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Public Heath Journeyman

Volume 4. Food Technology and Sanitation Evaluations

Air Force Institute for Advanced Distributed Learning

Air University

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THIS volume covers food technology and food inspection procedures performed to prevent foodborne illnesses to consumers, as well as facility sanitaion of both food and public facilities. In Unit 1, you will continue the study of food technology started in technical school. You will learn about food preservation, packaging, and causes of food deterioration.

Next, you will go through food procurement in Unit 2 and learn the ways that the government buys food and puts the requirements in a contract.

Unit 3 explains the procedures of receipt inspections, and Unit 4 explains the procedures of surveillance inspections. The special surveillance program of operational ration inspections is also included.

Unit 5 of this volume describes the types of food facilities you will evaluate and the sanitation requirements for each type. Previously, this was a separate volume but in an effort to reduce redundancy in printing by restating information available in the Food Code we cut it down and made it one unit within this volume. While there is no way we could explain every possible situation you might find in food facilities, we have tried to provide enough information and shared experience for you to use as a guide in evaluating them.

You will also study health and hygiene standards for employees of public (non-food) facilities on base and your role in resolving health and sanitation problems in these facilities to prevent the spread of disease. The facilities discussed in this unit are the most common ones evaluated by public health.

Your reading ends with the directives for both food and public facility sanitation programs. It also discusses evaluation techniques, evaluation report writing, and trend analyses.

A glossary of abbreviations and acronyms used in this course is included at the end of this volume.

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This volume is valued at 15 hours and 5 points.

NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then do the unit review exercises.

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Unit 1. Food Technology

ALL of us, at one time or another, have been exposed to spoiled food. Remember that forgotten bowl of leftovers? When you rediscovered it, it had become a jungle. It looked bad and smelled worse! How about that loaf of bread? Just when you wanted a sandwich, you found black and green splotched bread. Or the milk left sitting out? The point is—food goes bad. It spoils and deteriorates. At some point, food reaches a state where it's no longer edible. It's not appetizing, wholesome, or safe to eat.

As a public health journeyman, you need to know more about food spoilage than other folks. As part of your job, you evaluate food. Is food spoiled or can it still be used? Is food safe to eat or will it make someone sick? These are questions you'll ask yourself daily. To get answers to these questions you need knowledge—knowledge about how and why food spoils. You need to know what can be done to prevent or delay food spoilage, and you need to be able to recognize food spoilage. These are the things you'll learn from this unit. Let's begin our study by looking at the deterioration of fresh foods.

1–1. Deterioration of Fresh Foods

Obviously, fresh foods do not stay fresh. Over time they undergo a series of chemical, biological, and physical changes that affect their appeal, nutritional value, and safety. The causes of these changes are numerous, but of particular importance are microorganisms, enzymes, and nonenzymatic chemical reactions in the foods. Let's look at each of these.

601. Microbial deterioration

Microorganisms are the *most* important cause of food spoilage. The particular microorganisms that cause food spoilage are found everywhere—in dust and soil, in water and air, and certainly in the food items we consume. It is interesting that the tissues of the healthy plants and animals from which we derive our food are generally sterile and devoid of microorganisms. However, after we harvest these plants or slaughter the animals, there are many opportunities for the food to become contaminated. The result is foods that are no longer sterile but contain many different microorganisms. Some of these microorganisms cause the food to spoil. Other microorganisms, if allowed to grow, make the person consuming the food sick. The microorganisms that are particularly important in foods are bacteria, molds, and yeasts.

Bacteria (singular bacterium)

Bacteria are found just about anywhere you look. We often think of bacteria doing harmful things such as causing disease or food spoilage. It is true that bacteria are causes of disease and food spoilage. However, the majority of bacteria do beneficial things such as helping break down waste materials in the environment or even producing beneficial changes in food items, as we shall see later.

Shapes

Bacteria are simple, single-celled organisms. Most are small, only a few micrometers in length or diameter, and are not visible to the naked eye but can be seen with a microscope. With a microscope, you can see the different shapes of bacteria—some are spherical and called cocci, others are rod-shaped bacilli, others look like commas or spirals, and still others show a variety of other shapes. In addition to their shape, bacteria often form characteristic groupings (fig. 1–1). For example, *Staphylococcus* bacteria are cocci that group together in grape-like clusters. *Streptococcus* bacteria, on the other hand, form chains of cocci. Shape and grouping are important characteristics in identifying bacteria. Staining reactions are also important. Gram stain is frequently used, and bacteria are often referred to as either gram-positive or gram-negative. The gram-positive bacteria retain the stain, and the gram-negative bacteria do not. Motility, colony appearance, and results of biochemical and serologic tests are also useful in identifying specific bacteria. Other interesting properties of bacteria relate to their reproduction and survival.

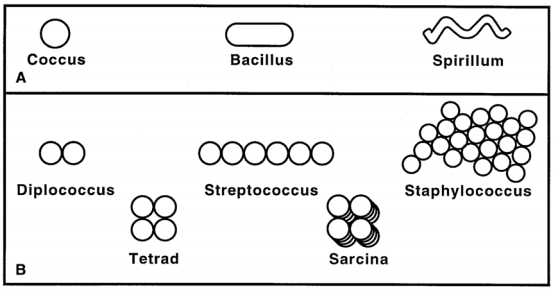


Figure 1–1. Bacteria shapes.

Reproduction

The major method of bacterial reproduction is binary fission. This is simple cellular division where one cell divides to form two cells. The time lapse from one cell division to the next is called the generation time. Under favorable environmental conditions, generation time may be as short as 10 minutes. This means if you start with 1,000 bacteria, in 10 minutes, you'll have 2,000 bacteria. In 10 more minutes, you'll have 4,000 bacteria. After an hour, those initial 1,000 bacteria will have multiplied to 64,000 bacteria! You can easily see when bacteria in food are allowed to grow and multiply; the numbers of bacteria rapidly increase.

Survival

Although certain environmental conditions are favorable and allow bacteria to multiply, other environmental conditions inhibit bacterial growth. Some environments kill bacteria. However, some bacteria are able to form endospores within the cells to survive such adverse conditions. Endospores contain the genetic material plus limited amounts of other cellular components from the bacteria. A thick, tough spore coat surrounds these materials. The process of forming the endospore is called sporulation. After the endospore forms, the rest of the bacterial cell may disintegrate. Endospores can resist heat, cold, drying, and many disinfectants. A number of food spoilage and food-borne disease bacteria, such as *Clostridium* species, form spores making their control more difficult.

Molds

Molds are a subclass or subgroup of fungi. Fungi (singular, fungus) are frequently classified as plants. However, they differ from the plants we are most familiar with because they lack chlorophyll and other photosynthetic pigments. Therefore, fungi are not able to use the energy of the sun for their

metabolic needs. Instead, fungi secrete digestive enzymes into their environment, break down organic materials, and then absorb the resulting nutrients.

Hyphae

Molds are fungi consisting of filamentous structures called hyphae. The mass of hyphae making up the mold colony is called a mycelium. A good example of a mold is the black, bread mold *Rhizopus* all of us have seen at one time or another. Some hyphae, called vegetative hyphae, grow on the surface and also penetrate materials such as bread. These hyphae secrete the digestive enzymes and absorb nutrients. Other hyphae, called fertile hyphae, extend into the air. At the tips of these hyphae are specialized reproductive bodies that produce spores. Reproduction occurs primarily through the production of asexual spores. Frequently these spores give a mold its characteristic color.

Helpful and harmful molds

Just like bacteria, molds can be both helpful and harmful. Certain molds can cause such problems as food spoilage or disease. However, other molds help us produce such food products as Bleu, Roquefort, and Camembert cheese. In addition, the antibiotic penicillin was first isolated from the mold *Penicillium notatum.*

Yeasts

Yeasts are also fungi, but they are single-celled, microscopic organisms. Yeasts have a wide variety of appearances, but most common yeasts are spherical or ovoid. Reproduction occurs primarily by budding. In this process a smaller new cell is pinched off from a larger existing yeast cell. Harmful yeasts in food can lead to spoilage. However, other yeasts are used for such processes as producing wine and leavening bread.

Results of microbial growth in foods

Later, when we discuss specific food items, we will describe some results of microbial growth in those specific items. However, we can make some general comments about the results of microbial growth in foods.

Desirable results

As mentioned earlier, sometimes microorganisms in foods produce desirable results. Products such as beer, wine, some cheeses, sauerkraut, and many others depend on changes produced by bacteria, yeasts, or molds.

Undesirable results

On the other hand, some microorganisms produce undesirable changes. For example, if bacteria like *Staphylococcus aureus, Salmonella typhimurium, Clostridium perfringens,* or *Clostridium botulinum* are allowed to grow in foods, people consuming these foods may get sick.

Illness organisms

Therefore, certainly one type of undesirable change in foods is the growth of food-borne illness organisms making the foods unsafe to eat. It is important to point out that growth of such microorganisms does not always cause observable changes in foods. The foods may look, smell, feel, and taste normal and still make someone sick.

Food spoilage

The second type of undesirable change caused by microbial growth is food spoilage. With spoilage, the food item has deteriorated to the point where it is unacceptable to the consumer. It may or may not be unwholesome or unsafe to eat. Spoilage is associated with changes in the food that can be detected organoleptically. That means we can use our senses to detect the problem. The food looks spoiled, feels spoiled, smells spoiled, or tastes spoiled. For example, the appearance of food may

change in a number of ways. Pigmented bacterial colonies may be present, or the food may be covered with whiskery mold growth. Clear liquids may become cloudy. Some microorganisms degrade food pigments such as chlorophyll, carotene, or myoglobin changing the characteristic color of the food. The feel or texture of foods may change. Some microorganisms degrade pectin and cellulose in fruits and vegetables, making them soft and mushy. A number of bacteria metabolize sugars in foods to produce levans or dextrans. These substances make the surface of meat, poultry, or fresh fish feel slimy. Taste and odor may become unacceptable due to microbial degradation of proteins, carbohydrates, and fats.

602. Factors influencing microbial growth

We need to know about the time factors influencing this growth if we are to understand food deterioration and ultimately be able to delay food spoilage.

Bacterial growth curve

Let's look at some of these factors that influence microbial growth. Figure 1–2 shows a bacterial growth curve. Similar curves can be drawn for other microorganisms. As the figure illustrates, there are four growth phases—they are lag (A), log (B), stationary (C), and decline (D).

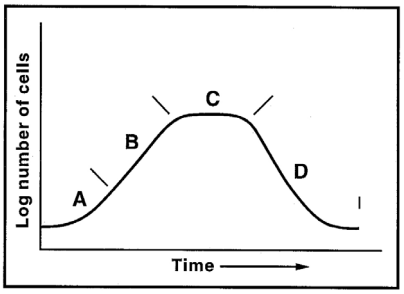


Figure 1–2. Bacterial growth curve.

Lag phase

The first phase is called the lag phase—position A on the curve. During this phase, there is no increase in the number of bacterial cells. In fact, there might even be a slight decrease. During this phase, the bacteria are probably adjusting to their environment and preparing for cell division. Thus, even if we put a particular bacterium in an environment ideally suited to its growth and reproduction, there will be a period of time before the number of bacteria begins to increase.

Log phase

The lag phase is followed by the log phase—position B on the curve—or period of logarithmic growth. Bacteria have now become adapted to their environment and begin rapid cell division. The phase is called the log phase because the bacterial numbers increase logarithmically. That means if you start with one cell, it quickly becomes two, which become four, which become eight, and so on. The result is a very rapid increase in cell numbers.

Stationary phase

The next phase is the stationary phase—position C on the curve. During this phase, there is no net increase in the number of cells. In other words, the death rate equals the reproductive rate.

Decline phase

Finally, there is the death or decline phase—position D on the curve. Here the death rate exceeds the reproductive rate. Bacteria begin dying because of the accumulation of waste materials and depletion of nutrients. The number of cells decreases.

Influence of time

As the growth curve illustrates, one factor that certainly influences microbial growth is time. As time progresses, we expect different numbers of bacteria. Of particular importance is the lag phase, that phase where the number of microorganisms is not increasing. If we can keep the microorganisms contaminating foods in the lag phase, they will not increase to levels that cause food spoilage. One way to do this would be to only keep foods a very short time. Generally, this is not practical. However, by making the environment around the microorganism less favorable to its growth and

reproduction, we can essentially lengthen the lag phase. We can increase the time during which the numbers of microorganisms do not increase. We can make the environment unfavorable by manipulating a variety of other factors influencing microbial growth. What are these factors? The next lesson explains them in detail.

603. Food factors influencing microbial growth

Foods are complex substrates for growth of microorganisms. Various compositional factors of foods certainly have an impact on microbial activity. Prominent factors are pH, water activity, nutrients, natural inhibitors, and microbial flora.

pH

Defined as the negative logarithm of hydrogen ion concentration, pH is essentially a measure of acidity. The values of pH range from 1 to 14. A pH value of 7 is neutral. Values less than 7 are acid—the lower the value, the greater the acidity. Values greater than 7 indicate alkaline conditions.

Growth range

Different organisms have different pH ranges in which they can grow. Each microorganism has an optimum pH as well as maximum and minimum pH values for growth. In general, molds can grow in more acidic conditions than yeasts. Yeasts, in turn, can grow at lower pHs than most bacteria. Most bacteria grow best at pH values around neutrality. However, there is great variability. For example, some bacteria will grow at pHs as low as 4, and others will grow at pHs as high as 11.

Different ranges

The different pH ranges for microorganism growth account, in part, for the types of microorganisms most commonly associated with spoilage of specific food items. See figure 1–3 for a pH scale with pH values for different foods. For example, fruits are relatively acidic. Since molds and yeasts can tolerate acid environments better than bacteria, spoilage of fruits is usually due to molds or yeasts and less commonly due to bacteria. Meats, on the other hand, have a pH closer to neutrality and, therefore, are often spoiled by bacteria.

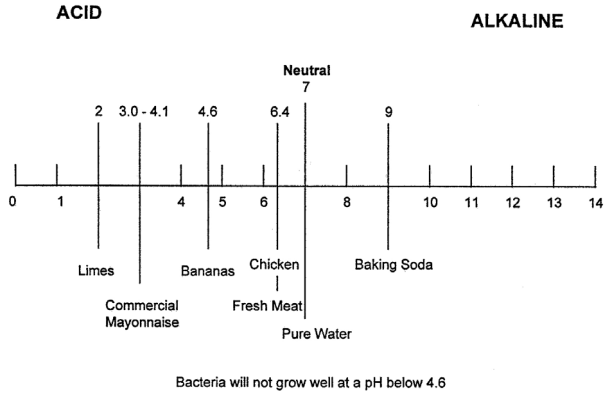


Figure 1–3. pH scale.

Stability

In general, lower pH results in a food item with greater stability. The acid to cause this low pH can come from a variety of sources. Some foods, such as citrus fruits or tomatoes, are naturally acidic. Other foods, such as sauerkraut, are produced by fermentation. In the fermentation process, nonharmful bacteria break down carbohydrates in food to lactic acid. As the lactic acid accumulates, the pH drops resulting in a more stable product. In other foods, pH is adjusted by adding chemicals such as acetic acid or citric acid. When used to adjust pH in foods, these materials are called

acidulants. Interestingly, when adding acidulants to food products, the inhibitory effect on microorganisms is due not only to the lowering of pH but also to the specific acid used. For example, at the same pH, acetic acid has greater inhibitory effects than lactic acid.

Water activity

Microorganisms need water to grow and reproduce. Most foods have fairly large moisture content. However, moisture content (the total amount of water in the food) is not a reliable indicator of water usable by microorganisms. This is because water in foods exists as both "bound" and "free" water. Bound water is held by large molecules in the food and, therefore, cannot be used by microorganisms. Free water is the water available to microorganisms for their metabolic activities. This brings us to water activity.

Measurements

Although there are various formulas for calculating water activity, simply put, water activity is a measure of the availability of water for chemical reactions and microbial metabolism. Water activity is abbreviated as aW. The aW for pure water is 1.0. Foods have aW values less than 1.0. The smaller the aW, the less the amount of available or free water. For example, fresh fruits and vegetables typically have aW values around 0.97 to 0.99. Jams and jellies, which have less free water, have aWs around 0.80. Dry products such as cereals may have aW values as low as 0.10 to 0.20.

Requirements

Different microorganisms have different water requirements. Generally, bacteria require high aW values for growth and reproduction, often in the range 0.96 to 0.99. An exception to this is halophilic (salt-loving) bacteria that may grow at aW values as low as 0.75. Yeasts grow at aW values lower than those needed for most bacteria. Many grow at aW values around 0.90. Others grow at aW values of 0.78 or lower. Molds typically can grow at lower aW values than other microorganisms. Some grow at aW values as low as 0.62. Just as we saw with pH, the type of microorganism involved in spoiling a particular food might be explained by the minimum aW for growth of the microorganism. Thus, we might expect jams and jellies to be more likely spoiled by yeasts and molds than by bacteria.

Adjustments

Lowering the aW of a food item can increase its stability. Typically, one of three methods is used to decrease aW. Food can be dried or dehydrated which removes water from the food. Freezing food turns water into ice, a form in which it is not available to microorganisms. Thus, this decreases water activity. Finally, solutes such as sugar or salt can be added to a food. These substances bind water and, therefore, decrease aW. You will learn more later about how such procedures are used to preserve foods.

Nutrients

Different microorganisms have different nutritional requirements for growth. Many foods are excellent sources of nutrients for microorganisms. For example, foods of animal origin are typically rich in a variety of nutrients and can support the growth of many microorganisms. Other foods may be less good sources of particular nutrients. Thus, the nutrient composition of foods can influence the microorganisms that will grow and can also influence the metabolic products formed during microbial growth.

Natural inhibitors

Another food factor influencing the activity of microorganisms is the presence of various inhibitory substances in foods. Many foods contain naturally occurring substances with antimicrobial activity. For example, egg white contains lysozyme, conalbumin, avidin, and ovomucoid, all of which are natural antimicrobials. Milk also contains antimicrobial substances such as lysozyme, lactoferrin, and

lactoperoxidase. Cranberries have relatively high concentrations of benzoic acid, the same compound added by food processors to other foods because of its preservative effects. Various spices have long been recognized for their preservative qualities, and a number of antibacterial agents have been isolated from such spices as cinnamon and cloves. Many other foods also contain an extensive variety of natural inhibitors. The effects of these inhibitors are not the same on all microorganisms. For example, gram-positive microorganisms are often more affected by such inhibitors than gram-negative organisms. Thus, the presence of natural inhibitors will influence which microorganisms can grow in a particular food to cause spoilage.

Microbial flora

A final food factor that affects the growth of microorganisms in food is the microbial flora of the food. Microbial flora refers to the microorganisms present in the food. As noted earlier, foods are not sterile. Foods frequently contain many microorganisms that interact with one another. The growth of one microorganism may inhibit or stimulate the growth of other microorganisms in a variety of ways. For example, microorganisms may compete for nutrients. One microorganism, therefore, may consume nutrients needed by a second, thus, inhibiting the growth of the second microorganism. On the other hand, a certain microorganism may provide essential nutrients needed by another microorganism. In this case, growth of the second microbe will be stimulated in the presence of the first. Some microorganisms may consume oxygen as they metabolize, changing an oxygen-containing (aerobic) environment to an oxygen-deficient (anaerobic) environment. As we shall see, this change can influence which microorganisms grow. Many microorganisms produce substances such as acids and antibiotics. Such substances are inhibitory to other microbes. Spoilage of milk is a good example of how the growth of microorganisms can be affected by other microorganisms. Streptococci may grow in milk and convert lactose, or milk sugar, to lactic acid. The resulting drop in pH allows streptococci to grow but inhibits other bacteria. As lactic acid continues to accumulate, the pH drops to a point where streptococci are inhibited, but lactobacilli, another group of bacteria, are able to grow. Lactobacilli continue to ferment lactose to lactic acid. The milk becomes sour. As pH continues to drop, yeasts and molds are able to become the dominant microorganisms. However, yeasts and molds convert lactic acid to nonacid products, and pH rises. The increase in pH allows other bacteria to grow. Thus, we can see how microorganisms can alter a food so that other microorganisms are either helped or hurt.

604. Nonfood factors influencing microbial growth

In addition to food composition factors that influence microbial growth, there are nonfood factors that can have an influence. Typically, these factors are associated with the environment surrounding the food. Two particularly important factors are oxygen availability and temperature.

Oxygen availability

Different microorganisms differ in their abilities to grow in the presence or absence of oxygen. Some microorganisms can live and grow in the presence of free oxygen. These are called aerobic microorganisms, and this group includes all molds and many bacteria and yeasts. On the other hand, some bacteria grow only in the absence of oxygen. These are called anaerobic microorganisms or anaerobes. Another group of microorganisms can grow either in the presence or absence of oxygen. These microorganisms are referred to as facultative. Thus, oxygen availability might determine which microorganisms can reproduce and cause spoilage in specific food items. For example, since molds require oxygen for growth, we would expect mold growth and resulting food spoilage to begin on the surface of a food exposed to air. As we shall see later, by controlling the exposure of certain foods to oxygen, microbial deterioration can be delayed.

Temperature

Temperature is one of the most important environmental conditions influencing microbial growth. In fact, temperature not only has dramatic effects on microbial growth, it also can affect the very survival of microorganisms. As you might expect, different microorganisms have different minimum, optimum, and maximum temperatures for growth. These different growth ranges let us divide microorganisms into three groups—psychrophiles, mesophiles, and thermophiles.

- Psychrophiles grow at relatively *low* temperatures.
- Mesophiles grow at *moderate* temperatures.
- Thermophiles grow at relatively *high* temperatures.

Another term you may encounter is psychrotroph. A psychrotroph grows best at moderate temperatures but also can grow at low temperatures.

Typical temperatures

There is no general consensus on the exact temperature ranges for these groups. However, some typical values can be given. For example, psychrophiles typically grow best between 68 and 77°F (20 to 25°C) with a full range for growth between 19 and 86°F (–7 to 30°C). Psychrophiles include microbes that spoil refrigerated foods. Mesophiles grow best around 98°F (37°C) with a range of growth between 68 and 110°F (20 to 43°C). Most food-borne illness bacteria are mesophiles. Thermophiles grow in the range 113 to 160°F (45 to 71°C) with best growth between 131 and 150°F (55 to 66°C).

Optimum temperatures

The rate of growth is most rapid at the optimum temperature. At temperatures above and below the optimum, the rate of growth decreases. This decrease is particularly dramatic as the temperature is raised above the optimum. No growth occurs below the minimum temperature. However, microorganisms can often survive at temperatures well below the minimum. On the other hand, as temperatures increase above the maximum, not only does growth stop, but microorganisms are also killed. Exceptions to this are bacteria that form spores that can often tolerate temperatures much higher than the maximum temperature for growth.

Interaction of factors

An important point to remember about the factors influencing microbial growth is that they do not act independently. These factors exert their effects simultaneously, and often the effect of one factor on microbial growth will alter the effect of a second factor. For example, water activity and temperature interact. At the optimum temperature for growth, a microorganism can grow at lower water activity values. As the temperature approaches the extremes of the growth range, water activity values approaching the optimum are needed for growth. Similar interactions occur between water activity and pH and between pH and temperature.

Enzymatic activity

The second largest cause of food spoilage is the deterioration of foods by enzymes. Some of the same control methods for microbial growth also control enzyme breakdown.

Two types of enzymes

When discussing enzymes, the two types of enzymes that affect foods are the enzymes of the food itself or food enzymes, and the enzymes of the microorganisms or microbial enzymes in the food. Enzymes are catalysts that often cause breakdowns of substrates such as carbohydrates, fats, and proteins in the foods. The enzymes are released from the reactions unharmed and unchanged.

Beneficial enzymes

Some enzymes are beneficial. Enzymes are involved in ripening fruits and vegetables. Enzymes can also be responsible for changes in color, texture, and nutritional properties of many other foods. Heating food products often controls enzymes. For example, in fermented food products microorganisms are added to produce the necessary enzymes to break down carbohydrates. Later, the products are heated to inactivate the enzymes so that the reactions will cease.

Results of enzyme activity

There are many uses of enzymes in the food industry. Many preservatives, antibiotics, inhibitors, poisons, and insecticides inhibit many enzymes in foods. Tests can be performed on foods to determine the activity level of specific enzymes to determine the presence of the antibiotics, poisons, preservatives, and insecticides.

Heat tests

Since enzymes are heat sensitive, there are tests that can be performed to determine the heating given foods during processing. For example, if the enzyme phosphatase is found in milk, the efficiency of pasteurization for the milk is poor. The diatase (enzyme) test is used to determine the heat process applied to honey, while peroxidase is used as an indicator of proper blanching of vegetables.

Separating the enzymes

Many enzymes are used in food processing. For example, carbohydrases and proteases are used in the bakery industry for converting proteins to amino acids for improving the dough in baking. Proteases are also used for meat tenderizing, as enzymes in cheese, and for chill proofing beer. Lipases are used for making Italian cheeses. Advanced technology has made it possible to separate the enzyme from the food product making the enzyme reusable. This procedure is being used in the beer, wine, juice, and syrup industries.

605. Common deteriorative conditions

Specific foods such as meats, waterfoods, egg and diary products, fresh fruits and vegetables, and semiperishables have common deteriorative conditions. This lesson only discusses some of the more common examples of deteriorative conditions.

Meats

The common deteriorative conditions of meat are related to flavor, odor, texture, or appearance. Flavor conditions include rancidity, putrefaction, souring and gassing. Greening and other deteriorative conditions affect appearance.

Rancidity

Hydrolysis or oxidation causes rancidity. Enzymes (lipases) in the microorganisms on the meat cause hydrolysis of triglycerides. This release of free fatty acids is called hydrolytic rancidity. The oxidative deterioration of fat is called oxidative rancidity. Both of these reactions produce off odors and flavors. Most of the rancidity problems in meats are caused by the reaction of oxygen with unsaturated fats or oxidative rancidity. The oxidation of fats is influenced by the amount of oxygen, the temperature of the meat, the light present, and the pro-oxidant enzyme present. Microorganisms are not a major factor in most rancidity problems due to the environment on the meat inhibiting the growth of microorganisms. The free fatty acids and the peroxides formed through oxidation and hydrolysis are toxic to most microorganisms.

Putrefaction

Putrefaction is a type of spoilage where bacteria metabolize meat proteins or free amino acids. The bacteria produce enzymes that metabolize the proteins causing the off-odor and flavor. Putrefaction is commonly found in canned meat products and with bacon.

Souring and Gassing

Anaerobic bacteria sometimes metabolize carbohydrates in the meat products causing the production of organic acids such as lactic acid. This acid brings the pH of the meat down and develops a sour flavor in the meat. Other forms of anaerobic bacteria can also grow in meat products such as sausage products or vacuum packed meats. Certain species of anaerobic bacteria can form gasses such as carbon dioxide, which is colorless, odorless, and tasteless and causes the package to become distended. Usually when a gas is produced, acids are also produced causing an off-flavor. Souring and gassing is commonly found in fresh meats, bacon, hams, sausages (gassing), and canned meats.

Greening

The three types of greening are green cores, green rings, and surface greening.

Green cores

Green cores is an appearance condition that occurs usually in large sausages such as bologna. Bacteria such as *Lactobacillus viridescens* produce hydrogen peroxide. Hydrogen peroxide is a strong oxidizing agent that degrades the meat pigment turning it green. When greening bacteria are introduced into the sausage mixture and not destroyed by the cooking process, green cores result. However, this condition does not occur until the meat is cut. This is because the bacteria are aerobic and do not grow until exposed to the air. The greening usually starts in the middle and spreads to the outside. This spreading is characteristic of microbiological greening and not of the other sources of greening such as with chemicals or metals. Cooking the meats during processing to an internal temperature of 160^{o}F will destroy the greening microorganisms.

Green rings

Green rings is similar to green cores except that the greening occurs in rings at varying depths within the meat. This greening usually develops within one to two days after processing of the meat. The reason for the rings is not really understood. However, the most common reason for this zone or ring area is that the oxygen tension is low and the environment is conducive to *Lactobacillus viridescens* growth, which produces a green discoloration of the pigment.

Surface greening

Surface greening is caused from the same bacteria that cause green cores and green rings. The major difference is in the time it takes for the product to turn green. Surface greening is not usually noticeable until about five days after processing and sometimes not until two weeks later. This condition occurs in nonvacuum packed meats. Since the bacteria are aerobic, surface greening usually does not occur on vacuum packaged meats while still packaged. However, it will show up on vacuum packaged meats after opened and exposed to the air for five days to two weeks.

Other deteriorative conditions

There are other conditions affecting meats you need to be aware of when conducting inspections. These are not all of the conditions associated with meats, but are some of the more common problems you will find.

Slime

Slime is a condition where bacteria and yeasts contaminate the meat products and multiply to excessive numbers. On nonvacuum packaged meats, slime appears in characteristic beads that are sticky to the touch and give off odors sometimes described as yeast-like. Slime is rarely a problem with vacuum packaged meats because the environment is not conducive for the bacteria that commonly cause slime. However, after a period of time the environment inside the vacuum package can change to allow these bacteria to multiply to extreme numbers forming a milky white liquid that can be seen with the naked eye.

Molds

Molds are a common contaminant of processed meats such as dry sausages and country-cured hams. Molds need oxygen and room to grow. Thus, they are not normally a problem with vacuum packaged meats. Some of the molds produce carcinogenic substances known as aflatoxins that are extremely toxic. Therefore, the conditions favorable for mold growth should be avoided and any meat products with mold growth should be discarded or trimmed.

Waterfoods

Fresh fish held at about 32^{o}F can last up to seven days. However, this is not true for all species. The reasons fresh fish spoils rapidly are due to microbiological, chemical, and physiological factors. The flesh of healthy live fish is basically sterile. However, there are large numbers of many varieties of bacteria on the surface and in the digestive tracts of the fish. These bacteria move to all tissues of the fish when the fish is killed. These bacteria are well adapted to the cold, since they live in the cold-blooded fish usually in the cold waters and will continue to grow well under refrigeration.

Trimethylamine

When a fish is killed, there is little or no odor present. A short time after death, a substance called trimethylamine is produced by breakdown of the fat or proteins in the fish due to enzyme and bacterial action. Trimethylamine causes the typical fishy odor. This odor may be accompanied by other odors resulting from fat degradation. The fats of fish are highly unsaturated and become easily oxidized, resulting in rancid off-odors and off-flavors.

Glycogen

After death, glycogen in fish is broken down to lactic acid, lowering pH and, therefore, acting as a preservative and limiting bacterial growth. However, fish usually struggle prior to being caught. This causes some glycogen in the muscles to be used up. The more fish struggle, the more glycogen is depleted. Little or no lactic acid builds up allowing the pH to stay higher. This allows more rapid bacterial growth and tissue breakdown.

Egg products

Before we discuss the deteriorative conditions associated with eggs, here is a short course in the formation of an egg. Yolks containing the female germ cell are formed in the ovaries of the hen. These yolks drop into the mouth of the oviduct and slowly pass down the oviduct, having layers of egg white added from albumen-secreting cells along the way. Further down the oviduct, protein-secreting cells add the membranous tissue along with calcium and minerals to form the shell. If the egg is to be fertilized, the sperm must travel up the oviduct and reach the yolk prior to the albumen and shell being formed.

Formation

Knowing the process of egg formation helps explain some defects of eggs. Fertilized eggs produce embryos or baby chicks. Ruptures in the oviduct or ovary will produce blood spots and sometimes meat spots. Diseases of the ovary or oviduct can produce eggs infected with bacteria or even parasites inside the sound shell.

Porous shells

Shells are porous allowing gases to pass in and out of the egg. An older egg is identified by a large air cell at the top of the egg. When the eggs are washed, the cuticle or bloom on the outside of the shell is removed which exposes the open pores of the shell. Eggs are then usually treated with a solution that coats the outer layers of the shell, sealing the pores to guard against microbial contamination. If the eggs are improperly washed or processed, bacteria can easily enter the shell through these open pores.

Stuck yolk

Older eggs exhibit a thin egg white when broken out on a plate. The position of the yolk inside the egg is also important in determining staleness. A yolk will stay in the middle of the egg if fresh, and it will drift off-center when stale. This is known as a stuck yolk. It is easy to determine this condition if you candle eggs or put them up against a bright light to see inside.

Salmonella

Another problem with eggs is contamination by *Salmonella* bacteria. These bacteria are found in chicken fecal material. Also, *Salmonella enteriditis* is found in the reproductive tract and can easily enter the eggshell as it is forming. This is why *Salmonella* is found inside the eggs. Since it is difficult to keep *Salmonella* out of the egg products, all portions of commercially processed eggs out of the shell must be pasteurized. This still makes whole uncracked eggs very dangerous because of the *Salmonella* bacteria inside the egg. If the egg goes through further processing under heat, then the problem is minimized. However, if the eggs are to be used raw and not undergo further processing, the products can be considered dangerous.

Dairy products

Some of the most common defects with milk include souring, usually caused by *Streptococcus lactis*; ropiness; sweet curdling or slight coagulation caused by bacteria that produce enzymes; malty, rancid, yeasty, bitter, fruity, and putrid flavors; and purple and reddish colors. All of these conditions are caused by microorganisms. The intensity of the off-flavor depends on the extent of microbial action on milk proteins, fats, and lactose. Most of the organisms that affect the flavor are postpasteurization, gram-negative, psychrotrophic contaminants belonging to the *Pseudomonas, Flavobacterium, Chromobacterium, Alcaligenes* species and coliforms.

Hardened ice cream

Hardened ice cream usually does not have spoilage problems since there is not much time between pasteurization and freezing. Time between pasteurization and consumption, temperature abuse, and possible contamination are all problems associated with soft serve ice cream. Often, the facilities and cleaning practices for soft serve machines are marginal at best, which increases the risk of microbial contamination.

Cheeses

Cheeses are subject to abnormal microbial fermentation that leads to putrid, unclean, yeasty, fermented, and rancid flavors. The microbes most often associated with cheese spoilage are molds, yeasts, and anaerobic spore-formers that can oxidize lactate and various protein and fat products. Controlling the humidity, wrapping the cheese with plastic or wax, and keeping the storage shelves clean are all methods of reducing these problems.

Gas production

Gas formation too early in cheese production can cause defects also. For example, growth of coliforms during cottage cheese production may produce sufficient gas to cause the curd to float. The cheese will have an off-flavor and soft and shattered curd particles. Other sources of gas production during cheese processing include using raw milk, inadequate heat treatment, contamination after pasteurization, and slow acid production by the starter bacteria such as *Streptococcus lactis*.

Reducing microbial growth

There are factors that reduce microbial growth in cheeses. These include a low pH (generally below 5.3), salting the cheese that reduces the water activity, low temperature of ripening, and low oxidation-reduction potential. In general, this means low oxygen availability or low oxygen tension.

Fresh fruits and vegetables

There are many problems associated with fruits and vegetables. However, there are not many problems that would make someone ill.

Vegetable spoilage

Most spoilage of vegetables is caused by bacteria. However, molds also cause some of the more common rots in vegetables. Some examples of bacteria and mold spoilage include soft rots, spots, blights, and wilts. Some spoilage problems associated with the more common vegetables are black rot of carrots; watery, soft rot of celery; downy mildew of lettuce and spinach; smudge and black mold rot on onions; wilt and *Rhizopus* soft rot on green beans; tuber rot on potatoes; gray mold rot on cabbages; and black rot on cauliflower.

Fruit spoilage

Fruits are usually very acidic, and, therefore, the primary spoilage organisms are fungi and predominantly molds. The spoilage starts on the surface of the fruit and spreads internally. Once the spoilage spreads to the inside, washing the fruit to make it usable is basically ineffective. Some of the more common spoilage problems are listed below.

Common Spoilage Problems	
Fruit	*Problem*
Oranges	Spoil from blue rot, green rot, gray mold rot, and blossom-end rot. Citrus products with blue rot exhibit soft, watery, tan to light brown areas that are readily gouged out with the tissue inside having a moldy or musty odor and flavor. There are typical bluish-green spores on the fruit.
Apples	Spoil from blue rot, black rot, core rot, and brown rot. The blue rot is the same as the rot in oranges. However, this type of rot is more common in apples than oranges. Black rot causes the tissue to become soft and watery. Brown rot causes unsunken, decayed areas, turning dark brown to black in the center. The mold spore masses are yellowish-gray, and the skin clings tightly to the center of the old lesion.
Strawberries	Spoil from gray mold rot, tan rot, and leather rot. Gray mold rot is evidenced by light brown, fairly firm, watery decay. Grayish-brown velvety spots may be seen in more advanced spoilage.
Peaches	Spoil from brown rot, pink and *Rhizopus* rot. Pink rot is evident by the pink spore masses on the spots.
Bananas	Spoil from finger rot, black rot, and crown rot. Black rot is the same as the black rot described in the section on apples.
Pears	Spoil from black rot, blue and brown rot, and powdery mildew. Powdery mildew causes a white powdery looking substance on the skin.
Lemons and limes	Spoil from cottony rot, brown rot, and sour rot.

Semiperishables

Most semiperishables are packaged in cans, bags, boxes, or jars. Assuming that the product is in excellent condition at the time of packaging, it is likely that only packaging defects will affect product usability. Several defects to the packaging are possible. Cans might become dented severely enough to cause a leak or to let microbes into the product that would cause spoilage. Bags or boxes might get wet or torn allowing insects or rodents into the product. More on this topic will be discussed in the receipt inspection's unit.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

601. Microbial deterioration

1. What is the most important cause of food spoilage?

2. What are spherical-shaped bacteria called?

3. What are rod-shaped bacteria called?

4. What do we call the time lapse from one cell division to another?

5. What is sporulation?

6. What is mycelium?

7. How do yeasts reproduce?

602. Factors influencing microbial growth

1. What is the lag phase of bacterial growth?

2. What is the log phase of bacterial growth?

3. In what phase does the reproductive rate equal the death rate of bacterial cells?

4. What phase begins when cells start dying because of the accumulation of waste materials and depletion of nutrients?

603. Food factors influencing microbial growth

1. What happens in the fermentation process that affects pH?

2. What is water activity in foods?

3. What are the three methods typically used to lower the aW?

4. What term is used for an environment without oxygen?

604. Nonfood factors influencing microbial growth

1. What are the three temperature groupings of microorganisms?

2. What temperature grouping grows well at relatively low temperatures?

3. Thermophiles grow relatively well at what temperature range?

4. What is a psychrotroph?

5. What is the second greatest cause of spoilage in foods?

6. What substance is a catalyst to break down substrates such as carbohydrates, fats, and proteins in foods?

7. What does it mean if phosphatase is found in a gallon of milk?

605. Common deteriorative conditions

1. What causes meat rancidity?

2. What is putrefaction?

3. What causes souring in meats?

4. What are the three types of greening?

5. What causes the meat pigment to turn green?

6. How is the greening organisms destroyed during processing?

7. How does slime appear on nonvacuum packaged meats?

8. Why should meats with molds be discarded or trimmed?

9. What causes the typical fishy odor in fish?

10. Why does fish struggling before being caught cause the pH to be higher?

11. What does it mean when an egg yolk drifts off-center?

12. Why is *Salmonella* found inside an egg?

13. What are the most common spoilage organisms associated with cheese?

14. What type of organism causes most vegetable spoilage?

15. What does blue rot look like on oranges?

1–2. Food Preservation

You have studied what microorganisms need to survive and grow in foods. Food technology has provided several methods for controlling microorganisms. These methods range from heat treatment to substances being added to foods to control growth of microorganisms. You need to know the different preservation methods used in the food industry. We start this section with a short explanation of the more common types of food preservation and then focus on one preservation method—using additives.

606. Types of food preservation

The common types of food preservation are thermal or heat processing, refrigeration and freezing, drying and dehydrating, fermenting, irradiating, controlled atmospheres, and smoking. Let's begin this lesson by learning about the heat treatment of foods.

Thermal or heat processing

The first and probably most often used method of food preservation is thermal or heat treatment of foods. Most organisms grow easily between 61 and 100°F. However, temperatures of at least 140°F will start to kill pathogenic bacteria and most organisms start to die at a temperature of at least 179°F. Some of the commercially used methods of heat processing include canning, pasteurization, and blanching.

Canning

Canning is the process where food is prepared and placed into a can. A vacuum is created, the can is sealed, and then it is heated to proper temperatures. These heat-processed products are considered to be commercially sterile. This means that all organisms that might be a health hazard, as well as spores that might cause spoilage under normal nonrefrigerated storage conditions, are destroyed. Some extremely heat-resistant thermophilic spores might remain in the product. With normal storage temperatures, these organisms will not grow. The vacuum reduces the stress on the container during heat processing, holds the ends in a collapsed concave position during storage, and reduces the headspace oxygen that retards the growth of the remaining microorganisms.

Agitation

Most cans are agitated while heating takes place. This agitation allows all of the food in the can to heat on a more even basis. If the can were still while heating, the food might be "cooked" to the can wall with the center of the food not reaching required temperatures. Agitation also allows higher temperatures to be used during heating without harming the product.

Can seal

The seal of the can is very important in protecting the product from contamination. There are different types of seals on a can. There are end seals or end seams, side seams, and a newer type of can with only one top seam. This newer type has only one seal because the rest of the can is one piece of metal molded into a can. Defects of cans will be discussed later in this unit.

Pasteurizing

Pasteurization is a process using heat treatment to either eliminate pathogenic organisms or eliminate other organisms to extend the shelf life of the product. For example, milk and liquid eggs are pasteurized to eliminate the pathogenic organisms to make the product safe for consumption. There is a difference between pasteurization and commercial sterilization. A temperature below 100°C is called pasteurization while a temperature above 100°C is referred to as sterile. Some organisms are killed during pasteurization; some are attenuated or just injured; and some spores may be stimulated to germinate.

Various methods

There are various methods of pasteurization used in the industry ranging from the holding method where milk is kept at a temperature of 145°F for 30 minutes to the flash method where milk is brought to a temperature of 161°F for 15 seconds. There is also an ultra-high temperature (UHT) method where milk is heated to 207°F for three seconds and is basically sterile milk. This milk can be placed in a box and put on the shelf without refrigeration for several months. Other pasteurized dairy products are chilled rapidly immediately after pasteurization and must be kept under refrigeration.

Extending the shelf-life

Beer, wine, and fruit juices are examples of using pasteurization to eliminate organisms to extend the shelf life of the products, since these products do not normally carry pathogenic organisms. Pasteurization is not limited to liquid foods. In fact, even oysters can be pasteurized in the shell to lower bacterial counts.

Blanching

Blanching is a kind of heat treatment that is generally applied to fruits and vegetables primarily to inactivate the natural food enzymes. This process is used on products that are to be frozen since freezing does not stop the enzyme activity. Blanching also destroys some organisms in the foods. Fruits and vegetables are passed through either water or steam at temperatures of 190°F to 212°F (steam).

Refrigerating and freezing

Refrigeration and freezing have been methods of food preservation for a long time. Most organisms are controlled at temperatures of 41°F or lower and even the psychrotrophic organisms are effectively controlled at temperatures below about 15°F. Through research and technology, we have learned that it is important to cool products as soon as possible to extend the shelf life. For example, meat is cooled immediately after the animal is slaughtered. Another example is fruits and vegetables being placed into a hydrocooler or water bath to bring down the temperature of the product. This method slows down the enzymatic activity that, in turn, slows the deterioration process.

Effectiveness

Refrigeration and freezing have little or no effect on the taste, texture, nutritive value, or other attributes of the foods. This makes refrigeration and freezing two of the best methods of food preservation in the food industry in terms of not changing the food. However, refrigeration and freezing are not as efficient at stopping the deterioration process as heat, dehydration, irradiation, and fermentation.

Control problems

One of the possible problems that must be carefully controlled is air circulation and relative humidity. Air circulation moves heat away from the food and cools it down. This process helps to cool the food more rapidly. Air containing too much humidity can condense on the surfaces of the foods and allow psychrophilic organisms to grow. For example, molds will grow at common refrigeration temperatures under such conditions. Also, the humidity must be controlled carefully because if the air gets too dry, the foods will dry out. Since not all foods require the same humidity or air circulation, an optimum balance must be reached for the cold storage area.

Drying and dehydrating

The terms “dehydrating” and “drying” have basically the same meaning. There are many different ways to dry food products. This section will only mention some of the more common methods. Both dehydrating and drying reduce the water activity (aW) of foods. As the aW is lowered, microbes will not grow, and the food is preserved. Many foods are also dehydrated to reduce the weight and bulk of the product. For example, fruit juices are dehydrated into a powder and weigh about 1/8th of the wet

weight. All forms of drying foods use heat. However, there are a variety of ways to accomplish the actual drying of foods.

Solar drying

The foods most commonly dried by this method are fruits, fish, rice, and other foods such as grains and coffee. Fruits are usually prepared before drying. For example, stone fruits are halved, pitted and placed on trays in the open sunlight. Sometimes sulfur dioxide is added to preserve the color and flavor of the fruits. This method is most effective where the dry season coincides with the harvest. When fish are solar dried, salt is usually added to prevent microbial growth. All products must be protected from the rains, birds, dust, insects and halophilic (salt loving) bacteria.

Drum or roller drying

Drying by this method requires foods to be put into a drum or roller, which is preheated to assist with rapid drying. The liquefied food is run as a thin layer onto the revolving heated drum. The moisture is removed almost immediately. This process is used for products like instant breakfast cereals, starch, and soup mixes. This process is inexpensive, and some foods, such as tomato flakes, acquire a "cooked" flavor.

Hot air drying

There are several methods using hot air to dry foods. These include placing food stacked on trays in a tunnel of hot air until the food is completely dried. Two of the most common methods are rapid drying and spray drying. Rapid drying is done by passing particulate foods, such as vegetables, over a porous plate with hot air being blown up through the plate. Egg products are placed in a pan with hot air blown over the top of the food surface. Spray drying is commonly used for milk, coffee, and egg albumen. Small droplets of liquid are sprayed into a stream of very hot air. These droplets dry rapidly with little or no off-flavor or discoloration, and form particles that rehydrate readily.

Freeze drying

In this process, heat is applied to a frozen food under a vacuum. The vacuum increases the vapor pressure of the food. This forces moisture out of the food. The moisture condenses into ice on a cold surface. The food does not thaw during the process, so shrinkage does not occur and microbial growth is prevented. The ice, under vacuum conditions, goes off directly as water vapor, a process called sublimation. This gentle drying process protects all food quality attributes such as texture, color, flavor, and nutrients.

Concentration

This term refers to removing water without the product actually being changed to the dry state. For example, frozen concentrate orange juice is derived from orange juice, but water has been removed. The process can be used as a preservation method or it can be a means of conserving space. The latter is the common reason for using this process. For most concentrates, the aW is still relatively high, so there is not much of a preservation effect.

Fermenting

Fermenting consists of a chemical change or anaerobic breakdown of food brought about by the use of enzymes or microorganisms. There are three basic chemical changes made through fermentation:

1. Acidulation of milk as in cultured buttermilk.
2. Oxidation of nitrogenous organic compounds as in bakers' yeast used in bread.
3. Decomposition of starches and sugars into ethyl alcohol, carbon dioxide, and organic acids as in sausages and pickles.

Fermentation usually increases the nutritional value of the foods affected. For example, riboflavin, vitamin B_{12}, and the precursor of vitamin C are processed through the fermentation process.

Lactic acid

Lactic acid-producing bacteria are used to process cucumbers into pickles, cabbage into sauerkraut, and Taro root into the Hawaiian dish of Poi. These same bacteria are used on meats to produce Salami sausage and Lebanon bologna. The same class of bacteria can be used on dairy products to produce cheeses such as Ricotta, Cheddar, and Edam and milk products such as yogurt, Acidophilus milk, and buttermilk.

Acetic acid

Acetic acid-producing bacteria can convert wine, cider, honey, and any other product high in sugar into vinegar. Yeasts by themselves can produce wines from fruits, rum from molasses, whiskey from grain mashes, and bread from dough. Soy sauce is made from the fermentation of yeasts in combination with bacterial fermentation. Acetic acids are used in other foods such as catsup, salad dressings, and cucumber pickles. This acid usually lowers pH to 5.0 or below, which is inhibitory to most bacteria. However, a lower pH is needed to inhibit most molds and yeasts.

Irradiating

The United States is experiencing a resurgence of interest in food irradiation as an alternative to harmful chemical additives. Consumer concern over the use of pesticides and other chemical additives necessitates extensive study into the increased use of radiation as a food preservation process. Additionally, it is becoming more cost effective to use this preservation technique. There is also substantial consumer concern regarding safety of irradiated foods.

Objectives

Objectives for the use of ionizing radiation are to control certain parasites in beef and pork, slow the maturation in fresh fruits and vegetables (FF&V), and provide microbial disinfection and disinfestation of arthropod pests in certain foods.

Dosage

The various applications of food irradiation can be classified by dosage. Low dose applications up to 1 KGy (1 Kilogrey = 100 kilorads) are used to inhibit sprouting, control insect infestation and delay maturity. Medium dose applications (Ca. 1 – 10 KGy) are used to reduce the microbial load, prolong shelf life and reduce the load of nonsporing pathogens. High dose applications (10 – 50 KGy) are used to achieve commercial sterilization, enabling food products to be stored at ambient temperatures with suitable packaging.

Accumulating data

Even though irradiation seems to be an ideal preservation technique, the FDA is still accumulating data and trying to find answers to very important questions such as, “Will irradiation create an environment in which microorganisms can adapt and flourish?” Residues are not left to fight recontamination after the food has been irradiated. “Will the public become careless when purchasing and handling certain foods, such as foods that are salmonella-free due to irradiation, like poultry products?” Salmonella is one of the major causes of food borne illness in this country. Packaging and labeling are also of concern to the FDA.

Approvals

Eleven countries, including the United States, have already approved, with certain restrictions, the use of radiation to preserve foods. Thirty-two other countries are seriously considering its use. Therefore, the public health field will face the challenge of enforcing standards and obtaining data on possible health hazards associated with consumption of irradiated foods.

Controlled atmospheres

Fresh fruits and vegetables respire during storage, and this respiration contributes to the loss of quality. The atmosphere must be controlled to decrease respiration. A controlled atmosphere (CA) is the regulation of O_2 and CO_2 for storage of fresh foods. A controlled atmosphere is usually used for apples and other fruits that respire and ripen during cold storage. Respiration depends upon the availability of oxygen, and in the process gives off carbon dioxide. There are three ways to control this respiration: reduce the temperature, deplete the oxygen, or increase the level of carbon dioxide. For example, Macintosh apples respire the fastest at about 87 percent relative humidity, about 21 percent oxygen and .03 percent carbon dioxide. To properly store these apples, a cold storage room should be gastight, brought to the desired temperature, filled with the apples, and sealed. Then the carbon dioxide can be increased to 3 percent for the first month, the oxygen reduced to 3 percent, and either nitrogen or an inert gas can be used to fill in the balance of the atmosphere. This is maintained for about a month when the carbon dioxide is increased to about 5 percent and maintained for up to 6 months of storage.

Ethylene gas

Another example of a controlled atmosphere would be the use of ethylene gas to speed the ripening of bananas. The gas stimulates ripening, which changes the color of the bananas from green to yellow. The gas also brings out the sweetness of the product.

Energy savings

CA can be used with many other products. It is practiced whenever food is packaged in any container under a vacuum, nitrogen, carbon dioxide, or any atmosphere without the normal composition of air. Controlled atmospheres can change the rate of microbial and enzymatic spoilage. The possibility of energy savings by using less refrigeration is of great interest to the industry instead of storing foods at freezing temperatures.

Smoking

Smoking meats is an age-old practice probably going back to prehistoric times when meats were hung next to the smoke vent. The keeping time for food items such as meats and fish was improved by hanging them in this location. Today, smoke is usually combined with heat treatment to achieve a drying effect with a smoke flavor added to the food. Other desirable effects achieved from smoking include fixing the color of the lean portion of meats, tenderizing the food by the heat and smoke, adding a desirable finish or gloss to the skin of meats, adding antioxidants to the fat, adding a favorable odor to the food, reducing microbial organisms present, and adding the particles of smoke to the food that acts like a preservative.

607. Food additives

Federal law defines a food additive as “any substance the intended use of which results or may reasonably be expected to result directly or indirectly in its becoming a component or otherwise affecting the characteristics of any food.” This law excludes those substances that are GRAS (generally recognized as safe) under the conditions of their intended use.

Food additives

The Federal Food and Drug Administration must approve all additives for foods. In most cases, foods must be prepared with some form of additive or preservative that may affect the food product. As a food inspector, you need to be aware of the different types of additives that might affect the foods you inspect.

Curing

Curing is preserving food by adding salts or other substances to inhibit microbial growth. The process alters the food's color, flavor, texture, as well as susceptibility to microbes.

Dry cure

A dry cure is the adding of salt, nitrates, or nitrites to a food product to inhibit microbial growth. Using salt is known as a salt cure. Most cured meats are heated along with the salt cure. However, there are some meats that are unheated, while there are two levels of heat added to other cured meat products. Only those products unheated or mildly heated need refrigeration after curing. Those with thorough heating do not require refrigeration. Salt cures reduce the water activity (aW) in the food. Nitrates and nitrites are added primarily to fix the color of the foods, such as meats, even though a small amount of preservation takes place to inhibit the growth of microbes. One exception is nitrites are added to inhibit the growth of *Clostridium botulinum*.

Wet cure

A wet cure is also known as a pickle and consists of the same ingredients as a dry cure but has been put into a brine or solution for easier placement into the food products. The most common food pickled is meat. Meats, such as hams, are either immersed or injected with pickle cure. Injecting the cure into the arteries of meat provides a uniform pickle. Other meats are just immersed or sprayed with the pickle to cure the product.

Defects of curing

Color defects can result from either nonbacterial or bacterial reasons. Nonbacterial defects are usually a result of under curing or fading of the cure. Under curing is exhibited by a brown or grayish-green color due to a poor reaction with the nitrites and the meat pigments. Fading of the cured meat results from oxidation and is accelerated by light. The bacterial reasons for curing defects in color are nitrite burns, surface greening, green core, and green rings. Microbes can be the cause of nitrite burns because there are bacteria that reduce the nitrates in the meat. This reduction of nitrates increases the effectiveness or amount of the nitrites in the meat and causes a nitrite burn. Green core, green rings, and surface greening have been previously discussed. There are many other defects associated with curing agents. We cannot list all the defects here; however, there are several good books published on food technology that list and explain most of these defects.

Sugar

Sugars such as glucose, sucrose, and lactose are added to foods as sweeteners. However, if they are added in a high concentration, such as in syrup, jellies, jams, and honey, they act as preservatives. Sugar, in high concentrations, reduces the aW in the food. This inhibits the microbial growth. There are a few yeasts and molds that can still grow on the surface of these highly sugared foods.

Chemicals

Technology has provided many chemicals that can be added to foods to preserve the characteristics of that food. These chemicals preserve or change the flavor, color, taste, and texture of foods.

Chemicals Added to Food	
Chemical	*Use*
Nitrites and nitrates	Added to foods to fix the color, and they only have limited inhibitory use. Most of the time they are mixed with other chemicals for curing foods such as meats.
Sulfur dioxide and sulfites	Used to fix flavor and color of fruits and vegetables. They have limited inhibitory use against microbes. When dissolving sulfite salts in water, a sulfurous acid is formed that is used to inhibit yeasts, molds, and bacteria. This solution is used mainly in the wine industry as well as for dried fruits and vegetables.
Sorbic acid and sorbates	Sorbic acid is an unsaturated fatty acid used to protect acid foods from mold and yeast growth. This acid is added to such foods as cheese, orange juice, fruit and fruit syrups, margarine, pickles and yogurt.
Propionic acid and propionates	Is effective against molds and bacteria but not against yeasts. This substance is commonly used to prevent mold growth on baked goods and cheeses, and in artificially sweetened jams, jellies, and preserves.
Benzoic acid and benzoates	Used to preserve acidic foods such as carbonated beverages, fruit juices, cider, pickles, and sauerkraut. This acid is more effective against bacteria and yeasts and less effective against molds.
Ethylene oxide and propylene oxide	Gaseous chemicals are used to inactivate microorganisms in certain products if further processing is to be performed. These products include cocoa, gums, processed spices, starch, and processed nuts (except peanuts). Propylene oxide can also be used as a fumigant for dry prunes and glazed fruit.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

606. Types of food preservation

1. Why is a vacuum put into canned foods?

2. What is pasteurization?

3. What is the difference between pasteurization and commercial sterilization?

4. What is blanching?

5. What are the different methods of drying and dehydrating foods?

6. What are the three basic chemical changes made through fermentation?

7. What are the objectives of using ionizing radiation on foods?

8. What is a controlled atmosphere (CA)?

607. Food additives

1. By law, what is a food additive?

2. What is curing?

3. What is another name for a wet cure put into a brine or solution for easier placement into the food products?

4. What is the common characteristic of under curing a food product?

5. What is a common use for propionic acids and propionates?

1–3. Food Packaging and Storage

As a food inspector you will need to have an understanding of how foods are packaged, packed, and stored in order to be able to make good sound judgments or recommendations on foods. What caused the swell in the can of applesauce you are inspecting? How long can I expect this can of dehydrated shrimp to last in the warehouse under hot conditions? How do I know that the foods stored in the freezer and walk-in refrigerators are actually stored properly? These are just a few questions that inspectors ask almost every day! You will now embark on an educational journey through the food packaging industry with stops at the canning factory, glass company, and paper mill to see how these materials are able to protect the foods we eat. Then you will wind up this trip with a look at how these foods are properly stored. Keep in mind, that packaging designed for a specific food item will also impact the amount of time a food will be stored.

608. Types of food packaging

Food packaging employs a wide variety of materials. These include:

- Rigid metals used in cans and drums.
- Flexible metals such as aluminum foils.
- Glass used in jars and bottles.
- Plastics used in canisters and squeeze bottles, as well as flexible pouches.

- Cardboard, paper, and wood products used in boxes and bags.
- Laminates of paper, plastic, and foil combined and used to protect food products.

There are specific requirements and functions that containers must meet to protect foods. These include being nontoxic; sanitary; protecting from moisture, gas, odor, light, and unwanted intrusion such as with tamper-resistant or tamper-evident packages; easy opening; easy disposal; fitting the size, weight, and shape limitations of the food product; and being neat and appealing in appearance. There are other requirements and functions for packaging that are specific to certain food items but are too lengthy to mention here.

It is important to explain the difference between a hermetic container and a nonhermetic container. Hermetic means a container that is impermeable to or not allowing the entry of gases and vapors. This impermeability also keeps out bacteria, yeasts, molds, and dirt or dust. A hermetic container protects a food product from moisture gain or loss and is essential for strict vacuum and pressure packaging. The most common examples are properly sealed metal cans and glass bottles. However, a nonhermetic container also prevents the entry of microorganisms, but is permeable to or allows the entry of gases. Common examples include flexible packaging such as cellophane and paper or cardboard packaging, which are not completely impermeable. Even cans can become permeable if the seal is broken or weakened.

Cans

Cans have been used to preserve and protect foods since the mid-1800s. It was not until the early 1900s that the sanitary can was produced—that is, a can produced by a machine, filled, and sealed without being handled by people. Cans not only offer good protection for the food product, but also lend themselves to high-speed production. Stores can easily display the canned products, and the packaging is easy for consumers to use.

Characteristics

You have probably heard of the term “tin can.” Most cans are made of steel and have a thin coating of tin over the steel to prevent corrosion. When the tin might react with the food product, a thin coating of enamel can be added or substituted to prevent the reaction. Chromium and chromium oxide have also been used to coat the interior linings of cans. However, an organic coating such as citrus enamel can be used to further protect the product.

Reaction

In time, if the tin coating is used, the tin will gradually disappear while the amount of exposed steel increases. There will eventually be a reaction between the food and the steel. This reaction produces a hydrogen gas, which can build up enough to distend the ends of the can. However, a hydrogen swell does not usually occur until almost all of the tin has been used up.

Aluminum, the light weight metal

Aluminum, a lighter weight metal, has a lower chance for atmospheric corrosion and is easier to shape. Although aluminum is not as strong as steel, the aluminum can be strengthened by injecting a small amount of liquid nitrogen into the can prior to final closure. The gas expands and provides an internal pressure, which adds rigidity.

Advantage of aluminum

One advantage of aluminum is that, when mixed with oxygen, it forms aluminum oxide that prevents corrosion. Oxygen is readily available outside the can. However, oxygen is not generally available inside the container because of the food processing techniques used to prevent the presence of oxygen. To help protect the food products and to prevent corrosion with this low oxygen

environment, an organic enamel coating similar to the ones used for tin and steel cans is used to prevent the reactions. If these enamel coatings wear out, several flavor and color defects might result.

Defects

There are many defects associated with cans. In order to get a better understanding of these defects, you need to know their classifications. The classification of defects is divided into critical, major, and minor. A critical defect, such as a leaking can, affects product safety. A major defect can result in failure of, or materially reduce, the usability of the unit. A minor defect limits the product's serviceability and does not meet the standards for that particular item. Figure 1–4 shows parts of a can that may be affected by defects.

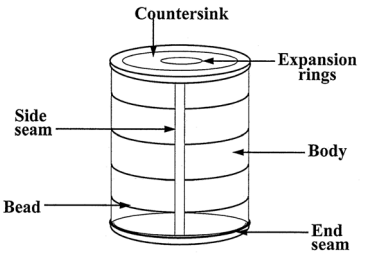


Figure 1–4. Can parts.

Dents

Dents are the most common defect associated with cans. Dents can be classified as either a major or minor defect. A dent *cannot* be classified as a critical defect.

- A major dent is also known as a severe dent. This severe dent can be a body dent with very sharp edges or apexes that might affect the ability of the metal or interior enamel to protect the product. A severe dent also may be a body dent that affects the side seam or end seam where the hermetic seal may be broken or weakened considerably. The countersink or rings on the top of the can are usually affected when the end seam is involved.
- A minor dent is also known as a moderate dent. This moderate dent can affect the body of the can including the side seam with only moderate or slightly rounded edges. With cans that do not have a side seam, the moderate dent might affect the end seam. However, the end seam cannot be weakened and the countersink or rings at the top of the can *cannot* be affected with the moderate dent.

Paneling

Paneling is sometimes confused with can dents. Paneling occurs when at least one side of a can is flattened or collapsed. This defect can range from a minor buckling of one side where the metal is not weakened, to a major collapsing of all sides where the metal is weakened with sharp ridges. This defect is usually caused from excessive exhausting or a vacuum too strong for the product and can. Another cause is excessive headspace of the can or under filling of the can, causing a very strong vacuum. This results in buckling on both sides of the can.

Flipper

A flipper is a can that appears normal but has little or no vacuum. The way to determine if the can is a flipper is to strike one end of the can on the surface of a table and watch the action of the other end. The opposite end usually pushes outward. The end can be pushed back in without the other end being pushed out. It would take another strike on a flat surface to get the end to distend. There are a few causes for this problem. Microbial action or a chemical reaction between the lining of the can and the product produces gas that distends the end of the can. Either overfilling the can or insufficient exhausting of the can also might produce a flipper. A flipper is classified as a critical defect.

Springer

The springer is similar to the flipper, except one end of the can is always distended. When you pick up the can, you can push in one end of the can and the opposite end pushes out or springs out. This condition is caused by gas production either from microbial or chemical action. A springer is a critical defect.

Sweller

A sweller is a critical defect that occurs when both ends of a can are distended at the same time. The gas produced from either microbial or chemical actions can cause swellers. A soft swell can be depressed by hand, but the distended ends return to the original swollen shape. A hard swell is more dangerous. If you try to depress it by hand, the can might explode! One reason for a sweller might be foods with large amounts of sugar breaking down chemically when storage temperatures become too high. This can release carbon dioxide gas, resulting in the product swelling the can. Another reason for swelling might be cans with a low initial vacuum that have been transported to areas of higher altitude or elevated temperatures.

Buckled can

The buckled can is the opposite of a paneled can. Sometimes, during processing, a can is overfilled or pressurized to the extent that internal pressure causes the sides or ends to distend. The countersink or rings are usually distorted first before the sides are affected. The buckled can is a minor defect if the end seam or side seam is not affected. However, if the end or side seam is affected, then the can becomes a major defect.

Manufacturing defects and external defects

There are several manufacturing defects that you might see when inspecting cans. These conditions can range from minor to critical defects.

Manufacturing Defects		
Name	*Explanation*	*Type of Defect*
Lipper	An incomplete end seam that can have either a smooth or sharp projection or lip on the seam. The can-sealing machine rolls around the outer edge of the can, forming the seal, and sometimes the roller misses the metal and creates a lip or incomplete seal.	This condition is usually a major defect.
Spur	An incomplete end seam that can have either a smooth or sharp projection or lip on the seam. The can-sealing machine rolls around the outer edge of the can, forming the seal, and sometimes the roller misses the metal and creates a lip or incomplete seal.	The spur is considered a major defect.
Skipper	Is similar to a lipper, except that only a short portion of the seam is skipped by the machine rollers. The seam is thicker in some places and thinner in other places, and the seam is not completely flattened out.	This is a major defect.
Spinner	Is when the end seam is not always rolled by a machine. Sometimes, it is folded into a double seam and soldered.	A spinner is a critical defect because the end seam was mistakenly not soldered to the rest of the can, causing the top of the can to “spin” freely but not come off.
Cable cut	Is where cans are moved on a conveyor belt and held down to the conveyor by metal cables. These cables move with the belt. If there is a holdup on the cans and the belt continues to move, the cables can start to cut into the cans especially if the cables are tight.	Most cable cuts occur on the top of the can and are considered minor defects, unless the first layer of metal has been completely cut through on the end seam. If the lamination is showing through the end seam ridge, then the defect is major.
Pitted rust	Is corrosion in the metal. This form of rust cannot be wiped away with a cloth and will eventually lead to the can leaking. This form of rust is usually found under the can labels. Pitted rust can reflect a manufacturing problem or a storage problem at a base.	Is usually classified as a major defect.
Leakers	Just as the name suggests, leakers are leaking cans; they usually result from other defects.	Considered critical defects

Internal can defects

Not all defects occur on the outside of the can. Some of the most common defects found on the inside of the can include scarred enamel, flaked enamel, spangling, detinning, discoloration of the can, and pinholing. The process of canning sometimes creates scars on the enamel coating inside the can, thus, allowing a reaction with the food product. Flaked enamel is a loosening of the enamel in spots caused by improper heating during canning. Both scarred enamel and flaked enamel are major defects.

- Spangling is a dark gray discoloration or etching on the tin part of the can. This is due to a reaction of acids such as citrus juices with the tinplate causing a spotty or mottled appearance somewhat like galvanized containers. Spangling can range from insignificant to major defects.
- Detinning also can range from an insignificant to a major defect. This reaction is due to the product reacting with the tinplate or exposed steel causing the tin to be removed from the can.
- If sulfur-bearing foods such as corn, peas, fish, meats, and poultry react with the tin, the tin turns black and iron sulfides are produced as a waste product. This condition is usually caused by an improper interior coating of enamel.
- Another interior defect occurs when an acid product reacts with the tinplate and causes erosion. This erosion can lead to small holes developing, usually on the lid, where the code numbers are embossed into the metal. These pinholes are critical defects because microorganisms can enter and grow in the food. This type of defect is usually found in brine-packed items, vinegar-packed items, or water-packed fruits.

Plastics

Modern technology has provided a number of flexible packaging materials. One mixture of these materials is used extensively in the food industry—plastic. There are a variety of plastics used to protect foods. Some examples include cellophane, nylon, mylar or Scotch-Pak, polyethylene, polypropylene, polystyrene, Saran, and polyvinyl chloride. Most of these materials are transparent, provide moderate protection from sunlight, can be used for a variety of foods, and can withstand moderate amounts of pressure (bursting strength). The technology associated with the plastics' industry is rapidly changing and improving. The packaging materials are improving in terms of bursting strength, protection of food, and the use for a wider range of products.

Glass

Glass has been used in the food industry for a long time. As a matter of fact, the majority of glass containers in the United States are used in the food and beverage industry. As a food package, glass is chemically inert or unreactive with most substances. Some of the advantages of glass include: it is one of the strongest materials on earth in its virgin condition; chemically inert; transparent; capable of being manufactured into virtually any shape; made of raw materials that are plentiful, inexpensive, and of no strategic importance; compares favorably to other materials in its energy requirements; and is capable of being made easy to open and reseal for later use of a product.

Breakage

One of the most common problems with glass is the possibility of breakage. This breakage can be minimized with proper thickness and the coating treatments such as waxes and silicones. These coatings help prevent breakage because the bottles and jars glance off each other instead of taking direct hits. Glass containers are often scratched during processing, which creates a weak point in the glass. The coatings also strengthen these weak areas.

Closure

The typical closure of glass containers is a metal lid with either a rubber or plastic gasket that forms a hermetic seal. The metal lid must be protected against reactions with the food product, just as metal cans are protected with enamel coatings.

Cardboard and other paper materials

Paper in itself is not a good material to use to protect food products. Most paper, when used in primary containers, must be treated, coated, or laminated to improve its protective qualities. Paper is bleached, coated, or impregnated with waxes, lacquers, plastics and laminations of thin metals, such as aluminum foil, to improve its water vapor and gas impermeability, flexibility, tear resistance, grease resistance, sealability, appearance, and bursting strength. All paper or cardboard products that touch the food must meet FDA standards for chemical purity, and the coatings must be nontoxic and meet rigid microbiological testing standards.

609. Food storage

Proper food storage practices are important in preventing deterioration or total loss of products. Do not take storage techniques lightly. Your recommendations on the proper storage practices for foods may afford the government substantial savings. You will find some storage practices are similar for both perishable (refrigerated) foods and semiperishable (dry) foods. This lesson focuses on perishable foods, since these foods are more susceptible to deterioration. Use DODR 4145.19–R–1, *Storage and Materials Handling*, as a guide for storing foods and to determine the shelf life or humidity requirements of both perishables and semiperishables. Also, Defense Commissary Agency (DeCA) Directive 40–1, *Commissary Operations*, has information on how to properly store and handle both perishables and semiperishables purchased for DeCA accounts.

Chilling foods and cold storage

All chilled and frozen foods are perishable and can deteriorate rapidly when improperly stored. Storing foods at improper temperatures, at improper humidity, in the absence of proper air circulation, and under unsanitary conditions can lead to spoilage and eventual loss of the product. You will first learn about the types of refrigeration and then the proper storage practices for both chilled and frozen products.

Types of refrigeration

There are four basic types of refrigeration used in cooling foods. These include:

1. Room cooling device that uses cooled air.
2. Hydrocooling, which uses cooled water to lower the temperature of foods.
3. Vacuum cooling, which evaporates water and takes heat out of foods.
4. Icing, which is either chopped or flaked ice put on foods and is the best method for short term cooling.

You will see the room cooling method most often. A good example of room cooling would be the walk-in refrigerators you see in the back of restaurants and grocery stores. Hydrocooling and vacuum cooling are used for fresh fruits and vegetables in the fields immediately after harvesting.

Chilled and frozen storage

When the product first arrives at the warehouse, it is inspected using the procedures outlined in the receipt and surveillance inspections' units later in this volume. Warehouse workers mark items with a date arrived, so later identification is easier for proper rotation practices. There has been a long-standing rule of first in, first out (FIFO) for proper rotation of products. However, this is not always the case. If a product comes in with noticeable deterioration and the same product that has been in the warehouse is in excellent condition, which product do you think should be issued and used first?

Use the product with noticeable deterioration first to prevent total loss of the product. FIFO is only a guide for warehouse personnel to use. You may need to recommend not using this guide for specific products.

Temperature of chilled rooms

Because of a wide range of required temperatures, usually three separate rooms are used to store chilled products. The temperature of chilled rooms can range from 32 to 50°F. The three areas include a room of 32 to 35°F, a room of 45 to 50°F, and an air-conditioned room between 50 and 80°F for fruits and vegetables not needing refrigeration but that cannot be exposed to hot temperatures. The rooms should have a thermometer placed near the warmest part of the room (that is usually by the door). The temperature requirements for frozen foods are below 0°F. The products must be properly packaged in a material that will prevent moisture from escaping, so freezer burn will not be a problem. Freezer burn is a condition where moisture in the product is greater than moisture in the freezer atmosphere, causing the moisture to be drawn from the food to the air if the food is not properly packaged. Freezer burn produces a shriveled, discolored product. If a freezer is clean, sealed, and temperature controlled and the product is handled and packaged properly, then defects can be prevented. Refer to AFMAN 23–210 for more details about freezer storage.

Amount of humidity

Another important aspect of chilled storage is the amount of humidity in the room. Some fruits need high amounts of water in the air, while some vegetables need very low amounts. The proper amounts of humidity inhibit the gain or loss of moisture in the item. Storing food at a higher humidity can cause condensation and allow the food to absorb the water, while at a lower humidity the food can dry out and shrink.

Separation

Separate food products according to their temperature and humidity requirements, and ability to give off or absorb odors. Some foods, like onions, give off strong odors. These foods should not be stored with foods, like eggs or apples, which easily absorb odors.

Air circulation

When the products are stored in a chilled or frozen room, air circulation becomes extremely important for maintaining the proper temperature. The foods must be stored on pallets that will lift them off the floor to allow air circulation under the foods. This also allows proper cleaning under the foods. The pallets must be placed at least 4 inches from the wall and no closer than about 2 feet from the ceiling. Fans must be in good working condition. Check the doors for leakage of cold air. Freezers will develop ice around areas where air leaks in or out. This ice buildup is a safety hazard but not much of a public health threat.

Atmosphere

Another factor in storing chilled products, mainly fresh fruits and vegetables, is the atmosphere. A controlled atmosphere can be used to increase the storage life of many products. One example is the use of carbon dioxide in large rooms filled with apples to extend the shelf life to almost a year or more. Modifying the atmosphere to reduce the oxygen and controlling the temperature of the storage room allows the control of growth of many of the pathogenic and deteriorative microorganisms found on most foods.

Segregation

Another item to remember for either frozen or chilled perishables is to segregate bad food items, such as a rotten potato, before the entire area becomes either rotten or absorbs the smell of the rotten potato. Inspect these items according to surveillance inspections in unit 4 of this volume.

Dry storage

The term *semiperishable* refers to foods that are canned, dried, dehydrated, or otherwise processed to the extent that such items may, under normal conditions, be stored in nonrefrigerated spaces. Semiperishable foods are not as susceptible to deterioration as perishables. However, if stored improperly, mishandled, or stored for excessive periods of time, semiperishables can deteriorate. The length of storage is based on the date of pack and not on the date of receipt. Proper storage practices, such as proper rotation, segregating infested or contaminated foods, cleaning up spills and leaks, and locating foods away from heat sources are used to help protect products and lengthen storage time of foods. Pallets are also used to lift foods above the floor for air circulation; easier cleaning and better sanitation; applying insecticides and rodenticides; checking for evidence of infestations; and providing for clearance from the wall, ceiling, and floor. The wall clearance must be about 6 to 8 inches, while the ceiling must be at least 18 inches away from the tallest container stored in the warehouse. To prevent food contamination, another important practice is to ensure nonfoods are *not* stored with food items. Refer to AFMAN 23–210 or DeCA Directive 40–1, *Commissary Operations*, for more information on the proper storage practices of semiperishables.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

608. Types of food packaging

1. What does hermetic mean?

2. How can an aluminum can be strengthened just prior to final closure?

3. What is a critical can defect?

4. What is a flipper defect in a can?

5. What is a sweller can defect?

6. What is a small piece of metal projecting out from a can due to an incomplete closure of the can?

7. What is spangling?

8. List three advantages of using glass to make containers for foods?

609. Food storage

1. What are the three separate storage room temperature requirements for storing chilled foods?

2. What happens to foods stored in a refrigerator with low humidity?

3. How far away from the wall should pallets of foods be stored in a refrigeration unit?

4. What is the ceiling clearance from the tallest container in a semiperishable or dry storage warehouse?

Answers to Self-Test Questions

601

1. Microorganisms.
2. Cocci.
3. Bacilli.
4. Generation time.
5. The process of forming the endospore.
6. The mass of hyphae (filamentous structures making up fungi) making up the mold colony.
7. Budding, where a smaller new cell is pinched off from a larger existing yeast cell.

602

1. The first phase of bacterial growth where there is no increase in the number of cells, and the bacteria are adjusting to their new environment.
2. This phase is when the bacteria grow logarithmically or very rapidly.
3. Stationary phase.
4. Decline phase.

603

1. Nonharmful bacteria break down carbohydrates in food to lactic acid, and as the lactic acid accumulates, the pH drops resulting in a more stable product.
2. A measure of the availability of water for chemical reactions and microbial metabolism.
3. Foods are dried or dehydrated, frozen, or treated with a solute of sugar or salt.
4. Anaerobic (oxygen-deficient).

604

1. Psychrophiles, mesophiles, and thermophiles.
2. Psychrophiles.
3. Relatively high temperature ranges of 113 to 160^{o}F with the best range between 131 and 150^{o}F.
4. A microorganism that grows best at moderate temperatures but can also grow at low temperatures.
5. The deterioration of foods by enzymes.

6. Enzymes: either enzymes from the food itself or enzymes from microorganisms in the food.
7. The efficiency of pasteurization of the milk is poor.

605

1. Hydrolysis or oxidation.
2. A type of spoilage where bacteria metabolize meat proteins or free amino acids.
3. Anaerobic bacteria metabolize carbohydrates in meats causing lactic acid that brings down the pH and develops a sour flavor.
4. Green cores, green rings, and surface greening.
5. Hydrogen peroxide is a strong oxidizing agent that degrades the meat pigment. Lactobacillus viridescens is the organism that produces the hydrogen peroxide.
6. Cooking the meat to an internal temperature of 160^{o}F.
7. In characteristic beads that are sticky to the touch and give off odors sometimes described as yeast-like.
8. Some molds produce carcinogenic substances known as aflatoxins that are extremely toxic.
9. A substance called trimethylamine.
10. The glycogen is depleted which is usually broken down into lactic acid that lowers the pH. With the glycogen depleted, fewer amounts of lactic acid are produced causing the pH to be higher.
11. The egg is stale.
12. Salmonella is found in the reproductive tract of the hen, which allows the organism to multiply and grow inside the egg.
13. Molds, yeasts, and anaerobic sporeformers that can oxidize lactate and various protein and fat products.
14. Bacteria.
15. Soft, watery, tan to light brown areas that are readily gouged out with the tissue inside having a moldy or musty odor and flavor. There are typical bluish-green spores on the fruit.

606

1. It reduces the stress on the container during heat processing, holds the ends in a collapsed concave position during storage, and reduces the headspace oxygen that retards the growth of the remaining organisms.
2. A process using heat treatment to eliminate either pathogenic organisms or other organisms to extend shelf life of the product.
3. A temperature below 100^{o}C is called pasteurization while a temperature above 100^{o}C is referred to as sterilization.
4. A heat treatment applied to fruits and vegetables primarily to inactivate food enzymes by passing the products through water or steam at temperatures of 190^{o}F to 212^{o}F.
5. Solar drying, drum or roller drying, hot air drying, freeze drying, and concentration.
6. Acidulation, the oxidation of nitrogenous organic compounds, and the decomposition of starches and sugars into ethyl alcohol, carbon dioxide, and organic acids.
7. To control certain parasites in beef and pork, slow maturation in FF&V, and provide microbial disinfection and disinfestation of arthropod pests in certain foods.
8. The regulation of O_2 and CO_2 for storage of fresh foods.

607

1. Any substance the intended use of which results or may reasonably be expected to result directly or indirectly in its becoming a component or otherwise affecting the characteristics of any food.
2. Method of preserving food by adding salts or other substances to inhibit microbial growth.
3. Pickle.
4. Brown or grayish-green color due to a poor reaction with the nitrites and the meat pigment.
5. They are used to prevent mold growth on baked goods, cheeses, and in artificially sweetened jams, jellies, and preserves.

608

1. Container that is impermeable to or not allowing the entry of gases and vapors.
2. By injecting a small amount of liquid nitrogen into the can. The gas expands and provides an internal pressure that adds rigidity.
3. Defect that affects product safety.
4. A can that appears normal but has little or no vacuum.
5. Critical defect where both ends of the can are distended at the same time.
6. A spur.
7. Dark gray discoloration or etching on the tin part of the can caused from a reaction of the acids of the foods with the container.
8. Any three of the following:

   It is one of the strongest materials in its virgin form; chemically inert; transparent; capable of manufacturing into any shape; made from materials that are plentiful, inexpensive, and of no strategic importance; compares favorably to other materials in energy requirements; and is capable of being made easy to open and reseal.

609

1. 32 to 35^{o}F, 45 to 50^{o}F, and foods stored in air conditioning between 50^{o}F and 80^{o}F.
2. The foods dry out or lose moisture to the air in the refrigerator.
3. At least 4 inches.
4. At least 18 inches.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to ECI Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

1. (601) Bacteria grouped in grape-like clusters are called
   a. diplococcus.
   b. streptococcus.
   c. streptobacillus.
   d. staphylococcus.

2. (601) The primary method of yeast reproduction is
   a. budding.
   b. cell division.
   c. sexual spores.
   d. asexual spores.

3. (602) The first growth phase for bacteria is
   a. lag.
   b. log.
   c. decline.
   d. stationary.

4. (602) The growth phase that exhibits a significant increase in the number of bacteria is
   a. lag.
   b. log.
   c. decline.
   d. stationary.

5. (603) The primary cause for spoilage of fruits is
   a. mold.
   b. bacteria.
   c. low water activity.
   d. low pH of the fruit.

6. (603) The water activity value of a food is the
   a. amount of water bound by a food.
   b. total availability of water in a food product.
   c. amount of water in a form unusable by microorganisms.
   d. total availability of free water in a fruit for chemical reactions.

7. (603) The natural microbial inhibitor lactoferrin is found in
   a. milk.
   b. cinnamon.
   c. egg whites.
   d. cranberries.

8. (604) Facultative microorganisms are
   a. microorganisms that grow only in an oxygen environment.
   b. yeasts, bacteria, and molds that can grow at any temperature.
   c. yeasts, bacteria, and molds that grow only in an anaerobic environment.
   d. microorganisms that can grow with or without oxygen in the environment.

9. (604) Which one of the temperature growth ranges of bacteria is only in the low temperature range?
   a. Mesophiles.
   b. Thermophiles.
   c. Psychrophiles.
   d. Psychrotrophs.

10. (604) After a reaction is over, enzymes are
   a. left unchanged and unharmed.
   b. converted into a new substance.
   c. broken down into two substances.
   d. combined with other substances in the reaction.

11. (604) The efficiency of pasteurization of milk products is determined by
   a. a coliform test.
   b. a phosphatase test.
   c. an adulteration test.
   d. a standard plate count.

12. (605) Putrefaction spoilage in meats is caused by
   a. oxygen reacting with fats.
   b. molds reacting with lipases.
   c. yeast reacting with myoglobin.
   d. bacteria reacting with amino acids.

13. (605) The greening defect that takes the longest to be noticeable on a product is
   a. green cores.
   b. green rings.
   c. green slime.
   d. surface greening.

14. (605) Aflatoxins are produced by
   a. yeast.
   b. mold.
   c. bacteria.
   d. enzymes.

15. (605) Fishy odor in waterfoods is caused by
   a. the degradation of yeasts.
   b. trimethylamine in the product.
   c. large amounts of lactobacillus viridescens.
   d. molds with aflatoxins breaking down enzymes.

16. (605) Most spoilage of vegetables is caused by
   a. fungi.
   b. yeasts.
   c. bacteria.
   d. enzymes.

17. (606) A product is considered commercially *sterile* at a temperature of
    a. 75ºC.
    b. 85ºC.
    c. 95ºC.
    d. 105ºC.

18. (606) The UHT for pasteurizing milk is where
    a. milk is heated to 207ºF for three seconds.
    b. dairy products are heated to 161ºF for 15 seconds.
    c. milk is kept at a temperature of 145ºF for 30 minutes.
    d. dairy products are kept at a temperature of 145ºF for 30 minutes.

19. (606) The foods most commonly preserved by solar drying are
    a. fruits, fish, and rice.
    b. milk and egg albumin.
    c. vegetables, and egg products.
    d. breakfast cereals, starch, and soup mixes.

20. (606) Sublimation is the
    a. oxidation of fish and meat fats.
    b. enzymatic action of dairy products.
    c. process of converting ice to water vapor.
    d. formation of acids in a product to increase pH.

21. (606) The dose of radiation that achieves commercial sterilization of food products is
    a. 1 KGy.
    b. 5 KGy.
    c. 9 KGy.
    d. 15 KGy.

22. (607) Nitrates and nitrites are added to foods, such as meats, to
    a. fix the color.
    b. prevent mold growth.
    c. aid in enzymatic action.
    d. assist with starter bacteria in fermentation.

23. (607) To prevent mold and yeast growth on pickles, yogurt, and orange juice, add
    a. sulfur.
    b. sorbic acid.
    c. benzoic acid.
    d. propionic acid.

24. (608) A hermetic container is a
    a. flexible cellophane container.
    b. container able to reach high temperatures.
    c. container that allows only moisture into the contents.
    d. container that does not allow gasses and vapors into the contents.

25. (608) A can defect that is *not* classified as *critical* is a
    a. leaker.
    b. sweller.
    c. dent.
    d. buckle.

26. (608) A can with a defect, where at least one side is flattened or collapsed, is called a
    a. flipper.
    b. sweller.
    c. springer.
    d. paneled can.

27. (608) A can with a defect, where the end seam is *not* soldered and the top freely moves or rotates, is called a
    a. lipper.
    b. flipper.
    c. skipper.
    d. spinner.

28. (609) The type of refrigeration most often used in restaurants and grocery stores is
    a. icing.
    b. room cooling.
    c. hydrocooling.
    d. vacuum cooling.

29. (609) Freezer burn is a condition where there is a
    a. lower temperature in the atmosphere causing the product to freeze.
    b. lower humidity in the atmosphere causing the product to lose water.
    c. higher humidity in the atmosphere causing the product to take on water.
    d. higher temperature in the atmosphere causing the product to lose water.

30. (609) The wall clearance for dry storage food items stored in a warehouse is how many inches?
    a. 1 to 2.
    b. 2 to 4.
    c. 4 to 6.
    d. 6 to 8.

Please read the unit menu for unit 2 and continue ➔

Unit 2. Food Procurement

FOR years the military procurement system has been filled with inefficiencies. This created a large inventory of food in government depots and created problems with food quality and food loss due to aging. The Department of Defense (DOD) is now quickly moving away from the idiosyncrasies of traditional food procurement and inspection procedures and moving toward a system that is in line with our civilian counterparts. This will ensure that the highest quality foods are being procured and prepared for our personnel. In this unit, we will cover requirements and types of contracts used in food procurement.

610. Approved source publications

As you know, public health (PH) inspects all foods received on base. However, before actual food inspection procedures take place, ensure products received are from an approved source.

Procurement offices must purchase all food items from approved sources in collaboration with public health. Vendor requests to sell to the military are to be forwarded to public health for review.

Listing

AFI 48–116, *Food Safety Program,* lists the type of products that require listing in an approved sources book. Approved sources must conform to the criteria in the appropriate approved sources book.

Listings

The sources must be listed either in the *Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement*, published by the US Army Veterinary Corps, unless exempt according to AFI 48–116, or in a locally approved establishment list.

Sources of listing

Sources of Listing	
Products	*Sources*
Meat products	The sources must offer products bearing the mark of a federal or state agency. Federally inspected approved plants are listed in the USDA publication *Meat and Poultry Inspection Directory*.
Eggs and egg products	The sources must offer products listed in the USDA publication, *Listing of Plants Operating Under USDA Poultry and Egg-Grading and Egg Products Inspection Program*.
Milk and milk products	The sources must have a pasteurized milk compliance rating of 90 percent or higher certified by a state milk sanitation officer, or must appear on the *Sanitation Compliance and Enforcement Rating of Interstate Milk Shippers List (IMSL).* These source plants may supply dairy products indicated by product codes, flavor drinks, and other novelty fluid drinks.
Fish products	The sources must be listed in the *US Department of Commerce Approved List of Fish Establishments and Products*.
Dairy products (other than milk	The sources must appear in *Dairy Plants Surveyed and Approved for USDA Grading Service*.
Shellfish products	For oysters, clams, or mussels, the sources must appear on the *Interstate Certified Shellfish Shipper's List (ICSSL),* the listing covering all shucking, packing, and processing of these shellfish.

Approving agencies

In the continental United States (CONUS), imported packaged foods of foreign origin are approved due to USDA, USDC, or FDA inspection at the point of entry.

United States Department of Agriculture (USDA)

The USDA publishes two different documents that list approved sources for buying foods; they are the *Meat and Poultry Inspection Directory* and the *Dairy Plants Surveyed and Approved for USDA Grading Service*. Contact the USDA if you need any updated copies of these documents.

Meat and Poultry Inspection Directory

The *Meat and Poultry Inspection Directory* lists all of the companies that have an assigned USDA establishment number. It is published semi-annually and lists the establishment number, the company name, address, telephone number, and the application number. There is a number or code immediately after the establishment number that explains some information about the operation, such as if the company is approved for slaughter, processing, or boning. This number or code may also mean that the company is equipped with a railroad siding or is approved for edible or inedible fat processing and rendering. This document does cost money; check with the USDA for the current price.

Dairy Plants Surveyed and Approved for USDA Grading Service

The *Dairy Plants Surveyed and Approved for USDA Grading Service* is published once a quarter and is divided into two sections.

- Section 1 lists each company (by state) that has been inspected and found eligible for USDA grading or inspection services. It also includes the plant number, location, and the code explaining the approved product or operation.
- Section 2 lists companies that meet USDA requirements for processing or packaging operations. It is usually free to food inspectors.

United States Department of Commerce (USDC)

Semi-annually, the National Marine Fisheries Service, part of the National Oceanic and Atmospheric Administration, USDC publishes a document entitled "*USDC Approved List of Fish Establishments and Products*." This document is usually free to food inspectors. It is a reference document published to determine which fishery products have been certified by the USDC. The USDC inspects, approves, and certifies establishments as being sanitary and capable of producing safe, wholesome products. Companies request inspections at their own expense and voluntarily subscribe to the USDC standards of sanitation. The list is merely a compilation of those companies participating in the National USDC Seafood Inspection Program. AFI 48–116 states companies selling fish to the government must be listed in this document. All products must be processed in accordance with specific quality regulations written by the USDC. This document includes the company listings for crab, scallops, lobsters, shrimp and finfish. The listing is divided into three sections.

Sections of the USDA USDC Approved List of Fish Establishments and Products

Section	*Description*
One	Includes establishments approved only for sanitation. This section lists the company code, establishment name, and plant address.
Two	Includes establishments approved for sanitation and processing which have been inspected and bear the official USDC inspection and grade markings. This section lists the establishment name and plant location.
Three	Includes establishments approved for sanitation and processing of animal feed products. This third section also lists products by category and includes brand names, package sizes, and plant code numbers.

Army Health Services Command (HSC) Directory

The *Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement* (*CONUS*) is published quarterly by HSC and is free to food inspectors. It lists establishments by state and includes the company name, approved product(s), plant address, city, zip code, and the inspector responsibility code of the Army office that performed the inspection.

Food and Drug Administration (FDA)

The FDA publishes two documents for approved sources of food procurement; they are the *Interstate Milk Shippers List (IMSL)* and the *Interstate Certified Shellfish Shippers List (ICSSL).*

IMSL

The *IMSL Sanitation Compliance and Enforcement Ratings of Interstate Milk Shippers* is published quarterly and is free to food inspectors. The list is divided by state and gives the company name, city, plant code, product code, and the sanitary compliance rating for raw milk, plant operations, pasteurized milk, and the overall enforced rating for the plant. Each company must have a sanitary compliance rating of at least 90 percent to be approved. The document also lists the rating agency and the date inspected.

ICSSL

The *ICSSL* is published monthly and is free to food inspectors. This document lists the state, company, city, plant code, operations code and the expiration of the certificate. The shellfish included under the National Shellfish Sanitation Program are fresh and fresh frozen oysters, clams, and mussels. Other shellfish such as scallops, shrimp, crab, and lobster are not included.

Locally approved lists

If a company wants to sell to your base only, it can be approved locally. Your office is responsible for conducting the inspections and for maintaining the locally approved lists.

611. Wholesomeness and quality assurance markings

There are many different markings used on foods in the United States. As a food inspector, you need to know what the markings are and what they mean.

Wholesomeness stamp

When a plant meets USDA standards, its products are stamped with a round USDA wholesomeness stamp (fig. 2–1). This indicates products were produced in a sanitary environment and were wholesome at the time of stamping and packaging. When you see this stamp, you can be confident the product is from an approved source. However, the stamp does not mean the product meets contract requirements, and you still inspect the product for wholesomeness upon delivery.

Figure 2–1. USDA wholesomeness stamp.

Federal grades for meat

The federal government has two grading systems—quality grades and yield grades. A quality grade is a guide to the eating quality of meat based on tenderness, juiciness and flavor. The quality grade is based on the maturity of an animal at slaughter and the quality and muscularity of the muscles. A yield grade estimates the amount of lean meat to fat and bone. Some of the factors that affect the yield are as follows:

- Size of muscle.
- Size of bone.

- Amount of fat.
- Location of fat.

Grades for beef

Official quality grades for beef (from highest to lowest) are prime, choice, select, standard, commercial, utility, cutter, and canner. Choice beef is the most common and is what the commissaries sell. The lower grades are used for processed meat products, such as hamburger meat, hot dogs, bologna, potted meat, etc. Official yield grades for beef (from highest to lowest) range from 1 to 5. The military only buys beef of yield grade 3 or better.

Grades for lamb

Official quality grades for lamb (from highest to lowest) are prime, choice, select, utility, and cull. The yield grades for lamb are the same as those for beef.

Grades for mutton

Official quality grades for mutton (from highest to lowest) are choice, select, utility, and cull. The yield grades are the same as above.

Grades for pork

Official quality grades for pork (from highest to lowest) are US No. 1, US No. 2, US No. 3, US No. 4, and utility. There are no yield grades for pork.

Grades for poultry

The only grades for poultry are quality grades of US Grade A, US Grade B, and US Grade C. However, there are other common terms used for poultry you should be aware of; they are class, style, and type. Class refers to the age and sex of the bird. Style refers to the way the product is cut, for example, whole, quartered, halved, pieces, etc. Type means fresh, frozen, or type of preservation.

Federal grades for shell eggs

There are certain external and internal factors used to grades shell eggs. External factors include shape, soundness or condition, and cleanliness of the shell. Internal factors include the depth of the air cell; the visibility and shape of the yolk; and amount of thick white and the height of the white. The official grades for shell eggs (from highest to lowest) are AA, A, B, Dirty, Check, Leaker, and Loss. A size or weight class is usually combined with the quality grade; these are Jumbo, Extra Large, Large, Medium, Small, and Pee Wee. Most grocery stores carry AA and A eggs; the best economic value is Grade A Large.

Federal grades for fresh fruits and vegetables (FF&V)

There are literally hundreds of grades used for FF&V—too many to mention in this unit. Keep in mind, however, that grading factors for all types of FF&V are always similar. Some of these factors include condition, quality, appearance, variety, maturity, and size.

Acceptance stamps

The USDA will inspect products for the user upon request. The USDA inspector inspects the product and stamps the product or sealed carton with a shield-shaped stamp (fig. 2–2), bearing the words “USDA Accepted as Specified.” This stamp means the product was wholesome and met the grade, trim, weight and other requirements requested by the purchaser. This stamp is usually used for chilled or frozen meat items.

Figure 2–2. USDA accepted as specified stamp.

USDC markings

USDC markings are used for processed fish. The markings assure products were inspected for wholesomeness, sanitation, grade, quality, and classification. The "US Grade" mark, which signifies a product is clean, safe, and wholesome, is followed by a letter designation, such as A or B, to designate the grade level. Each grade level has a specifically established standard for products to meet in order to be stamped. The USDC also has rectangular and circular stamps, both of which are used to signify a product was packed under federal inspection. "Packed Under Federal Inspection" may be displayed as an official mark on the product label. This signifies the product was clean, safe, and wholesome when packaged and has been produced in an acceptable establishment with appropriate equipment under the supervision of federal inspectors. The product is not graded for a specific quality level; rather, it is an acceptable commercial quality as determined by federal inspectors in accordance with approved standards or specifications.

DOD markings

There are two types of DOD stamps: a circular one that designates *partial inspection approval* (PIA) and a square one that designates *destination (complete) inspection approval* (DIA). Army inspectors perform some origin inspections (Class 3) and stamp all products that meet acceptable standards with the PIA stamp. It is similar to your inspection stamp with one major difference: the eagle is enclosed with a circle instead of a square. Although the PIA stamp means the product met requirements at the plant during processing, it does not guarantee wholesomeness at destination.

See figure 2–3 for an example of the *destination (complete) inspection approval* stamp. This is the one you are probably most familiar with. The stamp is set up with the base code (shown as 1), the class of inspection (shown as 2), the stamp registration number (shown as 3), and the Julian date (shown as 4). The stamp registration number is read from bottom left to top left and top right to bottom right; in the case of figure 2–3, the registration number is 0003. The stamp is applied to products, unit containers, shipping containers, shipping documents, and inspection reports. However, the stamp is only applied to items actually inspected rather than entire shipments of food.

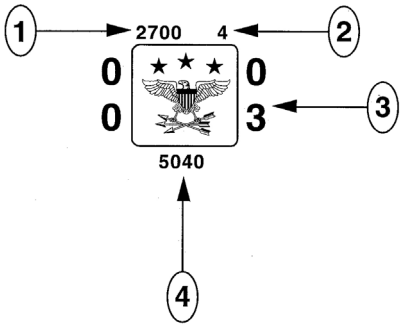


Figure 2–3. Destination (complete) inspection approval stamp.

612. Contracts

The Defense Commissary Agency (DeCA) Services, and Army and Air Force Exchange Services (AAFES) each have their own system for ordering and purchasing foods. Regardless of the system, the primary objective in purchasing food is to order only the minimum amount needed and reduce the amount of food placed in storage.

DeCA contracts

The DeCA uses three types of contracts to purchase food products. They are the Blanket Purchase Agreement (BPA), the Recurring Ordering Agreement (ROA), and Prime Vendor, which is discussed later in this lesson.

BPA

The BPA is a contract used by DeCA to purchase brand name foods or foods from local vendors. The commissary establishes a list of approved contractors and prepares an agreement with each one to purchase items over a period of time (usually five years).

Purchases

During this period of agreement, the contracting officer or his or her authorized representative can request any item agreed upon in the contract at any time. Prices are determined at the time each request is made.

Inspections

BPA-purchased foods are inspected in accordance with AFI 48–116 and quality assurance provisions. Quality assurance provisions provide all the necessary inspection criteria from general requirements on transportation, code dating, packaging, temperature, shelf life, and labeling to specific item quality assurance provisions.

ROA

The ROA is the same as the BPA listed above; however, only brand name foods are purchased with this type of agreement. Inspection requirements for ROAs are included in AFI 48–116 and the brand name inspection requirements. The brand name inspection requirements contain inspection criteria similar to BPA quality assurance provisions.

Services contracts

Over the past few years, the DOD has experienced political pressures to change the military food supply system. For years, food was purchased by the Defense Personnel Support Center (DPSC) in large quantities and stored in large supply depots across the country. As installations required food, it would be shipped from these depots. This created a middleman, costing the government a large amount of money in storage operating costs and loss of food due to spoilage.

Prime vendor

The Prime Vendor program is DOD'S newest initiative in reducing costs and improving food quality and customer service. Prime Vendor consists of local distributors delivering food as needed. Contracts are developed with a few local distributors that carry all the foods needed by services. Again, food is delivered as needed, so no specified quantities or frequencies are mentioned in the contracts. Ordering personnel can order any amount of food, as often as necessary to meet their needs.

Public health responsibilities

Public health responsibilities have become much easier under the Prime Vendor system. Inspection of food is conducted in accordance with AFI 48–116 and the *Joint Service Receipt Inspection Manual.* The bottom line of inspections is ensuring sanitary conditions of the carrier are adequate, foods are from approved sources, and determining if products are wholesome.

AAFES contracts

AAFES uses negotiated and solicitation contracts as well as availability agreements and delivery orders to acquire needed products.

Negotiated

The negotiated contract is an agreement between AAFES and one company with established, fixed prices for all of the products listed in the contract. Most of these contracts will be used for the AAFES resale store or shoppette.

Solicitation

The solicitation contract is an agreement between AAFES and one company; however, the prices fluctuate. This contract is used for bakery, dairy, and egg products: products that have a price fluctuation in the commodities market. Again, this contract is for foods delivered to the shoppette.

Availability agreement

This contract is an open contract with several companies. The price fluctuates, allowing AAFES to have the flexibility to change companies when items are on sale. This contract is used for either resale or wholesale foods. Wholesale foods are those that will undergo further processing before being sold. An example would be bulk ground beef purchased to make burgers for a snack bar.

Delivery order

This contract is with a local vendor that sells brand name products. Since products delivered under this type of contract are brand name, we only inspect for identity and condition.

AAFES Form 4700–1, Medical Food Inspection Requirements

Inspection requirements for food purchased by AAFES are listed on AAFES Form 4700–1, Medical Food Inspection Requirements. This makes inspections easier because inspection requirements are listed on one sheet of paper. For CONUS bases AAFES Form 4700–1 is used for all AAFES products; however, at overseas bases, only resale items are inspected using this form. Wholesale foods are inspected in accordance with Exchange Service Manual (ESM) 25–1, *Food and Expense Supplies Purchase Descriptions*.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

610. Approved source publications

1. Federally inspected approved plants selling meat products are listed in what USDA publication?

2. What must the pasteurized milk compliance rating be for milk and milk products?

3. The source for dairy products other than milk must appear in what publication?

611. Wholesomeness and quality assurance markings

1. What type of stamp is used when a plant meets USDA standards?

2. What does yield grade estimate?

3. What are the official quality grades for beef?

4. What are the external factors used to grade shell eggs?

5. USDC markings are used for what type of product(s)?

612. Contracts

1. Quality assurance provisions are used to inspect food purchased with what type of contract?

2. What type of food is purchased under a Recurring Ordering Agreement (ROA)?

3. Services utilize what type of contract?

4. What main criteria are considered when inspecting food purchased by services?

5. Match the type of contract in column B with its description in column A. Items in column B may be used more than once or not at all.

Column A	*Column B*
____ (1) One company, fluctuating price.	a. Availability agreement.
____ (2) One company, fixed price.	b. Solicitation.
____ (3) Sells brand name products.	c. Negotiated.
____ (4) Several companies, fluctuating price.	d. Delivery order.

6. What document is used to inspect foods purchased by AAFES?

Answers to Self-Test Questions

610

1. *Meat and Poultry Inspection Directory*.
2. 90 percent or higher.
3. *Dairy Plants Surveyed and Approved for USDA Grading Service.*

611

1. A round USDA wholesomeness stamp.
2. Amount of lean meat to fat and bone.
3. Prime, choice, select, standard, commercial, utility, cutter, and canner.
4. Shape, soundness or condition, and cleanliness of the shell.
5. Processed fish.

612

1. Blanket purchase agreement (BPA).
2. Brand name food.

3. Prime vendor.
4. The sanitary condition of the carrier, food from approved sources, and product wholesomeness.
5. (1) b.
   (2) c.
   (3) d.
   (4) a.
6. AAFES Form 4700–1, Medical Food Inspection Requirements.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

31. (610) The sanitary compliance rating a company must have to be listed in FDA's Interstate Milk Shipper's List is
    a. 80 percent.
    b. 85 percent.
    c. 90 percent.
    d. 95 percent.

32. (610) Which publication do you check to determine if a shipment of milk is from an approved source?
    a. AFI 48–116, *Food Safety Program*.
    b. Dairy Plants Surveyed and Approved for USDA Grading Service.
    c. Sanitation Compliance and Enforcement Rating of Interstate Milk Shippers List.
    d. Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement.

33. (610) The two documents published by the USDA are the Dairy Plants Surveyed and Approved for US Department of Agriculture (USDA) Grading Service and the
    a. Interstate Milk Shippers List.
    b. Meat and Poultry Inspection Directory.
    c. Interstate Certified Shellfish Shippers List.
    d. Directory of the Sanitarily Approved Food Establishments for Armed Forces Procurement.

34. (611) A yield grade is
    a. a guide to the eating quality of meat.
    b. an estimate of the maturity of an animal at slaughter.
    c. an estimate of the amount of lean meat to fat and bone.
    d. an indication that meats were processed in a sanitary manner.

35. (611) In reference to poultry products, style means
    a. cut.
    b. age and sex.
    c. quality grades.
    d. type of preservation.

36. (611) US Department of Commerce markings are used for processed
    a. beef.
    b. fish.
    c. pork.
    d. shell eggs.

37. (612) Two types of contracts DeCA uses to purchase food products are
    a. BPA and ROA.
    b. negotiated and solicitation.
    c. prime vendor and ROA.
    d. negotiated and BPA.

38. (612) The main reason prime vendor contracts were developed was to
    a. reduce the number of inspections.
    b. increase the number of inspections.
    c. reduce costs and improve food quality.
    d. increase the amount of food in storage.

39. (612) What AAFES contract gives the AAFES facility manager the flexibility of choosing companies to get the best sale item?
    a. Delivery order.
    b. Negotiated contract.
    c. Solicitation contract.
    d. Availability agreement.

40. (612) What type of AAFES contract requires local vendors to sell brand name products?
    a. Negotiated.
    b. Solicitation.
    c. Delivery order.
    d. Availability agreement.

Please read the unit menu for unit 3 and continue ➔

Student Notes

Unit 3. Food Inspections

NOW that you know how the Air Force purchases food, you need to understand your role in the food procurement process. As a food inspector, you are the next link in the food safety chain. Your job is to ensure items meet the provisions listed in the procurement documents. These inspections are known as receipt inspections. Receipt inspections are normally shared with the in-checker for the facility.

613. Receipt inspections

There are three classes of inspection used when receiving food at an installation. Class 4 and 8 inspections are conducted before the government purchases the food. Class 5 inspections are receipt inspections conducted on food already owned by the government. The three classes of inspection (4, 5, and 8) and inspection procedures are discussed in this lesson.

Classes

Class 4

Class 4 inspections are conducted upon receipt of food products at an appropriated fund activity. The government provides tax dollars for support. The commissary and services troop issue are two examples of appropriated fund activities. Depots and supply points also fall into this category; however, Army inspectors conduct Class 4 inspections at these facilities.

Class 5

Class 5 inspections are also receipt inspections, but the food products are already government owned. This means the products are arriving from another government facility, such as a depot or another base.

Class 8

Class 8 inspections are very similar to Class 4 inspections; the only difference is product destination. If products are going to a nonappropriated fund activity, a Class 8 inspection is conducted. Nonappropriated fund activities survive from the profits they generate and do not receive money from the government. Some examples of nonappropriated fund activities are clubs, shoppettes, recreation facilities, and AAFES food courts.

Inspection procedures

There are some standard procedures that apply to all receipt inspections regardless of class of inspection. This lesson briefly describes the general inspection procedures; you may find more detailed information listed in the *Joint Receipt Food Inspection Manual*. Public health (PH) is mainly concerned with vehicle sanitation, unwholesomness, and temperature of product.

Inspection policy

As soon as possible after shipments arrive at your base, inspections of food products must be conducted by PH or an equally trained receiving authority. Make every effort to complete the inspections and appropriate documentation within 24 hours of delivery.

Retail

An establishment where food or food products are offered for issue or resale to the final customer is considered a retail activity, e.g., commissary stores, clubs, and exchanges. For retail activities, a

contractor's quality history will be established by evaluating each delivery. After a reliable quality history is established the inspection frequency may be reduced.

Rejection

Class 4 and 8 foods are rejected if they are found to be unwholesome or in violation of federal or state regulations. Class 5 foods found to be unwholesome or in violation of federal or state regulations are placed on medical hold until disposition is made. Remember, Class 5 foods are already government owned; rejection is not an option.

Inspection procedures

Inspection procedures generally require you to determine the origin of a product, conduct inspections, and prepare reports.

Origin

Determine if required origin inspection documentation is present at time of receipt and if the product originates from an approved source. Determine the opening temperature of the delivery vehicle.

Inspect

Perform a sanitary inspection on the delivery vehicle and a product inspection in accordance with *Joint Receipt Food Inspection Manual* (29 Jan 96).

Report

Report any violations of documentation, source, or vehicle sanitation immediately to the appropriate ordering officer prior to completing the inspection.

Minimum receipt verification frequencies

Foods are broken down into four groups, as listed below. After a reliable quality history has been established, the following are the reduced frequencies for inspection.

Food Groups	
Group	*Explanation*
I	Those with the greatest potential for nonconformances. The majority of these items are highly perishable and have high potential to cause foodborne illness. Food items in this group include fresh beef, fresh waterfoods, fresh poultry, fresh lamb, fresh pork, and shell eggs. Group I foods are inspected at each delivery.
II	Require frequent verification due to wide fluctuations in quality and wholesomeness because of the nature of the product. These foods include fresh vegetables, fresh dairy products, and fresh fruits. Group II foods are inspected weekly.
III	Have less potential for nonconformances because of nonperishability or quality requirements, such as cheeses, bakery products, specialty foods, frozen foods/desserts, processed meats, and infestibles. Group III foods are inspected monthly.
IV	All other food items such as canned foods, grains, and grain products locally classified as noninfestibles; they are inspected as needed.

614. Retail inspections

As mentioned earlier, all receipt inspections are conducted using the *Joint Receipt Food Inspection Manual*. This manual streamlines inspections and standardizes procedures for each military service. This lesson briefly describes Class 4 and 8 inspections, and then discusses Class 5 inspections.

Class 4 and 8 inspections

For food delivered to DOD appropriated and nonappropriated fund activities, routine destination inspections are normally limited to Groups I, II, and III foods. The inspection determines wholesomeness and quality according to contract quality assurance provisions and applicable regulatory standards.

Receipt inspections

The general provisions of receipt inspections are temperature, wholesomeness, and approved source determination.

Temperature

In addition to conveyance temperatures, product internal temperatures must also be taken. Sampling criteria and temperature requirements are contained in the Blanket Purchase Agreement (BPA), Recurring Ordering Agreement (ROA), or applicable regulatory standards. As a minimum, three temperatures must be taken. Select samples in appropriate increments during off-loading, from the rear, center, and front of the conveyance.

Representative sampling

For results to be representative of the shipment, sample containers may be drawn from various locations throughout the load: rear, center, and front of the load.

Open package inspection (OPI)

An OPI or destructive OPI (DOPI) is performed on each sample unit to determine product temperature, and wholesomeness.

Receipt inspection of perishable subsistence

This receipt inspection includes all perishable subsistence *except* commissary meats, fresh fruits and vegetables, and shell eggs.

Sampling

Strict random sampling is not required; however, take representative samples from each line item inspected.

Lot size

Lot size is expressed as the number of shipping containers for each line item delivered. Grandlotting is allowed for multiple line items of the same national stock number (NSN). However, a product is not rejected based on grand lot sampling. The number of shipping containers and the number of pallets from shipping containers are selected in accordance with the sampling table in the *Joint Receipt Food Inspection Manual*.

Sample unit

A sample unit is one unit of product, one pound of product, or the sample unit prescribed by the recognized inspection procedures for the items inspected per sample shipping container.

Receipt inspection of commissary chilled red meats

The inspection of newly received chilled red meats at the commissary is sampled, the lot size determined, and any defects reported. This inspection is predominately done by the receipt meat personnel. PH can assist when asked.

Sampling

Strict random sampling is not required; however, take representative samples from each line item inspected.

Lot size

Lot sizes are determined as the number of each subprimal or subcomponent of the market-ready cuts received.

Sample unit

A sample unit is one unit of product. In order to determine the number of units delivered, determine how many items are packed in each box and how many boxes were delivered. Pull samples from different boxes (e.g., if your sample size is 5, pull one unit from 5 different boxes). Again, sample units are selected in accordance with the *Joint Receipt Food Inspection Manual*.

Defect reporting

Defects are reported as defects per hundred units (DHU); however, multiple instances of a single defect (e.g., two-bone or two-score defects on a single cut) are scored only once per cut. PH is still responsible for maintaining and documenting discrepancies.

Receipt inspection of fresh fruits and vegetables (FF&V)

FF&V are sampled, the lot size determined, and any defects reported.

Sampling

Strict random sampling is not required; however, take representative samples from each line item inspected. The destructive sample size will be one unit of product or the amount prescribed by other recognized inspection procedures.

Lot size

Lot size is expressed as the number of shipping containers.

Sample unit

The entire contents of a sample case or sample unit prescribed by other applicable inspection procedures.

Defect reporting

Defects are reported as percent defective. Defect classification and tolerances will be in accordance with applicable US standards for grade or specification. The product is evaluated for grade/specification requirements and for any appearance factors which will affect the customer's acceptability. Factors that are included in the customer acceptability evaluation include those listed in the US standards as basic requirements and those abnormalities that are known to be unacceptable to the customer but that are not scoreable as grade defects.

Receipt inspection of shell eggs

Establish a shell egg contractor's quality history.

Routine inspection

Routine inspection consists of product temperature, wholesomeness, and approved source determination.

Receipt inspection of semiperishable subsistence

Semiperishable subsistence items are sampled, lot size determined, and any defects reported.

Sampling

Strict random sampling is not required; however, take representative samples from each line item inspected.

Lot size

Lot size is expressed as the number of primary containers. The number of primary containers, shipping containers, and the number of pallets are selected in accordance with the *Joint Receipt Food Inspection Manual*.

Sample unit

The number of sample units per sample shipping container is one unit of product, one pound of product, or the sample unit prescribed by the recognized procedures for the items inspected.

Defect reporting

Defects are reported as DHUs. Any defects observed are classified according to their appropriate severity (critical, major, or minor).

Reporting receipt inspections

Reporting receipt inspections involve suspected unwholesomeness or violation of federal or state law and reporting product characteristic defects.

Suspected unwholesomeness or violation of federal or state law

When you suspect unwholesomeness of foods or that there has been a violation of federal law, you are required to complete certain reports and notify the appropriate offices.

Reports

Report all instances of unwholesomeness or violations of law to the responsible public health officer. Report meat, poultry, and related product violations to the lowest practical level of USDA, Food Safety Inspection Service. Report other product deficiencies to the FDA.

Notifications

Notify by telephone and provide a written report containing the following information:

Inspector making the report	Name Grade Organization
Contractor information	Contractor number Lot number Date of pack Product nomenclature Location of product Manufacturing establishment number Name Address
Rejection information	Quantity Date Time Place Cause

Reporting product characteristic defects (other than AAFES)

Report receipt inspections involving suspected unwholesomeness or violation of federal or state law and report product characteristic defects for agencies other than AAFES.

Reports

Describe defects as product characteristics that do not comply with applicable requirements. Report all defects noted on the inspection on DD Form 1232, Quality Assurance Representative's Correspondence, or DD Form 1237, Shell Egg Inspection, as applicable. Be descriptive as possible to reflect a clear understanding of the defects found. Consecutively number each DD Form 1232 or DD Form 1237 generated for each contract in the upper right corner.

Notifications

If the product does not meet applicable requirements, immediately notify the accountable officer.

Accountable officer

The accountable officer decides to accept, reject, or accept with price adjustment based on the inspector's findings. The final decision is noted on DD Form 1232. DD Forms 1232 are forwarded to the responsible ordering/contracting officer.

Reporting product characteristic defects for AAFES

AAFES Form 6500–20, Subsistence Inspection Report, is used in accordance with Exchange Service Regulation 1–2, *Veterinary, Preventive Medicine, and Public Health Services,* to report product characteristic defects for AAFES facilities. Further details on form distribution can be found in the inspection manual.

Class 5 inspections

Wholesomeness and suitability for use are the primary concerns when conducting Class 5 inspections.

Disposition

The proper disposition of Class 5 inspections is according to the following recommendations.

Issue

Issue is by normal means.

Unwholesomeness

Condemnation is for unwholesomeness.

Alternative storage

Alternative storage is for aged, infestible, or slightly stressed foods.

Extended ITD

Extended shelf life or inspection test dates (ITD) are for sound foods that have exceeded their ITDs.

Percentage

Defects are expressed as percent defective.

Overseas shipments

Supplies that are source loaded in CONUS for overseas shipment become government-owned supplies at the port of embarkation. However, the government does not always inspect supplies leaving CONUS. You perform receipt inspections on these products for contractual compliance upon arrival overseas. Reports of nonconformances at overseas receipt inspection are crucial to warranty action. Furnish reports of nonconformance to the accountable officer. The accountable officer submits reports for warranty action, transportation claims, or discrepancies in shipment.

Surveillance factors

Surveillance factors to consider as important parts of Class 5 inspections are:

- Evidence of actual or potential deterioration or spoilage due to contamination by microorganisms or their toxins.
- Exposure to biologicals, chemicals, radioactive material, or other foreign matter.
- Suitability of the item for the purpose intended.
- Evidence of insect or rodent infestation.

- Transportation damage and deterioration.
- Potential keeping-time requirements.
- Warehousing requirements.

Receipt inspection procedures

Receipt inspection procedures include determination of resale factors and issue subsistence.

Resale subsistence

When inspecting resale subsistence, you must determine if:

1. Age of the product is within the manufacturer's guidelines (i.e., sell by date, best if used by date, or shelf life guidelines).
2. Condition of product is good.
3. Intended purpose matches product.
4. Special handling is required.
5. Delivery requires warranty action.

Troop issue subsistence

Perform inspection of all troop-issue subsistence to include OPI.

Troop Issue Subsistence	
OPI	OPI will be one sample unit for lot sizes less than 8,500 and two sample units for lot sizes of 8,500 or more. Report significant discrepancies to the accountable officer.
Sample units	When you remove sample units from cases, tag, stamp, label or otherwise identify cases. The use of the DOD stamp is the acceptable way to identify these cases. After taking samples, double stamp cases across resealed box joints. After resealing and stamping, mark cases with the number of units removed and by whom.
Overage and infestible products	Of particular concern are overage products and infestible products arriving at overseas locations where shipment times are prolonged, temperatures and humidity are frequently very high, and pest losses are excessive. Determine the extent of destructive sampling after considering the type of product (perishable, semiperishable, infestible, etc.), environmental condition, findings during closed container inspection, etc.

Extended ITD or AKT

After considering the factors listed above and performing necessary OPI, you may decide to extend or not to extend ITDs or approximate keeping times (AKT). Normal projections range from an extended ITD or AKT of 90 to 120 days; however, products that exhibit mild/minor deterioration (but maintain wholesomeness) might only receive a 30- to 60-day extension period. Similarly, products that show absolutely no signs of deterioration or quality loss may be considered for extension of 180 days. If AKTs and ITDs are adjusted, advise the property custodian in writing of the new adjusted date. The property custodian will make the appropriate changes on all affected cases/units.

Products approaching AKT or ITD

To minimize in-storage inspections, you can perform OPI on products which are approaching their AKT and ITD (within 30 to 60 days) when performing Class 5 inspections. Undertake this type of inspection and extension only if warehouse personnel anticipate the product being on hand at the expiration of the current ITD or AKT.

615. Wholesale inspections

Wholesale activities differ from retail activities. At the wholesale level, food products require further preparation or distribution, e.g., supply points or depots, prior to reaching the consumer.

Initial inspection procedures

Initial inspections are conducted promptly when products arrive with emphasis placed on foods that are infestible. Knowledge of the quantity and lot sizes of products is important to the planning of the inspections.

Infestible products

Inspections are conducted promptly upon arrival with priority given to deliveries of infestible products.

Infestation present

Use Military Standard 904A for further guidance whenever any pest infestation or contamination is detected.

Quantity

The number of primary containers, shipping containers and pallets that should be sampled for initial inspection is determined in accordance with the *Joint Receipt Food Inspection Manual*.

Lot size

Lot size and sample units are expressed based on the type of products. For semiperishables, the lot size is expressed as the number of primary containers (i.e., bag, can, jar, etc.) or unit of issue or as otherwise specified by inspection documents. The sample unit will be a primary container. For perishable foods, the lot size is expressed as the number of shipping containers of product. For shell eggs the lot size is expressed as the number of “30-dozen” cases of the equivalent “30-dozen” cases. The sample unit is a shipping container. For shell eggs 100 eggs per sample unit are candled.

Receipts from contractors

Inspect items in accordance with the general inspection procedures discussed earlier. Nonconformances are reported to the Contract Quality Assurance Element (CQAE) or the ordering officer. When finding nonconformances, if the CQAE directs you to proceed with the inspection, continue with inspection procedures for that product.

Inspections

Inspections are conducted in accordance with the *Joint Receipt Food Inspection Manual*. Open package inspections are performed on every inspection. If temperature is a factor condition, the internal temperature of three samples is checked before off-loading from the delivery vehicle. Select samples from the rear, center, and front of the vehicle. If a potential contract nonconformance is detected, calibrate all thermometers immediately and draw additional samples before reporting a temperature nonconformance. The total number of temperature samples equals the contractual sample size for full inspection. Immediately report product temperature nonconformances to the CQAE before continuing the inspection.

Compliance with requirements

The shipping containers from which the primary containers were selected are the samples used to determine compliance with shipping and intermediate container identity and condition requirements. If unitization is a contractual requirement, only those pallets from which sample-shipping containers were selected are inspected for unit load requirements.

Obvious defects

Perform product identity, condition, and net weight examinations for obvious defects. As a food inspector, be familiar with contractual requirements before performing this inspection to identify obvious defects.

Accepted or additional inspection

If the initial inspection reveals a conforming item, the item will be accepted. If you find obvious defects, perform an additional, full inspection for all terms of the contract.

Receipt from interdepot or supply-points shipments

First, obtain appropriate inspection reports, i.e., quality history record, and/or shipping documents. Samples are selected in accordance with the *Joint Receipt Inspection Manual*. Open-package inspections are performed on every inspection. Inspect the samples to the extent necessary to determine if the products delivered are the products ordered and manifested, and they are fit for continued storage and issue. Accomplish eggshell candling if there is suspicion of loss of quality or carrier damage. If no obvious defects are noted and the product is determined to be fit for issue and continued storage, no further inspection is required. If obvious defects are noted and the product is within its warranty period, a warranty inspection is required. If the product is not within its warranty period further inspection will be at the discretion of the Defense Personnel Support Center (DPSC). Warranty inspections are conducted in accordance with inspection procedures of DLAR 4155.37, *Appendix S, Material Quality Control Schedule* or DPSCM 4155.7, *Perishable Subsistence In-storage Quality Control and Inspection*.

Full inspection procedures

Develop a sampling plan in accordance with contractual requirements. Select sample units so that the total number of sample units is equal to that required by contractual end item criterion.

Strict random sampling

If an end item examination cannot be performed without excessive destructive inspection, call the CQAE for further guidance. Strict random sampling is required. Open-package inspections are performed on every inspection.

Egg inspection

For shell eggs, the inspection is in accordance with the USDA Regulations Governing the Grading of Shell Eggs or the local procurement regulation for overseas bases.

No sampling criteria

When the contractual documents do not contain sampling criteria for a particular requirement or the obvious defect is for other than grade or weight class (shell eggs), the inspection for that requirement is accomplished in accordance with single sampling plans for normal inspection in MIL–STD 105.

Reports

Perform inspection for identity, condition, and net weight requirements. Complete inspection reports and report findings. Items found to be conforming will be accepted. Items found nonconforming will be reported to the CQAE or ordering officer. DD Form 1232 will be completed for all nonconformances.

FF&V inspection at supply points

Fresh fruits and vegetables are inspected for all contractual requirements in accordance with the quality assurance provisions. After completing an inspection for administrative, sanitation, or product protection requirements, the product is examined for product identity, quantity, condition, and quality.

Vendor delivery

Product grade or quality verification is done in accordance with the grade or quality specified in the procurement documents. US Standard for Grade is usually referenced when contracting for produce. The most frequently purchased grade is US Number 1; however, some items may be purchased as US Fancy or Extra Fancy grade. The specific grade procured is found in the procurement documents.

Initial inspection procedures

Sampling for closed package inspection is conducted in accordance with the *Joint Receipt Food Inspection Manual*. The destructive sample size will be one unit of product or the amount prescribed by other recognized inspection procedures. Defect classification and tolerances is in accordance with the USDA, AMS, Quick Reference Manual and the applicable United States Standard for Grade or procurement description. Defects are expressed as percent defective.

Quantity of FF&V

FF&V are inspected for quantity. They are examined for product size, count per container, and weight ranges or weight per container as required by the product standard and/or the procurement documents.

Condition and identity

A product condition and identity evaluation is performed to determine if obvious defects exist. The product and product sizes must be the same as ordered, invoiced, and listed on labels. The product must be of the quality and condition required by the grade. The product defects are evaluated for grade requirements and for appearance factors that will affect the customer's acceptability. Factors that are included in customer acceptability evaluation include those listed in the US standard/procurement description as basic requirements and those abnormalities that are known to be unacceptable to the customer but which are not scored as grade defects. If examination of a sample shows the product to be acceptable for grade and customer appeal factors, the product will be accepted with no further inspection. If examination of samples reveals the amount of defects found will meet or exceed the tolerances of the US standard/procurement description or if individual sample cases have large amounts of defectives or if appearance factors will cause the product to be unacceptable to the customer, a full inspection is required.

Full inspection procedures

Sample sizes are determined by the *Joint Receipt Food Inspection Manual*. Defect classification and tolerances will be in accordance with the applicable US standard for grade/procurement description and the corresponding market inspection instructions. The product examination and defects classification concepts are the same as explained in the initial inspection procedures. If examination of the samples reveals the amount of defects found exceeds the tolerances of the US standard or if the individual sample cases have large amounts of defectives that exceed the "Application of Tolerance Provisions" of the US Standard for Grade, the product lot will be reported as nonconforming. A written narrative description of unacceptable appearance factors will be reported to the receiving/accountable officer.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

613. Receipt inspections

1. Match each class of inspection in column B with its description in column A. Items in column B may be used once, more than once, or not at all.

Column A	*Column B*
____ (1) Used to inspect nonappropriated fund activity foods.	a. Class 3.
____ (2) Used to inspect appropriated fund activity foods.	b. Class 4.
____ (3) Used to inspect government-owned foods.	c. Class 5.
	d. Class 6.
	e. Class 7.
	f. Class 8.
	g. Class 9.

2. How soon after arrival at an installation are food products inspected?

3. When may an inspection frequency be reduced?

4. What is the disposition of unwholesome Class 4 foods?

5. Highly perishable foods that have a high potential to cause foodborne illnesses belong to what group?

6. How often are Group III, reduced frequency, foods inspected?

614. Retail inspections

1. Class 4 and 8 inspections are normally limited to what group of foods?

2. How many internal temperatures *must* be taken upon receipt?

3. How is sampling conducted for perishable subsistence?

4. How are defects classified for semiperishable subsistence?

5. Who decides to accept or reject food products when product characteristic defects are reported?

6. What recommendations for disposition can be made during Class 5 inspections?

7. When inspecting troop issue subsistence, what is the normal extension period for ITDs and AKTs?

8. Why would you perform OPI on products that are approaching their AKT or ITD (within 30 to 60 days) when performing Class 5 inspections?

615. Wholesale inspections

1. When initially conducting an inspection at the wholesale level, what type of products is given priority?

2. Lot size and sample units are expressed based on what factor(s)?

3. Who may direct you to continue with inspection procedures if nonconformances are found during an initial inspection?

4. What must you do if you find obvious defects during an initial inspection?

5. How is a sampling plan developed?

6. How often are open-package inspections performed?

7. What is the most frequently purchased grade for FF&V?

8. What factors are considered when inspecting FF&V for quantity?

9. Who receives reports of unacceptable appearance factors?

Answers to Self-Test Questions

613

1. (1) f.
   (2) b.
   (3) c.
2. Within 24 hours of delivery.
3. After a reliable quality history is established.
4. They are rejected.
5. Group I.
6. Monthly.

614

1. Groups I, II, and III.
2. Minimum of three.
3. Representative samples should be taken from each line item.
4. According to their appropriate severity (critical, major, or minor).
5. The accountable officer.
6. Normal issue; condemnation for unwholesomeness; alternative storage for aged, infestible, or slightly stressed foods; or extended shelf life or inspection test dates (ITD) for sound foods that have exceeded their ITDs.
7. To 120 days.
8. To minimize in-storage inspections.

615

1. Infestible products.
2. Type of product(s).
3. The Contract Quality Assurance Element (CQAE).
4. Perform an additional/full inspection.
5. In accordance with contractual requirements.
6. On every inspection.
7. US Number 1.
8. Product size, count per container, and weight ranges or weight per container.
9. The receiving/accountable officer.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

41. (613) What class of inspection is a receipt inspection of government-owned foods?
    a. 4.
    b. 5.
    c. 6.
    d. 8.

42. (613) What class of inspection is a receipt inspection of nonappropriated foods?
    a. 6.
    b. 5.
    c. 6.
    d. 8.

43. (613) Which of the following are Group I foods?
    a. Eggs.
    b. Fruits.
    c. Cheeses.
    d. Grain products.

44. (613) Group III foods are inspected
    a. weekly.
    b. monthly.
    c. as needed.
    d. at each delivery.

45. (614) At least how many internal product temperatures must be taken upon receipt of food items?
    a. 1.
    b. 2.
    c. 3.
    d. 4.

46. (614) When inspecting a perishable subsistence, defects are reported as
    a. percent defective.
    b. acceptable quality level.
    c. defects per hundred units.
    d. inspection severity tightened.

47. (614) Accept or reject items, based on a receipt inspection, is determined by the
    a. MTF commander.
    b. public health officer.
    c. accountable officer.
    d. inspector.

48. (614) What are normal projections for extending an ITD or AKT?
    a. 90 to 120 days.
    b. 90 to 180 days.
    c. 120 to 180 days.
    d. 180 to 360 days.

49. (615) What must you do *first* if a potential contract nonconformance is detected for product internal temperatures?
    a. Take more temperatures.
    b. Calibrate your thermometer.
    c. Notify the accountable officer.
    d. Notify the public health officer.

50. (615) How often are OPIs performed when conducting full inspection procedures?
    a. As needed.
    b. Once a week.
    c. Upon request.
    d. Every inspection.

51. (615) To report nonconformances, use
    a. SF 364.
    b. DD Form 1222.
    c. DD Form 1232.
    d. DD Form 1608.

52. (615) What is the most frequently purchased Grade for produce?
    a. US Fancy.
    b. US Number 1.
    c. US Number 2.
    d. US Extra Fancy.

53. (615) Sampling for closed package inspection of FF&V is conducted in accordance with
    a. AFI 48–116, *Food Safety Program*.
    b. USDA Regulations Governing FF&V.
    c. Joint Receipt Food Inspection Manual.
    d. USDA, AMS, Quick Reference Manual.

Please read the unit menu for unit 4 and continue ➔

Student Notes

Unit 4. Surveillance Inspections

THE previous unit discussed procurement inspections, also known as receipt inspections. In this unit you will explore information concerning surveillance inspections, which consists of Classes 6, 7, and 9. A surveillance inspection is performed on foods that are already government owned and are either in storage, being served or issued, or transported to other installations or agencies.

4–1. Surveillance Inspections and Procedures

The Air Force spends a tremendous amount of money on food products to be used in dining halls. Foods specially purchased and packaged for dining halls are known as troop issue foods. These foods must be kept in excellent condition to prevent loss while in storage awaiting issue.

Due to the difference in the nature of foods, inspection procedures will differ even if the type of inspection is the same. This section also describes in-storage inspection procedures for semiperishable and perishable foods.

616. Classes and general information

Classes 6, 7, and 9 are explained in this lesson. Also explained is the inspection of semiperishable and perishable foods.

Classes

Class 6

Class 6 inspections are performed prior to shipment to another base or agency. A detailed inspection need not be performed if scheduled inspections have been performed and a quality history record is available for review. An inspection is done to see that no obvious deficiencies or discrepancies are present. If the product has been fumigated, a quality history report goes with the product.

Class 7

Inspections performed at issue or sale are Class 7 inspections. They are walk-through inspections for obvious defects, including dry pet foods.

Class 9

Class 9 inspections are conducted on foods in storage. These inspections are conducted to detect early signs of deterioration and to advise the accountable officer so arrangements can be made to issue or otherwise dispose of such foods before losses are sustained. These inspections are performed on a planned, recurring basis for condition. Note incorrect temperatures, faulty warehouse facilities, or other practices that may lead to deterioration.

With the popularity of prime vendor, this style of inspection is almost not needed. Most facilities on the base will order just enough food for the week. Therefore long-term storage is not needed. However, there may be a facility that uses long-term storage.

General information

As a food inspector you inspect subsistence as required. Give priority to products that have the oldest date of pack (DOP) and are highly susceptible to insect and rodent damage, including dry pet food and distressed products.

Methods of inspection

Methods of inspection are statistical sampling or 100 percent inspections and biased sampling.

Statistical sampling inspection

A sampling inspection estimates the condition of a lot based on examination and testing of a portion of the lot. Samples must be as representative of the lot as practical. Strict random sampling is used during warranty inspections.

100 percent inspection

Every unit of the product is inspected during a 100 percent inspection.

Biased sampling

This sampling is performed when storage conditions have been less than ideal. Samples may be selected from areas of distress.

Other inspections

Other inspections are warranty and special inspections, inspection of isolated lots, inspection of unit basic loads (UBL), and conveyance inspections.

Warranty inspections

Subsistence contracts, except for some perishable items, require that the contractor guarantee supplies after the procurement receipt date at destination. The supplies furnished are free from defects in material and workmanship and conform to all contract requirements. The warranty inspection is usually initiated by findings of excessive defects or deterioration during another inspection, such as receipt or surveillance inspections. The length of the warranty period varies depending on the type of subsistence item.

Special inspections

These inspections are requested by the accountable officer or the contract quality assurance element of DPSC or at the discretion of the food inspector.

Isolated lots

Lots of unknown storage history, such as captured enemy rations, lots found in storage area with no record of inspection, returned stocks to depots, supply points or troop issue subsistence activities (TISA) from ships, dining facilities or other food service accountable officers, and so forth. Inspect these lots for all appropriate defects that may be applicable.

Inspection of UBLs

UBLs are individual operational rations stored by units. UBL inspections are performed in accordance with DPSC Handbook 4155.2.

Conveyance inspection

The carrier is inspected to determine if it meets the requirements for sanitation, product protection, and temperature.

Extension of approximate keeping times (AKTs) and inspection test dates (ITDs)

AKTs or ITDs may be extended after performing open container examinations of products. AKTs can be extended up to 180 days, if products are in excellent condition. You can extend AKTs 90 to 120 days or only 30 days if a product displays noticeable deterioration but is still wholesome.

Likewise, you may extend ITDs up to 360 days, but more commonly ITDs are extended 90 to 180 days. If a semiperishable product has undergone considerable change but is still wholesome, extend the ITD only 30 days. If ITDs or AKTs are extended, line out the old date and mark the new ITD or AKT, so the lot does not lose its identity.

Reports

Reports prepared during surveillance inspections include DD Forms 1714 and 1608, and Standard Form 361.

DD Form 1714, Product Verification Record

DD Form 1714 is used to report warranty inspections. Routine inspections are reported on a locally developed form.

DD Form 1714	
Minimum contents	As a minimum all reports will contain: • Lot number (if applicable). • Location of lot. • Estimated remaining shelf life. • Disposition recommendations.
Report distribution	Copies of all reports are distributed as follows: • The original is forwarded to the accountable officer after receipt of all inspection results. • One copy is filed in the food inspection office. • The second copy is forwarded to higher headquarters, when requested. For warranty inspections, a third copy of DD Form 1714 is prepared and forwarded to the original acquisition agency.

DD Form 1608, Unsatisfactory Material Report (Subsistence)

DD Form 1608 is prepared for foods that are unwholesome or unfit for intended use and considered unsatisfactory. These unsatisfactory foods are reportable if the conditions are beyond normal base control, such as the product not meeting specification requirements or foreign material found in the product. Mechanical damage does not warrant reporting a UMR.

Standard Form 361, Transportation Discrepancy Report (TDR)

Standard Form 361 (SF 361) is prepared according to *Joint Service Regulation,* AR 55–38, AFR 75–18, NAVSUPINST 4610.33C, MCO P4610–19D, DLAR 4500.15. Food inspection personnel must notify the accountable officer and/or transportation officer immediately upon discovery of a discrepancy in shipment. This allows the accountable officer or transportation officer time to prepare an SF 361.

617. Inspection of semiperishable foods

When you are inspecting semiperishable foods, your primary concern is their deterioration. You need to know at what level they are inspected and how often you need to inspect.

Deterioration of semiperishable foods

Storage conditions and particularly high temperatures can greatly accelerate deterioration of semiperishable foods. As a general rule, each rise of 18°F, or 10°C from specified storage temperature doubles the rate of the chemical reaction.

Frequently classified critical defects

Defects frequently associated with semiperishables are:

- Swellers—due to any reason.
- Oxidation or rancidity—due to chemical changes.
- Mildew, mold, or dry rot—any discoloration, growth, or decaying caused by fungi.
- Leakers—due to any reason.
- Contamination—presence of matter which is foreign to or deleterious to the product or substance in which it is contained.
- Insect or rodent infestation.
- Vacuum loss.

Other frequently identified defects

Other frequently identified defects associated with loss of packing and packaging protection are:

- Separation or delamination.
- Closure failure.
- Water damage.
- Soiled (spots, stains, dirt).
- Physical damage.
- Reinforcement failure.
- Brittleness (flexible packing).
- Product intermingling (flexible packaging).
- Corrosion or rust.
- Cuts, abrasions, or scratches.
- Peeling, flaking, or chipping.
- Etching, grazing, or checking.
- Detinning or flaking of enamel lining.
- Dents.
- Breakage.

Inspection level

Inspection levels and sample sizes may differ based on the type of inspection. Inspection levels and samples sizes are derived from the *Joint Surveillance Food Inspection Manual*.

Formation of lots

When considering the formation of lots, you need to consider and understand the meaning of contractors', grand, and isolated lots.

Contractors' lot

A contractor's lot consists of units of a product that are identical as to national stock number (NSN), package size, contractor, contract number, DOP by month/year or Julian date, quality, and storage history.

Grand lot

The grand lot consists of two or more lots of like quality grouped together to decrease the cost of surveillance inspections by reducing the number of samples. Grandlotting is authorized, but the identity of sublots must be maintained and samples must be drawn from each sublot in proportion to its size. When defects are concentrated in a particular sublot, reinspect the sublot separately as a contractor's lot. Grandlotting is limited to inspection procedures and paper transactions which require no rewarehousing or reworking of material prior to the inspection and to units identical as to NSN, package size, DOP by month/year or Julian date, quality, and storage history.

Isolated lots

Captured enemy rations and other lots of unknown storage and inspection history must be handled on an individual basis. If the lot is composed of sublots, the sublots are inspected separately. These items are inspected under General Inspection Level II in the surveillance manual.

During storage inspections

You need to know what foods are to be inspected with the specifics of the inspection to be conducted. You also need to know how often foods are to be inspected, what the rejection numbers are, and what to do about defective lots and sublots.

Class 9 inspections

Accountable officers (except commissary officers) must provide food inspection personnel with a monthly listing of all foods requiring inspection. As a minimum the listing of foods will include:

- Name and address of the storage facility.
- Product nomenclature.
- Contract number.
- Date of receipt.
- Date of pack.
- Warehouse lot number or location.
- Number of cases in the lot.

Inspection frequency

Semi-annual

Each lot of semiperishable subsistence is inspected every six months from date of receipt. OPI is performed on all products with extended ITDs. Frequency can be adjusted when there is evidence of infestation or premature deterioration, *i.e.*, rancidity, swellers, flippers, etc.; or when there are adverse storage conditions affecting item serviceability; or if directed by command.

Infestible items

Food items (to include dry pet food) whose nature and method of packaging make them subject to actual or potential pest infestation are inspected on a frequency consistent with climatic conditions. In some locations, all grains may be considered infestible. In temperate climates these items will require inspection monthly from April through October and every three months from November through March. Other climates may require a different frequency. If infestation is found, refer to MIL–STD–904A for guidance.

Warranty inspections

Warranty inspections are usually not applicable to the USAF, but food supplies received from vendors may be subject to the supply warranty clauses of the contracting agency. The warranty

inspection must be scheduled 90 days after receipt. This does not preclude the scheduling of another inspection within the six-month warranty period if evidence of early deterioration is detected.

Rejection numbers

The rejection number constitutes a warning signal. When defects found do not equal or exceed the rejection number, the inspection is complete.

Products that meet or exceed the rejection numbers for CPI, OPI, or both, require further inspection according to the surveillance inspection manual. The samples for further inspection are selected as randomly as possible considering available resources and conditions. When further inspection is performed, the combined inspection results are used in determining disposition recommendations.

Defective lots and sublots

If defective lots and sublots are found and if the defects equal or exceed the rejection numbers, a report of the findings is made to the accountable officer as prescribed by the inspection manual and AR 40–657/NAVSUPINST 4355.4/AFI 48–116/MCO P10110.31. If defects are concentrated in one or two particular sublots, even if the rejection numbers are not equaled or exceeded for the whole lot, the sublots in question can be individually inspected as contractor lots.

618. Inspection of perishable foods

When you are inspecting perishable foods, your primary concern is their deterioration. You need to know at what level they are inspected and how often you need to inspect.

Deterioration of perishable foods

Storage conditions and, in particular, high temperatures, can greatly accelerate deterioration of perishable foods. Defects need to be detected and identified before consumption.

Storage conditions

Chilled and frozen subsistence continues to deteriorate during storage. The rate of deterioration is directly dependent upon storage conditions, such as temperature, humidity, sanitation, and enzymatic and microbiological action.

NOTE: See AFMAN 23–210 for more detailed information and guidance on storage conditions.

Defects

Defects frequently associated with perishables are:

- Brittleness.
- Crumbling or cracking.
- Hardening.
- Caking.
- Loss of crispness.
- Swellers.
- Oxidation or rancidity.
- Mildew or mold.
- Odor change.
- Decay or rot.
- Flavor change.
- Physical change.
- Freezerburn and dehydration.
- Separation.
- Contamination.
- Discoloration.
- Freeze damage (chill items).
- Defrosting.
- Insect or rodent infestation.
- Friability.
- Coagulation.
- Product intermingling—grease or moisture transfer.
- Liquefaction or syneresis.
- Evaporation or leakage.

Other frequently identified defects

Other frequently identified defects associated with loss of packing and packaging protection are:

- Mildew or mold.
- Separation or delamination.
- Closure failure.
- Water damage.
- Soiled with spots, stains, or dust.
- Physical damage.
- Brittleness.
- Corrosion or rust.
- Leakers, pinholes, or improper closures.
- Detinning, flaking, or enamel lining.
- Vacuum loss.

Inspection level

Inspection levels for CPI and OPI are found in the surveillance manual. With the use of the serviceability quality level (SQL), you accept and reject numbers. Critical, major, and minor defects are not applicable to surveillance inspection of perishable subsistence; however, acceptable quality levels (AQL) are necessary for warranty inspections. When subsistence is government-owned awaiting issue, a more general form of inspection is sufficient to monitor serviceability on a cyclic basis.

NOTE: OPI need not be performed until product will exceed its ITD by the next cyclic inspection or unless obvious defects are noted. If a more detailed inspection is necessary, the sample size may be increased.

Formation of lots

The lot size is normally expressed as the number of shipping cases in the lot. Total units (packages or pieces) are used only when determining open-package sample size. The sample unit for CPI is a shipping case of product. The sample unit for OPI is a package or piece. Samples can be selected and inspected from a contractor lot or grand lot. The date of pack for perishable subsistence is shown by month and year.

Class 9 inspections

Each lot of perishable food is inspected at least every 90 days. Perishable foods with a shelf life less than 30 days are closely monitored during Class 7 inspections. Fresh fruits and vegetables (FF&V) subject to rapid deterioration receive a daily inspection after they have been in storage 24 hours to determine condition and remaining storage life. If deterioration is noted on the daily inspection, notify the produce manager.

Storage compatibility of FF&V

Although it may be necessary to store various fresh fruits and vegetables together, there are some products which must be separated whenever possible. Do not store apples, pears, bananas, peaches, plums, cantaloupes, ripe honey dew melons, avocados, tomatoes and other ethylene-producing fruits or vegetables with lettuce (causes russeting), carrots (become bitter), cucumbers, green peppers, acorn or hubbard squash (loss of green color). Odors from apples and citrus are readily absorbed by meats, eggs, and dairy products. Pears and apples acquire an unpleasant earthy taste and odor when stored with potatoes. The combinations to avoided in storage rooms are apples or pears with celery, cabbage or onions; celery with onions or carrots; green peppers with pineapples, and citrus fruit with any of the strongly scented vegetables. Onions, nuts, citrus fruit and potatoes should be stored separately whenever possible.

Accountable officers (except commissary officers)

Accountable officers provide food inspection personnel with a monthly listing of foods requiring inspection. As a minimum, the listing will include:

- Name and address of storage facility.
- Product nomenclature.
- Contract number.
- Date of receipt.
- Date of pack.
- Warehouse number or location.
- Number of cases in the lot.

Other inspections

Other inspections are warranty, special, and conveyance inspections.

Warranty inspections

Any inspection conducted within the 120-day warranty period is considered a warranty inspection. If, during the warranty period, the results of any inspection show excessive deterioration or the stocks are determined to be unserviceable by the inspector, an inspection is performed immediately using the end item inspection criteria (for only those defects found) cited in the contract. This inspection constitutes the official warranty inspection and all nonconformances are immediately reported to the procurement agency.

Special inspections

The accountable officer or the CQAE from the procurement agency, usually because of a customer complaint, requests these inspections. The accountable officer or CQAE may tell you which inspection level to inspect by.

Conveyance inspections

Inspections determine if the conveyance meets the requirements for sanitation, product protection, and temperature. Ensure the refrigeration units are operating properly.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

616. Classes and general information

1. Match each class of inspection in column B with its description in column A. Items in column B may be used once, more than once, or not at all.

Column A	*Column B*
____ (1) An inspection performed at issue or sale.	a. Class 3.
____ (2) An inspection conducted on foods in storage.	b. Class 4.
____ (3) An inspection performed prior to shipment.	c. Class 5.
	d. Class 6.
	e. Class 7.
	f. Class 8.
	g. Class 9.

2. What foods *must* be given priority when inspecting subsistence during surveillance inspections?

3. What is the maximum extension period for AKTs if products are in excellent condition?

4. When is DD Form 1608, Unsatisfactory Material Report (Subsistence), prepared?

617. Inspection of semiperishable foods

1. What is a grand lot?

2. Who is required to provide a monthly listing of all foods requiring inspection?

3. When will food items whose nature and method of packaging make them subject to pest infestation be inspected?

4. Why are rejection numbers used?

618. Inspection of perishable foods

1. The rate of deterioration of chilled and frozen foods is dependent upon what factors?

2. How is lot size expressed?

3. As a minimum, how often should perishable foods be inspected?

4. What is considered a warranty inspection?

4–2. Special Inspections

There are some programs public health (PH) is involved in that do not fit into a particular class of inspection. They are designed for a specific purpose and deserve your attention. These programs have been around for a long time. The way the programs have operated has changed several times; however, the purpose is still the same.

619. Operational rations inspections

The DOD has a special program for inspecting operational rations due to the importance of the food item. Our ability to sustain a fighting force in a combat zone depends upon the ability to keep the troops supplied with the necessities of life. Part of that plan is to feed our troops operational rations until other food supply lines and equipment have been established and received. A DOD rations' inspection program ensures consistency and accuracy among the services.

Publications

DPSC Handbook 4155.2, *Subsistence, Inspection of Composite, Operational Rations, Appendix A, Inspection of Meal, Ready-to-Eat (MRE) Rations* is used to inspect the MREs used by our troops.

Other Appendices Used for Operational Rations	
Appendix	Uses
B	T-rations or tray packs
C	cold-weather rations
D	light-weight rations
E	food packet, survival, aircraft, and life raft
F	food packet, survival, general purpose

The DPSC Form 5117, *Report of Inspections of Government Owned Meals, Ready To Eat*, is used to record the results of inspections performed on MREs. The Air Force liaison to this joint service program is AFSVA/SVPHF at Randolph AFB, Texas. Policy changes and program information is sent through AFSVA to base offices. Direct your questions to AFSVA for guidance.

Frequency

How often you inspect foods is known as the frequency of inspection.

Receipt inspections

A receipt inspection is accomplished when rations are first received into Air Force inventory. MREs are inspected at most Air Force bases upon receipt from an Army or DPSC storage facility.

Surveillance inspections

Surveillance inspections are normally performed:

1. When rations are received from another Air Force installation.
2. When the rations reach their original ITD and annually thereafter.
3. At six-month intervals, once the rations have exceeded their estimated serviceable storage life.
4. At three-month intervals, once the rations have been classified as Condition Code B.
5. Monthly, when rations are in Condition Code C and the defects noted are progressive.

NOTE: If stocks are in Condition Code C and the defects noted are not progressive in nature, then inspection frequency may be reduced up to three month intervals.

6. At a frequency requested by the accountable officer or as deemed necessary by the inspection activity to ensure the rations are fit for the purpose intended.
7. Prior to issue, sale, or shipment.

Warranty inspections

A warranty inspection is performed at the first DOD destination to receive the rations from the assembly contractor. Ideally, warranty inspections are conducted between five and six months of the date of receipt at destination. However, if defects are found during any inspection within six months of receipt, *perform a warranty inspection*.

Special inspections

A special inspection is performed when deemed necessary based on routine inspection findings, customer complaints, requests from supply points, or whenever reasons exist for such an action.

Procedures

The first step of inspecting rations is to determine when you need to inspect them. Then, depending on whether the inspection is a receipt or surveillance inspection, determine the lot identity.

Identification of lot

Use the contractor's lot information for a single production lot on receipt inspections. This lot information includes the stock number, package size, contractor, contract number, date of pack, type of pack, quantity, and storage history. Grandlotting can be conducted for surveillance inspections. Grandlotting is the process of combining multiple lots in order to decrease the cost of surveillance inspections by reducing the number of samples. The rations must have the same stock number, the same date of pack (same month and year for wholesale stocks and same year for retail stocks), and same Condition Code. Wholesale stocks are those found in DPSC warehouses, while retail stocks are those in the service's possession such as in the commissary or Civil Engineering or Security Police squadron storage areas.

Sample selection

Once the lot size has been determined, it's time to develop a sample plan. Using the DPSC Handbook 4155.2 and tables A, D, and H, develop the sampling criteria. Table A is for shipping containers, Table D is for closed-package inspection of the menu bags and contents including accessory bags and components, and Table H is for open-package or destructive inspection of the meal. These tables give the number of samples necessary; categorizes defects as either Major A, Major B, or Minor; and lists the action number that would cause a special inspection or closer look. After the plan is developed, pull the samples so the entire lot is represented. However, do not pull samples with obvious damage unless they represent the entire lot.

Tables of inspection

Inspect the rations using tables C, F, G, and J in the handbook. Table C is used for the inspection of shipping containers; table F is for the unopened menu bag and accessory bag; table G is for closed-package inspection of food components and accessory bag items; and table J is used for destructive open-package inspection. When inspecting the rations, use the monographs in the handbook to determine the normal characteristics of the product and packaging. The monographs also include a list of defects that are likely to occur, unique examination or test procedures, and possibly some special notes about the product.

Classification of defects

Defects, if you find them, are matched with the defect number listed in the tables of inspection. Next, find a specific defect code in table K of the handbook that identifies the exact defect found. These defects are necessary for reporting the results of the inspection on DPSC Form 5117. The defects are

classified as either Major A, Major B, or Minor according to the inspection tables of the handbook. Defects are also categorized as affecting primary, secondary, or ancillary products using table M of the handbook.

Interpretation of results

Match the defect categories found against tables A, D, and H where the action numbers are found. If the action numbers are not equaled or exceeded, then the inspection is complete. However, if the action numbers are equaled or exceeded for minor defects, or if any Major A or Major B defects are found (without the action numbers being equaled or exceeded), then perform a special inspection.

Special inspections

A special inspection is a separate inspection to look closer at a specific component with a problem. For example, if one menu item such as chicken loaf has a problem and the problem is found in every chicken loaf in your sample, you will probably need to perform a special inspection because the action numbers will be exceeded. You will look at more chicken loaves during this special inspection and then complete a new DPSC Form 5117. Use Tables B, E, and I to develop the sampling plan for the special inspection. The table of inspection that the problem was identified from, such as Table J, *Destructive Open Package Inspection* is the only table entered on the special inspection DPSC Form 5117. If the action numbers for Major B or minor defects have been equaled or exceeded on the normal inspection, a special inspection does not need to be performed. For Major B defects equaling or exceeding the action numbers, the serviceability for the lot can be determined without the special inspection. For minor defects equaling or exceeding the action numbers, the determination for a special inspection is up to the inspector.

Disposition

Determine the serviceability and condition code of the rations after they have been inspected and results are recorded on the form. This requires using tables N and O of the handbook. In order to determine serviceability and condition code, there are certain items to consider first. These include the following:

1. Can the rations be reworked?
2. Can the defective menus or components be removed just prior to consumption?
3. How rapidly is the most defective component expected to deteriorate to the point that it is unlikely to be consumed?
4. Can the lot be issued and supplemented with similar commercial items, supply catalog items, or operational ration components?
5. Can the particular lot be consumed “as is,” perhaps every third meal per day, without any nutritional concerns?
6. What is the estimate percentage of defective components?
7. Who is the most likely consumer of these rations, and under what conditions are they to be consumed?

Serviceability

Once these questions have been answered, use tables N and O to determine the serviceability and condition code. Serviceability of a lot of rations can fall into four categories including fully usable, limited use, restricted use, and unusable. Use table N in the handbook to match the number of components in a menu that equals or exceeds the action number. This will determine the serviceability of the lot.

Condition codes

Condition codes listed in DPSC Handbook 4155.2 are A, B, C, H, L, and J. Match the number of meals in each of the serviceability categories from table N to the appropriate condition code in table O of the handbook. For example, if the lot was fully serviceable from table N, then how many meals are fully serviceable in that lot? If there are 12 fully serviceable meals, then the condition code would be A. If there were only 8 meals fully serviceable in the lot, then the condition code would be C.

Condition Codes	
Code	*Explanation of Rations*
A	Fully issuable without qualification. They can be rotated normally.
B	Issuable but with qualifications. The accountable officer must determine what qualifications will be specified in order to issue condition code B stock. For example, issue with instructions to consume within 60 days; issue with instructions not to consume dehydrated fruit component and supplement with fresh fruit; etc.
C	Issuable with qualifications. The accountable officer must evaluate the problem identified by the inspector and either correct the problem or follow the recommendations. These minor problems are usually involving a major component except the main meal item, such as the peanut butter component.
H	Unserviceable and must be destroyed in accordance with local policy. This classification is used when the entire lot has been deemed unserviceable. However, when a lot meets the criteria for an unusable status, further evaluation as to the total number and seriousness of the defective menus, and possible rework or substitution for the menus must be considered before a final disposition may be rendered.
J	On hold pending laboratory testing, placed on medical hold, being reworked, or on reclassification hold. These rations cannot be issued until the hold has been lifted.
L	Have been placed on hold awaiting warranty action and cannot be issued until the hold is lifted.

Reporting

The accountable officer must be notified of the condition code, the estimate of remaining shelf-life, a summary of package integrity, and any other additional comments that might assist the accountable officer for each lot of rations. If the rations are owned by the commissary and stored in its warehouse, then provide a copy of the DPSC Form 5117 to the commissary officer. However, if the rations belong to a squadron on base, the report should be in letter format and sent to the accountable officer for that squadron. Ensure a copy of each report is kept in the PH quality history files for future reference.

620. Consumer protection programs

One of your functions as a food inspector is to listen to the complaints registered by consumers against particular food items that may or may not be stocked in our local food facilities. The complaints are usually taken first by the facility managers or their representatives and then forwarded to your office. They are an extension of your surveillance inspection program and could indicate serious problems in the warehouse on base. If there is a problem with food in the warehouse and you have not found it in your inspections yet, customer feedback is extremely important. Granted, not all complaints are indicators that problems exist in the warehouse; in fact, most are not. However, there is a chance that you could find a problem with a product early enough to prevent a total loss of the product. The customer complaint system is designed for just this reason.

Customer complaint system

DeCA, the Defense Commissary Agency, headquartered at Kelly AFB, Texas, seeks to provide military consumers with the best available product for the best available price.

Form completion

When customers experience problems with a product purchased at the commissary, they may return the product to the store, complete DeCA Form 40–45, *Food Quality Report*, and wait for a reply.

Your job is to evaluate the product as well as other similar product in the store or, if necessary, send the product to your local area lab for analysis.

Check the stock

The complaint forms are usually completed at the customer service counter in the store. The form along with the product is brought to the food inspection office for analysis. You first try to determine what the problem is through a quick sensory analysis. Check stocks of the identical product in the store on the shelf as well as the stocks in the warehouse to determine if the same problem exists. If you cannot determine the problem, send the required number of samples to your local area lab.

Forward copy

Once the tests are completed and the results are known, complete the form and forward a copy to the commissary officer. Also, call or follow up with a typed, official letter on the results of the analysis if the patron has requested notification. If the product is defective, place the entire lot on medical hold and perform a surveillance inspection and make recommendations for disposition.

Hazardous food and nonprescription drug recall system

Air Force or military food inspectors may discover food items in the military food chain which pose a potential, or actual, public health danger. Someone from the food inspection office must then contact the proper authorities as described in AFI 48–118, *DOD Hazardous Food and Nonprescription Drug Recall System*. The ALFOODACT system is designed to inform other DOD agencies of potential hazards in foods and nonprescription drugs. This message system is a DOD response system to ensure that hazardous foods and nonprescription drugs are taken away from the resale shelf to protect the patron's health.

Types of Recalls	
Class	*Explanation*
I	Class I recalls are situations where there is a reasonable probability that the use of, or exposure to, will cause serious adverse health consequences or death.
II	Class II recalls are situations where there is a reasonable probability that the use of, or exposure to, may cause temporary or medically reversible adverse health consequences, or where the probability of serious adverse health consequences is remote.
III	Class III recalls are situations where the probability that the use of, or exposure is not likely to cause danger to health.

Take action

These ALFOODACT messages are very important documents and must be logged in when received on base. Once the message is received, take action as described. As a minimum you need to check the food facilities on your base to see if the product described is located on base. If you find the product, place on medical hold until you get further instructions on the disposition of the product. Do not just check once and think that the investigation is over. Remember, the facilities are receiving products every day, and those stocks must also be checked. Usually higher headquarters is involved and issues the messages for disposition of the product. Ensure you completely carry out these directives. Make a memo for the record describing your actions for future reference.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

619. Operational rations inspections

1. What document covers the inspection procedures for MREs?

2. What form is used to record results of MRE inspections?

3. What is the definition of a receipt inspection of operational rations?

4. What information is used to identify a lot for a receipt inspection of rations?

5. What is required when you find a Major A defect in a lot of rations on a routine inspection?

6. What table(s) do you use to determine the serviceability and condition code of a lot of rations?

7. What is condition code J?

620. Consumer protection programs

1. What form do DeCA customers use to report complaints?

2. What do you do if you can't identify the problem with a food product that was brought in on a customer complaint?

3. What directive gives guidance on what to do with hazardous food items found on base?

4. What messages are used to notify other installations about hazardous foods?

Answers to Self-Test Questions

616

1. (1) e.
   (2) g.
   (3) d.
2. Products with the oldest date of pack (DOP) and highly susceptible to insect and rodent damage, including dry pet foods and distressed products.
3. 180 days.
4. When foods are found to be unwholesome or unfit for intended use and considered unsatisfactory.

617

1. A lot consisting of two or more lots of like quantity grouped together to decrease the cost of surveillance inspections by reducing the number of samples.
2. Accountable officers.
3. On a frequency consistent with climatic conditions.
4. They are used as a warning signal for further inspection.

618

1. Storage conditions, such as temperature, humidity, sanitation, and enzymatic and microbiological action.
2. As the number of shipping cases in the lot.
3. Every 90 days.
4. Any inspection conducted within the 120-day warranty period.

619

1. DPSC Handbook 4155.2, Appendix A.
2. DPSC Form 5117.
3. The first time the rations are inspected in the Air Force inventory.
4. The contractor’s lot information which includes the stock number, package size, contractor, contract number, date of pack, type of pack, quantity, and storage history.
5. A special inspection must be performed.
6. Tables N and O.
7. Means the rations have been sampled for lab testing, placed on medical hold awaiting disposition, are being reworked, or have been placed on reclassification hold.

620

1. DeCA Form 40–45, *Food Quality Report*.
2. Send samples to your local area food laboratory.
3. AFI 48–118, *DOD Hazardous Food and Nonprescription Drug Recall System*.
4. ALFOODACT messages.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

54. (616) What class of inspection is conducted on foods in storage?
    a. 6.
    b. 7.
    c. 8.
    d. 9.

55. (616) What type of inspection is performed when storage conditions have been less than ideal?
    a. Biased sampling.
    b. Special inspection.
    c. Warranty inspection.
    d. 100 percent inspection.

56. (616) A warranty inspection is usually initiated
    a. within three months of receipt.
    b. within six months of receipt.
    c. by finding excessive defects.
    d. when requested by the accountable officer.

57. (617) Lots of unknown storage and inspection history are known as
    a. sublots.
    b. grand lots.
    c. isolated lots.
    d. contractors' lots.

58. (617) Surveillance inspections of semiperishable subsistence are conducted
    a. every three months.
    b. every six months.
    c. every 12 months.
    d. when requested by the ordering officer.

59. (617) Products that meet or exceed the rejection number for surveillance inspections
    a. must be rejected.
    b. require reworking.
    c. must be destroyed.
    d. require further inspection.

60. (618) The rate of deterioration of chilled and frozen foods is dependent upon what factor?
    a. Size of product.
    b. Type of product.
    c. Storage conditions.
    d. Amount of product.

61. (618) Class 9 inspections of perishable foods are conducted
    a. every 30 days.
    b. every 60 days.
    c. every 90 days.
    d. only if requested.

62. (619) What appendix of DPSC Handbook 4155.2, *Inspection of Operational Rations*, is used for MRE rations?
    a. A.
    b. B.
    c. C.
    d. D.

63. (619) If a lot of meal, MRE rations have reached their ITD, but are in good condition, the next inspection is scheduled for
    a. one year from the ITD.
    b. six months from the ITD.
    c. when the rations reach the end of their shelf-life.
    d. at three-month intervals until the product is depleted.

64. (619) Normal characteristics describing MRE rations are found in
    a. tables A through F.
    b. tables G through J.
    c. tables K through L.
    d. the monographs in Appendix A of the Inspection Manual.

65. (619) Besides reporting the condition code, remaining shelf life, and other comments as needed, what other information is given to the accountable officer when reporting on the inspection of MRE rations?
    a. Storage history of rations.
    b. Quality history of rations.
    c. Nutritional value of the meals.
    d. Summary of package integrity.

66. (620) When DeCA customers have a product complaint, they complete
    a. DeCA Form 1.
    b. DD Form 1232.
    c. DD Form 1234.
    d. DeCA Form 40–45.

67. (620) When a complaint form is completed by the medical food inspector, a copy goes to the
    a. contracting officer.
    b. commissary officer.
    c. vendor or company representative.
    d. contract quality assurance element.

68. (620) When received on base, ALFOODACT messages are
    a. filed.
    b. logged.
    c. discarded.
    d. forwarded to DeCA.

Please read the unit menu for unit 5 and continue ➔

Unit 5. Conducting Evaluations

FAST food services have become increasingly popular because of our fast-moving society. Because these services are provided by food facilities, part of your job as a public health journeyman is to ensure the food prepared in those facilities is safe for public consumption. Before you can evaluate a facility and determine whether or not it offers safe food, you need to be familiar with the types of food facilities and the sanitation requirements for each. This unit discusses those aspects of two types of food facilities and also gives you some information to use as a guide for evaluating them.

5–1. Food Facilities

Many of the food facility sanitation evaluations you perform on your base may include dining halls, officer and NCO clubs, cafeterias, snack bars, mobile units, aircraft, hospital dining facilities, and vending machines. Here we present some factors or problems that contribute to a foodborne disease outbreak and explain solutions to these problems.

It is important for you to be aware of the problems that occur in a food facility. By recognizing these problems, you can identify conditions in the facility that could lead to someone becoming ill. Then you can help the facility management take steps to eliminate these conditions and prevent illness. Prevention is the heart of your job.

621. Factors contributing to a foodborne disease outbreak

Person in charge

The person in charge is the individual present at the food establishment who is responsible for the operation at the time of inspection. The person in charge is the individual responsible for ensuring that the facility operations comply with the preventive measures in the current AF version of the Food and Drug Administration (FDA) Food Code.

Food employees

A food employee is any person who works with unpackaged food, food equipment or utensils, or food contact surfaces in any way.

Infected food employees

Food facility patrons are truly at the mercy of the food employees. You learned about how foodborne diseases are transmitted in Volume 2. Keeping this in mind will help you identify and correct situations, such as employees coughing or sneezing over uncovered foods, employees who blow their nose, sneeze into their hands, wipe their nose with an arm or sleeve, or rub secretions out of their eyes without washing their hands afterwards. Also, food employees can have open cuts, sores, or burns that can be infected and lead to contamination of food.

Food employees do not have to show signs of illness to contaminate the foods they prepare. Naturally occurring human pathogens such as *Staphylococcus aureus* can easily contaminate food if it is improperly handled.

Poor personal hygiene

Food employees who practice poor personal hygiene are also a threat to the patrons. Poor personal hygiene includes failing to wash one's hands after using the bathroom, smoking, or handling raw foods prior to handling prepared foods. Employees' clothing also can be a source of contamination. For instance, cooks often wipe their hands on their aprons rather than washing their hands. They must be educated on the importance of hand washing and the risk of contamination if they don't. Many times employees complain that the sink is either difficult to get to or it's a hassle to stop and wash every few minutes. They sometimes feel that they won't get anything done if they wash their hands like they should. Help them overcome this "feeling" through education.

Obtaining foods from unapproved sources

It is important for employees to know that foods must be purchased only from approved sources in accordance with AFI 48–116, *Food Safety Program*. Facilities may want to purchase specialty items, such as raw dairy products. Since these products may be unpasteurized, they can be very dangerous for the patrons. Other examples of foods from unapproved sources include home canned foods and seawater plants from waters infected with Red tide. These foods could make people ill.

Preparing foods several hours or days in advance

Some managers believe it is easier to prepare large quantities of popular foods in advance to ensure they will not run out of these particular items. These foods might be prepared several hours or even days prior to serving the meal. The Centers for Disease Control published a list of top 10 factors contributing to foodborne disease outbreaks. The excessive time between preparing and serving foods was the contributing factor for 26 percent of the reported outbreaks. Having excessive time between preparing and serving food can be an unsafe practice for a number of reasons. But one main reason is that certain microorganisms can multiply while food is cooling in the refrigerator. Even though the food is refrigerated, pathogens continue to grow until food is below 40ºF. These foods require careful monitoring to ensure proper storage temperatures and proper handling procedures. It is best to serve foods immediately after cooking to prevent microbial growth.

Failure to cook foods thoroughly

Since certain foods are likely to carry pathogens, it is important to cook these foods properly to destroy the pathogens. For example, meats such as beef rounds are often contaminated with *Clostridium perfringens,* while *Salmonella* organisms are commonly found on poultry. If these foods are not cooked thoroughly, the chances of foodborne illness increase greatly.

Look at the list that follows. It contains the minimum temperature that must be achieved and the amount of time the food must remain at that specified temperature.

Type of Food	*Minimum Temperature*	*Minimum Time*
Eggs, fish, and red meat.	All parts must reach 145°F.	15 seconds.
Roasts of beef and corned beef.	145°F internally.	3 minutes.
Pork, ratite, comminuted fish and meats (like hamburger), injected meats, and immediate service eggs.	155°F internally.	15 seconds.
Any poultry, stuffed foods, or reheated leftovers.	165°F internally.	15 seconds.
Animal origin food cooked in a microwave.	165°F internally.	15 seconds measured after 2 minute covered stand time.

Cross contamination of foods

There are several methods of cross contaminating foods. Food employees might handle raw or contaminated foods and then handle uncontaminated foods without washing their hands. Pieces of equipment, such as cutting boards, and knives also might be sources of contamination if they are not properly cleaned and sanitized after use. Storing both contaminated and uncontaminated foods together may also cause problems. A common mistake is to mix raw or contaminated foods with cooked foods. If the mixture is not thoroughly cooked, microbial growth may occur and lead to a foodborne disease outbreak. Another problem often overlooked is thawing meats on the shelf above vegetables or ready-to-eat foods. The juices from the thawing meats dripping onto the foods below could contaminate them.

Improper holding temperatures

This is the most frequently occurring factor contributing to a foodborne disease outbreak. Since there are two basic temperatures at which potentially hazardous foods must be kept, we will look at each a little closer.

Cold holding temperatures

The internal temperature of cold food needs to be at or below 41°F to prevent the growth of most pathogenic microorganisms. Some common problems related to cold temperatures are malfunctioning freezers or refrigerators, thawing frozen foods at room temperature, and failing to store foods in shallow pans for more rapid cooling.

Hot holding temperatures

Potentially hazardous hot food needs to be kept at 140°F or higher to prevent the growth of pathogenic microorganisms. All foods that are considered to be hot must be held at 140°F or above at all times, especially while on the serving line. The temperature at which food is held during all phases of preparation and serving is extremely important to prevent the growth of pathogens or production of toxins. For example, microorganisms need proper temperatures (41°F to 140°F), adequate time, and necessary nutrients for growth. Consequently, there are a number of factors that can be controlled to prevent a foodborne disease outbreak.

622. Controlling factors that contribute to foodborne disease

Now that you know the factors contributing to foodborne disease outbreaks, let’s look at some ways to control these factors and prevent foodborne disease outbreaks. The primary purpose of performing food facility sanitation evaluations is to prevent foodborne disease outbreaks. In order for you to do this, there are certain requirements that must be met.

General areas with potential for disease

Food employees are the first line of defense in preventing foodborne disease outbreaks. They have specific responsibilities for food safety, including personal and facility cleanliness. They report all potentially hazardous situations to the person in charge. This person not only manages facility operations but is also the critical link between public health and the food employees. In this capacity, the person in charge ensures the prevention of foodborne disease outbreaks through his or her responsibilities.

Personal responsibilities of food employees and the person in charge

By now you should have an understanding of some of the problems associated with food employees, and the person in charge. They have many responsibilities such as disease reporting, proper cooling and thawing procedures, serving and storage restrictions, and temperature requirements. Now, let's look at what they are required to do to help solve these problems.

Report disease or illness

Food employees have a grave responsibility to report to the person in charge and to the base medical facility or their health care provider information about their health and activities as they relate to diseases transmissible through food. A food employee or applicant must report information in a manner that allows the person in charge to prevent the likelihood of foodborne disease transmission, including the date of onset of jaundice or any other past or present illness. Diseases that are extremely important and must be reported promptly are:

- Salmonella typhi.
- Shigella spp.
- Escerichia coli (E. coli) O157:H7.
- Hepatitis A virus.

There are other instances in which food employees must report illness to the person in charge. One is when employees are experiencing symptoms from an illness, infection, or other source associated with acute gastrointestinal illness, such as diarrhea, fever, vomiting, jaundice, or sore throat with fever. Another is when employees have lesions containing pus—such as boils or an infected wound that is open or draining—that are located on the hands, wrists, exposed portion of the arms, or other parts of the body. When reporting to a medical facility, food employees must identify themselves as such to medical treatment personnel.

Food employees must report not only their health to the person in charge, but they must also report their exposures to incidences of foodborne disease outbreaks. If he or she is living with a person known to have *Salmonella typhi, Shigella spp., Escerichia coli O157:H7,* or *Hepatitis A* virus, or are living with a person who attends or works in a setting where there is a confirmed disease outbreak, he or she must report it. He or she must notify the person in charge when he or she travels outside of the country. The person in charge notifies the supervisor and public health when the employee reports the above information. Also, if a food employee is removed from duty, notify the supervisor and public health flight. The food employee will not return to food handling duties until cleared by a medical authority.

Have medical examinations

Food employees can be required to obtain a medical examination before starting food handling duties. The purpose of this examination is to prevent individuals with diseases such as hepatitis, typhoid, dysentery, diphtheria, streptococcal or staphylococcal infections from handling food. The Aerospace Medicine Council (AMC) establishes the criteria for medical examination frequency and type of examination to be performed. The examination is performed by the physical examination and standards (PES) section and is documented on an AF Form 1021, Medical Certificate, or in the food employee's medical record on an SF 600 or SF 600 overprint.

Receive training

All food employees must be trained in the principles and practices of preventing a foodborne disease outbreak. Meeting this requirement is done through training programs conducted by public health and facility supervisors.

Initial food employee training is required before an individual can actually perform the duties of a food employee. This training concentrates on the individual food employee's role in preventing contamination of foods and food contact surfaces, keeping microorganisms from growing in foods, and proper cleaning and sanitizing of food contact surfaces. This initial training is given by the individual facility supervisor. Public health approves initial formal food safety training for food service employees.

Supervisory training is given annually by public health to all food facility supervisors. It is presented at a more advanced level than that given to food employees. The training identifies the supervisor's role in preventing a foodborne disease outbreak and cites the implication of problems noted during food facility sanitation evaluations. This training stresses the epidemiology of foodborne diseases and the impact of food safety on military readiness and the health of the community.

On-the-job training is an ongoing process. Specific training sessions are arranged or conducted by management as the need arises.

Practice personal hygiene

Food employees are a point of contact and thus are critical in preventing foodborne disease outbreaks. They must keep their hands and exposed portions of their arms clean at all times.

General cleanliness

In addition to medical examinations and food employee training, food employees must maintain basic personal hygiene standards. It is the responsibility of both the food facility supervisor and the food employee to make sure these standards are followed. These standards include at least the following:

- Keeping hands and exposed portions of arms clean at all times.
- Bathing daily.
- Wearing clean, light colored outer garments.
- Keeping facial hair clean and wearing a beard restraint.
- Wearing hair restraints such as hats or hairnets.
- Washing hands after using the restroom, coughing, sneezing, or blowing one's nose.

Hand washing

Hand washing is vital to preventing the spread of disease, and it becomes even more important for food employees serving and handling our food. Food employees are expected to wash their hands before beginning or returning to work. To ensure hands and exposed portions of their arms are thoroughly cleaned, they should vigorously rub together the surfaces of their lathered hands and arms for at least 20 seconds, and then thoroughly rinse with clean water. While washing their hands, food employees must pay particular attention to the areas underneath the fingernails and between the fingers.

Preparing, serving, and keeping food

When preparing and serving foods, food employees play a key role in preventing foodborne disease outbreaks. They must follow some basic rules for preparing and serving food in order to control microbiological growth.

All foods that arrive at a food facility are either perishable or semiperishable. Examples of perishable foods are frozen vegetables, milk and dairy products, meats, and fresh vegetables. Examples of

semiperishables are flour, sugar, cereals, and canned products. Your primary concern is for foods that can sustain bacterial growth, mainly the perishable foods.

Controlling time and temperature

The current AF version of the FDA Food Code lists the time and temperature requirements for most foods (fig. 5–1). These are controls set to prohibit or slow the growth of pathogenic microorganisms. There are two basic rules for controlling the time and temperature of foods. The first is to maintain perishable products below 41°F or above 140°F. The second is not to let food remain in the dangerous temperature zone of 41°F to 140°F for more than four hours total, from receiving to consumption.

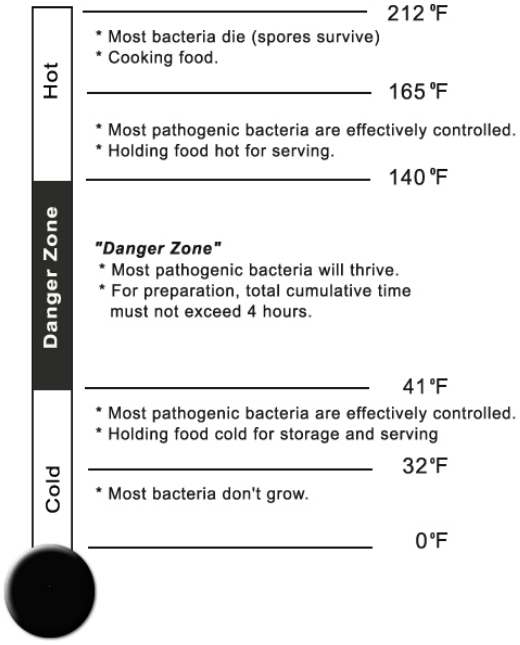


Figure 5–1. Temperatures and the danger zone.

Cooling foods

Cool food quickly to prevent the growth of microorganisms. To speed up the rate of cooling, leave food uncovered, and in a location that is protected from contamination, such as from dripping meats that are thawing. Then cover the food being cooled when it reaches the proper internal temperature. Keep foods covered during all other aspects of food storage, to protect from contamination.

When cooling food, it needs to reach 41°F within four hours. Ideally, potentially hazardous food should be cooled from 140°F to 70°F within two hours, and from 70°F to 41°F or below within four hours. Placing foods in shallow pots and pans, and increasing the airflow, such as by using a blast chiller, will also speed the rate of cooling.

Thawing foods

Another critical point in the preparation process is thawing foods prior to cooking them. Food employees follow certain procedures for thawing potentially hazardous foods. When thawing in the refrigerator, maintain foods at 41°F or below. Foods can also be thawed as part of the cooking process. Microwaves can also be used for thawing if the food will be transferred immediately to a conventional oven with no interruption in the process. Foods can start thawing under room temperature as long as the item is placed under refrigeration when the surface of the food reaches 41°F. As a last resort, completely submerging foods under running water is the least preferred method. If it is necessary to use this method, the water must be potable with a temperature of 70°F or

less. The water must have sufficient velocity to agitate and remove loose particles, and the process must be continued for a period of time that does not allow thawed portions to rise above 41°F.

Serving foods properly

Protect food from contamination and handle it properly to ensure that any pathogenic microorganisms present do not grow to harmful levels when displaying and serving.

Handling foods while serving

When serving, food employees cannot touch ready-to-eat food, or the eating surface with their bare hands while loading food onto a plate or bowl. Food should be handled with utensils whenever possible. The serving utensils can be stored in the food as long as the handle sticks out of the food.

Practicing proper storage techniques

The requirements for storing dry, cold, or hot foods are the same except for temperature and humidity requirements. Store all foods, regardless of how perishable, at least 6 inches above the floor on pallets or similar devices. This practice permits personnel to clean the floor easily. Storing foods at least 6 inches above the floor is especially helpful when storing sugar and flour bags that occasionally spill or leak.

Store foods at least 18 inches from the ceiling and 4 inches from a wall to allow air circulation.

Dry storage areas are perfect targets for insect and rodent infestations. These areas can be insect and rodent proofed by ensuring the facility has screens on the doors, and sealed walls around pipes and structural supports. Store food items separately from nonfood items such as cleaning agents and chemicals. This prevents personnel from using toxic substances as food additives in a recipe.

Do not store food items, (food preparation equipment, and utensils) in latrines even if other storage space is nonexistent.

623. Controlling microbial contamination by cleaning and sanitizing

Personal hygiene and proper temperature control and storage are not the only important factors in keeping food safe. Cleaning and sanitizing are crucial in controlling microbial contamination. Cleaning and sanitizing is a two-fold process. A food contact surface must be cleaned properly before it can be sanitized adequately. Before you can evaluate a food facility's cleaning and sanitizing procedures, you need to understand the principles and common methods used in food facilities.

Cleaning factors

Effective cleaning is a lot more complicated than the simple combination of soap, water, and scrubbing. Many variables such as type of soil, water, cleaning agent, and applied pressure can affect the cleaning process. Let's take a look at a few of these.

Type of soil

Soils and stains can be classified as protein-based (eggs and raw meat juices, for example), grease or oil-based (margarine or animal fats), or acid or alkaline-based (tea or dust). These different types of soils necessitate different types of cleaning agents.

Water

Water used for cleaning must be potable. Dirty water and mineral impurities limit the effectiveness of the cleaning agent. Cleaning agents dissolve most effectively and quickly in hot water.

Surface of the item

The surface of the item being cleaned is important. Some surfaces may be difficult to clean, such as wooden countertops, while others like steel are easier to clean.

Types of cleaning agents

The role of a cleaning agent is to lift soil from the surface being cleaned and keep it suspended so it is not redeposited on the item. A cleaning agent is anything such as steam, water, soap, or chemical compound that removes soil.

Select a particular cleaning agent for its specific cleaning properties. A cleaning agent needs to fit the needs of the facility and be stable, noncorrosive, and nontoxic when used as directed. There are three main types of cleaning agents that you may see while performing evaluations: alkaline, acid, and abrasive cleaners.

Alkaline

Normally alkaline cleaners are in the form of detergents. They are effective for removing soil from floors, walls, most equipment, dishes, and utensils.

Acid

Acid cleaners are used to remove lime deposits in warewashers (also referred to as dishwashers), rust stains on equipment, and other soils not removed by alkaline cleaners.

Abrasives

Sometimes soil is attached so firmly to a surface that alkaline or acid cleaners will not work. When this occurs, a cleaner containing a scouring agent, usually finely ground feldspar or silica, is used to attack the soil. Rinse all items thoroughly after cleaning.

Sanitizing methods

The term *sanitized* means that the microbial contamination of an object or surface has been reduced to a safe, consumable level. It is a step above clean, which is the absence of unwanted soil, but a step below sterile, which is the absence of all microbial contamination. All food contact surfaces must be sanitized after cleaning.

Sanitizing can be done in two ways: the object can be heated to a temperature high enough to kill microorganisms or it can be treated with an approved chemical compound. Usually the medical treatment facility (MTF) commander approves sanitizers for use in food facilities. Regardless of the sanitizing process, the object to be sanitized must be cleaned and rinsed properly for the sanitizing process to work. Caked-on soils, not removed by cleaning, may shield bacteria from the sanitizing process.

The most frequently used method of heat sanitization is rinsing or immersing an object in water at 171°F or above for a minimum of 30 seconds. This time and temperature relationship is necessary to bring the plate contact surface to 160°F, which kills most disease-causing microorganisms. Chemical sanitizing can be performed in two ways: (1) immersing an object in a chlorine solution for a minimum of 10 seconds, or (2) immersing the object in an iodine solution for a minimum of 30 seconds. Other methods used to sanitize include rinsing, swabbing, or spraying using double the recommended concentration of sanitizer on the item to be sanitized.

Warewashing methods

Warewashing means the cleaning and sanitizing of food contact surfaces of equipment and utensils. Warewashing is performed in two ways: manually or mechanically.

Warewashing manually

Warewashing manually is done using a three-compartment sink. A three-compartment sink is separated by function: washing, rinsing, and sanitizing equipment and utensils. The sink compartments need to be large enough to accommodate immersion of the largest piece of equipment or utensil. If equipment or utensils are too large for the warewashing sink, use a warewashing machine or alternative equipment. This work area should be equipped with separate drain boards for

clean and soiled items, and an area for scraping and rinsing food soil into a garbage container for disposal.

Warewashing mechanically

Properly operated and maintained machines can be more reliable in removing soil and microorganisms from tableware and kitchen implements. Because of this factor and the needs of high-volume operations, the food service industry has moved increasingly to the use of warewashing machines.

Warewashing machines are stationary machines, in which a rack of items to be washed sits in one place while the machine goes through wash, rinse, and sanitizing cycles. There are also conveyer machines that move the dishes through the machine on racks or conveyers equipped to hold them. Conveyor or clipper-type machines are required to have baffles or curtains to prevent internal cross contamination between the washing and rinsing phases of the cleaning process.

While warewashing machines can be the most reliable way to clean and sanitize tableware and utensils, they also can be the source of innumerable problems if installed or operated improperly. If asked, recommend that food facilities refer to the manufacturer's instructions for troubleshooting problems with individual machines.

Cleaning of facilities

There are many locations that are critical in controlling microbial contamination in a food facility. These critical areas include the food preparation areas, the clean pot/pan and dish storage area, the latrines where food employees must wash their hands prior to returning to work, and hand washing stations.

Food preparation and serving areas

Food preparation areas include the salad-making area, steam kettles, ovens, cutting boards, food preparation tables, grills, and the serving line. These areas must be cleaned to avoid an accumulation of food debris.

Floors

Mop floors often and wash as needed. Make sure walls, ceilings, light fixtures, and ventilation systems are kept clean and free from dust and dirt buildup to prevent contamination of food or food contact surfaces. Grease traps need to be cleaned out periodically to prevent grease build-up that clogs the system.

Latrines

Latrines need to be kept clean and free from excessive dirt. Hand-washing facilities must be available, and stocked with supplies, in all latrines to allow food employees to wash their hands prior to returning to work.

Outside/back dock area

Evaluate the mop and broom rack, garbage can cleaning area, garbage dumpster, and surrounding grounds for sanitation. The dumpster must be emptied and cleaned to avoid attracting insects, and the area around the dumpster needs to be cleaned as well.

Cleaning and sanitizing equipment

Stationary food preparation equipment should come with the manufacturer's instructions for disassembly and cleaning. Make sure these instructions are followed if they are available. For general equipment cleaning, unplug the unit if it is electrically powered. Remove parts, if possible, prior to cleaning and sanitizing. Ensure the remaining food contact surfaces are washed and then rinsed with a solution of chemical sanitizer mixed to 50 ppm if the temperature of sanitizing solution is 75°F, warm

water, or 100 ppm if the temperature of the sanitizing solution is between 55°F and 75°F, cool water. Wipe down the non-food contact surfaces and allow them to air dry before reassembling.

Make sure cloths used for wiping down stationary equipment and other surfaces are rinsed frequently in a sanitizing solution, stored in the solution when not in use, and laundered daily. Cloths used for food contact surfaces must be kept separate from other wiping cloths.

Some stationary items are designed to have detergent and sanitizing solutions pumped through them. This is called cleaning in-place. Personnel need to consult the manufacturer's instructions for these items.

Floor-mounted or large equipment

Floor-mounted equipment such as a steam kettle must be cleaned in-place. These items are cleaned and sanitized before and after each use with power spraying equipment and sanitization solution as described above.

Table-mounted equipment

Probably the dirtiest item in most food facilities is the can opener. Many food employees forget to run it through the warewasher or hand wash it at least daily. This is one area where cross contamination of foods can easily occur.

Loose equipment

Loose equipment includes utensils, small pots and pans, mixers, blenders, funnels, or other items used to prepare, serve, or handle foods. These items must be washed and sanitized as any other equipment.

624. Your role in reviewing facility design

Include public health in the process of reviewing the plans of a new or remodeled facility, as well as the plans for purchasing the food preparation equipment to be installed. We don't attempt here to cover all of the factors of a properly designed facility; rather we try to cover some of the most common requirements or design features that you should verify in the building design. You are not necessarily a design expert, but you can use your experience in performing sanitary evaluations and use good common sense to determine if the design is satisfactory.

Most requirements are listed in the National Sanitation Foundation (NSF) Standards; the NSF reference guide entitled "Sanitation Aspects of Food Service Facility Plan Preparation and Review," and the Food Code. Use these documents in CONUS and as a guide in overseas locations.

Kitchen

Obviously, this is the most important part of the design within a food facility. The first thing you need to determine is the type of food service operation. Will it serve hazardous foods or only non-hazardous foods? How many people will be served? Once you have answered these questions, then you can look at some specific aspects of the kitchen design.

Movement or flow of food through the kitchen

Is there a possibility of cross contamination through a design flaw, such as placing the walk-in refrigerators next to the garbage dumpsters outside? The food should come in the back door and flow logically through the preparation area to the front serving line and the customer. Ensure that this flow is not interrupted by latrines or other sources of contamination.

Type and location of sinks

There must be separate sinks for food preparation, equipment cleaning and sanitization, and hand washing in appropriate locations throughout the kitchen. Each sink needs to be equipped with hot and cold water, as well as a wall-mounted paper towel dispenser.

Grease traps

These are traps that collect grease from kitchen wastes. They should be located where emptying and cleaning will not contaminate any food contact surface. The best location is on a wall with outside access so trucks can be hooked up to the trap from outside the facility.

Pot and pan room

Have the pot and pan room accessible to the kitchen. However, make it a separate room to reduce cross contamination between the kitchen and the dirty pots and pans.

Storage areas

There are a variety of considerations when reviewing storage area plans. Cooling units must be located where they can discharge condensation outside the facility. They should be accessible and well insulated. Storage areas need to follow the flow of food from the back of the facility to the front. Doors must be tight fitting, and holes and cracks in storage areas should be sealed to reduce the possibility of insect or rodent infestation. This is especially important in the dry storage area where flour or sugar products are stored.

Outside area

The design of the outside back dock area is important. This is the first line of defense against insects and rodents. Since there are often flies present near the back dock of food facilities, install a fly fan or curtain at the doors of the facility and put screens on all windows. These measures prevent flies from entering the facility. The design of the outside area is to include the position of the dumpster. Ensure the dumpster is easily accessible but far enough away from the dock area to prevent insect and rodent infestations.

Equipment

When designing a facility, engineers first consider the type of service the facility will provide. Then they need to consider the type of equipment before the actual facility design is finished. If not, the equipment may be too large for the area. This will waste money and time. The requirements for cleaning equipment must also be considered when selecting equipment and designing the facility. Consider locations for water connections, if hoses are needed, and requirements for water heaters. Identify the location of drains, and determine a requirement for a garbage disposal.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

621. Factors contributing to a foodborne disease outbreak

1. Define the term “food employee.”

2. Give examples of foods from unapproved sources.

3. Why is preparing foods several hours or days in advance an unsafe practice?

4. What is the major problem with inadequately cooked poultry?

5. What is the most frequently occurring factor contributing to a foodborne disease outbreak?

6. What are some common problems associated with keeping food cold?

7. What are the required temperatures for holding hot and cold foods?

622. Controlling factors that contribute to foodborne disease

1. Who serves as the link between public health and food employees?

2. What should a food employee do when suddenly becoming ill while on the job?

3. What form(s) may be used when a medical examination is completed?

4. Who provides initial food employee training in food handling responsibilities?

5. Who provides training to the person in charge and/or food facility supervisors? How often is it given?

6. What is the hand-washing procedure for food employees returning from the latrine?

7. Potentially hazardous foods cannot be in a temperature danger zone for longer than what amount of time?

8. List at least three of the different acceptable methods for thawing foods.

9. How high off the floor should foods be stored and why?

623. Controlling microbial contamination by cleaning and sanitizing

1. List the specific variables that affect cleaning.

2. What is sanitizing?

3. Who approves the use of sanitizers in food facilities?

4. What is the minimum temperature and time requirement for hot water sanitization?

5. List the two chemicals commonly used for sanitizing in food service sanitation.

6. When sanitizing manually with a chlorine solution in tepid water, how long should the item be sanitized (come into contact with the chlorine)?

624. Your role in reviewing facility design

1. Where can you find most design requirements for food facilities?

2. Where should grease traps be located within a food facility?

3. Why should the equipment be chosen before the final facility design is finished?

5–2. Mobile Facilities and Special Evaluations

Sanitation evaluations take place in many different environments. You may have to evaluate mobile units, aircraft, off-base facilities, temporary facilities, and even vending machines. These food service operations deserve special attention. As a public health journeyman, be aware of the special problems these operations have. In this section, we discuss these special food service operations and vending machine sanitation so that you will have an idea why they are so special.

625. Mobile, temporary food facility operations, and vending machines

Have you ever bought a chili dog from a street vendor or a tuna sandwich and chips from a catering truck? Did you become ill several hours later? It's almost impossible for civilian public health authorities to police these food operations adequately. There are so many of them and very few inspectors. You might be gambling on stomach upset and illness when you get a quick bite to eat from your friendly neighborhood hot dog cart.

General restrictions and requirements for mobile facilities

The dispensing of foods on a military installation is a carefully controlled and evaluated process. The Army and Air Force Exchange Service (AAFES) operates the mobile food facilities on most Air Force installations. Although these mobile facilities have little space for food storage, trash disposal, or for cleaning and sanitizing materials, they are still food service areas. These facilities must comply with most requirements in the Food Code. However, there are some special requirements and exemptions that apply to mobile facilities. Mobile food facilities need not comply with requirements for water and sewage systems, or for cleaning and sanitizing equipment and utensils ***if***:

- They only serve foods prepared in a permanent facility that meets all requirements of the Food Code.
- The foods are packaged as individual servings and transported and stored in accordance with the Food Code.
- They serve nonhazardous beverages dispensed from covered urns or other protected equipment, including single service cans or bottles sealed in proper commercial facilities.
- The food service facility that supplies the mobile unit or pushcart has all the required cleaning and sanitizing equipment.

Operators of mobile units are limited to serving foods that are not potentially hazardous or foods wrapped at supply points and maintained at proper temperatures. These units also can prepare and serve frankfurters, Polish sausage, knockwurst, or similar types of meat items. The MTF commander may add additional requirements if necessary, or delete requirements when no public health hazard exists.

The food employees must follow the same guidelines as other food employees for such things as personal hygiene and food handling practices. The foods must be handled and protected the same as foods in a stationary facility, and the same temperature requirements apply.

For patron use, single-use cups, plates, spoons, forks, and knives are recommended. However, the mobile unit may use normal metal utensils for preparing foods and serving them to patrons provided the utensils could be washed and sanitized properly.

Water and waste requirements

Units that require a water system for washing *must* have:

- Potable water under pressure.
- Enough water for preparing food, cleaning and sanitizing utensils, and washing hands.
- A water inlet that is located where it cannot be contaminated by road dirt, waste discharge, oil, or grease. The inlet must be used only for adding potable water into the tanks. If the mobile unit produces liquid wastes, the waste tank must have a capacity for at least 15 percent more than the capacity of the water tank.

Supply and servicing area requirements

The mobile facility must operate from a supply point or fixed food facility and return to that facility at least once each day for re-supplying, cleaning, and servicing.

General restrictions for temporary food establishments

Temporary food establishments operate for a period of no more than 14 consecutive days in conjunction with a single event or celebration. Some examples of temporary food establishments might be a concession stand near the base softball fields or booths open during a base open house. As with any other facility, temporary food establishments must comply with the requirements outlined in the FDA Food Code and AFI 48–116 for food establishments. At most Air Force bases, public health must be notified in writing of such an establishment and when it will be open for operation. The

Aerospace Medicine Council and public health determine the frequency of inspection for these facilities.

Vending machine sanitation

Machine locations

Vending machines can be found just about anywhere. The location of these machines is important. Machines located outside must be protected from insect and rodent infestations and weather extremes. The area must be easily cleaned, free from pests, and well ventilated. If you find a candy machine located out in the hot sun, recommend a change of location. The area around a vending machine should be cleaned daily. There should also be trash containers at each location.

Food preparation and storage

All condiments and single-use utensils must be individually packaged or dispensed from clean, sanitary dispensers. All fresh fruits to be eaten raw, without peeling, can be dispensed unpackaged, but they must be washed in potable water prior to stocking the machine. Potentially hazardous foods must be placed in the machine as soon as possible after preparation and removed within three days of preparation or removal from frozen storage. These foods must display the pull date. All dairy products must be coded and must be removed by the manufacturer's expiration date. Remember when doing your inspections that there is an allowable "recovery time" after the machine is stocked for it to return to its required temperature. For chilled food, this time is 30 minutes, while hot food machines have two hours to heat the food to a hot holding temperature.

Transporting food, equipment, and supplies

Potentially hazardous foods must be protected from temperature fluctuations during transit and while in storage. All foods, single-use items, and containers must be protected from contamination while in transit.

Sanitary evaluations

The public heath flight evaluates the sanitary conditions of vending machines. Ask the vendors to open the machines for you. Vending machines inspection frequencies are determined by the Aerospace Medicine Council. The form you use to evaluate vending machines is AF Form 661, Vending Machine Inspection. The form is completed in duplicate. One copy is given to the agency evaluated and PH files the other copy.

626. Hospital kitchen and flight kitchen sanitation

Hospital kitchens

A hospital kitchen is different from a traditional food facility. A patient's resistance to infection may be compromised, increasing the chances of a foodborne disease outbreak if food is mishandled. Monitor the operation carefully and strictly enforce all rules, especially those that relate to time and temperature. Most patients are served in their rooms. Warming carts must keep the foods as warm as possible while the trays are being delivered. Food employees must practice excellent personal hygiene and ensure all equipment is kept clean and sanitized at all times. If a patient is allergic to the cleaning or sanitizing agents used in the kitchen, an alternate method must be available.

Flight kitchens

Flight kitchens prepare meals for aircrew members, flightline personnel, and aircraft passengers. The meals are intended to be wholesome, nutritious, and aesthetically appealing. The flight kitchen is an extension of the food service operation and normally is staffed by personnel from base dining halls. The need for good sanitation and careful food preparation is paramount here, too. An in-flight foodborne disease outbreak could result in disaster.

Environment

The mission of flight kitchens is unique. These facilities are responsible for providing meals anytime, day or night. They may have to prepare 4 to 200 boxed lunches in an hour's notice. With such a responsibility, most of the foods used in boxed lunches are prepared and stored in bulk, and the meals are actually constructed on an "as needed" basis. Examples of these foods include sandwiches, fried chicken, bagged chips, cookies, fruit, and canned beverages. Foods prepared for later use and boxed lunches must be labeled with the date and time of preparation. All foods must be stored chilled or frozen.

Frozen in-flight meals also are prepared and stored in the in-flight kitchen. These foil-packed dinners are very much like TV dinners. They have a six-month shelf life for in-flight use, but may be kept longer for ground feeding if still wholesome, and checked periodically for signs of thawing. When signs of thawing are observed, discard the meals.

Regardless of the type of meal prepared and stored in a flight kitchen, do not use potentially hazardous leftovers in the preparation of any in-flight meal.

Sanitation

Protecting food from contamination, storing foods at safe temperatures, cleaning and sanitizing food contact surfaces, and maintaining adequate personal hygiene are the basics of sanitation in a flight kitchen. Surely, it is obvious to you why the outbreak of a foodborne disease in an aircrew would be so serious. The loss of an aircraft, its crew, and possibly passengers would be a tragedy of terrible proportion not only to the families of the aircrew but also to the overall mission of the Air Force. As a public health journeyman, make sure that all aspects of AFI 48–116 and the Food Code are followed exactly to prevent such a situation.

627. Commercial evaluations

Military and commercial contract aircraft

General considerations

The health and sanitation aspects of flying have been a concern of PH for many years. Military aircraft come in all sizes and shapes. Each has a distinct mission and capability. However, one thing all military aircraft have in common is that they must carry survival equipment for the crews and passengers. Included in this survival equipment are food and water. Food may be in the form of survival rations or frozen in-flight meals, while water may be in cans. When not aboard the aircraft, these items are usually stored in buildings such as flight kitchens or survival gear storage buildings. Large passenger aircraft have water tanks on board. Food typically is brought on board just prior to take off. Small fighter aircraft have cans of water and survival rations stored in the rear of the cockpit.

The following standards are, at best, the minimum sanitation and hygiene requirements for aircraft. AFI 48–116 states that public health ensures that the food and water supplies and services for military aircraft meet the requirements unique to the Air Force mission.

The general requirements in aircraft sanitation and hygiene include the following:

- Food and water must be free of pathogenic organisms.
- Utensils and food contact surfaces must be clean and sanitary.
- Waste materials, especially human wastes, must be stored in a manner that prevents contamination of food and water supplies.
- All disease vectors are kept under control.

Food and water

In military aircraft, you are virtually assured that the water and food supplied to the galley are from approved sources. They normally are stored under sanitary and safe conditions, are safe for use, and

should not cause undue concern. However, the same cannot be said of commercial contract aircraft that transport military personnel. You cannot assume that either the food or the water is safe for use until you have evaluated them using your best judgment and inspecting skills. **NEVER** assume anything about the sanitary status of a commercial aircraft until you have evaluated it!

The sanitary standards outlined in the Food Code apply to the sanitation of aircraft. Foods must be refrigerated or frozen prior to serving. The Air Force does not allow hot foods to be stored aboard aircraft. Meals heated by ovens must be served immediately. Foods must be labeled with the time and date of preparation, date frozen, or time and date thawed. All personnel aboard the aircraft must protect food from contamination and use proper food handling practices.

Make sure that water used aboard military and commercial contract aircraft comes from an approved source. Sample the water on a periodic basis to ensure that chlorination is effectively controlling the microbiological levels in the storage tanks. The Bioenvironmental Engineering Section (BES) is responsible for water sampling on military and commercial-contract aircraft.

Cleaning and sanitizing

It is difficult to clean and sanitize food contact surfaces adequately in the confined spaces of an aircraft galley. Monitor the effectiveness of this service closely.

Waste storage

Aircraft designed to carry passengers must have latrines on board. These latrines are evaluated for sanitary conditions. Aircraft designs allow human wastes to be storaged in a belly tank near the latrines at the rear of the aircraft. Your job is to ensure that the sewage tanks have been cleaned before the plane is airborne. Although you are not responsible for visual inspection of the cleaning procedure in every instance, you ensure that cleaning, using proper procedures, is occurring. Therefore, you might want to observe the area occasionally.

Disease vector control

The fact that military and commercial contract aircraft travel around the world makes disease vector control of primary importance. While you are evaluating sanitation, it is also a good idea to look for insects and animals in aircraft arriving or departing. This was covered in more detail in Volume 2 of this course.

Aircraft evaluations

You are required to evaluate aircraft that store or serve food and water. Usually, you will be limited to those aircraft that provide mass passenger transport, not fighter or bomber aircraft. The frequencies for evaluating locally assigned aircraft, aboard which food and water can be stored and served, are approved by the Aerospace Medicine Council. Evaluate Air Mobility Command (AMC) contract carriers according to the AMC contracts and any additional guidelines HQ AMC/SGPM provides. These evaluations are to verify these carriers do not have a potential to cause a foodborne disease outbreak and are complying with the contract. Send a copy of the completed inspection report (AF Form 977, Food Facility Sanitation Evaluation) to the local AMC contract coordinator. If a rating is unsatisfactory, send a copy of the evaluation to the appropriate numbered Air Force. If in the 15th Air Force area, send the report to the 60th Medical Group/SGPM, 101 Bodin Circle, Travis AFB CA 94535–1800. If in the 21st Air Force area, send the report to the 438th Medical Group/SGPM 5250 New Jersey Ave., Fort Dix, NJ 08641–5071.

Except for the evaluation of AMC contract carriers, there are no specific Air Force standards for evaluating the sanitary condition of military or civilian passenger-carrying aircraft (you generally apply the requirements in the Food Code). The regulatory authority (public health or medical unit) must use sound judgment when evaluating all aspects of flight feeding. The potential for time-temperature abuse of potentially hazardous food is high. The World Health Organization's "Guide to Hygiene and Sanitation in Aviation" provides additional information for Public Health inspectors.

Off-base local sanitary evaluations

Off-base local (initial) evaluations are performed on commercial food establishments when they request to sell to the government. Air Force public health generally is only involved in off-base sanitary evaluations when the off-base facility is supplying only one base. These evaluations approve or disapprove the establishment as a source of food for the base.

Initial sanitary evaluations

Initial sanitary evaluations are performed using one of two formats. In the first, the complete facility is evaluated, including the entire production process, for sanitary abuse or compliance. In the second type, only the sanitary control system of the facility is evaluated. The second type of initial sanitary evaluation is most often used when performing an initial evaluation on a branch plant of a large national food producer or distributor. These companies are usually so well organized and self-policed that an in-depth evaluation would be a waste of time and government expense.

Routine sanitary evaluations

After an establishment gains approval to sell its product to a base, continue to evaluate it from time to time at a frequency established by the Aerospace Medicine Council. Routine sanitary evaluations determine the current sanitary status of these establishments. They result in continued approval, or disapproval if observed discrepancies are not corrected in a specific period of time.

Special sanitary evaluations

A special sanitary evaluation is made at an establishment to determine if the plant will remain on the approved sources listing. Special sanitary evaluations are initiated when food from the establishment is thought to be contaminated or unwholesome, or when significant sanitary deficiencies are found during a routine sanitary evaluation.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

625. Mobile, temporary food facility operations, and vending machines

1. What limits are placed on mobile units?

2. Who may add or delete requirements for mobile food facilities?

3. What is the requirement for water inlet connections on mobile units having water storage tanks?

4. The liquid waste tank on a mobile food facility must be how much larger than the water storage tank?

5. What is a temporary food facility?

6. Name some examples of a temporary food facility.

7. What is the acceptable recovery time after filling cold vending machines? Hot vending machines?

8. Who determines the inspection frequencies for vending machines on base?

9. What form is used to record vending machine evaluations?

626. Hospital kitchen and flight kitchen sanitation

1. What makes a hospital dining hall different from a typical food service facility?

2. Why are mobile warming units necessary in a hospital food facility?

3. What is the primary purpose of a flight kitchen?

4. When a frozen in-flight meal has been thawed completely, what must be done with the meal?

5. What should *not* be used in the preparation of any in-flight meal?

627. Commercial evaluations

1. What are the temperature requirements for hot foods stored aboard commercial contract aircraft?

2. Who is responsible for sampling water aboard aircraft?

3. What guidelines are used for evaluating commercial contract aircraft?

4. What form do you use to record an aircraft evaluation?

5. What is an initial sanitary evaluation?

6. List the types of off-base establishment inspections.

7. What is a routine sanitary evaluation?

8. When must a special sanitary evaluation be conducted?

5–3. Requirements and Criteria for Public Facilities and Employees

Public facility is a general term that covers a variety of facilities providing a variety of services. In this section we focus on public health's role and on how our facilities are to be maintained so as not to threaten the health of users at any time. This includes the importance of good health and personal hygiene of employees of these facilities.

628. Public health

Long before the development of modern principles of public health, people recognized relationships between our environment and disease. Although most of us think of running water and flushing toilets as being inventions of the last century, their history actually goes back several thousand years. Historical records indicate that the Myceneans and Minoans (1600–1200 B.C.) were responsible for building drainage systems and water closets (toilets), and that they actually used a water-flushing system. About 1500 B.C. the Hebrews wrote what is believed to be the first hygienic code in the Book of Leviticus. This code dealt with various personal and community responsibilities including such concerns as sanitation of living sites, disposal of human wastes and garbage, isolation of people with communicable diseases, and protection of water and food supplies.

The Romans are famous for their aqueduct system, which consisted of an extensive network of conduits that supplied safe drinking water. In fact, several of their aqueducts still exist and have been incorporated into the present day water and sewer systems. If the need for such things as safe water and proper waste disposal was recognized so long ago, why did the world have so many epidemics during the several hundred years prior to the 1900s?

With the coming of the Dark Ages, the Christian church played a very big part in the course of history that followed. In order to get away from the Greek and Roman lifestyles, which were considered to be pagan, any pampering of the body was highly discouraged. During this period, it was actually considered immoral to view your own body. As a result, people began to bathe less often and wore clothes that were extremely dirty. For all practical purposes, sanitation was nonexistent, with human wastes and garbage accumulating in and around dwelling places. This lack of personal hygiene and disregard for sanitation took its toll in the form of the infamous epidemics and pandemics of plague and cholera. It is estimated that in the seventeenth century, the bubonic plague, better known as the Black Death, claimed about 60 million lives. Large-scale communicable disease problems continued through the late 1800s. Between 1830 and 1860 cholera was repeatedly introduced into the Americas by groups of settlers. It quickly spread along the water routes and even followed the gold prospectors to California. Old public health data indicates that about one-third to one-half of an affected population died as a result of the outbreaks.

It was not until the late 1800s that a real interest and commitment to public health and the control of communicable diseases were recognized in this country and abroad. In the last 100 years, great strides have been made in all aspects of public health. The discovery of antibiotics and vaccines, along with enforcement of public health standards, has resulted in the high standards we enjoy today.

Your public health role

As a public health journeyman, your primary goal is to promote and preserve the health and well being of the Air Force community, including military and civilian personnel, and their dependents. You do this by monitoring sanitation and communicable disease trends on your base. As you just read, the earliest concern for public health was motivated by a need to control serious and widespread epidemics.

Prevent spread of disease

Today, the primary purpose of public health programs is to establish and maintain conditions necessary for the prevention of disease. While conducting an evaluation, your main concerns are those items that affect the health of the workers and patrons. There continues to be ongoing research in areas such as disease and vector control, sewage and waste disposal, proper food handling and preparation, and water supply certification.

Promote sanitation standards

The primary mission of the military is to protect and defend the country. Personnel cannot do this if they are ill. The promotion of good sanitation standards is important for everyone from the fighter pilot to the mechanic who fixes the aircraft. If you read through history, more men were put off the front line because of communicable diseases than from battle injuries. With this in mind, you have a very important job to do.

Resolve health and sanitation problems

Changing a procedure, ordering equipment, or simply educating the personnel working in the facility can solve most sanitation problems. However, some problems are not so easily solved because of design or structural problems. You may have to suggest ways to work around these problems if it is not possible to have them physically eliminated. It is essential that public health personnel convey their ideas of good public health practice to workers and supervisors, health care providers, and commanders. If you consider the possible effects on the Air Force mission that inadequate public health controls have, you will be able to appreciate the importance of public health education and making solid recommendations during public facility evaluations. When you consider that, based on your observations, you can make recommendations to your supervisors on ways to control, modify, or eliminate any problems, you find it is easy to appreciate the value of your recommendations.

Public health interventions

Since you are responsible for conducting periodic evaluations of public facilities on your base, you need to have some idea of what you need to observe in the facility, as well as what are acceptable and unacceptable practices and conditions. The interventions that are ongoing within a facility include facility maintenance, garbage and refuse handling and disposal, insect and rodent control, cleaning and sanitizing procedures, and employee health and hygiene policies.

In order for a facility to maintain a constant high level of sanitation, these interventions must be constant priorities. You will find specific guidance on these topics in AFI 48–117, *Public Facility Sanitation.*

Facility maintenance

For a facility to maintain a high level of sanitation, the building itself must be in good repair. The age of the facility is not necessarily important if it is kept in good repair. Both inside and outside areas should be free of rodents, insects, and trash. Floors should be constructed of materials that are easy to clean and well sealed to prevent harboring pests. All corners where floor, walls, and fixtures meet must be sealed tightly to minimize the entrance of insects and rodents. Having good lighting is also important, as people will tend not to clean what they can’t see.

Garbage and refuse handling and disposal

As an inspector you will have many areas to inspect inside a facility—but don't forget the outside area. Generally this is where the garbage is stored until it is picked up. Ensure all trash cans and dumpsters have close-fitting covers to prevent the attraction of insects and rodents. If such pests are attracted to the outside of a building, it is only a matter of time before they will go inside.

Insect and rodent control

Insects and rodents may serve as reservoirs or vectors for disease. When conducting an evaluation in a facility with an obvious insect infestation, determine what the supervisor has already done to attempt to control the situation. Determine what type of support, if any, the Entomology personnel are providing. When are they spraying? How often do they spray? What are they using? It may be that they are not using the appropriate pesticide, or the insects may have developed a resistance. In many cases, improved sanitation will take care of the problem. The most important point to stress is the relationship between good sanitation and insect and rodent control.

Be especially concerned about insect and rodent control within the child development facility. Be concerned about the type of pesticides that are used, and most important, when they are being applied. Pesticides are not to be applied just prior to opening the facility or during hours of operation. The most appropriate time to treat the facility is immediately after it closes for the day. This allows for dissipation of the chemicals.

Cleaning and sanitizing procedures

Cleaning and sanitizing personal items are important links in preventing the transmission of many diseases. Facilities such as the child development center, beauty and barber shops, and the gymnasium are a few excellent examples. There is specific guidance on this in AFI 48–117.

Employee health and hygiene policies

In any facility that performs a service to the public, it's absolutely imperative employees practice good personal hygiene and stay healthy. During your evaluations, you need to ensure personnel working in public facilities follow established guidelines to avoid passing infections or communicable diseases between patrons or between themselves and their patrons. The ideal is to have only healthy people working in ALL our facilities so that we can prevent, as much as possible, the spread of infections and communicable disease.

629. Public facility sanitation requirements

Our discussion is divided into three broad areas: personal service facilities, recreational facilities, and living quarters. Let's begin with the personal service facilities.

Personal service facilities

For the purposes of this lesson, a personal service facility is one that renders a specific personal service or issues personal use items for reuse. We cover beauty and barber shops, child development centers, family home day care, laundry services, and family services. Lets look at a few of these.

Beauty and barber shops

Focus your evaluation on the personal hygiene and sanitation practices that may influence the health and welfare of the patrons.

Employee health and hygiene

Do not permit people who have communicable diseases or infections to work in beauty and barber shops. The Aerospace Medicine Council decides what type of pre-employment medical exam is required and the frequency of routine exams.

Make sure all beauty and barber operators practice good personal hygiene. This includes everything from washing their hands between patrons to wearing a clean uniform or smock. In addition to their

own hygiene, operators must be able to recognize patrons who should not be served. This group includes, but is not limited to, patrons with lesions on the scalp, face, or neck (especially if they contain pus), and anyone infested with lice.

Cleaning and sanitizing

Articles such as neckstrips, towels, and headrest covers should be disposable or freshly laundered. Common-use hairbrushes, shaving mugs, shaving brushes, sponges, powder puffs, or styptic pencils cannot be used. Neck dusters can be used when they can be sanitized, using ultraviolet light, between patrons. If it is necessary to stop the flow of blood, operators can use sterile individual applicators with an appropriate powder or liquid. Operators should not use forced air to remove loose hair from patrons; however, they may use vacuum devices. Every effort needs to be made to keep the shop clean and free of accumulations of hair and trash.

In addition to keeping the environment clean, all instruments used to shave patrons or give manicures and pedicures must be thoroughly cleaned and disinfected after each patron to avoid the transfer of bloodborne diseases. These instruments must be washed thoroughly with soap and water, then soaked in an approved disinfectant for 15 minutes, rinsed in running water, and dried with a clean cloth or paper towel. Barber and beauty shop employees use a stiff bristle brush to clean clipper heads. The brush is not to be used for any other purpose. To clean other instruments, rinse them thoroughly with hot water after each patron.

Periodic evaluations help to identify problem areas and also give you an opportunity to educate the operators on the importance of good personal hygiene and good sanitation. Although there is no requirement for a standard checklist, most public health offices have developed a checklist of important areas to focus on for their use when inspecting these and other public facilities.

Child development center

Most Air Force bases have a child development center. This facility has become as essential as the MTF or the dining hall. The child development center is often the only place shift workers can leave their children. These centers often open early and close late for base recalls and mobility exercises. Our personnel are entitled to know that their children are cared for in a healthy and safe environment.

Unfortunately, the child development center may pose a communicable disease threat on your base if good personal hygiene practices and sanitation are absent. Child development centers provide the perfect environment for spreading communicable diseases by clustering children in a confined area. It is believed that children are exposed to more diseases in a child development center because they are exposed to more children. Each child brings his or her own infections to the center. Respiratory and diarrheal type diseases spread most easily in these centers. Children not only share their toys but also their viruses and bacteria. Considering these factors, it is very important that public health conduct good surveillance in these facilities to ensure children are not subjected unnecessarily to communicable diseases. In a nutshell, your job is to represent the MTF commander and monitor the sanitary conditions in these facilities.

As an evaluator, you must be thoroughly familiar with the contents of AFI 34–701, *Child Development Programs*. This instruction contains a great deal of guidance on the level of sanitation that must be maintained in the center. Caregivers also must be thoroughly familiar with the contents of AFI 34–701. The health and welfare of each child is their highest priority.

One practice that supports the health and welfare of the children is the separation of children by age, which is done in all Air Force child development centers. Especially important is the fact that children still in diapers are kept separate from toilet-trained children. The personal hygiene of children still in diapers is very questionable. Children under the age of two years may be “silent carriers” for Hepatitis A virus, which is shed in the feces. The term “silent carrier” means that the child actually is infected with the disease but does not exhibit any symptoms.

In addition to requiring separation of children by age, AFI 34–701 specifies the ratio of caregivers to children. This requirement is to ensure optimum supervision of the children.

Employee health and hygiene

Be concerned not only about the health of the children, but also the people who are caring for them. Caregivers must comply with several health requirements before and after they are employed. They must be in good mental and physical health, including being free from pulmonary tuberculosis and other communicable diseases. They must meet the requirements established by the state health department or the MTF commander. The child development center's medical advisor usually decides if any periodic medical examinations need to be performed. If such exams are required, they may be monitored through the occupational physical examination program.

Good personal hygiene, for caregivers and children, is absolutely essential and the FIRST STEP in breaking the chain of disease transmission. Caregivers need to be especially attentive to their daily hygiene before arriving at the center and then continue while at work. They must wash their hands after changing diapers, using the toilet, or assisting a child with the toilet, and before serving food to the children. They also need to ensure that the children wash their hands after using the toilet or before eating. Make sure there is an adequate supply of soap and disposable hand towels in the restrooms and at the sinks.

Children's health policies

All children attending a child development center have a health card on file that includes a record of all their immunizations. If their immunizations are not current for their age, they cannot be admitted to the center unless it is an emergency. Caregivers must be able to recognize common childhood illnesses and communicate this information to parents and health care providers. Each center needs to have specific guidance on the admission of children to the facility. AFI 34–701 gives very specific guidance on the admission of children with fevers, communicable diseases, and particular skin conditions. The child's primary caregiver will screen all children for signs of illness at the time of entry into the child development center. Primary caregivers will accept children with special health problems only at the concurrence of the program director and the program medical advisor. The medical advisor also may direct caregivers to refuse admission to children with any other diseases they feel may impact the health of the other children or the caregivers. At the same time, caregivers who arrive with contagious diseases or illnesses must not be allowed in contact with the children. However, if a child becomes ill while at the child development center, move the child to an isolation room until the parent or guardian arrives. Caregivers need to also be familiar with the readmission policies as outlined in AFI 34–701. The medical advisor may recommend more stringent readmission policies based on the incidence of communicable diseases in the community.

Cleaning and sanitizing procedures

Because of the potential for communicable disease transmission in this type of facility, strict sanitation is a must. Children are very curious and love to touch everything. They put things in their mouths and crawl all over the floors. There are very specific guidelines in AFI 34–701 on the cleaning of toys, furniture, equipment, surfaces (especially diaper-changing areas), walls, floors, and toilet facilities. Ensure child development center employees use agents that are appropriate for the task and approved by public health. It is very important that employees follow these guidelines and maintain a safe environment for children.

Family home day care

The family home day care program is an Air Force program that authorizes child-care in on-base family quarters. The purpose of this program is to supplement the child development centers, since it is impossible for them to handle all military and civilian dependents requiring child-care services.

Each program has a family home day care coordinator. As part of the licensing process, the coordinator will notify all the agencies required to conduct inspections, including public health. PH is

required to make an initial inspection of each home and forward recommendation for approval or disapproval to the family home day care coordinator. If approved, a sample of at least 10 percent of the homes is inspected each year.

Before an inspection is conducted, formulate a realistic checklist. The focus of your evaluations is on practices that contribute to the spread of communicable diseases and infections. Your evaluation should focus on the level of general sanitation in the home and the prospective caregiver's personal hygiene and ability to recognize situations when children should not be admitted.

Laundry facilities

Laundry facilities include coin-operated laundries, dormitory laundry rooms, and other base laundry facilities. AFI 48–117 contains specific guidance on the requirements for handling clean and dirty linen in laundry facilities.

During your evaluation, there are several factors you need to keep in mind. Your main concern is the sanitary condition of the facility. Your next concern is the flow of the linen from its arrival at the laundry until it exits at the clean end. Make sure that dirty linen doesn't contaminate the facility or clean linen when being handled, stored, or transported during the laundering process. Linen should arrive at one end of the facility for sorting; then proceed to the wash, dry, and pressing areas.

Family services

Most bases in the Air Force have a family services facility on the base. This is a non-profit service that is usually run by volunteers. They have a supply of household items such as dishes, bedding, ironing boards, and linens that are loaned to military personnel and dependents to assist them until their household goods arrive. This is usually a free service. When you evaluate this facility and service, your main concern is the procedures for cleaning and disinfecting reusable linens, bedding, and eating utensils. It is also important to consider how and where these items are being stored. The volunteers that run this service often have to settle for a location that is less than desirable. Some facilities may lack the type of sinks needed to properly wash and disinfect food and beverage containers. You may have to work with these people and offer suggestions on cleaning the items, proper storage, and, in some cases, pest management.

Recreational services

You will no doubt have a recreation supply service at your base, normally operated by Morale, Welfare, and Recreation Services (MWRS). The purpose of this facility is to rent items such as camping, skiing, and other sports equipment. The items for rent vary from base to base, depending on the recreational activities in the area. Your main concern in these facilities is the cleaning, sanitizing, and storing of personal use items, namely such items as sleeping bags, and food and beverage containers.

Recreation facilities

Facilities such as campsites and picnic areas are often located in remote areas on a base or at locations some distance from the base. Your main concern in these recreational areas is the accumulation of garbage and trash. Are there adequate containers and are they emptied frequently? If not, they will attract insects, rodents, and stray animals. If there are restrooms, what condition are they in? Are they clean and well maintained? Do they have an adequate supply of toilet tissue, soap, and water? Do the doors and screens fit tightly? The frequency of evaluating these areas depends on the climate and when the areas are open for use. Some areas may be open only during the summer, others year round. Other factors to consider include the frequency of use, number of people using an area, and the sanitation history.

Gymnasiums, fitness centers, and swimming pools

With the present day emphasis on health and fitness, most bases have very well equipped gymnasiums and fitness centers. In addition to the usual basketball courts, racquetball courts, and

weight rooms, many now have indoor pools, saunas, and whirlpool baths. These all present their own risks as far as sanitation and communicable disease control are concerned. AFI 48–117 has very specific guidance on the construction and maintenance of these facilities. Your job is to ensure facility personnel comply with this guidance and maintain a clean and healthy environment.

Restrooms and toilet facilities

Each restroom must be equipped with tight-fitting, self-closing doors. These doors are to be kept closed except during cleaning or maintenance, and each entryway shall be kept clean and in good repair.

When provided, each restroom will be conveniently located and have hand-washing sinks with soap and running water. If possible, liquid or powdered soap should be used, and each restroom will provide single-use towel dispensers or air dryers. Common-use towels are prohibited.

In order to reduce the opportunity for mold or mildew growth in restrooms, floors need to be constructed of watertight, easy-to-clean materials. Personnel will clean and disinfect bathrooms and toilet fixtures as needed, using a 50-ppm chlorine solution (one teaspoon of household bleach, that is, 05.25 percent sodium hypochlorite per gallon of water) or an equally effective sanitizer. All restrooms must have garbage cans for the collection of trash.

Dressing and locker rooms

Each dressing and locker room must be cleaned daily, including the floors. Floors must be disinfected at least once each week using a 50-ppm chlorine solution or an equally effective sanitizer. To ensure proper cleaning and reduce objectionable odors, each area must have adequate lighting and ventilation. In addition to dressing and locker room ventilation, each clothing locker must be ventilated. To ensure safety and prevent mold or mildew growth in wet areas, nonskid, easy-to-clean, and durable floor coverings must be provided. Floor coverings that support bacterial growth must not be used.

Saunas and steam rooms

If your base has an indoor pool and whirlpool bath, are they being monitored by the Bioenvironmental Engineer (BEE)? Keep in mind that whirlpool baths are kept at temperatures around 100°F and, consequently, chlorine evaporates more quickly than in a swimming pool. There are also more people in a much smaller body of water, increasing the potential for bacterial multiplication and the need for close monitoring of the chlorine level. It is very important that people with infections and skin lesions do not use a whirlpool bath. A sign also should be posted near the whirlpool bath to inform people of the potential health problems from heat stress. There should be a requirement for patrons to shower with soap and water prior to entering pools and whirlpool baths. This all boils down to good personal hygiene on the part of patrons and good sanitation on the part of the staff in charge of the facility.

Living quarters

We know you want everyone who resides on base to have a clean, safe, and healthy place to live. However, you do not normally inspect facilities assigned to individuals for private use. However, there are occasions when you may be asked to assist occupants or base officials by making recommendations for managing a problem in such a facility. Let’s discuss factors related to problems in several types of individual living quarters.

Family housing

Ordinarily, you do not inspect family housing unless requested to do so by the occupant or by the base commander. Occupants often call public health when they are experiencing insect or rodent problems. It is advisable to consult with the housing office prior to making such a visit. You may discover that the problem already has been taken care of. You cannot inspect a home based on a

neighbor's complaint. The neighbor should direct concerns to the housing officer who will then investigate the situation and call you if necessary.

Billeting facilities

This includes facilities such as billeting officer quarters (BOQ), temporary living quarters (TLQ), and dormitories. As in the case of family housing, you don't normally inspect individual rooms. However, you can inspect common areas, such as kitchens and lounges that are used by all occupants. Other areas you may evaluate include linen storage and housekeeping services.

Contract quarters

At many bases there are insufficient visiting officers and airmen quarters on the base to accommodate all the transient personnel who report to the base. The base must often contract with motels and hotels in the local area to house the overflow. The billeting office lets a contract in the local area to house transient personnel when quarters on base are filled. The billeting office agrees to pay a set price for each room under the contract.

Before a contract is awarded, the motel or hotel under consideration is subject to evaluation by key personnel on the base. A joint evaluation is normally conducted by representatives from billeting, safety, public health, and the fire department. Each representative evaluates the areas of concern and then makes a recommendation to the billeting officer to approve or disapprove the facility's bid for the contract.

As a representative of PH, you evaluate the sanitation aspects of the facility, just as you do an on-base facility. In general, is the facility clean, well maintained, and free of insects and rodents? Ask to see an unoccupied guest room and look at the general condition. Is the bathroom clean and odor free? What types of cleaners and sanitizers are used? How often is the linen changed? Observe the housekeeper's cart to determine if clean and dirty linen is handled properly and separately. Ask to see the clean and dirty linen storage areas. Are they separate? Is clean linen subject to contamination? How are drinking glasses and ice buckets cleaned and sanitized in-between guests? How and where is trash disposed? Is there evidence of good insect and rodent control?

Evaluation frequency criteria

As we mentioned earlier, PH conducts evaluations of on-base facilities to ensure the health, welfare, and enjoyment of all people who use them. How often these evaluations are conducted varies from one base to another and one facility to another, based on a number of different factors. Factors that PH considers when recommending the frequency of evaluations include geographical location, local conditions, sanitary history of the facility, potential for public health problems, and the number of people who use the facility.

AFI 48–117 states that the minimal frequency of inspection in a public facility is once a year, but this is strictly a minimum. Most facilities need to be considered on an individual basis using the criteria mentioned above. PH normally determines the frequency using these criteria and then presents it to the Aeromedical Council for approval. Here again, this establishes a minimum frequency. PH may evaluate as often as necessary based on local conditions or the potential for health effects. However, if it is found that a facility's frequency of evaluation can be decreased, the Aeromedical Council must approve this.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

628. Public health

1. What is the primary purpose of public health programs today?

2. Why is it so important for you to promote good sanitation on an Air Force base?

3. What value are the recommendations you make during a facility evaluation?

4. Why is it important to have good lighting in a facility?

5. Why is garbage and refuse handling important?

6. What is the most important measure in good insect and rodent control?

7. When is the best time to spray for insects in the child development center?

8. Which Air Force instruction gives specific guidance on the cleaning and sanitizing procedures in public facilities?

9. Why is good personal hygiene so important for people working in public facilities?

629. Public facility sanitation requirements

1. What should be the focus of your inspection at the beauty and barber shops?

2. Who decides the type and frequency of physical examination for the barbers on your base?

3. What should barbers use to stop the flow of blood?

4. What should be done with manicure and pedicure instruments after they have been used?

5. Why does the child development center provide the perfect environment for spreading disease?

6. Why are diapered children and nondiapered children separated at the child development center?

7. What is the first step in breaking the chain of disease transmission in a child development center?

8. Which Air Force instruction provides guidance on the admission of children with illnesses to the child development center?

9. What happens when a child becomes ill while at the child development center?

10. What should be the focus of your evaluation in support of the family day care program?

11. What is your first concern during an evaluation of family services?

12. Why is the management of garbage and trash at picnic areas and campsites so important?

13. When would you conduct an evaluation of private living quarters?

14. When evaluating a BOQ, what areas do you inspect?

15. Who accompanies PH during an evaluation of contract quarters?

16. What are some of the factors considered in determining the frequency of public facility evaluations?

17. What is the minimum frequency for conducting an evaluation of a facility?

18. Who is the approval authority for the frequency of evaluations?

5–4. Directives and Techniques

We have already mentioned some of the directives outlining the sanitation requirements in various facilities. In this section we review those directives, and we also introduce some others that you need to be aware of when conducting your sanitary evaluations.

630. Facility sanitation directives

FDA Food Code

The current version of the AF Food and Drug Administration Food Code is the primary reference for sanitation in food facilities. The Food Code applies to both appropriated and nonappropriated fund activities. It is imperative that any food service contracts, for any part of the food service operation, include this regulation as a reference. Without this reference, managers of contractor-operated facilities may not be aware of sanitation requirements.

Defense Commissary Agency (DeCA) directives

These directives cover the sanitation of the different departments within the commissary, such as meat, produce, grocery, and customer service departments. Keep in mind that the Food Code is the only directive that we can *enforce* in a food facility.

DeCA Directives		
Directive #	*Title*	*Explantion of Directive*
40–3	*Directive, Meat Department Operations*	Covers the sanitation of meat departments and delicatessens operated within the commissary. Certain sections give temperature requirements, cleaning and sanitizing procedures, personal hygiene requirements, the prohibition of tobacco use, and the requirements for a self-inspection program.
40–4	*Produce Department Operations*	Sets forth the procedures to operate the produce department in all DeCA commissaries. The directive is broken down into areas of interest within the produce department, including storage, rotation (first in, first out), handling, and general sanitation.
40–5	*Grocery Department Operations*	Covers sanitation requirements within the resale store area—the area where customers shop. There is a specific paragraph that discusses the routing of satisfactory and unsatisfactory sanitary evaluations, and it states that the Regional Commissary officer or commander will ensure corrective action is taken, based on your sanitary evaluation reports.
40–6	*Customer Service Department*	Sets procedures for the operation of the commissary's customer service department. Customer service operations that involve public health include handling customer complaints (DeCA Form 40–45) and general store sanitation.

Exchange Service Regulation (ESR) 1–2, *Veterinary, Preventive Medicine, and Public Health Services*

This publication contains the responsibilities of the public health office to provide medical evaluation services to AAFES. The responsibilities are not only in the areas of facility sanitary evaluations and environmental surveys, but food inspection as well. ESR 1–2 explains the reporting procedures for

nonconformances found during an AAFES sanitary evaluation and tells where to forward reports of unsatisfactory evaluations.

AFI 48–116, *Food Safety Program*

This instruction is another primary reference (along with the Food Code) for sanitation in food facilities. It contains information on ensuring that foods are obtained from an approved source and the procedures to conduct a kitchen inspection.

AFI 48–117, *Public Facility Sanitation*

This instruction outlines the sanitation requirements for barber and beauty shops, bathing facilities, laundry facilities, sleeping areas, outdoor recreation areas, and other public facilities. It also presents insect and rodent control procedures for public facilities. It describes the installation commander's and MTF commander's responsibilities concerning sanitation for these facilities.

AFI 34–701, *Child Development Programs*

This instruction specifies in detail the requirements for the operation of a child development center and the family day care homes program. There are sections covering health, safety, personnel, facilities and equipment, operating policies, medical care, sanitation, and food service operations. Use this instruction as a guide when conducting an evaluation of the child development center or family day care homes.

631. Facility evaluation techniques

You have learned the sanitation requirements for food facilities and public facilities, as well as the directives you use to conduct evaluations of these facilities. Now let's look at evaluations as a process.

Performing an evaluation

Preparation steps

Be prepared before you actually enter a facility to perform an evaluation. Be very familiar with pertinent instructions, have a good idea of what you are likely to find in the facility, and then determine what equipment or supplies you will need. Finally, you're ready to decide on the best time to visit the facility.

Review regulations and history

Proper review is a key step to effectively evaluate foodservice facilities. What do you need to review? First, pull the facility folder and review it for trends; that is, discrepancies that never seem to go away! Also, check the time periods of other evaluations. You don't want to be predictable, nor do you want to evaluate facilities during the same times of the day. Evaluate facilities during all phases of operation, including after-duty hours. Group the evaluation times into periods such as morning, lunchtime, afternoon, evening, and after-duty hours (which includes weekends).

Be sure to review regulations and other instructions that pertain to the facility. Being familiar with the requirements will better enable you to relate them to management and workers.

Determine equipment and supplies you will need

After reviewing a facility's sanitation history and pertinent facility instructions, your next step is to make sure you have all of the equipment needed to evaluate the facility. Equipment might include thermometers (both a holding and baby dial thermometer), paper, pens, chlorine test strips, a flashlight, and a good supply of evaluation forms for both food facilities and public facilities. The bottom line is to be prepared. Know what to evaluate and have the right equipment to test the sanitary conditions of the facility.

Select a time

The selection of time is very important. There are many things to consider before selecting the time of the evaluation. First, consider when past evaluations were performed. If many of the evaluations were conducted in the morning and seldom in the afternoon, then schedule the next evaluation in the afternoon. Evaluate facilities during all phases of operation, including after-duty hours. Group the evaluation times into periods such as morning, lunchtime, afternoon, evening, and after-duty hours (which includes weekends).

Procedure

The time has come; the evaluation is set to begin. While there is no formal set of procedures for you to follow, we offer guidelines here to make your evaluation productive and meaningful.

Notify management

Notify the manager upon your arrival at the facility. This serves several important functions. First, you are telling the manager the purpose of your visit. Since there are many reasons you might visit a facility, it is essential the manager understands why you are there this time. Try to understand the problems of the facility manager, but at the same time do not jeopardize the sanitation standards that might make someone ill. Establish a good rapport. Remember, you are evaluating to help, not hurt the facility. Storming into a facility like a police raid will shut off communications and cripple your ability to adequately perform the evaluation. If the facility manager knows you are there to help, you will get a lot more done. Once rapport is established, invite the manager to join you on the evaluation. Health education is a big part of facility sanitation evaluations. For this reason, it's important the manager, or designated representative, accompany you on the evaluation.

Select a starting point

After notifying the manager and establishing rapport, select a starting point for your evaluation. Don't let the manager lead you around. You choose the area to begin the evaluation. Be careful not to start every evaluation at the same point. Select the starting point at random to keep management guessing and to keep your perspective fresh. You may see something this time that you missed during past evaluations.

Take notes

While performing the evaluation, bring a few sheets of plain paper with you to keep track of the discrepancies you find. Also, ask the manager about the sanitation practices you observe. For example, if you find meat thawing on a table, ask how they plan to use it, and how long it will be out at room temperature. If you see a discrepancy, use the opportunity to educate the manager and workers about the possible consequences. Don't forget to annotate how well management is or is not following up on past discrepancies. Do not hesitate to write up management if management is the real problem. Make sure you have all of the facts before you write the report. By taking notes during the evaluation, you are giving yourself a method to recall the discrepancies and to organize your report. Take notes on temperatures you take, any discrepancies you see, as well as any good practices you notice.

Educate management and workers

The overall purpose of performing sanitary evaluations is to prevent foodborne disease outbreaks. The purpose of identifying discrepancies and writing a report is to provide management with recommendations to correct the discrepancies and prevent them from recurring. The only way to change the behavior of facility workers is to educate them. This process must begin with management, since management has the primary responsibility for educating workers. Timely and effective education results in fewer discrepancies in a facility.

632. Writing evaluation reports and identifying trends

After walking through a facility and making notes of the sanitary conditions, you're ready to write your evaluation report. Find a quiet location to do this. The form you use will be either an AF Form 977, Food Facility Sanitation Evaluation, for a food facility, or a local form or checklist for a public facility. You will give your recommendations and assign a rating to the facility.

Food facility sanitation evaluations

You use AF Form 977 (figs. 5–2A and 5–2B) to document a food facility evaluation. This form has three functions:

1. Officially notifies the facility management of discrepancies and provides recommendations to correct them.
2. Provides management with information to educate their employees.
3. Provides a follow-up tool to prevent repeat discrepancies.

Evaluate items

First, complete the top section of AF Form 977, which includes facility, building number, date, and time. Annotate in the appropriate noncompliance block each discrepancy you found during the evaluation. The printed items on the AF Form 977 correspond to the table of contents in the FDA Food Code. Note that those items in the Food Code that are marked with an asterisk (*) are considered to be critical items. Critical items are provisions of the Food Code that, if in noncompliance, are more likely than other violations to contribute to food contamination and increase the risk of a foodborne disease outbreak.

Describe discrepancies

Describe each identified discrepancy in a narrative, paragraph format. To satisfy the intent of why you are doing sanitary evaluations, most narratives should have four parts:

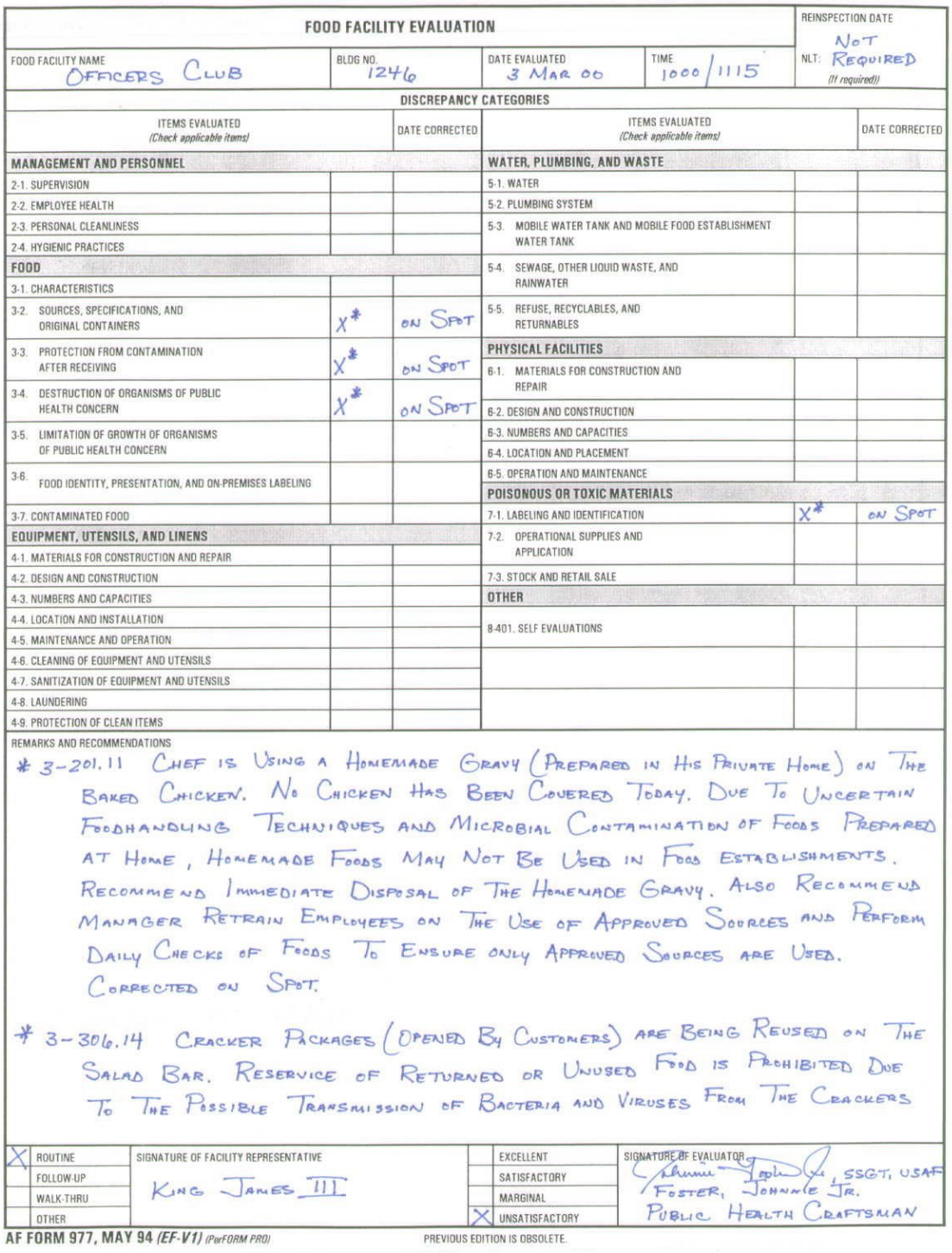
1. Identify the discrepancy.
2. Explain why it is a discrepancy.
3. Offer a short-term solution.
4. Give a long-term solution.

Start your narrative by stating the main point or the exact problem. You can usually describe the problem in one or two short complete sentences. Be clear and specific. Write so that someone not working in the facility will get a good mental image of the problem. Then, follow-up by explaining why the discrepancy is a problem. Avoid quoting the regulation as your sole source for why the problem was noted. Use this part of the narrative to educate those who might read your report. Will the discrepancy lead to food spoilage, monetary loss, or a foodborne disease outbreak? Clearly explain why the discrepancy is a problem. After you address the "what" and "why" of each problem, make your recommendations for possible solutions.

Make recommendations

When you find a discrepancy in a food facility or a public facility, your job is to recommend a solution to correct it. These recommendations are very important, as this is another opportunity for you to educate management.

When you make recommendations to management, make two types. First, recommend a short-term fix to the problem. That is, what can management do to correct the problem right now? However, the short-term fix is not always the long-term answer. Most permanent solutions to a problem often cannot be established overnight. This is why long-term solutions are needed as well. Let's take a closer look at both the short-term and long-term recommendations.



FOOD FACILITY EVALUATION

REINSPECTION DATE: NOT REQUIRED NLT: (If required)

FOOD FACILITY NAME	BLDG NO.	DATE EVALUATED	TIME
OFFICERS CLUB	1246	3 MAR 00	1000/1115

DISCREPANCY CATEGORIES

ITEMS EVALUATED (Check applicable items)		DATE CORRECTED
MANAGEMENT AND PERSONNEL		
2-1. SUPERVISION		
2-2. EMPLOYEE HEALTH		
2-3. PERSONAL CLEANLINESS		
2-4. HYGIENIC PRACTICES		
FOOD		
3-1. CHARACTERISTICS		
3-2. SOURCES, SPECIFICATIONS, AND ORIGINAL CONTAINERS	X*	ON SPOT
3-3. PROTECTION FROM CONTAMINATION AFTER RECEIVING	X*	ON SPOT
3-4. DESTRUCTION OF ORGANISMS OF PUBLIC HEALTH CONCERN	X*	ON SPOT
3-5. LIMITATION OF GROWTH OF ORGANISMS OF PUBLIC HEALTH CONCERN		
3-6. FOOD IDENTITY, PRESENTATION, AND ON-PREMISES LABELING		
3-7. CONTAMINATED FOOD		
EQUIPMENT, UTENSILS, AND LINENS		
4-1. MATERIALS FOR CONSTRUCTION AND REPAIR		
4-2. DESIGN AND CONSTRUCTION		
4-3. NUMBERS AND CAPACITIES		
4-4. LOCATION AND INSTALLATION		
4-5. MAINTENANCE AND OPERATION		
4-6. CLEANING OF EQUIPMENT AND UTENSILS		
4-7. SANITIZATION OF EQUIPMENT AND UTENSILS		
4-8. LAUNDERING		
4-9. PROTECTION OF CLEAN ITEMS		

ITEMS EVALUATED (Check applicable items)		DATE CORRECTED
WATER, PLUMBING, AND WASTE		
5-1. WATER		
5-2. PLUMBING SYSTEM		
5-3. MOBILE WATER TANK AND MOBILE FOOD ESTABLISHMENT WATER TANK		
5-4. SEWAGE, OTHER LIQUID WASTE, AND RAINWATER		
5-5. REFUSE, RECYCLABLES, AND RETURNABLES		
PHYSICAL FACILITIES		
6-1. MATERIALS FOR CONSTRUCTION AND REPAIR		
6-2. DESIGN AND CONSTRUCTION		
6-3. NUMBERS AND CAPACITIES		
6-4. LOCATION AND PLACEMENT		
6-5. OPERATION AND MAINTENANCE		
POISONOUS OR TOXIC MATERIALS		
7-1. LABELING AND IDENTIFICATION	X*	ON SPOT
7-2. OPERATIONAL SUPPLIES AND APPLICATION		
7-3. STOCK AND RETAIL SALE		
OTHER		
8-401. SELF EVALUATIONS		

REMARKS AND RECOMMENDATIONS

* 3-201.11 CHEF IS USING A HOMEMADE GRAVY (PREPARED IN HIS PRIVATE HOME) ON THE BAKED CHICKEN. NO CHICKEN HAS BEEN COVERED TODAY. DUE TO UNCERTAIN FOODHANDLING TECHNIQUES AND MICROBIAL CONTAMINATION OF FOODS PREPARED AT HOME, HOMEMADE FOODS MAY NOT BE USED IN FOOD ESTABLISHMENTS. RECOMMEND IMMEDIATE DISPOSAL OF THE HOMEMADE GRAVY. ALSO RECOMMEND MANAGER RETRAIN EMPLOYEES ON THE USE OF APPROVED SOURCES AND PERFORM DAILY CHECKS OF FOODS TO ENSURE ONLY APPROVED SOURCES ARE USED. CORRECTED ON SPOT.

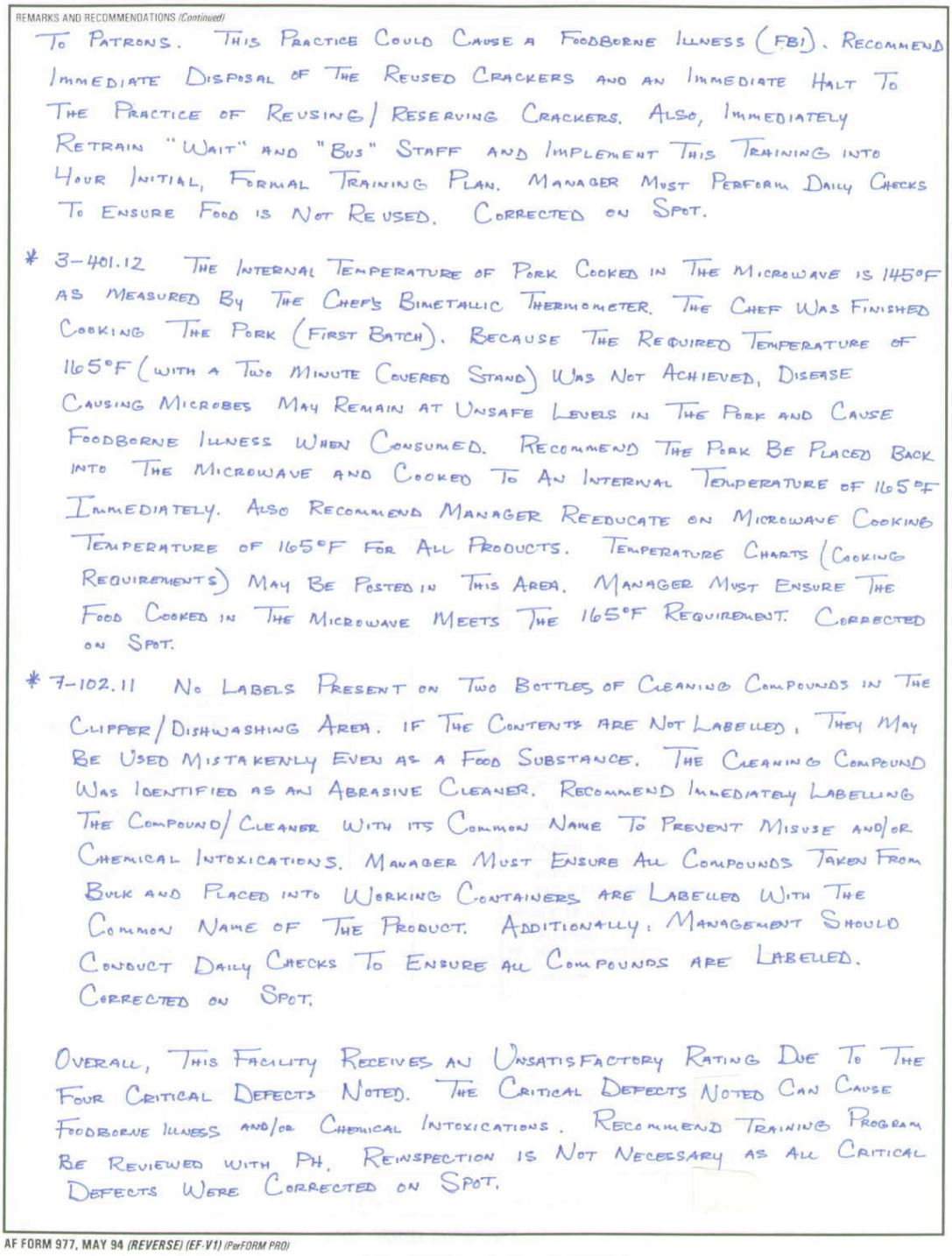
* 3-306.14 CRACKER PACKAGES (OPENED BY CUSTOMERS) ARE BEING REUSED ON THE SALAD BAR. RESERVICE OF RETURNED OR UNUSED FOOD IS PROHIBITED DUE TO THE POSSIBLE TRANSMISSION OF BACTERIA AND VIRUSES FROM THE CRACKERS

X	ROUTINE	SIGNATURE OF FACILITY REPRESENTATIVE		EXCELLENT
	FOLLOW-UP	KING JAMES III		SATISFACTORY
	WALK-THRU			MARGINAL
	OTHER		X	UNSATISFACTORY

SIGNATURE OF EVALUATOR: SSGT, USAF
FOSTER, JOHNNIE JR.
PUBLIC HEALTH CRAFTSMAN

AF FORM 977, MAY 94 (EF-V1) (PerFORM PRO) PREVIOUS EDITION IS OBSOLETE.

Figure 5–2A. Sample, AF Form 977, Food Facility Evaluation Checklist (Front).



REMARKS AND RECOMMENDATIONS (Continued)

TO PATRONS. THIS PRACTICE COULD CAUSE A FOODBORNE ILLNESS (FBI). RECOMMEND IMMEDIATE DISPOSAL OF THE REUSED CRACKERS AND AN IMMEDIATE HALT TO THE PRACTICE OF REUSING/RESERVING CRACKERS. ALSO, IMMEDIATELY RETRAIN "WAIT" AND "BUS" STAFF AND IMPLEMENT THIS TRAINING INTO 4HOUR INITIAL, FORMAL TRAINING PLAN. MANAGER MUST PERFORM DAILY CHECKS TO ENSURE FOOD IS NOT REUSED. CORRECTED ON SPOT.

* 3-401.12 THE INTERNAL TEMPERATURE OF PORK COOKED IN THE MICROWAVE IS 145°F AS MEASURED BY THE CHEF'S BIMETALLIC THERMOMETER. THE CHEF WAS FINISHED COOKING THE PORK (FIRST BATCH). BECAUSE THE REQUIRED TEMPERATURE OF 165°F (WITH A TWO MINUTE COVERED STAND) WAS NOT ACHIEVED, DISEASE CAUSING MICROBES MAY REMAIN AT UNSAFE LEVELS IN THE PORK AND CAUSE FOODBORNE ILLNESS WHEN CONSUMED. RECOMMEND THE PORK BE PLACED BACK INTO THE MICROWAVE AND COOKED TO AN INTERNAL TEMPERATURE OF 165°F IMMEDIATELY. ALSO RECOMMEND MANAGER REEDUCATE ON MICROWAVE COOKING TEMPERATURE OF 165°F FOR ALL PRODUCTS. TEMPERATURE CHARTS (COOKING REQUIREMENTS) MAY BE POSTED IN THIS AREA. MANAGER MUST ENSURE THE FOOD COOKED IN THE MICROWAVE MEETS THE 165°F REQUIREMENT. CORRECTED ON SPOT.

* 7-102.11 NO LABELS PRESENT ON TWO BOTTLES OF CLEANING COMPOUNDS IN THE CLIPPER/DISHWASHING AREA. IF THE CONTENTS ARE NOT LABELLED, THEY MAY BE USED MISTAKENLY EVEN AS A FOOD SUBSTANCE. THE CLEANING COMPOUND WAS IDENTIFIED AS AN ABRASIVE CLEANER. RECOMMEND IMMEDIATELY LABELLING THE COMPOUND/CLEANER WITH ITS COMMON NAME TO PREVENT MISUSE AND/OR CHEMICAL INTOXICATIONS. MANAGER MUST ENSURE ALL COMPOUNDS TAKEN FROM BULK AND PLACED INTO WORKING CONTAINERS ARE LABELLED WITH THE COMMON NAME OF THE PRODUCT. ADDITIONALLY, MANAGEMENT SHOULD CONDUCT DAILY CHECKS TO ENSURE ALL COMPOUNDS ARE LABELLED. CORRECTED ON SPOT.

OVERALL, THIS FACILITY RECEIVES AN UNSATISFACTORY RATING DUE TO THE FOUR CRITICAL DEFECTS NOTED. THE CRITICAL DEFECTS NOTED CAN CAUSE FOODBORNE ILLNESS AND/OR CHEMICAL INTOXICATIONS. RECOMMEND TRAINING PROGRAM BE REVIEWED WITH PH. REINSPECTION IS NOT NECESSARY AS ALL CRITICAL DEFECTS WERE CORRECTED ON SPOT.

AF FORM 977, MAY 94 (REVERSE) (EF-V1) (PerFORM PRO)

Figure 5–2B. Sample, AF Form 977, Food Facility Evaluation Checklist (Back).

Short-term

A short-term recommendation is used to correct a discrepancy on the spot. For example, let's assume during an evaluation you notice a food service worker preparing food without a head cover. The short-term solution to this problem is to have the worker put on a hat or hair net.

Sometimes there is only one possible solution to a problem because the regulation is so specific in a particular area. On the other hand, there are times when you might want to suggest more than one solution. It is best to provide a few short-term solutions if possible. Explain these short-term recommendations verbally and in writing in your report.

Long-term

When you find a discrepancy during an evaluation, you provide not only a short-term recommendation, but a long-term solution as well. This type of recommendation is used to prevent the discrepancy from recurring. For the food service worker who did not wear a head cover, the short-term solution was to have the worker put on a head cover. What do you think the long-term recommendation should be? How about a refresher training class conducted by the management on the importance of wearing head covers? This might be an acceptable solution depending on the history of this individual. On the other hand, you might suggest that management check employees more frequently throughout the day to ensure they meet personal hygiene standards. Again, explain these recommendations verbally and then write them in your report.

Some long-term problems may take several months to correct, such as replacing a warewashing machine or modifying a building. You will find, however, that most long-term solutions require some type of management action. When conducting future evaluations, be sure to evaluate the follow-up actions taken by management and document them by making status entries on your evaluation report.

Assign a rating

After all of the discrepancies have been identified and recommendations made, it is time for you to assign a rating to the facility. This requires good judgment on your part. Not every situation is cut and dry when it comes to assigning a rating. However, here are several things to consider.

First, look at the sanitation history of the facility. This is one area that plays a key role. Also, look at management's attitude toward developing and maintaining a sanitary facility. During some evaluations, it's easy to decide the rating because the discrepancies either pose a significant potential for creating a foodborne disease outbreak, or they are extremely minor. You must know the public health office policy before assigning ratings. Your entire office must discuss this area before evaluations are conducted. Keep the lines of communication open among the people in your office in order to avoid different ratings from different people even though the discrepancies are the same. Giving consistent ratings helps maintain public health's credibility in the health care arena. Here are the different ratings you can assign to facilities and the basic criteria for choosing them.

Excellent

This rating is used for facilities that exhibit outstanding sanitation practices. Reserve excellent ratings for those facilities consistently demonstrating a level of sanitation above the expected standard. Make sure the facility actually deserves the rating. The excellent rating is a tool to recognize outstanding facilities for their dedication to excellence. Ensure there is a method to make commanders aware of this excellence and for the installation commander to formally recognize the facility.

Satisfactory

The satisfactory rating is used for facilities that exhibit only minor discrepancies. The facility must not exhibit any sanitation condition that could significantly increase the potential for creating a foodborne disease outbreak. Sometimes there is a fine line between an excellent and a satisfactory rating. Again, good judgment must be used to rate facilities. There is no further action required for facilities rated satisfactory unless your MAJCOM or base requires further action.

Marginal

The marginal rating is based primarily on the same criteria as the satisfactory rating, except that a downward trend in performance has become apparent. Discrepancies may have been repeated, or the trend of several different minor discrepancies has been reported at each evaluation. It is important never to give a marginal rating when an unsatisfactory rating is deserved. The best way to distinguish between a marginal and an unsatisfactory rating is that the discrepancies listed on a marginal rating should not present a high likelihood of causing a foodborne disease outbreak. After giving a marginal rating, you must conduct another evaluation within five working days to ensure the discrepancies have been corrected and measures implemented to prevent recurrence.

Unsatisfactory

An unsatisfactory sanitary rating is given when a critical item is identified. Provide an explanation in the report if a critical item is noted, but an "unsat" rating is not given. The follow-up procedure for this type of rating is to reevaluate the facility within 24 hours (or next business day), unless it is not feasible for the discrepancies to be corrected within that amount of time. Also, if the discrepancies can be fixed on the spot, a reevaluation may not be necessary. An unsatisfactory rating requires that you send a report through the Chief, Aeromedical Services and MTF commander to the Air Base commander or equivalent. The results of the follow-up inspection must accompany the report to the installation commander.

Walk-through or make education visits to a facility

There are other times you might notice discrepancies in a food facility. You may visit a facility just to see how the sanitation practices are going, or you may be eating in the facility. These probably would be categorized as a "walk-through" or an educational visit. Annotate any discrepancy you find during these visits on the back of the previous AF Form 977. Mark the date, time, discrepancy, and your recommendation, and then sign your annotation. There is no requirement to perform these types of evaluations; however, they are a good way to keep an eye on facilities, especially those in marginal or unsatisfactory categories.

Public facility sanitation evaluations

There is no standard Air Force form to report a public facility sanitation evaluation. Each PH office establishes criteria for rating these facilities. Many offices use a checklist developed for specific facilities such as one for gymnasiums, one for barber and beauty shops, and one for laundry services. The evaluations are basically the same as for food facilities. The ratings are the same, and you brief management in a similar manner. The only difference is the form used to document your evaluation. You write up the results of your evaluations in a report (remember the report form we showed you in unit 2?) similar to the example in AFI 48–117. All marginal and unsatisfactory reports require follow-up evaluations if public health deems them necessary. For AAFES facilities found to be unsatisfactory, the public health officer must send a copy of the report to the local Exchange manager and to AAFES headquarters.

Trend analysis

A trend analysis is the tracking of data in one specific area for a period of time and then analyzing the data. Public health personnel use trend analyses to identify sanitary trends in food and public facilities. The analyses also can be used to determine the effectiveness of management practices. Poor sanitation trends over a period of time can indicate a management problem. Trend analyses are excellent tools to keep commanders and managers informed of the status of base food service and public facilities. The facility managers use this analysis to prevent future discrepancies.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

630. Facility sanitation directives

1. What are the two primary documents used for the medical evaluation of food facilities?

2. What does ESR 1–2 contain?

3. What regulation do you use to evaluate sanitation procedures performed in public facilities?

4. You use AFI 34–701 to evaluate what two facilities?

631. Facility evaluation techniques

1. What is the first step in preparing for a sanitation evaluation?

2. What are some considerations for selecting the time of an evaluation?

3. Why would you take a few sheets of plain paper with you on an evaluation?

4. What is the overall purpose of performing sanitary evaluations?

632. Writing evaluation reports and identifying trends

1. Name the three reasons the AF Form 977 is used to evaluate food facilities.

2. What are the four parts included in your write-up of a discrepancy on an AF Form 977?

3. What are the four different ratings you can give to a facility?

4. How soon is a follow-up inspection conducted after an unsatisfactory food facility sanitation rating has been given?

5. How do you document walk-throughs and educational visits to food facilities?

6. Who establishes criteria for rating public facilities on a base?

7. How do you report unsatisfactory AAFES public facility sanitation evaluations?

8. How do PH personnel use trend analysis reports?

Answers to Self-Test Questions

621

1. Any person who works with unpackaged food, food equipment or utensils, or food contact surfaces in any way.
2. Raw dairy products, seafood from polluted waters, and home-canned foods.
3. The CDC reports this is a contributing factor for about 26 percent of reported outbreaks of foodborne disease. Certain microorganisms grow rapidly in food even while cooling in the refrigerator. Also, the time and extra handling involved can contribute to contamination.
4. *Salmonella* contamination.
5. Failure to keep hazardous foods at proper temperatures.
6. Malfunctioning freezers or refrigerators, thawing frozen foods at room temperature, and failing to store foods in shallow pans for more rapid cooling.
7. Cold—41°F or below; hot—140°F or above.

622

1. The person in charge.
2. Report to the medical facility or his or her health care provider and the person in charge.
3. AF Form 1021, Medical Certificate, or a SF 600 or SF 600 overprint.
4. Facility supervisors.
5. Public health; annually.
6. They should clean their hands, exposed portions of their arms, and areas underneath the fingernails and between the fingers by vigorously rubbing together the surfaces of their lathered hands and arms for at least 20 seconds, and thoroughly rinsing with clean water.
7. Four hours.
8. In the refrigerator, by cooking, microwave oven if transferred to a conventional oven immediately following thawing, in a rapid thaw cabinet, at room temperature, or under potable running water of 70°F or lower provided the velocity is strong enough to agitate off the loose particles. NOTE: the temperature must never exceed 41°F.
9. Six inches above the floor to make cleaning under the food items easier.

623

1. Soil, water, surface, pressure, duration, and cleaning agents.
2. Reducing the microbial contamination of an object to a safe, consumable level.
3. Usually the MTF commander.
4. At least 171°F for at least 30 seconds.

5. Iodine and chlorine.
6. At least 10 seconds.

624

1. National Sanitation Foundation (NSF) Standards, NSF Reference Guide: "Sanitation Aspects of Food Service Facility Plan Preparation and Review," and the FDA Food Code.
2. Near an outside wall with easy access to hook up to trucks. This will make cleaning easier and will not contaminate any food contact surface.
3. To ensure the equipment fits into the area designed for that specific function.

625

1. They may serve only foods that are not potentially hazardous, are wrapped at supply points and maintained at proper temperatures, or they may prepare and serve frankfurters, Polish sausage, knockwurst, or similar type meat items.
2. MTF commander.
3. Must not be located where it can be contaminated by road dirt, waste discharge, oil, or grease. The inlet must be used only for adding potable water into the tanks.
4. 15 percent larger.
5. A food establishment that operates for a period of no more then 14 consecutive days in conjunction with a single event or celebration.
6. A concession stand near the base softball fields or booths open during a base open house.
7. 30 minutes for cold and two hours for hot vending machines.
8. The Aerospace Medicine Council.
9. AF Form 661, Vending Machine Inspection.

626

1. There are people with special dietary requirements as well as patients with suppressed immune systems who could easily become ill if food is not prepared properly.
2. To keep the food warm as it is delivered to the hospital patients in their rooms.
3. To provide meals for aircrew members, flightline personnel, and aircraft passengers.
4. It must be discarded.
5. Potentially hazardous leftovers.

627

1. The Air Force does not allow hot foods to be stored on board these aircraft.
2. BES.
3. AMC contracts and any additional guidelines HQ AMC/SGPM provides.
4. AF Form 977.
5. An evaluation performed on commercial establishments when they request to sell to the government.
6. Initial, routine, and special.
7. An evaluation done to determine the current sanitary status of a commercial establishment.
8. If food from the establishment is thought to be contaminated or unwholesome, or if significant sanitary discrepancies are found during a routine evaluation.

628

1. To establish and maintain conditions necessary for the prevention of disease.
2. To ensure a level of sanitation that prevents illness and to ensure personnel are ready to serve should the situation arise.
3. Based on your observations you can make recommendations to your superiors on ways to control, modify, or eliminate any problems you find.
4. If people can't see dirt, they probably won't clean it.

5. To discourage the attraction of insects and rodents.
6. Good sanitation.
7. Immediately after it closes for the day.
8. AFI 48–117.
9. To avoid passing infections or diseases between patrons or between themselves and patrons.

629

1. Personal hygiene and sanitation practices.
2. Aerospace Medicine Council.
3. Sterile individual applicator with an appropriate powder or liquid.
4. The instruments should be thoroughly cleaned and disinfected after each use.
5. Children are clustered in a confined area and exposed to more diseases because they are exposed to more children.
6. The personal hygiene of children in diapers is questionable. Children under the age of two are silent carriers for the Hepatitis A virus, which is shed in the feces.
7. Good personal hygiene.
8. AFI 34–701, *Child Development Programs*.
9. The child should be moved to an isolation room until the parent or guardian arrives.
10. Practices that contribute to the spread of communicable diseases and infections, and general sanitation and personal hygiene of the family day care home providers.
11. Procedures for cleaning and disinfecting of reusable linens, bedding, and eating utensils.
12. Because garbage and trash attracts insects, rodents, and stray animals.
13. When requested by the base commander or a representative, or the occupant.
14. Common areas such as kitchens, lounges, linen storage, and housekeeping services.
15. Representatives from billeting, base safety, and the fire department.
16. Geographical location, local conditions, sanitary history, physical condition of the facility, potential for public health problems, and number of people who use the facility.
17. Annually.
18. Aeromedical Council.

630

1. FDA Food Code and AFI 48–116.
2. The responsibilities of the public health office for providing medical evaluation services to AAFES.
3. AFI 48–117.
4. Child development centers and family day care homes program.

631

1. Review the facility folder for its history of sanitation evaluations.
2. Consider past evaluations, phases of the facility's operation, and whether the facility operates after normal duty hours.
3. To take notes of discrepancies while walking through the facility.
4. To prevent foodborne disease outbreaks.

632

1. (1) To officially notify management of discrepancies, with recommendations for correcting them.
   (2) To provide management with information to educate their employees.
   (3) To provide a follow-up tool to prevent repeat discrepancies.
2. A description of the problem, why it is a problem, a short-term solution, and a long-term solution.
3. Excellent, satisfactory, marginal, and unsatisfactory.
4. Within 24 hours or by the next business day.

5. On the back of the previous AF Form 977. Document the date, time, discrepancies, recommendations, and then sign your annotation.
6. Each base's public health office establishes its own criteria.
7. By sending a copy of the report to the local Exchange manager and one to AAFES headquarters.
8. To identify sanitary trends in food facilities, identify the effectiveness of management practices, and to evaluate the inspection practices of PH.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to ECI Form 34, Field Scoring Answer Sheet.

Do not return your answer sheet to AFIADL.

69. (621) To be considered safe for consumption, pork must be heated to an internal temperature of at least
    a. 155°F for 15 seconds.
    b. 160°F for three minutes.
    c. 165°F for 10 seconds.
    d. 170°F for 15 seconds.

70. (621) What is the most frequently occurring factor contributing to a foodborne disease outbreak?
    a. Poor personal hygiene.
    b. Improper holding temperatures.
    c. Failure to cook foods thoroughly.
    d. Preparing foods several days or hours in advance.

71. (622) Who provides initial employee training on food handling responsibilities to new employees?
    a. Facility supervisor.
    b. Public health only.
    c. Chief, Aeromedical Services.
    d. Physical Examination and Standards section.

72. (622) Which statement *best* describes hand-washing procedures that food employees should follow to prevent the spread of disease?
    a. Wash hands with soap and water for at least 10 seconds.
    b. Vigorously rub hands and arms with soap and water for 20 seconds.
    c. Wash hands twice after handling potentially contaminated beef or poultry.
    d. Wash and sanitize hands and arms after using the restroom or touching one's nose.

73. (622) At least how far above the floor should foods be stored to provide for easier cleaning?
    a. 4 inches.
    b. 6 inches.
    c. 10 inches.
    d. There is no requirement.

74. (623) The term sanitized is defined as the
    a. removal of visible soils from a surface or area.
    b. removal of the microbial contamination of an object or surface.
    c. reduction of visible soils on a surface or area.
    d. reduction of the microbial contamination of an object or surface.

75. (623) In food facilities, the two chemicals used most often for sanitizing are
    a. chlorine and iodine.
    b. ammonia and iodine.
    c. ammonia and chlorine.
    d. ammonia and alkaline.

76. (624) What is the most important part of a food facility to consider during the design stage?
    a. Dish storage area.
    b. Outside dock area.
    c. Kitchen preparation area.
    d. Storage and latrine areas.

77. (624) What is the *best* location for a kitchen grease trap in a food facility?
    a. Next to a hot water drain.
    b. On a wall with access to the outside.
    c. Next to the garbage dumpsters outside.
    d. Adjacent to the ovens and steam kettles.

78. (625) Who may add requirements for mobile food facilities if a public health hazard exists?
    a. Chief, Aerospace Medicine.
    b. Chief, Environmental Health.
    c. Aerospace Medicine Council.
    d. Medical treatment facility commander.

79. (625) When, if ever, may normal metal utensils be used for preparing foods and serving them to patrons of a mobile food facility?
    a. When they can be washed and sanitized properly.
    b. When running water is available in the mobile facility.
    c. Never; they are not authorized on mobile facilities.
    d. Never; only single-use items are permitted.

80. (625) The tank that holds liquid wastes on a mobile food facility must be able to hold how much more waste than the water tank capacity?
    a. 2 percent.
    b. 5 percent.
    c. 10 percent.
    d. 15 percent.

81. (625) Temporary food facilities operate in conjunction with a single event or celebration, but normally for a period of no more than
    a. 14 days.
    b. 21 days.
    c. 30 days.
    d. 45 days.

82. (625) Temporary food facilities are inspected in accordance with
    a. AFIs 48–116 and 48–117.
    b. AFI 48–116 only.
    c. AFI 48–116 and FDA Food Code.
    d. FDA Food Code only.

83. (626) What is the *primary* reason why hospital kitchens differ from other food facilities?
    a. Hospital kitchens have a unique mission.
    b. All hospital patients have special dietary requirements.
    c. Hospital kitchens need to be larger and more specialized.
    d. Hospital patients are more susceptible to a foodborne disease outbreak.

84. (626) What is the shelf life for frozen commercial dinners (in prime condition) when used for military in-flight feeding?
    a. 3 months.
    b. 4 months.
    c. 5 months.
    d. 6 months.

85. (626) Which one of these food products should *not* be used in the preparation of any military in-flight meal?
    a. Chicken issued from a cold storage warehouse.
    b. Tuna salad left over from the dining hall's noon meal.
    c. Ten half-pints of milk just delivered to the kitchen from a vendor.
    d. Small individual cans of orange and apple juices in good condition.

86. (627) Which type of off-base inspection is designed to evaluate facilities that request to sell food products to the government?
    a. Initial.
    b. Routine.
    c. Update.
    d. Special.

87. (627) After an establishment gains approval to sell its product to a base, it must continue to be inspected at a frequency established by the Aerospace Medicine Council. What are these inspections called?
    a. Follow-up.
    b. Routine.
    c. Special.
    d. Update.

88. (628) What is the *primary* purpose of public health programs?
    a. Control the spread of disease and vectors of disease.
    b. Ensure the public has a safe source for food and water.
    c. Ensure the proper treatment of sewage and disposal of wastes.
    d. Establish and maintain conditions for the prevention of disease.

89. (628) What is your *main* concern when conducting a sanitation evaluation of a public facility?
    a. Inspecting items that affect the safety of the patrons and workers.
    b. Evaluating items that directly affect the health of the workers and patrons.
    c. Making recommendations that control, modify, or eliminate safety hazards.
    d. Identifying any fire hazards while looking at the sanitary conditions of the facility.

90. (629) Instruments that are used to shave patrons or give manicures and pedicures must be cleaned
    a. after each patron and disinfected weekly.
    b. after each patron and disinfected daily.
    c. and disinfected at the end of each day.
    d. and disinfected after each patron.

91. (629) Children under two years of age can be silent carriers of what communicable disease?
    a. Hepatitis A.
    b. Hepatitis B.
    c. Salmonella.
    d. Shigella spp.

92. (629) Who is responsible for screening children for signs of illness as they enter the child development center each day?
    a. Center director.
    b. Center employees.
    c. Program medical advisor.
    d. Child's primary caregiver.

93. (629) During an evaluation of a base family services facility, your main concern should be the
    a. personal hygiene of the workers.
    b. amount and type of storage space.
    c. upkeep and maintenance of the facility.
    d. procedures for cleaning and sanitizing reusable items.

94. (629) What solution is recommended to clean and disinfect bathrooms and toilet fixtures in base gymnasiums?
    a. 50 ppm chlorine solution.
    b. 100 ppm chlorine solution.
    c. 25 percent sodium hypochlorite per gallon of water.
    d. 50 percent sodium hypochlorite per gallon of water.

95. (629) Besides billeting, who accompanies public health during a contract quarters inspection?
    a. Base safety only.
    b. Fire department only.
    c. Base safety and fire department.
    d. Base safety and Bioenvironmental Engineering.

96. (630) The FDA Food Code applies to which activities?
    a. Appropriated fund only.
    b. Nonappropriated fund only.
    c. Appropriated and nonappropriated funds.
    d. None of the above.

97. (630) Which DeCA directive covers the prohibition of tobacco use by employees and the requirements for a self-inspection program?
    a. 40–3, *Meat Department Operations*.
    b. 40–4, *Produce Department Operations*.
    c. 40–5, *Grocery Department Operations*.
    d. 40–6, *Customer Service Department*.

98. (630) Which publication describes the responsibilities of the public health office to provide medical evaluations to AAFES facilities?
    a. Air Force Instruction (AFI) 48–101.
    b. AFI 48–117.
    c. Exchange Service Manual (ESM) 25–4.
    d. Exchange Service Regulation (ESR) 1–2.

99. (631) To prepare for a facility evaluation, your *first* step is to
    a. gather equipment.
    b. select a starting point.
    c. notify the management.
    d. review the facility folder.

100. (631) Which of these statements *best* applies to your starting point for an evaluation of a facility?
    a. Always begin at the back dock area.
    b. Select a starting point at random each time.
    c. Allow management to select the starting point upon your arrival.
    d. Start with the serving line for food facilities and latrines for public facilities.

101. (632) What does an asterisk (*) in the Food Code table of contents signify?
    a. Communicable disease-causing item.
    b. Noncompliance item.
    c. Critical item.
    d. Rated item.

102. (632) What type of information do you put in the *first* part of your report to describe discrepancies found during an evaluation?
    a. Identification of the problem.
    b. Why the discrepancy is a problem.
    c. Short-term solutions to the problem.
    d. Long-term solutions to the problem.

103. (632) A food facility sanitation evaluation rating of marginal stems from almost the same criteria as a satisfactory rating. What most distinguishes a marginal rating?
    a. No more than one critical item found.
    b. Discrepancies found require long-term solutions.
    c. Repeat discrepancies found from the previous inspection.
    d. Discrepancies found present a high likelihood of causing a foodborne disease outbreak.

104. (632) Within how many working days, if any, should a facility be reevaluated after it has been given a marginal rating?
    a. One.
    b. Three.
    c. Five.
    d. No reevaluation is required.

105. (632) If you find a discrepancy during a walk-through evaluation of a food facility, document it on
    a. a new AF Form 977.
    b. a new AF Form 978.
    c. the back of the previous AF Form 977.
    d. the back of the previous AF Form 978.

Student Notes

Glossary

Abbreviations and Acronyms

AAFES	Army and Air Force Exchange Service
AFI	Air Force instruction
AIDS	Acquired Immunodeficiency Syndrome
AKT	approximate keeping time
AMC	Aerospace Medicine Council or Air Mobility Command
AQL	acceptable quality level
aW	water activity
BEE	Bioenvironmental Engineer
BES	Bioenvironmental Engineering Services
BOQ	billeting officer quarters
BPA	blanket purchase agreement
CA	controlled atmosphere
CONUS	Continental United States
CPI	closed package inspection
CQAE	contract quality assurance element
DeCA	Defense Commissary Agency
DHU	defects per hundred units
DOD	Department of Defense
DODISS	Department of Defense Index of Standards and Specifications
DOP	date of pack
DOPI	destructive open package inspection
DPSC	Defense Personnel Support Center
ESR	Exchange Service regulation
FDA	Food and Drug Administration
FF&V	fresh fruits and vegetables
FIFO	first in, first out
GRAS	generally recognized as safe
IAW	in accordance with
ICSSL	Interstate Certified Shellfish Shipper’s List
IMSL	Interstate Milk Shipper’s List

ITD	inspection test date
MRE	meal, ready-to-eat
MTF	medical treatment facility
MWRS	Morale, Welfare, and Recreation Services
NAMA	National Automatic Merchandising Association
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NSF	National Sanitation Foundation
NSN	national stock number
OIC	officer in charge
OPI	open package inspection
PES	Physical Examinations and Standards
PH	potential hydrogen
PH	public health
Ppm	parts per million
QAE	quality assurance element
QAP	quality assurance provisions
ROA	recurring ordering agreement
SCR	sanitary compliance rating
SQL	serviceability quality level
TDY	temporary duty
TISA	troop issue subsistence activities
TLQ	temporary living quarters
UBL	unit basic loads
UMR	unsatisfactory material report
USDA	United States Department of Agriculture
USDC	United States Department of Commerce
WHO	World Health Organization

Student Notes

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