
UNIT 10 HYGIENE AND SANITATION IN FOOD SERVICE ESTABLISHMENTS

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10.1 INTRODUCTION

In the previous unit we studied about food safety measures in food service establishments and other food service areas. In this unit, we shall focus on sanitation and hygiene of food service establishments and its personnel.

As you read through the unit, you will realize that sanitation is not just cleanliness, it is much more than that. A food or an equipment can be free of visible dirt and still be carrying microorganisms or chemicals that can cause food borne disease or spoilage of food. So then, how do we maintain good sanitation? What are the aids used for cleaning and sanitizing units? How waste disposal and pest control can influence the food sanitation programme? These are a few issues we will discuss in this unit.

Further, you must understand that a major risk of food contamination lies with the food handler. Dangerous organisms present in or on the food handler's body can multiply to an infective dose, given the right conditions come into contact with food or the surfaces used to prepare food. The food handlers infect the food, as well as, acquire the contamination from the food. It has been found that in all cases involving infected food handlers, they have acquired the infection from food handled in the course of their work. Food handlers, infected or colonized with pathogens may contaminate food, thus transmitting food borne illness. In this unit, we will learn more about food handlers health status, personal hygiene and other requirements like cloak room facility, medical facilities etc. for ensuring food safety.

Objectives

After studying this unit, you will be able to:

- define sanitation and discuss the types and uses of cleaning compounds,
- enumerate various disinfectants or sanitizers,
- discuss effective ways of disposing waste,
- adopt the practical measures of pest and rodent control,
- discuss the health status of employees handling food,

- describe the various parameters to ensure personal hygiene of the food handlers, and
- enlist employee facilities to ensure food safety.

10.2 SANITATION IN FOOD SERVICE ESTABLISHMENTS

We start our study of this topic by first defining *what is sanitation?* A three-word definition of food sanitation is *protection from contamination*. Primarily, sanitation comes from the Latin word *Sanitas*, which means health. Sanitation means *creating and maintaining hygienic and healthful conditions*. Food sanitation means *creating and maintaining hygienic and healthful conditions in the food preparation, storing and serving areas*.

Sanitation is a dynamic and ongoing function and cannot be sporadic or something that can be turned on once a day, once a week, etc. Therefore, another definition could be *sanitation is a way of life*. What do you think? Sure, you would agree with this concept.

So then, why is sanitation important in food service establishments? There can be no two views about the fact that all food products must be protected from contamination from receiving (and before) through distribution. Yes, contamination from microorganisms which can cause food spoilage and food borne diseases. Sanitary practices and hygienic conditions are important because food is being processed, prepared and sold in large volumes than before. Sanitation can reduce contamination of food by microorganisms which are a major cause of food borne illnesses. Further, sanitary principles also apply to waste disposal and can help reduce pollution and improve ecological balance in and around the food service unit.

You may recall, reading earlier about the sources of contamination in Unit 3, under section 3.3. We learnt that all plants and animals have a natural microflora associated with it. These microflora are one of the sources of microorganisms associated with spoilage. Equipment, employees, air and water, insects and rodents, sewage all are potential sources of contamination. Therefore, healthy sanitary practices, appropriate cleaning programme and pest management system must be developed and implemented within the food service establishments to prevent microbial contamination and ensure safe food. Cleaning and sanitization should be accorded utmost priority. *By cleaning we mean, free from dirt, stain, or impurities, unsoiled*. The cleaning process, therefore, primarily removes the soil deposits. *Sanitizing*, on the other hand, *destroys microbes that are left on the cleaned surfaces*. Various cleaning agents, sanitizers, disinfectants are available and approved for use in food service units. What are these substances? We will learn about them in the subsequent section(s). We start with cleaning agents.

10.2.1 Cleaning Agents

Food particles and other debris provide good nutrients for the microorganisms to grow. In fact, the food particles protect microorganisms during cleaning. Hence, it is essential to clean food debris before applying sanitizers. Before we understand about cleaning agents, we must know how they work. Cleaning agents work in two ways:

- 1) lower the energy of the bond between the food debris and the surface, so that the debris can be dislodged and loosened, and
- 2) suspend the debris in the solution so that they can be flushed away.

Depending upon the type of soil (food debris), water supply, use for specific purposes, area and kind of equipment to be cleaned, various kinds of cleaning compounds are used. Good cleaning compounds are economical, easy to measure and dissolve well. They are approved for use on food surfaces, are not corrosive and do not cake, leave dust, or break during storage. They are classified based on their chemical properties i.e. alkaline cleaning compounds and acid cleaning compounds. Before the advent of these chemicals, there are certain natural compounds which have been in use in India. Figure 10.1 illustrates these cleaning agents.

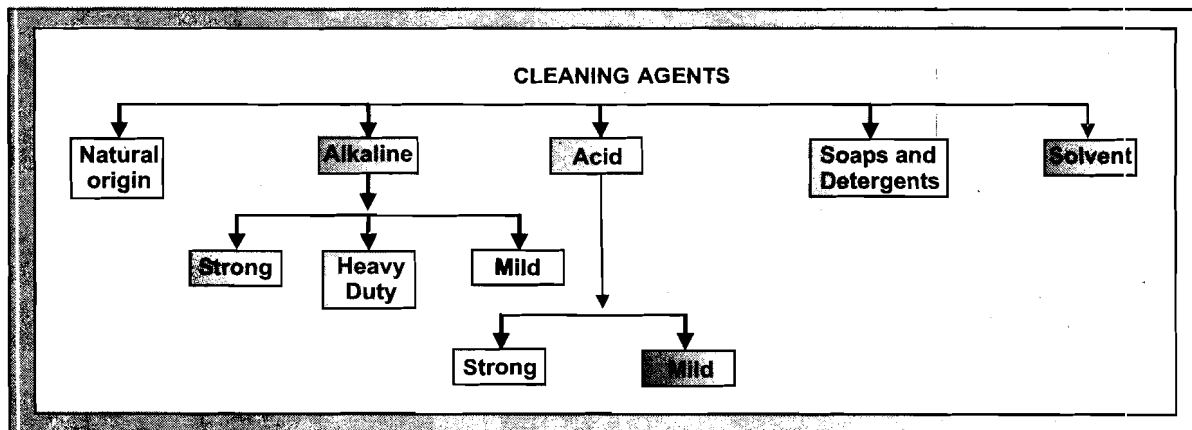


Figure 10.1: Classification of cleaning agents

Let's learn about these different cleaning agents.

A) *Cleaning substances of natural origin*

Bengal gram powder or besan is a natural cleaning powder that has been used in India, since times immemorial. It has been traditionally used to remove oily adherences of cooking utensils.

B) *Alkaline cleaning compounds*

Carbonates, bicarbonates, hydroxides of various metals are called *alkaline compounds*. Alkaline cleaning compounds have a pH between 7 and 14. Cleaning compounds which have a pH near 14 are called *strong alkaline cleaners*, e.g. sodium hydroxide, which destroys microbes, dissolves protein and effectively disperses and emulsifies the soil. Use of silicates with sodium hydroxide makes it less corrosive but improves its penetrating and soil removing property. These are used specially in commercial ovens and smokehouses. These cleaners have strong dissolving powers and are very corrosive. If these come in contact with skin, they can lead to burns, ulcers and scarring. In fact, a prolonged contact may cause permanent damage. Inhaling its fumes or mist can cause lung damage.

Another type of alkaline cleaner is *heavy-duty alkaline cleaners*. These have moderate dissolving powers and are either slightly corrosive or not corrosive at all. These are often used for cleaning in-place or high pressure or other mechanized systems. They are very good at removing fats but do not remove mineral deposits. One of the widely used and cheap heavy-duty cleaner is *sodium carbonate*.

Now, we come on to the third category i.e. *mild alkaline cleaners*. These are used to clean lightly soiled areas by hand. These compounds are good at softening water but do not remove mineral deposits. *Sodium bicarbonate* is an example of a mild alkaline cleaner.

C) *Acid cleaning compounds*

Acid-based cleaners like *phosphoric acid* and *hydrofluoric acid* are commonly used. They are very useful in removing mineral scales that are dried on or encrusted on equipments or utensils surfaces. They are especially good at removing mineral deposits on metal surfaces. The acid cleaners dissolve the minerals in the deposits so that they can be easily removed.

Organic acids, such as *citric acid*, *tartaric acid* are also used as cleaning compounds and are excellent water softeners, rinse off easily and do not corrode surfaces or irritate the skin. Inorganic acids, though excellent at removing and controlling mineral deposits, can be very corrosive to surfaces and irritating to the skin. These are used for special cleaning purposes, and are comparatively less effective against the soil caused by fats, oils and proteins.

Like the alkaline cleaning compounds, acid cleaning compounds can also be classified into *strongly acid cleaners* and *mildly acid cleaners*. The strongly acid cleaners corrode concrete, most metals and fabrics. Further, if heated, it produces corrosive and toxic gases, which can damage the lungs. However, they are very effective cleaning agents. They remove encrusted surface matter and mineral scale from steam equipment, boilers and some food-processing equipment.

The most commonly used strong acid cleaner is phosphoric acid, as it works well with many surfactants and is not very corrosive. Hydrofluoric acid is another acid cleaner, however, it is corrosive to stainless steel and dangerous to handle because it tends to release hydrogen gas.

Mildly acid cleaners are slightly corrosive and may cause sensitive reactions. A few examples are *hydroxyacetic*, *acetic* and *gluconic acid*. Cleaners like acetic acid and gluconic acid are good manual cleaners.

D) *Soaps and detergents*

Soaps and detergents emulsify fats, oils and grease so that they are easily washed away. They usually contain chemical builders to enhance their cleaning efficiency. Soap is an oldest and best cleaning compound used but it forms an insoluble curd with hard water, hence not preferred. Instead, detergents are used.

A detergent is *a substance which assists in cleaning when added to water*. These are normally *sodium salts of fatty acids*. To be effective, a detergent must have a good wetting capacity and the ability to remove soil from surfaces and carry away residues. Soaps and detergents for household cleaning have a pH of 8.0 to 9.5.

E) *Solvent cleaners*

Solvent cleaners are based on ether or alcohol and work well on soils caused by petroleum products, such as lubricating oils and greases. These are used to remove large amounts of petroleum deposits in areas free of protein-based and greasy soils. They may be mixed with wetting agents, water softeners and other additives.

In addition to these cleaning compounds discussed above, depending upon the type of food debris, certain additives are also used as cleaning agents for better performance. They may be:

- sequestrants, which chelate metals like magnesium and calcium and prevent their interaction with food components or utensils. It actually is *a chemical added to cleaning compounds to prevent the salts of calcium and magnesium in hard water from forming deposits on equipment surfaces*.

- surfactants, which are *complex molecules that blend with a cleaning compound to reduce the bond energy around the soil and allow closer contact between the soil and the cleaning compound*. In other words, these agents help to spread cleaning or sanitizing compounds and the surface to be cleaned.

Before we end our discussion on cleaning agents, we would also like to focus on issues related to choosing a cleaning agent. It is important to choose the right cleaning agent for the type of soil. A good rule to remember is that '*like cleans like*' i.e., an acid soil requires an acid cleaner, while an alkaline soil is best removed by an alkaline cleaning agent. Heavy-duty alkaline cleaning agents work best with heavy deposits of fats and proteins. Acid cleaning agents remove mineral deposits and other soils that are not removed by alkaline cleaning agents. Phosphates complexed with organic chlorine are the most common types of cleaner-sanitizers.

Having studied about cleaning agents, next let us get to know about disinfectants and sanitizers.

10.2.2 Disinfectants or Sanitizers

We learnt earlier that a cleaning process removes the soil deposit. *A disinfectant is a chemical substance which is capable of killing microorganisms*. A disinfectant is also referred to as sanitizer, signifying the properties of their activity in maintaining sanitary conditions.

What are the *disinfecting agents* used in the food industry? The information presented next will provide a deep insight into these compounds.

The disinfecting agents used generally in the food industry include:

- A) *Chemicals*, such as
 - a) Chlorine releasing compounds
 - b) Iodophors/Iodine compounds
 - c) Quarternary Ammonium Compounds (QUATS)
- B) *Amphoteric compounds*
- C) *Heat*
- D) *Radiation*

Let us study these in detail.

A) *Chemicals*

Food processing and food service operations use various chemical sanitizers for different areas and types of equipment. Before we learn about these sanitizers, we need to know that the effectiveness of chemical sanitizers depends on few factors which include:

- *Exposure Time* – The death of microbial colonies follow a logarithmic pattern i.e. if 90% of microbes die in 10 minutes, 90% of the remaining microbes die in the next 10 minutes and so on.
- *Temperature* – Microorganisms are killed more quickly at higher temperatures by the use of chemical sanitizers. In other words, higher temperatures usually speed up the death rate of bacteria than their growth.
- *Concentration* – The higher the concentration of sanitizer, quicker is the rate of microorganisms killed.
- *pH* – Small changes in acidity or alkalinity affect the activity of sanitizers.

- *Cleanliness* – The reaction of the soil on equipment and surfaces with sanitizers leads to neutralization of the sanitizer in such a way that it does not work properly.
- *Water hardness* – Hard water makes sanitizers less effective. The calcium and magnesium salts in hard water neutralize quaternary ammonium compounds. If the water has over 200 ppm of calcium, a sequestering or chelating agent should be added.

Let us now briefly describe the different chemical sanitizers used in food industry.

a) *Chlorine-releasing compounds*

Of all the chlorine - releasing compounds, *hypochlorites* have been the choice disinfectants used in food industry. The hypochlorites are powerful disinfectants with a wide range of anti-bacterial activity including bacterial spores. The salts of hypochlorous acid (HOCl) like sodium hypochlorite (NaOCl) are widely employed. They dissociate to form OCl⁻, which is the ion that is responsible for the bactericidal property. The diluted solutions of sodium hypochlorite are used widely but they should be used very carefully as they are corrosive and are skin irritants. They have to be prepared fresh before use. Chlorine compounds are often preferred over other sanitizers because of a few advantages as highlighted in Table 7.2. However, they have some disadvantages, as well as, mentioned in Table 7.2.

Table 7.2: Advantages and disadvantages of using chlorine-releasing compounds

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Kills all types of vegetative cells ▪ Easily available and cheap ▪ Hard water does not make them less effective 	<ul style="list-style-type: none"> ● Unstable, heat and light breaks them down and organic soil makes them less effective ● Corrode stainless steel and other metals ● Can be in contact with food handling equipment for a short time, else they corrode it

b) *Iodophors*

In these disinfectants, iodine is incorporated along with a detergent. They are not as effective as hypochlorites against bacterial spore but also get inactivated in the presence of organic matter. They have a long shelf life, but once dissolved, the iodine may vapourize. Iodophors, are generally used in the dairy industry due to their bactericidal capacity, as well as, the presence of phosphoric acid which is helpful in the control of milk stone. The *stone* is the deposition of mineral salts on equipments due to the presence of fats and proteins.

It is a very good hand sanitizer and hand-dipping agent because it does not irritate skin. However it has following disadvantages:

- expensive than chlorine compounds
- cause off-flavours in some food products
- vapourize at 50°C (approx.), and
- sensitive to pH changes.

c) *Quaternary Ammonium Compounds (QUATS)*

These compounds are ammonium salts and are quite expensive and less effective when compared to hypochlorites and iodophors. The solutions of these compounds

have the tendency to stick to the surfaces and require thorough cleaning. They have to be used in higher concentrations when used with hard water. The most common quaternary compounds are the *cationic detergents*, which are poor detergents.

QUATS form a bacteriostatic film over the surfaces, which is better at killing some bacteria when compared with other sanitizers. They do not kill bacterial spores, rather they inhibit their growth. They work at a high pH and are effective against moulds.

Having studied about the chemical sanitizers above, we move on to other disinfectants and sanitizers which can be used in food service establishments.

B) *Amphoteric compounds*

Amphoteric compounds are essentially alkyl or acyl amino acids. They combine detergent and disinfectant properties. They are generally very expensive than other disinfectants.

C) *Heat*

The efficiency of heat, as a sanitizer, depends on the humidity, temperature required and the length of time it takes to destroy microbes at that temperature. The most common types of heat used for sanitization are steam and hot water. The sterilization of an item depends on the time-temperature relationship. This means that if equipments are sterilized at a lower temperature, they must be kept at heat temperature for longer duration while if they are sterilized for a shorter duration, the temperatures must be higher. Examples of time-temperature combinations are 15 minutes of heat at 85°C or 20 minutes at 82°C.

D) *Radiation*

Radiation as ultraviolet light or energy cathode or gamma rays destroys microorganisms. However, it is not entirely effective in food processing and food service facilities for the following reasons:

- Some bacteria are more resistant to radiation and need a longer exposure for destruction
- Rays kills only the microorganisms that are very close by
- Dust, grease and opaque or cloudy solutions absorb radiation and prevent it from killing microbes.

The discussion above, we hope, provided you a comprehensive understanding about cleaning agents, disinfectants and sanitizers.

Check Your Progress Exercise 1

1) Explain the working of cleaning agents.

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2) How can cleaning compounds be classified? Give examples.

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3) Match the following:

- | A | B |
|---------------------------------|---|
| a) Besan | i) Phosphates |
| b) Acid Cleaning Compound | ii) Insoluble curd with hard water |
| c) Alkaline cleaning compound | iii) Anti-bacterial activity |
| d) Iodophores | iv) Removes oily adherences of utensils |
| e) Soap | v) Sodium hydroxide |
| f) Chlorine releasing compounds | vi) Bactericidal capacity |
| | vii) Solvent cleaner |

4) Explain the following terms:

a) Food Sanitation

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b) Sequestrant

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c) Disinfectant

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d) Detergent

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e) Surfactant

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In the section above we studied the role of cleaning agents and disinfectants/sanitizers in maintaining sanitation in food service establishments. Next, let us look at waste disposal and pest control as sanitary measures in a food service unit.

10.2.3 Waste Disposal

An adequate and hygienic waste disposal system is a necessity for any food service establishment. What does this waste material consists of and what is the appropriate method of discarding it? Let's find out. Well, the waste materials from food establishment include food scraps, vegetable peels, empty covers and other liquid wastes which cannot be washed down through the sewage lines. All such wastes should be collected in waste bins specially kept for collection. They should be first collected in plastic bags before putting them in the waste bins with lids. The solid wet wastes should be collected in the polythene covers and sealed before disposal.

In the kitchen, the wastes generated due to continuous operations of food preparation should be immediately collected into foot-operated suitable waste bins which have tight-fitting lids. They must not be allowed to accumulate except where it is unavoidable. They should be frequently transferred to the big waste bins kept outside the food preparation area and cleaned each time with disinfectants.

All waste bins should be set up in a corner outside the kitchen over a raised platform or stands specially made for placing the bins which should be easily removable. They should be closable and maintained in a sound condition. They must have tight lids to avoid the pollution of surrounding areas. The area around the waste bins should be always kept clean and nuisance-free by using disinfectants. There should be a tap point in this area for ready cleaning operations. Good control and management of refuse and refuse areas can also prevent odour nuisances occurring and avoid pest and insect infestations.

Next, we look at pest and rodent control.

10.2.4 Pests and Rodent Control

In any food establishment, varieties of insects, pests and rodents pose a big threat to the maintenance of hygienic surroundings. They contaminate food with hair, fur, droppings, eggs and dead bodies, as you have already learnt earlier. They can also cause considerable damage to food stocks and premises.

The common pests found in food processing and food service establishments include two groups of insects, *the flies and cockroaches*, which are the important carriers of food borne diseases. Flies feed indiscriminately on waste matter, animal wastes and on food from kitchens. The housefly may successively visit a dirty cup, clean glass, a waste material and a dish containing cooked food. The flies leave an invisible trail of bacterial and other disease causing germs. Remember, housefly can spread typhoid, dysentery and diarrhoea. They may also have a part in spreading cholera and many other diseases.

Ants are considered harmless but they too create nuisance. They live in walls and soil. They eat a wide variety of foods. The cereal mite which is widely distributed is found stored in dry food commodities like *flour, suji* etc. There are other insects like borers which can cause damage and contamination of foods due to their quick movements from place to place.

Let us learn about the preventive and control measures, next.

Preventive measures are ideal. It should be ensured that no food scraps are left lying out. No dirt or rubbish is allowed to accumulate. All holes, gaps, drains and air ducts should be covered with thick wire mesh or grating.

Drying the raw materials like grains, adequately preserving commodities like suji, maida (refined flour) at low temperature are ideal. Regular checkups must be made to ensure that the premises are free from pests. The persons responsible for pest control should:

- inspect all internal and external areas of food premises
- revisit if there are signs of infestation
- ensure that insects are properly identified to carry out effective treatment, and
- maintain the records of chemicals, pest problems, indications of infestation.

Insect control

The insects can breed and hide in garbage and other places where there is availability of waste materials. The cockroach lives and breed in moist dark places around plumbing cupboard, pantries and under refrigerators. The best prevention approach is to fit all the doors, windows and ventilation with wire-mesh. The flying insects can be destroyed by employing fluorescent tubes which attract and destroy them due to an electrified field. They are collected in a collecting tray. The crawling insect hideout should be sealed by blocking all the cracks etc. which harbor insects. They are generally destroyed by spraying and using commercial insecticides like *pyrethrum*. The cockroaches can be prevented entry by painting a band of insecticide between the joints of wall and floor. Of late, aerosol sprays have become very popular in eliminating flying insects. But care has to be taken to avoid contamination of foods and food contact surfaces getting sprayed with the aerosols.

Rodent control

Rats and mice are destructive and cause huge loss of stored food commodities. They transmit pathogenic bacteria. Rats and mice are generally most active during twilight hours. If food and wastes are stored and handled properly, the rodent infestation could be reduced or eliminated. They can squeeze past narrow openings and gnaw the edges of wooden doors.

Rodents gain entry into the premises in bags of flour in straw packages, boxes, cartons etc. If proper storage practices are not adopted and things are scattered, rodent infestation is sure to occur. Rats need lots of water, in fact, they drink three times the amount they eat. Signs of rodent infestations are evident by presence of droppings, greasy foot prints and rat odour. Baited traps and other tracking methods could be followed to ensure that rodents are not present in the food area.

Other control measures include:

- regular checking of new deliveries, stored stock and equipment for signs of infestation
- storage of open dry foods in solid with close-fitting lids
- storage of goods off the ground and clear of walls, with adequate space between stocks
- clear spoilage as soon as possible, and
- empty bins in the kitchen frequently and keep them clean.

Prevention

Best preventive measure is to correct all dripping taps, repair defective gutters and also make the food unavailable by proper storage of foods in metal containers. The empty cartons, boxes should be stacked on a pallet and away from walls, as rats prefer to move nearer to the walls.

Here, it can be summarized that pest control is essential in any food service establishment because of:

- preventing the spread of disease
- preventing the wastage of food
- preventing damage generally caused by gnawing of electric cables or pipes, and
- preventing loss of customers who are well-aware and educated about hazards of eating in infested premises.

Food refuse container should be cleaned after discarding. Care has to be taken to remove food scraps, crumbs, vegetable peelings etc. They should not be left on the floor and ensure that premises is as clean and neat as possible. The rodents can be refused to gain entry into the building by rodent proofing the building by changing the defective doors, windows, cupboards and covering up of small openings especially the corners of doors and windows, pipes, floor drains, exhaust fan openings. To control the rodents, either traps or poisoning is employed. Care has to be taken while rodenticides are employed as their poisons are harmful to human beings. The rodent eradication programme has to be undertaken by an experienced and trained person.

Apart from all these measures, a properly planned maintenance of premises with periodic checks of food storage, preparation areas and efficient handling of wastes helps in preventing the pests' entry into the food service establishment.

To protect the premises from insects, rodents and pests and reduce the risk of infestation, the following points have to be kept in mind:

- Keep the premises clean
- Clean all spillages promptly
- Check all incoming goods and boxes
- Keep doors and windows screened
- Keep reusable boxes, crates etc. out of the kitchen
- Keep drains clean and in good condition
- Cover the waste bin. Empty accumulated wastes promptly and wash it regularly along with the surrounding area
- Keep the shelves, cupboards and drawers in good repair
- Use of proper "dunnage" racks below stored products, so that the areas can be cleaned without difficulty and moisture does not migrate
- Sightings of pests or pest damage are reported to management
- Periodically undertake vermin elimination programme with the help of a trained person

The discussion above presented a detail review of how to ensure proper sanitation and hygiene in a food service establishment. Does the government also have a role in ensuring healthy sanitary practices and appropriate cleaning programmes in the food service areas? We will find the answer to this question in the next section.

10.3 HYGIENE REQUIREMENTS FOR LICENSING AND SALE

The Government of India has prescribed the following hygiene requirements under the *PFA Rules 1955*, for licensing and sale of food items:

- a) No license shall employ in his work any person who is suffering from infectious, contagious or loathsome disease.
- b) No person shall manufacture, store or expose for sale or permit the sale of any article of food in any premises not effectively separated to the satisfaction of the licensing authority from any privy, urinal, sludge, drain or place of storage of foul and waste matter.
- c) Every utensil or container used for manufacturing, preparing or containing any food or ingredient of food intended for sale shall be kept at all times in good order and repair and in clean and sanitary conditions. No such utensil or container shall be used for any other purpose.

- d) No person shall use for manufacturing, preparing or storing any food or ingredient of food intended for sale, any utensil or container, which is imperfectly enameled or imperfectly tinned or which is made of such materials or is in such a state as to be likely to injure such food or render it noxious.
- e) Every utensil or container containing any food ingredients intended for the manufacture of food / sale, shall at all times be either provided with a tight-fitting cover or kept closed or covered by a properly fitting lid or by a closed fitting cover or gauze, net or other material of a texture sufficiently fine to protect the food completely from dust, dirt, flies and other insects.
- f) No utensil or container used for the manufacture or preparation of or containing any food or ingredient of food intended for sale shall be kept in any place in which such utensil or container is likely by reason of impure air or dust or any offensive, obnoxious or deleterious gas or substance or any noxious or injurious emanations, contaminated and thereby render the food noxious.

Check Your Progress Exercise 2

- 1) Give any two ways of hygienic waste disposal.
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- 2) Why do you think pest and rodent control is essential?
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- 3) Suggest how pests pose a threat to the maintenance of hygienic surroundings.
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- 4) Give five preventive measures for pest and rodent control.
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So far we have learnt about the sanitary practices, cleaning procedure and agents, pest control measures and waste disposal systems to be used in food service areas, to ensure food safety. Another important factor crucial to maintaining hygiene in a food service area is the food handlers. The next section(s) focus on this important resource and their role and responsibility in maintaining hygiene in the food service areas. We start by first discussing about the health status of the food handler.

10.4 HEALTH STATUS OF FOOD HANDLERS

In its simplest form the word "health" means the absence of disease. Health status, on the other hand, *is an outcome of health indicated by or measured by injury, sickness, disease, physical and psycho-social functioning, other morbidity, and mortality.* In fact, it is a general term for the *state of health of an individual, group or population that reflects the degree to which a person is able to function physically, emotionally, and socially, with or without aid from the health care system.*

The concept of health status, well-being of workers in food service establishments, particularly the food handlers, applies to the self-assessed or self-reported perception of a person with respect to his or her health condition.

The term 'food handler' applies to *the persons who prepare food and sell it*. He is the key person to maintain food safety in the food service establishments since he/she works with unpackaged food, food equipments or utensils, or food contact surfaces. In this context, therefore, people known or suspected to be suffering from or to be a carrier of a disease or illness, likely to be transmitted through food, should not come to work or allowed to enter any food handling area if there is a likelihood of their contaminating food.

Every employee should be thoroughly checked for medical clearance before being employed. This gives an indication of his general health status. Although his subsequent ill health could not be assessed on his initial health report, it would be easy to monitor him afterwards for a major illness. The first principle to be taught to the employee is that he should inform the management about his health problem so that a preventive strategy could be worked out. Medical examination of a food handler should be carried out if clinically or epidemiologically indicated.

The conditions or the specific infections which should be reported to management so that any need for medical examination and/or possible exclusion from food handling could be considered, include:

- jaundice
- diarrhoea
- vomiting
- fever
- sore throat with fever
- visibly infected skin lesions (boils, cuts, etc.)
- discharges from the ear, eye or nose

Food handlers should not have:

- 1) *Salmonella typhi*
- 2) *Shigella*
- 3) Shigatoxin producing *E. coli*
- 4) Hepatitis A virus

It is important to remember that any worker infected by the above mentioned microbes, should not touch food or equipments/utensils used to process, prepare or serve food. Contaminated foods can cause several illnesses, including:

- Respiratory diseases, e.g. cold sore throats, pneumonia and tuberculosis
- Gastrointestinal diseases, e.g. vomiting, diarrhoea, dysentery
- Typhoid fever
- Infectious hepatitis

The important thing to note is that even after the worker has recovered from the illness, he/she often becomes the carrier. This means that they still carry the disease-causing microorganisms in or on their body. For example, an employee may carry *Salmonella* for several months after recovering from *salmonellosis*. The virus that causes hepatitis may still be in the intestinal tract over 5 years after the symptoms are over. This requires special attention.

Further, even if a food handler does not feel sick, he or she can still be carrying microorganisms on their body or clothes that can cause illness if they get into food. Hence, food handlers should maintain a high degree of personal cleanliness and hygiene. What are the aspects of personal hygiene, which need to be considered? We will learn about this aspect in the next section.

10.5 PERSONAL HYGIENE

The word *hygiene* means *using sanitary principles to maintain health*. You may recall reading about food hygiene in Unit 2. Just as *food hygiene* refers to all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain, *personal hygiene* refers to all conditions and measures necessary to ensure *the cleanliness of a person's clothes and body*.

Food worker need to be healthy and clean to prepare safe food. The food handler should keep his hands, arms and exposed parts very clean. They should wash their hands after touching bare human body and after using the toilet room. Hands, breath, hair, sweat, coughs and sneezes all carry microorganisms. Even if a food handler does not feel sick, he or she could still be carrying the microorganisms that can cause illness if they get into the food. Hence, it becomes vital to consider the sources of microbial contamination. All food handlers should remember the following:

- Scrupulous personal cleanliness is essential for those responsible for food storage, preparation, cooking and service
- Food should be touched by hand only when there is no alternative
- Refrain from behaviour which could result in contamination of food, for example, smoking, spitting, chewing or eating, sneezing or coughing over unprotected food
- Eating and drinking, while working, can spread germs from the person's mouth to hands
- Hands should be clean at all times with short nails and no nail paint
- Personal effects such as jewellery, watches, pins or other items should not be worn or brought into food handling areas, if they pose a threat to the safety and suitability of food, and
- Illness must be immediately reported.

Personnel should always wash their hands when personal cleanliness may affect food safety, for example:

- at the start of food handling activities
- immediately after using the toilet, and
- after handling raw food or any contaminated material, where this could result in contamination of other food items. They should avoid handling ready-to-eat food, where appropriate.

To understand why employees need good personal hygiene it is vital to consider the following sources of microbial contamination.

Skin

The skin constantly deposits sweat, oil and dead cells on its outer surface. When these materials mix with dust, dirt and grease, they form an ideal medium for the bacteria to grow. Therefore, bacteria from skin can contaminate food. If the secretions build up and bacteria continuously grow, the skin can become itchy and irritated. Food handlers rub or scratch the skin and transfer bacteria when they touch it.

Regular bathing and washing often reduces the number of microorganisms. Poor skin care and skin disorders can also cause bacterial infections like boils. Boils, you may already know, are severe local infections caused by the infections in hair follicles or skin glands after the outer layers of skin get damaged. *Staphylococci* or other microorganisms multiply in the hair follicle or skin gland and produce a toxin that kills the cells around it and causes swelling and soreness. The body forms a barrier around the boil to prevent the infection from spreading. Hence, a boil should never be squeezed. If it is squeezed, it will spread the infections and cause a cluster of boils called as a *carbuncle*. Food handlers should use a hand dip for disinfection after touching boil or pimple. To prevent contamination of food by harmful bacteria, employees should where appropriate, wear suitable protective clothing, head covering and footwear, cover boils, cuts, wounds and septic spots with suitable water-proof dressings.

Hands

Bacteria may be picked up by the hands when they touch dirty equipment, contaminated food, clothing or parts of the body. Food handlers should wash hands frequently and use a hand dip sanitizer after touching these things so that they do not contaminate food. Food handlers must wash their hands regularly and especially:

- before starting work
- on returning to work after each break
- after going to the toilet
- on entering the food processing/preparation area
- in-between handling of raw and cooked foods
- after combing or touching the hair
- after eating, smoking, coughing or blowing the nose
- after handling waste food or refuse
- after handling cleaning chemicals, and
- after contact with pests or contaminated food.

Washing the hands with soap and water removes transient bacteria and using a hand soap that contains an antiseptic or sanitizer controls resident bacteria.

Finger nails

One of the easiest ways to spread bacteria is through dirt under the finger nails. Food handlers should never handle food if their finger nails are dirty. Food handlers should not have long finger nails or artificial finger nails, while working.

Jewellery

Food handlers should not wear jewellery in food processing or food service areas, as they harbor dirt and bacteria. It can fall into the food and can contaminate the food, further it can also get caught in machinery, causing a physical and safety hazard.

Hair

Hair is constantly falling out and along with dandruff, can result in the contamination of food. Scalp carries microorganisms especially *Staphylococci*. While handling food, food handler should wear a hairnet or suitable head covering such as a cap or scarf which completely encloses the hair. Combing of hair near the work area should be avoided and take place only in the cloak room and should not be carried out while wearing the protective clothing, as hair may end up on the shoulders and then in the product. Lastly, the workers should always wash their hands whenever they scratch their heads.

Eyes

Normally, eyes do not carry bacteria. But whenever there is an eye infection, food handlers may rub their eyes with hands and thereby there is a chance of the food getting contaminated.

Mouth

Mouth carries many bacteria, particularly *Staphylococci*. Many bacteria and viruses found in mouth can cause disease, especially if the employee is ill. Food handlers, while working, should not eat sweets, chew gums, tobacco, pan masala, gutka etc. or blow into glasses to polish them. Tasting food by licking finger or an unwashed spoon is a bad practice and should be avoided.

Smoking should not be allowed in food service establishments. Smoke can cause transmission of bacteria from mouth to the food. Smoking leaves an irritating taste in the mouth which makes the person to spit. Spitting should not be allowed in food processing operation.

Nose, Throat and Lungs

Compared to mouth, nose and throat have fewer bacteria. Up to 40% of adults carry *Staphylococci* bacteria in the nose and mouth. Employees who have sinus infection will be suffering from nasal discharges, they should be careful in handling the food. They should use decongestants to reduce discharge, wash and disinfect their hands after blowing their noses. Picking or scratching the nose is not acceptable. Cough and sneezing can carry droplet infection for a considerable distance and person with bad cold should preferably not handle open food.

Sore throat is usually caused by a type of *Streptococci*. *Streptococci* cause scarlet fever, rheumatic fever and tonsillitis. These diseases spread if employees' personal hygiene is poor.

Influenza infects the body through lungs; secondary bacterial infections by *Staphylococci*, *Streptococci* or *Pneumococci* can cause death. All such ailments must be reported to the supervisors and medical clearance should be sought.

Personal habits

Do you know that apart from personal hygiene, faulty personal habits of the food handlers have an adverse effect on the quality and safety of foods? Personnel engaged in food handling activities should refrain from behaviours which could result in contamination of food. What are these habits or activities? Let's find out.

Smoking, pan chewing, eating etc. should not be done in food handling areas. Smoking, in fact, should be prohibited in the work area. Not only is this to prevent cigarette ends and ash contaminating food but also because:

- people touch their lips whilst smoking and they may transfer harmful bacteria to food
- smoking leads to coughing and droplet infections, and
- cigarette ends contaminated with saliva are placed on working surfaces and hence can contaminate food

Food handlers should not have bad hygiene practices like nail biting, keeping the fingers in ears or nose, tasting food through finger etc. Supervisory staff should carefully observe the food handlers for their behaviour while carrying out the job and should be suitably advised.

Clothing and Headgear

Food handlers should wear protective clothing while they are in food handling areas. Clothing should be light in colour, mostly white is preferred. It should be made up of a material that can be easily washed and kept clean. Nylon clothing has an advantage that it can be washed at the end of working day, dried overnight and needs no ironing. But in our hot climate, cotton clothing is preferred, but it has to be washed and ironed regularly. Cooks should wear white caps/protective headgear to protect the food from hair, as well as, to protect the hair and scalp from the effects of steamy heat. This helps to ensure that hair and dandruff does not contaminate food or surfaces. The long hair should be tied back.

These clothings should not be worn outside the food premises not used to and from work and not worn during lunch time sporting activities. This is to prevent contamination from bacteria and dirt and physical contamination from buttons etc. falling into open food. Also, outdoor clothing and personal effects must not be brought into food rooms unless stored in suitable lockers. Suitable footwear should be worn to prevent slipping and to protect the feet.

With a comprehensive review of sources of microbial contamination with respect to personal hygiene, we end our discussion here on health status of food handlers.

Check Your Progress Exercise 3

- 1) List a few ways by which food handlers may act as an important source of transmitting food borne illnesses.

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- 2) What are the specific infections that need to be looked in for before employing a food handler?

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- 3) How can one avoid microbial contamination through the following:

- a) Skin

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- b) Hands and nails

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- c) Nose, mouth and throat

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d) Clothing
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e) Personal habits
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The discussion above focused on measures to be adopted by the workers in a food service establishment to ensure good personal hygiene. What about the role of the management in providing adequate facilities to its employees to ensure food safety? Providing adequate facilities to the food handlers/employees is a must to ensure food safety. What are the facilities which would contribute to safe food? Let's find out.

10.6 FACILITIES TO EMPLOYEES

The management, in any food service unit, must have a protocol to make sure employees use hygienic practices and provide them with facilities, services and training to make it easy for the employees to stay clean and hygienic. What are the facilities which would encourage the employees to adopt good hygiene practices? Proper toilet facilities, locker-rooms, hand-washing facilities etc. are a few facilities. Let us learn about these facilities next.

Toilets

Adequate toilet facilities must be provided for employees, particularly separate facility for male and females. However, number of toilets to be provided in each food service establishment depends on the number of work force. Fruit Products Orders, Meat Food Product Orders and Milk and Milk Product Orders specifically indicate the number of toilets to be provided under sanitary requirements. Wash hand basins should also be provided within the areas, with adequate hot and cold water supplies, soap, and a suitable hand drying facility (preferably paper towels).

Cleaning and disinfection should be carried out at least once per day. Construction materials for ceilings, walls, floors and cubicle partitions should be durable and impermeable to water. Junctions between walls and floors should be covered and wall angles should be rounded. Floors should slope towards drain. All sanitary conveniences within the food premises must be provided with adequate natural or mechanical ventilation. Efficient ventilation to the outside atmosphere, possibly aided by extraction fan, is vital. This is to prevent (as far as possible) aerosols and offensive odours from permeating the food rooms.

Lavatories must not lead directly into rooms in which the food is handled. Toilets must be ventilated and must not communicate with a food room. This means there must be a lobby between the toilet and any food room. Ideally this lobby should be ventilated.

All toilet facilities should be well maintained and operating at all times. Sufficient wash basins should be provided in all toilets. Hot and cold water taps are required, which should be foot operated. Liquid or powdered soap dispensers should be provided rather than cakes, as they are likely to pose contamination from one food handler to other. Hand drying should be by means of disposable paper towels or by warm air driers.

Wash hand basins

An adequate number of wash hand basins must be available which are suitably located and designated for cleaning hands. The number of basins will depend on the size of the business and the size and layout of the premises. They must be located close to toilet facilities and at strategic places in the premises, so that workers have convenient access to them.

Wash hand basins must be provided with hot and cold (or appropriately mixed) running water, materials for cleaning hands and for hygienic drying.

Antibacterial soap and paper towels are recommended. Where necessary, the provisions for washing food must be separate from the hand washing facility.

Hand dip

Hand dip facility consisting of a bowl containing sanitizers need to be made available at convenient location. The sanitizers in the bowl need to be changed every day. It has been often observed that once sanitizer solution is kept in the bowl, is not changed. Often bacterial slime is formed at the bottom of the bowl. Studies carried out on food safety in many food industries like milk, milk products, mushrooms have indicated that food handlers are the main source of contamination. A simple hand dip facility would minimize the contamination from food handlers.

Cloak rooms

Best place for sitting, the cloak room should be at the entrance of the factory/food service establishment. Adequate changing facilities for personnel must be provided. Provision must be made to allow food handlers to change and to store their street clothes and personal effects away from open foods. It is a good practice to have separate changing rooms and to provide secure storage for personal effects.

Lockers should be used for keeping only outdoor clothes and personal items should not be used to store food. Locker taps should be sloped or abutted against ceiling in order to prevent their use as storage space and a collection point for litters. Litter is often thrown behind the lockers and so lockers should be located centrally in rooms with an access nearest to walls.

Cloak rooms should have toilet facilities. Showers should be provided for employees handling raw meat, poultry, fish and for those working in humid conditions. Showers should be provided at the rate of 1 per 20 employees.

Canteens

Food service facilities of one form or the other must be provided for employees. Depending upon the type of service i.e. canteen or cafeteria, the layout and maintenance has to be designed. Dining, service, storage, waste disposal, washrooms and kitchen should be regularly cleaned. All corridors should be screened and the doors should be self-closing. If the full canteen facilities are not provided, vending machines or snacks should be made available. We have learnt about vending machines and their maintenance in the Unit 9. Do you remember the ways by which these can be protected to prevent contamination of foods? These measures should be followed. Drinking water should be readily available in suitably situated places.

Health facilities

As a minimum requirement, one first-aid room which can also be used as a rest room, should be provided. If the number of employees are more, part-time or full-time medical officer may be employed. First-aid room must provide the following facilities to the employees:

- cover all cuts with a blue waterproof plaster or porous plaster and blue waterproof finger stall, and
- medication should not be kept in the first-aid box or given to staff.

In addition to the facilities enumerated above, it is the duty of the management to put in place measures which would minimize hazards associated with staff. These measures, some of which have been discussed earlier too and have been summarized next under the heading minimizing hazards associated with staff.

Minimizing hazards associated with staff

The hazards of contamination and cross contamination can be minimized by making sure that the staff:

- receives appropriate training and supervision when new to the job and whenever changes in staff duties or in processes require them to have additional understanding and skills relating to food safety and hygiene
- attend suitable training courses in hygiene awareness and maintenance of hygienic practices and standards
- wash with soap and dry their hands immediately before starting work and frequently throughout the day and always after using the toilet, combing hair, handling waste, eating, blowing nose, and after handling any item likely to harbor a hazard to food safety, e.g. used packing material, food containers, etc.
- keep hands clean throughout the milking operation, cheese-making and retail activities
- wear suitable clean working clothes. The light coloured clothing must be worn, which covers personal clothing and which should not have pockets. Poppers may be preferable to button fastenings, as buttons may fall into products. It is good practice for food handlers not to wear one piece overalls as they may come into contact with the floor, e.g. when using toilet facilities
- use plastic aprons where appropriate
- keep their hair clean and tidy. If hair is long, it must be kept tied back neatly away from the face. Do not smoke, eat or drink in work areas
- follow recommended good practices by not wearing jewellery or watches
- when the food handlers join the business, they should have no medical condition which would affect the safety of the food being handled, e.g. this would include people who have been ill with symptoms of Salmonellosis and who have subsequently recovered but who may still carry the bacteria which could be passed on to food
- keep any wounds to the skin covered with a waterproof dressing
- notify the concerned authorities when they (or a partner or other family member) are ill where there might be food safety implications
- if they are suffering from illness, do not milk animals and do not handle the food
- do not work if they are suffering from diarrhoea and/or vomiting
- do not return to work after illness until fully fit, and
- are free of medical conditions which would affect food safety when they return from holiday or a break.

Finally, a word about controlled access.

Personnel and visitor access to specific food-product handling areas must be restricted. Personnel involved in raw product handling (e.g. farm truck drivers etc.) must not be allowed in processing or finished product areas. Foot baths and hand dips, where required, must be properly maintained and used. Colour coding of clothing, maintenance and other equipment should be used to clearly identify raw vs processed product operations.

With a discussion on what facilitates a management should provide to its employees to ensure food safety we come to an end of our study on hygiene and sanitation in food service establishments.

Check Your Progress Exercise 4

1) Fill in the blanks:

- a) The facilities to be provided to the employees include,, and
- b) The cloak rooms for employees must have lockers to be used forand not for storing
- c) In the absence of full canteen facilities, must be provided.
- d) The sanitizers meant for hand washing needs to be replaced often to avoid slime formation.
- e) Provision of showers in cloak rooms must be at the rate of per employees.

2) How can the hazards associated with the staff be minimized?

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10.7 LET US SUM UP

In this unit, we studied about sanitation practices to be followed in maintaining hygiene in food service establishments. In this respect, action of cleaning agents was described followed by the classification of cleaning agents into alkaline and acid compounds. Further, the properties of disinfectants/sanitizers in maintaining the sanitary conditions in the food industry were discussed. A variety of disinfecting agents including chemicals, heat and radiation were also described. Finally, the measures of pest and rodent control were discussed along with the hygiene requirements for licensing and sale of food items under the PFA Rules, 1955.

The second part of the unit focused on the health status of employees handling food. The personal hygiene of food handlers was emphasized that included the various body parts, such as skin, hands and fingernails, hair, mouth, nose and throat. Also, the various facilities to be provided to the employees to ensure minimal risk of food borne diseases were described in detail. The provision of toilets, cloak rooms with adequate facilities, canteens or vending machines, hand-dip sanitizers and first-aid and other medical facilities to the food handling staff as one of the measures to ensure food safety were discussed.

10.8 GLOSSARY

Amphoteric compounds	: alkyl or acyl amino acids.
Antiseptic	: a substance which prevents or retards putrefaction, or destroys, or protects from putrefactive organisms.
Boils	: severe local infection caused by infections in hair follicles or skin glands after the outer layers of skin gets damaged.
Carbuncle	: a cluster of boils.
Decongestant	: a medicine to treat nasal infections.
Dunnage	: planks and pieces of wood used to protect
Food borne illness	: illness or disease caused by the ingestion of foods containing toxic or infectious agents.
Rheumatic fever	: disease that may develop between one and 5 weeks after recovery from strep throat or scarlet fever after recovery from strep throat or scarlet fever.
Scarlet fever	: an acute contagious disease caused by group A beta-hemolytic streptococcus bacteria. It occurs predominantly among children and is characterized by a scarlet skin eruption and high fever.
Tonsillitis	: inflammation of the tonsils.

10.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) Cleaning agents work in two ways, they lower the bond energy between the food debris and the surface so that the debris can be dislodged and loosened. Secondly, they suspend the debris in the solution so that they can be flushed away.
- 2) Cleaning compounds can be classified into:
 - Natural origin: Bengal gram powder or *Besan*

- Alkaline compounds: Strongly alkaline-NaOH, Heavy-duty-Sodium carbonate, and Mildly alkaline-Sodium carbonate.
 - Acid compounds: Strongly acid- Phosphoric acid.
 - Soaps and detergents: Sodium salts of fatty acids.
 - Solvent: Ether or alcohol-based.
- 3) a) – iv)
b) – i)
c) – v)
d) – vi)
e) – ii)
f) – iii)
- 4) a) Food sanitation is the creation and maintenance of hygienic and healthful conditions in the food preparation, storing and serving areas.
- b) A chemical substance which is added to the cleaning compounds to prevent the salts of calcium and magnesium in hard water from forming deposits on equipment surface is referred to as sequestrant.
- c) A chemical substance which is capable of killing microorganisms is referred to as disinfectant.
- d) Detergent is a substance which assists in cleaning when added to water.
- e) Surfactants are the agents that help to spread cleaning or sanitizing compounds and the surface to be cleaned.

Check Your Progress Exercise 2

- 1) The two ways of hygienic waste disposal are:
- collection of waste materials in plastic bags before putting them in the waste bins with lids
 - collection of the kitchen waste into foot-operated suitable wastes bins which have tight-fitting lids.
- 2) Pest and rodent control is essential to prevent: spread of disease, wastage of food, damage caused by growing of electric cables or pipes and loss of customers.
- 3) Pests that pose a threat to the maintenance of hygienic surroundings are:
- Flies and cockroaches – They feed indiscriminately on waste matter, animal wastes and food from kitchens.
 - Housefly – They visit utensils, equipments, and waste matter and leave on invisible trail of bacterial and other disease-causing germs.
 - Ants – They eat a variety of foods

- Cereal mite – Found in stored dry food commodities
 - Borers – cause damage and contamination of foods.
- 4) Preventive measures for pest and rodent control can be listed as (any five of the following):

Keep the premises clean, clean all incoming goods and boxes, keep doors and windows screened, keep reusable boxes, crates etc., out of kitchen, keep drains clean and in good condition, keep waste bin covered, empty wastes promptly and wash it regularly, reporting of pests or pest damage, periodic vermin elimination programme and keep the shelves, cupboards and drawers in good repair.

Check Your Progress Exercise 3

- 1) Food handlers may act as an important source of transmitting food borne illnesses when organisms present on the food handler's body comes in contact with the food, they acquire infection from food handled during their work and may further contaminate food and ill-health and lack of personal hygiene can further be a contributory factor.
- 2) The specific infections that need to be looked in for before employing a food handler include:
- *Salmonella typhi*, *shigella*, *E. Coli*, Hepatitis A Virus
 - Diarrhoea, Fever Vomiting, Jaundice and Sore throat
 - Lesion containing pus or infected wound.
- 3) a) Microbial contamination through the skin can be prevented by regular bathing and washing.
- b) Microbial contamination through hands and nails can be prevented by washing of hands frequently, use of hand-dip sanitizer and avoid long fingernails or artificial fingernails.
- c) Use of decongestants to reduce nasal discharge, wash and disinfect their hands can avoid microbial contamination through nose, mouth and throat.
- d) Use of protective clothing, which should be made up of an easily washable material.
- e) Microbial contamination through personal habits can be prevented by refraining from the activities engaged in food handling which could result in contamination of food.

Check Your Progress Exercise 4

- 1) a) toilets, cloak rooms, canteens, hand dip, health facilities
- b) clothes, food
- c) snacks
- d) bacterial
- e) 1, 20

2) The hazards associated with the staff can be minimized by

- receiving appropriate training, supervision and additional understanding and skills relating to food safety and hygiene
- keep hands clean throughout the various activities
- wear suitable clean working clothes
- should have no medical condition which would affect the safety of the milk or cheese, and
- keep any wounds to the skin covered with a waterproof dressing and notify the concerned authorities when they are ill.