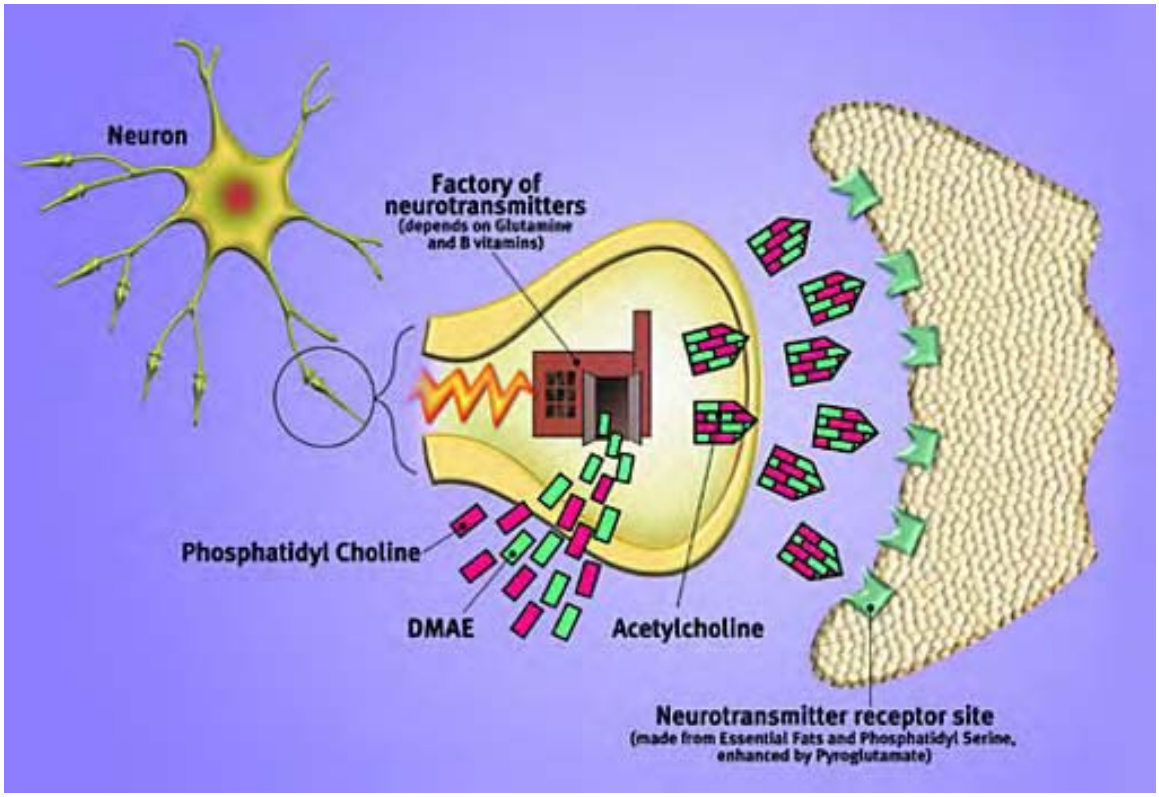

Figure 3-1. Normal ACh transmission.

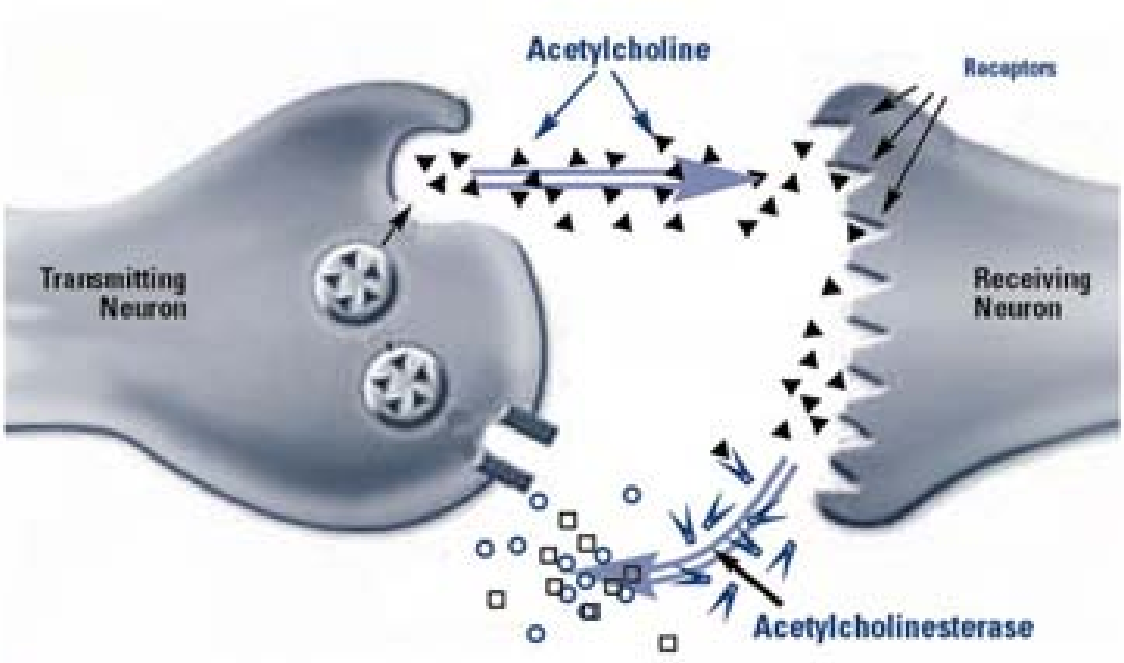

Fig. 1. After signalling, acetylcholine is released from receptors and broken down by acetylcholinesterase to be recycled in a continuous process.

Figure 3-2. Normal AChE role.

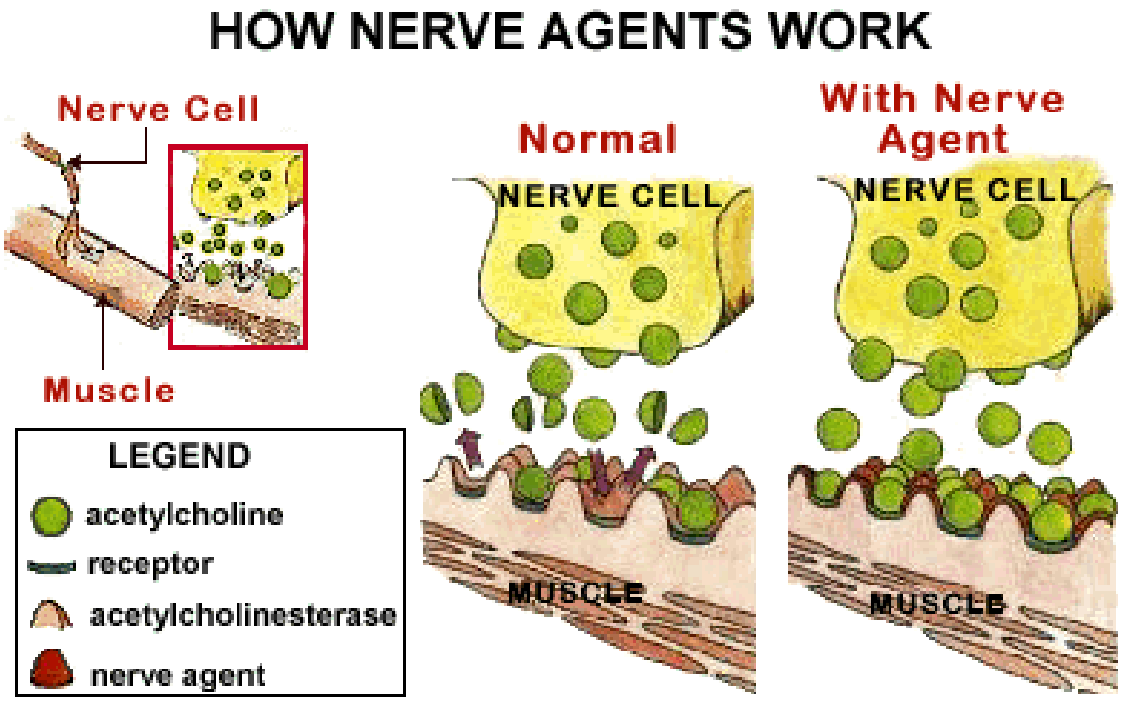

Figure 3-3. Nerve agent effect on ACh and AChE.

3-3. NERVE AGENT CHARACTERISTICS

a. Nerve agents remain in a liquid state unless they are exposed to extreme cold or heat. Extreme heat will cause the liquid to become a vapor.

b. The potency of nerve agents ranges from highly potent (vapor) to lower potency (liquid or oily state).

c. Nerve agents are colorless to light brown and odorless.

d. Routes of entry. Nerve agents may enter the body by absorption (contact), by inhalation, and by ingestion.

(1) Following release of nerve agents into the air, people may be exposed through skin contact, eye contact, or by breathing air that contains the agent.

(2) Some nerve agents mix with water or foods, so they could be used to poison water or food.

(3) A person's clothing can spread nerve agent for about 30 minutes after contact. This could easily lead to exposure of other people.

(4) Sarin (a type of nerve agent) is heavier than air, so it sinks to lower lying areas and creates a greater vapor exposure there.

3-4. NERVE AGENTS EFFECTS

The initial effect of exposure to a nerve agent depends on the dosage and the route of exposure. The initial effects from a sub-lethal amount of agent by vapor exposure are different than the initial effects from a similar amount of liquid agent on the skin.

a. **Levels of Exposure**.

(1) Mild. Exposure to small amounts of nerve agent vapor usually cause effects in the eyes, nose, and airways. These effects are from local contact of the vapor and may not have systemic absorption of the agent. A small amount of liquid agent on the skin will cause a systemic effect in the gastrointestinal system. Mild exposure effects include the following.

(a) Rhinorrhea (runny nose worse than a cold or hay fever). This may be the first indication of nerve agent vapor exposure.

(b) Frontal headache and eye pain.

(c) Difficulty in seeing (dimness of vision due to miosis/pupillary constriction). Miosis (constriction of the pupil) is usually bilateral in an unprotected individual, but may be unilateral in a masked person with a leak in his mask eyepiece.

(d) Tightness in the chest or difficulty breathing.

(e) Excessive flow of saliva (drooling).

(f) Localized sweating at the exposure site.

(g) Muscular twitching at exposure site. (fisiculations)

(2) Severe. The signs and symptoms of mild nerve agent exposure may occur, as well as the following.

(a) Nausea and vomiting are early signs of liquid exposure on the skin. Diarrhea occurs with exposure to larger amounts of agent.

(b) Severe muscular twitching occurs due to stimulation of the skeletal muscle. After an exposure to a large amount of agent, fatigue and weakness of the muscles occurs, followed by muscle flaccidity.

(c) Seizures.

(d) Loss of bowel and bladder control.

(e) Confused behavior, which may be followed by loss of consciousness.

(f) Cessation of respiration occurs within minutes after the exposure to a large amount of nerve agent. Death is usually the result of complete respiratory system failure.

b. **Time Interval of Effects**.

(1) Effects from nerve agent vapor exposure begin within seconds to several minutes after exposure. Loss of consciousness and seizures have occurred within a minute of exposure. There is no delay period in onset from vapor exposure.

(2) Effects from nerve agent liquid exposure may have a delay in symptoms from 1 to 30 minutes in a large exposure. In a small exposure, the onset of effects may be delayed as long as 18 hours after contact. Generally, the longer the interval, the less severe are the effects.

3-5. SELF-AID FOR NERVE AGENT EXPOSURE

a. Put on your protective mask and hood. The protective mask and hood protect the face and neck, eyes, mouth, and respiratory tract against nerve agent spray, vapor and aerosol.

b. Give the alarm to warn others.

c. Perform a hasty self-evaluation for signs and symptoms of nerve agent poisoning.

d. Administer antidote if signs and/or symptoms are present.

(1) Use one MARK I Nerve Agent Antidote Kit (NAAK) auto-injector set. You should never administer more than one NAAK to yourself. If you have the mental capacity to consider whether you may need more than one NAAK, then you are not experiencing anything more than symptoms of mild exposure.

(2) If you have Antidote Treatment, Nerve Agent Auto-injector (ATNAA) instead of the NAAK, one ATNAA may be administered. As with the NAAK, you should never administer more than one ATNAA to yourself.

e. Decontaminate your skin if necessary. Use the Decontaminating Kit, Skin: M291.

f. Put on remaining protective clothing. Liquid nerve agents penetrate ordinary clothing rapidly.

g. Seek buddy-aid or medical care if you have signs/symptoms of exposure to nerve agent.

3-6. NERVE AGENT ANTIDOTES

a. Each MARK I Nerve Agent Antidote Kit (NAAK) auto-injector set contains:

(1) Atropine--2 mg (drug of choice). Atropine blocks the effects of acetylcholine and produces relief from most of the symptoms previously listed. A 2 mg IM injection of atropine will be effective in 3-10 minutes.

(2) Pralidoxime chloride (2-PAM-Cl)--600 mg/2 ml. Pralidoxime chloride increases the effectiveness of atropine drug therapy. The role of 2-PAM-Cl is to block and reverse the bonding of the nerve agent to the nerve agent receptor. (Think of 2-PAM-Cl as a crowbar that pries nerve agent from acetylcholinesterase (AChE).

NOTE: The 2-PAM-Cl must be given early in the poisoning; after a short period of time, it may no longer be effective. Also, 2-PAM-Cl varies in its effectiveness against nerve agents.

b. Each Antidote Treatment, Nerve Agent Auto-injector (ATNAA) set contains the following in one self contained injector.

(1) Atropine--2.1 mg.

(2) Pralidoxime chloride (2-PAM-Cl)--600 mg/2 ml.

3-7. TREATING A NERVE AGENT CASUALTY

If a nerve agent casualty is unable to care for himself, buddy-aid or medical care is required.

a. First, take immediate steps to protect yourself. You will not be able to assist the casualty if you become a casualty also.

b. Mask the casualty and, if possible, have him clear his own mask.

c. Check the casualty's pocket flaps and the area around the casualty for expended auto-injectors (this will guide you regarding how much additional treatment may be necessary).

d. Casualties with symptoms of mild nerve agent exposure may self-administer one NAAK/ATNAA (assist as necessary). In casualties exhibiting symptoms of severe nerve agent exposure, administer three NAAK/ATNAA. Use the casualty's sets. Remember, each NAAK contains two auto-injectors (one atropine and one 2-PAM-chloride). Each soldier is issued three antidote kits.

e. Administer one Convulsant Antidote for Nerve Agent (CANA) injector immediately after the third NAAK/ATNAA. The CANA injection contains diazepam (an anti-seizure medication). The CANA should be given to all casualties that require the use of three NAAK/ATNAA kits, regardless of whether the casualty is having detectable seizures or not. Each soldier is issued one CANA.

NOTE: If the casualty has severe nerve agent poisoning, administer the three antidotes and one CANA with no waiting period between administrations.

f. Decontaminate the casualty's exposed skin.

g. Assess the casualty for signs of effectiveness of treatment as evidenced by a heart rate above 90 beats per minute, reduced bronchial secretions, reduced salivation, dilated pupils, and cessation of convulsions.

h. Administer additional atropine and/or CANA if needed.

(1) Additional atropine may be administered at 15 minute intervals until the heart rate is above 90, bronchial secretions are reduced, and salivation is reduced (this is known as atropinization). It may be necessary to administer atropine at intervals of 30 minutes to 4 hours to maintain atropinization or until the casualty is evacuated to a treatment facility.

(2) A second and third CANA may be administered at 5 to 10 minute intervals if convulsions persist.

i. Secure all used injectors to the casualty's upper left pocket flap of the battle dress overgarment (BDO) or the left pocket on the sleeve of the Joint Service Lightweight Integrated Suit Technology (JSLIST) overgarment.

j. Record the number of injections given and all other treatment provided on the casualty's Field Medical Card (FMC).

k. Evacuate the casualty and provide assisted ventilations if necessary.

3-8. NORMAL SIDE EFFECTS

a. **Atropine**. Atropine usage will give the patient normal, expected symptoms. These symptoms are not related to the nerve agent exposure.

(1) Mild--dry mouth, warmth, flushing of skin, minimal drowsiness, decreased combat performance.

(2) Moderate/Severe--drowsiness, fatigue, blurring of vision, increased heat injury risk, incapable of effective combat performance.

b. **PRALIDOXIME CHLORIDE**. The main side effect of the antidote 2-PAM-Cl is mild visual changes.

c. **ANTIDOTE DIAZEPAM**. The main side effect of the antidote diazepam (CANA) is decreased combat performance.

Continue with Exercises

EXERCISES, LESSON 3

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise or best completes the incomplete statement or by writing the answer in the space provided.

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. All of the following are true of nerve agents EXCEPT:

   a. Following release of nerve agents into the air, people may be exposed through skin contact, eye contact or by breathing air that contains the agent

   b. Some nerve agents mix with water or foods, so they could be used to poison water or food.

   c. A person's clothing can spread nerve agent for about 30 minutes after contact; this could easily lead to exposure of other people.

   d. Soman (a type of nerve agent) is heavier than air, so it sinks to lower lying areas and creates a greater vapor exposure there.

2. Nerve agents are divided in to two major groups: ____ and ____.

3. _____ is a neurotransmitter present at neuromuscular junctions.

4. List four signs and/or symptoms of MILD nerve agent exposure:

   a. _____

   b. _____

   c. _____

   d. _____

5. List four signs and/or symptoms of SEVERE Nerve agent exposure:

   a. _____

   b. _____

   c. _____

   d. _____

6. After you administer the first CANA to a casualty, you should wait about _____ minutes while observing him before administering the second CANA.

   a. Ten.

   b. Twenty.

   c. Thirty.

   d. Sixty.

7. Nerve agents that have already been absorbed into the body can be neutralized with the application of:

   a. Atropine and 2-PAM chloride.

   b. Nerve agent pyridostigmine pretreatment (NAPP).

   c. M258A1 decontamination kit.

   d. Convulsive antidote for nerve agent (CANA).

8. a. Effects from _____ nerve agent exposure begin within seconds to several minutes after exposure.

   b. Effects from _____ nerve agent exposure may have a delay in symptoms from 1 to 30 minutes in a large exposure.

9. A casualty is experiencing severe nerve agent poisoning. What is the proper treatment for this casualty after he has been masked?

   a. Administer one NAAK and wait ten minutes to assess the casualty.

   b. Administer two NAAK, then wait ten minutes and administer the CANA.

   c. Aadminister three NAAK, then wait ten minutes to administer the CANA, if needed.

   d. Administer 3 NAAK and one CANA without waiting between kits.

10. All of the following are normal signs of atropine use EXCEPT:

   a. Drowsiness.

   b. Fatigue.

   c. Excessive salivation.

   d. Flushed skin.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 3

1. d (para 3-3d)

2. G and V (para 3-1d)

3. Acetylcholine (para 3-1)

4. Any four of the following.

   Rhinorrhea (runny nose worse than a cold or hay fever).
   Frontal headache and eye pain.
   Difficulty in seeing (miosis/pupillary constriction).
   Tightness in the chest or difficulty breathing.
   Excessive flow of saliva (drooling).
   Localized sweating at the exposure site.
   Muscular twitching at exposure site. (fisiculations)
   (para 3-4a(1))

5. Any four of the following.

   Nausea and vomiting.
   Diarrhea.
   Severe muscular twitching
   Fatigue and weakness of the muscles, followed by muscle flaccidity.
   Seizures.
   Loss of bowel and bladder control.
   Confused behavior
   Loss of consciousness.
   Cessation of respiration.
   (para 3-4a(2))

6. a (para 3-7h(2))

7. a (paras 3-6)

8. a vapor. (para 3-4b(1))
   b liquid. (para 3-4b(2))

9. d (paras 3-7d, e, Note)

10. c (paras 3-8a(1), (2))

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4	Biological Agents Overview.
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 OVERVIEW

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

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

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

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

(5) Tetrodotoxin. Tetrodotoxins are neurotoxins that are present in several species of puffer fish.

(6) Phytotoxin. Phytotoxins 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) Mycotoxin. 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 that may be distributed by an airplane, missile, or bomb. 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 high explosive rounds.

(2) Arial 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) None 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.

(i) 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, wrists, 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 precautions 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 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. Treat 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 casualty's 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 or best completes the incomplete statement or by writing the answer in the space provided.

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. High explosive artillery.

   b. Fleas.

   c. Aircraft bombs.

   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

LESSON ASSIGNMENT

LESSON 5	Vesicants and Cyanide Agents.
LESSON ASSIGNMENT	Paragraphs 5-1 through 5-5.
LESSON OBJECTIVES	After completing this lesson, you should be able to: be able to:

5-1. Identify the classifications of vesicants.

5-2. Identify the effects of mustard exposure.

5-3. Identify the effects of Lewisite exposure.

5-4. Identify the effects of phosgene oxime agent exposure.

5-5. Identify the signs and symptoms of cyanide exposure.

5-6. Identify the treatment for mustard exposure.

5-7. Identify the treatment for Lewisite exposure.

5-8. Identify the treatment for phosgene oxime exposure.

5-9. Identify the treatment for cyanide exposure.

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 5

VESICANTS AND CYANIDE AGENTS

Section I. VESICANTS

5-1. VESICANTS

Vesicants are second only to nerve agents as a concern to the U.S. military. Vesicants cause damage to the respiratory system. The vesicant agents are mustard, Lewisite, and phosgene oxime. Of these, mustard is the one of most concern due to the delay in the onset of recognizable symptoms, the small amount of agent needed to cause tissue damage, and the resulting systemic damage that can result in death. Soldier medics must be able to recognize if a patient has been exposed to a vesicant or blood agent and the signs and symptoms associated with each type of chemical agent, as well as the appropriate methods of treatment.

a. **Classifications**.

(1) Sulfur mustard (HD).

(2) Lewisite (L).

(3) Phosgene oxime (CX).

b. **Properties**.

(1) Vesicants, as a group, are often referred to as "blister agents" due to the fact that blisters often form at the site of exposure (see figure 5-1).

(2) The severity of vesicant damage is affected by the environmental conditions at the time of exposure.

(a) Warm, humid conditions will increase the severity of vesicant damage and shorten the time for symptom onset.

(b) Cold weather can retard the time of symptom onset and, if the exposed skin remains cold, it can lessen the severity of vesicant damage.

(c) Since mustard and Lewisite are both heavier than air, they tend to accumulate in low-lying areas and near the floor in closed spaces.

Figure 5-1. Severe vesicant exposure.

c. **Detection**.

(1) Mustard received its name because of its distinctive garlic, horseradish, or mustard odor. Most soldiers will smell the agent before encountering the thick colorless or pale yellow liquid. Lewisite smells like geraniums and is a dark or amber colored liquid.

(2) M-8 detection paper will turn red in the presence of mustard and Lewisite agents.

(3) M-9 detection paper will turn pink, reddish-brown, or red-purple when exposed to agents, but will not specify the type of agent.

(4) The M-256A1 and the Chemical Agent Monitor (CAM) will also detect mustard and Lewisite.

(5) Phosgene oxime may have a pepperish odor and is detected by the M256A1, but not by M-8, M-9, or the CAM.

5-2. EFFECTS OF MUSTARD EXPOSURE

a. **Effects of Mild Exposure**.

(1) Skin.

(a) Erythema--resembles a sunburn.

(b) Blisters (later).

(c) The fluid contained within a blister will not cause further blister formation.

(2) Eyes.

(a) Itching.

(b) Tearing.

(c) Gritty feeling.

(d) Burning.

(e) Photophobia.

(3) Respiratory.

(a) Runny nose.

(b) Sneezing.

(c) Epistaxis.

(d) Hoarseness.

(e) Hacking cough.

b. **Effects of Moderate Exposure to the Eyes**.

(1) Reddening of the eye.

(2) Swelling of eyelids.

(3) Moderate pain.

c. **Effects of Severe Exposure**.

(1) Eyes. See figure 5-2.

(a) Severe pain.

(b) Severe edema of the eyelids and conjunctiva.

(c) Corneal damage (for example, ulcers, opacification).

Figure 5-2. Vesicant exposure in the eye.

(2) Respiratory.

(a) Productive cough with clear, foamy sputum.

(b) Pulmonary edema.

(c) Cyanosis.

(d) Shock.

(e) Cardiac failure.

(3) Systemic effects.

(a) Destruction of bone marrow's ability to produce red blood cells, white blood cells, and platelets.

(b) Nausea and vomiting.

5-3. TREATMENT OF MUSTARD EXPOSURE

a. Don protective mask and go to MOPP level 4.

b. Decontaminate exposed skin with the M291 kit.

c. Apply calamine lotion and topical antibiotic cream (done after life-threatening conditions are corrected).

d. Cover blisters less than the size of a quarter with antibiotic cream. Large blisters should be opened and irrigated several times daily. If blisters are larger and numerous, evacuate for further treatment.

NOTE: Large blisters are more likely to rupture and become infected; therefore, it is recommended to open them, irrigate, and dress them.

e. If eyes are affected:

(1) Irrigate with saline or water from the casualty's canteen.

(2) Place Vaseline on the eyelids to prevent sticking.

(3) Do not cover eyes.

(4) Evacuate immediately.

f. If respiratory system is affected:

(1) Maintain airway.

(2) Give humidified oxygen (if available).

(3) Provide mechanical ventilation with supplemental oxygen if needed.

(4) Ensure casualty is kept at rest.

(5) Evacuate immediately.

g. Record the treatment given on the Field Medical Card.

WARNING

Death is mainly a result of sepsis, infection, and pulmonary damage.

5-4. EFFECTS OF LEWISITE EXPOSURE

a. **Eyes**.

(1) Liquid form will cause rapid and devastating effects to the eye.

(2) Pain and blepharospasm (involuntary contraction of eyelid muscles) experienced upon contact.

(3) Swelling of the eyelids, conjunctiva, and cornea

(4) Eyelids will normally be completely closed within one hour.

b. **Skin**.

(1) Immediate pain, which diminishes after blisters form (less severe than mustard exposure).

(2) Necrosis of the epithelium may occur within 5 to 10 minutes with the affected area having a grey appearance.

(3) Blisters are usually formed at the exposure site within 12 to 18 hours.

c. **Respiratory**.

(1) Burning sensation of the nasal and oral mucosa

(2) Pulmonary edema

5-5. TREATMENT OF LEWISITE EXPOSURE

a. Immediate decontamination using the M291 kit.

b. Eyes.

(1) Irrigate with saline or water from the casualty's canteen.

(2) Place Vaseline on the eyelids to prevent sticking.

(3) Do not cover or bandage eyes.

c. Respiratory support.

(1) Maintain airway.

(2) Given humidified oxygen (if available).

(3) Provide mechanical ventilation with supplemental oxygen if needed.

(4) Ensure casualty is kept at rest.

d. Cover blisters less than the size of a quarter with topical antibiotics. If blisters are larger and numerous, evacuate for further treatment.

e. Evacuate immediately for further supportive care (for example, maintenance of fluid balance, nutrition).

f. Record the treatment given on the Field Medical Card.

5-6. EFFECTS OF PHOSGENE OXIME AGENT EXPOSURE

a. **Skin**. Phosgene is an urticant (hive causing) or nettle agent and does not cause blisters, but it does causes erythema, wheals, and urticaria.

(1) Pain on contact from either the liquid or solid

(2) Blanching along with a surrounding ring of erythema occurs 20 seconds after contact.

(3) Wheal (similar to a bee sting) occurs within 30 minutes.

(4) Necrosis of skin at the site of contact (a dark eschar will form over the next week).

b. **Eye**.

(1) Immediate pain.

(2) Severe edema of the eyelids and conjunctiva.

(3) Corneal damage.

c. **Respiratory**.

(1) Burning of nasal and oral mucosa.

(2) Pulmonary edema.

5-7. TREATMENT OF PHOSGENE OXIME AGENT EXPOSURE

a. **Decontamination**. Immediate decontaminate using the M291 kit.

b. **Skin**. Keep the skin clean and avoid infection.

c. **Eyes**.

(1) Irrigate with saline or water from the casualty's canteen.

(2) Place Vaseline on the eyelids to prevent sticking.

(3) Do not cover to bandage eyes

d. **Respiratory Support**.

(1) Maintain airway.

(2) Given humidified oxygen (if available).

(3) Provide mechanical ventilation with supplemental oxygen if needed.

(4) Ensure casualty is kept at rest.

e. **Evacuation**. Evacuate immediately for further treatment of the necrotic skin.

f. **Documentation**. Record the treatment given on the Field Medical Card.

Section II. CYANIDE

5-8. OVERVIEW

Cyanide is a chemical agent that affects the blood (blood agent).

a. Cyanide may have the odor of pears.

b. M256A1 will detect cyanide vapors.

c. M-8, M-9, and the CAM will NOT detect cyanide.

5-9. EFFECTS OF CYANIDE EXPOSURE

a. **Moderate, from Low Concentrations**. Signs and symptoms occur within minutes.

(1) Transient increase in rate and depth of breathing.

(2) Dizziness.

(3) Nausea and vomiting.

(4) Headache.

(5) Irritation of eyes, nose, and airways similar to riot control agents.

b. **Severe, from High Concentrations**.

(1) Convulsions--within 30 seconds.

(2) Respiratory arrest--within 2-4 minutes.

(3) Cardiac arrest--within 4-8 minutes.

(4) The onset of symptoms may occur so rapidly that the casualty may expired before the medic has a chance to render care.

5-10. TREATMENT OF CYANIDE EXPOSURE

a. **Contaminated Environment**.

(1) Mask yourself, then mask the casualty. (Skin decontamination is not necessary with cyanide.)

(2) Remove any wet or contaminated clothing and wash the skin with water, if possible.

(3) Evacuate immediately to a medical treatment facility for cyanide treatment.

NOTE: Cyanide treatment includes IV with sodium nitrite and sodium thiosulfate. This treatment is usually not available until patient is at the battalion aid station.

(4) Record the treatment given on the Field Medical Card.

b. **Non-Contaminated Environment**.

(1) Maintain casualty's airway.

(2) Provide supplemental oxygen, with assisted ventilation (if needed).

(3) Evacuate immediately to a medical treatment facility for cyanide treatment (IV with sodium nitrite and sodium thiosulfate).

(4) Record the treatment given on the Field Medical Card.

Continue with Exercises

EXERCISES, LESSON 5

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the exercise or best completes the incomplete statement or by writing the answer in the space provided.

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. Exposure to high concentrations of a cyanide agent usually result in death:

   a. Within a few seconds to a few minutes.

   b. Within a few hours.

   c. Over a period of several weeks.

   d. Over a period of several years.

2. Describe the reaction of the following detection equipment when exposed to vesicants:

   a. M-8 detection paper _____

   b. M-9 detection paper _____

   c. The M-256A1 and the Chemical Agent Monitor _____

   d. Phosgene oxime _____

3. Which of the following statements is correct?

   a. Vesicants interfere with the nerves' ability to carry information and control the body's functions.

   b. Vesicants enter the circulatory system and react rapidly with enzymes that are vital in the absorption and release of oxygen.

   c. Vesicants attack lung tissue and cause irritation to the respiratory system.

   d. Vesicants are of no threat to the military.

4. Treatment for vesicant damage includes keeping the patient cool. Why is this important?

   a. Warm, humid conditions will decrease the severity of vesicant damage and shorten the time for symptom onset.

   b. Since mustard and Lewisite are both heavier than air, they tend to accumulate in low-lying cool areas.

   c. Cooling the patient will increase the effects of the agent.

   d. Cooling may lessen the severity of vesicant damage.

5. List the signs and symptoms mustard agent contact with the eyes:

   a. _____

   b. _____

   c. _____

6. All of the following are steps in the treatment of Lewisite EXCEPT:

   a. Irrigate the eyes.

   b. Decontaminate the skin immediately using the M291 kit.

   c. Return the casualty to duty.

   d. Provide respiratory support.

7. How does phosgene oxime differ from other vesicants?

   a. It is an urticant and does not cause blisters.

   b. It causes pulmonary edema.

   c. It causes pain.

   d. It requires respiratory support.

8. The M8, M9 and CAM will detect cyanide.

   a. True.

   b. False.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 5

1. a (para 5-9b(4))

2a. M8 Detection paper will turn red in the presence of mustard and Lewisite agents.
b. M9 Detection paper will turn pink, reddish brown or red-purple when exposed to agents but will not specify the type of agent.
c. The M256A1 and CAM will also detect mustard and Lewisite.
d. Phosgene oxime may have a pepperish odor and is detected by the M256A1 but not by M-8, M-9, or the CAM.
(para 5-1c(2-5)

3. c (para 5-1)

4. d (para 5-1b(2)(b))

5. Itching.
Tearing.
Gritty feeling.
Burning.
Photophobia. (para 5-2a(2))

6. c (para 5-5e)

7. a (para 5-6a)

8. b (para 5-8c)

End of Lesson 5