

9 July 1982  
SUPERSEDING  
MIL-HDBK-154A  
19 April 1979

MILITARY STANDARDIZATION HANDBOOK  
INSPECTION OF FRESH FRUIT AND VEGETABLE FARMS AND PACKING SHEDS  
IN OVERSEA AREAS



FSC 8915

DEPARTMENT OF DEFENSE

Washington, DC 20301

Inspection of Fresh Fruit and Vegetable Farms and Packing Sheds in Oversea Areas

MIL-HDBK-154B

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## 1. SCOPE

1.1 Purpose. This handbook establishes guidelines for fresh fruit and vegetable farms and packing sheds in oversea areas furnishing locally grown fresh fruits and vegetables to the US Armed Forces.

1.2 Application. This handbook is applicable to all types of fresh fruit and vegetable farms and packing sheds in oversea areas that furnish locally grown fresh fruits and vegetables destined for Armed Forces procurement, and for which detailed guidelines relating to specific types of farms and packing sheds are not available, or applicable. This handbook is intended as a guide to medical food inspection personnel (IAW AR 40-657/NAVSUPINST 4355.4C/AFR 163-2/MCOP 10110.31D) who are responsible for establishing and maintaining a food inspection program in support of US Armed Forces procurement of locally grown fresh fruits and vegetables in oversea areas.

1.3 Objectives. This handbook is intended to insure clean, wholesome food products that are free from microbiological, chemical, and physical contaminants and to prevent the transmission of foodborne disease to members of the Armed Forces. This handbook provides information concerning the disease-transmission potential of fresh fruits and vegetables and some of those diseases most commonly transmitted through soil and water to man.

1.4 Limitations. The most practical surveillance program for the control of parasitic ova on fresh fruits and vegetables is the examination of fresh salad-type vegetables as described in Appendix E. However, in those instances where commanders feel that a more comprehensive program may be justified, due to increased incidence of disease, a complete inspection program may be initiated.

## 2. REFERENCED DOCUMENTS

The following documents of the issue in effect on date of invitation for bids, or request for proposal, form a part of this handbook to the extent specified herein.

### LAWS AND REGULATIONS

#### US Department of Health and Human Services (HHS)

Code of Federal Regulations (CFR), Title 21, Food and Drug, and Regulations Promulgated Thereunder

(Application for copies should be addressed to Superintendent of Public Documents, US Government Printing Office, Washington, DC 20402.)

#### Governmental

AR 40-5, Health and Environment  
AR 40-657/NAVSUPINST 4355.4C/AFR 163-2/MCOP 10110.31D, Veterinary Food Inspection  
TM 5-700, Field Water Supply  
NAVMED P-5010-1, Food Sanitation, Manual of Naval Preventive Medicine  
FM 21-10, Field Hygiene and Sanitation

(Copies of regulations, technical manuals, and field manuals may be obtained from normal military publication channels.)

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Nongovernmental

American Public Health Association, Control of Communicable Diseases in Man

(Requests for copies should be addressed to American Public Health Association, 1015 Eighteenth Street NW, Washington, DC 20036.)

3. DEFINITIONS

3.1 Approved farm. An approved farm is a clearly-defined growing area approved by the commander of the major oversea command for the production of fresh fruits and vegetables for consumption by US Armed Forces personnel.

3.2 Approved packing shed. An approved packing shed and premises is a building that has been inspected and approved by the commander of the major oversea command for the washing, culling, trimming, and packing of fresh fruits and vegetables before delivery to the US Armed Forces.

3.3 Chlorine-contact time. The chlorine-contact time is the period of time elapsing between the time the chlorine is added to the water and the time when that particular water is used.

3.4 Chlorine demand. The amount of the chlorine dosage which reacts with and is consumed by organic material, bacteria, and other materials in the water.

3.5 Chlorine dosage. The chlorine dosage is the amount of chlorine added to water to satisfy the chlorine demand as well as to provide a residual after a specified time.

3.6 Chlorine residual. The amount of the chlorine dosage remaining after the demand has been satisfied. Dosage minus demand equals residual.

3.7 Free available chlorine. The total available residual chlorine present at the end of a specified contact period.

3.8 Fresh salad-type fruits and vegetables. Fresh salad-type fruits and vegetables are those fresh fruits and vegetables that normally are not peeled, pared, or cooked prior to eating.

3.9 Initial inspection. An initial inspection is a sanitary inspection of a farm or packing shed that is conducted to determine if the farm or packing shed meets the minimum sanitary requirements of this handbook.

3.10 Plot. A plot or farm plot is an identifiable subdivision of a farm.

3.11 Routine inspection. A routine inspection is a sanitary inspection performed at regular intervals following an initial inspection in which the farm or packing shed has met the sanitation requirements.

3.12 Special inspection. A special inspection (followup inspection) is an inspection conducted to determine if deficiencies noted on an earlier inspection have been corrected.

#### 4. THE INSPECTION PROGRAM

##### 4.1 Responsibilities.

4.1.1 Commander. The commander is responsible for providing protection for all personnel under his jurisdiction from communicable disease and environmental conditions which may become deleterious to health.

4.1.2 Surgeon or medical officer. The surgeon or medical officer is responsible for recommending the initiation of the comprehensive command program of preventive medicine to safeguard health.

4.1.3 Veterinarian. The veterinarian, as a professional advisor to the surgeon, is responsible for identifying insanitary conditions associated with subsistence and for making proper recommendations for their correction. One of his duties is to advise the surgeon on the inspection and approval of indigenous foods and their sources.

4.2 Preparing the directive. Normally, a command directive, such as a circular, regulation, or operating memorandum will provide the authority for instituting a preventive medicine program. The contents of the directive establishing and governing the conduct and procedures of the program will depend upon the desires of the surgeon and the commander. It may contain procedures for all aspects of the program or separate directives may be issued for each facet of the program; for example, the inspection and approval of indigenous foods and beverages and their sources may be covered by one directive; procedures for soil sampling may be covered by a second directive; and sanitary requirements for farms by a third. An example of a command directive that should be used, with modification to fit the local situation, may be found in Appendix A. This appendix material should be incorporated into command supplements to AR 40-657. Local conditions and aspects which must be considered before an effective control program can be established are:

- a. The status of the US Armed Forces in the country.
- b. Whether the US Armed Forces is in control or a guest in a sovereign country.
- c. The local farm customs and practices.
- d. Whether the farms are individually owned, operated by a cooperative, or controlled by the government.
- e. Whether the farms are under single managers or subdivided into plots, each with its own manager.
- f. The marketing policy of the country (i.e., can the US Armed Forces deal directly with the farmers).
- g. The control measures that will be necessary to provide good assurance that approved farms do not become outlets for fresh fruits and vegetables from nonapproved farms.

## 5. FRESH FRUITS AND VEGETABLES

5.1 Fresh fruits. Fresh fruits can be an important vehicle in the transmission of disease to man. Therefore, increased emphasis must be placed upon proper surveillance of the areas of procurement of fresh fruits which can be easily contaminated and difficult to clean (e.g., strawberries by parasitic ova). Fresh fruits, such as apples, peaches, and pears, normally eaten with the skin on, should be thoroughly washed and scrubbed with a brush before they are eaten. This procedure will remove pesticides that may be on the fruit. Fresh fruit, in which skin has been broken or the stem pulled, should be washed thoroughly and the defective area cut out with a knife prior to consumption.

5.1.1 Microbiology of fresh fruits. Three groups of microorganisms which are commonly found on fresh fruits are spoilage organisms, fermentation organisms, and pathogenic organisms. Since many organisms which cause intestinal diseases are found in soil and water, they have an excellent opportunity to contaminate fresh fruits. The disease-causing organisms most likely to be found on fresh fruits are those that cause cholera, dysentery, and typhoid fever. Since the meat of fresh fruits is normally sterile, the disease-transmission potential is derived primarily from external contamination. This contamination will usually result from contact with the soil and water on the farm or from handling at the packing shed, including the use of polluted water to "freshen" the product.

5.2 Fresh vegetables. Fresh vegetables are often implicated in the transmission of disease to man. Since the edible portions are grown in or near the ground, they have greater opportunity to become contaminated by soil and water microorganisms. It is recommended that water chestnuts, watercress, lotus, water bamboo, and other aquatic plants not be procured from local sources where intestinal and hepatic flukes are prevalent.

5.2.1 Fresh salad-type vegetables. Fresh salad-type vegetables include: cabbage, carrots, celery, chives, cucumbers, endive, green garlic, leeks, lettuce, green onions, parsley, scallions, Swiss chard, peppers, radishes, and watercress. Any other fresh vegetables that are eaten raw with the skin on or the rind intact may also be classified as salad-type vegetables.

5.2.2 Fresh nonsalad-type vegetables. Fresh nonsalad-type vegetables include: potatoes, sweet potatoes, string beans, okra, eggplant, and spinach greens. These fresh vegetables include those that are usually consumed after they have been cooked. Therefore, the disease-transmission potential of this type of fresh vegetable is not as great as that of the fresh salad-type. However, care must be taken to assure that handling of fresh nonsalad-type vegetables does not result in contamination of the kitchen, prepared foods, fresh salad-type vegetables, and/or utensils. Spinach greens, if consumed as a fresh salad-type vegetable, should be disinfected prior to consumption.

5.2.3 Microbiology of fresh vegetables. Two groups of microorganisms which are commonly found on fresh vegetables are spoilage organisms and pathogenic organisms. As with fresh fruits, the tissues of fresh vegetables are normally sterile. Surface contamination usually results from contact with the soil, irrigation water, or insanitary handling and packing practices. The washing of fresh vegetables removes soil contamination but does little to remove bacterial contamination. Fresh salad-type

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vegetables are most likely to be involved in disease transmission since they are eaten raw. The intestinal diseases and hepatitis A may be transmitted by fresh contaminated vegetables. The intestinal diseases include intestinal parasites, cholera, dysentery, typhoid, and paratyphoid fevers.

5.3 Pesticides. In many areas pesticides are used routinely on plants and crops. Pesticides used on crops include insecticides, fungicides, and herbicides. If pesticides are used on farms which supply fresh fruits and vegetables to the US Armed Forces, the inspector should determine that they are used only as instructed by the pesticide manufacturer. The use of indigenous pesticides on plants and crops should be permitted only when the manufacturer can provide authoritative evidence that the product and its instructions for use comply with the provisions of the US Food, Drug, and Cosmetic Act. When entomological advice or clarification is required a request will be initiated to the supporting command/staff entomologist. The inspector will inspect the label on the container of any pesticide to be used to insure that the label states (1) that the pesticide is authorized for use on the plant or crop to be purchased for consumption by US Armed Forces; (2) provides information on timing of last application prior to harvest; and (3) whether or not any restriction on the number of applications or volume of finished pesticide preparation which can be applied is stated. Action will be initiated to insure that such use restriction as stated on the label or as provided by a consulting entomologist are followed. The cleaning and disinfecting of fresh fruits and vegetables required in AR 40-5 is primarily concerned with the destruction of disease-producing organisms. However, it is also a definite aid in removing pesticide residues that may be present.

## 6. NIGHT SOIL (HUMAN EXCRETA)

6.1 General. For centuries, night soil has been used in many countries as a fertilizer and compost for crops grown for human consumption. Rapid advances in agricultural technology in recent years have demonstrated that the maintenance of soil involves the use of plant nutrients, or fertilizers, and the addition of organic vegetable matter or compost. Fertilizers furnish the chemical elements required for plant growth and must be added to the soil to replenish those elements used by growing plants. Compost is organic vegetable matter, with or without the addition of animal waste, that is added to the soil to increase the humus content--thus increasing the soil's aeration and water absorption capabilities. The bacterial action in compost assists in the breakdown of fertilizers so that they may be better used by the plants.

6.2 Transmission of disease. An infectious disease is one caused by a living agent--viruses, bacteria, protozoa, fungi, and parasites. Diseases can be transmitted by one or more direct or indirect methods such as: airborne (expectorating, sneezing), vehicle (feces, unwashed hands), vector (mosquito, bird), etc. Numerous infectious diseases are capable of being transmitted in feces, and thus, indirectly by fresh fruits and vegetables which have become contaminated by soil on which feces has been used as a fertilizer. Some of the most infectious diseases which may be transmitted to man by fresh fruits and vegetables contaminated by night soil (fecal-polluted) are:

### Bacterial infections

Shigellosis (Bacillary dysentery)  
Typhoid fever  
Cholera

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Helminthic infections

Nemathelminthic or Roundworm infections

Ancylostomiasis (hookworm)

Ascariasis (roundworm)

Trichuriasis (whipworm)

Platyhelminthic or Flatworm infections

Fasciolopsiasis (intestinal flukes)

Fascioliasis (liver flukes)

Protozoan infections

Amebiasis (Amebic dysentery)

Virus infections

Infections hepatitis

6.3 Diseases. Descriptions of these diseases, together with such other information as their occurrence, source of infection, and mode of transmission, are included in Appendix B. The use of human waste as fertilizer provides an important link in the transmission of these diseases from person to person. In some areas, more than 90 percent of the population is affected with intestinal parasitic infections. The causative agents of the intestinal diseases are discharged in the feces. The pathogenic bacterial organisms can be destroyed by treating contaminated fresh fruits and vegetables in an effective concentration of chlorine solution (or other approved disinfectants), provided an adequate contact-time period is afforded. However, the ova of intestinal parasites and hepatitis virus are highly resistant to such treatment. The control of infection by intestinal parasites depends upon maintaining a growing area free of parasitic ova.

6.4 Use of fertilizers. Farms producing fresh salad-type fruits and vegetables must have strict control over fertilization and composting practices in order to prevent contamination of the growing areas with pathogenic agents. Disposal of human waste must be regulated so it is not used as a fertilizer. Since eggs of parasites from humans may pass through swine and poultry and remain viable, manure from these species also should not be used. Approved procedures should include the following requirements:

a. Human, swine, and poultry manure shall not be used.

b. Horse and cattle manure may be used provided it is composted properly, and compost samples that have been submitted to the supporting medical laboratory prove negative for parasitic ova. Composting is the process of aerobic decomposition of organic materials. During the process, organic materials are partially decomposed by the activity of microorganisms. A considerable heating of the mass occurs which hastens the decomposition and killing of the eggs of helminths. The time required for proper composting depends on several factors including proper aeration, moisture, nutrients, temperature, and the frequency of turning the compost pile. Composted material which proves negative for parasitic ova, upon laboratory examination, may be used on the growing area provided that only horse and cattle manure has been used.

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- c. Chemical fertilizers may be used.
- d. Vegetable matter may be used.
- e. The farm should be located in such a manner that it is not contaminated by drainage from other farms that are using improper fertilization methods.

6.5 Soil samples. Soil samples should be collected and submitted to the supporting medical laboratory for examination for parasitic ova. During the initial farm inspection, samples should be collected from the growing area, compost piles, trenches, and any other areas that may cause contamination on or near the farm.

6.5.1 Selection and collection of soil samples. The number of samples collected from each farm will vary according to the size and topography of the farm. In countries where farms are subdivided into plots, at least one sample should be collected from each plot. Samples should also be collected from hothouses. Farms which are not subdivided should have samples collected from as many locations as necessary to assure that a representative sampling of the farm has resulted. In either event, accurate records should be maintained which identify each sample with its sample area. Each sample should be taken from the top 6 (15 cm) inches of soil, with a clean trowel or other similar instrument. It should be a composite of the top, center, and bottom soil of the sample site. Each sample of approximately 1/2 to 1 pound (227 to 454 gm) of soil should be placed in a moisture-proof, polyethylene bag for submission to the laboratory. Each bag must be marked with the farm name, sample number, and the type of examination required. The sample bags should be packed in a shipping container to prevent the bags from rupturing while in transit.

6.5.2 Frequency of sampling. After sampling in conjunction with the initial inspection of the farm, sampling should be conducted immediately prior to planting and at least once during the growing season for each crop supplied. Sampling should be conducted more often, if the inspector deems it necessary.

6.6 Laboratory findings and evaluation of soil samples. The supporting medical laboratory has the responsibility for examining soil samples for parasitic ova. No viable ova of *Ascaris* (roundworm) or *Trichuris* (whipworm) should be present. Routinely, the laboratory does not distinguish between human and animal parasitic ova. In some areas examination of soil samples for coliform organisms has been routinely conducted in an effort to determine whether or not animal wastes have been used as fertilizers. The examination of soil samples for coliform organisms is not recommended since their presence does not differentiate if animal or human excreta has been used as a fertilizer. It has been shown, however, that insanitary practices and conditions in the harvesting and marketing of fresh produce consistently resulted in high coliform counts, including *Escherichia coli*. In overseas areas where supporting medical laboratories are not readily accessible or where submission of soil samples is impractical, the inspector may perform the examination as described in Appendix C. Schematic drawings of parasitic ova, enlarged several hundred times, are also included in Appendix C. These may assist the technician in identifying ova which may be found during the examination of soils or produce.

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## 7. WATER SOURCES AND SUPPLY

7.1 Water sources. In many areas the natural rainfall is insufficient for growing crops and it must be supplemented by irrigation. A suitable water supply must be available in sufficient quantity to meet all needs and this water supply is usually available from ground water and/or surface water.

7.1.1 Ground water. Ground water is derived from wells and springs. It is a more acceptable supply than surface water since it contains less suspended matter and bacteria. Much of the objectionable material and bacteria has been filtered out as it seeps through the ground. Ground water may become contaminated during seasons of heavy rainfall.

7.1.2 Surface water. Surface water is obtained from rivers, streams, lakes, ponds, and pools. It is not subjected to the natural filtering process of ground water and is therefore, readily exposed to gross contamination, especially in populous areas. Streams and rivers may become turbid and polluted with material washed from the ground surface during periods of heavy rainfall. Because of the rapid movement of the water, the natural purification processes are disrupted and sewage may be carried for long distances.

7.2 Evaluation of the water source. The inspector must determine the acceptability of the water supply for use in irrigation of the growing area and in the processing of harvested produce. The source of water that is to be used for processing is of greater significance than sources that will be used for irrigation. However, every effort should be made to prevent the contamination of growing areas with polluted water. The following determinations should be made:

- a. The slope and extent of the drainage area that may contribute water to the supply.
- b. The type and distance of possible sources of pollution and the methods used to protect the water supply against pollution.
- c. Effect of seasonal changes on the source.
- d. Whether the quantity of water is sufficient for needs.
- e. Proximity of an unsafe supply that could possibly be substituted for a safe supply.
- f. Construction material, diameter, and protection of the top and sides of the well.
- g. Pump house construction.
- h. Disinfection method, equipment, testing, and supervision.
- i. Effectiveness of disinfection procedures.
- j. Amount of supervision that will be required by the military inspection activity.

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7.3 Disinfection of water supply. Water that is to be used for processing must be safe to assure that contamination is not introduced nor dispersed throughout the produce. In many areas filtration of the water supply will be necessary, as in areas where amebiasis is prevalent. The water supply used for processing operations shall be disinfected. The efficiency of the disinfection process is dependent upon numerous factors which include the chemical agent used, contact time, type and concentration of microorganisms, pH and temperature of the water, presence of interfering substances and degree of protection afforded organisms from the disinfecting solution by materials in which they are embedded. Disinfection of the water supply that will be used exclusively for irrigation is neither feasible nor economical in most instances.

7.3.1 Chlorine. Chemical disinfection using compounds of chlorine is a common and satisfactory means of disinfecting water supplies. Chlorine can be used in a solid, liquid, or gaseous form and is an oxidizing agent which has high germicidal power. It is relatively easy to use, economical when properly used, and readily available. The most common type of chlorine compound is household chlorine bleach which has a strength of approximately 5 percent available chlorine by weight. Calcium hypochlorite, available commercially as soluble powder or tablet, contains 65 to 75 percent available chlorine by weight. The available chlorine rapidly oxidizes the organic and inorganic matter and kills the microorganisms in the water. In this reaction the chlorine is converted to chloride and is no longer available as a disinfectant. The use of chlorine makes it possible to introduce an accurately measured dosage to insure the destruction of the disease-producing organisms, as well as to provide a readily measured residual to safeguard against recontamination during further handling.

7.3.2 Chlorine-contact time required. To properly disinfect water, sufficient chlorine compound must be added to satisfy the chlorine demand of the water with an adequate contact time. The amount of a specified chlorine compound to be added depends upon the amount of available chlorine, the chlorine demand of the water, and the amount of free available chlorine desired at the end of a specified contact time. Chlorine requires time in which to properly disinfect. The chlorine demand in most water is likely to be largely satisfied 10 minutes after the chlorine is added. After the first 10 minutes of chlorination, disinfection continues, but at a diminishing rate. A standard period of 30 minutes contact time is used to assure that highly resistant pathogenic organisms have been destroyed, provided a high enough dosage has been applied. The minimum time required depends upon the following:

- a. The type of chlorine residual available. Free chlorine is faster acting.
- b. The strength of residual present at the end of contact time. A higher residual indicates fast action.
- c. The pH of the water. The higher the pH the longer the time required for disinfectant action.
- d. The water temperature. The lower the water temperature the longer the contact time required.

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7.3.3 Minimum chlorine residual. A minimum free available chlorine residual of 5 ppm shall be maintained in filtered water supplies used for processing fresh fruits and vegetables in packing sheds. In unfiltered water a free available chlorine residual of 10 ppm shall be maintained.

7.3.4 Water storage tank. Since a minimum chlorine contact time is essential for effective disinfection, a storage tank should be used. Water can then be chlorinated as it enters the tank, or it can be chlorinated in the tank. In either case a contact time of 30 minutes must elapse between the time the storage tank is completely filled, or the chlorine is added to the water, and the time the water is used. Suitable storage facilities for relatively small systems may be constructed of concrete, steel, brick, and sometimes of wood if above the land surface, or of concrete or brick if partially or wholly below the ground surface. Such storage installations shall be of watertight construction with smooth interior surfaces. Manhole or other covers shall be present and tight-fitting to prevent the entrance of light, dust, surface water, insects, and animals. Asphalt or tar for waterproofing the interior of storage units is not recommended because of the objectionable taste imparted to the water and the possibility of undesirable chemical reaction with the materials used to treat the water.

7.3.5 Chlorination control. Since several factors in the water supply system have a direct bearing on the effectiveness of chlorine as a water disinfectant, it is impossible to set definite standards of chlorine disinfection applicable to all water supply systems. As stated previously, a minimum free available chlorine residual of 5 ppm (10 ppm in unfiltered water) shall be maintained in water supplies used for processing fresh fruits and vegetables. TM 5-700, states that under certain conditions, such as the presence of highly-resistant disease-producing microorganisms or adverse environmental conditions, the surgeon of a major command (field army or higher) will designate such higher residuals as may be necessary. To determine the chlorine residual of the water supply, the inspector should be supplied with a color comparator, such as -- Comparator, Color, Hydrogen Ion and Residual Chlorine -- as listed in the Federal Stock Catalog. With such an instrument the chlorine residual can be readily determined. Directions for its use are included with the kit.

7.3.6 Public health controls. Examinations and/or tests necessary to establish that the water has not been adulterated or contaminated shall be performed. Evidence that all necessary examinations and/or tests have been performed and records of such examinations and/or tests shall be on file and made available to the military inspector.

## 8. INSPECTION OF FRESH FRUIT AND VEGETABLE FARMS

8.1 Fresh fruits and vegetables for military consumption. Where appropriate, fresh salad-type fruits and vegetables for consumption by US Armed Forces personnel shall be procured only from farms or growing areas that have been inspected by qualified inspectors and approved by the commander of the major oversea command.

8.2 Standards. The following standards of sanitation are suggested as minimum criteria to be met by a farm for approval as a growing area for fresh salad-type fruits and vegetables. A farm shall not be approved unless all areas of the farm

meet the minimum requirements. A checklist such as the one in Appendix D is beneficial to the inspector. It provides added assurance that vital points of sanitation are not overlooked.

8.2.1 Map. Before the actual inspection of the farm is conducted, the farm management shall be required to furnish the inspector with a map showing the boundaries of the area for which approval has been requested. Easily recognizable landmarks, such as roads, wells, streams, ditches, buildings, and noncultivated areas shall be clearly indicated. The use of posts marking the exact boundaries is recommended.

8.2.2 Estimate of crop production. The farm management shall be required to provide the inspector with an estimate of crop production for one growing season. If properly used, this information may be an aid in preventing an approved farm from becoming an outlet for produce from nonapproved farms.

8.2.3 Fertilizer. Only approved fertilization methods (see paragraph 6.4) and composting procedures shall be permitted. The use of human excreta is prohibited, as is the storage of human excreta on the cultivated area. Animal feces must be properly composted before being used. Compost must consist of vegetable matter and animal excreta. Swine and poultry manure shall not be used.

8.2.4 Drainage. The farm must be situated so that drainage, runoff, or human waste from noncultivated or nonapproved areas cannot contaminate the farm.

8.2.5 Latrine facilities. Latrine facilities may or may not be located on the farm. If a latrine is situated on the farm, it must be constructed so that it does not contaminate the growing area or ground water. It shall be kept clean, in good repair, and a supply of toilet paper shall be available at all times. The presence of latrine facilities may aid in discouraging indiscriminate defecation on the growing area.

8.2.6 Irrigation ditches and flumes. Irrigation ditches and flumes must not be connected to compost storage pit.

8.2.7 Tools and equipment. Tools and equipment used in nonapproved areas and on nonapproved farms shall not be used on approved farms.

8.2.8 Soil samples. Soil samples shall be collected and examined for parasitic ova as described in paragraph 6.5 and 6.6.

8.2.9 Washing. Washing of fresh fruits and vegetables is not permitted, with the exception of root and tuberous plants, i.e., turnips, carrots, potatoes, etc., which shall be washed only to remove excess dirt. Washing shall be permitted only in approved packing sheds.

8.2.10 Containers. Products shall be placed only in clean containers. Reusable containers shall be constructed of such material and design as to permit easy cleaning. The containers shall be clean, in good repair, and used only for transporting of food items.

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8.2.11 Vehicles. Vehicles used for transporting products from the farm to the packing sheds shall be constructed and operated so as to protect their contents from contamination and damage. They shall have covered tops and shall be maintained in a clean condition.

8.2.12 Chemical contamination. In areas where heavy metals, pesticides, insecticides, or the like might be absorbed during the growing season, fresh fruits and vegetable products shall be initially and periodically tested for chemical contamination.

## 9. INSPECTION OF PACKING SHEDS

9.1 Standards. Where washing, culling, trimming, and packing of fresh fruits and vegetables is to be done by the vendor before delivery to the US Armed Forces, it is essential that the packing shed where the processing operations are performed meets minimum sanitation standards. The following standards of sanitation are minimum criteria to be met by packing sheds that will wash, cull, trim, and pack fresh fruits and vegetables for US Armed Forces procurement. In some areas it may be advisable to periodically submit samples of fresh fruit and vegetables to the medical laboratory for examination for the presence of parasitic ova. This sampling shall be done at the packing shed or upon delivery of products at destination. A satisfactory laboratory method is described in Appendix E. A checklist such as the one in Appendix F is beneficial to the inspector. It provides added assurance that vital points of sanitation are not overlooked.

9.1.1 Building. The building shall be constructed to prevent the entrance of insects, birds, and animals. The exterior openings, including doors, windows, conveyor openings, pipe openings, and vents, shall be clean and in good repair. Where practicable, exterior openings shall be equipped with screens or other effective means to prevent the entrance of insects, birds, and animals.

9.1.2 Walls, floors, and ceilings. Walls, floors, and ceilings shall be constructed to facilitate easy cleaning.

9.1.3 Lighting. Sufficient light (NLT 50 footcandles) shall be provided to permit sanitary processing and storing operation, and to provide adequate visibility for the inspector to determine that sanitary conditions are being maintained.

9.1.4 Equipment and utensils. All equipment and utensils shall be designed and be of such material and workmanship so as to be smooth, easily cleanable, and durable. Washing tables shall be self-draining and provided with a raised metal screen of not less than 1/4 inch (.64 cm) mesh to prevent the product from soaking in the wash water. Utensils such as knives, brushes, hammers, and hatchets shall be used only in the packing shed. Facilities for the proper maintenance and storage of the utensils shall be provided.

9.1.5 Water supply. The wash water shall be from a source approved by the inspector and must be potable and available in sufficient quantity to meet the needs of the operation. Water that is used for processing shall be disinfected. The free available chlorine residual shall be routinely checked by the management.

9.1.6 Washing. The wash water shall be directed onto the product by a spray or multiple spray system. Clean brushes with medium bristles shall be used for scrubbing. As far as practicable, culling of undesirable produce shall be performed before washing.

9.1.7 Packaging and packing. The product shall be well drained directly after being washed and then immediately packed.

9.1.8 Cleanliness and health of personnel. All personnel shall wash their hands before beginning work and upon returning to work after using toilet facilities, eating, smoking, or otherwise soiling their hands. They shall keep their hands clean and follow acceptable hygienic practices while on duty. Eating, expectorating, or use of tobacco in any form shall be prohibited in each room and compartment where any food products or supplies are prepared, stored, or otherwise handled. All persons engaged in receiving, testing, processing, manufacturing, packaging, or handling food products shall wear clean, white, or light-colored washable or disposable outer garments. Hair nets, caps, beard nets, or other effective hair restraints to effectively cover hair shall be worn so as to prevent contamination of food and food contact surfaces. Employee's personal effects shall not be stored in production areas. No person afflicted with, or a carrier of, a communicable disease shall be permitted in any room or compartment where products are prepared, manufactured, or otherwise handled. No person who has a discharging or infected wound, sore, or lesion on hands, arms, or other exposed portion of the body shall work in any processing rooms or in any capacity resulting in contact with the processing or handling of products, containers, or equipment. Where health authorities require health certificates, they shall be kept on file at the plant office. Plant personnel shall receive appropriate training in proper food handling techniques, disease control, and food protection principles and will be cognizant of the danger of poor personal hygiene and insanitary practices.

9.1.9 Latrine facilities. Latrine and handwashing facilities shall be provided on the premises for the employees. Toilet facilities required are as follows:

<u>Persons of same sex</u>	<u>Toilet bowls required</u>
1-15 inclusive	1
16-35 inclusive	2
36-55 inclusive	3*
56-80 inclusive	4*
For each additional 30 persons in excess of 80	1*

\*Urinals may be substituted for toilet bowls but only to the extent of one-third of the total number of bowls stated.

Toilet rooms shall be conveniently located, constructed of materials which can be easily and satisfactorily cleaned, adequately lighted, and separately vented to the outside. They shall be constructed so that they do not open directly into rooms or areas where components or products are processed or stored. The doors shall be tight-fitting and self-closing. A sign directing employees to wash their hands before returning to work shall be conspicuously posted in all toilet rooms.

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Handwashing signs shall be multilingual, as appropriate. Handwashing facilities, with running water at a suitable temperature for handwashing, soap (liquid or powder), soap dispenser, and sanitary single-service towels will be conveniently located in the toilet rooms and throughout the processing areas. Toilets, dressing rooms, and handwashing facilities will be maintained in a clean, orderly manner. There shall be a sanitary waste receptacle in each toilet room. Restrooms shall not be used for storage of cleaning equipment. Privies shall be separate from the processing building, and of a sanitary type, location, and construction.

9.1.10 Insects, birds, and animals. Insects, birds, and/or other animals shall be excluded from the packing shed. Effective measures for the control of insects, birds, and/or other animals shall be maintained at all times. Operations or procedures which produce rodent harborages or insect breeding areas are prohibited.

9.1.11 Storing and storage facilities. Storage facilities shall be provided for storing raw materials, packing and packaging materials, and finished products. They shall be clean, sanitary, and in good repair. Storing methods which minimize deterioration and prevent contamination shall be used. Shelves, cabinets, and dunnage or pallets shall be used where necessary to protect materials from contamination. Storage rooms shall be provided for holding fresh fruits and vegetables overnight or for longer periods of time.

9.1.12 Wastes. Liquid waste shall be disposed of through an approved sewage system. Drains must be trapped and floor drains shall be provided with covers. Dry and product waste shall be placed in suitable covered receptacles conveniently located throughout the plant and premises. All waste shall be collected and disposed of at frequent intervals in a sanitary manner to prevent insect and rodent attraction and development of objectionable odors.

## 10. TREATMENT OF FRESH FRUITS AND VEGETABLES PRIOR TO USE

10.1 Cleaning and disinfecting. The surgeon or medical officer will assure that procurement officers and, when applicable, patrons of commissary stores are informed whenever germicidal treatment of fresh fruits and vegetables is necessary. NAVMED P-5010-1, Food Sanitation, Manual of Naval Preventive Medicine, contains the procedure recommended for the disinfection of fresh fruits and vegetables for use by the Navy and Marine Corps. The procedure as specified in AR 40-5 and FM 21-10 for cleaning and disinfecting fresh hard-skinned fruits and vegetables with intact surfaces is as follows:

- a. Thoroughly wash in clean, potable water.
- b. Disinfect by either of the following methods:

- (1) Immerse in water at 160<sup>0</sup>F (71<sup>0</sup>C) for 1 minute.

- (2) Chemical disinfection: Wash thoroughly with potable water and soap or detergent, and then disinfect by soaking for 30 minutes in a 250 ppm chlorine solution.

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10.2 Fresh peeled or cooked fruits and vegetables. Fresh fruits and vegetables that are either peeled or cooked do not require chlorination; however, they shall be thoroughly washed with potable water. Such items would include: bananas, beans, beets, corn, eggplant, mangoes, cantaloupes, oranges, papayas, pineapples, potatoes, spinach, turnips, and watermelons.

## Custodians:

Army - GL  
Navy - SA  
Air Force - 50

## Preparing activity:

Army - GL  
Project No. 8915-0669

## Review activities:

Army - MD, TS  
Navy - MS, MC

Copies of this handbook for military use may be requisitioned on DD Form 1425 (Specification and Standard Requisition) and submitted to Commanding Officer, Naval Publications and Form Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120. The title and identifying symbol should be stipulated when requesting copies of military handbook.

APPENDIX A

EXAMPLE OF DIRECTIVE INSTITUTING AN INSPECTION PROGRAM

20. General. Following is an example of a directive presenting one method of instituting a command program for the inspection and procurement of locally grown fresh fruits and vegetables.

HEADQUARTERS  
UNITED STATES ARMY  
MILITARY ASSISTANCE ADVISORY GROUP  
APO 00000

AMAGG  
DIRECTIVE 40-0

2 January 1982

MEDICAL SERVICE

Inspection and Procurement of Local  
Food Products

20.1 Purpose. This directive prescribes procedures and outlines responsibilities relative to the sanitary inspection of locally procured food products and their sources.

20.2 Scope. This directive is applicable to the inspection of fresh fruit and vegetable farms and packing sheds, commercial food and beverage establishments, and commercial storage facilities which are current or potential suppliers of local food products to the US Armed Forces.

20.3 Responsibilities.

- a. The surgeon is responsible for:
  - (1) The inspection of locally procured foods and beverages and their sources.
  - (2) Maintaining the Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement published by each major oversea command.
- b. Organizational commanders and supervisors of civilian personnel engaged in procurement of indigenous foods and beverages for appropriated and nonappropriated fund activities shall take appropriate action to insure that such procurement is confined to approved items from approved sources.

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20.4 Definitions. For the purpose of this directive the definitions in MIL-HDBK-154B Inspection of Fresh Fruit and Vegetable Farms and Packing Sheds in Oversea Areas, paragraph 3, will apply. In addition, the following definitions shall apply:

- a. Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement. This directory is a listing of local sources for procurement of food items designated therein by the US Armed Forces. It is published by each major oversea command.
- b. Local food products. Local food products refer to foods of animal and vegetable origin, beverages, bakery products and confections, and any foods grown, processed, or manufactured locally and procured for consumption by the US Armed Forces personnel.

20.5 Approved suppliers.

- a. The Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement will be maintained by the commander.
- b. The directory will list the name and address of each supplier and the products for which each supplier has been approved.
- c. Vendors desirous of supplying food products to the US Armed Forces will submit a written request for a sanitary inspection of their farm, packing shed, or other establishment to the procurement agency. In addition, requests for inspection of farms will include the following:
  - (1) A sketch map outlining the farm to be inspected.
  - (2) The location of the farm and the mailing address.
  - (3) The name and address of the farmer.
  - (4) Means of identifying the farm boundaries, such as natural or artificial terrain features or permanent boundary markers.
  - (5) An estimate of production of each crop grown for each growing season. Where possible the estimate should be the average production of past growing seasons.
- d. If the procurement agency desires to have the vendor's establishment evaluated, the vendor's request will be forwarded to the Commanding General, ATTN: The Surgeon. The surgeon will, upon receipt of the request, designate the veterinarian to conduct an initial sanitary inspection.

20.6 Approved farms.

- a. The following fresh fruit and vegetables must be procured from approved farms. (Here the directive should list all fresh salad-type fruit and vegetables which are grown locally and may be available for procurement.)

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- b. An approved farm must meet the requirements specified in MIL-HDBK-154B, Inspection of Fruit and Vegetable Farms and Packing Sheds in Oversea Areas, paragraph 8. The checklist found in the Handbook, Appendix D, will be used by the inspector to determine compliance of the farm with the sanitary requirements.

20.7 Approved packing sheds.

- a. Fresh salad-type fruit and vegetables will be washed prior to delivery to the ultimate consumer.
- b. An approved packing shed must meet the requirements specified in MIL-HDBK-154B, paragraph 9. The checklist in the Handbook, Appendix F, will be used by the inspector to determine compliance of the packing shed with the sanitary requirements.

20.8 Inspection. In addition to conducting the inspection upon receipt for determination of compliance with contract provisions, the inspector will:

- a. Maintain a record for each approved farm. The record shall include the products received, date of receipt, and the quantity of each product received. The record will also state the farmer's estimate of production of each crop for the current growing season.
- b. Withdraw a sample of each fresh salad-type fruit and vegetable from each shipment from each packing shed at least once a month and submit it to the medical laboratory for examination for presence of parasitic ova.

## APPENDIX B

## SYNOPSIS OF DISEASES TRANSMITTED FROM SOIL AND WATER

30 General. This appendix provides a synopsis of each of several intestinal diseases that are commonly transmitted to man from soil and water that have been contaminated by the causative agents. Additional information concerning these diseases may be obtained from American Public Health Association's publication, Control of Communicable Diseases in Man.

30.1 Bacterial infections.

30.1.1 Shigellosis (bacillary dysentery). Shigellosis is an acute bacterial infection of the large intestine characterized by frequent stools containing blood, mucus, and pus. Mild infections may show no diarrheal symptoms. The disease is rarely fatal except in infants and elderly, debilitated persons.

30.1.1.1 Causative agent. Various species of genus Shigella.

30.1.1.2 Geographical distribution. The disease is found in all parts of the world but is most common and serious in the tropical and subtropical populations of lesser developed countries where malnutrition and poor sanitation coexist.

30.1.1.3 Reservoir and source of infection. Man is the reservoir. The source of infection is feces from infected persons.

30.1.1.4 Mode of transmission. The disease is transmitted by eating contaminated food, or drinking contaminated water or milk. It is also transmitted by hand-to-mouth transfer of contaminated material, by flies, and by objects soiled with feces of an infected person. Individuals primarily responsible for transmission are those who fail to cleanse contaminated hands.

30.1.1.5 Incubation period. The incubation period is from 1 to 7 days, but usually less than 4 days.

30.1.2 Typhoid fever. Typhoid fever is a systemic infection characterized by inflammation and ulceration of Peyer's patches of the small intestine, enlargement of the spleen and mesenteric glands, and catarrhal inflammation of the intestinal mucous membrane. Constipation is more common than diarrhea.

30.1.2.1 Causative agent. Salmonella typhi.

30.1.2.2 Geographical distribution. This disease is widespread throughout the world.

30.1.2.3 Reservoir and source of infection. Man is the reservoir. The source of infection is the feces and urine of infected persons.

30.1.2.4 Mode of transmission. The disease is transmitted by direct or indirect contact with a patient or carrier. The principal vehicles are contaminated food and water. Raw fresh fruits and vegetables are important factors in some parts of the world. Flies may act as vectors under some conditions.

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30.1.2.5 Incubation period. The incubation period is variable with a range of 1 to 3 weeks.

30.1.3 Cholera. Cholera is an acute intestinal infection characterized by sudden onset of vomiting, profuse watery diarrhea, rapid dehydration, and circulatory collapse.

30.1.3.1 Causative agent. Vibrio cholerae.

30.1.3.2 Geographical distribution. This disease is endemic in parts of India and East Pakistan. Cases have been reported in Africa and Asia.

30.1.3.3 Reservoir and source of infection. An infected person is the reservoir and his feces and vomitus are the source of infection.

30.1.3.4 Mode of transmission. Transmission in the initial wave of an epidemic is by contaminated water. Subsequent cases ordinarily occur by direct contact, by foods contaminated by soiled hands or utensils, and by flies.

30.1.3.5 Incubation period. The incubation period varies from a few hours to 5 days, usually 2-3 days.

## 30.2 Helminthic infections.

30.2.1 Ancylostomiasis (hookworm). Ancylostomiasis is a chronic debilitating infection caused by hookworms. Symptoms vary greatly and depend largely on the extent of the infection and nutrition of the patient.

30.2.1.1 Causative agent. Necator americanus and Ancylostoma duodenale.

30.2.1.2 Geographical distribution. This disease is widely endemic in those tropical and subtropical countries where disposal of feces is inadequate, and where soil, moisture, and temperature favor development of infective larvae.

30.2.1.3 Reservoir and source of infection. The reservoir is an infected person discharging eggs in feces. The source of infection is soil-contaminated with infective larvae.

30.2.1.4 Mode of transmission. The eggs in feces are deposited on the ground. The eggs hatch and the larvae develop to the third state (infective form) and penetrate the skin.

30.2.1.5 Incubation period. The onset of symptoms may appear within a few weeks after infection, or several months or years later depending upon the severity of infection and nutrition of the host.

30.2.2 Ascariasis (roundworm). Ascariasis is a common chronic intestinal infection by a nematode. Symptoms are variable and often vague or absent. Heavy infection may cause digestive disturbances, abdominal pain, vomiting, restlessness, and disturbed sleep. Live worms passed in stools or vomited are frequently the first recognized sign of infection.

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30.2.2.1 Causative agent. Ascaris lumbricoides, the large intestinal roundworm of man.

30.2.2.2 Geographical distribution. This disease occurs worldwide but is most frequent in moist tropical countries. The prevalence in such areas may exceed 50 percent of the population.

30.2.2.3 Reservoir and source of infection. The reservoir is an infected person discharging eggs in the feces. The immediate source of infection is soil containing embryonated eggs.

30.2.2.4 Mode of transmission. Transmission is by direct or indirect passing of embryonated eggs from soil or other contaminated matter to the mouth. Salads and other foods eaten raw are vehicles.

30.2.2.5 Incubation period. Worms reach maturity about 2 months after embryonated eggs are ingested by man.

30.2.3 Trichuriasis (whipworm). Trichuriasis is a nematode infection of the large intestine. Light infections may be asymptomatic and detected only by fecal examination. With heavy infections, intermitten abdominal discomfort, loss of weight, bloody stools, and diarrhea are observed.

30.2.3.1 Causative agent. Trichuris trichiura, the human whipworm.

30.2.3.2 Geographical distribution. This disease occurs worldwide and is especially common in warm, moist regions.

30.2.3.3 Reservoir and source of infection. The reservoir is an infected person discharging eggs in the feces. The source of infection is soil contaminated with human feces and embryonated eggs of the parasite.

30.2.3.4 Mode of transmission. Eggs passed in the feces require at least 3 weeks for embryonation in the soil. Ingested embryonated eggs hatch and the developing worm attaches to the mucosa of the cecum and proximal colon. Egg passage in the feces begins about 90 days after ingestion.

30.2.3.5 Incubation period. The incubation period, until symptoms appear, is variable and indefinite.

30.2.4 Fasciolopsiasis (intestinal fluke). Fasciolopsiasis is a trematode disease of the small intestine. Diarrhea usually alternates with constipation; vomiting and anorexia are frequent. Acute intestinal obstruction may be produced if large numbers of flukes are present. Within 20 days after infection, patients may show edema of the face, abdominal walls, and legs. Death is rare.

30.2.4.1 Causative agent. Fasciolopsis buski, a large trematode or fluke.

30.2.4.2 Geographical distribution. This disease is widely distributed in the Orient, especially central and south China. Prevalence is often extremely high.

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30.2.4.3 Reservoir and source of infection. The reservoir hosts of the adult flukes are man, pig, and the dog. The source of infection for man is aquatic plants eaten raw.

30.2.4.4 Mode of transmission. Eggs passed in the feces develop within 3 to 7 weeks under favorable conditions. The miracidia hatch and penetrate snails as the intermediate host. Cercariae develop, are liberated, and encyst in aquatic plants which transmit the infection to man.

30.2.4.5 Incubation period. The incubation period is about 3 months from the ingestion of encysted metacercariae until the passage of eggs.

30.2.5 Fascioliasis (liver fluke). Fascioliasis is a disease of the sheep, ox, goat, rabbit, and other wild and domestic herbivorous animals. It occasionally infects man. The fluke is found in the liver and may cause severe symptoms by obstructing the biliary passages, causing enlargement of the liver with degeneration and cyst formation.

30.2.5.1 Causative agent. Fasciola hepatica, or common liver fluke.

30.2.5.2 Geographical distribution. This disease has a worldwide distribution.

30.2.5.3 Reservoir and source of infection. The reservoir hosts of the adult flukes are primarily the wild and domestic ruminants. The source of infection for animals and man is aquatic vegetation.

30.2.5.4 Mode of transmission. Eggs eliminated in the feces of the host develop miracidia in 10 days or more depending on climatic conditions. The miracidia hatch and penetrate snails where cercariae develop. The cercariae escape periodically from the snails and encyst on aquatic vegetation. Man and animals are infected by ingesting the uncooked contaminated aquatic vegetation such as water cress and water chestnuts.

30.2.5.5 Incubation period. The incubation period in humans is variable.

30.3 Protozoan infections.

30.3.1 Amebiasis (amebic dysentery). Amebiasis is the disease caused by infection with Entamoeba histolytica. The infection has a wide range of clinical manifestations. The primary site of infection is the colon.

30.3.1.1 Causative agent. Entamoeba histolytica.

30.3.1.2 Geographical distribution. This disease occurs worldwide. Often 50 percent or more of the people in unsanitary areas may be affected.

30.3.1.3 Reservoir and source of infection. The reservoir of infection is an infected person. The source of infection is cysts from feces.

30.3.1.4 Mode of transmission. The cysts are transmitted by fecal contamination such as contaminated vegetables served raw, contaminated water, flies, and soiled hands of infected food handlers.

30.3.1.5 Incubation period. The incubation period is variable from a few days to several months, commonly 2 to 4 weeks.

#### 30.4 Virus infections.

30.4.1 Hepatitis A. Hepatitis A is an acute infectious disease of man causing fever, nausea, malaise, anorexia, and abdominal discomfort. Varies from a mild illness lasting 1 to 2 weeks, to a severely disabling disease lasting several months.

30.4.1.1 Causative agent. A filterable virus.

30.4.1.2 Geographical distribution. The disease is found worldwide and thus a disease of prime importance from the military-medical point of view.

30.4.1.3 Reservoir and source of infection. Man is the reservoir of infection. The feces, blood, and urine from infected persons have been demonstrated as being the source of infection.

30.4.1.4 Mode of transmission. Common vehicle outbreaks have been related to contaminated water and food, including salads.

30.4.1.5 Incubation period. The incubation period from virus entry to clinical onset is dose related; from 15 to 50 days, average 28 to 30 days.

APPENDIX C

EXAMINATION OF SOILS

40. Examination of the soils for parasitic ova. The examination of soils for the detection of parasitic ova is ordinarily conducted in medical laboratories. In some instances it may be necessary for the inspector to perform these examinations locally if the program is to succeed. Following is a list of equipment that should enable the inspector to conduct examinations.

- a. Microscope, optical, vertical fixed body tube.
- b. Balance, trip, NSN 6670-00-401-7195.
- c. Centrifuge, laboratory, table model, small, NSN 6640-00-145-1180.
- d. Graduate, liquid, laboratory, glass 1000 ml, NSN 6640-00-427-5250.
- e. Jar, 1 quart with cap (several required).
- f. Tube, centrifuge, glass 15 ml, NSN 6640-00-414-3000 (several required).
- g. Rack, test tube, laboratory, 14 tubes, NSN 6640-00-442-5100 (several required).
- h. Slide, microscope, glass, plain, NSN 6640-00-494-3893 (several required).
- i. Saturated zinc sulfate ( $ZnSO_4$ ) solution.

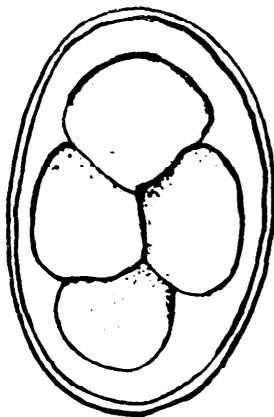
40.1 Procedure. The following procedure for preparing soils has been found to be satisfactory:

- a. Remove stones and extraneous materials before weighing soil samples; soil sample should weigh approximately 1 oz (28 g).
- b. Place samples in 1 quart jars and add 5 fl ozs (150 ml.) "Clorox" solution (Clorox = 5.25 percent sodium hypochlorite).
- c. Allow to stand for 30 minutes with occasional agitation.
- d. Add rapidly running tap water to jars so that the contents are stirred well.
- e. Let stand for 30 seconds, and transfer supernatants to a 1-liter graduate.
- f. Allow to settle for at least 1 hour.

- g. Decant supernatants and pour sediment into centrifuge tubes.
- h. Centrifuge the sample for 30 minutes at 2500 rpm.
- i. Decant supernatant and add saturated zinc sulfate ( $ZnSO_4$ ) solution almost to the top and stir.
- j. Centrifuge again for 90 seconds at 1500 rpm.
- k. Place tubes in test tube rack and place glass slides across the tops of tubes, leaving a crack so that additional  $ZnSO_4$  may be added.
- l. Add  $ZnSO_4$  solution carefully through the crack until the solution touches the slide.
- m. Let stand 5 to 10 minutes, then examine under a microscope. A magnification of 100 to 400 is sufficient for the detection of parasitic ova.

40.2 Drawings. The following schematic drawings depict enlargements of the ova of several species of parasites which may be found during the microscopic examination of soil samples and fresh salad-type vegetable samples.

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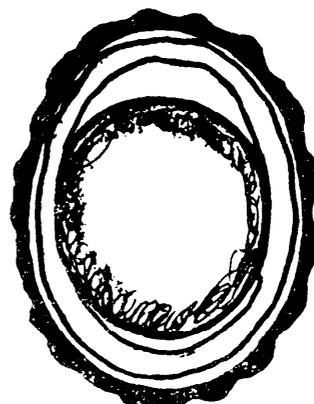
**Necator americanus Ancylostoma duodenale (hookworms)**

Egg

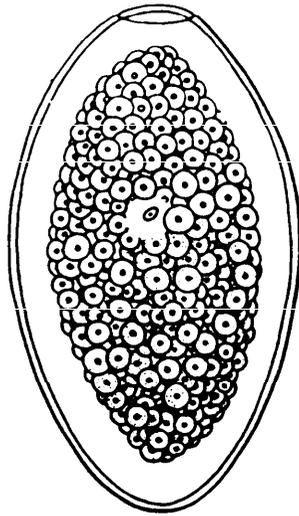
Eggs. The eggs of all species of hookworm of man and lower animals are identical and cannot be differentiated. Hence they are referred to as hookworm ova without reference to species designation. The eggs are ovoid in shape, glass clear, uncolored, and have smoothly rounded ends. They are approximately one and one-half times as long as wide. In fresh fecal specimens ova will usually contain embryos in the four to eight cell stage of development. In constipated stools or in situations where stool examination is delayed following passage fully embryonated eggs which contain a motile larva may be seen. These eggs may hatch in the stool specimen releasing free larvae which are easily confused with those of Strongyloides stercoralis.

**Ascaris lumbricoides (large roundworm of man)**

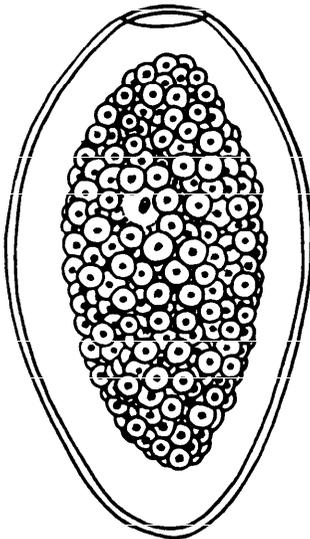
Eggs. Fertilized ova are normally broadly ovoid, and the outer covering or cortex consists of a thick lamellated protective covering beneath which is a smooth surfaced hyaline moderately thick shell. The eggs are unsegmented when passed, filled with highly granular yolk material, and dark golden-brown in color due to marked absorption of bile pigments.



Normal Corticated Fertilized Ova

**Fasciolopsis buski****Egg**

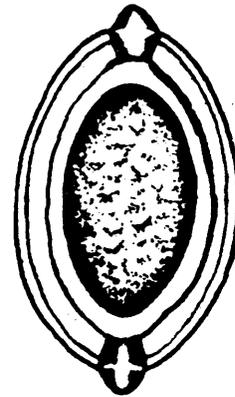
*Eggs.* Eggs are very large, possess a clear thick shell, are goose egg-shaped, and bear a small convex operculum the contour of which is continuous with the shell. They are undeveloped when passed from the host and packed with yolk cells in which the granules are evenly distributed throughout. There is a broad clear zone between the shell and the mass of yolk cells.

**Fasciola hepatica****Egg**

*Eggs.* Eggs closely resemble those of *F. buski*. They can be differentiated from the latter species by the distribution of yolk cell granules which in the present species are clustered about the yolk cell nuclei. They also tend to be deep golden-brown in color due to absorption of bile pigment.

*Trichuris trichiura* (whipworm)

**Eggs.** The eggs are very characteristically barrel-shaped, widest at the middle and tapering smoothly toward the rounded polar prominences, which are sometimes referred to as knoba. The eggs are unembryonated when oviposited and filled with a homogeneous mass of yolk granules which is slightly withdrawn from the inner shell. Eggs bear two prominent shells the outermost of which is thick and bile-stained and the inner of which is hyaline. The mucoid plugs which give rise to the polar prominences penetrate through the outer shell to the margin of the inner shell.



Ove

APPENDIX D

INSPECTION CHECKLIST FOR FARMS

50. Checklist for sanitary inspections of fruit and vegetable farms. It is recommended that the following checklist be reproduced and used as a guide in conducting sanitary inspections of farms. A deficiency, as indicated by a "No" answer, shall be sufficient cause to prevent approval of the farm on an initial sanitary inspection. A deficiency noted during a routine inspection shall be sufficient justification to notify the farm management that unless corrective action is taken within a reasonable period of time, action for disapproval of the farm will be instituted.

50.1 Farm identification.

Yes No

- a. Map is furnished by vendor indicating boundaries of the farm-----
- b. Boundaries are clearly marked and easily recognizable-----
- c. Drainage ditches are as indicated on map-----
- d. The farm is situated so that it does not receive drainage nor runoff from nonapproved areas-----
- e. Irrigation ditches and flumes are located so that they do not convey contaminated water to the farm-----
- f. Only approved fertilizatic methods and composting procedures are permitted-----
- g. The farm complies with soil test requirements and no parasitic ova are present-----
- h. Date of latest test results \_\_\_\_\_

50.2 Containers, tools and equipment, and vehicles.

- a. Harvesting containers are constructed of material that can be easily cleaned-----
- b. Containers are clean and in good repair-----
- c. Tools and equipment only used on approved farms-----
- d. Products are transported in clean, covered vehicles-----

Yes	No

50.3 Toilet facilities (if present).

a. Toilet facilities situated so as not to contaminate the growing areas either directly or indirectly-----

b. Toilet paper is provided-----

c. Latrine is clean and in good repair-----

## APPENDIX E

## EXAMINATION OF FRESH SALAD-TYPE VEGETABLES

60. Examination of fresh salad-type vegetables for parasitic ova. The examination of fresh salad-type vegetables for the detection of parasitic ova is ordinarily conducted in medical laboratories. In addition to the equipment listed in Appendix C, a supply of Triton (wetting agent, NSN 6850-00-135-4700) will be required.

60.1 Procedure. The following procedure for preparing the fresh vegetables has been found to be satisfactory:

- a. Separate fresh leaf-type vegetables from the root-type.
- b. Soak leaf samples in Triton solution for 1 hour (3 drops in one liter of water).
- c. Scrub root samples in a pan with Triton solution.
- d. Pour wash water into 1 liter graduates.
- e. Allow to settle for at least 1 hour.
- f. Decant supernatants and pour sediment into centrifuge tubes.
- g. Centrifuge the samples for 3 minutes at 2500 rpm.
- h. Decant supernatant and add saturated zinc sulphate ( $ZnSO_4$ ) solution almost to the top and stir.
- i. Spin the samples down again for 90 seconds at 1500 rpm.
- j. Place tubes in test tube rack and place glass slides across the tops of tubes, leaving a crack so that additional  $ZnSO_4$  solution may be added.
- k. Add  $ZnSO_4$  solution carefully through the crack until the solution touches the slide.
- l. Let stand 5-10 minutes, then examine under a microscope. A magnification of 100 to 400 is sufficient for the detection of parasitic ova.

APPENDIX F

INSPECTION CHECKLIST FOR PACKING SHEDS

70. Checklist for sanitary inspection of fresh fruit and vegetable packing sheds. It is recommended that the following checklist be reproduced and used as a guide for conducting sanitary inspections of fresh fruit and vegetable packing sheds. A deficiency, as indicated by a "No" answer, shall be sufficient cause to prevent approval of the packing shed on an initial sanitary inspection. A deficiency noted during a routine inspection shall be sufficient justification to notify the packing shed management that immediate corrective action must be taken to preclude disapproval as a source of fresh fruits and vegetables.

	Yes	No
70.1 <u>Construction of building.</u>		
a. Building is tightly constructed to prevent entrance of birds and animals-----		
b. Doors are tight-fitting-----		
c. Where practical, interior openings prevent the entrance of insects, birds, and animals-----		
d. Construction of walls, floors, and ceilings permit easy cleaning-----		
70.2 <u>Lighting.</u>		
Sufficient natural and artificial lighting is available to assure that sanitary practices are used-----		
70.3 <u>Equipment and utensils.</u>		
a. Equipment and utensils, designed and constructed to be smooth easily cleanable and durable-----		
b. Washing tables are self-draining-----		
c. Washing tables are equipped with a raised metal screen to prevent soaking of product in wash water-----		
d. Utensils are used only in packing shed-----		
e. Facilities for proper maintenance and storage of utensils are provided-----		



Yes No

- h. Medical examinations of personnel, when required, are being made and/or records of such are available-----
- i. Plant personnel are instructed in acceptable hygienic practices, disease control, and proper sanitary rules of food handling-----

70.7 Toilet and handwashing facilities.

- a. Sufficient number of toilets or privies are provided-----
- b. Toilet rooms are conveniently located and constructed of material easily cleaned-----
- c. Toilet rooms are adequately lighted-----
- d. Toilet rooms are separately vented to the outside-----
- e. Toilet rooms are constructed so they do not open directly into processing areas-----
- f. Doors are self-closing and tight-fitting-----
- g. Handwashing signs are present-----
- h. Suitable temperature water, soap dispenser, and single-service towels are provided-----
- i. Sanitary waste receptacles are present-----
- j. Cleaning equipment stored in room other than restrooms-----
- k. Privies are separate from packing shed-----
- l. Privies are of sanitary type, location, and construction-----

70.8 Insects, birds, and/or animals.

- a. Birds and animals are prohibited from the packing shed-----
- b. Effective measures for the control of insects, birds, and/or animals is maintained at all times-----
- c. Rodent harborages or insect breeding places are absent-----

70.9 Storing and storage facilities.

- a. Storage facilities are clean, sanitary, and in good repair-----
- b. Storing methods minimize deterioration or contamination-----
- c. Shelves, cabinets, or dunnage are used where necessary to prevent contamination or deterioration-----
- d. Storage rooms are provided when fresh fruits and vegetables are stored overnight or longer-----

70.10 Waste disposal.

- a. Liquid waste is disposed of through an approved sewage system-----
- b. Drains are trapped and floor drains covered-----
- c. Waste collected in suitable, properly covered containers, and disposed of at frequent intervals and/or in a sanitary manner-----

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**DOCUMENT IDENTIFIER (Number) AND TITLE**

**MIL-HDBK-154B Inspection Of Fresh Fruit And Vegetable Farms And Packing Sheds**

**NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER**

**In Oversea Areas**

**VENDOR**       **USER**       **MANUFACTURER**

1.  **HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?**       **IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.**

**A. GIVE PARAGRAPH NUMBER AND WORDING**

**B. RECOMMENDED WORDING CHANGE**

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**2. REMARKS**

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1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.