

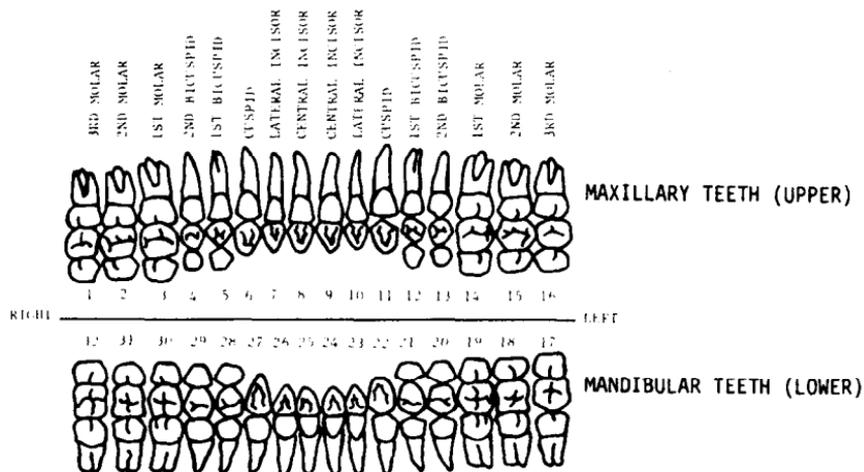
CHAPTER 19

DENTAL EMERGENCIES AND TREATMENT

19-1. GENERAL.

a. A tooth is divided into two major parts: the crown (portion of the tooth normally visible in the mouth) and the root or roots (portion embedded in the socket and partially covered by soft tissue).

b. The crown has five surfaces: the occlusal or biting surface, the lingual or tongue side surface, the facial or cheek side surface, and the other two surfaces (mesial and distal) that come in contact with adjacent teeth (mesial being the contacting surface nearest the midline and distal the farthest from the midline). All surfaces may be affected by dental decay (caries).



19-2. TOOTHACHES. Toothaches are usually associated with one of the following: caries (decay); tooth, crown, or root fractures; and acute periapical (root end) abscess.

19-3. CARIOUS LESIONS IN VITAL TEETH.

a. Diagnosis. Finding the offending tooth may be difficult. The patient with a toothache resulting from a carious lesion will usually present the following symptoms:

- (1) Intermittent or continuous pain that is usually intense.
- (2) Pain may be caused by heat, cold, sweet, acid, or salt substances.
- (3) The tooth will usually be grossly carious (decayed).
- (4) The carious enamel and dentin are discolored.

(5) Tapping the tooth with an instrument will usually elicit pain.

b. Diagnostic test.

(1) Thermal tests can be used; however, if hot and cold are used, a normal tooth must be tested also and used as a basis for comparison. The application of cold to normal teeth elicits pain in most instances, but the response ceases soon after the stimulus is removed. A diseased tooth, compared to a normal tooth, varies in its reaction to the temperature test. For example, a reaction to cold persists after application stops and the tooth responds very little to heat or the reaction to heat persists after application and the tooth appears to respond very little or not at all to cold.

(2) Thermal test procedure.

(a) Isolate the teeth to be tested from the saliva with gauze packs.

(b) Cold test. Spray a cotton-tipped applicator with ethyl chloride and place the cold surface on the tooth crown. Note the response and its duration. (Ice may also be used). A vital tooth will give a painful response to cold.

(c) Heat test. Heat an instrument (e.g., a mouth mirror handle) and touch against the tooth. Note the response and duration.

(d) Test an unsuspected tooth for comparison.

(e) Check vitality by touching sound dentin (pain upon touching dentin indicates vitality).

c. Treatment.

(1) This treatment regimen will only work on teeth that are still vital. Eugenol is an agent that will soothe hyperemic pulp tissue if treated indirectly (if not in direct contact with the pulp). If a mix of zinc oxide and eugenol is applied directly to vital pulp, it will kill the pulp.

(2) After finding the source of pain, local anesthetic will probably be necessary to carry out the following:

(a) Remove as much of the soft decayed material as possible with a spoon-shaped instrument. If the patient is properly anesthetized he should feel no pain.

(b) Irrigate the cavity with warm water until loose debris has been flushed out.

(c) Isolate the tooth with gauze packs and gently dry the cavity with cotton pledgets.

(d) Mix zinc oxide powder with two or three drops of eugenol on a clean dry surface (parchment pad) until a thick puttylike mix is obtained.

(e) Fill the cavity with the zinc oxide-eugenol paste, tamping it gently (use the Woodson Plastic Instrument #2 or #3).

(f) Relieve interference with opposing teeth by having the patient bite several times. Surplus filling material is easily removed by lightly rubbing the tooth with a moist cotton pledget. The pain should disappear in a few minutes and the paste will harden within an hour. Caution the patient not to chew on the treated tooth.

(g) If zinc oxide powder is not available, a cotton pledget impregnated with eugenol may be left in the cavity.

(h) Instruct the patient that the procedure is temporary and definitive care must be given by a dental officer.

19-4. TOOTH CROWN FRACTURES. The anterior (front) teeth are particularly susceptible to injuries that result in fracture of the crown. The classification and emergency treatment for the majority of these injuries are summarized below.

a. Simple fractures of the crown involving little or no dentin. Treatment: Smooth the rough edges of the tooth.

b. Extensive fractures of the crown involving considerable dentin but not the pulp. Treatment:

(1) Wash the tooth with warm saline.

(2) Isolate and dry the tooth.

(3) Cover the exposed dentin with a zinc oxide-eugenol paste (it is difficult to achieve retention in anterior fractures). A copper band or an aluminum crown, trimmed and contoured to avoid lacerating the gingiva, may be filled with this paste and placed over the tooth. An alternative method is to incorporate cotton fibers into a mix of zinc oxide and eugenol (the fibers give additional strength) and place this over the involved tooth, using the adjacent teeth and the spaces between them for retention. Have the patient bite to be sure neither the bands or the "splint" interfere with bringing the teeth together.

(4) Have the patient see a dentist as soon as possible.

c. Extensive fractures involving the dentin and exposed pulp. Treatment:

(1) Anesthetize the tooth.

(2) Isolate and dry the tooth.

(3) Wash gently with warm saline.

(4) Cover the pulp and dentin with a mix of calcium hydroxide and dycal (DO NOT USE ZINC OXIDE AND EUGENOL AS IT CAUSES NECROSIS OF THE PULP), allow to harden (if the mix is moistened with water after placement, the hardening will be more rapid).

(5) The efficiency of this treatment regimen depends on the size of the pulp exposure. If the exposure is larger than 1.5 mm. consider

extraction. If all you have available is zinc oxide eugenol, you must also consider extraction.

19-5. ACUTE PERIAPICAL (ROOT END) ABSCESS.

a. Diagnosis.

(1) Patient gives history of repeated episodes of pain that has gradually become more continuous and intense.

(2) The accumulating pus causes increased pressure and the tooth will feel "long" to the patient. It will seem to be the first tooth to strike when the teeth are brought together.

(3) There is severe pain on percussion. This is a most significant sign. Always begin percussion on a tooth that appears normal and progress to the suspected tooth.

(4) Swelling may be present.

(5) Malaise, anorexia, and elevated temperature are sometimes noted. If severe, antibiotics should be considered, but only if these signs are present.

(6) The gingival tissues around the tooth are often tender and inflamed.

(7) An untreated periapical abscess may burrow through alveolar bone and appear as a bright red elevation of the soft tissues in the area.

b. Treatment. Drainage usually provides immediate relief from pain. Two methods may be used to accomplish adequate drainage:

(1) If the abscess has "pointed," incise the fluctuant area of the soft tissue associated with the acute infection. Local anesthesia is neither necessary nor easy to obtain.

(2) Establish drainage from the tooth; stabilize the tooth firmly with the fingers, remove the soft decay with a spoon-shaped instrument until an opening into the pulp chamber is made. Finger pressure on the gingiva near the root of the tooth should force pus out through the chamber opening. Pain will usually subside immediately.

c. Untreated acute periapical abscess.

(1) The common course of an untreated acute periapical abscess is as follows:

(a) Accumulation of pus and destruction of bone at the root end of the tooth.

(b) Invasion of the marrow spaces and destruction of trabeculae (suppurative osteitis).

(c) Destruction of the cortex and displacement of the periosteum by suppurative material (subperiosteal abscess).

(d) Rupture of the periosteum with resulting gingival

swelling (gum boil or parulis).

(e) Spontaneous drainage by rupture of the parulis.

(2) This chain of events can usually be halted at any of the stages by removal of the cause. Extraction is usually indicated. If treatment is not given, spontaneous drainage, while affording welcome relief to the patient, does not suffice. The acute process is merely converted to a chronic state that may flare up at any time, especially during periods of lowered resistance. The spread of the primary periapical abscess is usually in the direction of least resistance. As a general

by its closeness to the abscess or parulis is an unreliable procedure. Certainly a tooth should not be extracted without further diagnostic evidence. The path of progression and the possibility of serious sequelae resulting from further spread of the infectious process is determined by the anatomy of the region. The following general statements may be made:

(a) Periapical abscess spread is usually toward the lateral aspect of the jaw.

(b) If the primary infection involves the palatal root of an upper tooth, the abscess usually drains in the palate (palatal roots are present in the upper molars and the first bicuspid). Abscesses on all other roots in the maxillary dentin tend to burrow through to the facial side.

(c) Periapical abscesses developing on the lingual surface of the mandible at a level producing drainage into the mouth are rare.

(d) Drainage may be extraoral. A periapical abscess may perforate the cortical bone and produce a pathway for drainage that opens onto a skin surface without involving the oral mucosa. The external application of heat may promote this untoward result.

(e) When the spread of a mandibular periapical abscess is directed lingually, the level of bone perforation dictates its course. If the breakthrough is above the attachments of the muscles of the floor of the mouth, sublingual infection results. If below these attachments, the avenue of spread is through the facial spaces of the neck, and grave, possibly fatal complications (e.g., Ludwig's angina) may result.

(3) Treatment. In more advanced cases, drainage is still essential. Antibiotics should be administered and their administration continued for several days subsequent to the remission of symptoms. In soft tissue abscesses, the application of heat is often helpful in localizing the suppuration. Emergency treatment centers around prevention of serious sequelae by drainage, if indicated, and the maintenance of high blood levels of antibiotics. It is highly probable that the extraction of the offending tooth will be necessary, but it is preferable to wait until the acute symptoms have subsided.

19-6. PERIODONTAL ABSCESS.

a. Diagnosis. A deep, throbbing, well-localized pain and tenderness of the soft tissues surrounding the tooth are characteristic. The patient frequently complains that the involved tooth seems elevated in its socket.

This acute suppurative process occurs in the periodontal tissues alongside the root of a tooth and involves the alveolar bone, periodontal ligament, and gingival tissues. It usually presents the following signs and symptoms:

- (1) Redness and swelling of the surrounding gingiva.
- (2) Sensitivity of the tooth to percussion.
- (3) Mobility of the tooth.
- (4) Cervical lymphadenopathy.
- (5) General malaise and elevation of temperature.

b. Etiology. This condition results from irritation from a foreign body, subgingival calculus (tartar, hard calcium deposits on the teeth) or local trauma, and subsequent bacterial invasion of the periodontal tissues.

c. Treatment.

(1) Carefully probe the gingival crevice to establish drainage and locate the foreign body.

(2) Spread the tissues gently and irrigate with warm water to remove remaining pus and debris from the abscess area.

(3) Remove any foreign bodies.

(4) Instruct the patient to use a hot saline mouth rinse hourly.

19-7. ACUTE NECROTIZING ULCERATIVE GINGIVITIS (Vincent's infection, trench mouth).

a. Diagnosis. Constant gnawing pain and marked gingival sensitivity are usually the outstanding complaints. These subjective symptoms are accompanied by pronounced gingival hemorrhage, fetid odor, foul metallic taste, general malaise, and anorexia. Necrosis and ulceration are the principal characteristics of this painful inflammatory disease of the gingival tissues. Necrotic lesions commonly appear between the teeth. These are craterlike ulcerations covered by a grayish pseudomembrane. Cervical lymphadenitis and elevation of temperature may develop after the onset of acute oral symptoms. Untreated lesions are destructive with progressive involvement of the gingival tissues and underlying structures.

b. Etiology. Although it was felt for many years that fusospirochetal organisms were solely responsible, the precise cause has not been proven. It is considered to be an infection arising as a result of the action of ordinarily harmless surface parasites exposed to an altered environment. General health, diet, fatigue, stress, and lack of oral hygiene are the most important precipitating factors. This disease is not considered to be transmissible; however, the fusospirochetal organisms are very virulent.

c. Treatment. The primary problem in therapy is the establishment of good oral hygiene. Simple emergency treatment is outlined as follows:

- (1) First day.

(a) Wear surgical or exam gloves when working on this if possible.

(b) Swab the teeth and gingiva thoroughly with a 1:1 aqueous solution of 3% hydrogen peroxide on a cotton-tipped applicator twice.

(c) Instruct the patient to rinse his mouth at hourly intervals with this same solution. Issue the patient one pint of hydrogen peroxide. Caution him not to use this treatment for more than 2 days (due to possibility of precipitating a fungal infection).

(d) Place the patient on an adequate soft diet and advise a copious fluid intake.

(e) Have patient return in 24 hours.

(2) Second day. Patient will be much more comfortable.

(a) Using a soft toothbrush soaked first in hot water, clean the patient's teeth without touching the gingiva.

(b) Maintain the hourly hydrogen peroxide mouthwash regimen.

(c) Have patient brush with a soft toothbrush soaked in hot water every hour.

(d) Have patient return in 24 hours.

(3) Third day. Patient is essentially free of pain.

(a) Clean patient's teeth as before.

(b) Floss between all teeth.

(c) Discontinue hydrogen peroxide mouthwash regimen.

(d) Have patient brush 3-4 times a day.

(e) Tell patient to floss once a day.

(4) The above steps will suffice for the management of the typical acute case. After treatment, the acute form subsides and the chronic phase ensues. Although clinical symptoms are minimal, tissue destruction continues until further corrective measures are completed. Definitive care consists of cleaning and scaling of the teeth, instruction in oral hygiene and, in some cases, recontouring of the tissues involved in the infection. Unless the patient develops systemic involvement, antibiotic therapy should not be instituted. Antibiotic lozenges should never be employed in the management of this disease. As in other oral disorders, the use of silver nitrate or other caustics is definitely contraindicated.

d. Remarks. Lesions similar to those of acute necrotizing ulcerative gingivitis frequently appear in patients suffering from blood dyscrasias or vitamin deficiencies. Any case of gingivitis that does not respond well within 24 hours requires hematological analysis.

19-8. HERPETIC LESIONS (COLD SORES, FEVER BLISTERS).

a. Diagnosis. Intense pain is the most frequent symptom when the fully developed herpetic ulcer is present. Itching, burning, and a feeling of tissue tautness are characteristics in the early stages. Oral herpetic lesions usually appear as small, localized ulcerations, but extensive involvement is occasionally seen. The vesicular stage (presence of fluid-containing "blisters" characteristic of involvement of the lips) is seldom seen with the mouth. Intraoral vesicles are quickly ruptured and the hepatic lesion then appears as a small eroded area with a bright red, flat or slightly raised border. In later stages, the lesion becomes covered with an all white plaquelike mass of epithelial cell fibrin and debris. Generalized herpetic infections produce large areas of fiery red, swollen, and extremely painful oral mucosa. It is in this type that systemic symptoms are pronounced.

b. Etiology. Lesions are due to the herpes simplex virus. This virus persists throughout the lifetime of the patient in areas near the site of the primary infection. In an otherwise healthy mouth, a degree of lowered resistance must be present in the oral structures for the virus to produce its effects. Predisposing factors include emotional stress, the common cold and other upper respiratory infections, gastrointestinal disorders, nutritional deficiencies, food allergies, and traumatic injuries to the oral mucosa. In females, menstruation and pregnancy often seem to trigger this process.

c. Treatment. Treatment is directed at the symptoms. Antibiotics are ineffective, but in severe cases they may prevent secondary infection. Fluids should be forced to prevent dehydration. Spices, spirits, and smoking should be avoided since they irritate the already painful lesions. Oral hygiene must be maintained.

d. Remarks. Healing usually occurs in about 2 weeks. Scar formation or serious sequelae are exceedingly rare. The primary infection, usually seen during childhood, produces a much more extensive and serious oral involvement than do the later episodes. Lesions are usually larger and more numerous and the pain is consequently greater. Because of the pain, children frequently refuse to eat or drink and dehydration may result.

19-9. PERICORONITIS.

a. Diagnosis. Marked pain in the area of a mandibular third molar is the most constant complaint. Acute inflammation is present in tissue flaps over partially erupted teeth. The clinical picture is that of a markedly red, swollen, suppurative lesion that is very tender and often accompanied by pain radiating to the ear, throat, and the floor of the mouth. The opposing (upper) wisdom tooth may impinge on the swollen flap of tissue thus making chewing virtually impossible. Fever and general malaise are often present. In addition, there may be spasm of the masticatory muscle on the affected side. Involvement of the cervical lymph nodes is common. Principal etiologic factors include trauma from opposing teeth, accumulation of food and debris, and bacteria and their products.

b. Treatment.

(1) Wrap the tip of a blunt instrument with a wisp of cotton. Dip the cotton in 3% hydrogen peroxide and carefully clean the debris from

beneath the tissue flap; pus may be released.

- (2) Flush the area using warm saline solution.
- (3) Instruct the patient to use a hot saline mouth rinse hourly.
- (4) Prescribe an adequate soft diet.
- (5) Repeat this treatment at daily intervals until the inflammation subsides.
- (6) Stress that oral hygiene must be maintained.
- (7) Extraction of the opposing molar must be considered if the inflammation does not subside.

NOTE: Antibiotic therapy should be limited to the treatment of systemic symptoms. Extraction of the offending tooth is usually necessary. Since the inflammatory process tends to recur, definitive dental treatment will be necessary.

19-10. DENTAL ANALGESIA.

a. Maxillary.

(1) Infiltration will provide adequate analgesia of the maxillary teeth. (Analgesia - blocking of pain impulses. Anesthesia - blocking of all nerve impulses.)

(2) Technique. Both facial and palatal injections must be given for maxillary extraction.

(a) Facial injection (see illustrations below).

1. Insert the needle into the mucobuccal fold directly above the tooth.

2. Advance the needle upward about three-eighths of an inch until the needle gently contacts bone (this should approximate the root end).

3. Aspirate to insure that the needle has not entered a blood vessel.

4. Slowly deposit three-fourths of the cartridge's contents.

(b) Palatal injection (see illustrations below).

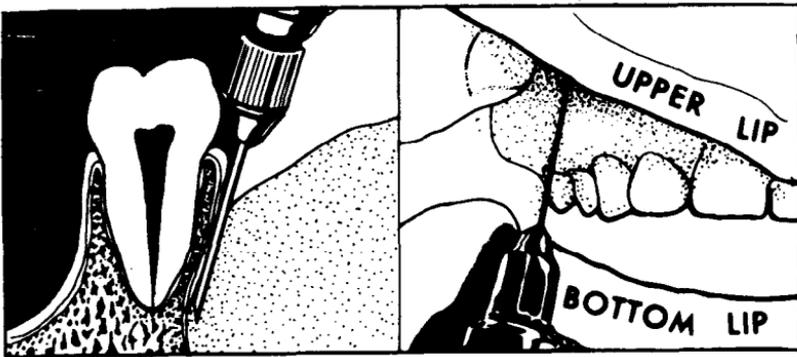
1. Insert the needle one-half of an inch above the gingival (gum) margin of the tooth.

2. Deposit 3-4 drops of solution - DO NOT BALLOON THE TISSUE.

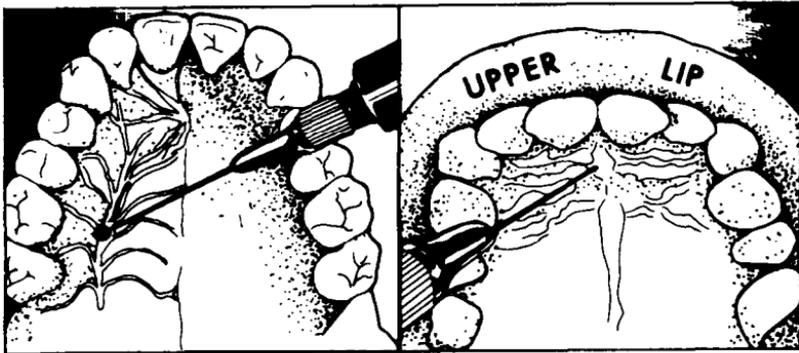
NOTE: The palatal injection is very painful.

b. Mandibular (Inferior alveolar). Conduction analgesia

supplemented by infiltration is the method of choice in anesthetizing the lower teeth. The inferior alveolar nerve is blocked as it enters the mandibular foramen on the medial aspect of the ramus of the mandible. This foramen is located midway between the anterior and posterior borders of the ramus and approximately one-half of an inch above the biting surface of the lower molars. The width of the ramus at this level can be estimated by placing the thumb on the anterior surface of the ramus (intraorally) and the index finger on the posterior surface extraorally. The inferior alveolar and lingual nerves are anesthetized by a single injection.



FACIAL INJECTION.



PALATAL INJECTION.

(1) Place the index finger on the biting surface of the lower molars so that the ball of the finger will contact the anterior border of the ramus. The fingernail will then be parallel to the midline.

(2) Place the barrel of the syringe on the lower bicuspids on the side opposite of the side to be anesthetized.

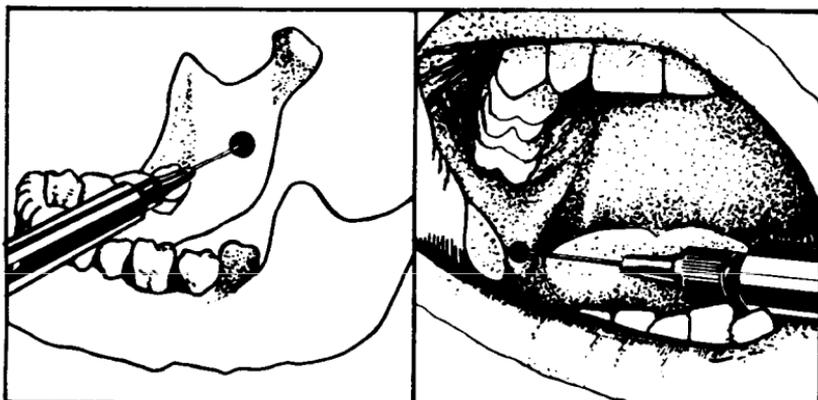
(3) Insert the needle into the tissue of the side to be

anesthetized in the apex of the V-shaped, soft tissue depression about one-half of an inch ahead of the tip of the finger on a line horizontally bisecting the fingernail.

(4) Advance the needle to contact the medial surface of the ramus. A 1-inch soft tissue penetration will usually suffice to position the needle point in the area of the mandibular foramen.

(5) Slowly deposit approximately two-thirds of the cartridge contents.

(6) Swing the barrel of the syringe to the side of the mouth being injected (leaving the needle in the position described in (4) above) and inject the rest of the cartridge contents while withdrawing the needle. This should anesthetize the lingual nerve.



MANDIBULAR INJECTION.

(7) Anesthesia of the area is completed by a long buccal injection (see illustration below). Insert the needle in the mucobuccal fold at a point just anterior to the first molar. Gently pass the needle held parallel to the body of the mandible, with the bevel down, to a point as far back as the third molar, depositing the solution slowly as the needle is being advanced through the tissue.

(8) After a 5-minute interval, the results of the injection are evaluated by checking the following symptoms:

(a) Inferior alveolar nerve (supplies lower teeth, alveolar bone up to the midline).

1. A sensation of swelling and numbness extending to the midline of the lower lip on the injected side.

2. Insensitivity of the facial gingival tissue extending to the midline on the injected side.

(b) Lingual nerve.

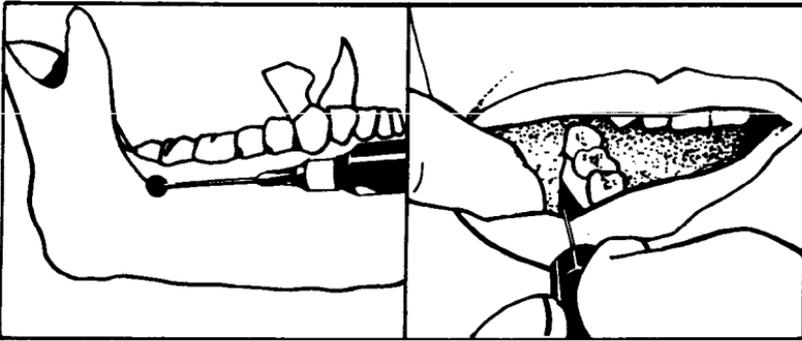
1. A swollen numb sensation extending to the midline of the tongue.

2. Insensitivity of the lingual gingival tissue.

(c) DO NOT ATTEMPT EXTRACTION UNTIL THE SIGNS DESCRIBED ABOVE HAVE APPEARED.

19-11. TOOTH EXTRACTION.

a. This section describes only one extraction technique. Although many types of extraction forceps are manufactured, the removal of any erupted tooth can usually be accomplished with one of two instruments: The Maxillary Universal Forceps (150) or the Mandibular Universal Forceps (151).



LONG BUCCAL INJECTION.

b. Technique. Break the attachment of the gingival tissue to the tooth by forcing a blunt instrument (Periosteal Elevator, Woodson Plastic Instrument, etc.) into the crevice between the tooth and the gingiva, all the way around the tooth. The tooth-tissue attachment should be broken to the level of the alveolar bone.

Use the free hand to guide the beaks of the forceps under the gingival margin on the facial and lingual aspects of the tooth and to support the alveolar process. Apply pressure toward the root of the tooth to force the tips of the forceps as far down on the root as possible. Slowly rock the tooth with progressively increasing pressure in a facial-lingual direction. This force is used for the loosening of teeth with more than one root (molars and upper first bicuspid). Single-rooted teeth are loosened by combining this rocking motion with a rotary force. When considerable mobility has been established, deliver the tooth by exerting gentle traction. Note the direction in which the tooth tends to move most easily and follow this path for delivery. Inspect the extracted tooth to determine if the roots have been fractured. After the extraction has been completed, compress the sides of the empty socket (this repositions the bone that has been sprung by the extraction force) and

place a folded dampened sponge or 2x2 over the wound. Instruct the patient to maintain light biting pressure on this compress for 20 minutes. Repeat if necessary to control hemorrhage. Caution the patient NOT TO RINSE the mouth for at least 12 hours since this may disturb the clot.

19-12. INJURIES OF THE JAWS.

a. General. The immediate treatment of facial trauma consists of the establishment of an airway, the control of hemorrhage, the treatment of shock, and the evaluation of neurologic findings. These basic measures MUST BE CONSIDERED FIRST. Although diagnosis is difficult when edematous distortion and muscular trismus are present, a thorough clinical examination should include inspection and palpation of the oral regions for the following:

- (1) Wounds, swelling, and discoloration.
- (2) Pain, tenderness, crepitus, and mobility at suspected fracture sites.
- (3) Facial asymmetry.
- (4) Trismus.
- (5) Abnormal mandibular excursions.
- (6) Altered biting relationship of the upper and lower teeth.
- (7) Segmental alveolar fractures. Exert pressure upon each individual tooth to determine the integrity of the underlying alveolar bone.

b. Dislocations of the mandible.

(1) The usual type of dislocation of the mandible is bilateral and the condyles are displaced anteriorly. The mouth is locked open with the chin protruded. Trismus is present and speech is difficult. In the unilateral type (very rare), the chin is deviated away from the side of the dislocation. Reduction of the dislocated jaw is normally accomplished without anesthesia. Narcotics are effective in relieving pain and apprehension and thereby prompt relaxation of the jaw muscles, but restraint must be exercised in their use. In the more resistant cases, general anesthesia may be indicated. Repositioning of the dislocated mandible is accomplished in the following manner:

(a) Wrap the thumbs with several thicknesses of gauze or towel. This provides protection against snap closure of the mandible.

(b) Place the thumbs lateral to the molar teeth to prevent injury to the thumbs and extend the fingers to grasp the under surface of the mandible. (The thumbs may also be placed on the biting surfaces of the lower molar teeth so that more pressure can be exerted, but when the jaw snaps closed you can get bitten.)

(c) Exert DOWNWARD pressure with the thumbs to bring the condyle of the mandible below the articular eminences. The fourth and fifth fingers may be used to exert an upward pressure on the point of the chin.

(d) Gently but firmly force the mandible FORWARD, then BACK. This will usually return the condyles to normal position.

(e) Caution the patient to avoid excessive opening of the mouth for several weeks.

(f) Prescribe a soft diet.

(2) Normally the pain following repositioning continues for about 72 hours. Analgesics should adequately control this pain. If marked pain persists or if there is a tendency toward recurrence of dislocation, immobilization is indicated. This may be effected by head bandages.

c. Mandibular fractures.

(1) Mandibular fractures must be differentiated from dislocations of the jaw because of the great difference in treatment. Some of the features of fractures are:

(a) Pain.

(b) Abnormal bite relationship between upper and lower teeth; they come together normally on one side and do not touch on the other when the jaws are closed.

(c) Crepitus.

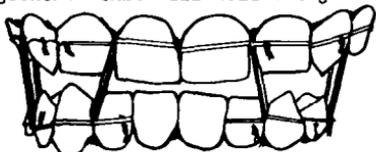
(d) Gross displacement of segments of the jaws.

(2) Once a mandibular fracture has been diagnosed, the patient should be evacuated in a face-down or side position to prevent aspiration of blood, saliva, vomitus, etc. The use of head bandages to immobilize the jaws is not recommended since the backward force exerted may push the tongue (or other soft tissue) back to obstruct the airway. In addition, head bandages make it difficult for a patient to vomit without aspiration. Reducing the fracture at this time is not suggested since the harm done may exceed any benefits derived. If evacuation is not possible and you have to keep the patient, wait until the patient's condition is stable, then line up the upper and lower teeth using wire sutures (0 silk if wire is not available). Wire the upper and lower teeth together as follows:

(a) Form a small loop in the center of the wire and wrap the wire in a figure 8 around two teeth with small loop centered between the teeth.

(b) Repeat this in at least four positions on the top teeth and the same number on the lower teeth, insuring the loops on top and bottom are opposite each other.

(c) Wire the two loops (in each of the four positions) together. This will hold the jaw in position. (See illustration below.)



The wires will have to remain in place from 3-6 weeks, and the patient will have to be placed on a liquid diet during this time. After the wires are removed, keep the patient on a soft diet for a couple of weeks; then gradually return him to a normal diet.

CHAPTER 20

PREVENTIVE MEDICINE (PM)

20-1. THE MEDIC'S ROLE IN PREVENTIVE MEDICINE.

- a. Plans preventive medicine programs.
- b. Advises and recommends preventive medicine measures to the commander.
- c. Supervises or performs preventive medicine measures.
- d. Insures that preventive medicine programs are implemented properly.
- e. Teaches and supervises personnel in preventive medicine measures.

20-2. PERSONAL HYGIENE.

- a. Foot care.
 - (1) Keep feet clean (dry well after bathing).
 - (2) Massage and powder twice daily if possible.
 - (3) Change socks daily or when wet.
 - (4) Keep socks and footgear in good repair.
 - (5) Keep toenails short with squared off cut.
- b. Showering and hand washing.
 - (1) Shower as often as possible to avoid skin disease.
 - (2) Wash hands after using latrine and before eating.
 - (3) If unable to bathe, wash face, underarms, groin, feet, etc.
 - (4) Desitin, A&D Ointment, or cornstarch in groin and between buttocks helps control rash.

20-3. INDIVIDUAL PROTECTIVE MEASURES.

a. Clothing. The combat uniform worn fully and properly is the best means of initial protection and first line of defense available. It should be worn loosely to permit ventilation and must be worn with the pants bloused into the boots, shirt tail tucked into pants, sleeves down and buttoned to provide protection against insects such as ticks and to lessen exposure to mosquitoes, sandflies, and other disease carriers.

b. Use of M1960-Clothing Repellent (DEET). The full uniform impregnated with M1960 repellent provides additional protection against arthropods. Do not impregnate underclothing and socks. The M1960 repellent kills mites and ticks and repels mosquitoes and other vectors. To mix, use a large container (approximately 15 gallons) and a long stick for stirring; add 1 gallon of DEET to 11 gallons of water. The ratio must

remain correct. Soak and saturate the outer clothing only. Wring out excess solution and allow the uniform to dry prior to wearing. This procedure must be repeated each time the uniform is laundered.

c. Individual insect repellent applied to exposed skin areas provides good protection against all insects. Kerosene applied to neck, wrists, and legs at the boot tops will prevent infestation from chiggers, mites, etc.

d. Lindane dust or sulfa powder provides good protection against mites, chiggers, and lice when other repellents are not available.

e. Aerosol insecticides sprayed into containment areas such as living quarters, tents, and bed nets are highly effective against flying insects.

f. If infestation of lice, chiggers, etc., should occur, bathing with a strong soap will rid the individual of the insects. Additionally, clothing must be removed and laundered to prevent reinfestation.

g. Good personal hygiene and protective measures are the basic lines of defense against disease.

20-4. COLLECTIVE PROTECTIVE MEASURES - FIELD SANITATION AND CHEMICAL CONTROL.

a. Pesticides (chemical control) can be valuable aids in the control of arthropods, but these are only to supplement, not replace, good field hygiene and individual measures of protection. Pesticides are poisonous and can be more dangerous than helpful to the environment and the individual if misused. Pesticides can be inhaled or absorbed through the skin if the user is improperly trained to protect himself through the use of respirators, protective masks, gloves, etc.

(1) Classification of pesticides.

(a) Stomach poisons (e.g., lead arsenate) must be ingested by the insect to be effective.

(b) Contact poisons (e.g., DDT, lindane, pyrethrum, and Diazinon) kill by merely coming in contact with the insect. These can be quick kill, short life or residual, long term kill expectancy. NOTE: DDT, lindane, pyrethrum, and Diazinon are either not available in the US or under the scrutiny of US Standards (EPA, FDA, USDA, etc.). However, they may still be accessible for export or available in the OCONUS area of operation. Care must be used in all applications of pesticides. You may find agents such as DDT, if available, very valuable in delousing operations. Do not hesitate to use pesticides in a cautious manner even though they have been banned in the US.

(c) Fumigants kill through the insect's respiratory system and are very dangerous to humans, normally requiring special handling and training; they are not recommended for the use of the medic in any situation.

(2) Toxicity. When you use pesticides, always read the instructions and follow those instructions to prevent harm to yourself and others or to the environment. Never use any pesticide marked "concentrate"; it must be diluted in accordance with its nature and handled only by specially trained personnel. When in doubt, avoid the substance or

contact the group preventive medicine personnel.

b. Equipment available for issue and use in chemical control and in application of pesticides are the hand duster for use with dusts such as DDT and lindane and the hand pressure sprayer for use with liquids.

20-5. FIELD DISINFECTION OF WATER (PURIFICATION).

a. Directions for the use of iodine water purification tablets call for adding one tablet to a quart canteen of clear water, two tablets if cloudy. Recent studies indicate that one tablet may not guarantee complete destruction of *Giardia* cysts in clear, very cold water. *Giardia*, an intestinal protozoan parasite, is found worldwide, particularly in cold water. Therefore, two tablets will be used in very cold water, whether cloudy or clear.

b. Canteen (1 quart):

(1) Concept: Any water can be collected in a soldier's canteen and made safe using iodine tablets. (Water Purification Tablets, NSN 6850-00-985-7166.)

(2) Procedures:

(a) CHECK THE WATER. (Use one tablet if clear; use two if cloudy or cold.)

(b) ADD IODINE TABLETS. (Use only steel gray; don't use red or white.)

(c) WAIT 5 MINUTES. (Allow time for the tablets to dissolve.)

(d) SHAKE THE CANTEEN. (Mix the contents well.)

(e) DISINFECT THREADS. (Loosen the cap; turn canteen upside down.)

(f) WAIT 30 MORE MINUTES. (Allow time for the iodine to kill.)

(3) Alternate methods of disinfecting if iodine tablets are not available.

(a) Boil water. Bring to a boil for at least 15 seconds.

(b) Iodine (tincture). Add five or more drops to each canteen.

(c) Bleach (Clorox). Add two or more drops to each canteen.

(d) Chlorine ampules. Break one ampule into a canteen cup; fill cup with water to the bottom rivet and stir; pour half a capful of the slurry into each canteen and wait 30 minutes.

c. Water bag (lister bag - 36 gallons).

(1) Concept: Any water can be poured into a lister bag and made safe using chlorine ampules. (Chlorination Kit, Water Purification, NSN 6850-00-270-6225.)

(2) Procedure:

- (a) DISSOLVE THREE AMPULES. (Use a canteen cup as a bowl.)
- (b) POUR INTO LISTER BAG. (Stir the bag with a clean stick.)
- (c) FLUSH ALL THE TAPS. (Let each run for several seconds.)
- (d) WAIT 10 MINUTES. (Allow time for chemical reaction.)
- (e) CHECK THE RESIDUAL. (Use the plastic test tube in the kit.)
 1. Crush one "OT" tablet in the metal cap.
 2. Dump the resulting powder into the plastic test tube.
 3. Flush the tap from which you are going to take the sample.
 4. Fill test tube with water to bottom of the yellow band.
 5. Compare colors: If the water is at least as dark as the yellow band, proceed to step 6; if the water is lighter, more chlorine is needed. Repeat steps 1 through 5 using one or more additional chlorine ampules.
 6. WAIT 20 MORE MINUTES. (Allow time for the chlorine residual to kill.) Check residual again before drinking; if chlorine residual is < 5 ppm., repeat steps 1-5.

d. Water cans (5 gallon).

(1) Concept: Water in standard 5-gallon cans can be made safe using chlorine ampules. (Chlorination Kit, Water Purification, NSN 6850-00-270-6225.)

(2) Procedure:

- (a) DISSOLVE ONE AMPULE. (Use a canteen cupful of water.)
 - (b) POUR HALF OF CUP INTO CAN. (Remainder can be poured into a second can.)
 - (c) DISINFECT THE THREADS. (Loosen cap; turn can upside down and shake; then retighten.)
 - (d) WAIT 30 MINUTES. (Allow time for chlorine to kill.)
- e. Water trailer (400 gallon).

(1) Concept: If the unit's field sanitation team tests the trailer and fails to find a measurable chlorine residue (any degree of yellow is acceptable), the water in the trailer can be made safe using chlorine powder. (Calcium hypochlorite, 6-oz. jar, NSN 6810-00-255-0471) or Chlorination Kit, Water Purification, NSN 6850-00-270-6225.)

(2) Procedure:

- (a) DISSOLVE ONE SPOONFUL. (Use a mess kit spoon and a canteen cup.)
- (b) POUR INTO TRAILER. (Stir with a clean stick.)
- (c) FLUSH TRAILER TAPS. (Let each run for several seconds.)
- (d) WAIT 10 MINUTES. (Allow time for chemical reaction.)
- (e) CHECK RESIDUAL. (Use the plastic test tube from chlorination kit.)
1. Crush one "OT" tablet in the metal cap.
 2. Dump the resulting powder into the plastic test tube.
 3. Flush the tap from which you are going to take the sample.
 4. Fill test tube with water to bottom of the yellow band.
 5. Compare colors: If the water is at least as dark as the yellow band, proceed to step 6; if the water is lighter, more chlorine is needed. Repeat steps 1 through 5 using half a spoonful of powder.
 6. WAIT 20 MORE MINUTES. (Allow time for the chlorine residual to kill.) Check residual again before drinking; if chlorine residual is < ppm., repeat steps 1-5.

f. Remarks.

(1) The concept that any water can be made "safe" by chlorination is a misconception. Chlorinating potentially contaminated water does not necessarily make it safe due to amoebic cysts. Filtration is a practical means of removing cysts from the water; however, this may be impractical. Boiling water to a hard roll for at least 15 seconds is another means of making the water safe from amoebic cysts as this action will kill the cysts.

(2) Chlorination, when performed properly, will make water "safe" in regards to killing disease-causing bacteria, such as E. coli; however, only filtration or boiling can kill or remove the amoebic cysts from the water source. All water from unknown sources must be considered dangerous and contaminated. All precautions for the treatment of the water must be utilized.

(3) POL containers or water containers that have been contaminated with POL must not be used for consumable water.

(4) Always check the water for chlorine residual, regardless of the source. When the residual is adequate, no disinfection is necessary. However, if the residual is low, disinfect the water using the procedures described for each container. A minimum of 5 ppm. chlorine residual is required for field water supplies.

20-6. WATER SOURCES.

a. Surface water (lakes, ponds, streams, rivers). Although this source is the least desirable, it is most plentiful and easily accessible. Knowing the best sites to choose to avoid excessive pollution and the proper methods of water treatment is the best prevention of waterborne disease. Sometimes water may be unpalatable due to odors or unpleasant taste, but it can be made potable and it may prevent death through dehydration if it is properly treated.

b. Ground water. Wells are usually the most desirable source; however, care must be taken to insure no pollution has been introduced by dumping animal carcasses, garbage, feces, etc. All water of unknown origin must be considered polluted and must be treated.

c. Precipitation. Even with rain and snow (often least common and least dangerous when fresh), precautions must be taken to avoid introducing disease pathogens to the individual; therefore, rain and snow require treatment to the recommended level.

20-7. WASTE DISPOSAL.

a. The term "wastes" includes all types of refuse resulting from the living activities of humans or animals: human wastes (feces and urine); liquid wastes (wash, bath, and liquid kitchen wastes); garbage; and rubbish.

b. The methods that should be used to dispose of wastes depend upon the situation and the location. Burial and burning are the methods most commonly used in the field.

c. Large quantities of all types of wastes, liquid and solid, are generated each day under field conditions. These materials must be removed promptly and thoroughly; otherwise, the camp or bivouac will quickly become an ideal breeding area for flies, rats, and other vermin. Filth-borne diseases such as dysentery (amebic and bacillary), typhoid, paratyphoid, cholera, and plague could become prevalent.

d. Disposal of human wastes:

(1) The devices for disposing of human wastes in the field vary with the situations.

(a) When on the march, each person uses a "cat-hole" latrine during short halts. It is dug approximately 1-foot deep and is completely covered and packed down after use.

(b) In temporary camp of 1 to 3 days the straddle trench is most likely to be used unless more permanent facilities are provided for

the unit.

(c) In temporary camps deep pit latrines and urine soakage pits are usually constructed. Until such time as the construction of deep pit latrines can be completed, straddle trench latrines are used. Where the construction of deep pit latrines is not practicable, other types of latrines are used.

(2) Rules common to the construction, maintenance, and closing of latrines.

(a) In determining the type of latrines to be constructed, consider the length of stay, the water level, and the soil conditions. To protect water from contamination, do not extend the depth of a latrine pit or trench below the underground water level.

(b) In determining the location within the camp area for construction of latrines, consider first the protection of food and water from contamination and, secondly, the accessibility to the users.

1. To protect food and water from contamination, select a location that is at least 100 yards from the unit mess and 100 feet from the nearest water source and that drains away from all water sources.

2. Choose a location that is accessible to the users and reasonably near the edge of the camp.

(c) Sufficient latrines should be constructed to serve at least 8 percent of the personnel at one time.

(d) After the latrines have been completed, construct the necessary protective and hygienic devices.

1. Place canvas or brush screens around the latrines or tents over them. In a cold climate the shelters should be heated, if possible.

2. To prevent surface water from flowing into the shelters, dig drainage ditches around them.

3. In each latrine shelter, provide toilet paper on suitable holders with tin cans for covering the toilet paper to keep it from getting wet during bad weather.

4. Install a simple, easily operated handwashing device just outside each latrine shelter. These devices should be kept filled with water at all times so that each individual can wash his hands after he uses the latrine.

5. At night extend cords from trees or stakes to the latrines to serve as guides.

(e) Police the latrines properly and maintain a good fly-control program in the entire camp area to prevent fly breeding and to reduce odors.

1. Keep the lids to the latrine seats closed and all

cracks sealed.

2. Scrub the latrine seats and boxes with soap and water daily.

3. Spray the inside of the shelters with a residual insecticide twice weekly. If a fly problem exists, also spray the pit contents and the interior of the boxes twice weekly with a residual insecticide. Using lime in the pits or burning out the pit contents, except in burn-out latrines, is not effective for fly or odor control; these methods, therefore, are not recommended.

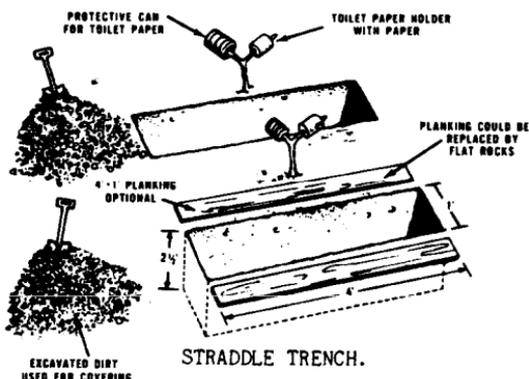
(f) When a latrine pit becomes filled with wastes to 1 foot from the surface or when it is to be abandoned, remove the latrine box and close the pit as follows:

1. Using an approved residual insecticide, spray the pit contents, the side walls, and the ground surface extending 2 feet from the side walls.

2. Fill the pit to the ground level with successive 3-inch layers of earth, packing each layer down before adding the next one; then mound the pit over with at least 1 foot of dirt and spray it again with insecticide. This prevents any fly pupa, which may hatch in the closed latrine, from getting out.

(3) Cat hole latrine. Primarily used when a unit is "on the march or for short-term duration" (1 day). It is 6-12" deep and is covered after use.

(4) Straddle trench latrine. Used for 1 to 3 day bivouac, in nonrocky or nonfrozen soil. Construct 1' wide, 2 1/2' deep, and 4' long. Accommodates two men. Parallel trenches at least 2' apart. Excavated earth is used promptly to cover excreta.



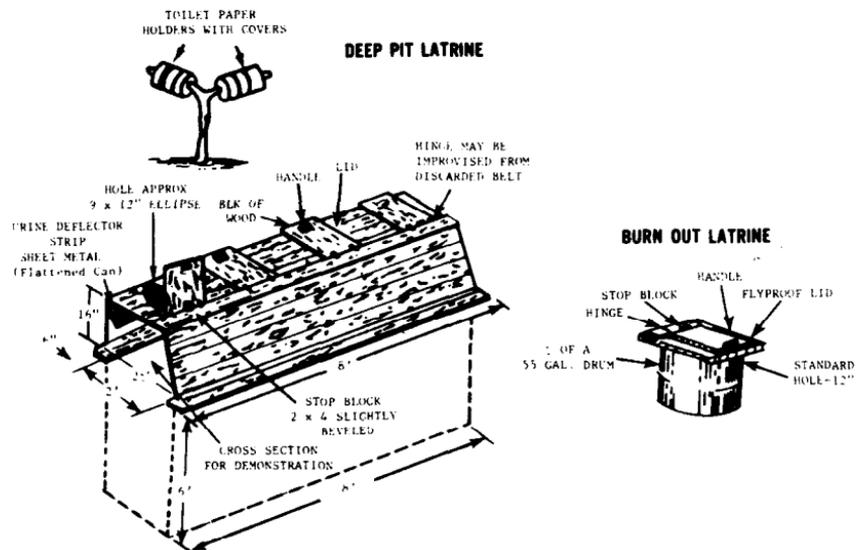
(5) Deep pit latrine (illustrated on next page). Used in temporary camps; not used in rocky or frozen soil or where the water table is high. Construct 2' wide, 7 1/2' long, and 1' of depth for each week of use. Add 1' of depth for dirt. Maximum depth 6'. Cover with latrine box. Accommodates four men. Wash latrines with soap and water daily.

(6) Mound latrine. Used when the water table is high or in

rocky soil. Build mound 6' wide and 12' long to accommodate a latrine box. Pit is built in mound. Pits have same dimensions as a deep pit latrine. Reinforce walls (if necessary) to avoid cave-ins.

(7) Burn-out latrine (illustrated below). Used in rocky/frozen soil or when the water table is high. Construct with 55-gallon drum; bury half or cut it in half. Cover with flyproof wooden seat. For feces only (not for urinating), burn out daily or when half full. (Use 1 qt. gas to 5 qt. diesel or kerosene.) Use two latrines (one in use, while other is burned).

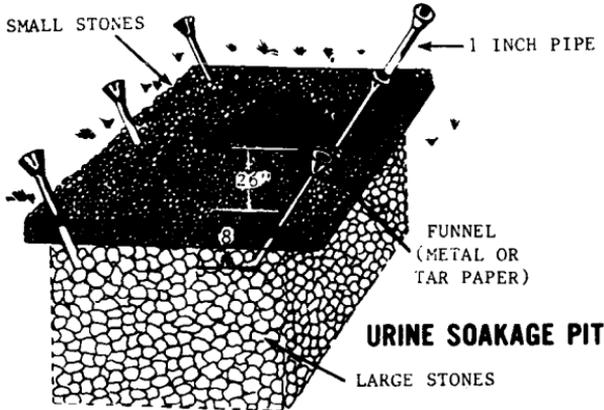
Burn until only ash remains, and bury ash.



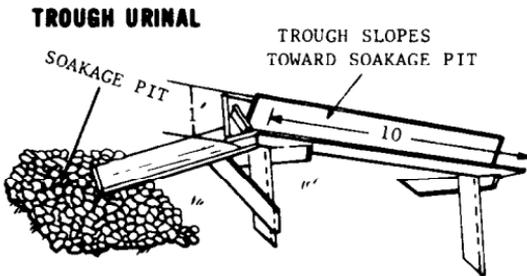
(8) Urinals.

(a) Construct one urinal per latrine facility or enough to serve 5% of the personnel at one time.

(b) Urine soakage pit. Construct 4 cubic feet in length. Fill with rocks, bricks, broken glass, or similar items. Place 1" pipes, 36" long, at each corner 8" deep into pit. Place funnels at the top of the pipes.



(c) Urine trough. Used when wood is more available than pipe. Allow 10' of trough/100 men. Construct V- or U-shaped trough with metal or tar paper lined wood. Place splash board down the center of trough. Drain into soakage pit or deep pit latrine.



e. Wash, bath, and liquid kitchen wastes:

(1) In the field, wash, bath, and liquid kitchen wastes are disposed of in the soil usually by means of either soakage pits or soakage trenches. In order for the soil to absorb these liquids, the grease and soap as well as any solid particles must first be removed; therefore, each soakage pit or trench used for disposing of wash and liquid kitchen wastes must have a grease trap. In places where heavy clay soil prevents the use of soakage pits or trenches, evaporation beds may be used if the climate is hot and dry.

(2) Soakage pits. In a temporary camp, a soakage pit 4 feet square and 4 feet deep normally will be adequate to dispose of liquid kitchen waste for 200 persons. If the troops are to remain in the camp for 2 weeks, two pits should be constructed for disposal of liquid kitchen waste; each pit should be used on alternate days, thus lessening the possibility of clogging. Each device provided for washing and bathing must also have a soakage pit under it. These soakage pits are constructed in the same way as a urinal soakage pit except that the urinal pipes are

omitted. A grease trap is provided for each pit, except those under showers. The area under field showers, as well as under drinking devices, should be excavated a few inches and then filled with small, smooth stones to keep the water from standing. If a soakage pit becomes, clogged, it is closed, and a new one is constructed. A soakage pit is closed by covering it with 1 foot of compacted earth.

(3) Soakage trenches. If the ground water level or a rock formation is close to the surface, soakage trenches instead of pits should be used. A soakage trench consists of a pit, 2 feet square and 1 foot deep, with a trench extending outward 6 or more feet from each of its sides. The trenches are 1 foot wide and vary in depth from a foot at the central pit to 1 1/2 feet at the outer ends. The pit and trenches are filled with the same material used in a soakage pit. Two such units should be built to dispose of liquid kitchen waste for every 200 persons, and each unit should be used on alternate days. One unit should be built for each washing device provided. A grease trap is provided for each soakage trench. A soakage trench is closed by covering it with 1 foot of compacted earth. Construction of a soakage pit is the same as for a urine soakage pit minus the pipes.

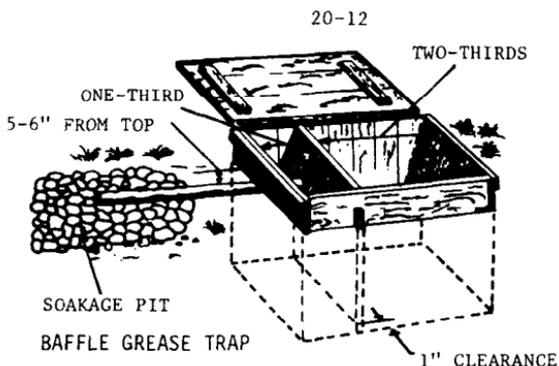
(4) Grease traps.

(a) Baffle grease trap.

1. A baffle grease trap may be made from a drum or from a watertight box. The drum or box is divided vertically into an entrance chamber and an exit chamber by attaching a wooden baffle. The baffle should be placed so that the entrance chamber will be approximately twice the size of the exit chamber. The baffle should hang to a point within 1 inch of the bottom. A strainer that may be made from a small perforated box filled with straw, hay, or burlap is inserted into the lid above the entrance chamber. A pipe is inserted into the exit chamber about 3 to 6 inches below the top as an outlet to the soakage pit. This baffle grease trap is usually placed on the ground at the side of the soakage pit with the outlet pipe extending 1 foot beneath the surface at the center of the pit. If a grease trap is not watertight, it must be placed partially under the ground.

2. Before the grease trap is used, the chambers are filled with cool water. The waste liquid is poured through the strainer that retains any solids. As the warm liquid strikes the cool water, the grease rises to the surface of the entrance chamber; and the liquid runs under the baffle, filling the exit chamber. When the liquid reaches the outlet pipe near the top of the exit chamber, it runs through this pipe into the soakage pit. Unless the grease trap is of sufficient capacity, the warm greasy liquid poured into the trap will heat the cool water in the trap, thus allowing the grease to remain uncongealed and to pass through the trap. The efficiency of this grease trap can be increased by constructing it with multiple baffles. Also, a series of traps may be used.

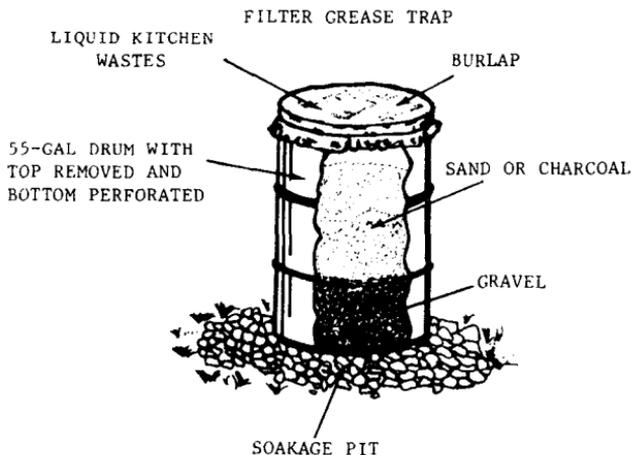
3. The baffle grease trap must be properly maintained to prevent clogging of the soakage pit. The grease retained in the trap should be skimmed from the surface of the water daily or as often as required and either buried or burned. The entire trap should be emptied and thoroughly scrubbed with hot, soapy water as often as necessary.



(b) Barrel filter grease trap.

1. The barrel filter grease trap may be made from a 30- to 50-gallon barrel or drum that has the top removed and a number of large holes bored into the bottom. Eight inches of gravel or small stones are placed in the bottom and covered with 12 to 18 inches of ashes or sand. A piece of burlap is fastened to the top of the barrel to serve as a coarse filter. The trap may be placed directly on the soakage pit, or it may be placed on a platform with a trough leading to the pit.

2. Every 2 days the grease trap should be emptied, washed, and refilled as described in 1 above. The material removed should be buried. The burlap filter should be either washed or replaced every day.



f. Garbage disposal. Garbage is the solid or semisolid waste resulting from the preparation, cooking, and serving of food. It does not include rubbish. Garbage is disposed of by burial or incineration.

(1) Burial. When troops are on the march, in bivouac, or in camps for less than a 1-week duration, garbage is disposed of by burial in pits or trenches. These pits or trenches should not be over 30 yards from

the mess area. Garbage must not, however, be buried closer than 100 feet from any source of water used for cooking or drinking.

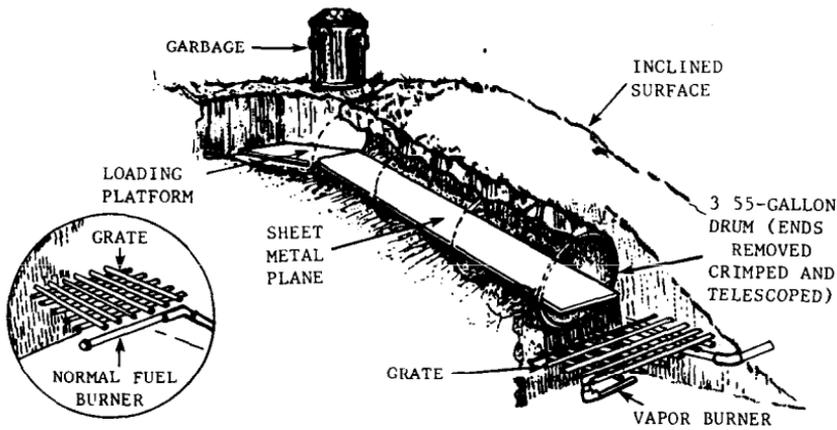
(a) Pits are preferred for burying garbage during overnight halts. A pit 4 feet square and 4 feet deep is suitable for 1 day for a unit of 100 men. At the end of the day or such time as the pit is filled to 1 foot below the ground surface, it should be sprayed with insecticide; then it must be filled with earth and mounded over with an additional foot of compacted earth.

(b) The continuous trench is more adaptable to stays of 2 days or more. The trench is first dug about 2 feet wide, 3 to 4 feet deep, and long enough to accommodate the garbage for the first day. As in the pit method, the trench is filled to not more than 1 foot from the top. The trench is extended as required, and the excavated dirt is used to cover and mound the garbage already deposited. This procedure is repeated daily or as often as garbage is dumped. It is a very efficient field expedient for disposing of garbage.

(2) Incineration.

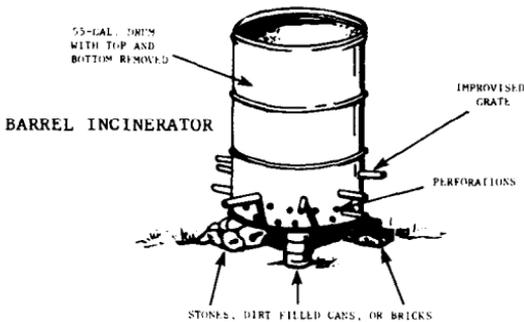
(a) In temporary camps of over 1 week, the garbage is often burned in open incinerators. Excellent types of open incinerators may be constructed from materials that are readily available in any camp area. Since incinerators will not handle wet garbage, it is necessary to separate the liquid from the solid portion. This is done by straining the garbage with a coarse strainer such as an old bucket, salvaged can, or 55-gallon drum in which holes have been punched in the bottom. The solids remaining in the strainer are incinerated, and the liquids are poured through a grease trap into a soakage pit or trench. Field incinerators should be located at least 50 yards downwind from the camp to prevent their being an odor nuisance.

(b) The inclined plane incinerator's effectiveness in combustion and the fact that it is somewhat protected from rain or wind make it an excellent improvised device. Time and skill, however, are required in building it. A sheet metal plane is inserted through telescoped 55-gallon drums from which the ends have been removed. The metal plane should extend approximately 2 feet beyond the upper end of the telescoped drums to serve as a loading or stoking platform. The telescoped drums are positioned on an inclined surface. A grate is placed at the lower end of the telescoped drums, and a wood or fuel oil fire is provided under the grate. After the incinerator becomes hot, drained garbage is placed on the stoking platform. As the garbage becomes dry, it is pushed through the telescoped drums in small amounts to burn. Final burning takes place on the grate. If time does not permit the construction of the inclined plane incinerator, it may be simplified as follows: Dig a fire pit at the bottom of an incline, line it with rocks, and place a grate over it. Place three telescoped drums in a shallow trench up the incline, letting the lower end of the telescoped drums extend somewhat over the fire pit so the flame will be drawn up the drums. The sheet metal plane, if available, should be used, as it permits more thorough drying of the garbage.



· INCLINED PLANE INCINERATOR.

(c) A barrel incinerator (illustrated below) is made from a 55-gallon drum by cutting out both ends, punching many holes near the bottom, and inserting grates inside the barrel several inches above the holes. The barrel is supported several inches above the ground on stones, bricks, or dirt filled cans, thus allowing space to build a fire under the barrel. The rubbish is put into the barrel on the top grate.



20-8. WASHING DEVICES.

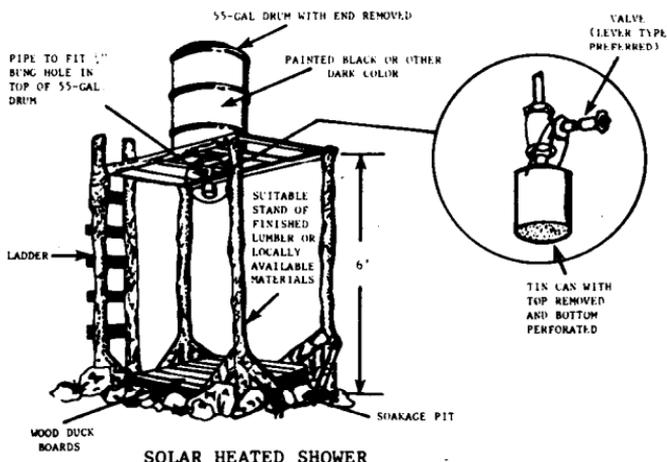
a. Hand washing devices (locate at latrine enclosures and unit messes).

(1) Suspended 5-gallon water can. From a frame over a soakage pit suspend one can of clear water and one can of soapy water so they can be tilted.

(2) Mounted #10 can. Make four holes in the bottom of can and mount it on a stand built over a soakage pit. Have on hand a 5-gallon can of water with a dipper and a bar of soap.

b. Shower devices. (Use soakage pits; a grease trap should be included if soap is used.)

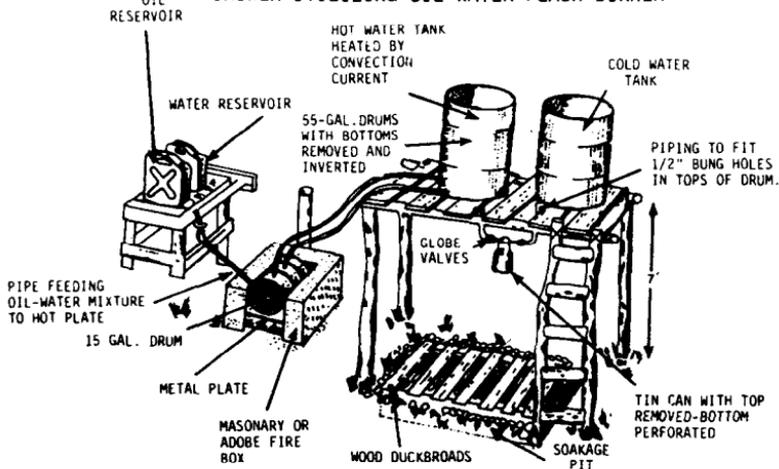
(1) Solar heated shower. Build a drum support to hold 500-600 lbs; color drum a dark, nonreflective shade. Invert a 55-gallon drum on stand. Attach a water control device to bung (top removed). Below valve, attach a tin can with perforated bottom.



(2) Tilted drum shower. Mount drum so it will tilt. Attach rope to one end of drum and attach safety strap onto the frame at the opposite end. Punch holes in side opposite top. Place rod halfway thru drum and in notches.

(3) Shower utilizing oil-water flash burner. (See diagram on next page.) Mount two 55-gallon drums on an overhead platform. Use pipe fittings to control water and flow. Connect heating drum (15 gallon) to overhead drum by rubber hoses. Place 15-gallon drum on an oil-flash burner.

SHOWER UTILIZING OIL-WATER FLASH BURNER



20-9. FOOD SANITATION.

a. Importance of food sanitation. Even the most appetizing food can cause illness if it becomes contaminated with pathogenic organisms through improper handling. Outbreaks of food poisoning, dysentery, infectious hepatitis, and typhoid fever may result from unsanitary practices in kitchens and dining areas. Therefore, persons who handle food must always maintain the highest standards of personal hygiene and sanitation.

b. Food handlers.

(1) All food handlers must be given a thorough physical examination. Those who have communicable diseases or who are known carriers of such diseases are not assigned as food handlers. Even more important than this initial screening is the supervisor's daily on-the-job check of food-handling personnel for signs of illness or infection. This inspection should be thorough enough to make certain that food handlers have no obvious signs of illness or infection; their hands, fingernails, and clothing must be clean, and they must have no boils, rashes, or other skin and wound infections. Food handlers should be instructed to report sore throats, colds, coughs, diarrhea, vomiting, and other symptoms of infection and disease. Questionable cases will be relieved from duties without delay. Food handlers should be provided adequate sanitary facilities, including showers, hand-washing devices, and latrines.

c. Transportation. Vehicles used for transporting food must be clean and completely enclosed.

d. Storage. Perishable food products are stocked at a realistic operating level. They should be refrigerated at 45°F. or below. Vegetables such as potatoes and onions are stored in a dry place on dunnage so air can circulate around them. Acid foods such as citrus fruit drinks must never be stored or served in galvanized iron cans.

e. Cleaning of cooking, serving, and eating utensils. The two procedures that may be used by kitchen personnel in cleaning the cooking,

serving, and eating utensils are outlined below:

(1) Procedure to be used when hot water is available. Scrape utensils free of food particles. Wash utensils in warm water containing soap or detergent. Rinse utensils in hot clear water. Disinfect utensils by immersing them in clear water of 180°F. for 30 seconds. If a thermometer is not available to determine the temperature of the water, heat the water to the boiling point. Allow the utensils to air-dry in a place where they are protected against dust, splash, and other sources of contamination.

(2) Procedure to be used when hot water is not available. Scrape utensils free of food particles. Wash utensils in water containing soap or detergent. Rinse utensils with potable water. Disinfect utensils by immersing them in a chlorine-water solution for not less than 30 seconds. This solution is prepared by using Disinfectant, Food Service, as specified on its container. If this disinfectant is not available, an emergency solution can be prepared by mixing at least one level messkit spoonful of calcium hypochlorite (water disinfecting powder) to each 10 gallons of water. If liquid chlorine bleach is available, it may be used. About one-third canteen cup of 5 percent chlorine bleach to each 10 gallons of water will provide the same disinfecting strength. Fresh chlorine-water solutions must be made for rinsing and disinfecting utensils for each 100 persons. Allow the utensils to air-dry in a place where they are protected against dust, splash, and other sources of contamination.

(3) Method of heating water.

(a) Oil-water flash burner.

1. The oil-water flash burner uses diesel or motor oil as fuel. In cold climates it may be necessary to thin these oils with gasoline or kerosene to obtain a good flow. If waste motor oil is to be used as fuel, it must first be strained through a screen or a cloth to remove sludge and lumps.

2. One oil-water flash burner is required² for each large can of water to be heated. This burner consists of containers for the oil and the water, a feed pipe, a metal burner plate, shields, and a grate. The containers are equipped with valves, taps, plugs, or siphons for controlling the rate of fuel and water flow. The shields, which prevent strong drafts or rain from cooling the plate, may be made from sheet metal or oil drums.

3. Serious explosion may result from an improperly constructed or operated burner. If the flame of a burner goes out and the fuel is not burned off, turned off, or relighted immediately, a dangerous concentration of gas may build up. If this gas is ignited, an explosion may result. This danger is not as great with the oil-water flash burner as it is with the vapor burner. The automatic relighting device will lessen the possibility of such an explosion. Also the possibility of an explosion in a fuel tank can be considerably decreased by not allowing the fuel to fall below the half-full mark. A visible float-level indicator should be used.

(b) Vapor burner.

1. The vapor burner uses liquids such as diesel oil,

kerosene, or gasoline, or a combination of these. As with the oil-water flash burner, it may be necessary in cold climates to thin the oil with gasoline before use. The construction of this burner requires several sections of pipe, a valve, pipe fittings, and a fuel reservoir. The operation of the vapor burner depends upon vaporization of the fuel by preheating before burning.

2. The pipe is assembled in such a manner that it is doubled under itself. The best size pipe to use is either one-half or three-quarters of an inch in diameter. Very small holes (1/16-inch or less) are drilled in the top of the lower pipe at points where the water containers will be placed. The end of the pipe is capped so that fuel can escape only from the drilled holes. Burning fuel that escapes from the holes in the lower pipe heats the fuel in the upper pipe, causing the fuel to vaporize into gas. The gas produces pressure in the lower pipe and forces the fuel out through the small holes as spray, thus making a better flame. For best operation, the pipes should be placed in a fire trench. The trench should be about 1 foot wide and 15 inches deep. Iron wire should be coiled around lower pipe just above the holes to serve as an automatic relighting device. These wires become red hot after the burner has been in operation for a few minutes. Should one flame go out, the heat from the wires would relight the fuel, thus preventing an accumulation of gas in the trench and a possible explosion.

3. Before lighting the burner, the valve that controls the flow of fuel is opened to allow a small amount of fuel to run out through the holes in the lower pipe. This fuel is then ignited, thus heating the upper pipe and starting the fuel-heat-gas pressure cycle described above. A properly operated burner will produce a blue flame. A yellow flame, which indicates incomplete burning, is caused by too much fuel escaping from the holes. This may be corrected by closing the valve slightly, thus reducing the amount of fuel going to the burner, or by decreasing the size of the holes in the pipe. If the flame is blue, but tends to blow itself out, not enough fuel is getting through the holes. The condition may be corrected by opening the valve slightly, thus allowing more fuel to go to the burner, or by enlarging the holes in the pipe.

(6) Fire trench.

1. When solid fuels are available, a fire trench is one method used for heating. The trench should be about 1 foot wide and 1 foot deep. Its length will depend on the number of water cans to be heated. An 8-foot trench is usually sufficient for three cans. The cans, supported by steel rods or pipes, are placed over the trench; and the fire is built in the trench. Oil drums cut into halves and with the ends removed may be placed around the water containers to increase heating efficiency.

2. Except as a temporary measure, the fire trench is not considered a practical method for heating water. It requires a large amount of solid fuel, such as coal or wood, that ordinarily is not plentiful in the field. Unless windshields are used around the corrugated cans, heating water to the boiling point becomes very difficult. Furthermore, the external heat from the open flame quickly burns out the cans. It also makes standing close enough to wash mess kits uncomfortable and possibly hazardous.

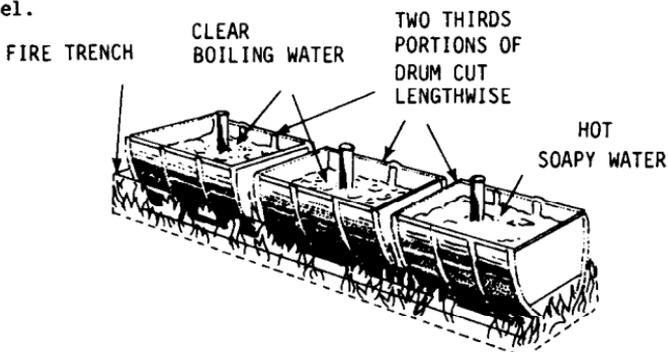
(4) Drums. When corrugated cans are not available, messkit

washing containers may be made from metal drums and used with any of the heating devices. The drums may be used with or without modification in size. In the modification of drums, they should be cut into two-thirds and one-third portions. The two-thirds portions are used as washing containers; the one-third portions are used as needed for supports or shields. Although drums are ordinarily cut crosswise, they may be cut lengthwise. The two-thirds portions of drums cut lengthwise are placed directly on a trench.

(5) Drainage device.

(a) As an aid in draining washing containers, a pipe coupling can be welded into the bottom of each of the three containers; then all three containers can be connected with pipes to one central outlet pipe. This central outlet pipe should be positioned so that the water will pass through a grease trap into a soakage pit.

(b) Plugs or pipes may be screwed into the pipe couplings inside the washing containers to secure the water until drainage is desired. If a pipe is used, it must be cut long enough to extend above the water level.



FIRE TRENCH AND DRUMS FOR MESSKIT WASHING SETUP

20-10. ARTHROPOD AND RODENT CONTROL.

a. Rodent control. The key to rodent control is good area police. There are many sophisticated programs that can be instituted; but if insects and rodents are denied a place to live and breed through a good clean-up campaign, a good start has been made in eliminating the problem. Ditches and depressions should be kept free of standing water. Do not allow garbage to remain unburied since it will attract flies and rats. Rats should be live-trapped and burned to kill fleas and mites they may have in their fur.

b. Arthropod control. An effective program for the prevention of arthropod-borne diseases should consist primarily of sanitation measures, but includes the use of personal protective measures and the application of pesticides. Fundamental to the operation of an effective program are a basic understanding of the life cycles of medically important arthropods and a knowledge of where they can be found. The following chart will serve as a reference.

MEDICALLY IMPORTANT
ARTHROPODSAPPROXIMATE DURATION
OF LIFE CYCLES AT
75°F.

WHERE FOUND

Flies (Example: housefly)	Egg-----10 hours larva----- 5 days pupa----- 5 days adult-----30 days	Animals or human waste, garbage, grass, decomposing animals, and mud contaminated with organic material.
Mosquitoes (Example: yellow fever mosquito)	Egg----- 4 days larva-----10 days pupa----- 2 days adult-----14 days	Standing water found in ponds, tin cans, old tires, and tree holes. (A large variety of places and conditions of breeding have been noted.)
Fleas (Example: oriental rat flea)	Egg----- 7 days larva-----15 days pupa----- 8 days adult-----365 days	Nests or beds of animals.
Lice (Example: human body louse)	Egg----- 7 days nymph-----16 days adult-----30 days	Head hair and clothing of humans. Lice cannot exist on a clean human.
Cockroaches (Example: German cockroach)	Egg-----30 days nymph-----60 days adult-----200 days	Cracks and crevices that provide warmth, moisture, and food such as around water, garbage, and food facilities.
Ticks and mites	Life cycle 6 weeks completed to 2 years	Tall grass, underbrush, animal watering places, and shady rest areas of animals.

20-11. IMMUNIZATION REQUIREMENTS (MILITARY ALERT FORCES).

IMMUNIZATION	NO. OF SHOTS	BASIC SERIES		REIMMUNIZATION	
		DOSAGE,	INTERVAL	INTERVAL	DOSAGE
Smallpox (*1)	2/4 punctures	1 gtt .		3 yr	
Dipt/Tetanus	3	1st) 0.5 cc. 2d) 0.5 cc. 3d) 0.1 cc.	4-8 wk 12 mo	10 yr (*2)	0.1 cc.
Typhoid	2	1st) 0.5 cc. 2d) 0.5 cc.	4 wk	3 yr	0.5 cc.
Cholera	2	1st) 0.5 cc. 2d) 1.0 cc.	1 wk	(*3)	
Plague	2	1st) 1.0 cc. 2d) 0.2 cc.	3 mos	(*4)	
Yellow Fever	1	0.5 cc. Dilute 1:10	NA	10 yr	0.5 cc.
Polio	3	1st) 2 gtt. (*5) 2d) 2 gtt. (*5) 3d) 2 gtt. (*5)	6-8 wk 12 mos	S/C	NA
Influenza	1	0.5 cc. (*6)	NA	1 yr	

General: All inoculations may be given either IM or SQ, with the exception of plague that must be given IM and smallpox that is given by the technique described below.

*1 Smallpox Reaction should be read 6-8 days after administration. Primary vaccination: Typical vesicle formation. Revaccination: Major - vesicular or pustular lesion or an area of induration or congestion surrounding a central crusted or ulcerous lesion. Minor - any other reaction. If minor, check procedures and revaccinate one time only. Punctures are given intradermally, 4 times with single needle or 2 times bifurcated needle initially and 30 times single needle or 15 times bifurcated needle for the revaccination.

NOTE: Do not clean the skin unless grossly dirty, then only with acetone. Never use alcohol to clean skin and allow the skin to dry before giving the vaccination.

*2 Dipt/Tetanus: If the basic series has been completed within the last 5 years, no booster is required for minor injuries. If there is doubt, or the injury is severe or a burn, a booster should be given and the dosage increased from 0.1 cc. to 0.5 cc. When in doubt whether tetanus diphtheria should be given, administer only tetanus toxoid.

- *3 Cholera: Reimmunization is required only upon deployment to Area II as outlined in AR 40-562 and while residing in Area II or as recommended by the World Health Organization (WHO). Revaccination is required every 6 months at 0.5 cc. dosage, SQ or IM.
- *4 Plague: Reimmunization is required only upon deployment to Area IIP as outlined in AR 40-562 and while residing in Area IIP or as recommended by the World Health Organization (WHO). Revaccination is required every 6 months at 0.2 cc. dosage, IM only.
- *5 Polio: The number of drops comprising the proper dose depends on the manufacturer's recommendations and will be given orally.
- *6 Influenza: Dosage may be varied with the recommendations and guidance of the manufacturer or medical authority. Worldwide geographic variations in seasonal influenza outbreaks increase potential morbidity rates in alert forces by flu. The requirement for mandatory vaccination of Army personnel will be further augmented by the mandatory requirement that all personnel in CMA/IMA will receive the flu vaccine regardless of program requirements in order that maximum protection may be afforded against influenza in the worldwide environment.

Maximum effort will be given to immunize personnel during the October-November time period; however, the program will not be curtailed at the end of that period.

NOTE: Live viruses: There should be a 30-day separation period when giving more than one live virus for the best immunity reaction. If necessary, two live viruses may be given on the same day, but at different sites. Once a live virus has been administered, no other live virus will be administered until the 30-day separation period has elapsed. The receiving individual should be afebrile and in good health. He must not be receiving any of the following: steroids, alkylating drugs, anti-metabolites, immunosuppressive agents, or radiation therapy. Pregnant women will not receive any live viruses except polio.

20-12. TECHNIQUE OF SOAP MAKING.

a. Ingredients.

(1) Method one: Two #10 cans of animal fat, two #10 cans of water, and one #10 can of lye.

(2) Method two: Two #10 cans of animal fat and two #10 cans of water poured through ashes.

(3) Optional ingredients: One-half cup borax, one-half cup liquid washing ammonia, and two tablespoons of granulated sugar.

b. Technique.

(1) Cut the fat into small strips and place into a pot to melt - moderate heat.

(2) Slowly add the lye and water (or the water that has been poured through the ashes) to the melted fat and stir until the mixture is about the consistency of honey. The optional items may be added during this procedure.

(3) Pour the thickened mix into a container to cool. After standing a few hours, the soap may then be cut into the desired sizes.

(4) This type of soap is excellent for both laundry and hands.