



# DEHYDRATION





# OVERVIEW



- Predisposing Factors
- Signs and Symptoms
- Treatment
- Preventive Measures
- Hyponatremia



# LEARNING OBJECTIVES



Please read your

## Terminal Learning Objectives

and

## Enabling Learning Objectives



FMST

Dehydration



# INTRODUCTION



- Water
  - 45 -70% of body weight
  - Used to carry out normal functions
    - Respiration
    - Elimination of waste
    - Lubrication
    - Regulate body temp



# INTRODUCTION



- Excessive changes in the normal body water balance alter homeostasis
- Vital organs cannot function properly without the correct amount of water and sodium



# PREDISPOSING FACTORS

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# PREDISPOSING FACTORS



- Alcohol consumption
- Medications
- High BMI / Low Fitness Level
- Inadequate diet
- Improper clothing





# PREDISPOSING FACTORS



- Medical conditions
- Age
- Fatigue / lack of sleep
- Improper acclimatization



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# SIGNS AND SYMPTOMS



# SIGNS AND SYMPTOMS



- Mild to moderate dehydration:
  - Fatigue
  - Headache
  - Decreased heat tolerance
  - Cognitive deterioration
  - Reduction in strength and physical capacity



# SIGNS AND SYMPTOMS



- Other common S/Sx:
  - Less frequent urination/dark color urine
  - Thirst
  - Lightheadedness
  - Dry skin
  - Decreased turgor



# SKIN TURGOR





# SIGNS AND SYMPTOMS



- Other common S/Sx (cont):
  - Dizziness
  - Confusion
  - Dry mouth and mucous membranes
  - Increased heart rate and breathing



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Dehydration





# TREATMENT

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Dehydration



# TREATMENT



- Identify and treat the cause
- Assess the level of dehydration based on the signs and symptoms
- Re-hydrate:
  - Mild: Oral hydration (If able to tolerate)
  - Moderate and Severe: IV Fluid Replacement
- Do not over hydrate



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Dehydration



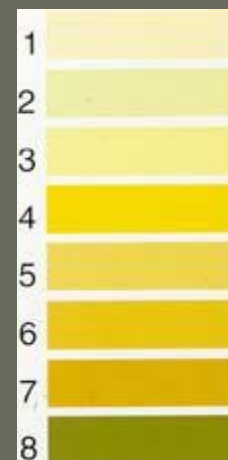
# PREVENTIVE MEASURES



# PREVENTIVE MEASURES



- Before activities
  - Drink extra fluids to produce straw colored urine
- During activities
  - Several fluid breaks per hour
  - 1 qt per hour
  - No more than 1.5 liter per hour





# PREVENTIVE MEASURES



- Maintain a balanced diet
  - MRE's are formulated to provide important electrolytes and other nutrients





# PREVENTIVE MEASURES



- Avoid diuretic beverages
  - Minimize consumption of alcohol, coffee, tea and caffeinated beverages
- Educate troops
  - Key to prevention
  - Eliminate myths



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Dehydration





# HYPONATREMIA



# HYPONATREMIA



- Hyponatremia is a low sodium level in the blood and can occur when
  - Sodium and water is lost from sweat
  - Excessive water intake = over dilution of sodium in the blood
- Disturbs the osmotic balance and can cause a rapid influx of water into the brain



# HYPONATREMIA



- Signs / Symptoms

- Headache

- Seizures

- Malaise

- Coma

- Nausea

- Permanent brain damage

- Confusion/Mental status changes

- Death



# HYPONATREMIA



- Risk Factors:
  - Exercise duration of greater than 4 hours
  - Low body weight
  - Overhydration
  - NSAID use
  - Extreme hot or cold environments



# HYPONATREMIA



- Treatment:
  - Recognize the disorder and determine severity
  - Mild symptoms
    - Observe
  - Symptomatic
    - Place in an upright position
    - TACEVAC
    - Only treated by an MO



# HYPONATREMIA



- Prevention:
  - Education
  - Do not restrict sodium intake
  - Do not rely solely on water



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Dehydration



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Dehydration





# ENVIRONMENTAL HEAT INJURIES





# OVERVIEW



- Predisposing Factors
- Types of Heat Injuries
- Methods of Cooling the Body
- Preventive Measures
- Flag Warning System



# LEARNING OBJECTIVES



Please read your

## Terminal Learning Objectives

and

## Enabling Learning Objectives





# BACKGROUND



- High internal temperatures can produce stress on the body
- If not counterbalanced, these high body temperatures can produce injury or death
- Heat injuries can occur anywhere, but are more frequent in warm weather due to high temperatures, humidity and sunlight



# BODY TEMPERATURE REGULATION



- Hypothalamus
  - Regulates the body's CORE temperature, not surface temperature
  - Can tell the body to either:
    - Conserve heat
    - Dissipate heat by increasing RR, cardiac output, vasodilation and perspiration
- Normal Range
  - 97.6°-99.6°F



# Predisposing Factors Associated with Heat Injuries



# PREDISPOSING FACTORS



- Chronic Conditions:
  - Fitness and Body Mass Index
    - Low levels of physical fitness reduce heat tolerance
  - Age
    - Thermoregulatory capacity and heat tolerance diminish with age





# PREDISPOSING FACTORS



- Chronic Conditions (cont):
  - Medical Conditions
    - Diabetes, thyroid disorders, renal disease increase the risk for heat intolerance and injury
    - Cardiovascular disease and circulatory problems are aggravated by heat exposure
  - Previous History of Heat Injury
    - May cause permanent damage to the hypothalamus



# PREDISPOSING FACTORS



- Chronic Conditions (cont):
  - Skin Trauma
    - Hampers the heat regulatory mechanism
    - Sunburn, heat rash, windburn, dermatologic disease
  - Medications
    - Increase metabolic heat production
    - Suppress body cooling
    - Reduce cardiac reserve
    - Alter electrolyte and fluid balance



# PREDISPOSING FACTORS



- Transient Conditions
  - Poor acclimatization
  - Illnesses
    - Colds
    - Fever
    - Vomiting
    - Diarrhea







# TYPES OF HEAT INJURIES



# HEAT CRAMPS



- Definition:
  - Short-term, painful muscle contractions
  - Frequently seen in the calf muscles and voluntary muscles of the abdomen and extremities





# HEAT CRAMPS



- Cause:
  - Prolonged physical activity in hot climates
  - Muscle fatigue
  - Body water loss
  - Sodium loss





# HEAT CRAMPS



- Signs/Symptoms:
  - Muscle cramps and tenderness
  - Skin is usually moist, pale, warm
  - Normal or slightly elevated core temp







# HEAT CRAMPS



- Treatment:
  - Rest in cool environment
  - Prolonged stretching
  - Consume oral fluids and foods containing sodium
    - Electrolyte pouches, sports drinks, salty snacks





# HEAT EXHAUSTION



- Definition:
  - Most common heat related disorder
  - Systemic reaction to prolonged heat exposure





# HEAT EXHAUSTION



- Cause:
  - Results from cardiac output that is insufficient to support the increased circulatory load caused by
    - Competing blood flow
    - Reduced plasma volume
    - Sweat-induced depletion of salt and water



# HEAT EXHAUSTION



- Signs/Symptoms:
  - Frontal headache
  - Decreased urine output
  - Drowsiness
  - Nausea/Vomiting
  - Light-headedness
  - Fatigue



# HEAT EXHAUSTION



- Signs/Symptoms (cont):
  - Anxiety
  - Irritability
  - Decreased coordination
  - Orthostatic hypotension
  - Moist, pale, clammy skin
  - Rectal temp usually below 104°F



# HEAT EXHAUSTION



- Treatment:
  - Move to a cool location
  - Loosen or remove clothing
  - Assess vital signs
  - Oral rehydration preferred
  - Active cooling
  - Transport if patient is unconscious or does not recover rapidly





# HEAT STROKE



- Definition:
  - **A TRUE MEDICAL EMERGENCY**
  - Can cause irreversible brain damage and death



# HEAT STROKE



- Cause:
  - Impaired heat loss mechanisms
  - Total failure of the thermoregulatory mechanism causing excessive rise in body temperature





# HEAT STROKE



- Signs/Symptoms:
  - Elevated core temperature of 104° F or greater
  - Mental status changes
    - Confusion
    - Disorientation
    - Combativeness
    - Unconsciousness



# HEAT STROKE



- Classic Heatstroke
  - Children, the elderly and sick patients
  - Dry, hot, red skin
- Exertional Heatstroke
  - Typically seen in men 15-45
    - Poor physical fitness
    - Lack of acclimatization
    - Involved in short-term, strenuous physical activity
    - Hot, humid environment
  - Sweat-soaked and pale skin at the time of collapse



# HEAT STROKE



- Treatment
  - Primary goal is to reduce core temp
  - Remove patient from heat
  - Immediately begin cooling patient
    - Active cooling should stop when the rectal temp reaches 102.2°F
  - Maintain ABC's
  - Monitor core temp every 5-10 minutes



# HEAT STROKE



- Treatment (cont)
  - Oral fluids if conscious
  - Unconscious Gain IV Access
    - 500 ml, no more than 1-2 liters
    - Vigorous fluid therapy may develop pulmonary edema
  - TACEVAC ASAP





# METHODS OF COOLING THE BODY



# MEHTODS OF BODY COOLING



- Immersion (Conduction):
  - Fastest method of cooling
  - Immerse patient in ice water
  - Not readily available in a field environment
  - Requires constant monitoring



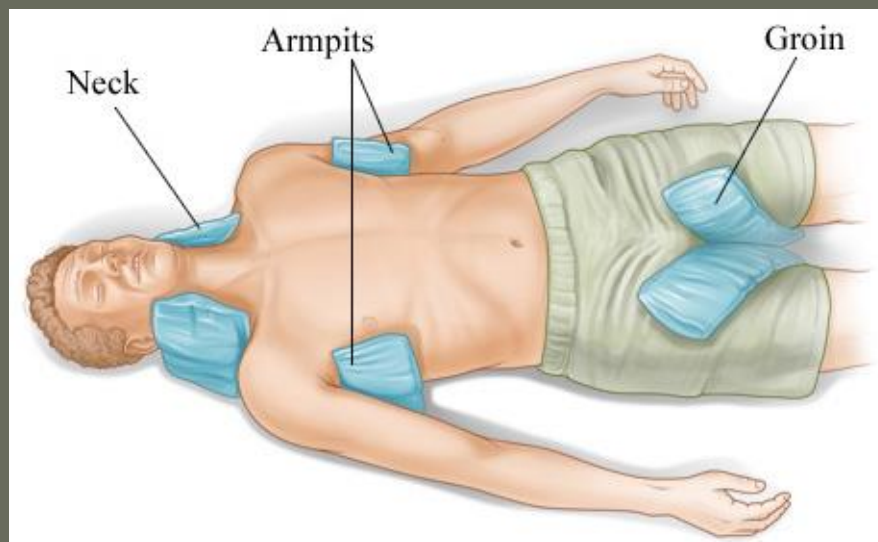
# MEHTODS OF BODY COOLING



- Direct Cooling

- Apply ice packs on head, trunks and extremities

- Place ice water towel/sheets over casualty







# MEHTODS OF BODY COOLING



- Room Temperature Water Misting
  - Remove clothing and wet the pt down
  - Fan the skin to cause evaporation and convective heat loss
  - Advantages
    - Fast method
    - Requires minimal monitoring
    - No cold or ice water necessary
    - Can treat multiple casualties at once





# Preventive Measures



# PREVENTIVE MEASURES



- Educate Personnel
  - Most important prevention measure
- Physical conditioning and health
  - Poor health and conditioning increases susceptibility





# PREVENTIVE MEASURES



- Proper water intake
  - Drink liberal amounts of water (especially in hot weather)
  - Replace electrolytes by eating an adequate diet
- Proper acclimatization
  - 2 to 4 weeks (3 weeks optimal)
  - Gradual introduction to PT



# PREVENTIVE MEASURES



- Proper clothing
  - Wear least amount possible
  - Avoid skin exposure to sunlight
  - Clothing should be loose fitting
  - NO STARCH of field uniforms
- Work Schedules
  - Tailor work schedules around the climate and type of work





# Heat Condition Flag Warning System





# HEAT CONDITION FLAG WARNING SYSTEM



- Wet Bulb Globe Temperature (WBGT) index considers
  - Humidity
  - Air temperature
  - Radiant heat temperature





# HEAT CONDITION FLAG WARNING SYSTEM



- Color coded flag warning system:
  - White
  - Green
  - Yellow
  - Red
  - Black
- Flags should be displayed at all commands



# FLAG WARNING SYSTEM

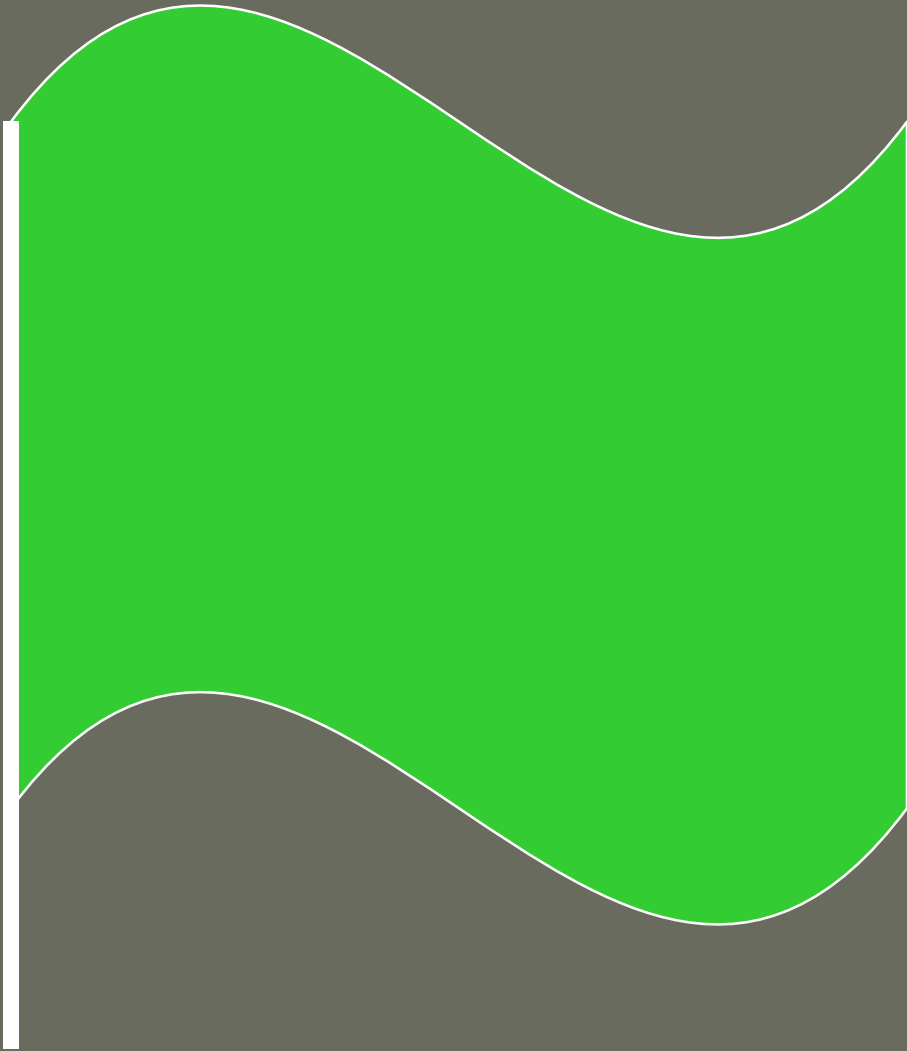


- White Flag:
  - WBGT 78 – 81.9° F
  - Caution must be taken





# FLAG WARNING SYSTEM



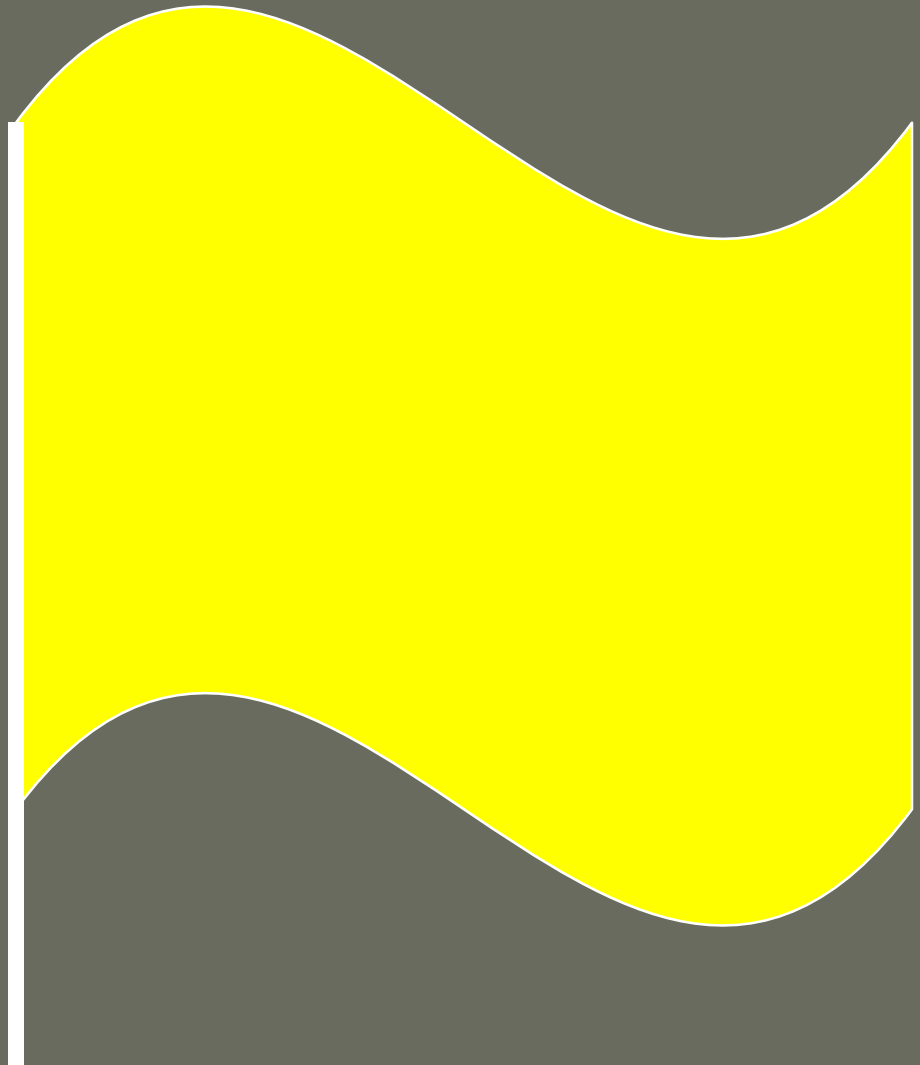
- Green Flag:
  - WBGT Index 82° - 84.9° F
  - Heavy exercise conducted with caution



# FLAG WARNING SYSTEM

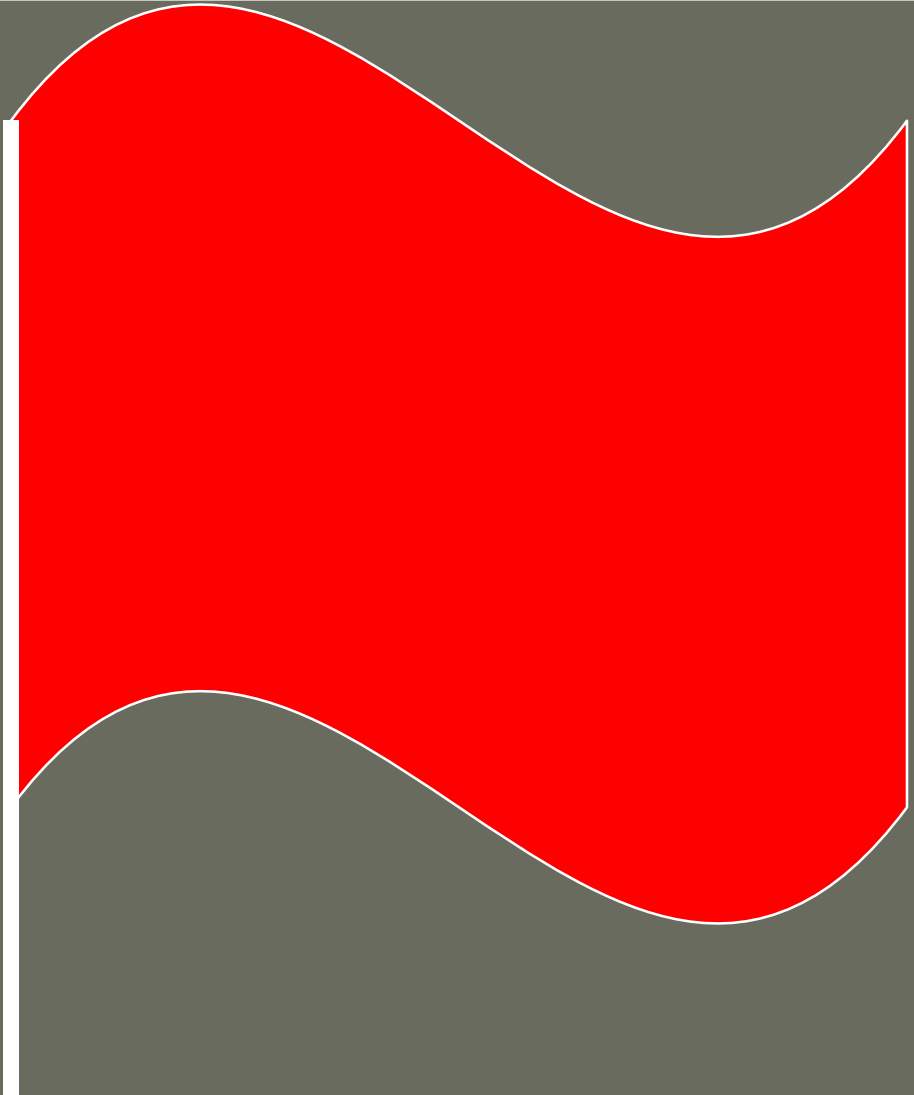


- Yellow Flag
  - WBGT Index 85°-87.9° F
  - Avoid strenuous exercise for unacclimatized troops
  - Avoid classes in sun





# FLAG WARNING SYSTEM



- Red Flag:
  - WBGT Index 88° - 89.9° F
  - Suspend PT for unacclimatized troops
  - Limited activity for acclimated troops



# FLAG WARNING SYSTEM



- Black Flag
  - WBGT Index 90°F and above
  - Suspend ALL physical activity for ALL Troops



Easy Work

Moderate Work

Hard Work

- Weapon Maintenance
- Walking Hard Surface at 2.5 mph, <30 lb Load
- Marksmanship Training
- Drill and Ceremony
- Manual of Arms

- Walking Loose Sand at 2.5 mph, No Load
- Walking Hard Surface at 3.5 mph, <40 lb Load
- Calisthenics
- Patrolling
- Individual Movement Techniques, i.e., Low Crawl or High Crawl
- Defensive Position Construction

- Walking Hard Surface at 3.5 mph, ≥ 40 lb Load
- Walking Loose Sand at 2.5 mph with Load
- Field Assaults

Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)
1	78° - 81.9°	NL	½	NL	¾	40/20 min	¾
2 (GREEN)	82° - 84.9°	NL	½	50/10 min	¾	30/30 min	1
3 (YELLOW)	85° - 87.9°	NL	¾	40/20 min	¾	30/30 min	1
4 (RED)	88° - 89.9°	NL	¾	30/30 min	¾	20/40 min	1
5 (BLACK)	>90°	50/10 min	1	20/40 min	1	10/50 min	1

- The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).
- NL = no limit to work time per hr.
- Rest = minimal physical activity (sitting or standing) accomplished in shade if possible.
- CAUTION: Hourly fluid intake should not exceed 1½ qts. Daily fluid intake should not exceed 12 qts.
- If wearing body armor, add 5°F to WBGT index in humid climates.
- If doing Easy Work and wearing NBC (MOPP 4) clothing, add 10°F to WBGT index.
- If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add 20°F to WBGT index.







# ENVIRONMENTAL HEAT INJURIES





# ENVIRONMENTAL COLD INJURIES





# OVERVIEW



- Risk Factors
- Types of Cold Injuries
- Stages of Hypothermia
- Treatment of Hypothermia
- Preventive Measures



# LEARNING OBJECTIVES



## Please Read Your Terminal and Enabling Learning Objectives





# BACKGROUND



- Hannibal lost over 20,000 men crossing the Alps
- Napoleon's retreat from Russia
- Trench foot during World War I
- 13,970 US deaths from 1978 - 1998 from hypothermia



# BACKGROUND



- Cold injuries are:
  - Tissue injuries produced by exposure to cold
  - Dependent upon duration of exposure, humidity, wind, altitude, clothing, medical conditions, and individual behaviors
  - Can occur at nonfreezing and freezing temperatures





# RISK FACTORS



# RISK FACTORS



- Fatigue
  - Slow metabolic rate
  - Inability to increase activity
  - May cause apathy leading to neglect of cold weather protection principles





# RISK FACTORS



- Age/Rank
  - Military personnel from 17-25 yrs of age
  - Front line troops who experience the most exposure
  - Higher ranks have more experience, less exposure and are receptive to training





# RISK FACTORS

- Nutrition

- Poor nutrition or incomplete meals contribute to cold injuries

- Eat a well balanced diet





# RISK FACTORS



- Discipline/Training/Experience
  - Well disciplined/trained personnel are better able to care for themselves:
    - Personal hygiene
    - Care of feet
    - Changing clothes
    - Practicing protection principles



# RISK FACTORS



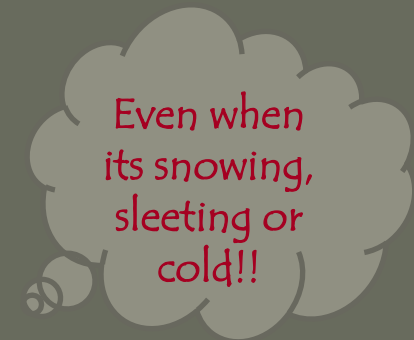
- Race/Geographic origin
  - Dark skinned individuals are more susceptible to cold related injuries
    - Greater susceptibility of pigmented cells to freeze compared to non-pigmented cells
  - Personnel from warmer regions are also more susceptible



# RISK FACTORS



- Dehydration
  - Occurs easily in cold environments with increased activity
  - Proper fluid hydration is necessary





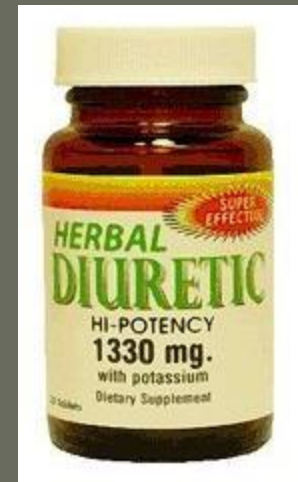
# RISK FACTORS



- Medication

- Avoid medications that cause vasoconstriction, increase urinary output or produce sweating

- Antihistamines, decongestants
- Diuretics
- Psychiatric drugs, BP meds







# RISK FACTORS



- Tobacco/Caffeine
  - Can cause vasoconstriction and poor circulation
- Alcohol
  - Vasodilator
  - Anesthetic properties cause subjects to not feel the cold





# RISK FACTORS



- Environmental Factors
  - Weather
  - Temperature
  - Humidity
  - Precipitation
  - Wind





# RISK FACTORS



## NWS Windchill Chart



		Temperature (°F)																		
		Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	-98

Frostbite Times  30 minutes  10 minutes  5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01



# RISK FACTORS



- Activity



- Over activity increases heat loss through rapid deep breathing and perspiration
- Immobility causes decreased heat production





# TYPES OF COLD INJURIES



# CHILBLAINS (PERNIO)



- Small, itchy skin lesions
- Appear as red or purple bumps
- Occur on exposed skin surface from chronic cold exposure



# CHILBLAINS



- Caused when cold constricts the small blood vessels
- Re-warming results in the leakage of blood and fluid in the surrounding tissues







# CHILBLAINS



- Symptoms:
  - Usually occur several hours after exposure
  - Appear as nodular plaques
  - Intense pruritus
  - Burning paresthesia





# CHILBLAINS

- Treatment:
  - Supportive in nature
  - Gently re-warm
  - Wash and dry affected area
  - Apply a dry, soft sterile bandage





# SNOW BLINDNESS



- Ultraviolet burns to the skin and eyes
- Caused from exposure to bright reflections
- Corneal burns can occur within an hour but do not become apparent for 6 -12 hrs



# SNOW BLINDNESS



- Signs / Symptoms:

- Excessive tearing

- Pain

- Redness

- Swollen eye lids

- Photophobia

- Blurred vision

- Headache

- Gritty sensation in the eyes





# SNOW BLINDNESS



- Treatment:
  - Prevent further exposure (e.g. sunglasses) or patch affected eye
  - Oral analgesics
  - DO NOT use steroid medication on eyes
    - Corneal Ulcerations
    - Corneal Perforation
  - TACEVAC if needed





# FROSTBITE



- Freezing of fluids in the skin and subcutaneous tissues
- Ice crystal form, expand and cause damage to surrounding tissue
- Affects hands, fingers, feet, toes and male genitalia





# FROSTBITE



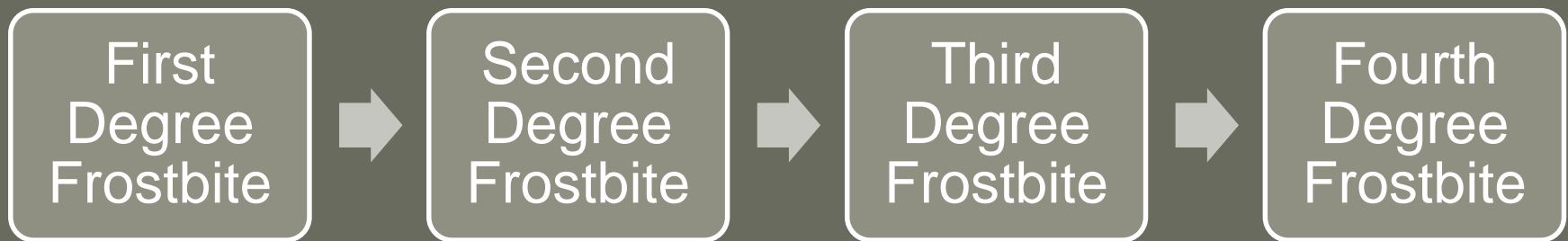
- Cause:
  - Exposure to temperatures below 28°F (-2°C)
  - Exposure time necessary to produce damage varies based on:
    - Wind velocity
    - Air temperature





# FROSTBITE

- Classified by depth of injury and clinical presentation
- Many cases will not be known for 24-72 hours







# FROSTBITE



- 1<sup>st</sup> Degree:
  - Epidermal, limited to brief contact
  - Skin appears white or yellowish
  - No blister or tissue loss
  - Thaws quickly, feels numb and appears red
  - Healing occurs in 7-10 days





# FROSTBITE



- 2<sup>nd</sup> Degree
  - Involves all epidermis and superficial dermis
  - Tissue feels stiff but gives way to pressure
  - Blisters contain clear or milky fluid
  - Surrounded by erythema and edema
  - No permanent loss of tissue
  - Healing occurs in 3-4 weeks





# FROSTBITE



- 3<sup>rd</sup> Degree
  - Involves epidermis and dermis
  - After thawing, skin will have blood blisters
  - Slow loss of skin
  - Healing is slow





# FROSTBITE



- 4<sup>th</sup> Degree
  - Full thickness through dermis with muscle and bone involvement
  - No mobility, passive movement after thawing
  - No blister, but will see early signs of necrotic tissue
  - Auto amputation





# FROSTBITE



- Treatment (Superficial Frostbite):
  - First and Second Degree
  - Place affected area against warm body surface





# FROSTBITE



- Treatment (Deep Frostbite):

- Third and Fourth Degree

- Move to warm shelter
    - Thaw in warm water if delayed transport
    - Cover with loose, dry sterile dressing
    - Separate fingers and toes with cotton



# FROSTBITE



- Treatment (Deep Frostbite):
  - Provide pain meds as needed
  - Start IV (250ml bolus warm saline)
  - TACEVAC ASAP





# FROSTBITE



- **DO NOT:**
  - Re-warm if there is a possibility of re-freezing
  - Drain blisters
  - Use ointments
  - Rub with snow
  - Give alcohol or tobacco
  - Allow casualty to walk on affected feet
  - Use direct heat greater than 102°F







# HYPOTHERMIA



# HYPOTHERMIA



- Definition:
  - A systemic, non-freezing cold injury in which the body's core temperature falls below 95°F
  - The body is unable to generate sufficient heat production
  - Inadequate clothing and physical exhaustion contribute to heat loss
  - Can occur in hot and cold climates



# HYPOTHERMIA



- Causes:
  - Prolonged exposure to cold and/or wet conditions
  - Inadequate protection/clothing
  - Dehydration and/or poor nutrition
  - Poor physical conditioning
  - Resuscitation with cold fluids



# STAGES OF HYPOTHERMIA



- Mild Hypothermia
  - Core temp above 93°F to below 97°F
  - Casualty shivering
    - Body's main mechanism to generate heat
  - Altered LOC
    - Confusion
    - Slurred speech
    - Altered gait
    - Clumsiness



# STAGES OF HYPOTHERMIA



- Mild Hypothermia (cont)
  - Body will attempt to generate heat by increasing
    - Heart rate
    - Blood pressure
    - Cardiac output
  - Respiratory rate increases



# STAGES OF HYPOTHERMIA



- Moderate Hypothermia
  - Core temp between 86°F to 93°F
  - Patient may not complain of being cold
  - Shivering will be absent
  - LOC greatly diminished
  - Paradoxical undressing
  - Cardiac dysrhythmias



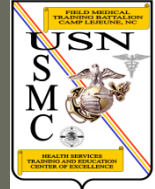
# STAGES OF HYPOTHERMIA



- Severe Hypothermia
  - Core temp below 86°F
  - Unconscious
  - Does not respond to pain
  - Vital signs barely or non-detectable







# TREATMENT OF HYPOTHERMIA



# TREATMENT OF HYPOTHERMIA



- Treatment:

**A PATIENT IS NOT  
DEAD UNTIL THEY ARE  
WARM AND DEAD**

- Move casualty to warm shelter
- Remove wet clothing
- Loosen / remove constrictive clothing



# TREATMENT OF HYPOTHERMIA



- Warm Casualty
  - Cover head and body with warm blankets
  - Inhalation of warmed oxygen if available
  - Warm water bath (100-108°F)
  - Hot, sweet drinks if conscious





# TREATMENT OF HYPOTHERMIA



- Treatment (cont)
  - Monitor vital signs
  - Monitor core temperatures
  - Warm IV solutions
  - TACEVAC





# PREVENTIVE MEASURES



# PREVENTIVE MEASURES



- EDUCATION
  - NUMBER ONE PREVENTIVE MEASURE
  - Prevention depends on education of troops and leaders
- ACTIVITY LEVELS
  - Maintain steady constant rate of work
  - Quick bursts of activity should be avoided





# PREVENTIVE MEASURES



- BUDDY SYSTEM
  - Train troops to observe each other
  - Train troops how to re-warm each other





# PREVENTIVE MEASURES



- The Marine Corps uses “COLD” as a standard acronym to describe cold weather protection principles.



# PREVENTIVE MEASURES



- **C**OLD
  - Keep clothing **C**LEAN
    - Oily and dirty clothing quickly loses its insulating effects



# PREVENTIVE MEASURES



- COLD
  - Avoid OVERHEATING
    - Over dressing and overexertion can produce dehydrated personnel and wet clothing





# PREVENTIVE MEASURES



- COLD
  - LAYER correctly
    - Clothes should be loose to trap air between layers, which produces the insulating effect necessary for survival in the cold



# PREVENTIVE MEASURES



- COLD
  - Keep clothing DRY
    - If clothing becomes wet, so does the skin, which will promote cooling and frostbite.
    - Change wet clothing at the first opportunity







# ENVIRONMENTAL COLD INJURIES







# PERFORM CARE OF THE FEET





# OVERVIEW



- Anatomy
- Common Types of Foot Disorders
- Preventive Measures



# LEARNING OBJECTIVES



# Please Read Your Terminal and Enabling Learning Objectives





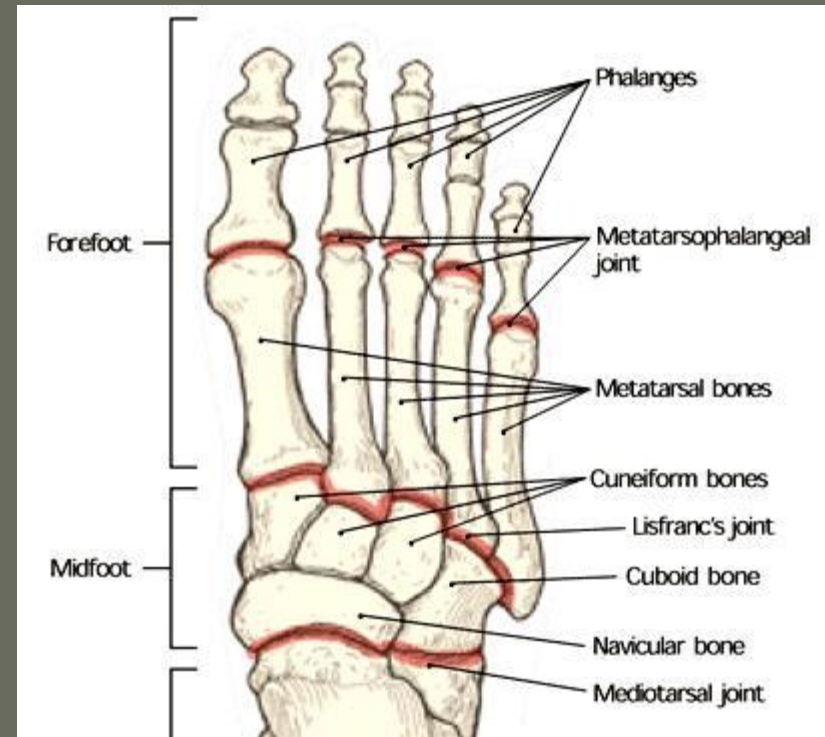
# ANATOMY OF THE FOOT



# ANATOMY OF THE FOOT



- Forefoot
  - Five phalanges
  - Five metatarsals
- Midfoot
  - Three cuneiform bones
  - Cuboid bone
  - Navicular bone

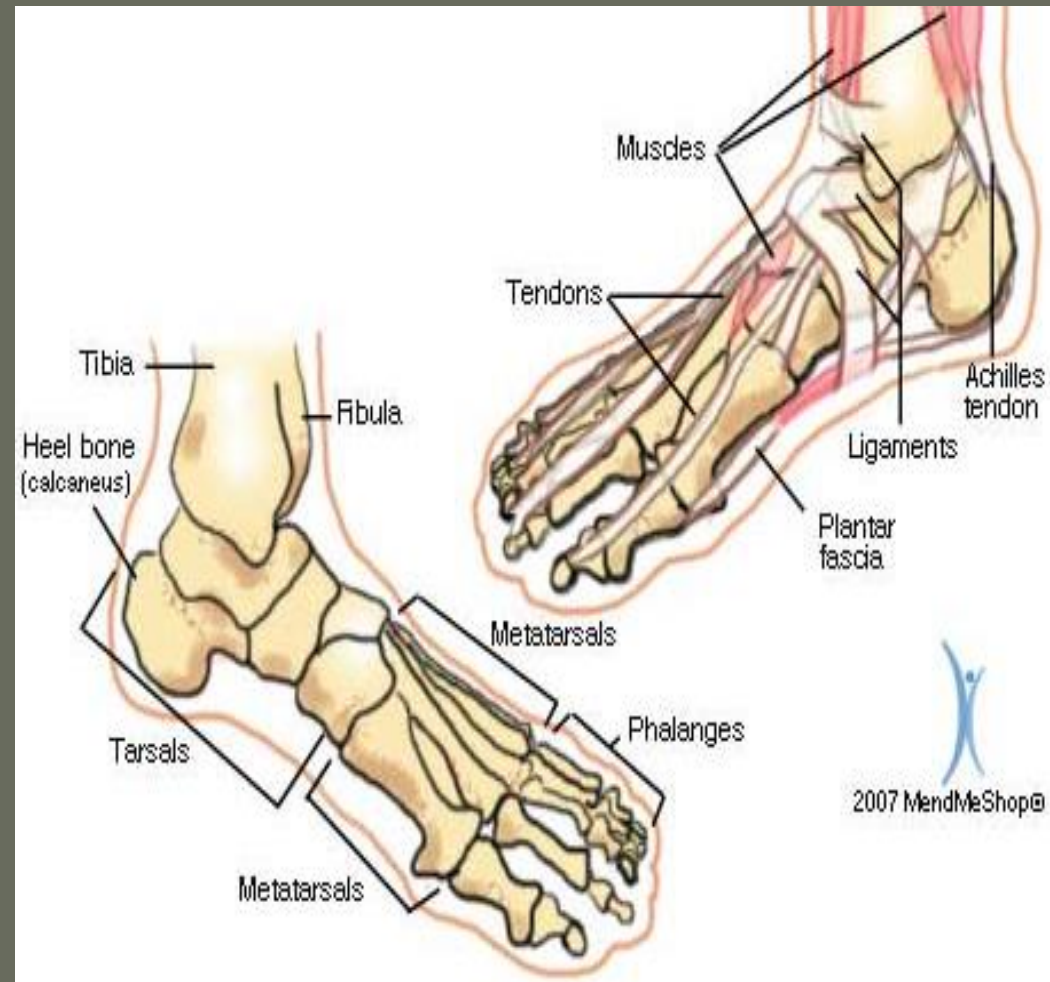




# ANATOMY OF THE FOOT



- Hindfoot
  - Talus bone
  - Calcaneus bone
- Muscles
- Tendons
  - Achilles
- Joints









# COMMON FOOT DISORDERS



# BLISTERS



- Definition
  - Pocket of fluid under the skin
- Causes
  - Improperly conditioned feet
  - Heat/Moisture
  - Improperly fitting boots and or socks
  - Friction/Pressure





# BLISTERS



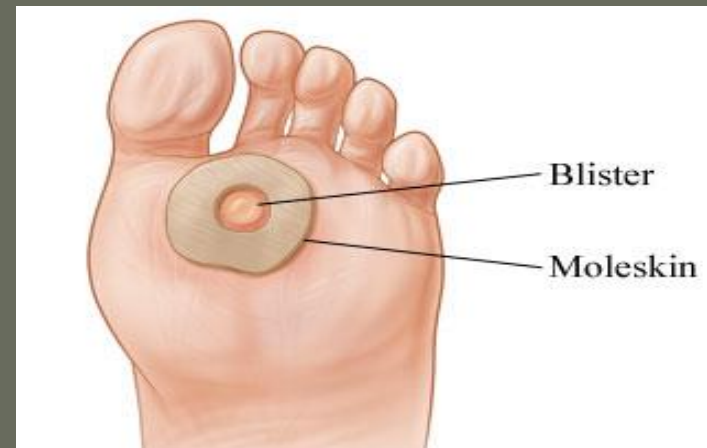
- Signs and Symptoms
  - Fluid collection under the skin
  - Mild edema and erythema
  - Sloughing of tissue
  - Localized discomfort



# TREATMENT OF BLISTERS



- Small Blisters
  - Clean area with soap and water
  - Monitor for signs and symptoms of infection
  - Apply protective moleskin if necessary to prevent irritation





# LARGE (CLOSED) BLISTERS



- If Affecting Individual's Gait:
  - Wash area with Betadine or alcohol
  - Drain near edge of blister
  - Apply gentle pressure to expel any fluid
  - Apply moleskin donut, with Tincture of Benzoin
  - DO NOT apply adhesive directly on blister
  - Use foot powder
  - Monitor for signs and symptoms of infection



# TREATMENT OF LARGE (OPEN) BLISTERS



- Wash with Betadine or soap/water
- Remove loose skin
- Apply Tincture of Benzoin around site
- Moleskin donut with:
  - Topical antibiotic to wound
  - Place Telfa pad inside moleskin donut
  - 2nd layer of moleskin over entire area
- Monitor for signs of infection



# BLISTER KIT



**MOLESKIN** →

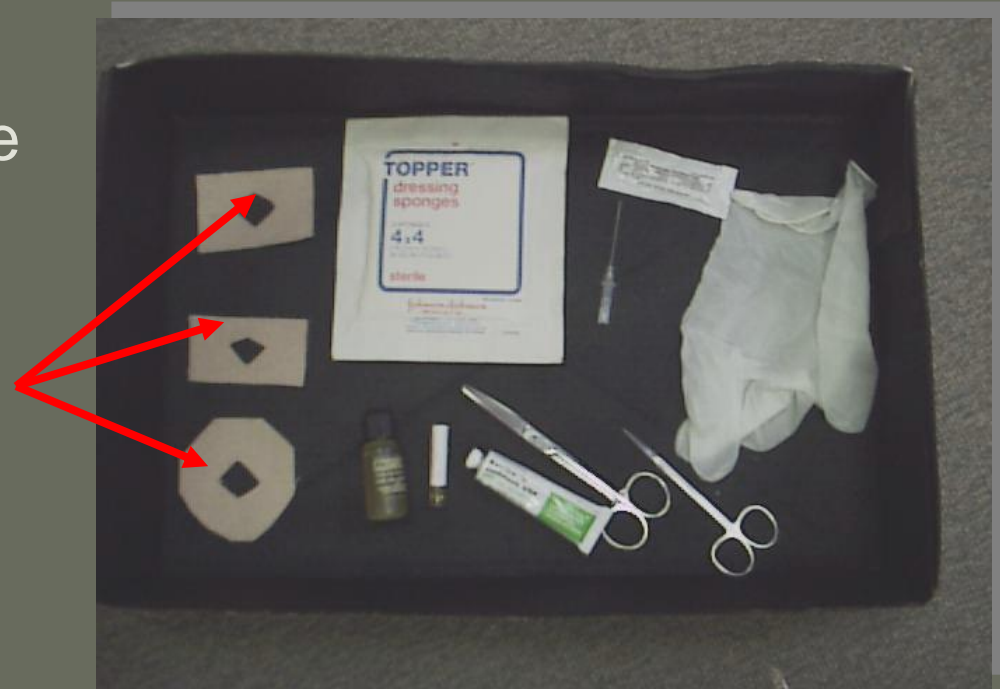




# HOW TO APPLY MOLESKIN DONUT



- Apply Tincture of Benzoin to skin around blister
- DO NOT put adhesive directly on blister
- Cut hole in moleskin large enough to surround blister and place around blister







# DEMONSTRATION



# ATHLETE'S FOOT (TINEA PEDIS)



- Definition
  - Chronic fungal infection
- Cause
  - Hot humid weather, excessive sweating
  - Contact with contaminated footwear and floors
  - Poor hygiene





# ATHLETE'S FOOT (TINEA PEDIS)



- Signs and Symptoms
  - Skin that is red, flakes, peels, cracks
  - Itching, burning, stinging between toes
  - Sore, purulent, weeping rash



# ATHLETE'S FOOT (TINEA PEDIS)



- Treatment
  - Antifungal powder daily
  - Antifungal ointment at night
  - Treat for 1 week after clearing has occurred
  - Refer to M.O. if unresponsive to treatment





# INGROWN TOE NAIL



- Definition:
  - Nail border or corner presses on surrounding tissue
  - Painful and often results in infection
  - Often affects big toe



# INGROWN TOE NAIL



- Causes

- Most common are improper trimming of the toenails and poor hygiene
- Trauma
- Improperly fitted footwear
- Abnormal shaped nail plate





# INGROWN TOENAIL



- Signs and Symptoms
  - Pain (along margin of toenail)
  - Localized edema
  - Infection
    - Drainage of pus or blood





# INGROWN TOENAIL



- Treatment
  - Trim the corner to relieve pressure
  - Elevate end of nail
  - Surgically correct by partial or complete removal of nail (Under supervision of M.O.)
  - Consider antibiotics



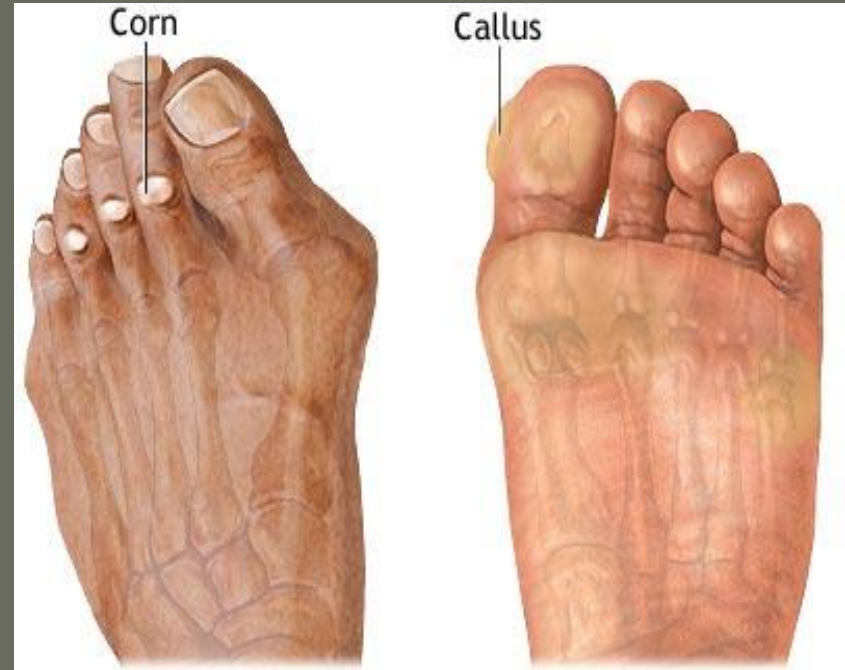




# CORNS AND CALLUSES



- Callus
  - Thickening of the outer layer of skin in response to pressure or friction
- Corn
  - Similar to a callus, involves a discrete pressure spot typically over a bone





# CORNS AND CALLUSES



- Causes
  - Tight fitting shoes
  - Deformed toes
  - Prolonged walking down slopes





# CORNS AND CALLUSES



- Signs and Symptoms
  - Thickened, dry skin over prominent bones (corn)
  - Large patches of thick dry skin on friction areas (calluses)
  - Pain on direct pressure of corns
  - Skin breakdown, possible infection





# CORNS AND CALLUSES



- Treatment
  - Debride excess skin
  - Apply padding
  - Fix cause of corns (Boots)
  - Refer to M.O. if extreme



# BUNIONS



- Definition
  - A bone deformity that causes the tip of toe to turn towards the other toes
- Causes
  - Causes bulge to form at the 1<sup>st</sup> metatarsal head
  - May be hereditary
  - Poorly fitted/excessively worn shoes





# BUNIONS



- Signs and Symptoms



- Thickened lump at base of big toe
- Erythema
- Pain near first metatarsal head
- Joint stiffness



# BUNIONS



- Treatment
  - Comfortable, properly fitted shoes
  - Toe pad or corrective sock
  - NSAIDS
  - Orthotics
  - Surgery for severe cases



# PLANTAR FASCIITIS



- Definition:
  - Inflammation of the connective tissue (fascia) on the sole of the foot
  - AKA heel spurs/ heel bursitis





# PLANTAR FASCIITIS



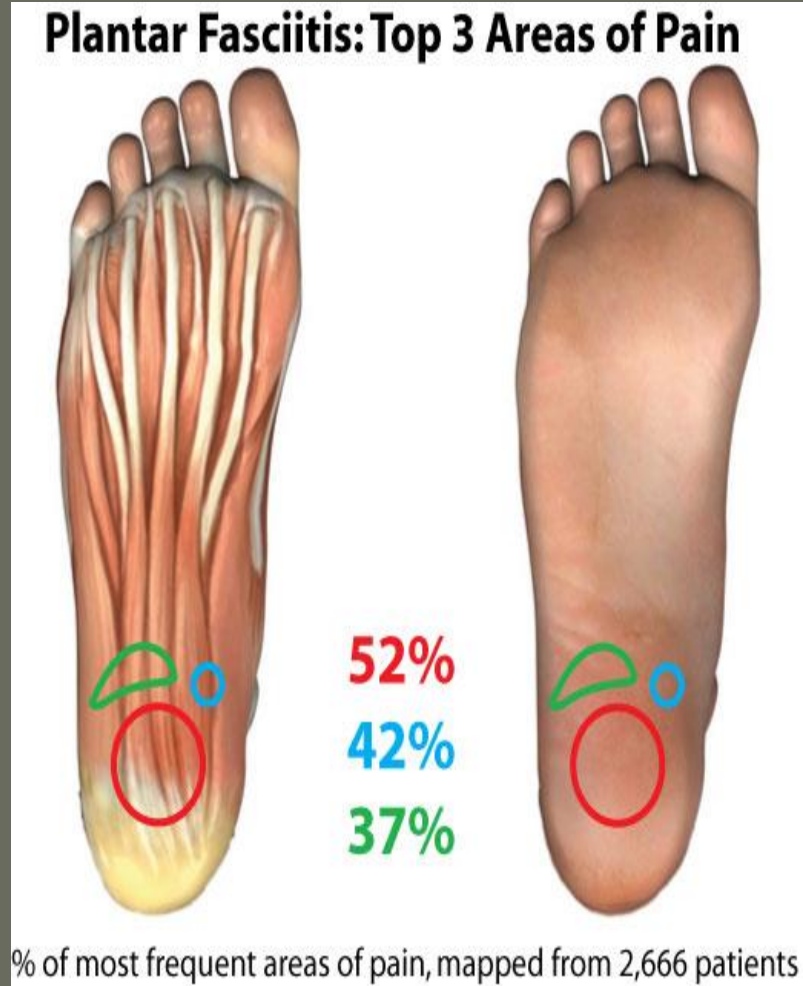
- Cause
  - Overuse or sudden increase in training volume/intensity
  - Abnormal joint mechanics
  - Tightness of Achilles tendon
  - Shoes with poor cushioning
  - Abnormal foot anatomy
  - Obesity, excess weight
  - Improper shoes
  - Bio-mechanical problems (mal-alignment of the heel)



# PLANTAR FASCIITIS



- Signs and Symptoms
  - Tenderness along medial fascia
  - Constant pain (worse in morning and after physical activity)
  - Tearing/pulling sensation
  - Altered gait





# PLANTAR FASCIITIS



- Treatment
  - Stretching Exercises
  - RICE
  - NSAIDS
  - Orthotics





# PLANTAR WARTS



- Definition:
  - Wart located on the sole of the foot
  - Can be single lesion or grouped together
  - Most often found on the ball of the foot and heel



# PLANTAR WARTS



- Cause
  - Human Papilloma Virus (HPV)
- Signs and Symptoms
  - Tiny black dots in center
  - Tender to touch



# PLANTAR WARTS



- Treatment
  - Shave down
  - Apply Salicylic Acid
  - Apply dressing to keep paste in place
  - Apply donut for comfort
  - Leave paste for 3 days
  - Repeat tx in 1 week
  - Refer to MO if needed

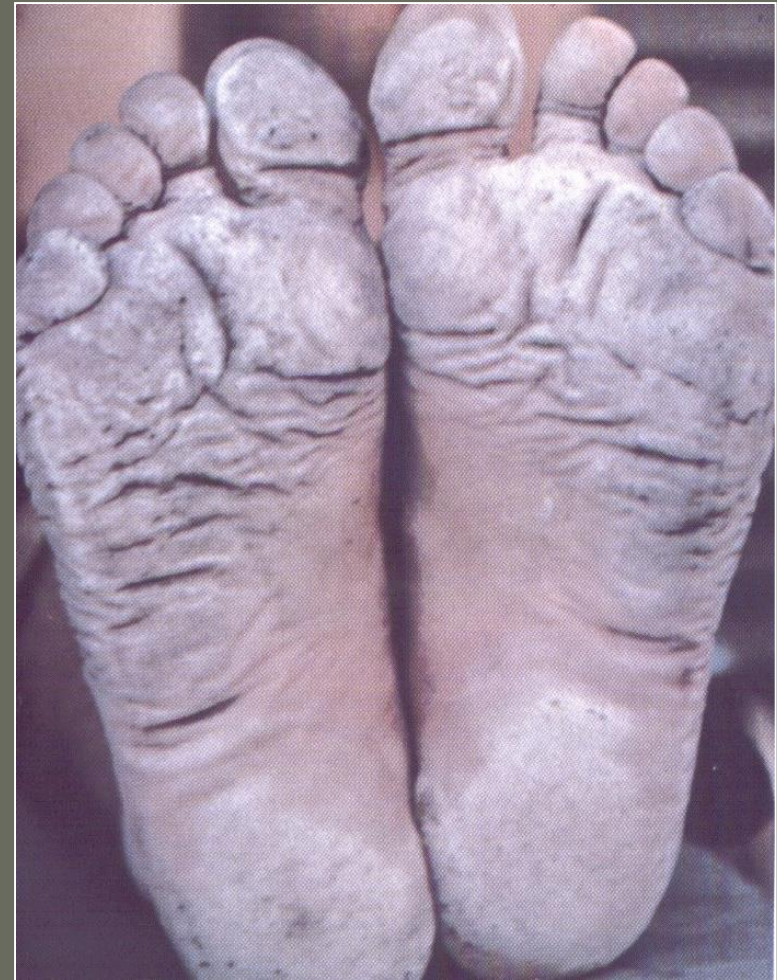




# TRENCH FOOT/IMMERSION FOOT



- Definition:
  - A non-freezing pedal tissue injury caused by prolong exposure to wet and cold conditions
  - Immersion foot is a more severe variant of trench foot





# IMMERSION FOOT (Trench Foot)



- Cause
  - Prolonged Exposure to water 32°- 50°F (Usually takes an excess of 12 hours)
  - Condition can occur on the hands due to damp or cold gloves
  - Limited movement







# IMMERSION FOOT (Trench Foot)



- Signs / Symptoms (EARLY)
  - Initially foot is pale, mottled, numb, pulseless, & immobile
  - After re-warming, severe burning pain and sensation returns





# IMMERSION FOOT (Trench Foot)



- Signs / Symptoms (LATE 2-7 days)
  - Hyperemic Limb (increased amount of blood flow)
  - Numbness
  - Edema
  - Ulceration
  - Gangrene



# IMMERSION FOOT (Trench Foot)

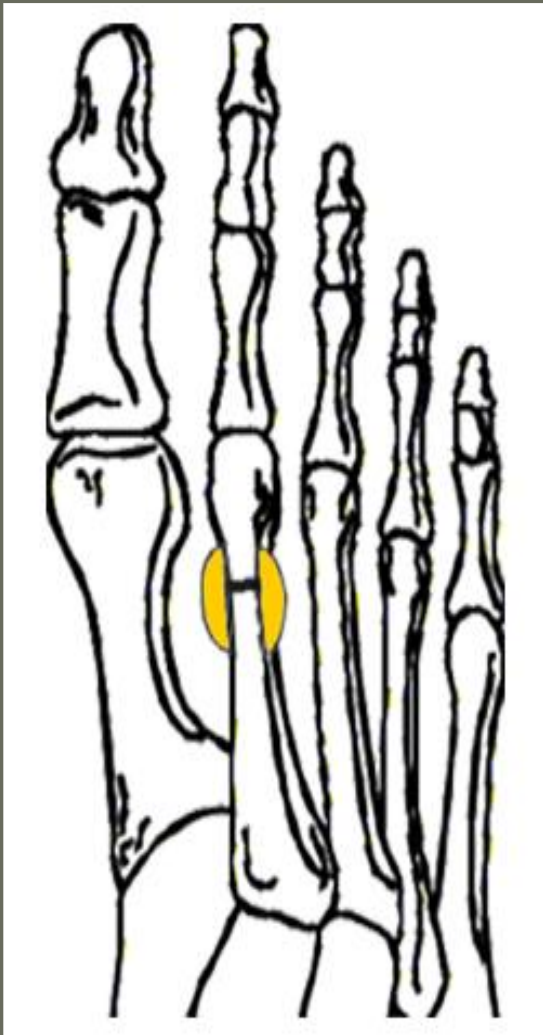


- TREATMENT

- Supportive
- Gentle re-warming
- Elevation
- Consider antibiotics
- Avoid wearing boots
- Do not drain blisters
- Refer to M.O.
- TACEVAC severe cases



# METATARSAL STRESS FRACTURE



- Definition:
  - Incomplete break of the metatarsal bones
  - Often seen in week 4 of intensive training programs
  - 2nd or 3rd metatarsal bones are most commonly affected; “March Fracture”



# METATARSAL STRESS FRACTURE



- Causes
  - Repetitive stress
  - Abnormal foot structure (flatfoot)
  - Increased levels of activity
  - Obesity



# METATARSAL STRESS FRACTURE



- Signs and Symptoms
  - Edema in dorsum (top) of foot
  - Tenderness at the top of the foot during and after exercise





# METATARSAL STRESS FRACTURE



- Treatment
  - Treat as fracture
  - RICE
  - NSAIDS
  - Rest for 2 or 3 weeks until pain is gone
  - Slow return to activity (i.e. low impact exercises)
  - Refer to M.O.







# PREVENTIVE MEASURES FOR FOOT DISORDERS



# PREVENTIVE MEASURES



- Improperly fitting boots and socks are common causes of foot problems.
- Bring orthotic inserts and/or socks with you to correctly fit new boots.





# PREVENTIVE MEASURES



- Toe box should be roomy enough to wiggle toes
- Ball of your foot should rest on widest part of sole
- Forefoot not wider than boot
- $\frac{1}{2}$  inch between end of longest toe and boot





# PREVENTIVE MEASURES



- Proper Fitting Socks
  - No excess material
  - Use ½ size larger socks for outer layer (If using 2 pair)

**NOTE:** Using Insoles may help cushion feet as boots begin to wear and stretch.



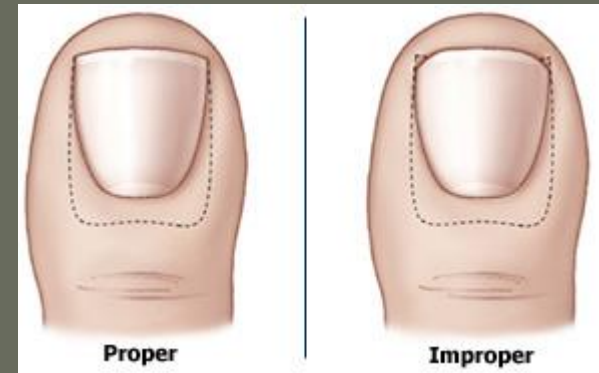


# PREVENTIVE MEASURES



## Before Marches

- Educate
- Keep feet clean and dry
- Use foot powder
- Properly trim toenails

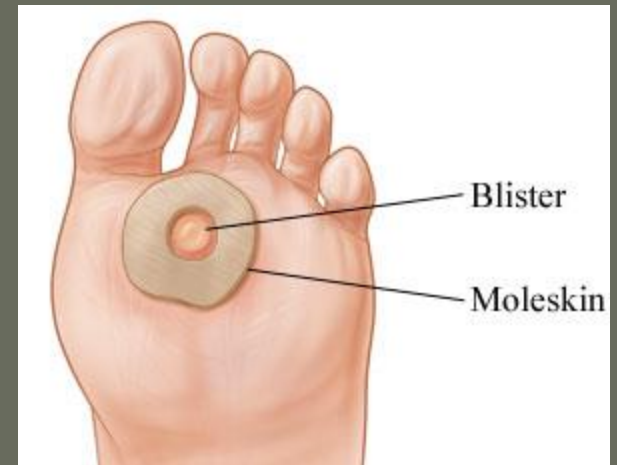




# PREVENTIVE MEASURES



- During marches
  - Elevate feet at rest points
  - Massage the feet
  - Apply foot powder
  - Take care of blisters
  - Loosen laces





# PREVENTIVE MEASURES



## After Marches

- Early and immediate attention to pain sources
- Wash and dry feet
- Treat foot injuries



# PREVENTIVE MEASURES



- If red, swollen, tender skin develops along the edges of the foot:
  - Aeration
  - Elevation
  - Rest
  - Wider foot wear









# PERFORM CARE OF THE FEET





# WATER PURIFICATION



FMST

Water Purification



Water Video.wmv



# OVERVIEW



- Water Sources and Characteristics
- Factors Affecting Sources of Water
- Procedures for Water Purification
- Water Testing



# LEARNING OBJECTIVES



# Please read your Terminal and Enabling Learning Objectives



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Water Purification



# BACKGROUND



- Safe water is essential
- Insufficient quantity or quality can affect operational readiness
- All personnel must be familiar with proper water discipline





# WATER SOURCES AND CHARACTERISTICS





# SALT WATER



- SOURCES
  - Ocean, sea
- CHARACTERISTICS
  - Less contaminated
  - Unlimited supply
  - Best source of water if a ROWPU is available





# GROUND WATER



- SOURCES
  - Wells & Springs
- CHARACTERISTICS
  - Best source of water during an NBC attack
  - Less chemical & biological pollution
  - Quantity is hard to determine





# SURFACE WATER



- SOURCES
  - Rivers, lakes, ponds, streams
- CHARACTERISTICS
  - Larger sources less contaminated
  - Moving water is preferable
  - Easiest to procure for individual use
  - Readily accessible





# RAIN WATER



- Not a reliable source
- May not provide an adequate supply



FMST

Water Purification





# QUANTITY



- Source should provide adequate for all troops
- Must last for the duration of operations







# QUALITY



- Free of contamination from sewage, toxic elements and NBC agents
- Source protected from runoff from latrines, showers, motor pools, etc.
- Should be clear/colorless

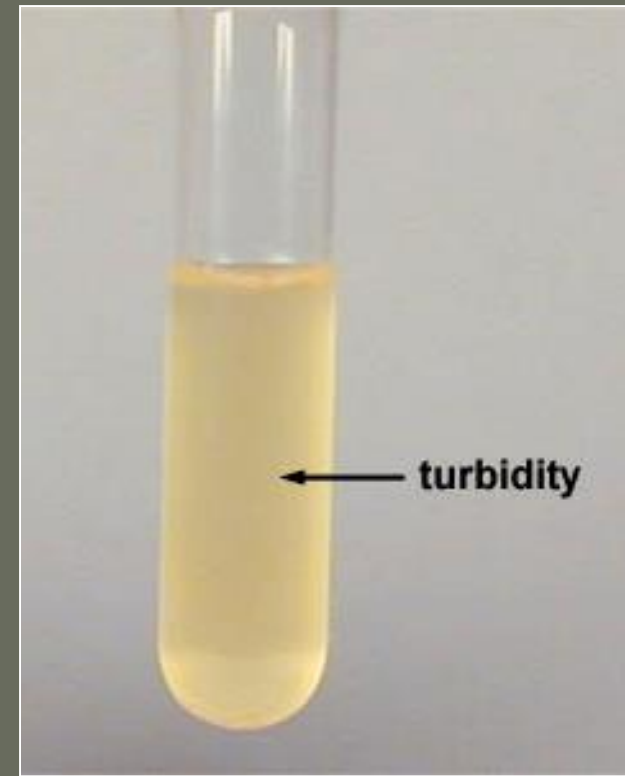




# QUALITY



- Water should not be objectionable due to taste and/or odors
- Remove turbidity to reduce contamination
  - Suspended particles often contain organisms that cause disease
  - Particles decrease effectiveness of chlorine





# QUALITY



- Temperature



- Warm water is not a palatable
- Consumption rate decreases as water gets warmer
- Cool water retains chlorine longer



# ACCESSIBILITY



- Must be easily ACCESSIBLE to water purification and transport equipment





FMST

Water Purification





# TYPES OF CONTAINERS



- Canteen
  - Individual use
  - 1 qt



- Jerry Can
  - 5 gallon container
  - Must be labeled  
“POTABLE WATER ONLY”

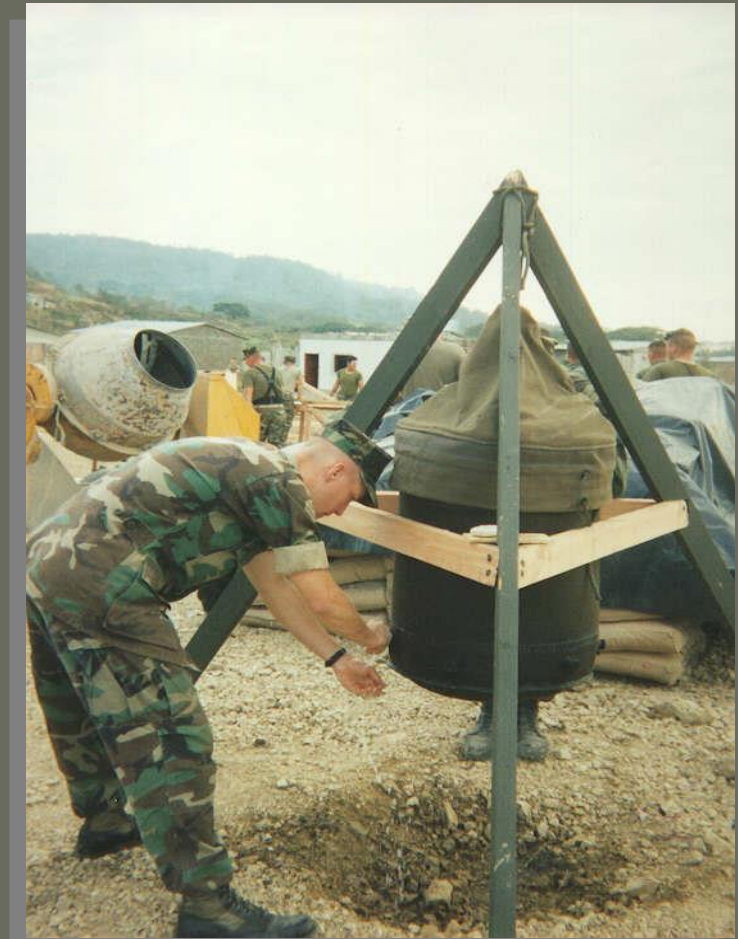




# TYPES OF CONTAINERS



- Lyster Bag
  - 36 gallon capacity
  - Used for hand washing stations







# TYPES OF CONTAINERS



- Water Bull
  - 400 gallon capacity
  - Mobile potable water
  - Easily accessible





# IODINE TABLETS



- Inspect tablets for signs of deterioration
- Should be solid and steel gray in color
- Tablets that are yellow or brown, that stick together or crumble easily are no longer effective





# IODINE TABLETS



- Purifying water in canteens:
  - Fill canteen with cleanest water possible
  - Add two iodine tablets to 1 quart canteen
  - If using tincture of iodine, five drops are equal to one tablet
  - Replace cap and shake to dissolve tablet
  - Wait 5 min, loosen cap and allow leakage around the threads
  - Tighten cap and wait an additional 25 min before drinking



# IODINE TABLETS



- Purifying water in hydration systems
  - Fill hydration system with cleanest water possible
  - Use four tablets for 70-72 oz system
  - Use six for 100-102 oz system
  - Allow 30 min total contact time





# CHLORINE BLEACH



- Add two drops of bleach per quart for canteens
- Use four drops for 70 oz reservoir
- Use six drops for 100 oz reservoir
- Let stand for 30 min before drinking





# MICROPUR



- Purifying water in canteens:
  - Fill canteen with cleanest water possible
  - Add one tablet to 1 quart canteen
  - Replace cap and shake to dissolve tablet
  - Wait 5 min, loosen cap and allow leakage around the threads
  - Allow 30 min contact time before consuming water, 4 hours for cold or cloudy water



# MICROPUR



- Purifying water in hydration systems:
  - Fill hydration system with cleanest water possible
  - Use two tablets for 70-72 oz system
  - Use three for 100-102 oz system
  - Allow 30 min contact time before consuming water, 4 hours for cold or cloudy water





# BOILING WATER



- Used in emergency situations for small amounts of water
- Vigorously boil water for 5 minutes
- Does not provide for residual disinfectant capabilities
- Not to be used to store large quantities of water







FMST

Water Purification



# PROCEDURES FOR WATER TESTING



# TESTING OF WATER



- All bulk water supplied for drinking must be tested daily for FAC
- Perform weekly bacteriological testing





# WATER TESTING



- Procedure for water testing
  - Fill sample test tube to line
  - Add (1) DPD #1 tablet, place cap on tube
  - Agitate until tablet is completely dissolved
  - Compare color of water to comparator

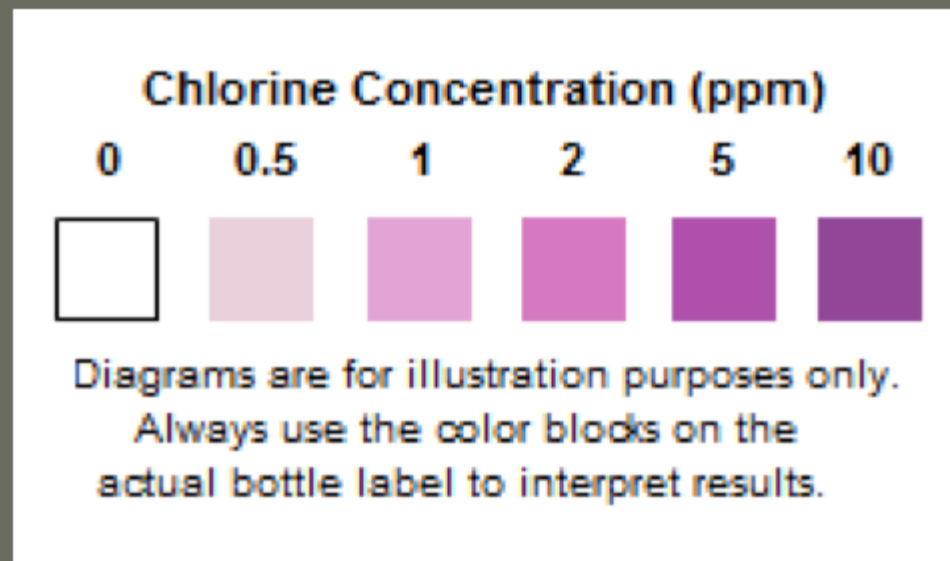




# TESTING OF WATER



- Range should be between  
–2.0 and 5.0 ppm





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Water Purification



# DEMONSTRATION



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Water Purification





# WATER PURIFICATION



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Water Purification



# FIELD WASTE DISPOSAL





# OVERVIEW



- Types of Waste
- Guidelines for Latrine Placement
- Devices Used for Human Waste
- Devices Used for Liquid Waste
- Garbage and Rubbish Disposal
- Guidelines for Garbage Pit Placement



# LEARNING OBJECTIVES

Please Read Your  
Terminal Learning Objectives  
And  
Enabling Learning Objectives





# WASTE



- All types of liquid and solid material excreted from the body as useless or unnecessary as a result of living activities of humans or animals.
  - Human
  - Liquid
  - Garbage
  - Rubbish



# TYPES OF WASTE

- HUMAN WASTE
  - Feces
  - Urine
  - Blood / body fluids
  
- LIQUID WASTE
  - Bath water
  - Liquid kitchen waste



# TYPES OF WASTE



- GARBAGE
  - Organic materials from food service operations
- RUBBISH
  - Boxes
  - Cans
  - Paper
  - Plastic







# GUIDELINES FOR LATRINE PLACEMENT



# LATRINE PLACEMENT



- DISTANCE
  - At least 100 feet from water sources
  - At least 100 yards (300 ft) from food operations
  - 50 feet from berthing areas





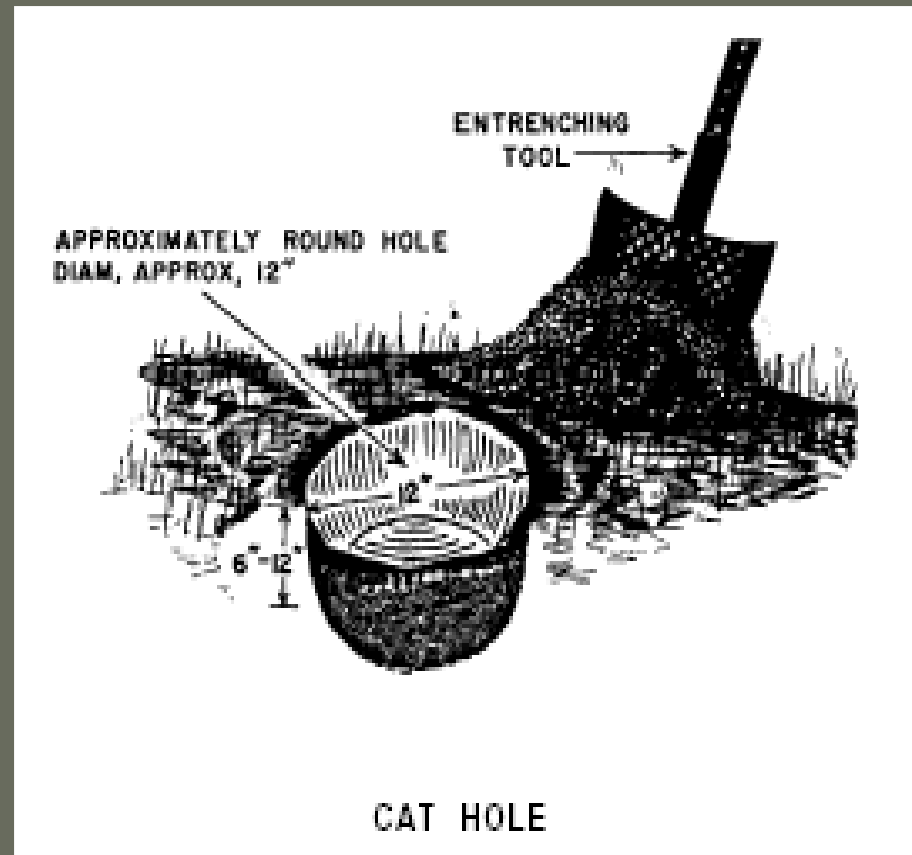
# FIELD SANITATION DEVICES FOR HUMAN WASTE DISPOSAL



# FIELD SANITATION DEVICES



- CATHOLE
  - Used on the move
  - Use E-Tool
  - 12" diam. x 12" deep
  - Cover immediately after use



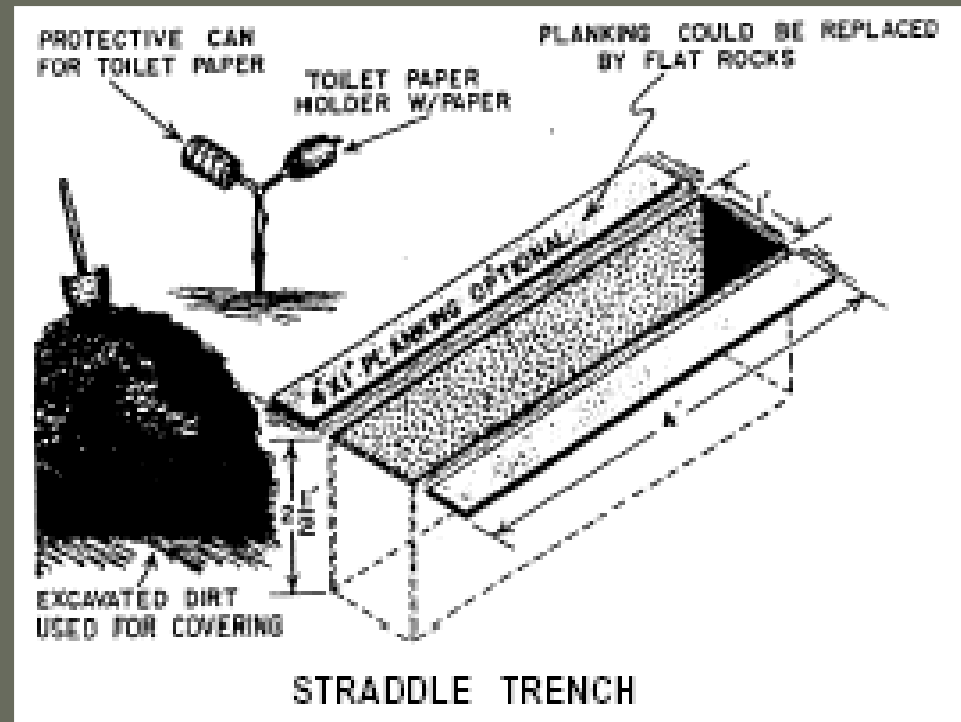


# FIELD SANITATION DEVICES



- **STRADDLE TRENCH**

- Temporary bivouac of (1 to 3 days)
- (4) trenches per (100) troops
- Construction
  - 1 ft wide x 2 ½ ft deep x 4 ft long
  - Use wood planks on each side
  - Forked stick with coffee can to cover toilet paper





# AFGHANISTAN







# FIELD SANITATION DEVICES



- BURN BARREL LATRINE
  - MOST COMMON latrine used in the field
  - Used in area of high water tables
  - (8) seats required per 100 troops
  - Place sign on door: DO NOT URINATE
  - Built as (2) or (4) seats over 55 gal. drum cut in half



# BURN BARREL LATRINE



- Operation
- Prime drums with 3" of diesel
- Burn cans daily
  - 4 parts diesel to 1 part gas
- Clean, disinfect and check screens daily
- Bury ash of burnt fecal matter





# BURN BARREL LATRINE



## TYPICAL BURN BARREL LATRINE

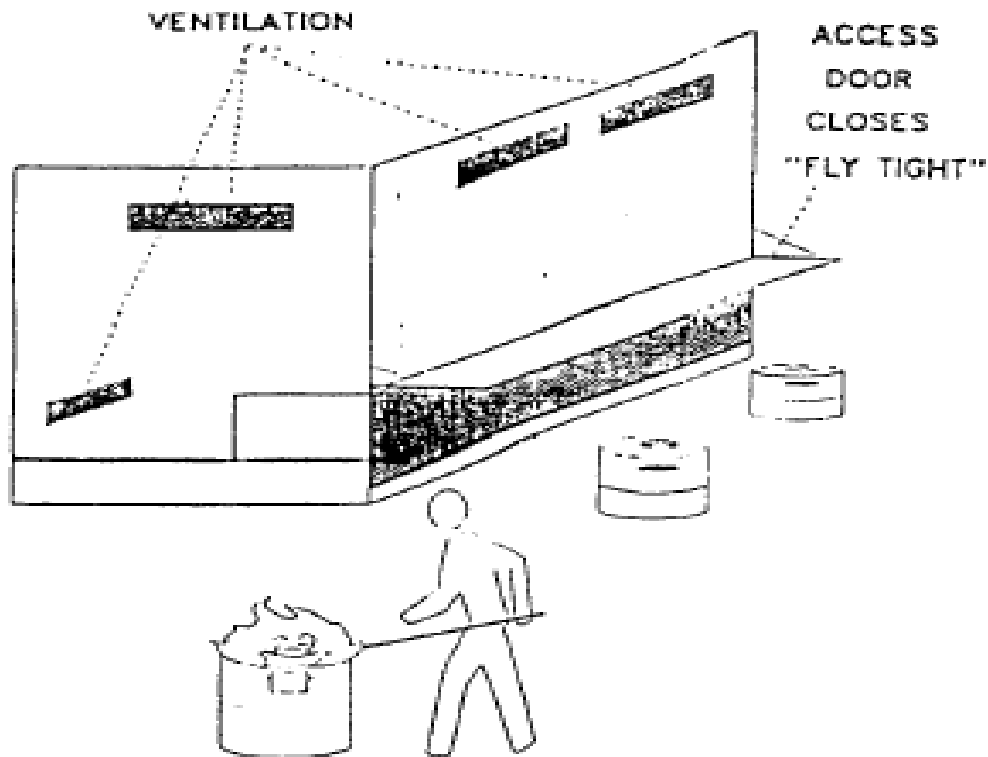
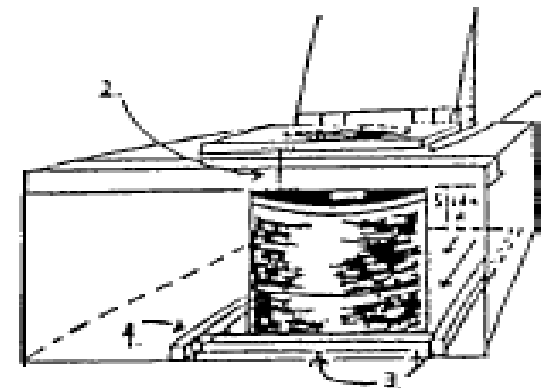


Figure 9-10.



### DETAILS

1. FORWARD EDGE OF HOLE SHOULD BE WELL BACK FROM THE EDGE OF THE BENCH(4-6").
2. TOP RIM OF BARREL SHOULD BE NO MORE THAN 2" FROM UNDERSIDE OF SEAT. (MORE THAN 2" WILL RESULT IN SPLASHING AND SPILLAGE INTO COMPARTMENT.)
3. THE BARREL SHOULD BE PUSHED ALL THE WAY BACK AGAINST THE BACK STOP WHICH HELPS TO CENTER CAN UNDER HOLE.
4. RUNNERS AID TO CENTER BARREL UNDER HOLE TO PREVENT SPILLAGE.

**BURN BARREL LATRINES with**  
**HAND WASHING STATION**

Note:  
Poor Screening  
No Doors





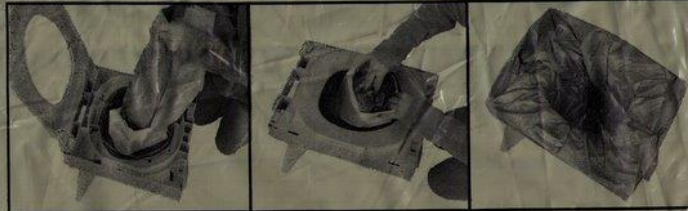
# WAG-BAG

## **WAG BAG<sup>®</sup> WASTE KIT** WASTE ALLEVIATION AND GELLING

### **The WAG BAG<sup>®</sup> WASTE KIT includes:**

- 1 Degradable waste bag with gelling agent, odor neutralizer & decay catalyst
- 1 Degradable zip-close disposal bag
- Toilet paper and hand sanitizer

### Instructions with the PETT<sup>®</sup> toilet



1. Open kit and place bottom of waste bag into zip-close bag.
2. Place both bags into the black net.
3. Spread top of waste bag over the seat.
4. Open positioned waste bag wide for capacity.
5. After use, fold waste bag into zip-close bag and zip closed.
6. Discard into trash receptacle for disposal.

**DO NOT INGEST POWDER IN WAG BAG WASTE KIT. IF POWDER GETS IN EYES, FLUSH WITH WATER.  
TO AVOID RISK OF SUFFOCATION, KEEP PLASTIC BAGS AWAY FROM CHILDREN AND PETS.**

**Please protect our environment--always dispose of properly.**







# URINE DISPOSAL DEVICES

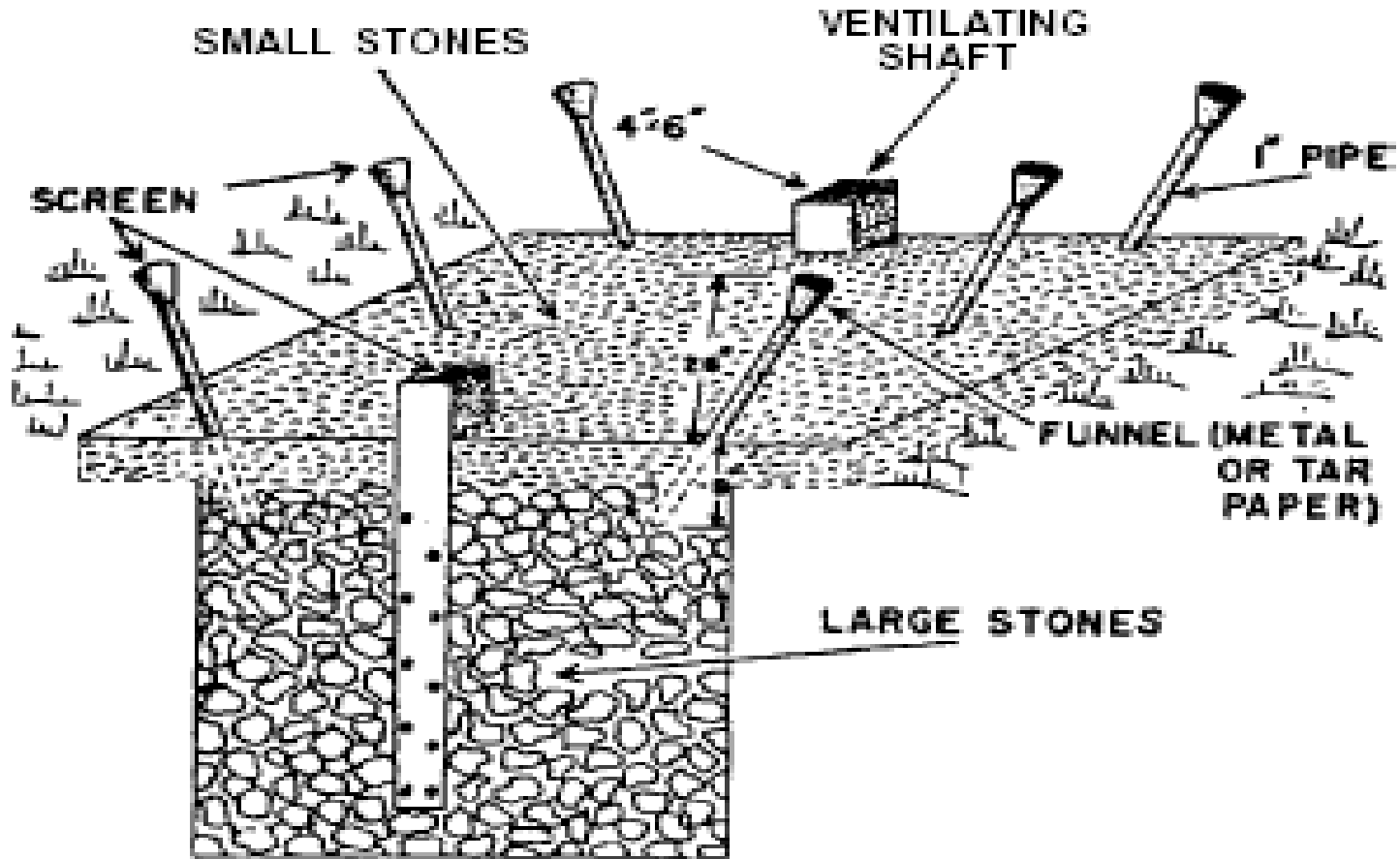


- Temporary latrine used in sandy soils.
  - One pipe can accommodate 20 men.
  - Pit: 4' x 4' x 4'
  - Fill with large rocks, flattened cans, bottles, rubble
  - Insert six 1" diam. 36" long pipes at an angle with 8" of pipe below surface
  - Ventilation shaft at each end of pit, 6-12 inches above ground
  - Cover ends of each tube with a funnel and mesh material





# URINE DISPOSAL DEVICES



URINE SOAKAGE PIT

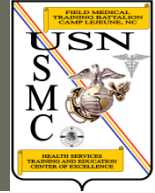


# URINE DISPOSAL DEVICES





# OTHER TYPES OF LATRINES



- CHEMICAL TOILETS
  - Maintained by contracted services
  - Commonly used in garrison or training
  - One toilet can service up to 15 personnel





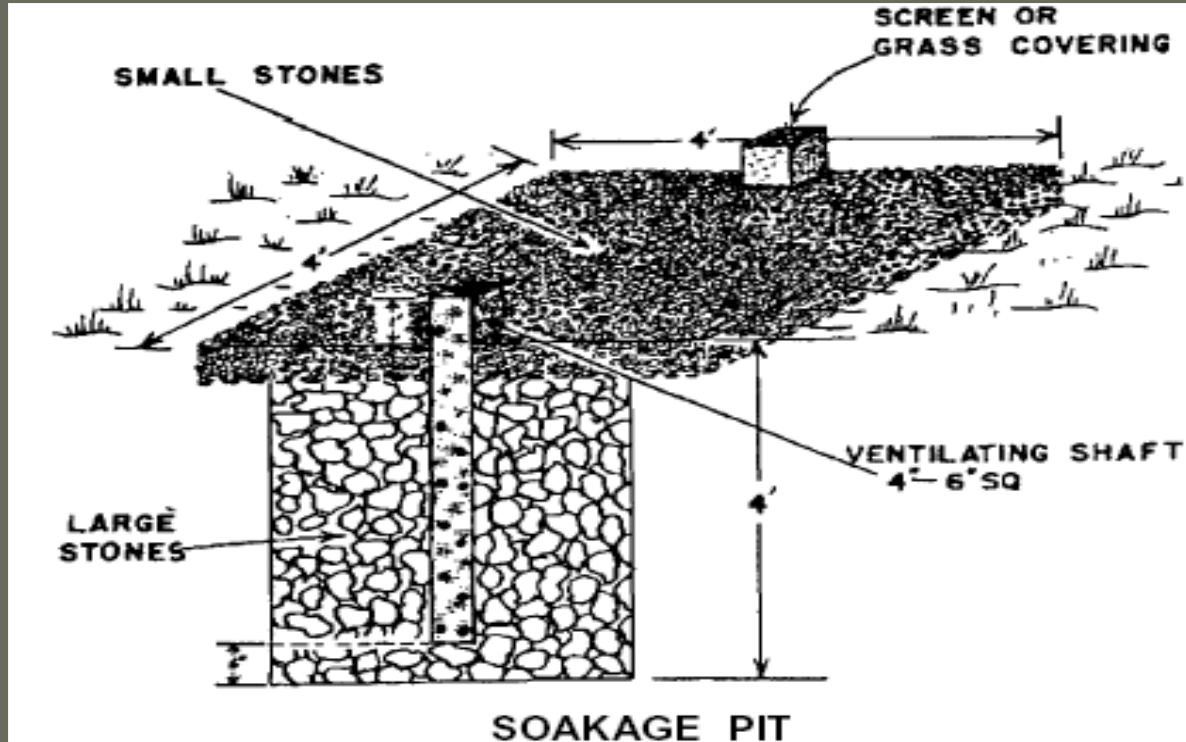


# LIQUID WASTE DISPOSAL DEVICES



# LIQUID WASTE DEVICES

- SOAKAGE PIT (4' x 4' x 4')
  - Built the same as Urine Soakage Pits (without tubes)
  - 1 pit can accommodate 200 men





# LIQUID WASTE DEVICES



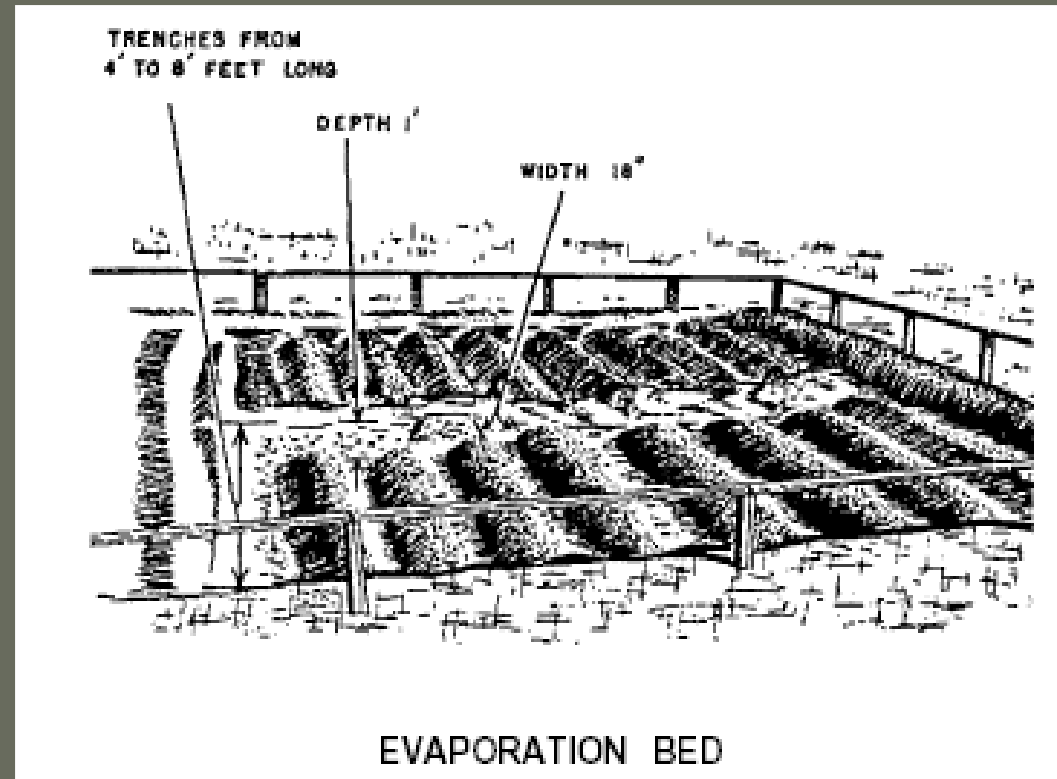
SOAKAGE PITS

Kandahar Airport



# LIQUID WASTE DEVICES

- EVAPORATION BEDS
  - Used to dispose of kitchen waste or bathing waste when Soakage pits are impractical
  - Used in hot, dry climates where ground is too hard to dig pits









# GARBAGE DISPOSAL DEVICES



# GARBAGE DISPOSAL DEVICES



- Garbage Pit: (4' x 4' x 4')
  - Preferred method of garbage disposal for overnight stay
  - Suitable for 100 troops for 1 day
- Garbage Trench: (2'w x 4'd)
  - Adaptable for 2 or more days
  - Continuous trench can be dug



# Garbage / Trash PIT



(Kandahar Airport)

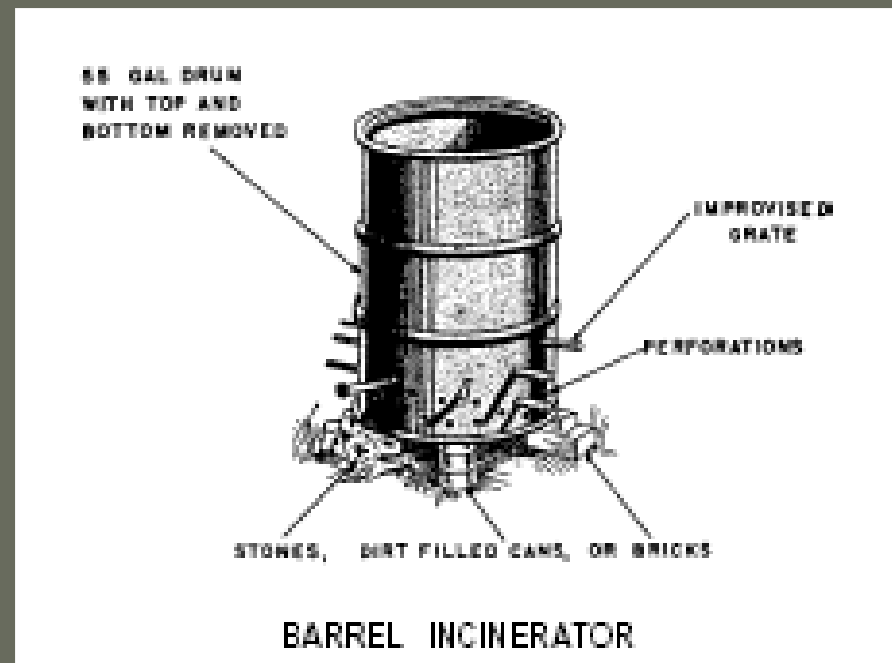




# RUBBISH DISPOSAL DEVICES



- Garbage Pit: For short stays. Rubbish is buried with the garbage.
- INCINERATION DEVICES
  - Barrel incinerator





# GARBAGE PIT PLACEMENT



- DISTANCE
  - At least 100 FEET from mess area
  - At least 100 FEET from water source
- INCINERATORS
  - At least 50 YARDS downwind from camp







# FIELD WASTE DISPOSAL





# ENVENOMATION INJURIES





# OVERVIEW



- Definitions
- Types of Venomous Snakes
- Treatment of Snake Bites
- Management of Arthropod Envenomation
- Anaphylactic Shock



# LEARNING OBJECTIVES



Please Read Your  
Terminal Learning Objectives  
And  
Enabling Learning Objectives





# DEFINITIONS



- Envenomation
  - An injury of illness caused by the poisonous secretion of an animal, usually transmitted by a bite or sting.



# ACTIONS OF SNAKE VENOM



- Hemotoxin:
  - Destroy red blood cells, disrupts blood clotting, and cause organ degeneration and tissue damage.
- Neurotoxin:
  - Acts on nerve cells and tissue, and disrupts brain function.
- Cytotoxin: Typically attacks only a specific type of cell, muscle group, or organ.







# CLASSIFICATIONS OF VENOMOUS SNAKE



## SNAKE VENOM:

- Affects the body in a number of ways depending on:
  - Type and quantity of venom
- Different snake species produce different types of venom.



# CROTALINAE (PIT VIPERS)



- Venom: Hemotoxin
- Characteristics:
  - Retractable fangs
  - Heat sensing pit
  - Large triangular head
  - Slit-like pupils





# CROTALINAE (PIT VIPERS)



- Examples:
  - Rattlesnakes
  - Moccasins
  - Copperheads
  - Saw-Scaled viper
  - Habu



Eastern Diamondback Rattlesnake



# CROTALINAE (PIT VIPERS)



## COTTONMOUTH (WATER MOCCASIN)



## SAW SCALED VIPER





# CROTALINAE (PIT VIPERS)



- Signs and Symptoms:
  - Excruciating pain at bite site
  - Tissue swelling at bite site
  - Bleeding from major organs (hematuria)
  - Tingling or numbness
  - Headache
  - Nausea / vomiting
  - Death may occur within 6-48 hours

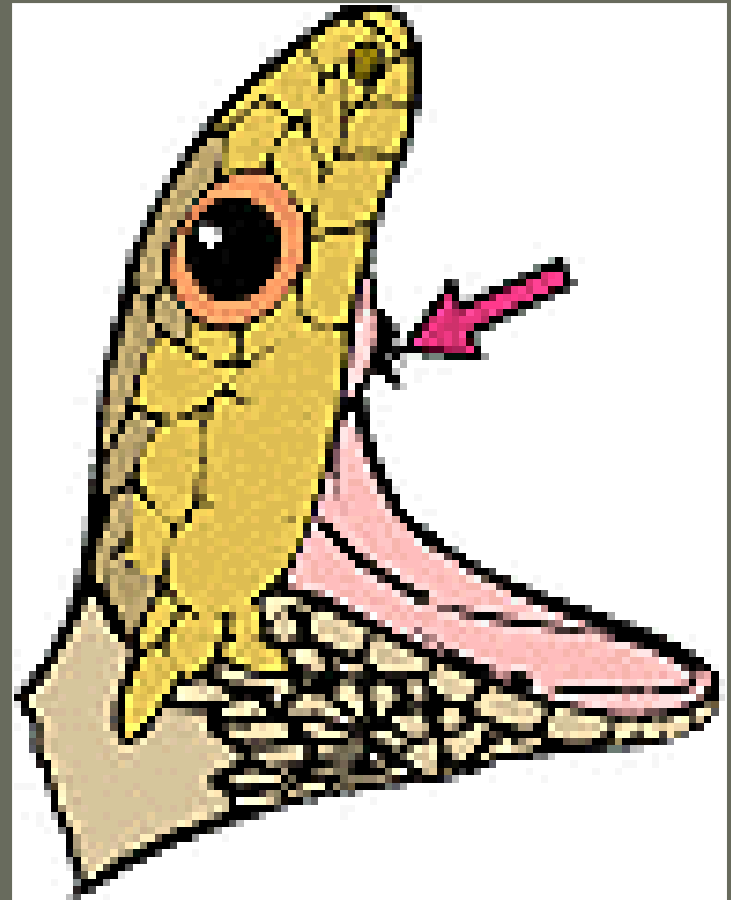




# COLUBRINAE



- Characteristics:
  - Venom is hemotoxic
  - Fixed fangs in rear of mouth
  - Egg shaped head
  - Large eyes





# COLUBRINAE



- Signs and Symptoms:
  - Symptoms may not manifest until hours after bite.
  - Hemorrhage to gums, nose and other orifices
  - Headache / nausea
  - Blood in stool, urine, or saliva
  - Death due to internal bleeding





# COLUBRINAE



- BOOMSLANG





# ELAPINAE



- Characteristics:
  - Venom is neurotoxic
  - Front fixed hollow fangs
  - Round pupils
  - Head shape is in proportion to the width of body





# ELAPINAE



- Signs and Symptoms:
  - Stiffness, muscle aches, spasms
  - Severe headache, blurred vision, and drowsiness
  - Pain at bite site
  - Nausea, vomiting, and diarrhea
  - Chills with rapid onset of fever
  - Respiratory paralysis and death



# ELAPINAE (CORAL SNAKES)



- **EXAMPLES:** Coral Snakes, Cobra, Krait

(red on black, red on yellow, and other patterns)



Tropical Coral Snake



Eastern Coral Snake



# ELAPINAE



**KRAIT**



**COBRA**



# HYDROPHIINAE (SEA SNAKES)



- Characteristics:
  - Neurotoxic venom
  - Fixed fangs
  - Flat tail
  - Brightly colored





# HYDROPHIINAE (SEA SNAKES)



- Signs and Symptoms:
  - Bites are usually painless
  - Little or no swelling
  - Most important early symptoms are of rhabdomyolysis
    - Headache
    - Thick-feeling tongue
    - Thirst
    - Sweating
    - Vomiting





# HYDROPHIINAE (SEA SNAKES)



- Symptoms that can occur after 30 minutes to several hours post-bite include:
  - Generalized aching
  - Stiffness and tenderness of muscles all over the body
  - Paralysis of voluntary muscles
    - Paralysis of muscles involved in swallowing and respiration can be fatal
- After 6 to 12 hours the result of muscle breakdown can lead to cardiac arrest.







# TREATMENT OF A SNAKE BITE



- Diagnosing a snake bite:
- Fang marks
- Bleeding, small lacerations
- Presence of fang marks does not always indicate envenomation
- Manifestation of signs and symptoms of envenomation are necessary to confirm diagnosis of a snake venom poisoning.



# TREATMENT OF A SNAKE BITE



Snake bite





# TREATMENT

- Most definitive care is:

# ANTIVENOM





# TREATMENT OF SNAKEBITE



- Keep victim calm and reassured
- Allow limb to rest at a neutral position in relation to heart
- Locate bite site, removing any rings or constricting items from extremity

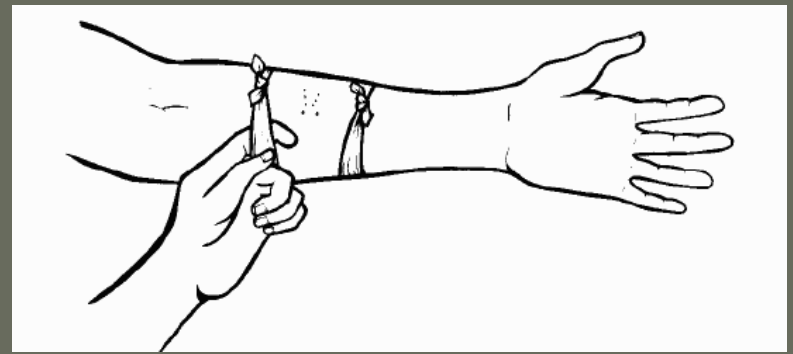




# TREATMENT OF SNAKEBITE



- If on extremity, place constricting band above and below the bite.
- On hand or foot, single band above wrist or ankle.
- Apply splint
- Check distal pulses
- Monitor and TACEVAC





# COMMON DON'TS



- DO NOT cut or incise the bite site
- DO NOT apply ice or heat
- DO NOT apply oral suction
- DO NOT remove any dressings/bandages
- DO NOT try to kill the snake for identification
- DO NOT have the victim eat or drink anything



# PREVENTION OF SNAKE BITES



- LEAVE THE SNAKE ALONE !!!!!
- Keep your hands and feet out of areas you can't see.







# ARTHROPOD ENVENOMATION



# BEEES AND WASPS



Honey bee



Bumble bee



Wasp



Hornet

- Reaction to sting from histamine response
- Honey bees sting once and leave stingers in skin
- Wasps, bumble bees, and hornets can sting multiple times



# BEEES AND WASPS



## Signs and Symptoms

- Pain
- Itching/burning sensation
- Wheal
- Be aware for anaphylactic shock





# INSECT STING TREATMENT



- Immediately remove stinger
  - DO NOT USE TWEEZERS
  - Scrap across skin with card or knife blade
- Apply ice
- Hydrocortisone 1% BID
- Monitor for Anaphalaxis





# ANTS



- Some species of ants can bite repeatedly, while some have stingers at the tip of their abdomen.
- Signs and Symptoms:
  - Pain
  - Itching/burning
  - Vesicles
  - Monitor for anaphylactic reaction





# ANTS



- Multiple bites can cause more severe reactions
  - Vomiting
  - Diarrhea
  - Edema
  - Hypotension due to vasodilatation
- Treatment
  - Apply ice
  - Apply Hydrocortisone 1% BID
  - Monitor for Anaphylaxis



# MILLIPEDES



- Secrete toxin as a defense mechanism
- Signs and Symptoms:
  - Dermatitis that begins with a brown stain on skin
  - Secretions in the eye can cause lacrimation and blurry vision





# MILLIPEDES



- Treatment:
  - Wash skin with soap and water
  - If toxin is secreted in the eyes, irrigate with water or saline; an ophthalmologic evaluation is mandatory
  - Monitor for anaphylaxis







# CENTIPEDES



- Signs and Symptoms:
  - Burning pain, tenderness
  - Erythema (redness)
  - Local swelling
  - Superficial necrosis and ulceration may sometimes occur





# CENTIPEDES



- Treatment:
  - NSAIDS
  - Lidocaine or other anesthetic
  - Look for anaphylactic reaction





# CATERPILLARS



- Venomous caterpillars have venom in hollow hairs all over their bodies
- Signs and Symptoms:
  - Dermatitis
  - Erythema and edema
  - Conjunctivitis
  - Necrosis



Saddle back caterpillar



# CATERPILLARS



## Treatment:

- Use scotch tape to remove hairs from skin
- Do not rub area
- Monitor for anaphylaxis



# BLACK WIDOW SPIDER



**Venom is  
Neurotoxic**

**Red "Hourglass"  
shape on abdomen**



# BLACK WIDOW



- Signs and Symptoms:

- Initial pain is not severe, but severe local pain rapidly develops
- Pain gradually spreads over the entire body and settles in the abdomen and legs
- Weakness
- Sweating
- Excessive salivation
- Rash may occur





# BLACK WIDOW



- Signs and Symptoms (cont):
  - Tremors
  - Nausea/vomiting
  - Respiratory muscle weakness combined with pain may lead to respiratory arrest
  - Anaphylactic reactions can occur but are rare
  - Symptoms usually regress after several hours and are usually gone in a few days



# BLACK WIDOW



- Treatment:
  - Clean with soap and water
  - Intermittent ice for 30 minutes each hour
  - Antibiotics if infection occurs





# BROWN RECLUSE

- Small body
- Light brown
- Dark brown violin shape on posterior thorax
- Venom is hemotoxic / cytotoxic





# BROWN RECLUSE

- Signs & Symptoms:
  - Painless bite
  - Painful red area with cyanotic center develops within few hours
  - Tissue damage is possible





Area of discoloration that does not blanch after several days.





# BROWN RECLUSE

- Signs & Symptoms:
  - After 1-2 weeks
    - Area turns DARK and scab falls off leaving ulcer
  - Ulcer may persist for weeks to months
  - Systemic reaction may occur that could lead to death





# BROWN RECLUSE

- Treatment:
  - Cold compresses
  - Provide supportive care
  - Refer to Medical Officer
  - Tetanus prophylaxis and antibiotics
  - Monitor for anaphylaxis





# SCORPIONS



- Predatory arthropods that have eight legs, a pair of grasping claws and a narrow segmented tail ending with a venomous stinger.
- Scorpions range in size and are found widely distributed over all continents.
- Scorpion venom has a fearsome reputation and about 25 species are known to have venom capable of killing a human being.
- Venom is neurotoxic





# SCORPION STING



- Signs and Symptoms:
  - Erythema and edema
  - Pain and/or paresthesia
  - Cranial nerve dysfunction
  - Somatic skeletal neuromuscular dysfunction





# SCORPION STING



- Treatment:
  - Based on level of envenomation
  - Ice
  - Oral analgesics
  - Monitor for anaphylaxis



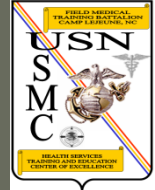




# PREVENTION OF ARTHROPOD ENVENOMATION



- LEAVE THEM ALONE
- Avoid nesting sites and hives
- Personnel with known allergies should carry an Epi-pen or Ana-kit
- Shake out sleeping bags and clothing
- Check boots
- Wear shoes
- Wear gloves
- Remove rubbish and wood from camp
- Fill in cracks and recesses





# ANAPHYLACTIC SHOCK



- Life threatening reaction to an allergen
- May have a rapid and severe onset
- May be caused by:

Injections

Stings

Ingestion

Inhalation

Absorption



# ANAPHYLACTIC SHOCK



- Signs and Symptoms:
  - will progressively get worse
  - Itching, redness, hives
  - Respiratory depression
  - Sense of fullness in throat
  - Anxiety, SOB, lightheadedness
  - Decreased LOC

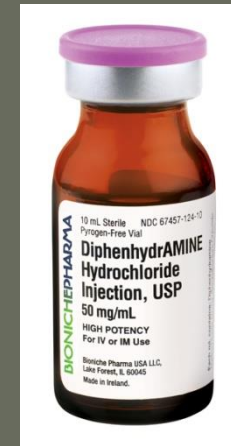
**The faster the onset of symptoms,**  
**the more severe the reaction!**

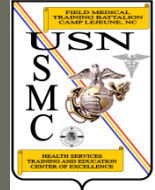


# ANAPHYLACTIC SHOCK



- Treatment:
  - Maintain ABC's
  - Benadryl
  - Epinephrine
  - Fluid resuscitation
  - Documentation of medicines given
  - TACEVAC







# ENVENOMATION INJURIES

