

**PROGRAMS DIVISION  
UNITED STATES ARMY SAFETY CENTER  
Fort Rucker, Alabama**

8 NOV 96

**LESSON OUTLINE**

**HEAT INJURY PREVENTION**

**TERMINAL LEARNING OBJECTIVE:** While serving as an Unit Safety Officer, the student will become familiar with the information and instructions to assist commanders and supervisors in the prevention of heat injuries IAW AR 40-5, FM 21-10-1 and FM 1-301.

**SAFETY CONSIDERATIONS:** None

**TRAINING RISK ASSESSMENT CODE:** L

**ENVIRONMENTAL CONDITIONS:** None

**ENABLING LEARNING OBJECTIVE:** The student will understand the importance of the prevention of heat injuries IAW AR 40-5.

1. Why heat prevention is important

- a. Combat capability is contingent upon the ability to adapt to the environment. One of the most debilitating environmental factors is the effect of heat stress.
- b. The body can survive only at a narrow range of core temperatures, that is the temperature which is measured deep within the body.
- c. Core temperatures that vary more than 2 or 3 degrees from the normal 98.6 impede mental and physical performance and variations more than 5 or 6 degrees can be fatal.

**ENABLING LEARNING OBJECTIVE:** The student will understand the body's natural mechanisms for releasing heat IAW FM 1-301.

2. How the body releases heat.

- a. Radiation: the transfer of heat from an object of intense heat to an object of lower temperature through space by radiant energy.
- b. Conduction: the transfer of heat from molecule to molecule of adjacent objects.
- c. Convection: the transfer of heat in liquids or gases in which molecules are free to move.
- d. Evaporation: heat loss involves the changing of a substance from its liquid state to its gaseous state.

**ENABLING LEARNING OBJECTIVE:** The student will understand the conditions that influence the body's heat equilibrium IAW FM 21-10-1.

3. The following is a list of factors that influences the body's heat.

- a. Air temperature
- b. Temperature of surrounding objects
- c. Sun's radiant heat
- d. Relative humidity
- e. Air movement
- f. Amount and type of clothing worn
- g. Heat produced by the body from physical activity

**ENABLING LEARNING OBJECTIVE:** The student will understand the three types of heat injuries IAW FM 21-10-1.

4. Types of heat injuries

a. Heat cramps

- (1) Result primarily from excessive salt loss from the body
- (2) Painful cramps of the muscles which may occur following exposure to heat
- (3) The muscles of the arms, legs and of the stomach area are usually involved, the cramps may be severe
- (4) Heat cramps may occur alone or in the presence of heat exhaustion
- (5) Body temperature is normal unless accompanied by heat exhaustion
- (6) Heat cramps can be avoided by acclimation, proper nutrition and hydration

b. Heat exhaustion

- (1) Occurs as the result of excessive salt and water loss
- (2) Soldiers may experience profuse sweating, headaches, tingling sensations in the hands and feet, paleness, difficulty breathing, irregular heart beats, loss of appetite, nausea and vomiting.
- (3) Trembling, weakness, lack of coordination, and a slight clouding of the senses to momentary loss of consciousness complete the classic picture.
- (4) The skin is cool and moist; the pulse rate is rapid (120 to 200 beats per minute) and the blood pressure may be low.
- (5) The oral temperature may be lower than normal in cases where hyperventilation is present.

- (6) Heat exhaustion can be avoided by proper work/rest cycles and maintaining good hydration

**CAUTION**

Individuals suffering from heat exhaustion are “Fragile”; if stressed again too soon, they may have another episode.

c. Heat stroke

- (1) Heat stroke is a medical emergency and the death rate is high
- (2) Heat stroke results when the heat regulatory mechanism stops functioning and the main avenue of heat loss (cooling by evaporation of sweat) is blocked
- (3) Early signs of heat stroke include headache, dizziness, delirium, weakness, nausea, vomiting and excessive warmth. Sweating may or may not be present
- (4) A casualty may first progress through heat cramps or heat exhaustion. The onset of heat stroke may occur quite suddenly with collapse and loss of consciousness. Coma and convulsions may occur. In the early stage, the skin is usually hot, red and dry. Even though the casualty may sweat, he or she could still have heat stroke.
- (5) The most significant sign is a high body temperature, over 106 degrees F or 41 degrees C
- (6) The casualty’s condition deteriorates rapidly, therefore treatment must begin immediately
- (7) Heat stroke can be avoided by proper work/rest cycles and maintaining full hydration

**CAUTION**

One attack of heat stroke makes the casualty susceptible to a second attack. Therefore, the individual should avoid a second exposure to hot weather conditions. The individual remains very susceptible to repeated heat injuries.

**ENABLING LEARNING OBJECTIVE:** The student will understand the requirements for administering first aid to heat casualties IAW FM 1-301 and GTA 8-5-50

5. First aid for heat injuries

a. Heat cramps and heat exhaustion

- (1) Move soldier to a shady area and loosen clothing if possible
- (2) Slowly give large amounts of cool water
- (3) Pour water on soldier and fan if it is a very hot day
- (4) Elevate soldier’s legs for heat exhaustion

(5) Watch soldier and if possible the soldier should not participate in strenuous activity for the remainder of the day

(6) Get medical help if symptoms continue

b. Heat stroke

(1) Lower the casualty's body temperature ASAP. Move soldier to shady area and loosen clothing if possible and pour or immerse in water.

(2) Elevate soldier's legs.

(3) Have the soldier drink water if possible.

(4) Get medical help.

**ENABLING LEARNING OBJECTIVE:** The student will understand the predisposing factors that influence heat injuries IAW FM 21-10-1.

6. Predisposing factors that influence heat injuries

a. Individuals who are unacclimatized are much more likely to be injured. In individuals who live in a cool climate do not handle heat stress well. In fact, a person who is acclimatized to heat and moves to a cool area loses most of the acclimatization to heat after 1 month.

NOTE: Full heat acclimatization takes 7-14 days, at least 2 hours a day of carefully supervised exercise in heat.

b. Overweight and fatigue impair the body's ability to lose heat. It takes work on part of the body to lose heat and an already tired body cannot do this well.

c. Heavy meals and hot foods put unnecessary stress on the body. Hot meals add heat which must be eliminated. Heavy meals direct blood flow to the digestive tract.

d. Alcohol and drugs influence heat injuries. Alcoholic beverages, especially amounts resulting of hangovers, will decrease the ability of the body to deal effectively with heat stress. Drugs which inhibit sweating such as atropine, antihistamines, some tranquilizer, cold medicines and some antidiarrheal medications markedly impair heat loss when temperatures are high.

e. Fever increases the amount of heat to be dissipated by the body. Fever is usually the result of disease processes, but can be induced by man. Many of the immunizations which are administered produce fevers.

f. Tight clothing is detrimental to heat loss from the body. Clothing should be loose so as not to restrict circulation or impede movement of air over the skin.

NOTE: Uniforms should be worn to protect against the sun. Use hats, head cloths, eye protection and sunscreen to protect areas exposed to the sun. Make sure clothing is loose around the neck, wrists, waist and lower legs to allow circulation.

**ENABLING LEARNING OBJECTIVE:** The student will understand the actions necessary to prevent heat injuries IAW FM 21-10-1.

7. Preventing heat injuries

a. Replace water loss frequently. The human body is highly dependent on water to cool itself in a hot environment. By sweating, a person may lose more than 1 quart of water per hour. If these water losses are not replaced the ability to work rapidly decreases and the body temperature rises.

b. Drink small amounts of water throughout the work time regardless of thirst. Normal thirst does not serve as a true indication of the body's need for water.

c. Use the heat injury prevention chart as a guide to estimate the drinking water requirements for exposure to heat.

d. Provide adequate water at all times. We can't learn to do without water. We can't be taught to adjust to decrease water intake. We cannot live or work in heat without sufficient water.

e. Maintain acclimatization on a person who has completed 2 weeks of progressively increased physical activities in a high heat stress environment.

(1) Limit intensity and time of training programs for those soldiers who are climatically and/or physically unseasoned to heat.

(2) Begin acclimatization to heat with the first exposure.

(3) Continue acclimatization with two 50 minute periods daily.

(4) Once acclimatized, the soldier will retain his adaptation for 1 week after leaving the hot environment. If not exposed to work in high temperatures, the acclimatization will decrease at a variable rate; most is lost in a month.

f. Maintain good physical condition. The general physical condition of the individual has a significant bearing on the reaction to heat stress.

(1) An individual's risk to heat may be increased by a number of conditions. These conditions include infections, fever, immunization reactions, heat rash, sunburn, fatigue, overweight and prior heat stroke.

g. Establish a good work/rest schedule. Work schedules must be tailored to fit the climate, the physical condition of personnel and the military situation.

(1) Take advantage of cooler hours to accomplish the work.

(2) Slowly increase exposure to heat as personnel become acclimatized.

(3) Avoid working in direct sunlight if possible

(4) Use the heat injury prevention chart as guide.

NOTE: During midday period personnel should rest and stay in the shade as much as possible since peak wet bulb globe temperature conditions between 1200 and 1600 hours.

#### **CAUTION**

Heat casualties may be expected at wet bulb globe temperature indices of 75 degrees F and above unless preventive measures are used. Overexertion can cause heat injuries at even lower temperatures, especially if body armor or vapor-impermeable protective clothing is worn.

h. Protect yourself from the environment with proper clothing.

(1) Except when exposed to the sun's rays, an individual in a hot environment should wear the least allowable amount of clothing.

(2) Clothing should be loose fitting to allow air to move over skin.

(3) Obtain the WBGT index from preventive medicine or the meteorological service.

(4) Add 10 degrees to the WBGT indication when wearing body armor or mission oriented protective posture (MOPP).

## **SUMMARY**

8. Review of main points

a. We discussed the three types of heat injuries; heat cramps, heat exhaustion and heat stroke.

b. We discussed the factors that influence heat injuries. Although nothing can be done to control the climate or weather in which you must function, much can be done to prevent the harmful effects and subsequent deterioration of performance.

c. We discussed successful measures to prevent heat injuries which involve;

(1) Procedures to alert yourself to the dangers of heat stress.

(2) Preventative measures.

(3) techniques to increase the resistance of exposure to heat.