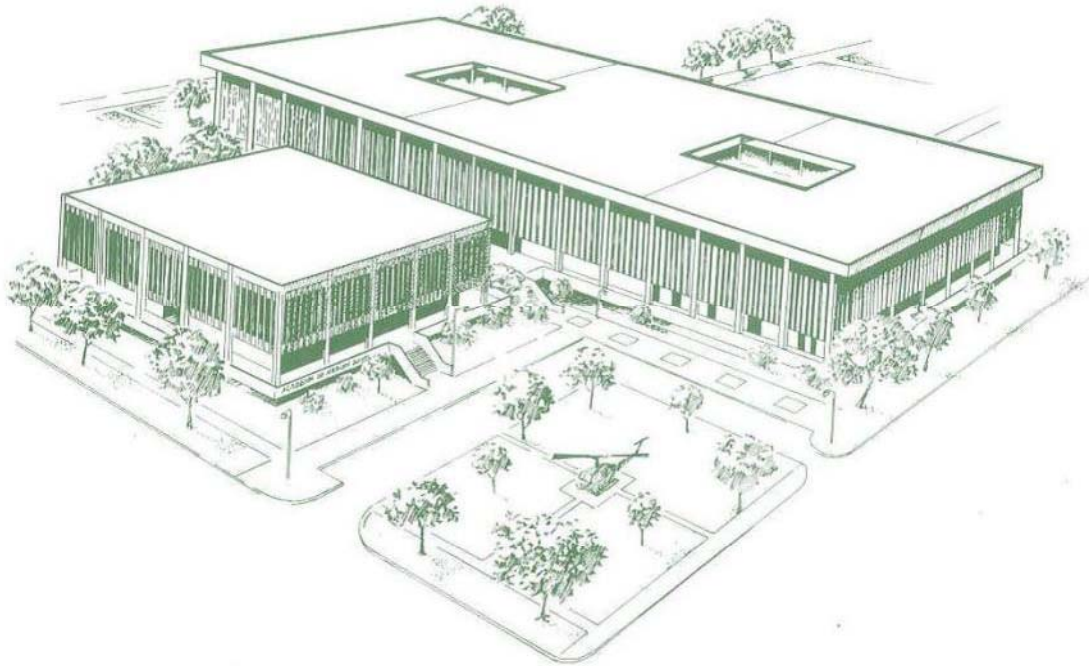


---

U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL  
FORT SAM HOUSTON, TEXAS 78234-6100

---



# MED153

FIELD SANITATION TEAM CERTIFICATION COURSE

CORRESPONDENCE SUBCOURSE  
NOVEMBER 2014

Rapid Revision 2014 by SFC Matthew P. Nicholls 30th Medical Brigade Sembach, Germany  
SFC Thomas R. Witt Department of Preventive Health Services, AMEDD Center and School  
Ft. Sam Houston, Texas  
Editing Support SSG Aaron K. Marr Medical Education Training Campus Ft. Sam Houston, Texas

## TABLE OF CONTENTS

<b><u>Title</u></b>	<b><u>Page</u></b>
LESSON 1 – Introduction to Field Sanitation Team Training	1-1
LESSON 2 – Operational Medical Threats in the Field	2-1
LESSON 3 – Personal Hygiene	3-1
LESSON 4 – Water Supply in the Field	4-1
LESSON 5 – Food Service Sanitation in the Field	5-1
LESSON 6 – Waste Disposal in the Field	6-1
LESSON 7 – Arthropods and Diseases	7-1
LESSON 8 – Management of Arthropods through Field Sanitation Individual Preventive Medicine Measures	8-1
LESSON 9 – Management of Arthropods Through Non-Chemical (Sanitation) and Chemical Practices	9-1
LESSON 10 – Rodent Management	10-1
LESSON 11 – Heat Injuries	11-1
LESSON 12 – Cold Weather Injuries	12-1
LESSON 13 – Controlling Toxic Industrial Materials (TIMs)	13-1
LESSON 14 – Noise Hazards and Noise Management	14-1
LESSON 15 – Field Sanitation Team Equipment and Supplies	15-1



## LESSON 1: Introduction to Field Sanitation Team Operations

**REFERENCES:** AR 40-5, Preventive Medicine; FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 4-02.17, Preventive Medicine Services; FM 3-05.70, Survival; FM 4-25.11, First Aid; FM 4-02.33, Control of Communicable Diseases Manual; ATP 5-19, Risk Management; FM 3-34.5/MCRP 4-11B, Environmental Considerations; DODI 6055.1, DOD Safety and Occupational Health Program; DODI 6050.5, DOD Hazard Communication Program; DODI 6490.3, Deployment Health; USACHPPM TG 248, Guide for Deployed Preventive Medicine Personnel on Health Risk Management.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 1

### Section I. INTRODUCTION

You are here because your unit commander has appointed you as a member of the Field Sanitation Team (FST). This is an important position. The effectiveness with which you accomplish your responsibilities will have far-reaching effects on the health of your fellow soldiers and on the success of your unit.

In this lesson you will study the importance of the FST, the types of occupational and environmental health and endemic disease (OEH/ED) hazards, problems for the individual soldier in the field environment, and the role and duties of the FST. This information will allow you to understand and accomplish your FST responsibilities, effectively adapting them to the OEH/ED hazards of a particular environment, and contribute to the success of your unit mission.

#### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 1-1. Given a list of terms match them to the correct definition.
- 1-2. Given a list of reasons for importance, select those related to the importance of the field sanitation team IAW ATP 4-25.12 and FM 4-02.17.
- 1-3. Understand the relationship between the FST and the unit commander for conducting Operational Risk Management (ORM).
- 1-4. Identify the requirements for selecting FST members and determining composition.

- 1-5. Identify the field sanitation team's role as they pertain to sanitation and preventive medicine measures.

## **Section II. EXPLANATION**

### **1-1. TERMS AND DEFINITIONS**

a. **Health threat:** Refers to an individual soldier's health. The term can include hereditary conditions that manifest themselves in adulthood, individual exposure to an industrial chemical or toxins where others are not exposed, or conditions that can result in other injuries and traumas that affect an individual's health but may not affect the health of the unit.

b. **Medical threat:** Refers to all "potential or continuing enemy actions and environmental situations that could adversely affect the combat effectiveness of friendly forces, to include wounds, injuries or sickness incurred while engaged in a joint operation.

c. **Disease and non-battle injury (DNBI):** Describes a person who is not a battle casualty, but who is lost to his organization by reason of disease or injury, including persons dying from disease or injury, or by reason of being missing where the absence does not appear to be voluntary, due to enemy action, or to being interned.

d. **Risk management:** The process of identifying, assessing, and controlling risks arising from operational factors and making decisions that balance risk cost with mission benefits. It is a five-step process used to identify and control hazards, to protect the force and increase the chance of mission accomplishment. It is a continuous on-going process that begins with the receipt of the mission and is applicable to any situation and environment.

e. **Risk assessment:** The identification and assessment of hazards (the first two steps in the risk management process).

f. **Hazard:** a condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation.

### **1-2. IMPORTANCE OF THE FIELD SANITATION TEAM (FST)**

a. The forerunner of the FST was established during WW II when it became apparent that the control of malaria and other arthropod-borne diseases was beyond the capabilities of engineer and medical units. Commanders of company-size units were required to appoint malaria control details. In 1956, animal pests were added to the duties of the malaria details. In 1958, health problems encountered in the field by the American Task Force in Lebanon focused on the need for a team with broader training

and knowledge of the relationship of effective PMM to individual soldier health and unit mission accomplishment.

b. Later, the vector control detail became the Field Sanitation Team (FST). Training was expanded to include field water supply, food service sanitation, waste disposal, and personal hygiene. The major role of the FST in reducing DNBI is firmly established. When a commander meets a problem beyond the FST's best efforts, assistance is requested from supporting preventive medicine elements.

c. United States military forces are frequently required to operate in some of the harshest environments on earth. Many of these areas present significant health threats which can quickly result in the spread of disease and increased incidences of non-battle related injuries if not properly addressed. Disease and non-battle injury rates from 1991 to 2003 are depicted in table 1-1.

**Table 1-1. Disease and non-battle injury rates in contemporary operations**

<i>Percentage of casualties attributed to disease and non-battle injury</i>		
Operation Desert Shield/Desert Storm	1991	6.5 percent
Operation Joint Endeavor	1995	7.1 percent
Operation Joint Guardian	1999	8.1 percent
Operation Enduring Freedom	2001	5 percent
Operation Iraqi Freedom	2003	4 percent

d. The reason the FST is important is because it is responsible for those preventive medicine measures (PMM) that affect units as a whole or are beyond the resources of the individual soldier (AR 40-5). This is an important responsibility because unit effectiveness is dependent on the health of its soldiers. When PMM breakdowns occur and units are unable to carry out their missions because soldiers are sick, the success of an army, the outcome of a war, and the fate of a nation may be seriously impaired. The success of operations is directly related to how well DNBI are prevented through effective PMM in the units. As a tactical measure, the units with sound PMM can maintain fighting strength and exploit this strength when the enemy may expect weakness due to disease and nonbattle injury.

### **1-3. FST and Operational Risk Management (ORM)**

a. FST members will participate in the ORM process by assisting unit commanders in identifying Occupational and Environmental Health/Endemic Diseases (OEH/ED) hazards, and assessing the threat associated with these hazards. Commanders will be able to make better-informed decisions on risk assessments based upon valuable input from the FST.

b. Identifying OEH/EH hazards is the first step in risk assessment. Using a process framed in the context of the mission, enemy, terrain, troops, time, and civilian considerations (METT-TC) to look for potential hazards, simplifies the process. Determining both the severity of the hazard and the probability that soldiers will be exposed to the hazard are required to assess identified hazards. The level of severity from an OEH/ED hazard is determined by the classification of health threats. Once a health threat is determined to have the potential to render a field unit combat or mission ineffective it is classified as a medical threat.

#### **1-4. FST REQUIREMENTS**

a. Today the FST is a key part of an effective command. Army Regulation 350-1 directs commanders of all company-sized units to appoint and train **two unit field sanitation teams (a primary and an alternate)** prior to deployment. A team must consist of at least two personnel, and one must be a noncommissioned officer. For units with organic medical personnel, the noncommissioned officer should be a medical noncommissioned officer. The important thing to remember is that the team should have enough members to accomplish its mission throughout the unit's area of operations. For units that consist of teams that operate individually, FST members should be placed in each team to provide support for the soldiers. FST members must be selected from personnel whose normal field duties will provide ample time for their duties to be performed. Every FST member will be trained and certified in field sanitation by supporting Preventive Medicine assets and have no less than 6 months time remaining with the unit.

b. The FST must also be equipped properly. This sub-course, MED153, contains equipment lists of required items for a unit. Commanders must make a priority to ensure these items are on hand, serviceable, and repaired/replaced as necessary. Enough items should be acquired to support the entire unit, and these supplies should be placed where they can be used by the FST members, or issued to soldiers as needed. One central location may not accomplish this.

#### **1-5. ROLES OF THE FIELD SANITATION TEAM**

The commander is ultimately responsible for ensuring the health of the troops. Therefore, the commander must have a clear understanding of the direct relationship between a soldier's health and mission accomplishment; and emphasize this at all levels. The commander appoints two functional FST's to assist in ensuring that preventive medicine measures are practiced to a high degree at all levels. To properly assist the commander in assessing the medical threat, FST members must be able to perform several tasks.

a. Inspect unit water containers and trailers; check unit water supply for chlorine and disinfect as required.



(1) Water is essential to the army in the field. Inspection of water containers and the unit's water supply will help eliminate such water-borne diseases as hepatitis, typhoid, and amoebic dysentery.

(2) Checking the unit's water supply for the proper levels of chlorination will reduce the potential for chemical poisoning that occurs with excessive chlorination.

b. Direct Unit Field Food Sanitation Operations.

(1) The conditions under which food is transported, stored, prepared, and served can have a direct bearing on the success of a mission.

(2) Monitoring the units' field food operations is vital to the soldiers' health, as well as the overall moral of the unit.

c. Direct unit field waste disposal operations.

(1) The proper disposal of all wastes is essential in preventing the spread of disease. Camps with improper waste disposal facilities soon became the breeding grounds for a multitude of pests such as flies and rats.

(2) As a member of the Field Sanitation Team you must assist the commander in the selection and construction of proper waste disposal devices.

d. Control arthropods and other animals in unit area. Directing and maintaining effective waste control, helps control arthropods and other animals in unit area.

e. Monitor status of PMM in unit against heat, cold, arthropod-borne illness, diarrheal disease, noise hazards, and toxic industrial chemical threats.

f. Assist in selection of the unit bivouac.

g. Supervise the construction of all field sanitation devices.

### **Section III. SUMMARY**

Worldwide deployments are a constant for every soldier. Our continuous missions within other countries that potentially expose us to hazards increase the importance of the FST mission. Today, more than ever, commanders must be aware of the hazards their soldiers face. As you can see, your role as a member of the FST encompasses a broad list of tasks. Throughout the course you will be taught these specific tasks in detail. It is only through the support of well-trained and motivated FST members that hazards are identified and assessed in a timely manner and the level of risk can be reduced or eliminated.



## **LESSON 2: The Medical Threat to Field Forces**

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 2

### **Section I. INTRODUCTION**

Statistics for the conflicts in which the United States has been involved, reveal that three times as many Soldiers have died from disease and non-battle injury (DNBI) than the number of Soldiers lost as a result of enemy contact. You are taught and trained to protect yourself from enemy weaponry, but the environment poses a significant threat to Soldiers, as well. As a member of the Field Sanitation Team (FST), you must be aware of the dangers posed by the environment and assist the commander in making decisions that will keep the Soldiers in your unit healthy and combat effective.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 2-1. Identify medical threat to field forces.
  - a. Four major
  - b. Three minor
- 2-2. Identify circumstances under which a Soldier, in a field setting, would not practice proper personal hygiene.
- 2-3. Identify the FSTs role as it pertains to sanitation and preventive medicine measures.

### **Section II. EXPLANATION**

#### **2-1. INTRODUCTION TO THE MEDICAL THREAT**

Although the medical threats have been classified as major and minor, all threats should be treated as potentially lethal.

a. The medical threat to field forces: History has revealed that casualties caused by disease and non-battle injury (DNBI) have a serious impact on military operations. There are four major and three minor threats to field forces that have contributed to the number of DNBI in military operations. We will look at each of them individually along with an example or two from history. By studying the impact of the medical threat from a historical perspective, you can become more effective members of the field sanitation

team. It is your duty as part of this team to see to it that the Soldiers in your unit do not repeat history.

b. **The four major medical threats.** Major medical threats are those that occur most often in the field. These medical threats exist in peacetime as well as wartime operations, and you should be conscious of their impact in both situations.

(1) HEAT is the most lethal of all the factors working against field forces.

(a) Heat is a tactical weapon as was proven in the 1967 Egyptian-Israeli conflict. The Egyptians suffered 20,000 deaths due to heat when the Israelis severed the Egyptians' water supply lines.

(b) In the 1982 U.S. Sinai Peacekeeping action, 35 Soldiers from an airborne company were so badly dehydrated; they required intravenous fluids to recover.

(c) Over 1,600 heat casualties in 2012 Army Active component required medical attention and/or lost duty time despite well documented and effective techniques for preventing heat illnesses. Heat continues to be a threat to Soldiers in training and in combat.

(2) COLD is also incapacitating on the battlefield.

(a) Over 90,000 U.S. Soldiers were admitted to hospitals with cold injuries during WW II.

(b) While in combat for 24 days on the Falkland Islands, cold injury accounted for 14% of the British casualties. How? The British, concerned about the possible number of cold weather casualties, conducted their main assault before they were fully prepared. By rushing their assault and going in unprepared, they actually increased the number of combat injuries they sustained.

(3) ARTHROPOD-BORNE ILLNESS can adversely affect military operations.

(a) Only 100,000 of Napoleon's 600,000-man army returned to France from Russia in 1812. They were destroyed by guerrillas, disease, and cold injury, which forced retreat. There were 70,000 combat losses, but 430,000 DNBI losses. It's estimated that over 100,000 soldiers of Le Grand Armee were lost due to louse-borne typhus.

(b) During the campaign for the Solomon Islands, malaria infection resulted in eight times more casualties to Allied Forces than were caused by the Japanese.

(c) From January 2003 to June 2004, 639 Soldiers deployed to Operations Enduring Freedom and Operation Iraqi Freedom were diagnosed with cutaneous leishmaniasis and three with visceral leishmaniasis.

(4) DIARRHEAL DISEASE is contracted from contaminated water and food, and it has a catastrophic impact on the fighting force.

(a) Not one of Rommel's highly successful generals was available to help him when he needed them most for his desert campaign in North Africa at El Alamein. They had all been medically evacuated due to illness. Rommel himself was not even available because he was in Germany recovering from hepatitis. His Chief of Staff, Intelligence Officer, and Operations Officer were all evacuated prior to or during the battle with amoebic dysentery.

(b) The U.S. commander of the 1980 exercise Operation Bright Star, rewarded his troops for a job well done with a night in town prior to re-deployment. Thirty percent (30%) of his troops awoke the next day infected with shigellosis. All were vomiting and had severe diarrhea on the flight back to the states.

c. **The three minor Medical Threats.** These threats are considered minor ONLY because they do not occur as often as the major medical threats. They should, however, still be treated seriously.

(1) Toxic industrial materials, or TIMS, exist throughout modern society. They may be beneficial to us in small quantities, but when they are spilled in large quantities or are misused, they can become harmful, or even deadly, to humans.

(a) These chemicals consist of Non-NBC hazards such as solvents, fuels, and cleaning chemicals.

(b) If not properly used, stored, or disposed of these chemicals can become extremely dangerous.

(c) Toxic materials introduced into burn pits, whether intentional or unintentional, exposes Soldiers to potential health problems long after the conflict is resolved.

(2) Noise is also a constant threat in military operations. The army is filled with heavy equipment, weapon-systems and generators that can have immediate, as well as gradual, detrimental effects on our hearing.

(a) Exposure to very loud concussion noises may cause an acute, or short-term, hearing loss.

(b) Prolonged exposure to vehicle and generator noises can cause a chronic or long-term, damage to your hearing.

(3) Pests other than arthropods, like mice and rats, are attracted to human dwellings for the shelter and food. Aside from the diseases these pests can transmit, the parasites they carry can also make us sick.

(a) Other pests include wild animals like snakes, bats, coyotes, as well as stray dogs and cats.

(b) These creatures can hurt you with poisonous bites and the possible spread of disease.

(c) Did you know that you don't need to be bitten to contract rabies? Even a cute, cuddly puppy can transmit rabies through its saliva. In August 2011 a Ft. Drum Soldier died after he received a dog bite on the right hand during January 2011 while deployed to Afghanistan. General Order 1 in deployed environments forbids the keeping of pets and mascots for this very reason.

## **2-2. CIRCUMSTANCES CONTRIBUTING TO POOR PERSONAL HYGIENE**

a. While in garrison, Soldiers generally maintain high standards of personal hygiene. This is due in part to the availability of latrine facilities that are kept at comfortable temperatures and have hot and cold running water. However, these conveniences might not be as readily available in the field, which may lead usually well-groomed Soldiers to be less inclined to maintain their personal grooming standards. Poor personal hygiene in the field is a difficult problem to overcome because it requires a sense of responsibility on the part of each Soldier to maintain personal hygiene practices regardless of the difficulties involved. Leadership must be proactive in this matter making sure that Soldiers have regular access to shower facilities and that Soldiers are using them.

b. The human body has an enormous capacity to protect itself against disease and climatic injury. But the efficiency with which it does this depends upon the overall well being of the individual.

c. Soldiers have the potential to encounter a wide range of climates, from mosquito-infested jungles and sand fly-infested villages to hot, dusty deserts and cold, windy plains. Even once modern cities can become harsh environments when natural disasters or wars destroy their power, water and/or sewer capabilities.

d. Deploying Soldiers halfway around the world can disrupt their circadian rhythm, or their body's natural cycle. Adding heat or cold, feeding meals at irregular hours, and depriving Soldiers of sleep, can soon result in individuals who are more susceptible to illness and combat stress.

e. The problems you face in the prevention or reduction of DNBI pertain not only to the existing natural elements, but also to the Soldiers' reactions to them.

### **2-3. THE THREE PRINCIPLES OF PMM**

These principles must be applied to ensure the success of the unit's mission.

a. First, the individual Soldier is responsible for putting individual PMM into practice.

b. Second, the commander is responsible for implementing and enforcing PMM.

c. Finally, the FST is responsible for advising the commander and training the unit's Soldiers.

### **Section III. SUMMARY**

During this lesson you have identified four major and three minor medical threats to field forces, circumstances that may influence a Soldier's personal hygiene, and the three principles of PMM. The commander will come to rely on you for the knowledge and experience you receive in this course.





## **LESSON 3: Personal Hygiene and Preventive Medicine Measures**

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; TG 281 A Guide to Female Soldier Readiness.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 2; Section I.

### **Section I. INTRODUCTION**

Personal hygiene is a lot broader than the isolated area of personal cleanliness that is associated with it. While cleanliness is important, it is only one of the elements essential to healthy living. To round out the total health concept, there has to be a balance of the mental as well as the physical aspects of personal hygiene. As a member of the Field Sanitation Team (FST), you must be able to direct the Soldiers in your unit in the preventive medicine measures necessary to maintain overall physical and mental health in order to keep them combat ready.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 3-1. Recognize proper personal hygiene practices associated with the care of the skin, hair, hands, mouth & teeth and clothing.
- 3-2. Recognize proper personal hygiene practices associated with the care of the feet.
- 3-3. Identify nutritional elements associated with maintaining good health.
- 3-4. Identify physical fitness factors associated with the maintenance of good health.
- 3-5. Recognize personal hygiene practices used to avoid diseases and injuries associated with the environment.
- 3-6. Identify mental fitness concepts associated with the maintenance of good health.
- 3-7. Identify proper guidance for avoiding illness in the field.
- 3-8. Identify personal hygiene concerns for female Soldiers.

## Section II. EXPLANATION

### 3-1. PERSONAL CLEANLINESS

Personal hygiene is very important. Although many of the personal cleanliness measures discussed are considered routine, some are often forgotten, or become less of a priority, to the deployed Soldier. Keeping the body and clothing clean is a simple, yet effective means of reducing the number of disease agents that could invade the body.

#### a. Skin Care.

(1) The body should be washed with soap and water from head to toe as often as possible. If a shower is not available, take sponge baths to wash all the body creases (armpits, groin, and crotch), the face, the hands, the feet, and the genitalia.

(2) Seek prompt medical attention for all infected cuts and burns.

(3) Special considerations – Arctic conditions.

(a) Washing in an Arctic environment may be accomplished by dry washing with snow.

(b) Shave at night to allow oil replacement by morning.

#### b. Hair Care.

(1) The hair should be kept trimmed, preferably 2 inches or less in length, and combed.

(2) Efforts should be made to wash your hair as often as possible.

(3) Shave facial hair daily.

(4) Grooming devices (brushes, combs and razors) - are not to be shared with anyone due to the chance of exchanging infection.

#### c. Hands.

(1) Keep fingernails trimmed short and clean.

(2) NEVER bite your nails.

d. **Clothing.**

- (1) Dirty clothing harbors disease and germs that may cause infections.
- (2) Change out of dirty or wet clothing as often as possible.
- (3) Dirt and grease render the BDU ineffective as an insulator.

e. **Care of the Mouth and Teeth.** The mechanical cleaning of the mouth and teeth immediately after and just before retiring constitutes the basic fundamentals of oral hygiene.

(1) **The toothbrush.**

(a) If you do not have access to a toothbrush, a certain amount of oral hygiene can be accomplished with a stick or tissue paper wrapped around a clean finger.

(b) Both the inside and outside surfaces of the teeth are best cleaned by vigorous horizontal strokes combined with a twisting motion.

(c) As part of your oral hygiene program you should lightly brush the tissue of the mouth.



(2) **Toothpaste.** If toothpaste is not available, table salt, baking soda or even just plain water used with a toothbrush will remove decay forming food particles lodged between teeth.

(3) **Prosthetic Devices and Fillings.**

(a) The degree of successful usage of dental prosthetic appliances (dentures, bridges) is dependent on the amount of maintenance given them by the wearer and the dental officer.

(b) As much consideration should be given to cleaning the prosthetic devices as is given to the cleaning of your natural teeth.

(c) Distorted or damaged dentures can be injurious to your mouth tissue and should be evaluated and corrected by a dental officer as soon as possible.

(d) Fillings, crowns, inlays and other types of restorations are simply substitutes for tooth structures and as such have a certain degree of functional

limitations. The use of sound judgment regarding the limitations of these structures is essential in maintaining the effectiveness of them and that of surrounding teeth.

- (e) Replace lost or damaged restorations ASAP.

### **3-2. FOOT CARE**

#### **a. General Foot Hygiene.**

(1) The feet should be washed with soap and water at least once a day, paying particular attention to between the toes and under the nails.

(2) The feet should be thoroughly dried all over and aired before putting clean socks back on. If your feet perspire a great deal it is wise to use foot powder on them at least twice a day.

(3) Foot powder. Apply foot powder lightly and evenly over the top and bottom surface of the feet as well as between the toes. In addition to the foot powder helping to eliminate moisture (one of the essential elements needed to support the growth of fungus) it contains an anti-fungal agent. Antiperspirants can also be applied directly to the feet to keep perspiration to a minimum when foot powder is unavailable.

(4) Clean feet by rubbing them with foot powder in cold climates or where water is not available.

(5) Shoes. There should not be any pressure points or binding spots. Nor should shoes be so large that the foot to moves inside the boot.

(6) Socks. Socks should be changed daily and washed. They should be large enough to allow the toes to remain straight, but tight enough to minimize wrinkling.

(a) Woolen socks should be purchased one size larger than cotton socks to allow for shrinkage.

(b) Socks with holes or poorly darned socks may cause blisters and should be discarded.

(c) Different types of socks are provided for various footgear. Their proper use should be learned upon issue.

**b. Common foot problems.** Many of the foot problems common to the Soldier can be avoided by following these guidelines.

(1) Blisters. Avoid getting blisters by wearing properly fitted socks and boots. Also be sure that boots are properly broken in before wearing them on long hauls, such as road marches.

(2) Ingrown toenails result from cutting the toenail to the contour of toe rather than straight across. Avoid ingrown toenails by ensuring that the nail is cut straight across the toe.

(3) Athlete's foot infection is one of the most common skin diseases. Avoid serious trouble with athlete's foot by practicing good foot hygiene as outlined above.

c. **Foot care on road marches.** The foot march is the most severe test of fitness of the feet. Unless special attention is given to the feet of marching troops, serious casualties from foot trouble will result.

(1) Preparing for the road march. Well in advance of the march, leaders should perform an inspection to ensure that all Soldiers are equipped with the proper type of well-fitted, broken in footwear; that they are carrying an adequate number of clean socks without holes; that their feet are free from blisters or other problems; and that they have an adequate amount of foot powder.

(a) Deficiencies in supply or properly fitted gear should be taken care of at this time.

NOTE: Never attempt to break in new boots on a march!

(b) Blisters or other problems with the feet should be taken care of before the march.

(2) On the road march.

(a) On the march the feet should be kept as dry as possible. If socks become damp from perspiration or wetting they should be changed for dry ones at the first opportunity.

(b) Tender pressure points should be relieved promptly by adjusting gear or applying moleskin or adhesive tape.

(3) Once or twice daily while on the march you should attempt to dust your feet with powder.

d. **Care of the feet during rest periods.**

(1) Inspect your feet carefully for potential trouble spots.

- (2) Wash your feet.
- (3) Elevate your feet to reduce swelling and muscle congestion.

e. **Care of the feet after the march.**

- (1) All used socks should be washed thoroughly with soap and water, stretched to facilitate drying, and hung in the sun or in an air current to dry.
- (2) Woolen socks should be washed in cold water to prevent shrinkage.
- (3) Feet should be inspected for potential trouble spots. Soldiers with blisters or infections should seek medical attention immediately.

### 3-3. NUTRITION

For proper strength, development and survival, the human body requires protein for muscle development, fats and carbohydrates for energy, minerals for blood and bone development, and certain essential vitamins, and water.

a. The army ration provides these essential food elements in adequate amounts and in the proper balance. It is also varied enough to meet the special requirements of climate and activity.

b. A normal intake of food usually provides all of the essential elements needed by the body, but supplements are occasionally needed such as extra amounts of salt in hot climates or vitamins for special situations.

NOTE: Coffee, tea, alcohol, etc., taken in moderation will not extensively hurt the body, but juices, milk and plain water should be the beverage of choice for the healthier you.

### 3-4. PHYSICAL FITNESS

a. Regular exercise is necessary to maintain stamina and good health. Most military duties provide a considerable amount of exercise and activity. This is usually injected into the schedule, but for some reason if it is not, you should participate in some type of exercise or sport to develop and maintain stamina.

b. **Rest and Relaxation.** Our bodies require rest to restore our mental and physical vigor. Seven or eight unbroken hours of sleep a night is desirable, but in the military, situations often make this impossible. It is up to the individual Soldier to learn how to take advantage of spare time, and to relax, even if they cannot sleep.



### 3-5. PROTECTION FROM THE ENVIRONMENT

a. **Protection from the elements.** Both in training and in combat the Soldier is often exposed to the full force of the elements. If a Soldier is to survive, they must discipline themselves to be conscious of their surroundings and situation and govern their actions accordingly. It is also up to the individual Soldier to learn to use the protective equipment that was provided for them.

b. **Protection against disease-bearing insects.** The uniform is specially designed to protect you. It, when used in conjunction with the DoD arthropod repellent system, is your primary defense against the diseases spread by arthropods.

- (1) Keep your uniform and body as clean as possible.
- (2) Properly use repellents.
- (3) Properly wear the uniform.

c. **Avoid Possible Sources of Disease.** Through a variety of measures, the Army attempts to make the Soldier's surroundings as healthful as possible. It is important to note, however, that the individual Soldier makes the difference. Every Soldier has a responsibility to himself and to the other Soldiers in his unit to follow the basic guidelines necessary to avoid unnecessary exposure to disease organisms.

(1) Army basic protective measures. Provisions for food and water that is free from disease organisms and poisons, sanitary disposal of body wastes and the elimination of insects and rodents are all ways the Army protects its Soldiers from disease.

(2) Army special protective procedures. Drug prophylaxis, immunizations, and the detection and treatment of cases of communicable disease are additional measures that can be implemented.

(3) Individual's basic protective measures. Each Soldier must avoid food and water that may be contaminated; they must take personal protective measures against insects, such as wearing the uniform properly and using repellents; and they must not expose themselves needlessly to potential sources of diseases such as venereal disease, malaria, or dysentery.

NOTE: Special protective measures. Each geographical area, climate, and living situation has its own special health hazard. These hazards may require additional special protective measures to ensure the safety of the Soldiers in your unit and may include the use of bed nets, prophylaxis, iodine tablets, and etcetera.

### 3-6. MENTAL HEALTH CONCEPTS

For total health you need a healthy mind as well as a healthy body. The two are unbreakably linked. The Soldier incapacitated by battle fatigue is as much a casualty, and as big a statistic, as the person who is wounded. By following these basic concepts you can do a lot to strengthen your total well being.

a. **Friendliness.** No man is an island. You need the companionship of others to round out your personality, and help you achieve what you are capable of achieving.

b. **Tolerance.** Apply the golden rule. The Army is composed of individuals of various ages, backgrounds, and religious beliefs. The right of each individual to his own beliefs and habits should be respected, as long as they do not interfere with proper military discipline.

c. **Combating worry.** Although worry cannot be shut off like a faucet there are always ways of combating it. Help is out there if you accept it. Your commander, First Sergeant, and NCOs can guide you towards the help you need if you give them a chance.

d. **Combating fear.** Fear is a normal reaction. It serves an important purpose of preparing the body for action, for self defense. Fear is only a problem when you let it control you. The best defense against overpowering fear is familiarity with the sensations involved - the trembling, jumpiness, the pounding heart, the sick stomach, the sweating, and the momentary freezing. This is why you are exposed to battlefield situations in basic training. It conditions you to concentrate on the job at hand and not what you perceive to be happening around you.



### 3-7. GUIDANCE FOR AVOIDING ILLNESS IN THE FIELD

a. Don't consume foods and beverage from unauthorized, unapproved sources. When using water from an unapproved source, use some form of purification; iodine tablets, chlorine, boiling, etc.

b. Don't contaminate the ground with urine or feces. Use available latrine facilities, or if you are on the move, dig a cat hole.

c. Keep fingers and other contaminated objects out of your mouth. Always wash your hands after using the latrine, and before eating.



- d. Avoid unnecessary exposure to wet and cold. Wear clothing suited to the temperature, weather conditions, and type of activity.
- e. Avoid insect bites by keeping your body clean, wearing your uniform in the proper manner, and using repellents and bed nets as instructed.
- f. Don't share personal items with anyone (i.e., comb, razor, toothbrush, towels, etc.).
- g. Don't take a laxative for pain in the stomach. See a doctor instead.
- h. Don't throw food scraps, cans, and refuse about the camp area. This only serves as a breeding ground for pests and disease.
- i. Avoid unnecessary contact with sources of disease, especially in areas where native sanitation is poor.
- j. When possible, get seven to eight hours of unbroken sleep each night.

### **3-8. PERSONAL HYGIENE AND FEMALE SOLDIERS**

a. Women comprise approximately 12% of the U.S. Army and constitute a substantial part of units deployed around the world. During Operation Enduring Freedom and Operation Iraqi Freedom, more than 160,000 female Soldiers deployed. Their medical and health concerns are different from male Soldiers. They have some special considerations in a field environment; however, when addressed appropriately, these requirements should have limited impact on the mission.

b. **Supplies.** Females have different cleanliness requirements than males, and to compensate for a lack of shower facilities, certain items must be added to the packing list:

(1) Baby wipes. They have multiple uses and should be mandatory for females to bring during operations or training exercises.

(2) Panty liner/sanitary pads. These should be added to the packing list, even if they do not expect their menstrual cycle during the exercise. They should be worn continuously and changed at least 3 times a day, if possible.

(3) Undergarments. Underwear should be designed as cotton, and bras should be moisture wicking sports bras or similar type designed for support. Underwear should be worn loose. During cold weather, Soldiers should wear long underwear made from polypropylene.

(4) Non-deodorant tampons with cardboard applicators. Given the many stresses associated with the field exercises or deployments, some women may experience changes or disruption of their menstrual cycle. Unscented, non-perfumed personal hygiene supplies are preferred, as scented products may cause skin irritation and attract biting insects.

(5) Contraceptives supplies. Use of birth control pills may reduce menstrual cycle problems that occur during the field or deployments.

(6) Yeast infection medication. Fungal and bacterial vaginitis may occur during field exercises or deployments. Limited showers increase difficulty in maintaining good hygiene, especially during the menstrual period.

c. **Bathing and Menstrual Period.** Female Soldiers should have access to bathing facilities daily during their menstrual period. This does not mean they need to have a fixed facility with hot and cold running water. It would be adequate to provide a place with privacy and drainage where the Soldier could take a “bird bath” using a 5 gallon container. It would be optimal for the Soldier to have access to a normal shower every third day or so if possible under mission constraints. Female Soldiers should not be restricted from certain duties or missions when they are having their menstrual cycle.

d. **Care of Female Reproductive System.** Increased incidences of urinary tract infections may occur during field exercises or deployments. These diseases can become serious if left untreated. Medical care is necessary for vaginal discomfort, sores (painful or painless), swelling of lymph nodes in groin, unusual vaginal discharge, painful or burning urination, or lower abdominal pain.

e. **Water Consumption and Field Mobility.** Maintaining adequate hydration is important in all climates. All Soldiers should drink adequate amounts of water to reduce risk of disease and non battle injury. Female Soldiers may be at greater risk of dehydration in the field because of their reluctance to use the latrine due to privacy or time constraints. Female Soldiers need more time and effort to urinate in the field than men because at least some disrobing is involved. Unit leaders need to plan long enough breaks to ensure that female Soldiers do not voluntarily dehydrate due to lack of private facilities.

f. **Female Urinary Device.** Female Soldiers who hold urine are susceptible to urinary tract infections. Use of the Female Urinary Device (4510-01-470-2805), which allows females to urinate through the uniform fly while standing, is encouraged. TG 281 contains more detailed information on female Soldier readiness.

### **Section III. SUMMARY**

During this lesson you have learned the importance of personal hygiene and preventive medicine measures for male and females Soldiers. It is not easy to maintain good personal hygiene while out of our normal environment, but it is critical if we are to

remain a functional fighting force. Disease and injury due to poor personal hygiene practices can decimate a unit and leave it vulnerable to enemy attack. Take the time necessary to perform personal hygiene as often as possible. A little prevention can go a long way.



## LESSON 4: Water Supply in the Field

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; TB MED 577, Sanitary Control and Surveillance of Field Water Supplies.

**STUDY ASSIGNMENT:** ATP4-25.12, Chapter 3

### Section I. INTRODUCTION

In combat, safe water ranks in importance with ammunition and food. It often has an important bearing on the success or failure of a mission. In this lesson you will learn the importance of water in the practice of sanitation, responsibilities for producing safe water in the field, sources of safe water, and procedures for disinfecting water.

#### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 4-1. Match a list of terms related to water treatment with a list of corresponding definitions.
- 4-2. Identify the importance of water in the practice of sanitation.
- 4-3. Determine the required quantity of potable water for a unit.
- 4-4. Match a list of organizations with their respective responsibilities for the production of potable water in the field.
- 4-5. Identify the rules of water discipline.
- 4-6. Determine the best water source based upon the unit's situation.
- 4-7. Identify water treatment processes used in the field.
- 4-8. Demonstrate the knowledge of the steps for inspection of a 400- gallon water trailer.
- 4-9. Demonstrate the knowledge of the steps to disinfect water in the field.

4-10. Demonstrate the knowledge of the steps to perform chlorine residual monitoring.

4-11. Monitor bottle water operations.

## Section II. EXPLANATION

### 4-1. TERMS AND DEFINITIONS

- a. **Palatable Water** - Water that looks, smells, and tastes good.
- b. **Potable Water** - Water that is fit for human consumption.
- c. **Water Treatment** - Procedures that are used to change the chemistry of water to improve its quality.
- d. **Disinfection** - A process of killing infectious agents outside the human body by direct exposure to chemical or physical agents.
- e. **Chlorination** - A treatment process that combines the water with chlorine or chlorine compound.
- f. **Chlorine Dosage** - The total amount of chlorine or chlorine compound added to a given amount of water.
- g. **Chlorine Demand** - The amount of chlorine dosage used or consumed by substances in the water.
- h. **Chlorine Residual** - The amount of chlorine left in the water after the chlorine demand has taken effect.
- i. **Concentration** - The parts of chlorine present in a given volume of water). This value may be expressed as Parts per Million (ppm) or Milligrams per Liter (Mg/L).

### 4-2. IMPORTANCE OF WATER IN THE PRACTICE OF SANITATION

a. **Safe water is essential.** Safe water ranks in importance with ammunition and food. Its availability often has a direct bearing on the success or failure of a mission.

(1) When in the field, soldiers must be supplied with sufficient water to drink and maintain personal hygiene and maximum health.

(2) The water must be safe to drink and should be reasonably free of objectionable tastes, odors, turbidity, and color. (NOTE: Water that is turbid is opaque with suspended foreign particles.)

**b. Water is a vehicle in disease transmission.** Waterborne disease organisms are a contributing source of disease to soldiers in a field environment.

(1) Common waterborne diseases of man are hepatitis, typhoid, bacillary and amoebic dysentery, cholera, leptospirosis, giardia and schistosomiasis.

(2) No direct method has been developed for detecting the minimum infectious quantities of disease organisms in water. Therefore, it is necessary to resort to an indicator test to determine the bacteriological acceptability of water.

**c. Water is tested for the presence of coliform bacteria.**

(1) Coliform bacteria are found in great numbers in the excreta (feces) of humans, warm-blooded animals, and in the soil. Because of this, water may be contaminated many times between the point where it is produced the point of consumption.

(2) Although the presence of coliform bacteria in water may not prove fecal contamination, it is an indication that pathogenic (disease-carrying) organisms may be present. This test is the best indicator that contamination exists.

(3) Many military units in the field do not have the capability for determining the presence of coliform bacteria in water; so all water must be thoroughly treated and disinfected before use.

#### **4-3. WATER REQUIREMENTS**

The quantity of water required for soldiers varies with the seasons of the year, the geographical area, and the tactical situation.

a. Universal Unit Level planning factors can be as low as 3.75 Gal per day in cold climates, up to 7.5 Gal per day in hot tropical for drinking water only! Sustained Military Missions can push that factor to more than 34 Gal per day. Operations Other than War may increase requirements up to 43 Gal per day.

b. Additional amounts of water are required for personal hygiene and cooking.

c. You may think that soldiers working in a cold climate do not need as much water for mission success as soldiers deployed to a hot desert climate. But the type of mission impacts upon this general rule. For example, soldiers marching through deep snow may need more water than desert troops in stationary positions.

**NOTE:** Water requirement information is available in FM 10-52.

#### **4-4. PRODUCTION OF POTABLE WATER IN THE FIELD**

a. **Army Medical Department responsibilities.** The Army Medical Department (AMEDD) does bacteriological examinations of water. While collecting water samples for bacteriological examination, they will also check the chlorine residual and pH levels. The AMEDD also establishes standards for water quality, inspects water points or water sources, advises the proper authorities about water purification methods and approves water for consumption.

b. **Corps of Engineers responsibilities.** The Corps of Engineers selects water sources and establishes water points. The selection of water points may be based on examination of data provided by the AMEDD as well as the reconnaissance performed by engineers.

c. **Quartermaster Corps responsibilities.** The Quartermaster Corps sets up and operates bulk water treatment equipment. They procure, treat, and distribute the treated water. Sometimes the Quartermaster Corps units transport water to centralized distribution points (dry points) for pick-up by military units.

d. **Unit Commander responsibilities.** Water supply and water treatment in the units are responsibilities of the unit commander. The commander makes certain that the unit has an adequate supply of safe drinking water; enforces the rules of water discipline; and ensures that each individual thoroughly understands the danger of drinking unsafe water. It is the responsibility of the FST to assist the commander in making sure soldiers are aware of the rules of water discipline and that they make every attempt to follow them.

#### **4-5. RULES OF WATER DISCIPLINE**

Water discipline does not imply teaching soldiers to do without water. It means using water intelligently and not wasting it. For optimum safe water usage in the field, follow these guidelines.

- a. Drink approved water only.
- b. Prevent water waste.
- c. Protect water sources with good sanitary practices.

#### **4-6. WATER SOURCES**

It is important to note that, although the selection of the water source is the responsibility of the Corps of Engineers, you may be called upon (in their absence) to assist in selecting a suitable site. Therefore, you must be familiar with the six sources of water and the factors you need to consider when selecting a water source.



a. **Surface water.** Surface water includes streams, ponds, rivers, and lakes. Surface water is generally the most accessible, and is commonly selected for use in the field. It is usually more contaminated and polluted than other water sources.

b. **Ground water.** Ground water includes wells and springs. When a surface source is not readily available, the engineers may select ground water for use. Even though ground water is usually less contaminated than surface water and requires less treatment, it is extremely difficult to determine the quantity available. It is also difficult, costly, and time-consuming to drive or drill wells. Because of these disadvantages, the use of ground water in the field is limited unless existing native wells are available.

c. **Rainwater, ice, and snow.** Rainwater is obtained by collecting it from the roofs of buildings or from other surfaces into containers. Water is obtained from ice or snow by collecting it then melting it over a heat source.

d. **Sea water.** Water obtained from oceans or saltwater lakes or seas cannot be used for human consumption until it has been distilled or de-mineralized to remove the salt.

**NOTE:** Rain, melted snow or ice, and sea water are only used in special instances when neither surface nor ground water is available. In addition, water taken from any of the above six sources must be considered contaminated and, therefore, must be treated before use.

e. **Factors to consider when selecting water source.** Several factors must be taken into account when selecting a source for your unit's water in the field.

- (1) The unit's military situation.
- (2) The quantity of water needed.
- (3) The accessibility of the source.
- (4) The general quality of the source.
- (5) The type of purification equipment available for use.

#### **4-7. WATER TREATMENT**

The purpose of water treatment is to produce potable water. Treatment processes used in the field are the same as those commonly used in civilian water treatment. In areas of the world where amoebic, bacterial, or viral dysentery or infectious hepatitis are problems, chlorination requirements as recommended by the surgeon will be established by a command directive. The methods of water treatment are:

- a. Coagulation and sedimentation to remove turbidity.
- b. Filtration to remove the remaining turbidity and a large portion of the pathogenic organisms.
- c. Disinfection to kill the pathogenic organisms that were not removed by sedimentation and filtration using chlorine compounds, iodine, or boiling of water.
- d. **Chlorine treatment.** A relatively small quantity of chlorine and contact time of at least 30 minutes is required for satisfactory water disinfection.

(1) Under ordinary field conditions the chlorine residual required is 2 ppm at the point of production and distribution (i.e. the ROWPU storage tanks, 5000-gallon water tankers) and at least 1 ppm at the point of consumption (i.e. the 400-gallon water trailers).

(2) The sudden disappearance of all chlorine probably indicates recontamination of the water.

e. Calcium hypochlorite treatment. Calcium hypochlorite is added to the water in the amount necessary to destroy the disease organisms present in the water (chlorine demand) with some remaining to serve as a continuing disinfectant (chlorine residual).

f. Reverse Osmosis Water Purification Units. Due to an increase in our use of Reverse Osmosis Water Purification Units (ROWPU) and reliance on bottled water, drinking water chlorination rules have been modified in recent years. If ROWPU are used to produce the drinking water, then the water must be maintained at 2 ppm at the point of production and distribution (i.e. the ROWPU storage tanks, 5000-gallon water tankers) and only 1 ppm at the point of consumption (i.e. the 400-gallon water trailers).

#### 4-8. INSPECTING THE 400 GALLON WATER TRAILOR

Water for use in the field is generally stored in a 400-gallon water trailer, or water buffalo. Prior to filling the 400-gallon water trailer with water, it should be inspected for cleanliness and serviceability.

**NOTE:** Refer to TB MED 577, page 131, Paragraph 16-7. Water trailer inspections

a. **Container appearance.** Perform a visual inspection of the water container prior to using it to store your unit's water. Generally speaking, the interior and exterior of the container should be clean and in a good state of repair.

(1) Interior surfaces of stainless steel and aluminum trailers.

(a) Interior seams should be free of rust. If rust is present, scrub the interior seams with a non-



metallic brush and a non-abrasive, non-chlorinated cleanser. Rinse the interior thoroughly after cleaning.

(b) Interiors should not be painted or coated with any material.

(c) Cracks and dents that expose the polyurethane foam insulation are not permitted for use and must be repaired.

b. **Exterior.** The words “**POTABLE WATER ONLY**” must be stenciled on both of the long sides of the exterior of the container.

(1) Manhole cover.

(a) Manhole covers should seal effectively to prevent contamination.

(b) Rubber gaskets should be intact, without cracks and missing pieces. Ensure gaskets are free of excessive dry rot, and fit cover properly.

(c) Locking mechanism should be fully functional.

(d) Manhole cover should be free of rust on both the interior and exterior.

(e) Insulation on the inside cover should not be damaged.

(f) Pressure relief valve should operate effectively.

**NOTE:** Test the pressure relief valve by blowing into the bottom. If air escapes through the top, then the valve is working correctly.

(2) Dispensing spigots.

(a) The T-handle that dispenses water to the spigots should open and close freely.

(b) Water should flow from the spigots when the T-handle is turned to the ‘open’ position.

(c) The protective box covering the spigots should be intact.



(d) Locking devices for the spigots should be operational.

(3) Drains.

(a) The drain plug should be easy to remove.

(b) Threads in the plug and drain hole should not be stripped or damaged.

(c) The drain plug should be installed hand tight only.

**NOTE:** Interior surface cracks around the drain hole indicate that excessive pressure was used to remove or install the plug. Remove thread corrosion at least semiannually.

c. **Initial Chlorine Check.** The chlorine residual must be rechecked when the trailer arrives at the unit's site. This verifies that the driver went to an approved water point, and it verifies that the water point is maintaining the correct chlorine residual in the water.

(1) If the residual meets the required standard, the water is safe to drink.

(2) If the residual does not meet the required standard, re-chlorinate the water to the required level.

**NOTE:** Heat and sunlight will cause chlorine to evaporate and dissipate more rapidly. Therefore, check the chlorine residual periodically and re-chlorinate as necessary.

#### **4-9. CHLORINE RESIDUAL MONITORING**

a. Components of the chlorination test kit.

(1) 6 oz. Calcium Hypochlorite bottle.

(2) Half gram spoon.

(3) HACH® Aquacheck Test Strips for Total and Free Chlorine.

b. Procedure for monitoring the chlorine residual in water.

(1) Wash your hands.

(2) Flush the taps of 400-gallon water trailer for several seconds.

(3) Hold the test strip under water stream for 10 seconds.

(4) Compare the free chlorine pads to the color chart on the bottle.

Estimate results if the color of the test pad falls between two color blocks.

## 4-10. RE-CHLORINATION PROCEDURES

### a. Procedure for re-chlorinating a full water 400-gallon trailer.

- (1) Mix 5 half-gram spoonfuls of calcium hypochlorite from the 6-ounce bottle (For 5 ppm, use 22 half gram spoonfuls) with one-half canteen cup of water.
- (2) Thoroughly mix the slurry and then add it to the water in the trailer.
- (3) Mix the solution with a clean stick or other clean device and flush the four taps.
- (4) Wait 10 minutes, flush the taps again, and check the chlorine residual.

(a) If the residual is 1 ppm or greater, wait an additional 20 minutes before releasing the water for consumption.

(b) If the residual is not 1 ppm, check the inside of the water buffalo for possible contamination (i.e. large amounts of dirt, leaves, rust or other debris.) If there is no sign of gross contamination, then add additional chlorine, but not a full MRE spoonful. Wait 10 minutes before testing the chlorine residual. Repeat this process until the chlorine residual reaches 1 ppm.

b. **Procedure for re-chlorinating a 5-gallon water can.** 5-gallon containers filled from the 400-gallon water trailer must also maintain a chlorine residual of 1 ppm. This procedure is for a full 5 gallons of water. Using this procedure to re-chlorinate less than 5 gallons of water may result in over chlorination.



- (1) Add 1 half-gram spoonful to a ½ canteen cup of water and stir the slurry solution.
- (2) Add approximately ½ of the solution to one 5-gallon can of water.
- (3) Shake the container and wait 10 minutes. Loosen the can cap, invert the can to let some treated water flow over the threads of the can.
- (4) Wait an additional 20 minutes, for a total of 30 minutes of contact time prior to water consumption.

c. **Procedure for re-chlorinating a 1-quart canteen.** In emergency cases, where no treated water is available, canteens of water can be disinfected using iodine tablets, calcium hypochlorite or Chlor-Floc (c).

- (1) Re-chlorination procedure using iodine tablets. Two iodine tablets must be used to disinfect a 1-quart canteen of water.

**NOTE:** Always inspect the iodine tablets prior to use. The tablets should be a uniform gray in color with a smooth even surface. Tablets that are yellowish brown or crumbling should be turned in and replaced with new tablets.

(a) Drop the tablets into the canteen filled with water and wait 5 minutes for tablets to dissolve.



(b) Cover the canteen and shake it.

(c) Wait 5 minutes, loosen the canteen cap and invert the canteen to allow the treated water to flow across the threads of the canteen neck. This will kill any organisms growing there.



(d) Wait an additional 25 minutes for a minimum contact time of 30 minutes to ensure all harmful organisms are killed prior to consumption of the water.

(2) Re-chlorination process using Calcium Hypochlorite.

(a) Dissolve the contents of 1 half-gram spoon in  $\frac{1}{2}$  canteen cup of water to make a slurry solution.

(b) Fill an NBC compatible canteen cap or  $\frac{1}{2}$  non-NBC compatible canteen cap with the slurry solution. Pour the cap contents into the canteen, cover the canteen and shake it.

(c) Loosen the canteen cap and invert the canteen to allow the treated water to flow across the threads of the canteen neck. This will kill any organisms growing there.

(d) Wait a minimum of 30 minutes to ensure all harmful organisms are killed prior to consuming the water.

**NOTE:** Sometimes, adding small amounts of chlorine to water can cause the water to taste and smell bad. If this happens, adding a little more chlorine to the water will usually correct this problem.

(3) Re-chlorination process using Chlor-Floc. Re-chlorinating with Chlor-Floc is another method of treating water in a canteen. Follow the directions listed on the Chlor-Floc package.

**NOTE:** This product requires a settling time. The treated water must also be strained before it can be consumed. Do not use Chlor-Floc in the personal hydration system reservoir. Add purified water from a separate container.

(4) Disinfecting a Personal Hydration System.

(a) Use two iodine tablets for 40-ounce water reservoirs, four iodine

tablets for 70- or 72-ounce water reservoirs, and 6 for 100- or 102-ounce reservoirs.

(b) Allow 30 minutes of contact time before consuming the water. If the water to be treated is cloudy or discolored, either double the dosage or use the chlorination kit (water purification) in a separate container.

(5) Disinfection process by boiling. In emergency situations without a means of re-chlorination, water can be boiled to destroy harmful disease organisms.

**NOTE:** There is no chemical residual in boiled water, so the water can be easily re-contaminated if not protected.

(a) Boil water at a rolling boil for 5-10 minutes to kill pathogenic organisms.

**NOTE:** In tactical situations where an open flame for minutes might mean attack or capture, boiling for as little as 15 seconds will kill most harmful organisms.

(b) After boiling, the water must be stored in a clean, closed container to prevent recontamination.

#### **4-11. BOTTLED WATER OPERATIONS**

a. Bottled water is often used in current operations. Bottled water is not chlorinated as is field water, and so can present a special challenge to ensure it is a safe product to the soldiers.

b. Bottled water must only come from approved sources through the normal supply chain. Preventive Medicine and the Veterinary Corps are the authorizing agents for bottled water.

c. Bottled water that is acquired from an approved source can still become contaminated in the field if not properly stored and protected.

d. Bottled water should be stored in a dry, cool environment out of direct sunlight. Sunlight can trigger biologic growth in the water, and exterior contaminants can seep into water bottles that become submerged due to flooding.

e. Bottled water that is opened for personal consumption must still be protected against secondary contamination from humans or the environment.

**DISCUSSION:** Bottled water is not chlorinated as is field water and can become contaminated if not properly stored and protected. Sunlight can trigger biologic growth in the water, and exterior contaminants can seep into water bottles that become submerged due to flooding. Therefore, it is very important to protect bottled water from secondary contamination from humans or the environment.

### **Section III. SUMMARY**

In all field situations, soldiers must be supplied with sufficient potable water to drink and to maintain personal hygiene. This requires the coordination efforts the AMEDD, Corps of Engineers, the Quartermaster Corps, the unit commanders, and the field sanitation team as well as the individual soldier.







## LESSON 5: Food Service Sanitation in the Field

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; TB MED 530, Tri-Service Food Code; FM 4-02.33 Control of Communicable Diseases Manual; TM 10-7360-211-13&P Food Sanitation Center

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 4.

### Section I. INTRODUCTION

**OPENING STATEMENT:** Personnel operating in a deployment setting, a tactical training environment, or operations afloat are categorized as a HIGHLY SUSCEPTIBLE POPULATION. Field feeding operations, operations afloat, and tactical training, especially in high-risk environments, can allow food to become vehicles in the transmission of communicable diseases, thus compromising not only the health and effectiveness of service members but unit readiness as well. Effective food sanitation practices and requirements are considered a must in any type of foodservice environment, but alternative practices may be necessary in field feeding operations. Failure to apply proper sanitary practices as they pertain to food service operations in the field can have a devastating impact on a unit's ability to accomplish its mission. Food handlers who are sick or who have poor personal hygiene habits can spread diseases and disease-causing microorganisms to the entire unit. The same potential exists when food service personnel fail to apply good food sanitation practices as they prepare, serve, transport, and store food. As a member of the field sanitation team, you need to be able to provide advice and training to the members and leaders of your unit, and direct proper food sanitation practices in the field.

#### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 5-1. Match a list of terms related to food service sanitation with a list of corresponding definition.
- 5-2. Select from a list of organism those that most often cause food-borne illnesses.
- 5-3. Identify the five sources of food contamination in the field.
- 5-4. Describe sanitary practices in food handling.

## Section II. EXPLANATION

### 5-1. TERMS AND DEFINITIONS

- a. **Contamination** - The unintended presence of harmful substances or organisms in food.
- b. **Spoilage** - The breakdown in the edible quality of food.
- c. **Potentially Hazardous Foods (PHFs)** - Foods that support the rapid growth of bacteria, which may cause disease or produce toxins.
- d. **Temperature Danger Zone** - The temperature range most conducive to bacteria growth and reproduction (between 41° and 134°F).
- e. **Cleaning** - Physical removal of soil and food particles.
- f. **Sanitizing** - Reduction of microorganisms by chemical or physical means.
- g. **Food-Contact Surface** - Surface of utensils or equipment that normally come in contact with food.
- h. **Cross-contamination** - Transfer of harmful microorganisms from one food item to another.
- i. **Calibration** - Adjusting equipment to maintain accuracy.

### 5-2. FOOD-BORNE ILLNESS

- a. Any source of food can become contaminated if proper food handling practices are not observed. Food handlers must maintain the highest sanitation standards to help prevent disease transmission.
- b. Using improper or unsanitary practices when dealing with food can cause it to become contaminated with disease-causing microorganisms resulting in an outbreak of food-borne disease. There are 5 bacteria that cause most of the reported food-borne illnesses.
  - (1) Campylobacter jejuni. Most raw poultry meat is contaminated with c. jejuni
  - (2) Escherichia coli. There are six different types. Transmission is usually through contaminated food, water, or hands.
  - (3) Listeria monocytogenes. Often associated with consumption of non-pasteurized milk or milk products including cheese.

(4) Salmonella. Epidemics are usually traced to foods such as processed meat products, inadequately cooked poultry / poultry products; uncooked or lightly cooked foods containing eggs / egg products, raw milk and dairy products, including dried milk, and foods contaminated by an infected food handler.

(5) Staphylococcus. Staph infection is most often caused by the poor hygiene practices of food handlers.

**NOTE:** Hygiene and sanitation standards for food service personnel are found in Part 2-2 of TB MED 530, Tri-Service Food Code.

### **5-3. SOURCES OF FOOD CONTAMINATION**

a. In the field, there are basically five sources of food contamination.

(1) Biological hazards. These exist when harmful microorganisms can contaminate food, usually through improper practices in food handling.

(2) Chemical hazards. These exist when harmful substances, such as cleaning solutions, sanitizers or toxic metals are introduced into food. This is usually an accidental or unintentional occurrence.

(3) Physical hazards. These exist when foreign particles such as glass, metal particles, bone or insects become mixed into food products through inadequate food protection.

(4) Cross-contamination. This can happen if raw meat, or raw meat particles, comes in contact with cooked meat on a preparation table.

(5) Unsafe food handling practices. Food-borne disease outbreaks can be attributed to the following unsafe food handling practices.

(a) Failure to refrigerate cold potentially hazardous foods (PHFs) or maintain them at temperatures below 40 degrees Fahrenheit.

(b) Failure to maintain hot PHFs at 135 degrees Fahrenheit or above.

(c) Not protecting foods from contamination and or cross-contamination.

(d) Improper food transportation and storage practices.

(e) Improper procedures and practices of food handlers.

b. It is important to remember that any food classified as a potentially hazardous food (PHF) furnishes a very good medium for harmful microorganisms to grow. Meats,

dairy, and poultry are especially hazardous; as are many salads, chopped meats and sandwich fillings due to the special handling they require during preparation and the combination of potentially hazardous foods.

**NOTE:** Field Sanitation Team members do not have to memorize every standard and regulation, but need to be aware of factors that contribute to food-borne disease outbreaks. The best way to control these factors is through proper supervisory action.

#### **5-4. SANITARY PRACTICES IN FOOD HANDLING**

The conditions present when food is prepared, stored, transported and served can have a direct bearing on the success or failure of a unit's mission.

a. **Preparing Food.** The temperature range for the temperature danger zone is from 41° to 134°F. More than likely, food products may have to be in the danger zone during some phases of preparation, but this time must be minimized as much as possible. During preparation, potentially hazardous foods can accumulate a total of four hours in the danger zone and not be a health hazard. After four hours, enough bacteria may have grown to cause disease and the food should be discarded.

(1) Food service personnel need to plan meals that reduce the amount of food waste. In garrison, some foods may be kept as leftovers. In the field, potentially hazardous foods cannot be retained.

(2) As food service personnel prepare meals, they need to coordinate their work to avoid any unnecessary lapses of time between the preparation and serving of food. To the extent possible, food that is done should be served immediately. This helps reduce the possibility of food contamination.

(3) Potentially hazardous foods that can't be served promptly after being prepared should be placed immediately in a refrigerator.

(a) If the food cannot be served or refrigerated immediately after preparation, as in the case of box lunches, PHFs should be avoided altogether.

(b) When using Insulated Food Containers (IFCs), "time only" as a Public Health Control is automatically applied. PHFs in IFCs shall be consumed within 4 hours from the time the IFC was filled. Any PHFs not consumed within this time period shall be discarded. PHFs exceeding the 4-hour time limit for consumption may not be reheated.

(c) If there is no means to refrigerate food, B rations, MREs and T rations will be the only foods served.

(d) Once a T ration has been opened, it can not be kept as a leftover. If the tray has been heated but not opened, it can be kept and reheated one time. If it's reheated and still not used, it must be thrown away even if it hasn't been opened.

(4) Fresh fruit and vegetables need to be cleaned and disinfected. Wash fresh fruits and vegetables in clean, potable water and disinfect them using an approved food service disinfectant.

(a) If food service disinfectant is not available, fruits and vegetables can be soaked in a 100 parts per million total chlorine solution for one minute, or they can be immersed in 140 degree water for one minute.

**NOTE:** Prepare the chlorine solution by mixing one tablespoon of liquid bleach (sodium hypochlorite 3-5%) with one gallon of potable water.

(b) There are some fruits and berries, like strawberries, that cannot be properly washed or disinfected. Therefore, they should not be served or eaten raw outside of the United States.

b. **Storing food.** It is important to note that foods containing enough microorganisms to cause food-borne disease do not necessarily have any changes in odor, taste or appearance. For this reason, the temperature of the foods should always be checked using a thermometer.

(1) Preventing food contamination. To prevent contamination of food supplies from pests, such as mice, rats, flies and other arthropods, good sanitation and exclusion practices, (that is storage in the proper containers), work best. However, if you need to use pesticides, use them only when absolutely necessary and only in accordance with the label instructions.

(2) Safe product temperatures. It is of the utmost importance that safe product temperatures be maintained. Failure to do this is the leading cause of food-borne disease outbreaks. Food or food products requiring refrigeration should be stored at 40° Fahrenheit or below.

(3) Food storage chest. Every unit with food preparation capabilities is issued an ice chest with a two hundred pound capacity. The internal temperature of any potentially hazardous food stored in the ice chest must not exceed 40° Fahrenheit.

(4) Semi-perishable foods, such as potatoes and onions, should be kept in a dry area and on pallets to allow air to circulate around them.

(5) Unwrapped food or food products can be stored in boxes but should be covered first to protect them from dust.

(6) Dry food items such as flour, sugar, coffee-creamer and rice should be kept in their original packaging. When transfer to other packaging is necessary, they should be placed in metal containers that have been lined with clean, disposable food-grade plastic liners. The lids should fit tightly and the containers should be protected from heat and moisture. Improper storage can result in product deterioration or infestation by insects and rodents.

(7) Acidic foods such as potato salad, tomato juice, lemonade or other citrus drinks must never be stored in galvanized containers. The acid can dissolve the zinc coating, which can cause metal poisoning.

c. **Transporting Food.** Whether you're moving food from the ration point to the unit or from the field kitchen to the troops, great care must be taken to avoid providing an environment for microorganisms or other substances to contaminate the food.

(1) Vehicles used for transporting food must be completely enclosed. If they have been used for transporting garbage, trash or petroleum products, they should not be used to transport food until they have been properly cleaned.

(2) Food containers, packages of single-use items, and utensils shall be placed on clean, dry pallets or other dunnage to prevent direct contact with the vehicle floor.

(3) Transporting potentially hazardous foods to troops away from the food service facility requires the use of insulated food containers (IFC). Whether you are transporting hot or cold food, using these containers correctly will help maintain safe product temperatures.

(a) Label the container with the common name of the food, the time it was packaged and the internal temperature of the food at the time it was packed.

(b) Food will be consumed within four hours from the time when the IFC is filled.

(c) Serving utensils that are sent with the container should be covered to prevent contamination.

(d) Disposable food service gloves should be provided.

d. **Serving food.** The condition of the dining facility and its staff can be primary sources of food contamination and disease.

(1) Purpose for inspection. Food service operations are inspected for three reasons.

(a) First, to identify basic defects that could cause or spread communicable diseases.



(b) Second, to recommend corrective actions.

(c) Third, to give assistance to unit food service personnel in understanding the importance of effective sanitation practices.

(2) General procedure. Perform the following general inspection to ensure compliance by food handlers in food service facility practices.

(a) Ensure that the unit is inspecting all food it receives at the time of delivery or pick-up. Food service personnel must inspect food immediately upon receipt. If they suspect any food is unfit for human consumption, they should contact the veterinary unit or their unit surgeon for instructions. Perishable foods should only be stocked according to the unit's ability to store them properly.

(b) Conduct a brief visual inspection of the facility to ensure that all food sanitation principles and practices are being followed.

(c) Ensure that all prepared foods are being maintained at the proper temperatures. That is, 40°F or below for cold foods and 135°F or above for hot foods. Food that is sent to troops at remote sites in IFCs must be consumed within 4 hours of the IFCs being filled.

(d) The NCOIC of the dining facility should check the facility for proper equipment prior to using it for food service.

(e) Ensure an adequate supply of food service gloves and aprons are on hand.

(f) There must be a hand-washing device for the food handlers. It must be conveniently located near the food preparation area and must be monitored to ensure it is provided with soap and water as well as paper towels.

(3) The NCOIC of the dining facility must inspect the food handlers at the start of each shift, every day.

(a) The focus of this inspection should be to insure that all food handlers are practicing good personal hygiene and verify that they're not sick with a communicable illness.

(b) Camouflage paint, while essential to survival in combat, is not good for humans if eaten. To reduce the chance of food contamination, food handlers are not permitted to have this on their face, hands or arms while they are preparing food, washing or sanitizing food equipment or performing KP duties.

(c) Food service personnel who are sick should report to sick call and be returned to kitchen duty only when the medical authority determines they are fit.

(4) Regardless of the type of food you are storing, it may become contaminated even if it is packaged according to the guidelines we've discussed. Here are some additional precautions you can take to prevent food contamination and spoilage.

**NOTE:** When in doubt, contact the supporting Veterinary Services unit to make a determination on food quality.

- (a) Keep food protected from the elements (sun, rain, freezing temperatures).
- (b) If at all possible, avoid storing food in excessive heat or moisture.
- (c) Carefully observe all expiration dates on foods. Be sure to dispose of food when the expiration date has passed.

e. **Cleaning and Sanitizing Utensils.** To avoid the transfer of disease organisms from food contact surfaces to food items, cooking utensils should be washed, rinsed and properly stored after each use. Use one of the following methods to clean and sanitize utensils.

(2) The Food Sanitation Center (FSC). Another method for cleaning and sanitizing eating and cooking utensils is the food sanitation center, or FSC. The food sanitation center consists of three sink assemblies. Each sink includes a base with burner racks that hold Modern Burner Units (MBU). The three sink drain hose assembly attaches to a grease collector before water is discharged to grey water collection.

- (a) Pre-scrape items to remove food.
- (b) Wash each item in one sink with hot (110°F to 120°F, 49°C to 52°C) detergent solution. Scrub items until free of all food and dirt. Change water when too dirty.
- (c) Rinse off detergents with hot (120°F to 140°F, 49°C to 60°C) clean water in second sink.

**NOTE:** Be sure all items are completely covered with clean, hot water.

- (d) Load rinsed items in the sink immersion rack and lower the loaded sink immersion rack into clean hot water (171°F or above, 77°C minimum) in a third sink.
- (e) Leave racks in water for at least 30 seconds.
- (f) Remove the rack from the sink. Remove the sanitized items from the rack, air dry, and store.

(g) The FSC is used with the modular field kitchen or the trailer mounted field kitchen. It is portable and can be set up or prepared for movement by four soldiers within 30 minutes.

f. **The food service thermometer.** Only an approved food service thermometer may be used for determining the temperature of food. The thermometer should have a metal stem, and a numerically scaled or digital display. It should have the capability of being calibrated and accurate to within  $\pm 2^{\circ}\text{F}$ .

**NOTE:** Bimetallic dial thermometers are available and can be ordered from unit supply. NSN 6685-00-444-6500.

**WARNING:** Thermometers containing mercury can not be used and should never come in contact with food or food-contact surfaces.

(1) Using the food service thermometer. Proper use of the thermometer ensures the most accurate reading.

(a) Wash your hands prior to handling the thermometer.

(b) Sanitize the thermometer with alcohol or a chlorine solution.

(c) Push the stem into the thickest part of the food, wait for the needle to stop moving. Do not allow thermometer to contact bone.

(d) Note the reading.

(2) Calibration of the food service thermometer. Periodic calibration of the thermometer is required to ensure accuracy. To calibrate the stem-type thermometer use one of the following methods:

(a) Ice point method. First, insert the stem into a 50/50 ice and water slush and wait for the needle to stabilize. Note the reading. If the thermometer does not read exactly  $32^{\circ}\text{F}$  then, using a wrench or pliers, adjust the calibration nut by turning it clockwise or counterclockwise until the indicator reads  $32^{\circ}\text{F}$ .

(b) Boiling point method. First, insert the stem into boiling water and wait for the needle to stabilize. Note the reading. If the thermometer does not read exactly  $212^{\circ}\text{F}$  then, using a wrench or pliers, adjust the calibration nut by turning it clockwise or counterclockwise until the indicator reads  $212^{\circ}\text{F}$ .

### **Section III. SUMMARY**

As an FST member, your knowledge of food service sanitation principles and procedures will ensure that the soldiers in your unit are healthy and combat ready. To do this, you must recognize proper food handling and storage procedures, as these are essential to the well being of the soldier in the field. It is also important to remember that when you are called upon to inspect a field food service operation, your philosophy should be one of assistance. You are there to help the food service personnel understand the importance of applying good sanitation and hygiene practices and to inform them that following these simple rules can prevent the outbreak of food-borne illness.





## LESSON 6: Waste Disposal in the Field

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 5.

### Section I. INTRODUCTION

Proper management of waste materials generated in the field is critical in protecting the health of Soldiers and the environment. Handling these materials improperly can create dangerous working conditions, damage vital natural resources, impede mission accomplishment, and cause irreparable harm to training areas. Poor waste management practices can also lead to criminal and civil penalties, substantial cleanup costs, and detract from the military's relationships with local communities and host nations. As a result, the Department of Defense demands integration of environmental considerations into all military planning and decision making.

Unit field sanitation teams provide —

- Awareness training on the dangers associated with the handling of hazardous waste materials.
- Monitoring of company- or unit-level waste management programs and facilities.
- Training Soldiers on the appropriate use of personal protective equipment that must be used during waste management operations.

Unit field sanitation teams also assist the unit commander in conducting inspections of waste management practices and provide supervision of—

- The construction and maintenance of human waste disposal facilities.
- The construction and maintenance of garbage and soakage pits.

### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 6-1. Identify the three categories of waste disposal in the field.
- 6-2. Select the best latrine for your unit's situation.
- 6-3. Select the best liquid waste disposal method for your unit's situation.
- 6-4. Select the best garbage and rubbish disposal method for your unit's situation.
- 6-5. Select the best hazardous waste disposal procedure for your unit's situation.

## Section II. EXPLANATION

### 6-1. WASTE DISPOSAL IN THE FIELD

When we talk about waste disposal we need to look at three categories. Any of these, when not properly disposed of can become a breeding ground for disease-carrying insects and animals.

- a. Human waste – feces and urine.
- b. Liquid waste – liquid kitchen and bath waste.
- c. Rubbish – combustible and non-combustible solids.

### 6-2. HUMAN WASTE DISPOSAL

Human waste disposal facilities are a must when talking about proper disposal of human waste in the field. There are two categories of human waste disposal facilities: latrines and urinals. The type of human waste disposal facility selected for use is dependent upon how long the unit will remain in one place. Usually, the longer the stay, the more sophisticated the facility. However, there are other considerations too, such as the tactical situation, weather and ground conditions, and local environmental laws.

**WARNING:** Army units MUST follow all local, state, federal, and international environmental standards during operations. The waste disposal devices described in this lesson MUST be reviewed and authorized by Preventive Medicine personnel prior to their use. This information is presented so units can develop their own waste disposal capabilities in EMERGENCY situations.

a. Latrines. Whatever type of latrine is used, the unit is responsible for its construction, maintenance, and closure. You, as the FST member, need to know the type of latrine best suited for the unit's location and operational status.

(1) Planning considerations. Regardless of the type of latrine you are going to use, you can't just build them anywhere. These planning factors must be taken into consideration.

(a) Location. The latrine should be located at least 100 yards downwind from the unit's field food service facility, 100 feet away from any unit ground water source, and at least 30 yards from the edge of the unit area.

(b) Privacy. A canvas or brush screen should be placed around each latrine, or a tent may be placed over it. The screen should have a drainage ditch dug around its edges to prevent rainwater from flowing into the latrine.

**NOTE:** In cold climates, you may consider heating the enclosure.



(c) Hand-washing devices. Hands contaminated with fecal matter are the most common means of disease transmission. Because of this, hand-washing devices are absolutely necessary. A simple hand-washing device should be installed outside of each latrine enclosure. It should be easy to operate and must be kept constantly supplied with soap and water.

(d) Cleanliness. Keep the latrines clean. Latrines should be policed daily to ensure they are being properly maintained. They should also be cleaned and sanitized every day to reduce germs and odor.

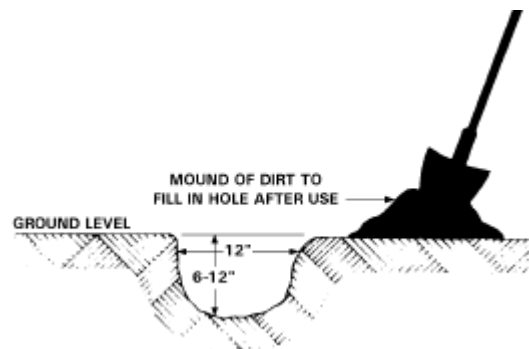
(e) Quantity. You must construct enough latrines to handle the unit population. You should have enough latrines to accommodate four percent of the unit's male soldiers and six percent of the unit's female soldiers at any one time.

(f) Closure. Even if you build a sufficient number of latrines, you will probably have some that fill up. Even if they are not completely full, all latrines must be properly closed. When a latrine pit is filled to within one foot of the top, or when it is to be abandoned, remove the latrine box and spray the contents of the pit, the side walls and the ground within two feet with an approved insecticide. Fill the pit to ground level, packing the dirt after every three inches of dirt added. Then mound the latrine with twelve inches of soil to prevent flies from entering or exiting the pit. Finally, place a sign on the pit that states the type of latrine, the date it was closed, and the unit designation.

**NOTE:** Unit designations should only be included on the closure sign in non-operational areas.

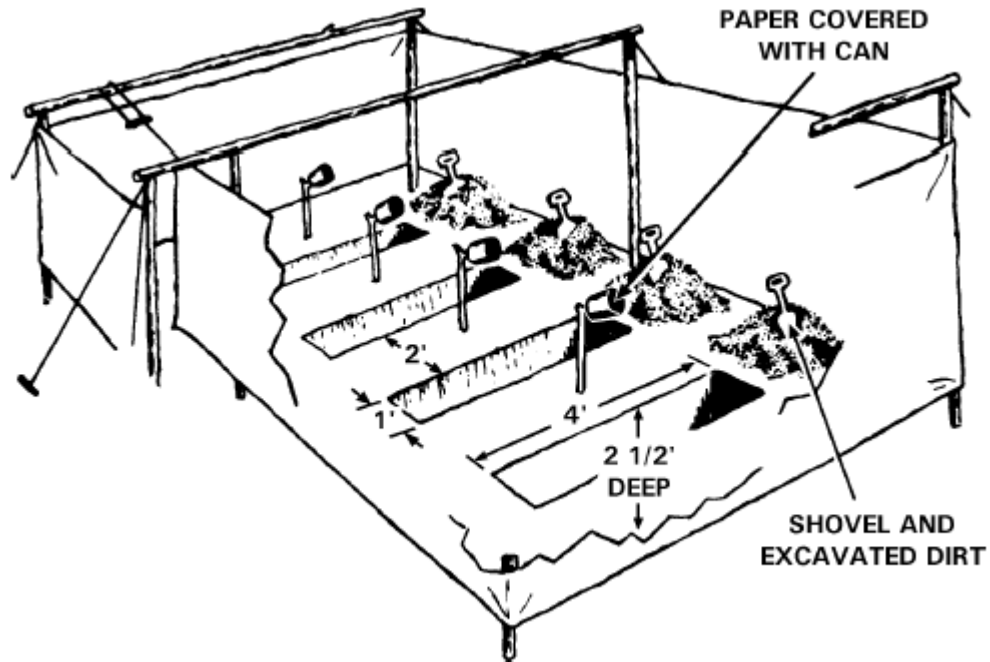
(2) Types of latrines. Remember that the decision on the type of latrine to be used is based upon the unit situation and other things like ground or soil conditions.

(a) Cat-hole latrine. The cat-hole latrine is used when the unit is on the move. The cat-hole latrine is simply a hole approximately one foot deep and one foot in diameter. After using a cat-hole it must be completely filled in and the dirt packed down.

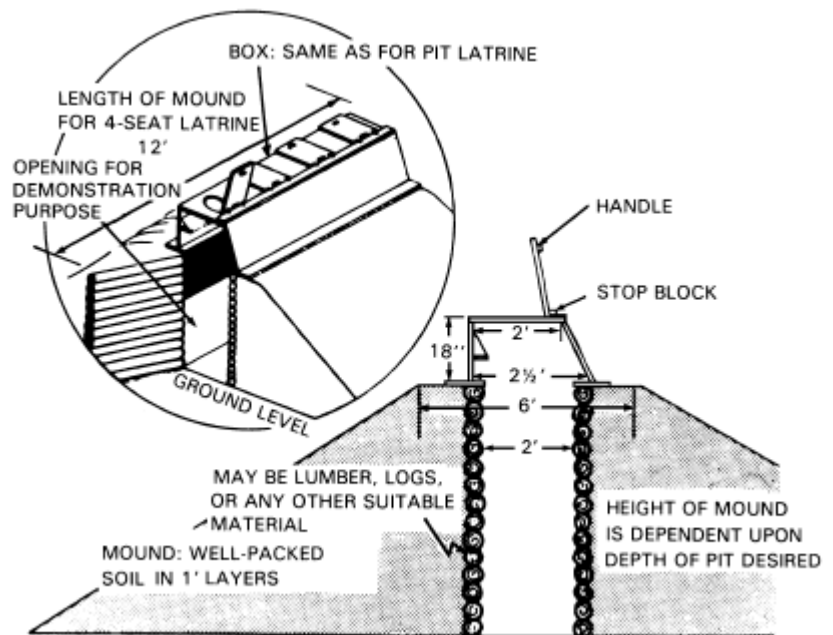


(b) Straddle trench latrine. Use the straddle trench latrine if the unit is remaining in one place for up to three days. Each trench is dug one foot wide, two and one half feet deep, and at least four feet long. Multiple trenches should be dug at least two feet apart.

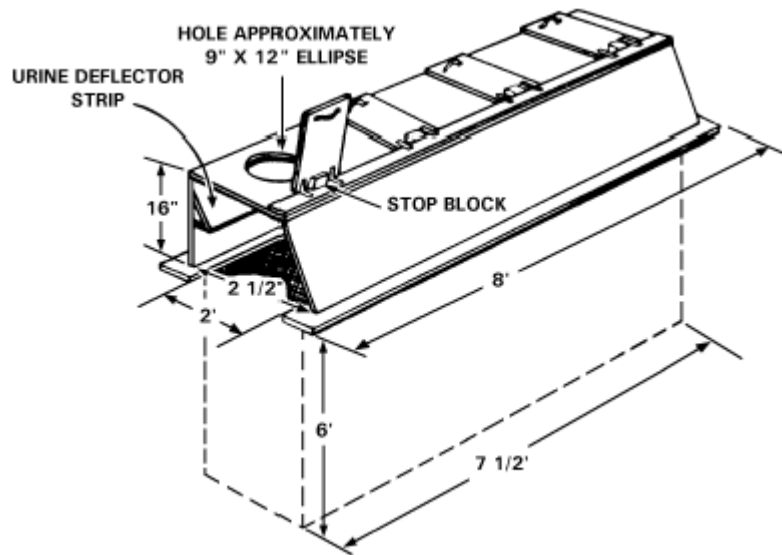
Each four-foot trench will accommodate two soldiers. Separate facilities should be constructed for male and female soldiers. Placing boards along both sides of the trench can provide better footing. Place toilet paper on broken sticks or branches and cover the rolls with a can to protect the paper in bad weather. Pile the excavated dirt at one end of the latrine and provide a shovel for the soldier to cover the excrement and toilet paper after each use. Close the latrine when the trench is filled to within one foot of the top.



(c) Mound Latrines. Mound Latrines are utilized when a high ground water level or a rock formation near the ground surface prevents digging a deep pit. A mound of earth with a top at least 6-feet wide and 12-foot long is formed and a four-seat latrine box is placed on top. The mound is formed in 1-foot layers and allows 1 foot from the base of the pit to ground level. The pit is dug into the mound when the mound has reached its desired level.



(d) Deep pit latrines. If the unit is going on an extended stay, longer than three days, then deep pit latrines are usually built. This latrine uses a two-seat or four-seat box either issued to, or built by, the unit using. The two-seat box is four feet long, two and one half feet wide at the base, and sixteen inches high. The four-seat box is eight feet long. To minimize flies entering the latrine, pack the dirt tightly around the base of the box. Lids that are fly-proof and self-closing should cover the seat holes. A metal urine deflector strip is placed inside the front of the box to prevent urine from soaking into the wood. The pit for the latrine is dug two feet wide and either three and one half or seven and one half feet long.



The depth of the pit should equal one foot for each week the latrine will be used, plus one foot for the dirt cover when the latrine is closed.

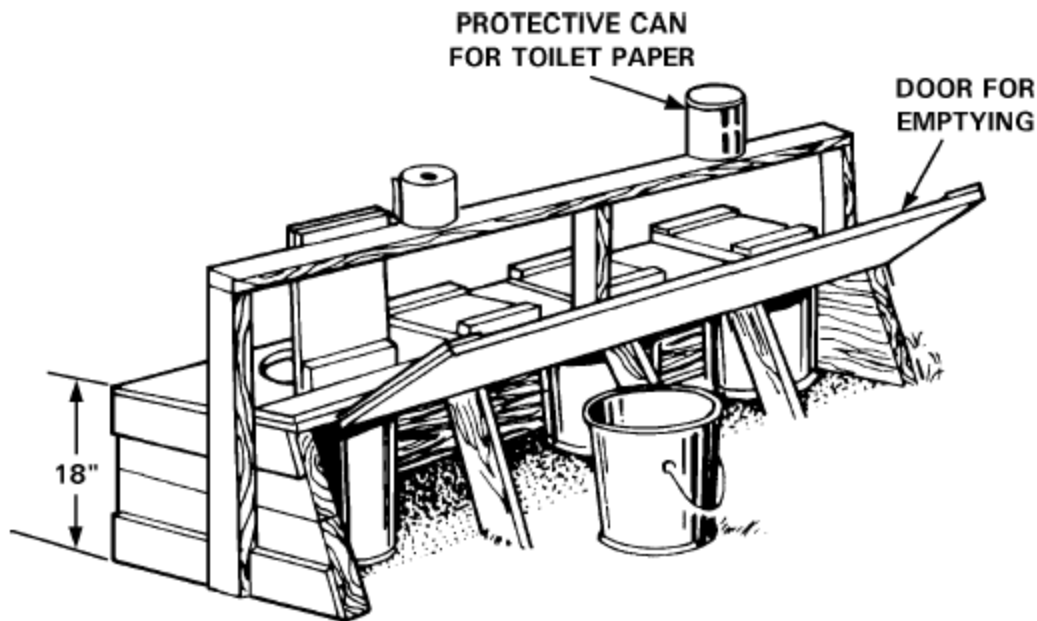
(e) Burnout latrines. Burnout latrines are particularly suited to jungle areas with high water tables, but can also be used when the ground is hard or rocky and digging is difficult or impossible. Do not use it in areas in which the air pollution regulations prohibit open fires. Furthermore, be aware that in combat areas, burnout latrines make great targets as the smoke and fire are easily seen.

1 To construct a burnout latrine, a 55-gallon drum is cut in half, and handles are welded to the sides of the half drum for easy carrying. A wooden seat with a fly proof, self-closing lid is placed on top of the drum. To prevent dilution of the waste, build urinals for men and create separate urinal barrels for women.

2 The latrine is burned out daily by adding sufficient fuel to incinerate the fecal matter. A mixture of 1 quart (1 liter) of gasoline (Mogas) to 4 quarts (4 liters) of diesel (JP8) oil is effective, but must be used with caution. For safety precautions, never add additional fuel while barrel is actively burning. Ensure fire-fighting capabilities at burn locations are on hand: fire extinguishers (operational), piles of dirt (with shovels), and water cans (with water). If possible, have two sets of drums, one set for use while the other set is being burned clean. If the contents are not rendered dry and odorless by one burning, they should be burned again. Any remaining ash should be buried.

**NOTE:** Due to a possible lack of supplies during deployments, Mogas may be hard to acquire. In that event a 100% JP8 solution may be used, but it will take much longer to burn the human waste. **NEVER USE 100% MOGAS FOR THIS TYPE OF OPERATION.**

(f) Pail latrines. Use the pail latrine where the water table is too close to the surface of the ground for digging a deep pit latrine. The same seat boxes constructed for a deep pit latrine can be modified for use as a pail latrine by placing hinged doors on the rear of the box, adding a floor and placing a pail under each seat. If the pail latrine is located in a building, the box should be placed to form part of an outer wall. The box should be placed on a floor of impervious material, such as concrete, that slopes toward the rear. The slope allows wash water to drain rapidly. If possible, line the pails with plastic to reduce the risk of accidental spillage. Dispose of the contents by burial, burning, or other sanitary measures.



(g) Chemical toilets. Chemical toilets are usually obtained where environmental laws prohibit the construction of latrines. They are seen quite frequently these days during training exercises. Chemical latrines are self-contained, having a holding tank with chemical additives to aid in waste decomposition and to control odor. These latrines must be cleaned daily, but the contents are emptied based on usage.

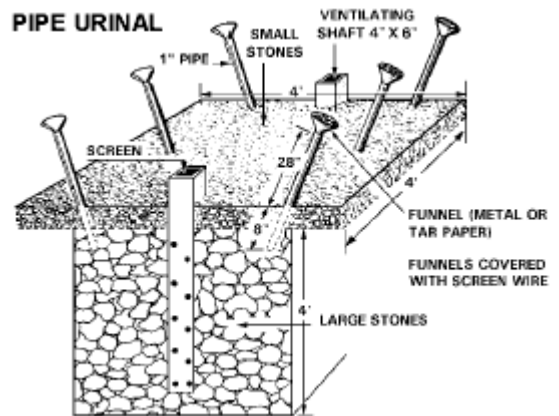
b. Urinals. Proper disposal of urine is just as important as the disposal of any other type of waste. Urine disposal devices are always used in conjunction with a urine soakage pit.

(1) General guidelines for the urine soakage pit. First, inform soldiers that they should not urinate on the surface of the pit; it defeats the sanitary purpose. Second, food service personnel should not use the pit for liquid waste disposal as grease and oils from kitchen waste will clog the pit. Finally, closed or abandoned pits

should be sprayed with a residual insecticide and covered with a two-foot mound of compacted dirt. Use a sign to mark the closed pit.

(2) Urine soakage pit construction.

The urine soakage pit is a four by four foot hole, dug four feet deep then filled with rocks, flattened cans, broken bottles or other similar non-porous rubble. Ventilation shafts can be inserted in the pit extending from within six inches of the bottom to about seven inches above the surface. Be sure to top the ventilation shafts with screens to prevent flies from entering the pit.

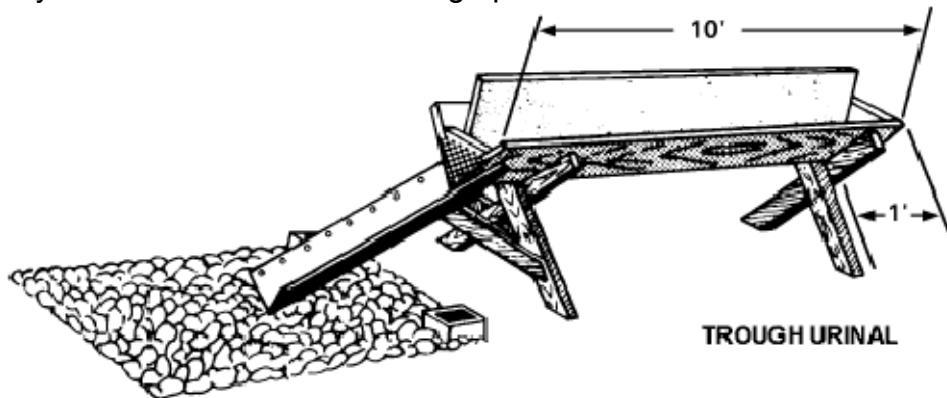


(3) Pipe urinals. Pipe urinals are

simply pipes, at least one inch in diameter, placed at an angle at each corner of the soakage pit. If needed, additional pipes can be placed on the sides, halfway between the corners to accommodate up to eight soldiers at a time. You'll need to have enough pipes available to accommodate five percent of the male soldiers in your unit at any given time. (In other words, five pipes are required for a unit with one hundred male soldiers.) The pipes should extend at least eight inches into the pit and about twenty-eight inches above the surface. Place a funnel made of tarpaper or sheet metal at the top of each pipe and cover it with a screen.

(4) Urine troughs. Urine troughs are used when the unit is going to be in

one area for a long period of time and when more permanent facilities are desired. As with the other waste disposal facilities, you will need to accommodate five percent of the soldiers at any given time. You'll need to build two feet of trough per soldier. Therefore, in a unit with 100 male soldiers, you'll need to build ten feet of trough. (5% of 100 = 5 soldiers. 5 x 2 ft/soldier = 10 ft.) The trough may be U or V shaped and built of sheet metal or wood. Wooden troughs should be lined with heavy tarpaper. The legs on one end of the trough should be slightly shorter. A pipe is then connected to this end to carry the urine to the urine soakage pit.



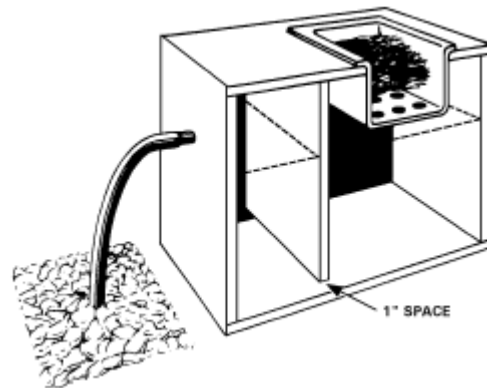
### 6-3. LIQUID WASTE DISPOSAL

In the field, liquid waste refers to wash, bath, and liquid kitchen waste. Liquid waste from food service operations contains particles of food, grease, and soap. This type of liquid waste requires treatment before it can be disposed of. Liquid kitchen waste accumulates at the rate of one to five gallons per soldier per day. There are three basic devices used to dispose of liquid waste in the field. They are the soakage pit, the soakage trench, and the evaporation bed. All three devices have one element in common; the grease trap. All liquids from food service operations must have the food, grease, and soap removed to avoid clogging the disposal device.

a. There are two main types of grease traps commonly used in the field. They are the baffle grease trap and the barrel filter grease trap.

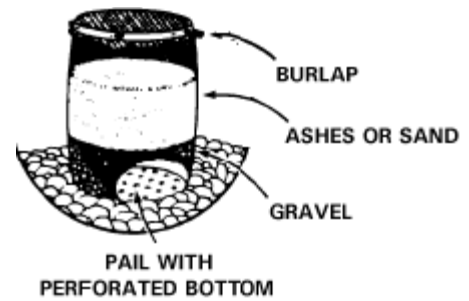
(1) Baffle grease trap. The baffle grease trap is the most effective way to remove grease from kitchen waste. It is constructed from a barrel or a watertight box.

(a) Inside the barrel or box is a wooden baffle that divides it into two chambers. The entrance chamber is given two-thirds the space, while the exit chamber is afforded the remaining one third. The baffle should run from the top of the barrel or box to within one inch of the bottom of it. Above the entrance chamber, insert a strainer into the lid. The strainer can be made from a small-perforated box filled with straw, hay or burlap. On the side of the exit chamber, closest to the pit, insert one end of a pipe about three to six inches below the top of the barrel or box. This is the outlet, which will allow the liquid waste to pass into the pit or trench. Once the grease trap is in place, the other end of the pipe should be inserted into the center of the pit or trench at least one foot deep. When the baffle grease trap is properly positioned and the pipe is inserted into the pit, it is ready for use.



(b) To begin, both chambers must be filled with cool water. Then pour the waste liquid through the strainer. The strainer will catch the solids. When the warm wastewater comes in contact with the cool water in the entrance chamber, the grease will solidify. The coagulated grease sits on top of the water in the entrance chamber while the remaining liquid passes under the baffle and into the exit chamber. Eventually, the displaced liquid reaches the pipe that goes to the soakage pit. However, the congealed grease remains on the water's surface in the entrance chamber until it is removed. To maintain the baffle grease trap, skim off the grease daily, or more often if required. Burn or bury the grease. Empty and scrub the entire trap with hot, soapy water as often as the mission allows.

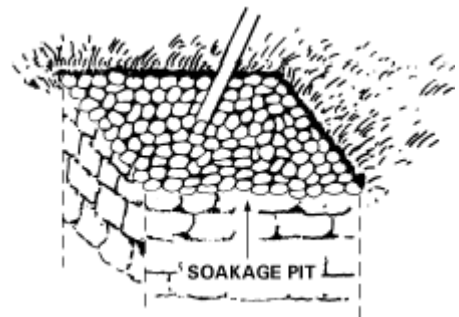
(2) Barrel filter grease trap. The barrel filter is the other type of grease trap you're likely to encounter. This trap is constructed using a thirty to fifty gallon barrel or drum. Start by removing the top of the drum and boring several holes into the bottom. Put eight inches of gravel or small stones in the bottom of the barrel. Then cover these with twelve to eighteen inches of wood ashes or sand. Finally, fasten a piece of burlap over the top of the barrel to serve as a course strainer.



(a) The barrel filter grease trap must be positioned in one of two ways for it to be effective. One is to place trap directly over the soakage pit. The other is to place the barrel on a platform with a trough that leads to the pit.

(b) Like all of our field sanitation devices, the barrel filter grease trap requires some maintenance to operate efficiently. Every two days empty and wash the trap. Then refill it with fresh ashes or sand. Wash or replace the burlap strainer daily. Burn or bury the ash or sand to prevent infestations from pest or insects.

b. Soakage pits. A soakage pit should be four square feet and four feet deep. The bottom of the pit should be covered with non-porous rubble, such as rocks, broken bottles or cans. One soakage pit is adequate for smaller units located in an area for a brief period. For units with 200 or more soldiers it is recommended that you have two soakage pits. Having two would allow them to alternate days and give each pit a chance to rest. In camps of long duration, each pit should be given a rest period of one week every month. The rest period prevents the pit from clogging.

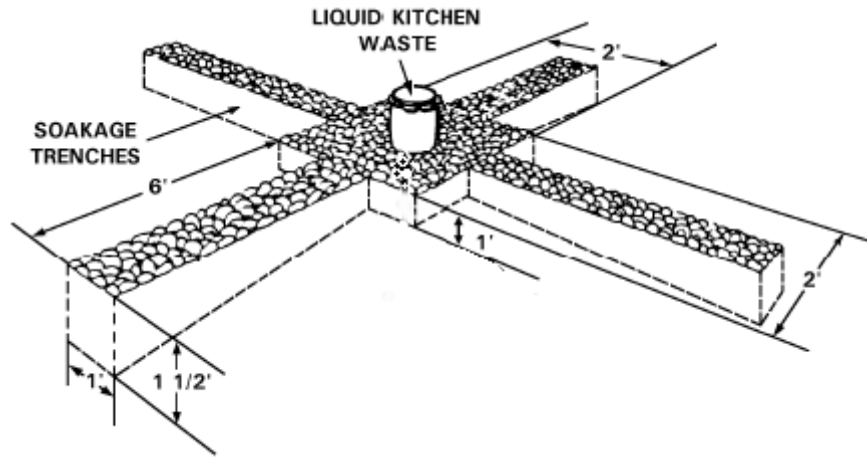


To close a soakage pit you should first mound it over with one foot of compacted soil. The compacted soil will keep insects and vermin from entering and exiting the pit. Then post a sign on the mound that states the type of pit and the date it was closed.

**NOTE:** Determine the required soakage pit size (volume) by considering these factors: duration of the operation, number of personnel involved, amount of drainage generated per day, expected period of use, and absorbent quality of the soil substrate.

c. Soakage trenches. Should your unit sit up in an area where digging may be difficult due to rocky terrain, or the water table is high you may decide to use the soakage trench to dispose of liquid waste.

(1) To construct a soakage trench dig a pit two feet square and one foot deep. One-foot wide trenches are then dug, radiating outward from the pit in each direction. These trenches vary in depth from one foot at the pit to one and a half feet at the outer edges. Line the bottom with the same non-porous material as the soakage pit.

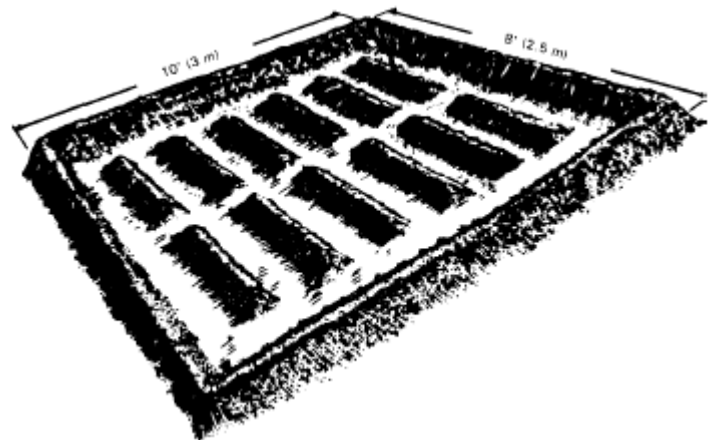


(2) Remember that you will need two soakage trenches for every two hundred persons and each one would require a grease trap. When using two trenches alternate their use to provide each a period of rest. To close the trenches use the same method used for the soakage pit.

d. Evaporation beds. In hot, dry climates where the soil is heavy clay, evaporation beds are used. This is due, in part, to the fact that the heavy clay prevents the use of soakage pits and trenches since it is basically non-absorbent. Evaporation beds are built in eight foot by ten-foot rectangles. You should allow three square feet per soldier per day for kitchen waste, and two square feet per soldier per day for wash and bath waste. While evaporation beds are seldom used, it is important that you are familiar with their construction in case the necessity arises that one needs to be built.

(1) To begin, scrape the topsoil from the area and mound it around to form the outside edges of the bed. Then, with a spade, turn the dirt over within the bed to a depth of between 10 and fifteen inches. With a rake, mound the loosened dirt into a series of horizontal or vertical ridges that are approximately six inches high. These ridges will help to distribute the water evenly within the bed.

(2) Evaporation beds actually operate on a process of evaporation, percolation and oxidation. To operate the bed, simply flood the bed with liquid waste until the wastewater is close to the top of the ridges within the bed. In other words, flood the bed to a depth of approximately six inches. The liquid should be allowed too sufficiently dry to permit re-spading and reforming on the mounds.





While this is happening, other beds are flooded on successive days and the same sequence of events is followed. It is important to give special attention to the proper rotation, maintenance, and usage of these beds. If these beds are used properly, they create no insect hazard and only a slight odor.

#### 6-4. GARBAGE AND RUBBISH DISPOSAL

The third type of waste disposal you'll need to concern yourself with is the disposal of garbage and rubbish.

a. Garbage refers to the food waste that occurs during food preparation, cooking and serving. Garbage is classified as either dry or wet. Rubbish is the non-food waste that usually comes from kitchens.

b. Rubbish is classified as either combustible or non-combustible.

c. Garbage and rubbish are disposed of in one of two ways: burial or incineration. The tactical situation will dictate which method is most appropriate. For example, in some situations, it may be necessary to conceal excavated soil. In other situations, smoke and flame may be intolerable.

(1) Burial method. There are two techniques used to bury garbage and rubbish. Again, knowing the tactical situation will assist you in selecting the most appropriate technique. The length of the mission is usually the primary factor in deciding whether to use a pit or a trench.

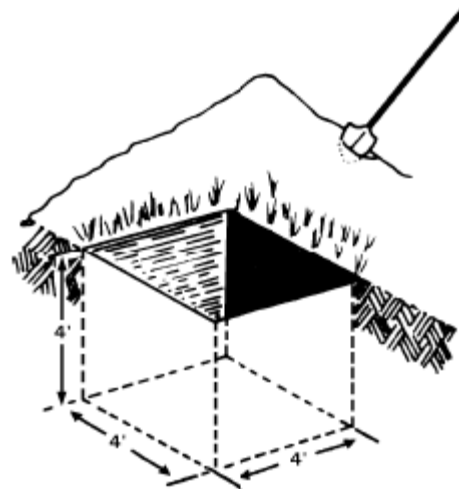
**NOTE:** When using either method, be sure to compact the rubbish before disposing of it. Doing so will help to prevent infestation by insects and rodents.

(a) Burial pits. Burial pits are preferred for overnight halts. A pit is four feet by four feet and four feet deep. A pit of this size is suitable for one day for one hundred soldiers.

##### 1 Operational considerations.

After depositing rubbish and garbage in the pit, cover it to keep pests away. At the end of the day, or when the pit is filled to within one foot of the ground's surface, fill it in with earth. Once it is filled in, mound it over with an additional one foot of compacted earth. Then mark the pit.

**NOTE:** Compacting the earth is very important. Doing so prevents flies and rodents from entering or exiting the pit.



2 Placement of the pit. Proximity to the food service area and the water supply are important. Locate the pit a minimum of thirty feet and a maximum of thirty yards from the food service area. The pit should also be located at least one hundred yards downstream from any source of water that is in use, for either cooking or drinking.

(b) Continuous trenches. For stays of two days or more a continuous trench two feet wide and four feet deep should be used. The overall length of the trench will vary depending upon the length of time the trench will be in use.

1 Operational considerations. To operate the trench, remove dirt to extend the length of the trench. Use the dirt you remove to cover the garbage that has been added during the day.

2 Placement of the trench. The same considerations for pit placement should be made when locating the continuous trench. Locate the trench a minimum of thirty feet and a maximum of thirty yards from the food service area. The trench should also be located at least one hundred yards downstream from any source of water that is in use, for either cooking or drinking.

(2) Incineration method. There are several types of incinerators. Your tactical situation must be taken into account in order to choose the incinerator that is best fitted to the needs of your unit. The incinerator should be located at least 50 yards downwind from camp. The further, the better. This prevents it from being an odor problem.

**NOTE:** Although a significant amount of time is spent discussing incineration and the various types of incinerators, Soldiers should be aware that burial is almost always the best method for disposing of garbage and rubbish. Therefore, burial should be used whenever possible.

(a) Remove non-combustible rubbish. Since incinerators will not handle either non-combustible rubbish or wet garbage, these items must be removed from the mix. First, remove all non-combustibles, such as cans.

(b) Remove wet garbage. Remember that wet garbage is actually semi-solid. Therefore, it is necessary to separate the liquid from the solid portion. To do this, strain the garbage with a course strainer.

1 Pour the liquids through a grease trap and into the soakage pit.

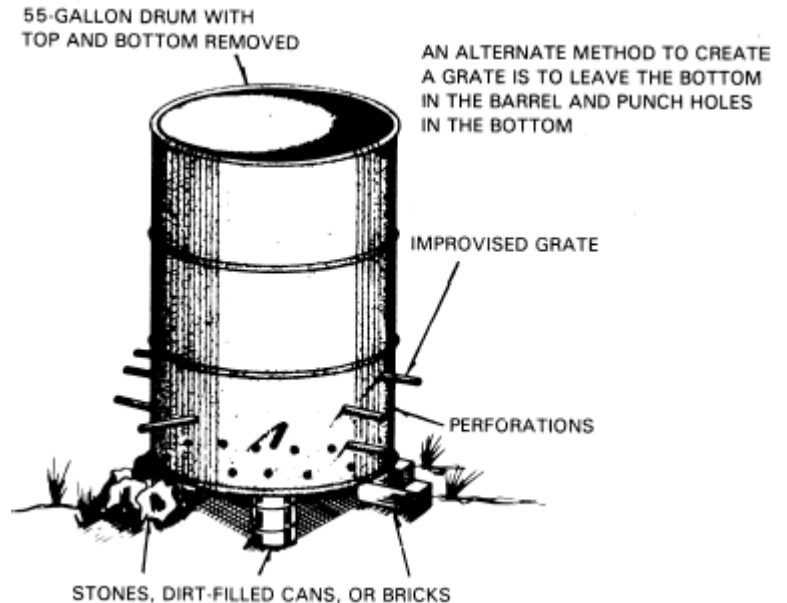
2 Incinerate the solids remaining in the strainer.

(c) Barrel incinerator. This incinerator is used to dispose of combustible rubbish. It is made from an empty 55-gallon drum with both ends removed.

1 Punch several holes near the bottom of the barrel and insert grates inside the barrel, several inches above the holes.

2 Support the barrel above the ground using stones, bricks, or dirt-filled cans. Be sure to leave enough space underneath it to allow a fire to be built.

3 Put the combustible rubbish on the top grate and ignite it.



(d) Cross trench and stack incinerator. This type of incinerator will effectively take care of the waste produced by a company-sized unit. This is an excellent dry trash device. Wet materials tend to disrupt airflow and keep the garbage from burning properly.

1 Construct two trenches that cross at right angles. Each trench should be ten feet long. The depth of each trench should slope from the surface of the ground to eighteen inches at the intersection.

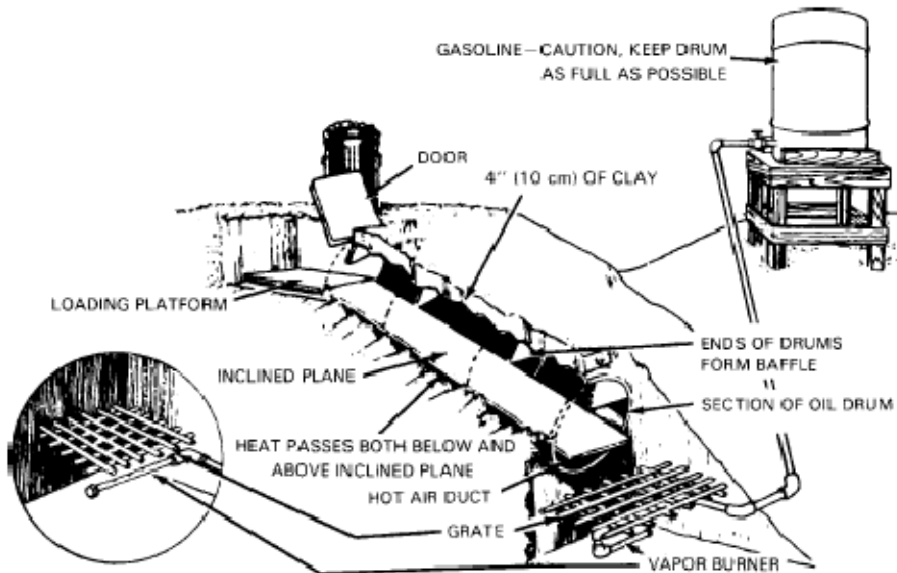
2 Build a grate from scrap iron and lay it over the intersection of the trenches.

3 Create a stack from an old drum with both ends removed OR with one end removed and holes drilled liberally in the other end to emit air.

4 Build a fire on top of the grate. Place the stack on top of the fire. Add waste to the stack, one shovel-full at a time.

(e) Inclined plane incinerator. This device is capable of disposing of the garbage for an entire battalion, combat support hospital, or other unit of similar size. Its effectiveness in combustion, as well as the fact that wind or rain does not hamper its operation, makes it an excellent device. However, skill and time are required to construct it.

- 1 Telescope two 55-gallon drums with both ends removed.
- 2 Insert a sheet metal plane through the telescoped drums. Make sure the plane extends two feet beyond the upper end of the drum. This will serve as your loading platform.
- 3 Position the drums, with the plane in place, on an inclined surface.



- 4 Put a grate at the lower end of the drums. The fire should be started under the grate. Either a wood or fuel oil fire is okay.
- 5 When the incinerator is hot, place the garbage on the loading platform. As the garbage becomes dry, push it through the drums in small amounts. Final burning takes place on the grate.

## 6-5. HAZARDOUS WASTE

Hazardous waste should normally be disposed of through the unit S4 section. Commanders should check with the supporting PVNTMED personnel for information concerning the turn-in of hazardous materials and hazardous waste materials.

### Section III. SUMMARY

Proper waste disposal in the field is essential in the prevention of the spread of disease. Solid and liquid wastes produced under field conditions can be as much as one hundred pounds per soldier per day. The unit commander is responsible for proper waste disposal in his unit area. However, he will be looking to you, the field sanitation team member, to supervise the construction and operation of the necessary waste facilities. Directing waste disposal in the field is a very important task. It is one that has

direct bearing on your many other duties, including the control of arthropods and rats in the unit area. You can well imagine how quickly one hundred pounds of waste per person per day, when not properly disposed of, can accumulate and become the breeding ground for all types of pests.



## LESSON 7: Arthropods and Diseases

**REFERENCES:** AR 40-5, Preventive Medicine; FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 4-02.17, Preventive Medicine Services; FM 3-05.70, Survival; FM 4-25.11, First Aid; FM 4-02.33, Control of Communicable Diseases Manual

**STUDY ASSIGNMENT:** ATP4-25.12, Chapter 6 Section II

### Section I. INTRODUCTION

You may ask yourself why the Army, with all of its high-tech weapons systems, concerns itself with something as small as a mosquito or a spider. The reason is that history is full of examples of armies that were decimated by arthropod-borne disease. In fact, worldwide, one out of every seventeen people die from malaria – a disease passed on by mosquitos. Think about that number for a minute. That means that if your unit deploys to a malaria-prone area, they will be at very high risk unless they take the necessary precautions. It's up to you to make sure the soldiers in your unit are aware of and realize the medical threat and to train your soldiers in the proper precautionary measures to protect themselves both in peacetime and wartime operations.

#### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 7-1. Match a list of terms related to arthropods and diseases with a list of correspondence definitions
- 7-2. Identify and select the habitats for each of the six arthropods important to military operations.
- 7-3. Identify the ways arthropods affect human health.
- 7-4. Identify how arthropods spread diseases.
- 7-5. Name the arthropod-borne diseases and their vectors.

### Section II. EXPLANATION

#### 7-1. TERMS AND DEFINITIONS

a. **Arthropods.** Includes ticks, spiders, mites and other insects as well as crustaceans such as shrimp, lobster and crabs.

b. **Vector.** A carrier. In this lesson, this term is used to describe an arthropod that transports a disease-causing organism, or pathogen, from one host to another.

## 7-2. ARTHROPODS IMPORTANT TO MILITARY OPERATIONS

To properly convey this information to your fellow soldiers, you need to be able to identify the six arthropods that have the greatest influence on military operations. In addition, knowing how and where arthropods live provides you with the key to protecting yourself and your fellow soldiers from getting ill. It will also help you to avoid or eliminate potential arthropod habitats and effectively control the arthropod population in your area of operations.

a. **Mosquitos.** Mosquitos have earned the honor of being labelled the most important arthropod for a number of reasons. First, you can find them practically everywhere. And where they are found they are usually in high numbers. Additionally, they are capable of transmitting a large number of diseases, some of which are war-stoppers. During WWII, Korea, and Viet Nam entire units were rendered combat ineffective by malaria.

(1) Life cycle. Mosquitos live short lives – about one month. They have four life stages; egg, larva, pupa, and adult. Mosquitos mature in about two weeks.

(2) Habitat. Mosquito larvae inhabit areas with standing water such as ponds, puddles, and ditches. Anything that can hold water provides a habitat for mosquito larvae; things like discarded cans, tires, and tree holes. Adult mosquitos continue to inhabit their larval habitats without venturing too far away.

b. **Filth flies.** The filth fly transmits many diseases. There have been situations in which filth flies have been allowed to breed unhampered. The resulting fly-borne disease outbreaks made hundreds of soldiers sick within a few days.

(1) Life cycle. Like the mosquito, flies do not generally live very long – usually about six weeks. They have four life stages: egg, larva, pupa, and adult. Filth flies mature in about two weeks, then live as adults for an additional three or four.

(2) Habitat. Flies are not too picky about their living quarters. They live in or near animal or human waste, garbage, decomposing plants and animals, or in mud with high organic content. A large population of flies is usually a good indicator of unsanitary conditions.

c. **Fleas.** Adult fleas are not only persistent and painful biters, but are efficient vectors of a number of diseases.

(1) Life cycle. The flea's life cycle has four stages; egg, larva, pupa, and adult. The flea matures in about one month and the adult flea can live for as long as one year.



(2) Habitat. Fleas are often associated with animals, although many humans are carriers, too. Large populations of fleas can usually be found around animal beds, burrows, and nests.

d. **Lice**. Head and body lice are considered external parasites of man. In other words, they live outside the human body and obtain nutrients from it. Both species bite causing an itching inflammation of the skin. However, only the body louse is a disease vector.

(1) Life cycle. The life cycle of the louse is somewhat different from the other arthropods we've discussed. Their life cycle has only three stages; egg, nymph, and adult. The louse matures from egg to adult in about sixteen days. The louse will live as an adult for another nine days, or so.

(2) Habitat. Lice normally inhabit the hairy parts of the body, along with clothing. They are often prevalent in crowded or unsanitary conditions. Soldiers who do not practice good personal hygiene can become infested with lice and pass them on to other soldiers when they come in contact with their hair, clothing, sleeping bags, or other linens.

e. **Cockroaches**. Cockroaches can carry a variety of disease-causing pathogens.

(1) Life cycle. Like the louse, the cockroach has three life stages; egg, nymph, and adult. They mature in about three months and live for adults for up to two hundred days.

(2) Habitat. Cockroaches prefer habitats with three criteria: water; shelter, such as cracks or crevices; and food, such as garbage or spillage. Anytime these three conditions exist, you should look for the existence of cockroaches. These three criteria usually exist together in kitchens and bath areas, especially when conditions are less than sanitary.

f. **Ticks and mites**. These two arthropods are very similar in biology, so are considered together. Ticks are the most efficient arthropod when it comes to disease transmission. This is because the female tick can pass the pathogen to the egg so that when the larva hatches it is already able to pass on the disease upon eating its first meal.

(1) Life cycle. Ticks and mites develop through four life stages; egg, larva, nymph, and adult. They live as adults for anywhere from one month to two years.

(2) Habitat. Ticks and mites are generally found in areas of tall grass or underbrush in close proximity to mammal resting places and watering holes.

### 7-3. HOW ARTHROPODS AFFECT HUMAN HEALTH

Now that you know the six arthropods most important to military operations, let's take a look at how they affect human health.

a. **Direct injury.** Direct injury results when the arthropod, itself, causes the disease or discomfort.

b. **Bites.** Bites are the most obvious mechanism for direct injury. Bites are not only annoying and painful, but can decrease a soldier's productivity level. It's not uncommon, in northern latitudes, for the bite counts of pests to reach twenty bites per minute. Can you imagine trying to be quiet while manning an LP/OP having to fight off this many insects?

c. **Envenomization.** This is the direct injection of venom into the body through a bite or sting. The damaging results of a bite or sting can range from dermatitis, or inflammation of the skin; (as seen with flea bites) to actual tissue damage (the result of the bite of the brown recluse spider).

d. **Entomophobia.** This condition is the irrational fear of real or imaginary insects.

**NOTE:** While this condition is not usually prevalent among soldiers, it can occur so it needs to be mentioned.

e. **Accidental injury.** Insects can cause accidental injury to our sensory organs. Any insect that enters the ear, nose, or eye can cause severe irritation.

f. **Myiasis.** This is a condition in which fly larvae invade a human host. It occurs in one of two ways. First, a fly lays its eggs on an open wound. When the eggs hatch the larvae begin to feed on human tissue. Secondly, a person may eat fly larvae on contaminated food. However, when this happens, the food is usually passed through the digestive tract without damage or illness. The process of myiasis may also be used as a medical treatment. In such cases, fly larvae are intentionally placed on wounds. The larvae feed on the dead tissue, which in turn, promotes the growth of living tissue.

g. **Allergies.** People who live in housing with a history of cockroach infestation could have a real problem with allergies as cockroach feces and the skins they shed when molting are potent allergens. Many people are also allergic to dust mites that are found in many buildings and in bedding materials such as mattresses and pillows. Allergies to the venom of some biting and stinging arthropods are also prevalent. While not often considered deadly, the nuisance caused by allergic reactions can, itself, be enough to reduce a soldier's productivity and effectiveness.

## 7-4. HOW DISEASE IS SPREAD

You're aware of how arthropods affect human health, but how are the diseases they carry actually passed to humans? Let's take a look at the ways in which vectors transmit disease-causing organisms.

a. **Passive or mechanical transmission.** This method of transmission occurs when the arthropod carries the pathogen from one host to another. During this transmission, the pathogen does nothing during the transfer except 'go along for the ride.'

(1) Example 1. Filth flies carry bacteria or other disease-causing organisms on their mouthparts and feet from infected human feces. If soldiers eat food that has been contaminated by a fly landing on it and depositing these pathogens, dysentery or other diarrheal disease may occur.

(2) Example 2. Cockroaches provide a similar 'taxi service' by carrying disease organisms on their legs, feet, and mouthparts. These pathogens can cause diarrheal diseases such as cholera.

b. **Active or biological transmission.** In this method of transmission the disease-causing agent undergoes some change in the body of the arthropod. The pathogen may multiply or simply develop into an infectious form. There are several ways a pathogen can be passed to humans via active transmission.

c. **Inoculation.** A vector injects the pathogen into the host with its saliva while it feeds on the host. Mosquitos transmit malaria by inoculation.

d. **Regurgitation.** The vector vomits the pathogen into the host while it feeds on the host. Fleas transmit bubonic plague by regurgitation.

**NOTE:** The bacteria that causes bubonic plague multiplies rapidly in the flea's gut and blocks it like stopping up a drain. When the flea attempts to eat, it can not ingest the host's blood due to the blockage. The flea ends up regurgitating the bacteria into the host.

e. **Fecal contamination.** The vector defecates into a wound on the host. As the wound itches, scratching and rubbing by the host causes the pathogen to enter the host's body. Chagas' disease, also known as North American Sleeping Sickness, is transmitted in this way by the kissing bug.

**NOTE:** The kissing bug bites the host causing a wound. It then takes a few steps forward and defecates into the wound.

f. **Crushing the vector.** The vector is smashed onto the skin of the host. When the host wipes off the dead bug, the pathogen is rubbed into the skin. The body louse transmits epidemic typhus in this manner.

**NOTE:** The bacteria that cause epidemic typhus live and multiply in the body of the body louse.

## 7-5. ARTHROPOD-BORNE DISEASES AND THEIR VECTORS

There are several arthropod-borne illnesses that are significant to military operations. Now that you are familiar with how diseases are spread, we'll look at some of the diseases that are most significant to Army operations.

a. **Malaria.** This is the most important disease to the military. The Anopheles mosquito transmits this disease. Malaria is responsible for the death of over three million people each year. Think about it – that's about twelve times the number of people in the active duty army!

b. **Yellow fever.** The Aedes mosquito transmits this viral disease. Since we are now inoculated against this disease, it is no longer considered a real threat to soldiers in the army.

c. **Dengue fever.** The Aedes mosquito transmits this disease. It is most prevalent in the tropical and sub-tropical areas of Asia, Africa, and Central and South America. No vaccine has been developed for this disease.

**NOTE:** This disease is characterized by fever, headache, extreme pain in the joints and muscles, and a rash.

d. **Encephalitis.** The Aedes and Culex mosquitos carry several forms of this disease. (St. Louis encephalitis, Japanese B encephalitis, and California encephalitis.) Ticks carry another form of this disease known as Russian spring/summer encephalitis.

**NOTE:** Symptoms of this disease may include headache, fever, and extreme drowsiness. The disease may leave lasting effects such as deafness, epilepsy, or an altered mental capacity, known as dementia.

e. **Sand fly fever.** This disease is also known as phlebotomus fever. This viral disease is carried by the phlebotomine sand fly.

f. **Leishmaniasis.** The sand fly transmits this disease. It is transmitted to humans by the transfer of a single-celled animal known as a protozoa.

g. **Epidemic typhus.** The body louse is the vector for this disease. This disease has occurred in widespread epidemics during wartime or other periods when

sanitation has not been strictly observed. It occurs in primarily temperate areas. During WWI, one hundred fifty thousand soldiers died of this disease.

h. **Bubonic plague.** Any one of the arthropods that are parasitic on rodents may transmit this disease. The most important of these is the rat flea. During the middle ages, bubonic plague occurred in huge outbreaks known as pandemics. These pandemics were known to wipe out the entire population of many cities.

### **Section III. SUMMARY**

As you have learned, arthropods can affect a soldier's health in many ways. Many people have the tendency to overlook the impact that arthropods can have on military operations, even though history is full of examples in which their impact can be devastating. An important part of your job is to inform your unit about the impact that arthropods can have on military operations and the ways in which unnecessary exposure to them can be avoided.



## **LESSON 8: Management of Arthropods through Individual Preventive Medicine Measures**

**REFERENCES:** AR 40-5, Preventive Medicine; FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 4-02.17, Preventive Medicine Services;

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 6 Section II

### **Section I. INTRODUCTION**

Manpower is the Army's most valuable asset. Everything possible must be done to conserve this asset. During recent wars, more deaths and illnesses have resulted from disease than from enemy action. Throughout the world, diseases carried by mosquitos, ticks, lice, and other arthropods threaten soldiers' health and combat effectiveness. Use of the Department of Defense, or DoD, Arthropod Repellent System is just one of the preventative systems emplaced that can help reduce or eliminate arthropod-borne disease in the field.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 8-1. Identify the components of the DoD Arthropod Repellent System.
- 8-2. Select, in order, the steps required to treat uniforms using the IDAA kit.
- 8-3. Recognize the correct procedure to treat uniforms using the .5% aerosol can method.
- 8-4. Recognize the correct procedure to treat uniforms using the 1-gallon sprayer.
- 8-5. Recognize the correct procedure to treat skin using DEET.
- 8-6. Recognize proper wear of the uniform in the field setting.
- 8-7. Identify the measures taken to protect "at risk" soldiers from arthropod-borne illness.

## Section II: EXPLANATION

### 8-1. THE DoD ARTHROPOD REPELLENT SYSTEM

The DoD arthropod repellent system is made up of three separate components:

- a. **The proper wear of the uniform.**
- b. **DEET on the skin.**
- c. **Permethrin on the uniform.**

Permethrin is an insect repellent that is applied to your uniform, tentage, liners and insect netting. Permethrin **SHOULD NOT** be applied to the skin. There are four ways in which permethrin can be applied.

- (1) Factory Treatment
- (2) Individual Dynamic Absorption Application (IDAA) kit.
- (3) 5% aerosol can.
- (4) Applying permethrin using the 1-gallon sprayer.

d. When used in conjunction with one another, these components provide excellent protection against a wide variety of arthropods and arthropod-borne diseases.

### 8-2. Factory Treatment

Factory treatment is the most preferred method for treating the ACU. Factory treatment ensures all ACU's are treated precisely and uniformly, according to EPA label requirements.

- a. Factory treatment eliminates the exposure risks associated with applying liquid and aerosol permethrin products.
- b. Independent research has shown that the ACU Permethrin provides 99-100% bite protection out to 50 launderings even though the label reads 25 launderings.
- c. The ACU Permethrin cannot be retreated with permethrin.

### 8-3. INDIVIDUAL DYNAMIC ABSORPTION APPLICATION (IDAA) KIT

The IDAA kit is the second most preferred method for treating the ACU.



a. The IDAA kit contains enough material to treat one ACU. It contains two individual bottles of 40% permethrin, two watertight zip lock bags, two sections of string, one pair of disposable plastic gloves, and a clothing marker.

b. The procedures for treating the ACU jacket. These instructions can be found on the back of the plastic bag marked A.

(1) Step 1. Lay the jacket flat and fold the sleeves across the front. Then fold the jacket shoulder to shoulder. Tightly roll the ACU jacket starting at the collar. Tie the roll tightly in the center with the string provided in the kit. Set aside.

(2) Step 2. Pour  $\frac{3}{4}$  canteen cup of clean water into the plastic bag marked with an A.

(3) Step 3. Put on the disposable plastic gloves and empty the contents of one bottle of permethrin into the bag, drop the empty bottle and cap into the bag, and gently shake to mix.

(4) Step 4. Place the rolled jacket into the bag and zip lock.

(5) Step 5. Gently shake the bag twice and then let it rest for at least three hours.

c. The procedures for treating the ACU trousers. These instructions can be found on the back of the bag marked B.

(1) Step 1. Lay the trousers flat. Fold them leg to leg then roll them tightly. Tie the roll in the middle with the string provided in the kit.

(2) Step 2. Pour  $\frac{3}{4}$  canteen cup of water into the bag marked with a B.

(3) Step 3. Put on the disposable plastic gloves and empty the contents of one bottle of permethrin into the bag, drop the empty bottle and cap into the bag, and gently shake to mix.

(4) Step 4. Put the ACU trousers into the bag and zip lock.

(5) Step 5. Gently shake the bag twice and then let it rest for at least three hours.

d. When the three hours has passed, put on the disposable plastic gloves and remove the jacket and trousers from the plastic bags. The ACU should then be hung in the shade for an additional three hours until it has had time to dry. Finally, consolidate all kit materials into one plastic bag and dispose of them in accordance with your unit's SOP.

**NOTE:** Hanging the uniform in the sunlight will decrease the effectiveness of the permethrin. Machine dryers, when available, may also be used to dry the uniform.

e. Mark the inside of the uniform Permethrin Treated and the date. This method of treatment is good for the life of the uniform, however, it should be repeated if the uniform is ever dry cleaned.

#### **8-4. 5% AEROSOL CAN**

This method can treat one uniform and is effective for up to six weeks or six launderings. These instructions can be found on the label on the back of the can. This is the second best method for applying permethrin to the uniform.

- a. Select a site outside that is protected from the wind.
- b. Place the ACU flat on the ground.
- c. Shake the can well before spraying. Then, while holding the can six to eight inches away from the uniform, spray it with a slow sweeping motion. Treat each side on the uniform, front and back, for a minimum of thirty seconds.

**NOTE:** The treatment should moisten the uniform fabric just enough to cause a slight color change (approximately  $\frac{3}{4}$  of the can). Use the remaining permethrin to treat your bed netting.

- d. Hang the uniform and bed net in the shade for three hours or until dry.

#### **8-5. 1-GALLON SPRAYER**

It is important to note that this method is the least preferred method for two reasons. First, it is very time intensive. Secondly, trained field sanitation team members or preventive medicine personnel should be the only persons to perform it. Safety is also a major concern. Be sure that whoever applies the permethrin wears goggles, gloves, and a properly fitted respirator.

- a. After you gather the safety equipment, lay the uniform flat on the ground in an area protected from the wind.
- b. Put on the gloves, goggles, and respirator. Then triple rinse the sprayer with clean water.
- c. Add one gallon of clean water to the sprayer tank. Holding the permethrin bottle away from you, open it and empty the contents into the tank. Add the second gallon of clean water.

d. Close the sprayer. Lift the can and agitate it slightly to mix the contents. Pump the plunger handle forty to fifty times to pressurize the sprayer to about 50 psi.

e. Using a fan nozzle, spray the uniforms from about twelve to eighteen inches away. Spray the front and back of the uniform for approximately fifty seconds each.

f. Hang the uniform in the shade for about three hours, or until dry.

g. The 1-gallon sprayer can also be used to treat bed nets and tentage.

(1) To treat the bed net, spray both sides then allow the netting to dry completely. Retreat it every six months or six launderings.

(2) **Only use on canvas tentage. Do not apply pesticides to synthetic materials.** To treat tentage and liners, treat the entryways, inside surfaces, ceiling, walls, and floor. Allow the tentage to dry completely before occupying the tent. If you are deployed in a moderate climate, retreat the tentage every nine months. In tropical climates, retreat the tentage every six months.

#### **8-6. DEET (N, N-diethyl-meta-toluamide)**

DEET repels mosquitos, biting flies, chiggers, deer flies, fleas, and stable flies. In tropical areas DEET repels terrestrial leeches. DEET is preferred over commercial products because the long-term effects of commercial products on your health have not been evaluated. In addition, when compared to commercial products, DEET was found to be more effective.

**NOTE:** Before using a commercial insect repellent, be sure to check with preventive medicine personnel.

a. Squeeze 2.5 milliliters of DEET into the palm of your hand. Note that 2.5 ml is approximately the length of the strip on the side of the tube, or about three inches.

b. Rub your hands together lightly, then apply a thin layer over your forearms, face, neck and ears. Be sure to apply DEET to ALL exposed skin. Apply the repellent two to three inches underneath the edges of your uniform.

**NOTE:** Be sure to apply DEET repellent to your skin before putting on your camouflage grease paint.

c. Wash your hands after applying DEET to avoid accidental contact with eyes or other sensitive areas.

**NOTE:** DEET is effective for up to twelve hours under normal training conditions. If training or deployed in a warm, humid climate where you might sweat a lot, you should

reapply DEET more often to ensure proper protection. This also applies if you are working or training in the rain.

## **8-7. PROPER WEAR OF THE UNIFORM**

The Army uniform has been designed to protect you from many elements you are likely to encounter in a field setting. Therefore it is important to note that the wear of the uniform in the field is much different from what may be acceptable in garrison.

a. Regardless of the season, during tactical field training exercises and deployments sleeves should be worn down and buttoned at the wrist. Keep every button on the ACU jacket buttoned.

(1) Wearing your sleeves down and keeping the buttons buttoned protects you from insect bites and poisonous plants.

(2) Wearing your sleeves down protects you from the harmful effects of the sun.

**NOTE:** DEET cannot be applied to skin that is irritated or infected as a result of sunburn thus increasing your vulnerability to insects.

b. The T-shirt should be worn tucked into your ACU trousers at all times. This is especially important when your tactical situation requires that you lay on the ground or perform low crawls.

**NOTE:** If your situation requires tactical low crawling or lying on the ground in a defensive posture, you should apply a thin layer of DEET to your abdomen around your belt line to further protect you from insects.

c. Keep the ACU trousers bloused loosely inside your boots.

d. The ACU should fit loosely and should not be starched.

(1) Tight uniforms make it easier for biting insects to reach your skin.

(2) Tight uniforms decrease the body's ability to cool itself.

(3) Starch keeps the fabric from 'breathing.'

e. When required, wear a head net to protect your face and neck from biting insects.

**NOTE:** Local command policy and medical intelligence reports will dictate the need for head nets.

## 8-8. PROTECTING SOLDIERS 'AT RISK'

Examples of times when a soldier is at increased risk of insect bites or arthropod-borne illness are during physical training exercises, while at rest, or while sleeping. This is especially true since you perform these activities in clothing other than the ACU. There are a few protective measures that can be taken to reduce your risk during these activities.

a. If possible, billets should be screened. While screened billets alone do not offer sufficient protection, they can reduce the insect population thus reducing your exposure to biting insects.

b. Use bed nets treated with permethrin while at rest. Be sure they are properly set up and tucked in at all times, even when you're not in bed.

**NOTE:** Inspect bed nets periodically for rips and tears. Repair small rips with a sewing kit. Bed nets with large rips should be turned in to your supply section for replacement.

c. Apply DEET to all exposed skin.

(1) DEET should be applied to the areas of the skin that may come in contact with the insect netting while resting in your cot.

(2) DEET should be applied to all areas of exposed skin when not in uniform, even if you are running a quick errand or placing a quick phone call. Remember to apply DEET three inches below the hemline of the clothes you are wearing.

(3) Reapply DEET more often if you are participating in an activity that causes you to get wet or sweat.

**NOTE:** The highest incidence of arthropod-borne illness occurs when soldiers are not in their ACU.

d. Avoid areas where high populations of insects are prevalent.

### Section III. SUMMARY

Remember that manpower is the Army's most valuable asset. During this lesson you learned about the DoD Arthropod Repellent System – a system that the Army has in place to protect this asset. Knowing the components of this system and implementing the procedures to use these products are the first steps in the management of arthropods through individual PMM.



## **LESSON 9: Management of Arthropods through Non-Chemical (Sanitation) and Chemical Practices**

**REFERENCES:** AR 40-5, Preventive Medicine; FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 4-02.17, Preventive Medicine Services;

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 6

### **Section I. INTRODUCTION**

In many of our lessons we have talked about the importance of good sanitation and hygiene practices and how they help control the spread of disease. You've been introduced to the arthropods that are important to the military. You are also familiar with the individual preventive medicine measures soldiers can take to protect themselves from them. Now, let's look at some of the measures that can be taken at the unit level to control arthropods and help prevent the spread of arthropod-borne illness.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 9-1. Identify non-chemical (sanitation) methods of controlling arthropods.
- 9-2. Identify properties of pesticides.
- 9-3. Identify the factors to consider when assessing the risk associated with the use of pesticides.
- 9-4. Identify safety precautions associated with the use of pesticides.
- 9-5. Describe disposal methods for pesticides and their containers.
- 9-6. Select, in order, the steps required to prepare the 1-gallon sprayer for use.
- 9-7. Select, in order, the steps required to operate the 1-gallon sprayer.
- 9-8. List the measures taken to maintain the 1-gallon sprayer.

## Section II. EXPLANATION

### 9-1. SANITATION PRACTICES

Many people feel on a large scale, such as the unit level, that the best way to control bugs is to hose them down with chemical pesticides. Unfortunately, this is often done without considering what caused the problem in the first place; improper sanitation practices. Consider a pile of opened garbage. You can spray and spray, but unless you eliminate this breeding ground for flies, you're still going to have a problem. Let's look, now, at some ways we can manage arthropods using good sanitation practices instead of chemicals.

a. **Eliminate arthropod habitats.** Remember when we talked about arthropods that we talked about their habitat? The safest way to control most arthropods is to eliminate their living and breeding areas. Let's see what you remember about arthropod habitats.

b. **Control rodents in the unit area.** Because rodents are a host to a number of parasites, rodent control plays a major role in the management of arthropods. Rodent control is discussed specifically in lesson ten.

c. **Use proper waste disposal procedures.** Proper disposal of garbage and waste is a critical factor in the control of the filth fly and cockroach.

(1) Garbage containers should be tightly covered and the garbage should be disposed of in approved sites.

(2) Latrine facilities should be properly constructed and fly-proofed. Latrines should be policed and cleaned daily.

(3) Garbage and waste disposal devices should be filled in and properly closed out when full or abandoned.

(4) Keep kitchen and food service facilities clean and free of debris that would provide food, water, and shelter.

d. **Avoid animal nesting areas.** In order to control exposure to mosquitos and fleas, do not establish the area of operations near animal breeding or nesting areas such as ponds or burrows.

### 9-2. CHEMICAL PRACTICES

There will more than likely be a time when even the best sanitation efforts fall short of controlling arthropods in your unit area. When this is the case, you can augment your efforts with the use of pesticides. **AUGMENT** is the operative word here;



chemicals are not meant to take the place of the individual or unit-level preventive medicine measures we have discussed.

a. **Properties of pesticides.** There are several things you must consider prior to implementing a chemical control program. Knowing the properties of pesticides will help you exercise sound judgment when using these chemicals in your area of operation.

(1) Pesticides are toxic. Pesticides are toxic, or poisonous, substances designed to kill pests such as mosquitos, ticks, and rodents. Keep in mind that, in sufficient quantities, they can also be harmful or deadly to domestic animals and humans.

(2) Pesticides and solvents. The toxic ingredients in pesticides are often mixed with solvents such as kerosene or fuel oil. The presence of these solvents makes them more hazardous to humans.

(3) Pesticide absorption into the skin. The toxic chemicals in pesticides are often mixed with an oil-based solution. Human skin repels water but absorbs oil. Therefore, the pesticide is absorbed into the skin along with the oil. This should tell you that protective clothing is required when working with pesticides.

b. Because of their toxic properties, all pesticides should be considered potentially hazardous. You can find the hazard and risk information on the pesticide label. Always refer to the label instructions for use, protective clothing requirements, and safety precautions prior to using a pesticide. In all cases, THE LABEL IS THE LAW.

### 9-3. ESTIMATE THE HAZARD

Estimating the hazard potential for any pesticide is important prior to using it. There are several factors to consider when determining the hazards associated with chemical use. To determine the hazard posed by a particular chemical, ask yourself these questions.

- a. What are the toxic effects if the pesticide is accidentally inhaled or ingested?
- b. What is the concentration of the toxic substance I will be handling while mixing the pesticide? While applying it?
- c. How much pesticide needs to be applied in order to achieve the desired results?
- d. How often do I need to apply the pesticide?

e. What environmental conditions exist at the time of application? Am I indoors or outdoors? Is there proper ventilation? Is there a breeze? What temperature is best and safest for the application of this chemical?

**NOTE:** It is important to remember that the hazard for any pesticide is negligible, as long as you use it correctly.

#### **9-4. SAFETY PRECAUTIONS**

Like all potentially hazardous substances, there are certain safety precautions that must be taken. Remember to consult the label instructions for additional safety precautions that are unique to the chemical that you plan to use.

- a. Pesticides should not be stored or used near an open flame.
- b. Do not mix pesticides. Mixing pesticides can render them ineffective or, worse, can create an even more toxic substance.

#### **9-5. PESTICIDE DISPOSAL**

- a. Dispose of any unused pesticide properly.
  - (1) The easiest way to dispose of pesticides is to avoid having any to dispose of. In other words, use the entire mixed amount of pesticide against the arthropod you have targeted.
  - (2) When a pesticide can not be used for its intended purpose or when a pesticide is no longer authorized for use, any unused quantity should be returned to the manufacturer through the Defense Marketing and Utilization Office (DRMO).
- b. Dispose of the empty pesticide container properly. Triple-rinse the container to ensure that the container is free of chemicals prior to disposal. Then crush or puncture the container prior to disposal to render the container unusable. To triple-rinse the container:
  - (1) First, fill the pesticide container with water.
  - (2) Pour the rinse water into the 1-gallon sprayer along with the water used to dilute the pesticide being applied.
  - (3) Repeat steps 1 and 2 two more times.

#### **9-6. PREPARING THE 1-gallon SPRAYER**

As a member of the field sanitation team, you are authorized to use the hand pressure sprayer to apply pesticides. The sprayer comes in either one or two gallon

capacities. The basic procedures are the same for both. This lesson discusses the procedure for using the 1-gallon sprayer. Just remember that when you use the 1-gallon sprayer you need to reduce all quantities by one half.

**a. Sprayer components.**

(1) Instruction manual. Your sprayer comes with an instructional manual that you must retain and follow for proper operation and maintenance.

(2) Three sets of spare parts.

(3) Pressure gauge. Each sprayer should come equipped with a pressure gauge. If your unit has an older model that does not have a gauge, one can be ordered and installed by following the manufacturer's instructions.

**b. Preparing to use the sprayer.**

(1) Mix the pesticide you are going to use. This is done right in the sprayer itself to help avoid contaminating the ground with spillage. Follow the label instructions to determine the amount of pesticide necessary for your situation.

(2) Select the appropriate nozzle. Choose the nozzle best suited for the type of application you desire. Attach it to the wand by screwing it on.

(a) Use the solid stream nozzle to spray cracks and crevices. This type of nozzle is most appropriate if cockroaches are suspected.

(b) Use the hollow cone nozzle to treat large areas where light coverage is desired. This type of nozzle is often used against mosquito larvae by spraying the surface of the standing water.

(c) Use the solid cone nozzle to treat large areas where heavy coverage is desired. This type of nozzle is especially effective in weedy, heavily vegetated areas and is often used when ticks and mites are suspected.

(d) Use the flat fan nozzle for even coverage of pesticide on a flat surface, such as a wall. You would also use this type of nozzle to spray a dumpster for fly control.

(3) Pressurize the sprayer to 40 psi. Unlock the pump handle by turning it ninety degrees to the left. If this is the first time you are using the sprayer for the day, you can increase the efficiency of the pump and make it easier to operate by putting a few drops of lubricating oil on the pump rod. (**NOTE:** this is the only lubrication the sprayer requires.)

## 9-7. OPERATING THE 1-gallon SPRAYER

- a. **Sprayer operation.** Operate the sprayer by squeezing the operating lever on the wand and moving the wand back and forth to create an even spray.
- b. It's a good idea to practice your spraying technique using water to simulate the pesticide until you are able to cover the designated surface evenly and without run-off.
- c. Use all of the pesticide in the sprayer on the job, whenever possible. NEVER pour excess pesticide down the drain or onto the ground.

## 9-8. MAINTAINING THE 1-gallon SPRAYER

Just like any other piece of equipment, a certain amount of maintenance is required to keep the sprayer operating efficiently. Sprayer maintenance is an operator responsibility.

- a. **Rinse the sprayer after each use.** Triple-rinse the sprayer and spray the rinse water over the treated area or store it in an approved, properly labeled container for future use.
- b. **Wipe the outside of the sprayer.** After rinsing, wipe the outside of the sprayer to prevent pesticide from crystallizing. The crystals will corrode metal, jam the valves, deteriorate the gaskets and cause the nozzle to malfunction.

**NOTE:** Any time the sprayer fails to function properly, thoroughly clean the tank and the strainers in water. Remove the nozzle strainer and the in-line strainer from the wand handle.

- c. **Replace worn parts.** Parts that may need replacement include the hose, the leather piston cup and the pump cylinder valve.

## Section III. SUMMARY

We hope you have seen that relatively simple but consistent sanitation practices can go a long way toward keeping arthropods at an acceptable level in your unit area. If necessary, these measures may be augmented with the use of pesticides, but remember that these are toxic chemicals and must be used in accordance with the label instructions. When used to apply pesticides, the 1-gallon sprayer can be a valuable tool. As a member of the Field Sanitation Team you are authorized to operate the 1-gallon sprayer. However, don't forget the importance of maintenance – it is an operator responsibility. Finally, always remember to read and follow ALL label instructions. When conflicting data is encountered remember, THE LABEL IS THE LAW.





## **LESSON 10: Rodent Management**

**REFERENCES:** AR 40-5, Preventive Medicine; FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 4-02.17, Preventive Medicine Services; FM 3-05.70, Survival; FM 4-25.11, First Aid; FM 4-02.33, Control of Communicable Diseases Manual

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 6 Section I

### **Section I. INTRODUCTION**

Throughout history, rodents have played an important role in human affairs. Rodents are carriers of several diseases, and are a host for many more. One of these deadly diseases is plague. This disease alone caused the death of approximately one fourth of the population of Europe during the middle ages. Plague still occurs today, even in the United States. In addition to disease transmission, rodents cause millions of dollars of damage to crops and foods each year in the U.S. alone. This lesson covers rodent characteristics as well as the intimate relationship of rodents to human disease, rodent management, and dead rodent disposal.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 10-1. Describe the general characteristics of rodents.
- 10-2. Identify the habitat, life cycle, food preferences, and physical characteristics of the 3 species of rodent important to military operations.
- 10-3. Name the human diseases associated with rodents.
- 10-4. Identify the measures used to control rodents.
- 10-5. Identify the processes and procedures associated with the disposal of dead rodents.

### **Section II. EXPLANATION**

#### **10-1. RODENT CHARACTERISTICS**

Rodents are a large group of mammals that include a wide variety of animals such as squirrels, chipmunks, prairie dogs, rats, and mice. Nearly 40% of all mammals are rodents. Two characteristics set rodents apart from other mammals. First is their two sets of chisel-like incisor teeth. The second is the absence of canine teeth. This tooth arrangement makes it easier for them to maintain their particular eating habits since rodents are primarily plant and seed eaters. During recent years three particular

species of rodents have closely associated themselves with humans for food and shelter. These are the species we will discuss in this lesson.

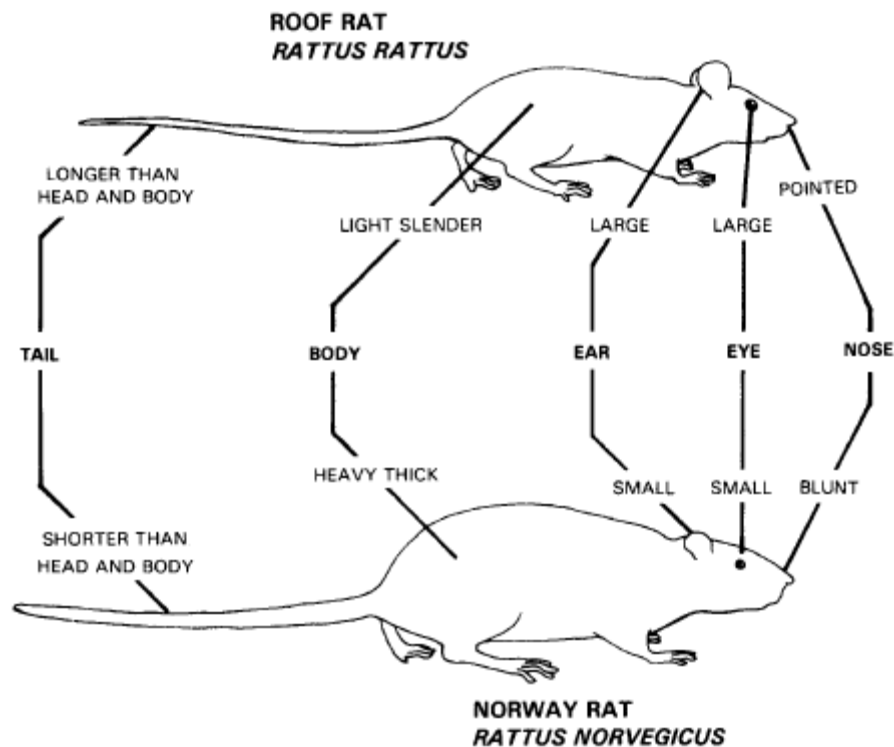
a. **Norway rat.**

(1) Characteristics. The Norway rat has a tail that is shorter than the combined length of the head and body. Its body is thick and its nose is blunt. The eyes and ears are small. As an adult, the Norway rat may weigh up to sixteen ounces (1 pound).

(2) Habitat. The Norway rat is usually found at ground level in temperate or moderate regions. These rodents live on farms and in cities. Their shelter is most often a burrow in the ground.

(3) Food. Norway rats require from  $\frac{3}{4}$  to 1 ounce of food a day and up to 1 ounce of water. Living in close contact with humans has given the Norway rat a taste for human food. Rather than plants and seeds they prefer meats, fish, and garbage. They're very brave and have been known to venture as far as 100 to 150 feet from their shelter to search for food.

(4) Life cycle. In the wild the Norway rat will live for up to one year. They reach sexual maturity between three and five months of age. They will usually have seven or eight litters a year. While a single female rat may have as many as eighty-four young per year, only about twenty of them are actually weaned.





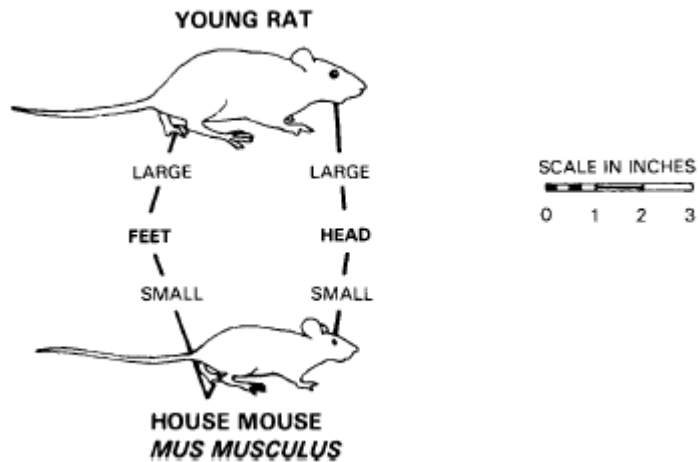
**b. Roof rat.**

(1) Characteristics. The roof rat has a tail that is longer than the combined length of its head and body. Their body is slender and their nose is pointed. Their eyes and ears are large. As adults they may weigh from eight to twelve ounces.

(2) Habitat. The roof rat lives in warm tropical or sub-tropical climates. They are often found near shipping ports and coastal areas. You may also find the roof rat living in attics or between the walls of buildings. Roof rats are excellent climbers, so you may also find them nesting in trees.

(3) Food. Their preferred diet consists of vegetables, fruits, and grains. However, they will also eat human food and garbage. Their daily requirements consist of  $\frac{3}{4}$  to 1 ounce of food and up to one ounce of water daily. They, too, have been known to roam from 100 to 150 feet from their primary shelter looking for food.

(4) Life cycle. The life span of a roof rat is approximately one year. And, like the Norway rat, the female reaches sexual maturity at three to five months of age. The roof rat will typically have about six litters per year. A total of about twenty offspring will be weaned.



**c. House mouse.**

(1) Characteristics. The house mouse has a tail that is roughly the same length as its head and body combined. They have a small body and a pointed nose. Their eyes are small and their ears appear large for their body. As an adult, the house mouse weighs  $\frac{1}{2}$  to  $\frac{3}{4}$  of an ounce.

(2) Habitat. The house mouse can easily adapt to a variety of living conditions throughout the world. They often live in houses and outbuildings, but have also been known to gnaw nest holes in frozen beef carcasses in storage lockers for shelter.

(3) Food. The house mouse diet consists of any food available. It does prefer grain and grain products, such as bread. The daily ounce of food and 1/20<sup>th</sup> of an ounce of water. They have been known to roam up to fifty feet from their shelter looking for food.

(4) Life cycle. The house mouse lives for up to one year. The female becomes sexually mature at six weeks. This is considerably sooner than the other rodents we have discussed. The gestation period for the house mouse is a short nineteen days. Each year the female is capable of producing six to eight litters. From these about thirty-five young are weaned.

## 10-2. DISEASES CARRIED BY RODENTS

Rats and mice are harmful to both humans and domestic animals. They are carriers of diseases that are transmitted to humans both through direct contact and through contact with their feces and urine.

a. **Leptospirosis**. This disease is caused by a disease organism that is shed with the animal's urine. Humans are infected when their broken skin or mucous membranes come in direct contact with the urine or tissue of an infected animal. They may also contract the disease if their broken skin or mucous membranes come in contact with contaminated water or moist infected soil. Humans can also contract the disease if they eat food that has been 'marked' with the animal's urine or feces.

b. **Salmonellosis**. This disease is caused by the disease organism being shed through either the urine or feces of an infected animal. Infections most commonly occur when humans eat food that is contaminated or food that is prepared on a contaminated surface. Mice are more common carriers of this disease than rats.

c. **Hanta virus**. There are a variety of hanta viruses, but all are contracted in the same manner. These diseases are transmitted through dried rat or field rodent urine and feces. Infection occurs when the dried fecal and urine particles are inhaled.

d. **Rat bite fever**. As its name implies, rat bite fever is caused by the bite of the rat. The organism that causes the fever is found on the teeth and gums of the rat.

## 10-3. DISEASES SPREAD BY RODENTS

Not only do rats and mice carry harmful organisms that cause disease in man, but they are also the host for fleas and mites, known as ectoparasites, which also carry diseases.

a. **Plague**. This is the most familiar arthropod-borne disease known to man. It is transmitted to humans primarily when the fleas of the infected rodent bite them. Humans may also acquire the disease by exposure to infected animal tissue. This

disease is found all over the world and can be passed from human to human, as is often the case in an epidemic.

b. **Murine typhus.** This infection is transmitted through the feces of an infected flea. When a flea bitten soldier scratches the bite, he rubs the flea feces into the skin causing the infection.

c. **Rickettsial pox.** This is a mild disease which is transmitted from mice to humans by the bite of the house mouse mite.

#### **10-4. RODENT MANAGEMENT**

Rodents can be a problem in any area where soldiers live; whether they live in a billet or a long-term bivouac site. Where there is food, water, and shelter there is the possibility of rodent infestation. As with any potential problem, the earlier it is detected, the easier it is to control or eliminate.

a. **Rodent survey.** Conducting the rodent survey is very important. It is the most important tool for early detection of rodents in your unit area. Rodent surveys must be ongoing to be effective. Any time you see any sign that rodents are present, a complete rodent survey should be conducted. As a member of the Field Sanitation Team you may conduct the survey during waste disposal and field sanitation inspections. An active rodent survey program looks for signs of rodents such as sightings of live rodents, the presence of dead rodents, rodent droppings and smudge marks, rodent tracks and trails, gnaw marks, burrows, and rodent sounds and odors.

b. **Eliminating food sources.** If rodents can't find a food source within your unit area, chances are they'll go elsewhere to find it. Proper waste disposal and proper sanitation measures should be followed to ensure that food waste does not become a food source for these pests.

(1) Eliminate access to garbage by using tight-fitting lids and disposing of garbage regularly in approved sites.

(2) Store all food in a tightly covered, metal, rodent-proof container. Although plastic bags may reduce the odors that attract rodents to your area, they are not rodent-proof.

(3) Clean up any food spills that may occur. Should you spill food on a dirt surface near your living area, use your E-Tool or a shovel to clean up as much of the spill as possible. Dispose of the food, dirt and all, in a tightly sealed trash container.

c. **Eliminating water sources.** Like the food sources, anytime you can reduce the rodents' access to a water supply you will greatly reduce the likelihood that they will stay in the area.

- (1) Drain run-off puddles that develop in low spots.
- (2) Remove any items from the unit area that may hold water, such as old tires and cans.
- (3) Keep stored water in bottles or five-gallon cans that close tightly.
- (4) Store cases of bottled water off the ground on pallets.
- (5) In areas with indoor plumbing, check to ensure that there are no leaky pipes. Repair any leaks found as soon as possible.

d. **Eliminating shelter.** Rodents rely on concealment when traveling, feeding, and resting. It is important to know that they are creatures of habit and tend to follow the same path to and from food, water, and nesting areas. They will also avoid well-lit, open spaces.

- (1) Keep the unit area free of unnecessary debris, building material, and trash to limit the areas where rats and mice can hide or nest.
- (2) Minimize the amount of vegetation around buildings and tentage. Remove or thin areas of dense vegetation where rodents can hide. Keep fence lines clear of thick growing vines, shrubs, and tall grass.
- (3) Keep your living areas free from clutter. Stack stored material away from the walls and, when possible, off of the ground. Putting stored material on pallets is a good way to accomplish this. Deny rodents access to potential nesting materials, such as paper, unused clothing, straw, or hay.

e. **Rodent traps.** The management measures we have discussed so far have focused on the prevention of infestation. If you should determine through your rodent survey that you have an infestation problem, you may have to resort to a more aggressive management measure. Rodent trapping is a management measure that involves the use of various baits and traps.

(1) Snap traps. Snap traps are used to kill rodents in areas where poison baits can not be used. For example, use a snap trap in an area where food is stored or prepared. Snap traps are also used when the rodent survey determines that the rodent population is not dense and immediate results are desired.

(a) Location. Trapping is only effective if the traps are placed where a rodent will encounter them. The best location for the snap trap is against a wall, behind or under objects, and in places or on routes where rodents have been spotted. Rodent runways are another good example. Since many rodents will not approach new traps, it may be necessary to leave the trap baited, but not set, for a few days to let the rodent get used to its presence.

(b) Number of traps. Placement of a large number of traps in or near rodent runways for a short period of time is often more effective than a few traps inappropriately placed over a longer period.

(c) Bait. Bait the trap with the food preferred by the suspected species of rodent. Ensure that the bait is securely fastened to the trap trigger mechanism.

**WARNING:** DO NOT use poisonous baits on snap traps that are placed in food storage or preparation facilities.

(2) Bait stations. Chemical rodent management involves the use of chemicals that are poisonous when consumed by rodents. The combined use of traps and poisons maximizes the effort in the elimination of rodents.

**WARNING:** These chemicals should never be used in food areas and should not be stored with or near food items. Rodent baits, known as rodenticides, may be confused for food and eaten by humans.

(a) Type of bait. The types of rodenticides used by the Field Sanitation Team are multiple dose anticoagulants. Anticoagulants thin the blood and prohibit it from clotting. This will cause the rodent to hemorrhage, or bleed to death, usually internally. This type of bait is considered the safest for general use.

(b) How it works. The action of the multiple dose anticoagulants is cumulative. In other words, to be effective the rodent must feed on the bait for several days with no more than forty-eight hours between feedings. For this reason, it is very important that the rodents' access to human food sources be limited or eliminated.

(c) Design of bait station. The rodent must enter the bait station to retrieve the bait. They are designed to be tamper-proof to prevent other animals and humans from tipping them over and spilling the bait.

(d) Effective placement. Placement of the bait stations is very important. As with the snap traps, they should be located in areas where rodents have been sighted, or along rodent runways. Placement near burrows or shelter is also good.

**NOTE:** If you notice that the rodents are not accepting the bait from within the bait station, notify Preventive Medicine personnel.

## **10-5. DEAD RODENT REMOVAL**

If your trapping and baiting measures are effective, you will have some dead rodents to dispose of. Disposal of dead rodents is another important role of the Field Sanitation Team member. There are a few essential safety measures you should follow

to protect yourself from the parasites that may still be living on the dead rodent. Do not assume that because the rodent is dead that all the parasites have left its body.

a. First, spread insect repellent on your hands, sleeves, and the front of your uniform. This will help to protect you from any remaining parasites.

b. Use long-handled tongs or a shovel to pick up the dead animal. Place the carcass in a plastic bag or in a metal container with a tight-fitting lid.

c. Finally, burn or bury the remains IAW your unit's tactical situation and local environmental restrictions.

### **Section III. SUMMARY**

During this lesson you were introduced to the general characteristics of rodents, and the specific characteristics and biology of the Norway and roof rats as well as the house mouse. You also learned about the relationship between rodents and human disease and the management of rodent populations in your unit area. As you can see, in field sanitation everything is linked in some way; practicing poor field sanitation techniques is an invitation to rodents and increases the likelihood that the soldiers in your unit will contract rodent-borne disease.







## **LESSON 11: Heat Injuries**

**TYPE OF INSTRUCTION:** Lecture and demonstration

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; TB MED 507, Heat Stress Control and Heat Casualty Management.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 7.

### **Section I. INTRODUCTION**

Heat injury is defined as environmental injuries that result when a Soldier is exposed to extreme heat for extended periods of time. A Soldier's condition may also be affected and compromised in specific environments due to the protective equipment and gear worn to shield them from injury and chemical, biological, radiological, and nuclear contamination during operations. Identification of high-risk personnel helps both leaders and individuals prevent injuries and cope with climatic conditions. Acclimatization and protection from undue heat exposure are also very important. Instruction on living and working in hot climates also contributes toward prevention.

Under normal conditions, the human body is able to shed excess heat through the skin and by exhaled breath, constituting heat relief. Some heat is discharged by radiation from the skin, but the body relies mostly on evaporation of sweat from the skin to cool itself. If the body is unable to cool itself normally and if the heat strain becomes more severe, a rapid rise in body temperature and heart rate can occur. Soldiers may not realize that this is happening because there is no pain associated with these events.

As soldiers, we are often required to deploy from areas that are temperate to areas that are either extremely hot or extremely cold. Although we can not control the climate in which we must work, there are many things that can be done to prevent the harmful effects the climate has on our bodies. This lesson focuses what you, as a member of the field sanitation team, can do to direct the measures to prevent heat injury to the soldiers in your unit.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 11-1. Define the types of heat injuries.
- 11-2. Select the factors that influence heat injuries.
- 11-3. Select the measures to prevent heat injuries.
- 11-4. Compute the WBGT Index.

## Section II. EXPLANATION

### 11-1. HEAT INJURY

Exposure to high environmental temperature produces heat stress in the body. As the body attempts to compensate, physiological strain or heat load results. This strain, usually in combination with other strains caused by work, dehydration, fatigue, and taking certain types of dietary substances may lead to heat injury.

a. **Heat cramps.** These are painful muscle cramps that may occur after exposure to heat and are caused primarily by the excessive loss of mineral salts in the body.

- (1) Cramps normally involve the muscles of the arms, legs, and abdomen.
- (2) Cramps may be severe enough to render a soldier ineffective.
- (3) Cramping may be accompanied by symptoms of heat exhaustion (abnormal body temperature).
- (4) Cramps differ from exertional muscle cramps in that the entire muscle is not involved. Exertion muscle cramps are more apt to occur during exercise.

b. **Heat exhaustion.** Heat exhaustion is the most common form of heat casualty and is not associated with evidence of organ damage. This condition is the result of excessive loss of both salt and water, usually due to profuse sweating as the body attempts to cool itself. As evidenced by the profuse sweating, with heat exhaustion the body's heat balance mechanism is still functioning normally.

- (1) Classic symptoms include profuse sweating, trembling, weakness, lack of coordination, and anything from a slight sensory clouding to a momentary loss of consciousness.
- (2) Additional symptoms may include headache, tingling in the hands and feet, paleness, difficulty breathing, irregular heartbeat, loss of appetite, nausea, and vomiting.
- (3) The skin generally is cool and moist from the evaporation of sweat, the pulse rate is rapid, blood pressure may be low, and body temperature may be lower than normal.

c. **Heat stroke.** Heat stroke results when the body's heat balance mechanism collapses and the primary method of heat loss (cooling by evaporation of sweat) is shut down.

**WARNING:** Heat stroke is a medical emergency. There is a high death rate associated with heat stroke. The condition of a person suffering from heat stroke will deteriorate rapidly. Therefore, treatment should begin immediately.

(1) Early signs of heat stroke include headache, dizziness, delirium (mental confusion), weakness, nausea, vomiting, and excessive warmth.

(2) A classic sign of heat stroke is hot, red, dry skin, although sweating may be present.

**NOTE:** Notice that these symptoms are very similar to heat exhaustion. Therefore, care must be taken to treat the victim immediately to avoid having heat exhaustion develop into heat stroke.

(3) In the past, a heat stroke victim was described as always having hot, dry skin as opposed to the moist clammy skin of a heat exhaustion victim. It has been found that although the skin may be hot and dry, just as often it may be moist from sweat. Therefore, upon initial evaluation, the skin can not be the differentiating factor in deciding on the degree of the heat injury.

(4) Most significant sign is a body temperature over 106° Fahrenheit or 41° Celsius.

(5) After one attack of heat stroke, the individual remains very susceptible to repeated heat injuries. Therefore, these individuals should avoid subsequent exposure to hot weather conditions.

d. **Heat Rash.** Heat rash is also known as prickly heat or miliaria rubra. It occurs usually in areas where the clothing is restrictive, and gives rise to a prickling sensation, especially as sweating increases. Heat rash may be more than an annoyance. It may interfere with sleep resulting in sleep deprivation which increases the risk of heat exhaustion and heat stroke.

e. **Sunburn.** Sunburn impairs sweating over the affected skin and predisposes soldiers to heat injury from systemic effects, including fever, that influence central thermoregulation. Sunburn should be prevented by making sun blocking lotions available to soldiers, insisting that they use them, and ensuring soldiers are protected from sun overexposure with protective clothing and adequate shelter or shade.

f. **Skin cancer.** Skin cancer, including basal and squamous cell carcinomas and melanoma, is the most common of all cancers. Exposure to ultraviolet radiation from the sun (regardless of cloud cover or low temperature) sets the conditions for skin cancer. Soldiers with fair skin that burn and freckle easily, light blue/green eyes and either red or blonde hair are at highest risk for developing melanoma; however, anyone can develop skin cancer.

**g. Rhabdomyolysis.** Rhabdomyolysis or rhabdo is the breakdown of muscle fibers and release of muscle fiber products into the circulation, producing muscle tenderness, muscle weakness, and abnormal urine color (dark, red, or cola colored). It is not classified as a heat injury but is caused by extreme exertion in a person who is unaccustomed to exertion, especially if subjected to environmental heat stress with inadequate hydration and electrolyte abnormalities from an inadequate diet and/or abuse of laxatives or diuretics. Some of the muscle breakdown products are toxic to the kidney and frequently result in kidney damage. Sickle cell trait can increase a Soldiers' risk for rhabdomyolysis.

**h. Hyponatremia.** Hyponatremia (water intoxication) is an electrolyte disturbance in which the sodium concentration in the blood serum is lower than normal often caused by fluid overload (such as drinking more than 12 quarts of water per day) and under replacement of salt losses (not eating enough salted food). This condition can be deadly. Symptoms of hyponatremia can mimic a heat injury, so it is important that Soldiers regulate their fluid intake and diet. Repeated vomiting and nausea, headache, confusion, lethargy, fatigue, appetite loss, restlessness and irritability, muscle weakness, spasms, or cramps, seizures, and decreased consciousness or coma are all signs that suggest over hydration in the presence of heat injury.

## **11-2. FACTOR THAT INFLUENCE HEAT INJURY**

There are several factors that cause heat load on the body, thereby increasing the likelihood of heat injury. Understanding these factors will enable you to caution leaders and soldiers and aid you in your prevention efforts.

**a. Acclimatization.** Acclimatization refers to how well adapted a soldier is to a particular environment.

(1) Soldiers who grow up in cool climates but are deployed to a warm or hot climate for training are more susceptible to heat injury. Their bodies do not handle the heat stress well.

(2) Soldiers who serve in hot climates but are then stationed in a cool geographical region, such as Germany, lose their acclimatization to heat in about one month.

**b. Being overweight or unfit.** Being overweight or unfit makes a soldier more susceptible to heat injury. This susceptibility is increased if the soldier also has a previous history of heat injury.

**c. Fatigue levels.** Fatigue impairs the body's ability to lose heat. It takes more energy to lose heat so an already tired body can not perform this function as well as someone who is less tired.

d. **Foods and alcohol.** Heavy meals and hot foods on a hot day put additional stress on the body. Alcohol should be avoided. Especially when consumed in an amount that causes a hangover, it decreases the body's ability to deal effectively with heat stress.

e. **Medications.** Both over-the-counter and prescription medications can alter the body's functioning and impair the body's ability to handle heat stress.

(1) Cold medications, antihistamines and antidiarrheal medicines all contain drying agents that reduce the amount of water in the body. With less water available, you can't sweat as much. Therefore, your body's ability to cool itself is reduced.

(2) Some drugs may cause a slight fever. Fever increases the amount of heat to be dissipated by the body. Some of the immunizations received by soldiers induce a temporary fever. Care should be taken if you must be exposed to heat when you have a fever.

f. **Clothing.** Tight fitting clothes restrict the flow of air around the body, reducing the cooling effects of evaporation. If properly worn, the BDU helps prevent heat injury because, when worn loosely, it does not restrict the flow of blood and allows air to move freely over the skin.

### 11-3. PREVENTING HEAT INJURIES

The best way to avoid becoming a heat casualty is to prevent the injuries before they occur.

a. **Replace water lost through perspiration.** One of the most important measures you can take is to make sure you replace any water your body has lost. Through sweating, a soldier can lose more than one quart of water per hour. Leaders must be aware that unless this water is replaced, a rapid decrease in the ability to work, a rise in body temperature and heart rate, deterioration in morale as well as heat injuries can occur.

(1) To replace the water lost, you need to make sure that soldiers are being encouraged to drink small amounts of water frequently, and given time to do it, throughout the work period. Small amounts of water should be consumed regardless of thirst since normal thirst is not a true indication of the body's need for water.

(2) Use the chart found in FM21-10 and ATP 4-25.12 (Table 7-4) to determine the amount of water to have on hand while soldiers are working in the heat.

**Table 7-4. Work/rest and water consumption guide**

Heat category	WBGT index in degrees Fahrenheit	Easy work		Moderate work		Hard work	
		Work/rest minutes	Water intake (qt/hr)	Work/rest minutes	Water Intake (qt/hr)	Work/rest minutes	Water intake (qt/hr)
1	78°–81.9°	NL	½	NL	¾	40/20	¾
2 (Green)	82°–84.9°	NL	½	50/10	¾	30/30	1
3 (Yellow)	85°–87.9°	NL	¾	40/20	¾	30/30	1
4 (Red)	88°–89.9°	NL	¾	30/30	¾	20/40	1
5 (Black)	> 90°	50/10	1	20/40	1	10/50	1

**Notes:**  
 The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hours of work in the specified heat category. Individual water needs will vary ± ¼ qt/hr.  
 Rest means minimal physical activity (sitting or standing), accomplished in the shade if possible.  
**CAUTION: Hourly fluid intake should not exceed 1½ quarts. Daily fluid intake should not exceed 12 quarts.**  
 Wearing body armor in humid climates adds 5°F to the WBGT index.  
 Wearing chemical, biological, radiological, and nuclear protective ensemble in humid climates adds 10°F to the WBGT index.

**Legend:**  
 °F degrees Fahrenheit  
 NL no limit to work time per hour qt/hr quarts per hour  
 > greater than  
 ± plus or minus  
 WBGT wet bulb-globe temperature index

Easy work	Moderate work	Hard work
Walking on hard surfaces at 2½ mph with less than a 30-pound load. Weapon maintenance. Manual of arms. Marksmanship training. Drill and ceremony.	Walking on hard surfaces at 3½ mph with less than a 40-pound load. Walking on loose sand at 2½ mph with no load. Calisthenics. Patrolling. Individual movement techniques, such as the low crawl or high crawl. Defensive position construction. Field assaults.	Walking on hard surfaces at 3½ mph, with more than a 40-pound load. Walking on loose sand at 2½ mph with load. What about times or duration of the events.

**Legend:**  
 mph miles per hour

**Table 7-2. Examples of work and their classification**

**CAUTION:** Soldiers need to be provided adequate water at all times. The belief that our bodies can be taught to adjust to decreased water intake is incorrect. When water is in short supply, limiting physical activity to the early morning or late evening hours when the heat load is less and sweating is reduced can save a substantial amount.

b. **Replace salt lost through perspiration.** In addition to water, sodium chloride or salt, is lost when you sweat. Normally meals provided by the Army provide adequate amounts of salt. MREs include a salt packet which, when consumed with the rest of the meal, provides enough sodium for soldiers to reduce their chances of becoming heat casualties.

**NOTE:** There may be operations where a doctor determines that even more salt is required in the diet. In those rare instances, guidance will come down to the units through their medics, physician assistants, and doctors. This decision is NOT an FST member decision.

c. **Allow for periods of acclimatization.** Normally a period of ten to fourteen days is required for acclimatization. Periods of heat exposure and physical exertion should be increased gradually.

(1) The body's acclimatization to heat begins with the first exposure and it's usually well developed by the end of the first week. However, soldiers who are unusually susceptible to heat will require additional time to become fully acclimatized.

(2) Once acclimatized to heat, a soldier will retain adaptation for about one week after leaving the hot environment, but if he's not exposed to work in high temperatures the acclimatization will decrease at a variable rate. Most acclimatization is completely lost within one month.

d. **Maintain good general health.** The general physical condition of a soldier has a significant bearing on his or her reaction to heat stress. A variety of conditions that may increase an individual's risk of heat injury include infections, fever, immunization reaction, heat rash, sunburn, fatigue, excess weight and previous history of heatstroke.

e. **Establish work/rest schedules.** As the heat load increases, work/rest schedules should be established. Table 7-4 in ATP 4-25.12 gives an example of suggested work/rest periods. Leaders should also be encouraged to take advantage of cooler hours to accomplish a portion of the work.

(1) For essential tasks that must be completed, arrange for two work details so that one group of soldiers can work while the other group rests. Always ensure that adequate water is available to the soldiers.

(2) The work/rest schedules in Table 7-4 are based upon work equal to that of marching with a 20-pound pack at a rate of 2.5 miles per hour. Lighter work can be carried out for a longer period, while heavier work should be carried out for shorter periods of time.

(3) Soldiers should be allowed to rest and stay in the shade as much as possible during midday hours when the temperature is at its hottest.

f. **Protection from the environment.** The best protection a soldier has from the environment is his uniform. The BDU is designed to protect your skin from harmful UV rays.

(1) Although clothing reduces exposure, it also decreases the movement of air over the surface of the body. Therefore; except when exposed to the direct rays of the sun, soldiers in a hot environment should wear the least allowable amount of clothing.

(2) There are other ways to protect soldiers from the environment that are often overlooked. For example, simply marching over grass instead of a paved surface will protect a soldier from the heat reflected off of the hard surface.

g. **Education.** An essential element of prevention is education. Education should occur at all levels within the unit. Heat injuries are more likely to be avoided when soldiers are trained and when informed leaders supervise them.

(1) Soldiers should be informed of the potentially serious results of heat injury, the general nature of these conditions, and how they can be prevented.

(2) Leaders should be trained to identify conditions under which heat injuries are most likely to occur. They should be able to recognize the earliest signs of heat injury and take action to prevent the development of serious cases.

(3) All personnel should also be trained and efficient in the common soldiers' task of providing first aid to heat injured soldiers.

(4) Medical personnel should assist commanders in the development of local programs for heat injury prevention.

#### **11-4. THE WET BULB GLOBE TEMPERATURE (WBGT) INDEX**

a. Purpose and general use of the WBGT.

(1) The amount of heat stress on the body is measured by the WBGT index. Monitoring the index will help you, and other leaders in your unit, to determine the proper preventive measures needed during hot conditions.

(2) Physical activity recommendations and fluid replacement guidelines for the various heat categories can be found in FM 21-10 and ATP 4-25.12.

(3) Compute the WBGT index on site, where the soldiers are working. If this isn't possible, you can obtain the information from preventive medicine or the meteorological service.



(4) Peak conditions usually occur between 1200 and 1600 hours. Local and regional conditions may warrant modification of the work schedule during these peak hours.

b. **The WBGT kit.** The WBGT kit is enclosed in an aluminum case sealed with a stainless steel clasp. There is a threaded hole on the bottom of the case to attach it to a photographer's tripod. Inside the case are a wet bulb thermometer, a black globe thermometer, and a dry bulb thermometer. Each thermometer is mounted on a hinged assembly that can be lifted out of the case, enabling you to take the necessary readings.

(1) **Wet bulb thermometer.** The wet bulb thermometer is a standard laboratory glass thermometer with the bulb encased in a cotton wick. The wick is inserted in a small flask filled with the distilled water, and the flask is hung at least  $\frac{3}{4}$  of an inch below the bulb of the thermometer. The water in the flask should be maintained at a level that allows the wick to stay wet.

(2) **Black globe thermometer.** The black globe thermometer consists of a six inch hollow copper sphere painted flat (matte) black on the outside, containing a thermometer with its bulb at the center of the sphere. The thermometer should have a range of 23 °F to 212°F.

(3) . The dry bulb thermometer is a standard laboratory thermometer. The bulb of the thermometer is shaded from the sun by a white hood.

c. **Compute the WBGT index.**

(1) **Prepare the kit for operation.**

(a) Open the kit and lift out the thermometer assembly. Check the assembly for deficiencies or damage.

(b) Wet the cotton wick and fill the plastic flask of the wet bulb thermometer with distilled water.

(c) Attach the tripod and position the kit approximately four feet off the ground.

(d) Let the tripod sit undisturbed for at least ten minutes to allow the thermometers to stabilize.

(2) **Take the readings.** After the thermometers have stabilized, observe and record the readings from each of the three thermometers.

The WBGT index can be calculated by using method, (3) OR (4), below.

- (3) Use the WBGT index calculator to determine the WBGT index.
  - (a) Locate the dry bulb temperature on the dry bulb thermometer scale.
  - (b) Holding the wet bulb scale, slide the dry bulb scale until the wet bulb temperature is directly under the dry bulb temperature.
  - (c) Locate the black globe temperature on the bottom scale. Read the WBGT index from its scale directly above the black globe temperature.
- (4) Use mathematical formulas to determine the WBGT index.
  - (a) Multiply the wet bulb temperature by 0.7.
  - (b) Multiply the black globe temperature by 0.2.
  - (c) Multiply the dry bulb temperature by 0.1.
  - (d) Add the products of the three calculations. The sum is the WBGT index.
- (5) Add 10°F if wearing of NBC clothing (MOPP) for easy work, 20°F for moderate and hard work, and 5°F for wearing body armor in humid climates to the final WBGT index.
- (6) Find the heat category associated with the WBGT index you have calculated.

### **Section III. SUMMARY**

Directing heat injury prevention measures in your unit requires that you know the signs and symptoms of heat injury. You must also be able to inform the soldiers in your unit of the factors that influence heat injury and encourage them to follow the basic guidelines of prevention. In addition, you should be able use the information obtained from the wet bulb globe thermometer to establish reasonable work/rest schedules and determine the water needs for the soldiers in your unit.

There are a number of resources outlined in Training and Doctrine Command Regulation 350-29. These resources are available to leaders for training Soldiers how to recognize, prevent, and if necessary treat heat injury casualties. These include annual training, the risk management process, and the Heat Injury Prevention Pocket Guide (United States Army Public Health Command Training Aid [TA-010-0711]). The United States Army Public Health Command website also provides numerous training and information-related products that cover heat injury related subjects.





## LESSON 12: Cold Weather Injuries

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 8.

### Section I. INTRODUCTION

History is filled with examples of the significant impact of cold on military operations. Among U.S. Army and Army Air Force troops, there were over 90,000 cold injuries requiring medical treatment during World War II, and another 10,000 during the Korean War, accounting for 10% of all casualties experienced during these conflicts. Given that the average air temperature recorded when cold injuries were experienced during World War II was 30° F, and that temperatures this low are experienced over about 60% of the earth's surface, leaders must appreciate cold-weather effects on soldier health and performance. Cold injuries can also occur when air temperatures are above freezing.

#### LESSON OBJECTIVES

After completing the lesson, you should be able to:

- 12-1. Define the types of cold injury.
- 12-2. Select the factors that influence cold injury.
- 12-3. Select the measures to prevent cold injuries.
- 12.4. Determine the wind-chill temperature.

### Section II. EXPLANATION

#### 12-1. COLD INJURIES

Cold injury is defined as tissue damage caused by extreme cold. The type of injury sustained depends upon three factors; the degree of cold to which the body is exposed, the duration of the exposure, and the environmental factors present at the time of exposure. When speaking about specific cold injuries it is important to remember that cold injuries can occur at both freezing and non-freezing temperatures. Thus, cold injuries are classified as either freezing or non-freezing.

**NOTE:** Remember, it is up to the medical specialist to recognize the signs and symptoms of all forms of cold injury. Your role as a member of the FST is to enforce individual PMM and make recommendations to the commander regarding the implementation of your unit's preventive medicine measures. Understanding the conditions under which cold injuries occur will allow you to make informed

recommendations that will, in turn, keep the Soldiers in your unit healthy and combat ready.

a. **Category 1 - Freezing.** These injuries occur when temperatures are at or below 32° Fahrenheit or 0° Celsius.

(1) Frostbite. Frostbite results from the crystallization of tissue in the skin and adjacent tissue. Frostbite can be categorized as superficial or deep. Depending upon the windchill factor, duration of exposure and adequacy of protection, severe injury could occur at lower elevations within a matter of minutes or take as long as several hours.

(2) High altitude frostbite. This type of frostbite results from exposure to temperatures between -20° Fahrenheit and -80° Fahrenheit at high altitudes. At these very low temperatures, severe injury could be instantaneous.

b. **Category 2 – Non-freezing.**

(1) Chilblain. The injury results from repeated, prolonged exposure of bare skin to temperatures from 60° Fahrenheit down to 32° Fahrenheit accompanied by high humidity. Chilblain is not usually serious enough to require evacuation or causes permanent impairment. It is considered the only cold injury that is not of significant military importance.

(2) Hypothermia. The destructive influence of cold on the body is known as hypothermia. Hypothermia occurs when the body loses heat faster than it can produce it.

(a) Hypothermia can be classified as mild, moderate, or severe.

(b) Hypothermia can occur in temperatures above freezing. When it occurs in temperatures below freezing, it is often accompanied by frostbite.

(c) Hypothermia can occur rapidly during cold water immersion (one hour or less when water temperature is below 45° Fahrenheit).

(d) Because normal physical activity causes the body to lose heat, physically active individuals are more prone to hypothermia.

(e) Fatigued individuals are more prone to hypothermia because exhaustion causes a sudden dilation of the blood vessels resulting in a more rapid loss of body heat.

(3) Trench foot. Trench foot is a very serious injury that may result in permanent nerve or tissue damage. Trench foot results from exposure to wet, cold

conditions in temperatures below 50° Fahrenheit. The average duration of exposure resulting in trench foot is three days.

(a) Trench foot is associated with immobilization, usually standing; and in situations where there is a high dependence on the lower extremities, such as in long walks or marches.

(b) Trench foot is likely to occur when Soldiers wear cold, wet boot and socks for prolonged periods.

**NOTE:** Soldiers wearing rubberized or tight-fitting boots are at risk for trenchfoot regardless of weather conditions, since sweat accumulates inside these boots and keeps the feet wet.

(4) Immersion foot. Immersion foot is an injury sustained as a result of prolonged exposure (usually in excess of 12 hours) in water at temperatures below 50° Fahrenheit. Immersion foot can also occur at tropical temperatures in water at 70° Fahrenheit when exposure exceeds several days.

(5) Snow blindness. Snow blindness occurs when the ultraviolet rays of the sun are reflected from a snow-covered surface into the eyes. It is important to note that this reflection exists even on cloudy days.

(6) Dehydration. It is important to remember that dehydration is just as prevalent in cold regions as it is in hot regions. Be aware that the cold weather makes dehydration very difficult to detect. Follow the guidelines presented in Lesson 11 regarding water needs for Soldiers especially during periods of high activity.

## **12-2. FACTORS THAT INFLUENCE COLD WEATHER INJURIES**

There are certain factors that influence the incidence, prevalence, type and severity of the injuries that occur as a result of exposure to the cold. Cold injuries are very predictable in that there are certain factors that, when present together, can result in cold injury. It is the combination and severity of these factors that will dictate the amount and type of injury sustained.

a. **Agent factors**. There is only one agent factor. It is the cold. While the effects of cold in cold injury are apparent, determining them is difficult. The effects of cold are considered in terms of body heat loss. And because of the ways that various host and environmental factors modify the rate of body heat loss, you can not assume that a certain type of injury will be sustained in a certain temperature.

b. **Environmental factors**. These are the things, other than the cold, that are in the soldier's environment at the time of exposure. There are three primary environmental factors that influence cold injury.

(1) Weather. All aspects of weather; wind temperature, precipitation and humidity modify the rate of body heat loss.

(a) Wind. Wind increases heat loss from skin exposed to cold air and can increase the risk of frostbite. The effects of cold weather are intensified as air movement passing the body increases. This effect is known as windchill and is experienced as a result of wind blowing against the body. Soldiers will also experience this effect when they move themselves quickly through space, such as taking a ride in an open vehicle, running, or skiing.

(b) Water. Water can conduct heat away from the body much faster than air of the same temperature. When clothing becomes wet due to snow, rain, splashing water, immersion, or accumulated sweat, the body's loss of heat accelerates. Performing physical exercise before cold exposure increases heat loss.

(c) Temperature and humidity. These factors are often considered together because of their relationship to one another. For instance, low temperatures and relatively low humidity, when combined, produce an environment that makes Soldiers very susceptible to frostbite. Higher temperatures (30°F to 50°F) together with moisture are usually associated with trench foot.

(2) Combat action. An increase in the incidence of cold injury is expected as exposure increases. Exposure increases when physical activity is extremely low.

(a) Because of their potential for immobility, Soldiers on guard duty should exercise greater awareness of cold injury prevention.

(b) Soldiers on active defense or offense have an increased likelihood of sustaining cold injury. This may be due to several factors including immobility while under fire, prolonged exposure, lack of opportunity to rewarm and change clothing, inability to perform basic personal hygiene practices, fatigue, or a lack of nutrition.

(3) Clothing. Adequate clothing properly worn is essential to survival. Clothing for cold weather combat is designed to accommodate a variety of weather conditions and activity levels. Cold weather clothing protection is based on the principles of insulation, layering and ventilation. By understanding these principles, Soldiers can vary their clothing to optimize performance and stay comfortable.

(a) Clothing that becomes wet from perspiration loses much of its insulating value. Therefore, care must be taken when performing high-activity tasks to prevent perspiration from accumulating in the clothing.

(b) Insulation depends on the amount of air trapped within the garment and properties of the material. When clothing is dirty or in bad repair, the material tend to be packed down, which compromises insulation.



(c) A standard number of layers can not be prescribed for universal wear during winter months. Therefore, follow these guidelines when determining clothing requirements and making clothing recommendations.

(d) Clothing should be flexible enough to allow outer layers to be removed for comfort and to permit the escape of perspiration during periods of increased physical exertion or in higher temperatures.

(e) Clothing must be loose enough to avoid constriction.

(4) Metal objects and liquid fuels. When these items are left outdoors in the cold they can pose a serious hazard. Both, metal objects and liquid fuels, can conduct heat away from the skin very rapidly. Fuels and solvents remain liquid at very low temperatures and become super cooled. Skin contact with fuel or metal at below freezing temperatures can result in nearly instantaneous freezing. Fuel handlers should use great care not to allow exposed skin to come into contact with spilled fuel or the metal nozzles and valves of fuel delivery systems.

c. **Host Factors**. Host factors are those factors that are unique to the Soldiers, themselves.

(1) Rank. Rank is a highly significant factor. Personnel in higher ranks are less likely to suffer from cold injury for a number of reasons; experience level, leadership, receptivity to training, and significantly less exposure.

(2) History of cold injury. Individuals who have experienced a cold injury in the past are at greater risk of experiencing a cold injury than other Soldiers. These Soldiers may be more sensitive to the effects of cold, or they may not have learned how to properly protect themselves. It is also highly likely that the cold injury sustained will occur to the same part of the body.

(3) Level of fatigue. The fatigue level of a soldier contributes to cold injury because a fatigued soldier is less likely to perform PMM. This is seen most often in personnel who have been in combat for 30 days or more without rest.

(a) Mental weariness may lead to apathy which may cause a soldier to neglect his physical needs for survival.

(b) Frequent rotation of troops from the front line can lessen the impact of fatigue.

(c) Soldiers who are sleep-deprived will not be able to sustain physical activity and will increase their risk for hypothermia

(4) Discipline, training, and experience. Well-trained and well-disciplined Soldiers are better able to care for themselves through personal hygiene and PMM.

**NOTE:** This is the one host factor over which FST members can have a profound impact. The PMM necessary for survival in the cold must be continuously stressed to the troops to enable them to cope with cold injury problems.

(5) Age. Persons >45 years old may be less cold tolerant than younger persons, due to either a decline in physical fitness (will fatigue sooner due to working at higher % of maximal aerobic capacity) or inability to conserve heat as well as their younger counterparts.

(6) Dehydration. Dehydration can increase susceptibility to cold injury by decreasing physical performance and cognitive function of the soldier.

(7) Psychosocial factors. Psychosocial factors are those influences that stem from how a soldier interfaces with those around him and with his environment.

(a) Cold injury tends to occur more often in individuals who have a passive or negative attitude.

(b) Soldiers who display little muscle activity or those who don't feel it necessary to carry extra footwear or change out of their wet socks are also at a higher risk.

(8) Geographical origin. In the Army, you will meet people from all over the globe. This is important because among Caucasians the geographic origin of the soldier seems to be a significant host factor. People who originate from warmer climates are more susceptible to cold injury.

(9) Race. In terms of numbers at risk, and independent of geographic origin, African American Soldiers appear to be considerably more vulnerable to frostbite than their Caucasian counterparts.

**NOTE:** Be aware that it is more difficult to detect the changes in skin color associated with the progression of frostbite with dark complexions. This fact makes it even more important for small unit leaders and battle buddies to frequently check their Soldiers' status in cold weather operations.

(10) Poor nutrition. Individuals who do not eat regularly or do not eat complete and balanced meals are more susceptible to cold injury.

(11) Alcohol. Alcohol can lower blood sugar levels and decrease shivering. Also, alcohol increases urine formation, leading to dehydration, which can further degrade the body's ability to perform. Most importantly, alcohol blunts the senses and impairs judgment, so the individual may not feel the signs and symptoms of developing cold injury.

**NOTE:** Soldiers who wear adequate clothing and are properly protected from the cold will not require additional calories during cold weather operations. Each of these Soldiers can exist on the military rations.

(12) Activity level. Soldiers who participate in too little or too much activity increase their risk of cold injury.

(a) Overactivity, which causes rapid breathing, can result in large amounts of body heat loss. Additionally, perspiration can get trapped in the clothing markedly reducing the insulating quality of the uniform.

(b) Immobility causes decreased heat production, increasing the danger of damage to the extremities.

(13) Drugs and medications. As in the case of heat injury, some medications increase a soldier's susceptibility to cold injury.

(a) Tobacco and alcohol decrease peripheral (e.g. hands) circulation and make a soldier more susceptible to frostbite.

(b) Blood pressure medications reduce the circulation making the soldier more susceptible to injury to the extremities.

### **12-3. FST ROLE IN PREVENTION**

It is important to note that, except in unusual situations, cold injuries are preventable. Success in prevention requires vigorous command leadership, prior planning, and the provision of cold-weather equipment and clothing. Your role as an FST member is to provide specific preventive medicine measures directed toward conserving body heat, avoiding unnecessary exposure of personnel to cold moisture, and educating personnel on the activities and factors that favor cold injury. You must employ any or all of the following elements to your program of prevention.

a. **Meteorological data.** All commanders must be familiar with and use meteorological data such as humidity, temperature, and wind. As you know from our previous discussions, all these weather elements influence the risk of cold injury.

(1) Weather conditions for each 12-hour period are typically predicted using meteorological data in conjunction with the existing weather conditions. This allows the commander to judge the severity of the environment and anticipate the hazards facing his troops over the next twelve hours.

(2) The commander may use this data to determine the necessity of shortening exposure times of individuals engaged in patrols, on guard, or in motor movement of unheated vehicles. This may occur despite the availability of adequate clothing and equipment.

(3) This data is also used to ensure that the proper clothing is provided for the anticipated weather conditions.

b. **The cold injury officer.** Each platoon or comparably sized unit should have a cold injury officer or NCO. In many cases, this may be an FST member. This person is selected for their leadership interest and ability to supervise others in simple, but constant, PMM. Frequent observation of the Soldiers in the unit is the most important role of the cold injury officer. There are many roles the cold injury officer should expect to perform.

(1) Look at Soldiers' exposed skin and extremities for early signs and symptoms of cold injury.

(2) Check all Soldiers daily for good personal hygiene, especially of the feet. Remind the Soldiers to change their socks at appropriate intervals and do what they can to keep them clean and dry.

(3) Encourage Soldiers to avoid constricting their extremities by wearing tight-fitting clothes or footwear.

c. **The buddy system.** You need to train the Soldiers in your unit to observe their buddy for evidence of cold injury and instruct them on the proper methods used to rewarm blanched body parts.

**WARNING:** Do not ignore the initial signs of frostbite – cessation of the sensation of cold or discomfort followed by a pleasant feeling of warmth.

**NOTE:** Blanching is evidenced by skin that loses its natural color.

(1) If blanching is recognized on the fingers, rewarm them by holding the fingers against the skin of the abdomen or in an armpit. Hold the blanched area until the skin rewarms and returns to its normal color.

(2) If blanching is noticed in the toes, hold them against your buddy's bare chest or abdomen while protecting your toes from the wind.

**WARNING:** Re-warming should ALWAYS be done by holding, NOT rubbing, the blanched area.

d. **Clothing.** The Extended Cold Weather Clothing System (ECWCS) will provide protection of the head, torso, and extremities from 40° to -60°F (4.4° to -51.1°C). The ensemble uses the layering principal to conserve body heat. Loose layers of clothing with air space between them, under an outer wind- and water-resistant garment, provide maximum protection. The ensemble is generally comprised of four layers: Polypropylene undershirt/drawers, fiber pile shirt/pants, polyester batting coat and trouser liner, and extended cold weather (GORE-TEXÆ) camouflage parka and

trousers. You should remind the Soldiers in your unit of the following basic clothing principles.

- (1) Clothing should be layered. Soldiers should have the flexibility to remove clothing layers during periods of high activity or warming temperatures.
- (2) Soldiers should ventilate the body during physical activity to avoid the accumulation of sweat in the uniform.
- (3) Clothing should be kept as clean and dry as possible. Dirt, grease, and mineral salts from sweat cause the uniform to facilitate heat loss more rapidly.
- (4) Clothing and footgear should not constrict. This means that Soldiers should be advised against wearing all tight-fitting socks, boots, trousers, underwear, sweaters, or jackets.
- (5) Clothing and footgear should be inspected daily for holes and rips.
- (6) Ground forces personnel in cold areas should be equipped with insulated rubber combat boots. Frequent changes of socks are important with these boots because of the increased sweating and retention of sweat inside the boot.

**NOTE:** Although sweating in these boots does not cause a loss of insulation, it does lead to the softening of the soles of the feet. Trauma to the soles, which can be produced simply by walking, can lead to skin loss and may require hospitalization.

**NOTE:** See Table 8-3 in ATP 4-25.12 (Figure 12-2) for further information on suggested clothing layering for physical training and work.

e. **Individual preventive medicine measures (IPMM).** Soldiers should be instructed as to how they can protect themselves from the ill effects of the cold.

- (1) Make sure Soldiers wear or carry adequate clothing for the anticipated weather conditions.
- (2) Remind Soldiers of the benefits of layering loose-fitting clothing. First, wearing layers permits air to circulate between them and act as an insulator. Secondly, loose clothing permits good blood circulation to all body parts. Layering permits Soldiers to remove excess clothing when near a fire or in a warm enclosure.
- (3) Advise Soldiers to keep their hands well protected. Mittens offer better protection against the cold than gloves. This is partly due to the fact that mittens are less constrictive than gloves. They also allow room for air to circulate around the fingers. The air circulating within the mitten provides the maximum insulating value.

**NOTE:** Keeping the hands well insulated is important because it takes a long time to recondition the hands to normal usage levels. Therefore, Soldiers should be warned against lengthy exposure of the bare hands and wrists that may cause stiffening and reduce the blood circulation.

**WARNING:** Soldiers should never touch metal, snow, or other cold objects with their bare hands.

(4) Tell Soldiers to do what they can do to avoid immobility in the cold. They should walk around or do some sort of light exercise periodically. If this is impossible, then they should shift positions occasionally. Remind Soldiers that it is especially important to move their toes, feet, legs, fingers, and arms to prevent cold injury.

**NOTE:** Inform Soldiers that in situations where they must sit or stand for long periods, it is beneficial to find some cardboard or other insulating material to sit or stand on to insulate themselves from the cold surface.

(5) Remember that certain groups of individuals require greater protection from the cold. Identify them, and supervise these people closely to ensure they are safe from cold injury.

(6) Shelter from the elements is secondary only to defending against enemy actions.

(7) Be prepared for sudden weather changes.

(8) Avoid cold injuries by using a buddy system and frequent self checks especially when individuals are not active or their duties require them to remove their gloves.

(9) Drivers and passengers should always have a sleeping bag and extra cold-weather clothing when traveling by vehicle away from the unit bivouac location.

**NOTE:** The groups of Soldiers you need to concern yourself with are the fatigue group, the racial group, the geographical origin group, the negative attitude group, and the group of individuals with previous cold injury.

f. **Windchill.** As wind speed increases, the danger of cold injury increases. Knowing how to determine the effects of wind speed on chilling the body will allow you to make the best possible recommendations for PMM to your commander and provide the best guidance to the Soldiers in your unit.

(1) Windchill chart.

(a) Notice that the maximum wind speed on the chart is forty miles per hour. This is due to the fact that wind speeds greater than forty miles per hour have little additional effect on the rate at which the body is cooled.

(b) Along the top is the thermometer reading in degrees Fahrenheit.

(c) Within the body of the chart are three categories and their associated descriptions. Your recommendations will be made based upon the level of threat of cold injury represented by each of these categories.

#### 12-4. DETERMINE THE WINDCHILL

It is important to note that you, as an FST member, will not be issued a thermometer. In addition, the exact temperature may not be known by anyone in your unit. Therefore, it will not be possible to accurately calculate windchill.

- Locate the wind speed in the left-hand column.
- Locate the temperature along the top of the chart.
- Locate the point on the chart where these two numbers intersect.

Wind speed (mph)	Actual temperature (degrees Fahrenheit)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent chill temperature in degrees Fahrenheit											
CALM	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	3	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	15	0	-15	-29	-44	-59	-74	-89	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-22	-37	-53	-69	-85	-101	-117	-132	-148
	LITTLE DANGER				INCREASING				GREAT DANGER			
<b>Notes:</b>												
Little Danger			Greatest danger from false sense of security.									
Increasing Danger			Exposed flesh may freeze within 1 minute.									
Great Danger			Exposed flesh may freeze within 30 seconds.									
Wind speed of more than 40 miles per hour has little additional effect.												
<b>Legend:</b>												
mph		miles per hour										
-		minus										

Figure 12-1. Windchill Chart

**CAUTION:** This chart is only good for predicting frostbite to exposed flesh. Any clothing or material that stops or reduces the wind will give a degree of protection to the covered area. UNDER NO CIRCUMSTANCES should you try to predict the amount of protection offered by such clothing when using the windchill chart. You could end up putting your Soldiers at additional risk.

**NOTE:** Another important fact is that wet clothing or boots results in heat loss nearly equal to that of exposed flesh.

<i>Low Freezing is possible below 32°F, but unlikely</i>	<i>High Freezing could occur in 10 to 30 minutes</i>	<i>Severe Freezing could occur in 5 to 10 minutes</i>	<i>Extreme Freezing could occur in less than 5 minutes</i>
<p>Increase surveillance with self- and buddy checks.</p> <p>Wear appropriate layers and wind protection for the work intensity.</p> <p>Cover exposed flesh if possible.</p> <p>Wear vapor barrier (VB) boots below 0°F.</p> <p>Avoid sweating.</p>	<p>Mandatory buddy checks every 20 to 30 minutes.</p> <p>Wear ECWCS or equivalent and wind protection including head, hands, feet, and face.</p> <p>Cover exposed flesh.</p> <p>Wear VB boots below 0°F.</p> <p>Provide warming facilities.</p> <p>Avoid sweating.</p>	<p>Mandatory buddy checks every 10 minutes.</p> <p>Wear ECWCS or equivalent and wind protection including head, hands, feet, and face.</p> <p>Wear VB boots.</p> <p>Provide warming facilities.</p> <p>Work groups of no less than two Soldiers.</p> <p>No exposed skin.</p> <p>Stay active.</p> <p>Avoid sweating.</p>	<p>Be ready to modify activities due to extreme risk.</p> <p>Wear ECWCS or equivalent and wind protection including head, hands, feet, and face.</p> <p>Wear VB boots.</p> <p>Provide warming facilities.</p> <p>Keep task duration as short as possible.</p> <p>Work groups of no less than two Soldiers.</p> <p>No exposed skin.</p> <p>Stay active.</p> <p>Avoid sweating.</p>
<p><b>Notes:</b></p> <p>Wet skin could significantly speed the time for frostbite to occur.</p> <p>Immersion syndrome (trench foot) can occur at any temperature. Always keep feet warm and dry.</p>			
<p><b>Legend:</b></p> <p>°C       degrees Celsius</p> <p>ECWCS   extended cold-weather clothing system</p> <p>°F       degrees Fahrenheit</p> <p>VB       vapor barrier</p>			

Figure 12-2 Leader's Guide For the Prevention of Cold Injuries  
Due to Exposure to Temperatures Below 50°F

### Section III. SUMMARY



### **Section III. SUMMARY**

Directing cold injury prevention measures in your unit requires that you know the circumstances under which cold injury is likely to occur. You must also be able to inform the Soldiers in your unit of the factors that influence cold injury and encourage them to follow the basic guidelines of prevention. In addition, you should be able use the information obtained from the windchill chart to provide your commander with appropriate guidance aimed at preventing cold injury to the Soldiers in your unit.



## **LESSON 13: Controlling Toxic Industrial Materials (Non-CBRNE)**

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FM 100-14, RISK MANAGEMENT.

### **Section I. INTRODUCTION**

The chance of U.S. Soldiers being exposed to Toxic Industrial Materials (TIMs) during operations increases each year as the world becomes more and more industrialized. Many operations in recent history involve U.S. units deploying into urban areas devastated by civil unrest and war. These areas are filled with industrial production and storage facilities that have been damaged or destroyed in the conflict. Our Soldiers may be exposed to harmful and potentially deadly chemicals that have been spilled or released either by accident or intentionally.

The U.S. has agencies like the Environmental Protection Agency and the Occupational Safety and Health Administration to ensure such TIMs are kept away from the population. But in most war-torn areas there are no such agencies available to protect the civilian population or U.S. Soldiers from these TIMs. The army has Preventive Medicine experts who can help to protect our Soldiers from exposure to TIMs, but there are a relatively small number of these technical experts. Accordingly, the FST needs to be able to identify areas of possible contamination and recommend actions to reduce exposure of their unit's troops as well as request Preventive Medicine support to evaluate the possible TIM hazards.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 13-1. Classify toxic industrial materials according to their physical states.
- 13-2. Identify the routes of entry of toxic industrial materials into the body.
- 13-3. Identify the biological effects of toxic industrial materials.
- 13.4. Identify the toxic industrial materials threat and their sources.

#### **Show Slide FSTCC013-4: Lesson Objectives (5-8)**

- 13-5. Identify the harmful effects of carbon monoxide, hydrogen chloride, bore/gun gases, and solvents, greases, and oils.
- 13-6. Describe the risk management process as it pertains to toxic industrial materials.

13-7. Describe the preventive medicine measures necessary to protect personnel from the exposure to toxic industrial materials.

13-8. Describe the individual preventive medicine measures necessary to protect personnel from the exposure to toxic industrial materials.

## SECTION II. EXPLANATION

### 13-1. PHYSICAL STATES OF TOXIC INDUSTRIAL MATERIALS (TIMs)

#### a. Gas.

(1) A state of matter in which the material is in a gaseous phase at room temperature.

(a) Carbon monoxide.

(b) Hydrogen chloride.

(c) Bore/gun gases.

(2) Gases expand and contract significantly in response to changing temperature and pressure. By increasing pressure and decreasing temperature, gases can be changed into either a liquid or solid state.

(3) Gases mix easily with other gases and uniformly distribute themselves throughout work areas or other contaminated areas.

#### b. Liquid.

(1) The state of matter in which a substance is free flowing and formless at room temperature.

(2) Capable of existing in three forms.

(a) Water.

(b) Vapor.

1 Finely separated particles of gas floating in air.

2 Normally seen as fog or smoke.

3 TIMs existing in the form of vapor can be inhaled deeply into the lungs.

(c) Mist

1 A suspension of liquid droplets generated by condensation from the gaseous to the liquid state.

2 Breaking up a liquid into a dispersed state can also cause mist.

**NOTE:** An example of mist would be spraying water from a household spray bottle.

c. Solids.

(1) Solids include fumes such as those from lead soldering, welding and brazing. These fumes consist of very small solid particles that are dispersed into the air.

(2) Dust is another form of a solid that is very common to most Soldiers. Dust consists of very small solid particles that have been mechanically removed from a larger solid by handling, grinding, impacting, detonating and weathering.

## 13-2. ROUTES OF ENTRY INTO THE BODY

a. Inhalation.

(1) The most significant route of entry into the body.

(2) Frequency and duration of exposure effect onset of symptoms.

(3) Inhaled TIMs enter the bloodstream through the gas exchange region of the lungs.

(4) Symptoms of TIM inhalation.

(a) Instant effects.

1 Cough.

2 Burning in throat or chest.

(b) Delayed effects may develop in periods as short as 24 hours or as long as several years.

**NOTE:** An example would be asbestosis, from inhaling asbestos, or other chronic lung disorders.

b. Absorption. Chemicals absorbed through the skin can have local as well as systemic effects.

(1) Local effects. The most common local effect is dermatitis, which is indicated by reddening of the skin or the appearance of raised, blister like lesions on the skin.

(2) Systemic effects. Systemic poisoning, such as cancer, can result from absorption.

**NOTE:** An example is cancer of the liver caused by absorption of carbon tetrachloride.

c. Ingestion.

(1) The result of eating or smoking with contaminated hands or utensils.

(2) Accidental ingestion may occur if toxic materials are stored with food or beverages.

d. Injection.

(1) Normally accidental; may occur from the rupture of high-pressure air or liquid lines.

(2) Toxic materials may enter the body through a traumatic injury such as a puncture wound or laceration.

### **13-3. BIOLOGICAL EFFECTS OF TIMs**

a. Irritation.

(1) Caused by irritants such as sulfur dioxide, acetic acid, formaldehyde, sulfuric acid, iodine, ozone and oxides of nitrogen.

(2) Symptoms include inflammation of the mouth, nose and lung tissue.

b. Asphyxiation.

(1) Caused by asphyxiants such as nitrogen, nitrous oxide, hydrogen, helium, methane, ethane, carbon monoxide and cyanide.

(2) Asphyxiants do not damage the lungs; they displace oxygen or cause the body to become incapable of using oxygen.

c. Anesthesia.

(1) Results from exposure to chemical solvents such as acetone and trichloroethylene.

**NOTE:** Both of these chemicals are commonly used as degreasing agents in motorpool operations.

(2) Biological effect is a depressant effect on the brain and central nervous system.

(3) The degree of anesthetic effect depends on the type of contaminant as well as the concentration and amount you are exposed to.

d. Systemic poisoning.

(1) May occur from exposure to organic solvents such as methylene chloride and carbon tetrachloride.

**NOTE:** These chemicals are found in many paints, degreasers and propellants.

(2) Damage internal organs such as the liver, kidney, central nervous system and the cardiovascular system.

e. Cancer. Chemicals suspected of causing cancer, based on animal studies, are called carcinogens.

#### **13-4. MEDICAL THREAT TO SOLDIERS**

**NOTE:** Explain that the discussion will be limited to the three TIMs that Soldiers are likely to encounter, carbon monoxide, hydrogen chloride, bore/gun gases, and liquid chemicals (i.e. solvents, oils and greases).

a. Carbon monoxide poisoning.

**NOTE:** Carbon monoxide is a by-product of the incomplete burning of carbon substances such as coal, gasoline and natural gas. Understanding where and how carbon monoxide is produced is a critical step in avoiding exposure to it.

(1) Sources of carbon monoxide.

(a) Internal combustion engines.

1 Vehicle engines – exhaust is a significant source.

2 Generators.

(b) Space heaters.

(c) Dynamite and other explosives.

(2) Carbon monoxide hazard.

(a) Because it is odorless, colorless and tasteless its presence may go undetected.

(b) By the time the presence of carbon monoxide is detected, you may be too overcome to remove yourself or your Soldiers from the area.

b. Hydrogen chloride.

(1) Sources of hydrogen chloride. Hydrogen chloride is produced as an exhaust from rocket systems such as shoulder fired or vehicle mounted rockets.

**NOTE:** During recent years, the development and use of better rocket systems has increased the incidence of exposure to hydrogen chloride.

(2) Hydrogen chloride hazard. When hydrogen chloride is combined with water it produces hydrochloric acid.

c. Bore/gun gases.

(1) Sources of bore/gun gases.

(a) Tank guns.

(b) Artillery cannons.

**NOTE:** When conventional weapon systems are fired, the ammunition propellant produces toxic gases.

(2) Bore/gun gas hazard. Gases produced when weapons are fired include carbon monoxide and oxides of nitrogen.

**NOTE:** The ventilation systems on tanks and artillery cannons reduce the chances of exposure to these gases. When conducting PMCS on these weapon systems Soldiers must ensure that the ventilation systems are working at peak efficiency.

d. Solvents, greases and oil. Used in the maintenance of vehicles and weapon systems, these are the most prevalent TIMs and pose a significant risk to Soldiers.

**NOTE:** Most of these substances are used in liquid form. Due to their properties, these substances evaporate into vapor readily and the vapors can easily be inhaled into the body.



(1) Most substances in this category are organic compounds. Organic compounds pose a hazard due to their ability to cause cancer and other medical problems.

(a) Solvents.

- 1 Carbon tetrachloride.
- 2 Trichloroethylene.
- 3 Weapons cleaning solvents.

(b) Fuels.

- 1 Gasoline (MOGAS).
- 2 Diesel fuel.

(c) Lubricants.

- 1 Oil.
- 2 Grease.

**NOTE:** Other organic compounds commonly found are the pesticides used to control rodents and arthropods.

(2) Hazards. The widespread use of these substances in day-to-day military operations, both in peacetime and war, put Soldiers at a significantly increased risk of exposure. Many times Soldiers can be exposed to TIMs most unexpectedly.

**NOTE:** Relate the following story involving U.S. Soldiers deployed to Bosnia, to the students:

Deployed Soldiers were tasked to remove cardboard boxes from an abandoned warehouse. The warehouse was not well ventilated and was very warm; the Soldiers removed their ACU tops as they worked. As the detail went on, many of the Soldier's arms became red and started to itch, eventually blisters developed.

When Preventive Medicine personnel were called to evaluate the situation, they determined that the boxes had been treated with a fungicide to prevent the cardboard from deteriorating. Since the boxes were not manufactured in the U.S., there were no controls on how much fungicide should be applied to the boxes. During storage, the fungicide had condensed and formed crystals on the outside of the boxes. In this concentrated form, the fungicide had become a blistering agent. As the Soldiers

worked, the concentrated fungicide mixed with their perspiration, was absorbed into the skin causing the blisters.

Although no obvious hazardous material was seen, the hazard was there.

### **13-5. HARMFUL EFFECTS CAUSED BY EXPOSURE TO TIMs**

a. Symptoms of carbon monoxide poisoning.

- (1) Headache.
- (2) Sleepiness.
- (3) Coma.
- (4) Death.

**NOTE:** The symptoms of carbon monoxide poisoning do not reverse themselves quickly. If you remove yourself and your Soldiers from the exposure source and your health conditions do not improve, you cannot assume that it is not carbon monoxide poisoning. Ventilate the area completely before returning.

b. Symptoms of hydrogen chloride exposure.

- (1) Irritation of the eyes, throat and lungs. (Caused by the action of hydrochloric acid on the mucous membranes.)
- (2) Cough.
- (3) Acid burn.
- (4) Flu-like symptoms.

**NOTE:** These flu-like symptoms may actually indicate the presence of lung disease.

c. Symptoms of bore/gun gas exposure.

- (1) Watch for symptoms of carbon monoxide poisoning.
- (2) Lung irritation (oxides of nitrogen).

d. Symptoms of exposure to solvents, greases and oils.

- (1) The most common symptoms are skin irritations.
  - (a) Rashes

- (b) Burns
- (c) Abnormally dry skin
- (d) Infections

(2) Occupational skin diseases account for the greatest number of reported occupational diseases.

- (a) May temporarily limit ability to work.
- (b) Normally not severe enough to cause permanent disability.
- (c) Healthy skin cells provide natural protection from injury due to exposure to many chemicals.
- (d) Cracked, dry or otherwise irritated skin provides less protection.
- (e) Type and severity of skin disorders due to exposure to TIMs depends on the chemical involved and the duration of exposure.

(3) Other effects.

- (a) Organ involvement such as liver and/or brain.
- (b) Permanent damage including cancer.

### **13-6. MANAGING RISKS ASSOCIATED WITH TIMs**

a. Identify the sources of toxic chemicals in your unit and maintain an up to date list of all chemicals used in the unit for quick reference.

b. Maintain Material Safety Data Sheets (MSDS) for all chemicals used.

- (1) Up to date health information.
- (2) Hazardous properties.
- (3) Control methods.

c. Include risk assessment in planning at all levels.

- (1) Incorporate risk management into all operations including training.
- (2) 5-steps of risk management (FM 100-14).

- (a) Identify hazards.
- (b) Assess hazards to determine risks.
- (c) Develop controls and make risk decisions.
- (d) Implement controls.
- (e) Supervise and evaluate.

**NOTE:** Time permitting, allow students to practice performing risk assessments using various TIMs.

### **13-7. PREVENTIVE MEDICINE MEASURES (PMM) FOR TOXIC CHEMICALS**

- a. Carbon monoxide.
  - (1) Prevent accumulation of engine exhaust.
    - (a) Run engines outside.
    - (b) When engines must be run inside, use tailpipe extensions.
  - (2) Provide adequate ventilation of work/sleep areas in which space heaters are being used.
- b. Hydrogen chloride (from rocket systems).
  - (1) Position Soldiers upwind from rocket systems.
  - (2) Use respirators designed to protect personnel from these gases.
- c. Bore/gun gases (tanks, cannons).
  - (1) Use on-board ventilation systems.
  - (2) Ensure proper maintenance and function of bore evacuators.
- d. Solvents, greases and oils (liquid chemicals).
  - (1) Environmental controls.
    - (a) Minimize exposure of Soldiers.
    - (b) Substitute a safer, less toxic substance for the more toxic substance being used.

**NOTE:** The use of stoddard solvents is recommended. A stoddard solvent is a chemical preparation that gives you the advantage of a solvent without the hazards present in gasoline, kerosene, etc.

- (2) Ensure personal protective devices/clothing are available.
  - (a) Gloves.
  - (b) Goggles.
  - (c) Respirators.

**NOTE:** Ensure Soldiers are fit tested for respirators.

(3) Medical controls. Medical controls refer to programs such as periodic physical exams and/or medical surveillance of Soldiers to detect early signs of occupational disease.

### **13-8. INDIVIDUAL PREVENTIVE MEDICINE MEASURES (IPMM) FOR TOXIC CHEMICALS**

- a. Identify source of toxic chemicals in your unit.
- b. Develop a protective action plan to reduce sickness or injury.
- c. Adhere to the following guidelines.
  - (1) Run engines outside or use tailpipe extensions.
  - (2) Ventilate work/sleeping areas when space heaters are in use.
  - (3) Do not use vehicle engines as a heat source.
  - (4) Use/maintain vehicle ventilation systems.
  - (5) Properly maintain bore evacuator systems.
  - (6) Substitute harmful solvents with safer 'stoddard solvents.'
  - (7) Use protective equipment/clothing.
- d. Practice good personal hygiene.

### **Section III. SUMMARY**

The loss of personnel due to injury or illness caused by non-CBRNE chemicals, or TIMs, can have a serious impact on a unit's ability to accomplish its mission. Awareness and the use of simple preventive measures can prevent most injuries caused by these substances. One of your jobs as a member of the FST will be to assist the commander in identifying these hazards and implementing the preventive measures necessary to protect your fellow Soldiers.







## LESSON 14: Noise Hazards and Noise Management

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team.

**STUDY ASSIGNMENT:** ATP 4-25.12, Chapter 10.

### Section I. INTRODUCTION

Provide a motivational opening appropriate to your student population, such as the following. We are so used to a sound filled environment, that a lack of sound can be disturbing. However, too much sound can literally be deafening. Certain noises can have profound physical and psychological effects on humans. Noise induced hearing loss, the most prevalent health hazard in the military, is a disability that is, in most cases, preventable. While hearing conservation programs are a command responsibility, the Army Medical Department is responsible for ensuring these programs are established and effective. As a member of the Field Sanitation Team, you will play an active role in this program in your unit. In this lesson you will study how to recognize the types and effects of noise, protect against noise, plan for control of noise hazards, and enforce individual and mission noise protection measures. This is valuable information for you since, in your FST duties, you will be able to protect your fellow unit soldiers' hearing loss, which can affect combat efficiency. You will also be able to help to decrease the most prevalent health hazard in the military, noise-induced hearing loss.

### LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 14-1. Define the two types of noise.
- 14-2. Recognize the effects of noise on the individual and on the mission.
- 14-3. Identify the preventive medicine measures necessary to protect personnel from exposure to noise.
- 14-4. Identify the individual preventive medicine measures necessary to protect personnel from exposure to noise.
- 14-5. Describe the proper wear of hearing protectors.
- 14-6. Identify the noise management measures necessary to protect personnel from exposure to noise.

## Section II. EXPLANATION

### 14-1. TYPES OF NOISE

Noise is simply defined as unwanted sound whether it is a pure tone, a complex of tones, or unwanted speech or music. The term is usually applied to sounds that contain a large number of separate frequency components, extend over a wide range of frequencies and which are not normally generated to convey meaning or information.

a. Impact, or impulse noise. The first type of noise is one that we are exposed to quite often during normal training and in combat. Impulse or impact noise is very loud and comes in short bursts. It is characterized by a sharp rise in intensity followed by a rapid decline in intensity. This type of noise cannot be measured accurately with an ordinary sound meter.

(1) Small arms fire.

(2) Cannon fire.

b. Steady noise. The second type of noise is steady noise. This noise is loud and steady with no significant change in intensity or frequency.

(1) Field generators.

(2) Personnel carriers, tanks, trucks and aircraft.

### 14-2. EFFECTS OF NOISE

a. Effects of noise on individuals. Exposure to excessive noise can have derogatory effects on both the individual soldier and the unit. Soldiers who are exposed to excessive noise may have both immediate and long-term reactions.

(1) Immediate reactions.

(a) Ringing in the ears.

(b) Temporary loss of hearing (muffling of sound) which may last minutes to hours.

(c) Pain, which may indicate the eardrum, is broken.

(2) Long term reactions. Long term exposure to excessive noise can damage delicate tissues in the inner ear.

(a) Usually leads to permanent loss of hearing.

(b) No known treatment for this type of hearing loss.

b. Effects of noise on unit mission. Excessive noise may affect the soldier's combat performance and the unit mission.

(1) Inability to hear important sounds.

(a) Twigs snapping.

(b) Metal rattling.

(c) Vehicles/aircraft approaching.

(2) Loss of hearing may cause a unit's mission to be impaired if positions are overrun or soldiers are caught by surprise. The unit may even be destroyed.

### **14-3. PREVENTIVE MEDICINE MEASURES (PMM)**

Units must take certain steps to protect soldiers from noise exposure.

a. Personal protective devices to lessen the risk of hearing loss such as earplugs or earmuffs should be available to soldiers.

b. Leaders must insure that vehicle or aircraft crewmembers wear the specifically designed helmets that are equipped with protective devices.

c. Realistic combat training includes the use of artillery simulators and blank ammunition. Units should be trained to carry out missions in this environment while wearing hearing protectors.

d. Leaders should be aware that short-term exposure to noise will effect a soldier's ability to hear combat significant sounds.

(1) Listening posts-observation posts (LP/OP) should be manned by soldiers who have not been exposed to noise.

(2) Consider using night vision devices or audible alarms to increase security around the LP/OPs.

### **14-4. INDIVIDUAL PREVENTIVE MEDICINE MEASURES (IPMM)**

a. The most important IPMM to protect your hearing is to wear the protective devices provided.

(1) Ear plugs

- (2) Ear muffs
- (3) Both (combination)

b. Do not remove protective inserts from CVC or aviators helmets.

**NOTE:** If soldiers complain that these are uncomfortable, advise them to have the helmet checked for proper size.

c. Avoid exposure to noise.

**NOTE:** If noise exposure is unavoidable, limit exposure to mission essential times.

d. Keep hearing protection devices clean (to prevent ear infection).

- (1) Wash with soap and water.
- (2) Dry before replacing in case.

#### 14-5. HEARING PROTECTORS

a. General principles.

(1) When worn properly, earplugs will create a good seal. You should feel a slight vacuum sensation in your ear and your voice should sound as if you are talking inside a barrel. Keep in mind, even a small leak defeats the purpose of wearing your earplugs.

**NOTE:** Medical personnel are responsible for fitting soldiers for ear plugs.

(2) Ear plugs tend to work loose as a result of talking or chewing. You will need to re-seat them periodically.

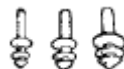
(3) You should have little difficulty understanding conversation when your ear plugs are worn, if the speaker's voice is raised slightly above the normal level.

(4) Ear plugs are part of your personal issue and are to be taken with you when you PCS.

(5) Well designed, properly fitted earplugs will reduce noise levels by 15 decibels in the lower frequencies and up to 35 decibels in the higher frequencies.

**NOTE:** At this point, solicit volunteers to demonstrate the proper wear of each type of hearing protection device as you walk the students through.

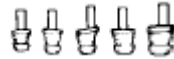
b. Proper wear of triple-flange earplugs.



- (1) Place stem of earplug in inserter (top of earplug case).
- (2) Straighten ear canal by pulling gently backward on ear.
- (3) Insert smallest flange in ear canal, push and twist plug into place.

**NOTE:** If you can't get a good seal, the earplug is probably the wrong size. Triple-flange earplugs are available in three sizes.

c. Proper wear of single-flange earplugs.



- (1) Straighten ear canal.
- (2) Hold tab and insert by pushing and twisting.
  - (a) Insure a good seal is made.
  - (b) Tab should be toward rear.

**NOTE:** If you can't get a good seal, the earplug is probably the wrong size. Single-flange earplugs are available in five sizes.

d. Proper wear of cylindrical earplugs (foam).



- (1) Roll the earplug between the thumb and forefinger until it is shaped like a small cone.
- (2) Insert the small end into the ear canal and hold.
  - (a) Allow the earplug to expand.
  - (b) Insure a good seal is made.

e. Proper wear of earmuffs.

(1) Adjust headband to insure earcup seals are in complete contact with the head.

(2) Personnel wearing eyeglasses must insure that the earcup seals fit well around the temples of the eyeglasses.

**NOTE:** If the seals have become hard or damaged, they must be replaced. Even a small leak eliminates the protection provided by the earmuffs.



f. Regardless of the type of hearing protector used, the only effective one is the one that is worn consistently. Hearing damage becomes progressively worse with each exposure; you must be able to convince your fellow soldiers of the importance of wearing their hearing protection.

#### **14-6. NOISE MANAGEMENT MEASURES**

a. Identify noise hazards in the unit.

**NOTE:** In garrison, mark noise hazard areas with signs indicating that hearing protection is required.

b. Leaders should insure that soldiers are medically fitted for, and issued multiple sets of hearing protectors.

**NOTE:** Leaders should include hearing protectors in periodic inspections such as basic issue layouts.

c. Units should insure that medical support personnel maintain an adequate supply of replacement hearing protectors.

d. Train soldiers to avoid noise whenever possible.

(1) Limit exposure to the time necessary to perform mission essential tasks.

(2) Insure that soldiers who are exposed to noise wear proper hearing protection.

e. Take steps to control noise sources, i.e., sandbagging generators.

### **Section III. SUMMARY**

Your continued ability to hear and the success of your unit to accomplish its mission are directly dependent on soldiers using hearing protectors in noise areas. Without adequate noise protection, you and your fellow soldiers could lose your lives, and your unit could be destroyed. The FST members play a vital role in ensuring hearing conservation procedures are followed.







## **LESSON 15: Field Sanitation Team Equipment and Supplies**

**REFERENCES:** FM 21-10, Field Hygiene and Sanitation; ATP 4-25.12, Unit Field Sanitation Team; FORSCOM Regulation 700-2.

### **Section I. INTRODUCTION**

We have covered all the major DNBI threats and the Preventive Medicine Measures you will be responsible for in combating those threats. But, just like maintaining your weapon or vehicles, the FST supplies and equipment must also be maintained to ensure mission capability. Many a mission has been impeded by a lack of equipment or supplies due to them being unserviceable or not on-hand at all. In this lesson you will learn of the equipment and supplies required to accomplish your mission. You will learn who shares responsibilities for your supplies and equipment, some of the maintenance, storage, hazardous handling and transportation requirements for certain key items, and reordering considerations.

#### **LESSON OBJECTIVES**

After completing this lesson, you should be able to:

- 15-1. Identify FST member, supply sergeant, and unit commander responsibilities for reordering FST equipment and supplies.
- 15-2. Identify those FST supplies that have special handling requirements.
- 15-3. Determine the FST supplies and equipment required to support a deploying unit.
- 15-4. Prepare a Unit's Field Sanitation Standard Operation Procedures (SOP)

### **Section II. EXPLANATION**

#### **15-1. RESPONSIBILITIES**

##### **a. FST Member.**

(1) Inspect FST supplies and equipment. It's a good idea to establish a schedule for checking your supplies. Talk to your commander and have quarterly inspections placed on the training schedule.

- (a) Check for cleanliness and serviceability.

1 WBGT kit.

2 Food service thermometer.

3 Mouse/rat traps.

4 Insecticide sprayer.

**NOTE:** Maintenance of this equipment was covered in the lessons on Heat Injury Prevention, Food Service Sanitation, and Arthropod Management.

(b) Check shelf-life items for expiration dates. If the expiration date has passed set the item aside for proper disposal and make a note to order a replacement.

(c) Check the condition of containers.

1 Leaks.

2 Breaks.

(d) Check to insure you have sufficient quantities of supplies.

(2) Order replacements for missing, damaged or out-dated supplies.

(a) Make an order list containing name, stock number and quantity required.

**NOTE:** Stock numbers and authorized quantities can be found in Fig. 3-1, FORSCOM Reg. 700-2.

(b) Give the order list to the Supply Sergeant.

b. Supply Sergeant responsibilities. It is the supply sergeant's responsibility to complete the necessary paperwork, order the required items and inform you when the items are available.

c. Commander responsibilities.

(1) Overall responsibility.

(2) Insure FST is trained, equipped and on orders.

(3) Insure FST supplies are included in out-load plans.

(4) Insure FST supplies are available during all phases of deployment.

## 15-2. SPECIAL CONSIDERATIONS

FORSCOM Reg. 700-2 requires that units pre-stock, and store, FST equipment and supplies. Most of these items can be stored in a sealed medical chest or footlocker. The chest is included in the authorized supply list. However, by nature of their properties, some items like calcium hypochlorite, insecticides and rodenticides require special handling and storage.

### a. Calcium Hypochlorite.

**CAUTION:** Calcium hypochlorite is an oxidizer that will supply oxygen to support combustion if it is combined with organic materials such as fuels. Additionally, at high temperatures, it gives off poisonous gases.

(1) Store away from organic materials.

(2) Store 6 oz. bottles in individual zip-lock bags placed in a serviceable ammunition can marked with a DOT "Oxidizer" label.

### b. Rodenticides, Insecticides and Insect Repellents.

(1) Do not pre-stock rodenticide baits Talon-G or Maki pellets due to their short shelf life. Order these items on a priority basis prior to an anticipated deployment.

(2) Insect repellents, insecticides and rodenticides require special handling and labeling when being shipped. Unit Hazardous Cargo NCO's can assist you in preparing these items for shipment.

### c. General.

(1) Keep FST materials in original packaging when possible.

(2) Repackage in fiberboard or plywood boxes when necessary.

(3) Store all supplies in a cool, dry, well-ventilated area.

**NOTE:** Always wash your hands after handling the supplies and always refer to a product's label directions for any special protective measures.

## 15-3. REQUIRED QUANTITIES

See Appendix A

## 15-4. PREPARE A FIELD SANITATION SOP

a. Define individual responsibilities.

- (1) Commander.
  - (2) Unit.
  - (3) Individual soldier.
- b. Define the responsibilities of the FST.
- (1) FST make-up.
  - (2) Food service sanitation.
  - (3) Field water supply.
  - (4) Field waste disposal.
  - (5) Personal hygiene.
  - (6) Prevention of heat and cold injuries.
  - (7) Arthropod and rodent management.

c. Provide reference information for members of your unit in appendices. These appendices should include information on unit and individual preventive medicine measures for avoiding disease and non-battle injuries.

### **Section III. SUMMARY**

As you can see, planning for the prevention of disease and non-battle injuries begins long before your unit deploys. It needs to be part of your normal garrison routine. Just as you maintain your weapon to ensure it is combat ready, you need to perform maintenance and quality control checks on your unit's field sanitation equipment and supplies to ensure they are ready if and when your unit deploys.

**Field Sanitation Team (FST) Expendable Items**  
(Source: FORSCOM Reg 700-2)

**DO NOT PRE-STOCK ITEMS THAT ARE HIGHLIGHTED IN RED. THESE ITEMS ARE HAZARDOUS, SHELF LIFE IS LIMITED, AND UNITS MAY NOT HAVE ADEQUAE STORAGE.**

**SUPPLY ITEMS FOR PREVENTION OF HEAT INJURIES**

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
Wet Bulb-Globe Temperature (WBGT) Kit	6665-01-566-1454	EA	1 / Team	8	Inventory component; replace broken thermometers, clean/replace wick as needed.
WBGT Black Globe Thermometer (replacement)	6685-01-110-4429	EA	1	8	WBGT component replacement as needed.
WBGT Wet Bulb Thermometer (replacement)	6685-01-110-4430	EA	1	8	WBGT component replacement as needed.
WBGT Dry Bulb Thermometer (replacement)	6685-01-110-6563	EA	1	8	WBGT component replacement as needed.
WBGT Wick		EA	1	8	Use cotton shoestring for replacement.

**SUPPLY ITEMS FOR PROVIDING POTABLE WATER**

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
<i>* Calcium Hypochlorite 6 oz jar (Local purchase liquid bleach (5-6%) may be substituted for use while in CONUS.)</i>	<i>6810-00-255-0471</i>	<i>BT</i>	<i>1/50 indiv 1Bottle / Team</i>	<i>2</i>	<i>Check expiration dates quarterly. See Note 1.</i>
Chlorination Kit, Water Purification	6850-01-374-9921	KT	1/15 indiv	2	Check expiration dates quarterly.
Water Purification Tablet, Chlorine (10 tablets) 720 Tablets /Box	6850-01-352-6129	PG	10 tablets /individual	8	Check expiration dates quarterly. 720 tablets/10 per soldier enough for 72 soldiers
Water Purification Tablet, Iodine, 8 mg (50 tablets)	6850-00-985-7166	BT	2 btl/indv	2	Check expiration dates quarterly. Randomly open bottles to inspect that tablets are steel grey.
Test Strip, Water Quality Or Chlorine Test Reagent	6550-01-456-5931 or 6550-01-565-2409	BT BX	3 / Team 1 / Team	8	Check expiration dates quarterly

Chose One Type

**SUPPLY ITEMS FOR PROVIDING FOOD SERVICE SANITATION**

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
Alcohol Swabs, Sgl Pads 500s	6510-01-153-4638	BX	1/150 indiv	8	
Disinfectant, Food Service (12 packets) (HHD Only)	6840-00-810-6396	BX	1/75 indiv	2	Check expiration dates quarterly.
Test Paper, Chlorine Residual (10/PG)	6630-01-012-4093	PG	1	2	Check expiration dates quarterly.
Thermometer, Food	6685-00-444-6500	EA	2 / team	2	Calibrate as per instruction.

**SUPPLY ITEMS FOR PERSONAL PROTECTIVE EQUIPMENT (PPE)**

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
Gloves, Chemical and Oil Protective (size 9) or (size 11)	8415-01-012-9294 8415-01-013-7384	PR	4/150 indiv	2	Maintain cleanliness, replace when torn.
Goggles, Industrial Non-vented	4240-00-190-6432	EA	4/150 indiv	2	Maintain cleanliness, store to prevent scratching.

This is personal protective equipment for the FST members, base stock by the number of FST members in the unit.

**SUPPLY ITEMS FOR CONTROL OF ARTHROPODS/RODENTS(INDIVIDUAL PROTECTION)**

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
* Insect Repellent, Personal Application, 2 oz tube (12 tubes/BX)	6840-01-284-3982	BX	4 tubes /indv	9	Visually inspect containers monthly.
* Insect Repellent, Clothing Application IDA Kit (12 kits/BX)	6840-01-345-0237	BX	4 kits /indv	9	Visually inspect containers monthly.
* Insect Repellent, Clothing & Bednet Treatment, Aerosol, 6 oz can (12 cans)	6840-01-278-1336	BX	1 can /indv	9	Visually inspect containers monthly.

**Field Sanitation Team (FST) Expendable Items**  
(Source: FORSCOM Reg 700-2)

**SUPPLY ITEMS FOR CONTROL OF ARTHROPODS/RODENTS( UNIT LEVEL PROTECTION)**

Chose One Type

ITEM	NSN	UI	AUTH QTY	C L	REMARKS
Chest, #3, 30x18x10 Aluminum	6545-00-914-3480	EA	As Reqd to load	9	<b>See Note 2.</b>
Sprayer, Insecticide, Manually Carried, 1-Gal	3740-00-191-3677	EA	2/150 indiv	9	Substitute for 3740-00-641-4719. <b>See Notes 3 &amp; 4.</b>
Swatter, Fly	3740-00-252-3383	DZ	1/150 indiv	9	
Mouse Trap, Spring Indv	3740-00-252-3384	DZ	4dz / 150 indiv	9	Maintain/clean as needed.
Rat Trap, Spring	3740-00-260-1398	DZ	4dz / 150 indiv	9	Maintain/clean as needed.
* Insecticide d-Phenothrin 2% Aerosol, 12 oz	6840-01-412-4634	CN	1 can/ indiv	9	Visually inspect containers monthly.
* <i>Rodenticidal Bait Anticoagulant, 0.005% diphacinone (40 blocks/BX)</i>	<i>6840-00-089-4664</i>	<i>BX</i>	<i>1/150 indiv</i>	<i>9</i>	<i>Visually inspect containers monthly. See Note 5.</i>
* <i>Rodenticidal Bait Anticoagulant, 0.005% brodifacoum (Talon-G) 11 lb. can</i> or * <i>Rodenticidal Bait Anticoagulant, 0.005% bromadiolone, (Maki Pellets) 11 lb can</i>	<i>6840-01-426-4808</i>  or <i>6840-01-151-4884</i>	<i>CN</i>	<i>1/150 indiv</i>	<i>9</i>	<i>Visually inspect containers monthly. See Note 5.</i>
* <i>Insecticide, Demand Pestab 10% Tablets, Unit Dose (40 tablets / CO)</i>	<i>6840-01-431-3357</i>	<i>CO</i>	<i>1/150 indiv</i>	<i>9</i>	<i>Visually inspect containers periodically. See Note 5.</i>
Container, Rodent Bait, Plastic, Tamper Proof, capable of dispensing solid or granular bait, Part No 05830OR PS2540, 6 bait stations per box.	3740-01-423-0737	BX	2/150 indiv	9	Maintain / clean as needed.

\* Indicates items with special handling requirements. Unit must have MSDS on hand for these hazardous materials; items should be included in hazardous material inventory.

**NOTE 1:** Containers be packaged in an overpack container with an inert packing material. Calcium hypochlorite (dry granular) is an oxidizer and must be handled with caution. Incompatible materials include POL products, flammable liquids, and pesticides. Item must be stored in a well-ventilated area. Overpack container must have a DOT oxidizer label and marked calcium hypochlorite. Only open overpack container outside or in a well ventilated area. See TB Med 577, Water Supply in the Field, for information to determine the amount of liquid bleach needed for desired chlorine residual in ppm.

**NOTE 2:** DO NOT PACK CALCIUM HYPOCHLORITE IN MEDICAL CHEST WITH PESTICIDES, POL, OR OTHER INCOMPATIBLE MATERIAL.

**NOTE 3:** Three sets of repair parts should be acquired for each sprayer. Repair parts will include items such as: check valves, pressure cups, filters, O-rings, four way nozzles with crack & crevice tips. Repair parts may be ordered from sprayer manufacturer by part number as Class IX repair parts.

**NOTE 4:** All sprayers should be equipped with a pressure gauge. If not order a pressure gauge, NSN 3740-01-332-8746 and filter, NSN 4330-01-332-1639, to retrofit the sprayers.

**NOTE 5:** Due to shelf life considerations and lack of adequate storage areas. **DO NOT prestock.** Order on a priority basis prior to anticipated deployment. **For emergency procurement: Contact the Defense Supply Center, Richmond (DGSCR) Emergency Supply Operations Center (ESOC) at DSN 695-4865 [commercial (804) 279-4865]. This ESOC is staffed 24 hours, 7 days per week.**

**NOTE 6:** Demand Pestab replaces Chlorpyrifos, 40 ml Btl (Dursban LO), 6840-01-210-3392. **Dursban LO is no longer authorized for use. Stocks must be returned through supply channels.**

**Field Sanitation Team (FST) Expendable Items**  
**(Source: FORSCOM Reg 700-2)**

**BED NETS AND RELATED MATERIAL\*\* (ITEMS ARE NOT INCLUDED IN FST SUPPLIES NSNs and PRICES PROVIDED AS INFORMATION)**

<b>NSN</b>	<b>Item (Alternate Trade Name)</b>	<b>Cage Code</b>	<b>AAC*</b>	<b>Price</b>	<b>U/I</b>
7210-00-266-9736	Insect Net Protector, Field Type, MIL -I-10901, 200" X 68", wt 1lb. Used to protect personnel from insects while sleeping. Mildew resistant nylon fabric. <b>S9T</b>	81349	D	<b>26.25</b>	EA
7210-00-267-5641	Pole, Folding Cot, Insect Net Protector. Four 30" X 1" wood poles, wt 1 lb., used to suspend Insect Net protector, Field Type (listed above) from military cots. MIL-P-17662. <b>S9T</b>	81349	D	<b>4.15</b>	SE
7210-00-300-6950	Clamp, Insect Net Protector Rod. Used to Attach Insect Bar, Rod s (listed below) to military cots. CID A-A-55099. Requires to clamps to attach Rods and erect the Insect Net Protector. <b>S9T</b>	58536	D	<b>2.75</b>	EA
7210-00-359-4850	Rod, Insect Net Protector. Two T-shaped metal rods, used to suspend the Insect Bar, Field Type. Rods may be pushed into the ground. Rods do not fit into military cots, use Insect Bar, Clamp (listed above). CID A-A-55099. Two Rods, Insect Net Protector are required to erect an Insect Net Protector. <b>S9T</b>	58536	D	<b>6.70</b>	EA
7210-00-266-9740	Insect Net Protector, MIL-I-82265, 27"X77.5," Used to protect personnel from insects while sleeping, for use with military cots. <b>S9T</b>	81349	D	<b>27.25</b>	EA
8415-00-935-3130	Insect Bar, Head Net. Used to protect head and neck from mosquitoes. 30" X 20," wt 1 lb. MIL-I-11489. <b>S9T</b>	81349	D	5.15	EA
8415-00-935-2914	Insect Net, Hat. CID A-A-55082. Nylon Netting, AG323, Elastic Headwear Attachment. <b>S9T</b>	58536	D	0.35	EA
8415-01-192-2357	Insect Net, Mittens. MIL-S-37205. Head and hand covering; nylon; black; packaged in heat-sealed, waterproof bag. A component of Survival Kit, Individual, NSN 6545-00-139-3671, but may be ordered separately. <b>S9T</b>	81349	<u>L</u>	-----	EA
8415-01-035-0846	Parka, Insect Repellent. Issued with a two oz tube of 75% DEET Repellent, NSN 6840-00-753-4963, Size - Small. Wt 1 lb., MIL-J-87024. <b>S9T</b>	81349	D	<b>16.55</b>	EA
8415-01-035-0847	Parka, Insect Repellent. Issued with a two oz tube of 75% DEET Repellent, NSN 6840-00-753-4963, Size - Medium, Wt 1 lb. <b>S9T</b>	81349	D	<b>16.55</b>	EA
8415-01-035-0848	Parka, Insect Repellent. Issued with a two oz tube of 75% DEET Repellent, NSN 6840-00-753-4963, Size - Large, Wt. 1 lb. <b>S9T</b>	81349	D	<b>16.55</b>	EA
01-483-2988	Jacket, Bug-Out outer wear, size Small, P/N 5460A	59590	D	37.60	EA
01-483-3002	Jacket, Bug-Out outer wear, size Medium, P/N 5460B	59590	<u>Z</u>	37.60	EA
01-483-3004	Jacket, Bug-Out outer wear, size Large, P/N 5460C	59590	D	37.60	EA
01-483-3007	Jacket, Bug-Out outer wear, size XL, P/N 5460D	59590	D	37.60	EA
01-483-3008	Jacket, Bug-Out outer wear, size XXL, P/N 5460E	59590	D	42.50	EA

\*\* These items are not required per FC Reg 700-2, issue to soldiers could be included in a deployment order.







