Alberta Health Services

Food Safety Course

For Provincial Food Handler Certification

Health Protection
Environmental Public Health Program

Version: 2EPHE-12-005
Revised: Apr/14

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Unit 1 – Introduction to Food Safety

Learning Outcomes

- Identify who is responsible for enforcing food safety rules in Alberta.
- Describe the role of the health inspector.
- Understand important requirements from the Alberta Food Regulation.
- Explain the requirements for a food handling permit.

Why is food safety important?

Practicing good food safety helps prevent foodborne illness. **Foodborne illness** is any illness caused by eating contaminated food or water. Health Canada estimates over 4 million Canadians are ill with a foodborne illness each year. That means every year, 1 out of 8 Canadians may be sick with foodborne illness. Foodborne illness costs the Canadian economy $12 to $14 billion dollars a year.

Who is responsible for food safety in a food establishment?

All staff has a role in handling food safely. However, the operator of a food establishment is the one responsible for making sure food is stored, handled, processed and served in a safe manner at all times. An operator of a food establishment may be the owner of the business, a manager, or a supervisor.

Provincial and Federal government agencies are responsible for enforcing food safety regulations in food establishments. Alberta's Food Regulation, under the provincial Public Health Act, is enforced by public health inspectors (also known as environmental health officers) who work for Alberta Health Services. The federal government is responsible for the Canada Food and Drugs Act and its regulations, which is enforced by the Canadian Food Inspection Agency (CFIA).

What is the role of a health inspector?

Health inspectors are responsible for enforcing Alberta's Public Health Act and all its regulations. This is to minimize illness and injury in the population and protect the health of the public, by performing such activities as:

- inspecting public facilities, including day cares, rental housing, public swimming pools and hot tubs, personal services such as hair salons, tattoo and piercing parlors and food establishments
- investigating public health complaints, and determining the cause of a foodborne illness or outbreak
- educating food handlers and the public in the prevention of disease and illness

The Public Health Act gives a health inspector the authority to enter and inspect a food establishment at any reasonable time. This includes times when the food establishment is very busy.

A health inspector may also:

- require documents, such as sales receipts
- interview the operator and staff with questions that may help the inspection or investigation
- take samples of food
- test food establishment equipment such as the dishwasher
- take photographs of the food establishment

When a food establishment is not in compliance with the Food Regulation, they are breaking the law. A health inspector has the authority to take action to correct the unsafe condition such as:

- seize food that has become unsafe, or order it to be discarded or destroyed
- close the facility
- press charges under the Public Health Act and seek prosecution of the facility owner or operator in a court of law
- suspend or cancel the food establishment's food handling permit

What is a food handling permit and who needs one?

The Food Regulation requires all food establishments to have a valid food handling permit. Examples of food establishments include, but are not limited to:

- restaurants
- grocery stores
- food warehouses
- mobile food vendors
- bakeries
- potable water trucks

A food handling permit is approved and issued by Alberta Health Services. Almost all food establishments must have a food handling permit before they are open for business. The food handling permit may restrict the type of food that is served or the manner in which it is prepared. For example, a convenience store may have a permit for selling prepackaged foods only, with no food preparation allowed. If the convenience store wanted to start making and selling sandwiches to customers, it would require a new food handling permit.

The food handling permit is only good for one year or less, so each food establishment pays for their food handling permit once a year. The permit cannot be traded or transferred between businesses or new owners. When a food establishment receives the food handling permit, it must be displayed in the food establishment so that customers can see it easily.

Operators at special events, temporary food establishments and community organization functions do not require a food handling permit. However, they must notify Alberta Health Services of their plans and they must follow regulatory requirements to ensure food is handled in a safe manner.

Where can I get more information about the Food Regulation?

You may get a copy of the Public Health Act and the Food Regulation online at the Alberta Queen's Printer website at www.qp.alberta.ca or by telephone at (780) 427-4952. The Food Regulation and Food Retail and Foodservices Code are also available on the www.albertahealthservices.ca/eph.asp website: click on Resources, then scroll down to Legislation.

The Food Regulation lists the minimum requirements a food establishment must follow to make sure food is handled safely:

General construction

- a food establishment must submit plans to Alberta Health Services for approval prior to construction or alterations of the food establishment
- the facility must be of sound construction and in good repair
- designed so that all equipment, utensils and surfaces can be effectively cleaned and sanitized
- designed to facilitate the safe and sanitary handling of food
- living quarters must be separate from food preparation areas
- handwashing stations must be easily accessed by all food handlers and supplied with both hot and cold potable water, and soap and paper towels in appropriate dispensers
- ventilation systems are required for the removal of grease and odours

Equipment, utensil, and food surfaces

- must be smooth, non-absorbent and easily cleanable
- refrigeration and hot holding equipment must be maintained at proper temperatures
- accurate thermometers must be present on all coolers and freezers

Storage of articles and materials

- food and non-food related items are to be stored separately
- chemicals and cleaners must be labelled and stored separately from food

Pest control measures

- the facility must be kept free of pests and conditions which attract pests
- written records of pest control measures used must be maintained

Obtaining food from approved sources

- all food entering the facility must be inspected by the government

Contamination and unfitness for human consumption

- all food must be protected from contamination and handled in a sanitary manner
- any food that is unfit for human consumption cannot be served, sold, processed or displayed

Processing food

- food handling must be done in a manner that makes food safe to eat

Storing, displaying and transporting food

- all high-risk food must be stored, displayed and transported at 4°C or colder or 60°C or hotter
- frozen foods must remain frozen while stored, displayed, packaged or transported

Sanitation procedures

- written sanitation procedures are required that includes a cleaning schedule and a list of all cleaning and sanitizing chemicals

Food handler's hygiene and health

- food handlers must wear clean clothing, footwear, exhibit cleanliness, keep hair under control, wash hands often and refrain from smoking in food areas

Food safety training

- at least one supervisor or manager from a food establishment must hold a certificate in Food Sanitation & Hygiene Training, and if there is 6 or more staff on duty, at least one staff holding a certificate must be present on site

SAMPLE QUIZ – UNIT 1

Choose the best answer

1. In Alberta, food safety is regulated by:
    a. Food and Restaurant Associations
    b. Federal and Provincial governments
    c. Cities and local municipalities
    d. Hospitals and health care agencies

2. Regulations governing food facilities are intended to:
    a. Minimize potential foodborne illnesses
    b. Ensure that food facilities are cleaned at least weekly
    c. Control all parts of a food business operation
    d. Improve customer service

3. Food handling permits in Alberta are issued by:
    a. Alberta Gaming and Liquor Commission
    b. Municipal Licensing Office
    c. Alberta Health Services
    d. None of the above

4. Which of the following facilities requires a food handling permit?
    a. Potable water truck
    b. Bakery
    c. Hot dog cart
    d. All of the above

5. A health inspector can enter your facility at any reasonable time to inspect and determine compliance with the Public Health Act and its regulations.
    a. True
    b. False

6. What should a manager do during a public health inspection?
    a. Make yourself available to the health inspector for questions and discussion
    b. Offer the inspector a cold drink
    c. Be ready to provide documents, such as receipts
    d. Both a and c

7. Which of the following statements is **not** true?
    a. A health inspector can put restrictions on a food handling permit
    b. A health inspector can enter a food establishment at any reasonable time
    c. A health inspector can require food to be thrown away
    d. A health inspector can fire a food establishment employee

NOTES

Unit 2 – Microbiology

Learning Outcomes

- Describe the types of microorganisms that are a concern to the food industry.
- Explain the conditions that allow microorganisms to grow and survive in food.
- Describe how the growth of microorganisms in food can be controlled.
- Identify the temperature danger zone.
- Describe the sources of pathogens.
- Define direct and indirect transmission, the fecal-oral route, and cross contamination.

Most foodborne illness is caused by microorganisms, or germs, that are in the food. Food handlers should know where microorganisms come from, and how they live, grow and move around. This helps food handlers to understand how safe food handling practices work to control contamination of foods, and how they control the growth of microorganisms in food.

What are microorganisms?

Microorganisms (also called microbes or germs) are living organisms that are so small they cannot be seen with the naked eye. Microorganisms can only be seen under a microscope.

Microorganisms are everywhere in our environment. They can be found in food, water, ice, air, soil, dirt and dust. Microorganisms are also found in plants and animals including those we use for food. People also carry microorganisms, both on the inside and outside of the body.

The presence of microorganisms in food does not always mean that the food is unsafe to eat. More than 99% of microorganisms are harmless. Many microorganisms are even beneficial, which means they are good for our health. For example, good bacteria are found in a healthy digestive system; yeasts and bacteria are known to help make foods

such as wine, cheese, and bread; and some antibiotics, such as penicillin are made from moulds.

Some microorganisms can damage and deteriorate food. These are called **spoilage organisms**. When present in food, spoilage organisms can cause noticeable changes in the food: appearance and colour, texture, odour and taste. For example, raw meat can turn green and slimy; deli meat can smell sour; or, cheese can grow fuzzy mould.

Some microorganisms can make people sick. Microorganisms that cause illness in humans are called **pathogens**. When present in food, pathogens do not change the appearance, colour, texture, odour or taste of food.

Note: Food that is contaminated with dangerous pathogens can look, smell and taste the same as healthy, safe food.

What kinds of pathogens do we find in food?

There are five main groups of pathogenic microorganisms that can be transmitted through food to make people sick:

1) **Fungi include yeasts and moulds**, which are more commonly a problem of food spoilage. Moulds and yeast are often detected by bad smell, taste, or are seen on the surface of foods as a change of colour, or a slimy or powdery film. In beverages, yeasts can cause cloudiness and produce gas bubbles. However, this does not mean that pathogenic mould or yeast may always be detected in food.

2) **Parasites** are organisms that live and feed off of other living organisms, which are called the parasite's host. Plants, animals and people can be a host to parasites. Parasites invade the host's tissues or organs and steal nutrients. Parasites may be spread through human or animal feces. A person can become infected with a parasite after eating food made from infected animals, or drinking water or eating food contaminated with feces that contained parasites or their eggs.

Some parasites grow large enough to be seen without a microscope, such as tapeworms and roundworms. Parasitic worms have been found in the flesh of fish and animals. In North America, sushi fish and undercooked wild game meat are common food products that may expose people to parasites.

3) **Protozoa** are parasitic microorganisms found in the soil, water and in the intestines of animals or humans. Protozoa can survive and spread through contaminated food and water, but they will not grow or multiply in these environments. They will only grow in a living host.

   Protozoa exist as small oocysts or cysts (like a spore) in the environment. Protozoan cysts are found in most lakes, streams and groundwater under direct influence of surface water. Drinking untreated water from these surface water sources is a common cause of waterborne illness. These cysts are also highly resistant to chlorine and other disinfectants that are normally used to kill bacteria and viruses in treated drinking water.

4) **Viruses** are the smallest of the microorganisms. Viruses can only grow and multiply inside the cells of another living plant or animal. Some viruses are spread through the exchange of bodily fluids, while others are spread through contaminated food, water, and surfaces. Certain viruses are easily spread from sick food handlers to customers through food.

5) **Bacteria** can be found almost anywhere in the environment, such as water, air, dust, food, intestines of animals and humans, human skin, hair, and clothing. Several species of pathogenic bacteria are even found in the soil from your own home garden.

   Unlike viruses and protozoa, **bacteria** do not need a living host to grow. **Bacteria can grow and multiply in many types of foods**. When conditions are right, the number of bacteria in food can quickly multiply to unsafe levels. When people eat this food they can get very sick from the high numbers of live bacteria.

Several types of bacteria produce **toxins** as they grow in food. These bacterial toxins are poisonous to people, and food containing the toxins can cause foodborne illness. **Toxins produced by bacteria are not destroyed by normal cooking temperatures.** The toxins cannot be detected by appearance, smell, or taste of the food.

Some bacteria can produce **spores.** A spore is like a shell which protects the bacteria from high heat and chemical sanitizers. **Spores produced by bacteria are not destroyed by normal cooking temperatures.**

What conditions found in food allow microorganisms to grow and multiply?

While viruses, protozoa and parasites can contaminate food, only bacteria and fungi can use the nutrients to grow and multiply in food. Both bacteria and fungi can cause spoilage and formation of toxins in the foods that they are growing in, but growth of pathogenic bacteria is a bigger concern because it more commonly causes foodborne illness.

Food that supports the growth of pathogenic bacteria and their toxins is known as **potentially hazardous food** or **high-risk food.** These foods typically include any food that consists in whole or in part of milk or milk products, eggs, meat, poultry, fish, shellfish or any other ingredients, in a form capable of supporting growth of pathogenic bacteria.

The acronym "**FAT TOM**" can help you remember the conditions that support the growth of pathogenic bacteria: **F**ood, **A**cidity, **T**ime, **T**emperature, **O**xygen and **M**oisture.

1) Food

Bacteria like foods rich in proteins and carbohydrates, such as meat, dairy, eggs, seafood, cereals and grains. Bacteria do not grow well in fats, like cooking oil and butter. However, if protein or carbohydrate ingredients are added to oil or butter (e.g. garlic butter, chilli infused oils) pathogenic bacteria may grow.

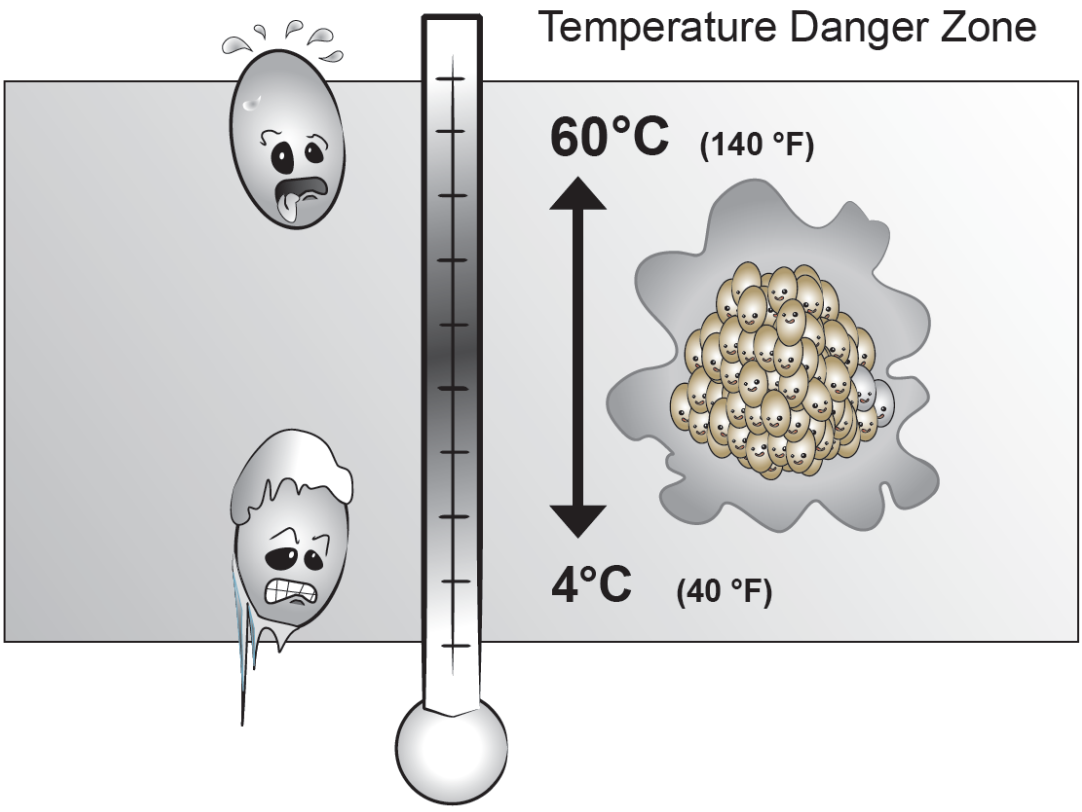
2) Acidity

Acidity and alkalinity are measured by pH. Most pathogens prefer *slightly* acidic food (between pH 5 to pH 6). **Pathogenic bacteria do not grow well in foods that contain a lot of acid (less than pH 4.6).** For example, adding vinegar (an acid) to pickled foods and sushi rice lowers the pH of the food below 4.6 and creates an environment that does not support the growth of pathogenic bacteria.

3) Temperature

Pathogenic bacteria grow and multiply quickly at temperatures between **4°Celsius and 60°C** (40 Fahrenheit and 140°F). This temperature range is known as the **temperature danger zone.** Note that pathogenic bacteria will multiply fastest when food is between 30°C and 45°C (86°F to 113°F) and especially near the temperature of the human body, 37°C (98.6°F).

Figure 1. Temperature Danger Zone



At refrigeration temperatures (4°C or below), bacterial growth only slows down; growth does not stop, which is why food can still spoil when left in the refrigerator for too long. At temperatures higher than 60°C, bacterial growth will also slow down and even stop. Controlling the temperature of high-risk food is the easiest thing a food handler can do to prevent the growth of pathogenic bacteria

4) Time

Under perfect conditions, each bacterial cell can divide into two new cells every 20 minutes. Bacterial growth can be controlled by limiting the amount of time that high-risk food spends in the temperature danger zone to no more than **two hours**.

5) Oxygen

Many bacteria need oxygen in order to grow. These bacteria are called **aerobic**. Spoilage organisms and many pathogenic bacteria are aerobic. Some bacteria grow only when there is no oxygen present. These bacteria are called **anaerobic**. Botulism is an example of a foodborne illness caused by anaerobic bacteria.

Canning, vacuum packaging, and modified atmosphere packaging (or MAP) removes oxygen from the food environment. This increases the shelf life of the food by preventing the growth of aerobic spoilage organisms and most harmful bacteria. However, when this type of packaging is used there is an increased risk for the growth of anaerobic bacteria. Submerging garlic, onions or herbs in oil also removes oxygen and allows for anaerobic bacterial growth.

In 1985, 36 people became ill after eating at a popular restaurant in Vancouver. The victims developed a range of neurological symptoms, including paralysis. Most of the victims were hospitalized; 7 patients could not breathe on their own.

The illness was linked to chopped garlic in soybean oil, which had been used in a few different menu items. This garlic-in-oil mixture had been left unrefrigerated for months before being opened.

These conditions allowed C. botulinum *spores that were on the garlic to germinate and grow in an anaerobic environment, and release botulism toxin into the food.*

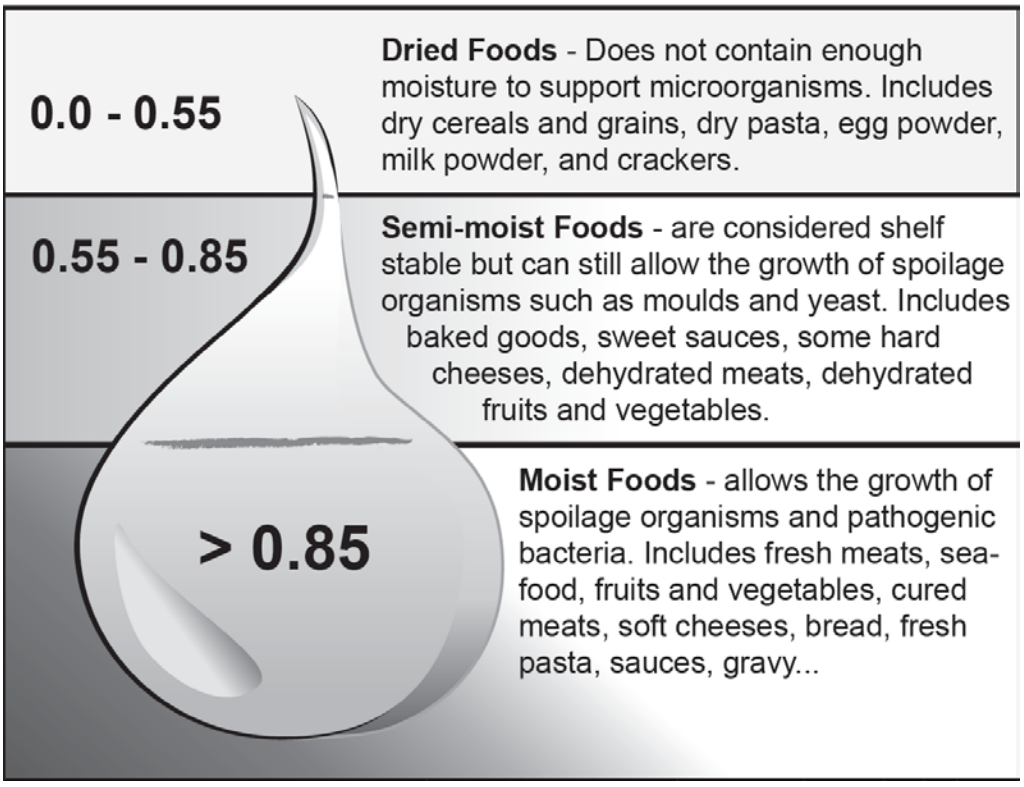
Modified atmosphere packaging uses an inert gas such as carbon dioxide or nitrogen in place of air, so that oxygen is not present in the packaging. Modified atmosphere packaged and vacuum-packaged products still require refrigeration.

6) Moisture

All microorganisms need water to grow. The term **water activity** (symbol is A_w) describes the amount of available free water or moisture to support the growth of microorganisms. Plain water has a water activity of 1, and dry pasta has a water activity of 0.5. Foods with a water activity less than 0.86 are considered shelf stable. These foods do not have enough available moisture to support the growth of spoilage organisms or pathogens. See Figure 2 for more examples of food and their water activities.

Available moisture in foods may be reduced by adding high amounts of sugar or salt, or by dehydration.

Figure 2. Water Activity of Different Types of Foods



How do pathogens get into food?

Microorganisms cannot move around by themselves. Instead, they are moved from place to place by people and pests, or on things which are being used and moved around the kitchen, such raw foods, utensils and equipment. Microorganisms can also move through the air in contaminated water droplets or dust.

Cross contamination often refers to the transfer of pathogens from one food to another. Cross contamination can also be the transfer of pathogens or harmful chemicals, from people, equipment, or work surfaces, to food. Cross contamination can happen directly, for example a piece of raw meat falls into a container of ready-to-eat salad. Or, it can happen indirectly, for example using the same knife and cutting board to cut raw chicken and then cut cooked chicken.

In 2010 more than 50 people were sick with Salmonella *infections after eating crab cakes at a local festival.*

The cakes were prepared in advance: the crab meat was boiled for 10 minutes, ground, formed into cakes, breaded and lightly baked. On the day of the festival, cooks only reheated the cakes enough to be crispy.

Unfortunately, the grinder used to prepare the cooked crab meat had been previously used to grind raw chicken and had not been properly cleaned and sanitized. This resulted in cross contamination of the crab meat with Salmonella *bacteria.*

The crab cakes were deep fried twice after they had been prepared, but the bacteria were not destroyed as the internal temperature did not reach 74°C either time.

How could this outbreak have been prevented?

In general, pathogens get into food by one of the following methods:

1) **Direct contamination** occurs when microorganisms are spread to food directly from the source of contamination. For example, when an infected food handler coughs or sneezes onto the food, or an infected cut or burn on a finger touches the food, or raw chicken drips onto foods stored on a shelf below, there will be direct transmission of pathogens.

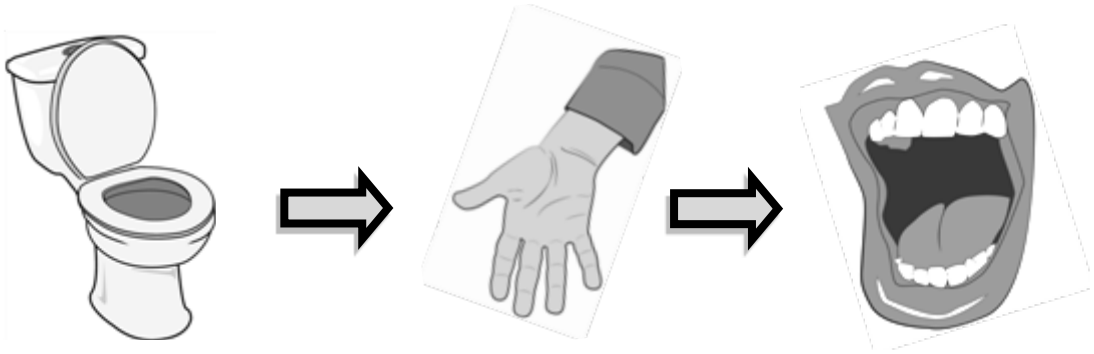
2) **Indirect contamination** occurs when an intermediate step or object is involved in spreading contamination from the source to the food. For example, a food service worker uses a knife and cutting board to cut raw chicken, and then before properly cleaning and sanitizing, uses the same equipment to prepare a salad. Pathogens

such as *Salmonella* bacteria are spread to the salad via the cutting board and knife. If a food handler used a dish towel to first wipe dirty hands, and then to dry clean dishes, there would be indirect transmission of pathogens from the hands, to the dishes via the towel.

In food service, the food handler is the most common source for the transmission of pathogens to food. Pathogenic organisms are commonly found in and on people, for example *Staphylococcus* bacteria can be found on skin and hair and in the nose and throat. Food handlers can also pick up pathogens from handling contaminated ingredients and equipment, and then easily pass this contamination on to the next thing they touch.

The **fecal-oral route** is the transfer of pathogens from feces to a person's mouth. This can happen when a food handler does not wash their hands properly after using the toilet and then prepares food for someone else. This is especially dangerous if the food handler is infected with a pathogen, such as the norovirus, hepatitis A virus, *Salmonella*, *E.coli*, etc. Customers may be exposed to these harmful microorganisms when they eat foods, drink beverages, or use eating utensils that have been handled by the infected food handler. The fecal-oral route is a common way disease is spread through ready-to-eat foods such as sandwiches, fruits and vegetables, sushi, and ice.

Figure 3. The Fecal-Oral Route



What are sources of pathogens?

Humans are the most common source of food contamination. People can carry pathogens in their intestines, such as *Salmonella* bacteria or hepatitis A virus. Pathogens are also carried on the outside of the body. *Staphylococcus aureus* is a type of bacteria commonly found on skin, hair, clothes, noses, throats, pimples, boils, and infected cuts and wounds.

Animals that are used for food also carry pathogens in their intestines and on their bodies, which leads to contamination of animal food products. For example, a major source of *Salmonella* is poultry and eggs. Cattle carry *E. coli* bacteria in their intestines and on their hides.

Insect and rodents are sources of viruses, bacteria and parasites that cause foodborne illness. Pests spread pathogens to food through their feces, or by touching food and food contact surfaces with their contaminated bodies.

Soil and filth will contain microorganisms which can spread around the kitchen environment. Many fresh fruits and vegetables are planted in or on soil, and so these foods may be contaminated with bacteria and spores of bacteria that were in the soil where they were grown. It is common to find *Clostridium botulinum* (botulism) bacteria and spores in garden soil.

Keeping microorganism numbers low

Start off with very low numbers of microorganisms in your environment and food by:

- Using food from approved sources
- Practice good personal hygiene
- Keep food out of the temperature danger zone
- Cook food to proper temperatures
- Clean and sanitize surfaces and equipment

How can microorganisms be controlled?

Safe food handling practices work to prevent foodborne illness by preventing the transmission of pathogens to food, or to control the growth of pathogens that are already in the food. There are a number of ways that we can reduce the number of microorganisms in food and in the kitchen environment. Foodborne illness may be prevented if microorganisms are either destroyed or controlled.

Controlling bacterial growth

Bacterial growth in food and the environment can be controlled by changing the conditions (FATTOM) that allow bacteria to grow and multiply. For example:

- Temperature control is the easiest method to prevent the growth of bacteria in food. This is done by keeping potentially hazardous foods out of the danger zone (time-temperature control).

- Freezing food.

- Lowering the pH, or increasing the acid in the food (e.g. vinegar in pickles and commercial mayonnaise).

- Decreasing water activity, or removing available moisture in foods by dehydration, or some smoking processes (e.g. dried fruits, smoked meats). Water activity is also decreased in foods by adding large amounts of sugar or salt (e.g. sweet preserves, salted fish).

- Lowering oxygen levels through certain packaging methods (e.g. modified atmosphere packaging). This will prevent the growth of aerobic organisms. There must still be temperature control to prevent growth of anaerobic bacteria.

- Adding food additives, or preservatives, to control the growth of microorganisms in foods (e.g. propionates in bread, benzoates in soft drinks and juice).

Generally, foods that are very sweet, very salty, very dry or very sour are more likely to be shelf stable, because one or more of the conditions needed for microbial growth is missing.

Destroying microorganisms

Most microorganisms are killed at high temperatures. When heat is applied to food or to a surface at the right temperature for a long enough period of time, most microorganisms are destroyed. Pasteurization of food uses heat to destroy pathogens. When drinking water is known or suspected to be contaminated, any pathogens that may be present can be destroyed by boiling the water at 100°C (212°F) for 1 minute.

It is important to remember **that heat does not destroy all bacterial spores or toxins in the food.**

Freezing foods at specific temperatures for a long enough period of time is an effective method to destroy most parasitic worms (some wild game worms are resistant to freezing), but freezing does not always kill other types of microorganisms, like bacteria.

Chemical sanitizers can also be used to reduce the number of microorganisms in the environment to a safe level. For example, a chemical sanitizer may be used on a counter top, plate, or other food-contact surface, to destroy microorganisms that are still present after cleaning these items.

SAMPLE QUIZ - UNIT 2

1. Pathogens are:
    a. Spoilage organisms
    b. Microorganisms that cause disease
    c. Viruses that you can see through a microscope
    d. Bacteria that produce spores

2. It is easy to know when pathogens are in food because they will change the appearance, color and taste of food.
    a. True
    b. False

3. Why should food handlers learn about microorganisms?
    a. To understand their role in human digestion
    b. To know what they look like
    c. To understand their characteristics in order to apply control measures when working with food
    d. To avoid buying food that contains microorganisms

4. What is the “danger zone”?
    a. It is a temperature range from 4°C (40°F) to 60°C (140°F)
    b. It is a temperature range from 10°C (104°F) to 55°C (57°F)
    c. It is the temperature range at which bacteria multiply rapidly in food
    d. Both a. and c.

5. How do pathogens move from place to place?
    a. They fly
    b. They attach to people, animals and objects
    c. They walk
    d. They take a very small taxi cab

6. Ice is always safe to eat because pathogens can’t survive in cold temperatures.
    a. True
    b. False

7. What is the best way to control the growth of bacteria in a food facility?
    a. You can’t control them because they are everywhere
    b. Use soap
    c. Change the conditions they need to survive and reproduce
    d. Only hire employees that are clean

8. A server sneezing on food is an example of direct contamination.
    a. True
    b. False

9. pH is a measure of:
    a. acidity and alkalinity
    b. bacterial growth
    c. cleanliness
    d. temperature

10. As the water activity or moisture content in the food increases, the more it will support microbial growth.
    a. True
    b. False

11. What do anaerobic bacteria need to reproduce?
    a. Oxygen
    b. Absence of oxygen
    c. High amounts of sugar and salt
    d. Both a and c

12. The following conditions support the growth of bacteria **except** for:
    a. Moisture
    b. Food such as protein
    c. High acidity
    d. Temperatures between 4°C (40°F) and 60°C (140°F)

13. Most pathogens are killed by:
    a. Freezing for a certain period of time
    b. High heat for a certain period of time
    c. Sanitizing
    d. Removing oxygen

14. Potentially hazardous foods, or high-risk foods, are foods that support the growth of pathogenic microorganisms.
    a. True
    b. False

15. What is the difference between a microbe and a microorganism?
    a. A microorganism is smaller than a microbe
    b. A microorganism causes disease; a microbe does not cause disease
    c. A microbe produces a toxin
    d. They are two names for the same thing

16. Toxins are poisonous waste products of bacteria which are usually destroyed by cooking temperatures.
    a. True
    b. False

NOTES

Unit 3 – Foodborne Illness

Learning Outcomes

- Define foodborne illness.
- Compare biological, chemical and physical hazards that lead to foodborne illness.
- Compare foodborne infection with food intoxication and toxico-infection.

Foodborne illness is any illness caused by eating contaminated food or water. The contamination can be from pathogens, toxins, chemicals or physical objects. People also use the term food poisoning. Allergic reactions, although they can be severe and life-threatening, are not considered to be foodborne illness. It's estimated that 1 in 8 Canadians get a foodborne illness every year. Most cases are not reported. The source of foodborne illness can be from food establishments or from the home.

Anyone can get sick with foodborne illness. For healthy people, most foodborne illnesses cause unpleasant symptoms such as:

- Diarrhea
- Vomiting
- Nausea
- Stomach cramps

Secondary symptoms can include fever, headache and body ache.

It can take anywhere from 30 minutes to several weeks for symptoms to show up after consuming a pathogen. This is called the **incubation period** of the pathogen. How many cells you need to consume to get sick depends on the pathogen. It can be as low as even one cell (*Salmonella*) to hundreds of thousands (e.g. *Clostridium perfringens*).

These symptoms may last a few days to several weeks. Sometimes the symptoms are very serious and require hospitalization, or lead to death. There may also be long term effects of foodborne illness such as arthritis, kidney problems, and bowel problems.

There are groups of people for which foodborne illness is much more dangerous. These groups are called **susceptible populations / immuno-compromised** and they include:

- the elderly
- people with an underlying illness
- pregnant women
- babies or very young children

Often, these groups will get foodborne illness more easily, the illness will be more severe, it will last longer and it will have increased risk of hospitalization, complications, or long term effects.

There are three general types of contamination which can lead to foodborne illness: biological, chemical, and physical.

Biological Foodborne Illness

Foodborne illness is most often caused by contamination of food by biological agents such as pathogens (harmful bacteria, viruses, parasites, protozoa, moulds) or their toxins.

Biological contamination of food can lead to three types of illness: **foodborne infection, foodborne intoxication,** and **foodborne toxico-infection.** A detailed chart on foodborne diseases can be found in Appendix 2 at the back of the book.

1. Foodborne Infection

A foodborne infection is caused by a person eating food containing live pathogens, which continue to grow inside the person's gut. The symptoms are caused by the infection of the person's body parts and tissues by the pathogens and usually include stomach cramps and diarrhea. A person that has a foodborne infection does not feel sick right away. For most people it will take at least 6 hours or longer for the infection to become large enough to cause symptoms.

Bacteria, viruses, protozoa and parasites can all cause a foodborne infection:

a) ***Salmonella*** is an example of bacteria that cause a foodborne infection.

- *Salmonella* bacteria are found in the intestines of humans and animals. Foods that are often contaminated with *Salmonella* bacteria are poultry such as chicken, turkey, duck, and egg products.
- *Salmonella* usually takes 12 to 36 hours to cause symptoms of nausea, vomiting, stomach cramps, diarrhea, fever and headache. These symptoms can last for several days or longer.
- Some people that get sick with *Salmonella* become dehydrated and require hospitalization, some people will develop arthritis as a result of the infection.
- **Main control: proper cooking.** Also avoid cross contamination.

In 2009 six patrons at an Alberta restaurant got sick with Salmonella enteritidis *following a romantic Valentine's Day dinner that included spring rolls.*

The restaurant, where the couples dined, used the same batter for many food preparation tasks, including battering raw chicken balls and sealing the vegetable spring rolls. The spring rolls were frozen once sealed with the batter. When needed, the frozen spring rolls were deep fried to golden brown.

The batter was probably contaminated with Salmonella *bacteria by dipping the raw chicken balls in the batter. The batter then contaminated the spring rolls when they were being sealed. Food handlers who did not properly wash their hands after handling the raw chicken balls may have contaminated the spring rolls too. No internal temperature was taken to verify the spring rolls were thoroughly cooked to 74C, and the* Salmonella *bacteria were not killed in the deep fryer.*

The restaurant no longer re-uses batter for more than one task. Batter is discarded once all chicken balls are prepared, and fresh batter is prepared and used to seal the spring rolls. The internal cooking temperature of deep fried foods is checked using a calibrated and sanitized thermometer.

b) **Campylobacter** is another example of a bacteria that causes a foodborne infection.

- Also associated with poultry; **main control is proper cooking**, as well as avoiding cross contamination. More information can be found in Appendix 2.

c) **Norovirus** is an example of a virus which causes a foodborne infection.

- Norovirus is very common and very contagious. It is usually spread through the fecal-oral route via food or common touching surfaces. It can also be spread via aerosolized vomit.
- Symptoms of a norovirus infection usually include sudden nausea and vomiting, diarrhea, stomach cramps, and fatigue. Muscle aches, headache, and fever can also occur.
- These symptoms appear between 24 to 48 hours after a person eats the food and will last 1 to 2 days.
- **Main controls: staying home if you have vomiting and/or diarrhea; good handwashing.** Do not prepare food for others for at least 48 hours after your symptoms stop. The virus will still be shed in your stool for up to 2 weeks after your symptoms end.

d) **Hepatitis A** is another example of a virus which causes a foodborne infection.

- It is spread via the fecal-oral route, and affects the liver.
- Can take up to 6 weeks after exposure to get sick.
- Can be contagious 1-2 weeks before symptoms appear.
- **Main control**: If travelling internationally, Hepatitis A vaccine is recommended. Make an appointment with a travel nurse at your local community health centre for recommendations on immunizations based on your destination. This should be done well in advance (more than a month) of your departure date. Good handwashing is also important.

e) ***Giardia lamblia*** is a protozoan pathogen that causes a foodborne infection called giardiasis.

- Giardiasis is also known as **Beaver Fever**. *Giardia* is easily spread in food and water that is contaminated with animal or human feces.
- Sometimes people get infected with *Giardia* after drinking untreated water from a stream, river or lake, when they are camping or hiking.

- Symptoms usually appear about a week after eating the contaminated food or water, and include stomach cramps, watery diarrhea and fever which may last for 1 to 2 weeks, or even months.
- **Main control: only potable water should be used for drinking and food preparation.** Treat unsafe water by boiling (rolling boil for at least 1 minute), or properly filtering and/or treating the water (go to an outdoor supply store for specialized filters and water treatment chemicals).

f) ***Trichinella spiralis*** is a parasitic round worm that may cause a foodborne infection.

- Pigs can be infected with *Trichinella* roundworms. When a person eats undercooked pork that contains these worms, they are at risk of developing the infection, called trichinosis.
- In North America, the rate of *Trichinella* infection of domestic pigs, and commercial pork, has become very low, but there are still cases of trichinosis from people eating undercooked meat from wild game such as bear, home-raised pigs, or from eating undercooked pork in other parts of the world.
- When a person has trichinosis, worms travel from the person's gut to muscle tissues, causing swelling, muscle pain, fever and weakness. If a large number of *Trichinella* worms are eaten, the person could die from damage to the brain, heart and lungs as the worms travel through these tissues.
- **Main control: proper cooking of meat.**

See Appendix 2 for more examples of pathogens that cause foodborne infection, such as Listeria, Shigella and tapeworms.

2. Foodborne Intoxication

Foodborne intoxication is caused by eating food that contains a toxin, or poison. Some microorganisms produce toxins as a waste product while they grow in the food. Sometimes toxins are naturally produced by certain plants and animals that are used for food. These toxins do not change the taste, smell or appearance of the food.

Many toxins are not destroyed by heat. That means the toxin cannot be removed from the food by cooking it to 74°C (165°F). When a toxin is eaten by a person, symptoms will usually include nausea and vomiting. Depending on the toxin, the symptoms can appear much more quickly than an infection, even starting as soon as 30 minutes after eating the contaminated food.

Bacteria, moulds, mushrooms, plants and animals can produce or contain toxins:

a) ***Staphylococcus aureus*** is an important example of bacteria that cause foodborne intoxication.

- When *Staphylococcus* is allowed to grow in food, it produces a toxin that is fast acting and causes nausea, vomiting, cramps, and sometimes diarrhea.
- Symptoms usually appear between 2 to 4 hours after eating the toxin. The toxin is not destroyed by cooking, freezing, or chemicals.
- This is an important pathogen because it is very easy to contaminate food with *Staphylococcus*. It is commonly found in the environment including the nose, throat, skin and hair of people.
- **Main control: good personal hygiene.**

In 2001, 18 children from an Alberta daycare were rushed to emergency with vomiting 2 hours after eating lunch. The children were served a chicken and rice dish that was contaminated with Staphylococcus *toxin.*

The chicken and rice dish was left at room temperature for several hours before lunch, giving the Staphylococcus *bacteria time to multiply and produce enough toxin to cause illness.*

How could this outbreak have been prevented?

b) ***Clostridium botulinum*** is a spore-forming, anaerobic bacterium that causes a well-known type of foodborne intoxication called **botulism**.

- This bacterium can produce a very powerful nerve toxin. The toxin can be destroyed if the food is boiled for 10 to 15 minutes.
- The toxin causes symptoms of nausea and vomiting within 12 to 36 hours after it has been eaten. The toxin affects nerve cells causing headaches, double vision, muscle paralysis, respiratory failure and death if not treated.
- *Clostridium botulinum* is an anaerobic bacteria - it can only grow and produce toxin when oxygen is very low or not present. Botulism is sometimes caused by improper home-canning of low-acid foods, for example, asparagus, green beans, beets, meats and seafood.

In 2006, 3 cases of carrot juice-linked botulism were reported in Canada. The victims had recently consumed California-produced carrot juice.

This tainted juice was found to contain the bacteria Clostridium botulinum. *Symptoms of the life-threatening illness include nausea, vomiting, fatigue, dizziness, headache, double vision, throat dryness, and nose and respiratory failure.*

A recall for this product had already been issued by CFIA earlier that month. The juice was removed from store shelves and consumers who purchased the products were advised to discard them.

- **Main control:** low-acid home canned items are NOT ALLOWED in a commercial operation as they may contain botulism toxin and cause very serious illness. If canning these types of food at home (for non-commercial use), be sure to use a pressure canner. See "Food Safety Tips for Home Canning" on Health Canada's website for more information.

c) **Mycotoxins** are toxins produced by certain types of moulds as they grow on food.

- Many moulds can produce a poison, or **toxin**, when they grow on foods. These toxins can have serious health effects. Some moulds can cause a person to have an allergic reaction or respiratory problems, while other moulds can produce "mycotoxins".
- Mycotoxins are known to cause illness and have cancer-causing properties, and are most often found as a contaminant of crop foods such as fruits, vegetables, nuts and grains.

- When mould grows on solid foods, such as hard cheeses, you can cut one inch around where the mould is growing and save the rest of the food that has not gone bad.
- On soft foods, such as fruits, vegetables, sauces, soft cheeses, etc, mould growth and toxins can penetrate deep and contaminate more than just the surface of the food. Therefore, when a soft food has mould on it, it is important to throw out the entire item instead of trying to save parts that do not appear to have mould.
- Monitoring and sampling of the food supply by government agencies involves identifying unsafe levels of mycotoxins.

d) **Plants and mushrooms** in whole or specific parts of some plants can contain naturally occurring poisons that can cause mild to severe symptoms in people who eat them.
   - Rhubarb leaves, improperly prepared fiddle heads (fern parts), and raw or undercooked red kidney beans can cause foodborne intoxication due to the presence of toxins.
   - Several species of mushroom contain powerful toxins that can cause delirium, gastrointestinal symptoms, and death by severely damaging major organs such as the liver and kidneys. Often these poisonous mushrooms are difficult to tell apart from edible mushrooms. Wild picked mushrooms should NEVER be used for food preparation in a commercial food establishment.
   - Cooking, canning and/or freezing may not always make these foods safe to eat.

e) **Fish and shellfish** can also contain toxins. Some fish can naturally produce toxins of their own as a form of defence. Both fish and shellfish can also absorb toxins from their sources of food. These toxins are passed on to people that eat the contaminated seafood. It is very important to only buy fish and shellfish from approved sources. Cooking does not destroy these toxins.
   - Shellfish (e.g. mussels, oysters, scallops) can contain harmful toxins if they are harvested from areas of the ocean where there are high concentrations of certain toxic algae, such as a **red tide**. There are many different algae toxins

that can end up in shellfish; these can cause symptoms of stomach cramps, diarrhea, nausea, vomiting, headaches, slurred speech, dizziness, paralysis, short-term memory loss, brain damage, seizures, coma and death.

- Reef fish from tropical and sub-tropical waters (e.g. barracudas, snapper, parrotfish, groupers, triggerfish, amberjacks) can also absorb high concentrations of algae toxins from the foods they eat. When people eat these fish they can get a foodborne illness called **ciguatera poisoning**. Symptoms include nausea, vomiting, and diarrhea, usually followed by headaches, muscle aches, numbness, and hallucinations. Ciguatera poisoning is almost never caused by cold water fish.
- **Scombroid food poisoning** is caused by eating certain types of fish after the fish flesh has been allowed to decay or spoil through temperature abuse after being caught, or during storage or processing. It is most commonly caused by mackerel, tuna, mahi-mahi, bonito, sardines, anchovies, and related types of fish. The symptoms of scombroid food poisoning usually occur within 10-30 minutes after eating the spoiled fish and include abdominal cramps, nausea, diarrhea, palpitations, anxiety, skin flushing, headache, and oral burning.

3. Foodborne Toxico-infection

A foodborne toxico-infection is caused by a person eating food containing live pathogenic bacteria, which continue to grow inside the person's intestinal tissues. As the bacteria are infecting the person's tissues, they also produce a toxin which can cause symptoms of illness. Symptoms are similar to a foodborne infection, and usually take at least 6 hours or longer to appear. Bloody diarrhea is sometimes a symptom of a toxico-infection.

Only certain types of bacteria can cause foodborne toxico-infection:

a) ***Escherichia coli,*** or *E. coli* O157:H7, is an example of bacteria that cause a foodborne toxico-infection.
   - *E. coli* is a bacteria commonly found in human and animal intestines. O157:H7 is a specific strain of *E. coli* bacteria that causes disease.

- Foods that come into contact with cow manure are sometimes contaminated with *E. coli* O157:H7, including beef, hamburger, fruits and vegetables. It can also be transmitted from person to person by the fecal-oral route.
- It causes a serious and sometimes fatal illness; the toxin produced by *E. coli* O157:H7 destroys cells lining blood vessels. A complication is Haemolytic Uremic Syndrome (HUS) which causes kidney failure.
- **Main control:** thoroughly cook all ground and mechanically tenderized meats.

> *In 2006 nine people across Alberta became infected with* E. coli O157:H7 *bacteria, suffering from severe stomach cramps, bloody diarrhea, and vomiting. Public health inspectors determined that all nine people had eaten donairs at the same Alberta chain restaurant a few days before they got sick. Health inspectors then reviewed the food preparation practices for the donairs.*
>
> *The donair meat, which is raw ground meat shaped into a cone and then cooked on the rotisserie, was contaminated with* E. coli *bacteria. The meat was not cooked to 74°C before being served to the customers, so the customers ingested live* E.coli *bacteria and became sick.*
>
> *Now it is required that donair meat that is cooked on a rotisserie be cooked a second time, for example on a grill, prior to being served to customers. Staff at donair shops must also check the meat is thoroughly cooked using a calibrated, sanitized thermometer.*

b) Some other examples are:

- ***Clostridium perfringens***, a spore-forming anaerobic bacterium, found in the soil and in the intestines of animals.
- ***Bacillus cereus***, a spore forming aerobic bacterium that grows in cereals, grains and rice after cooking.

These bacteria often cause foodborne illness due to temperature abuse that happens after the food has been thoroughly cooked. The spores survive the cooking and the bacteria are allowed to grow through improper cooling or improper hot-holding.

Chemical Foodborne Illness

Foodborne illness can also be caused by contamination of food by chemical agents. This contamination may occur by accident, like a spill or leak, or from the use of a chemical on food during harvest, production or preparation. Symptoms of a chemical foodborne illness will depend on the chemical that was eaten, but usually include nausea and vomiting. Symptoms will appear quickly after exposure, from a few minutes to a few hours.

Heating or cooking the food is not going to destroy the chemical contamination. Some chemicals may have a strong smell or taste that can be detected in the food, but other chemicals will not. Some people are very sensitive to chemicals; they can get sick from just a small amount of chemical contamination.

Some chemicals that are commonly found in the kitchen that can be sources of contamination include:

a) **Pesticides** are chemicals used to kill pests such as insects and rodents.
   - Aerosolized pesticides (e.g. “bug spray”) are NOT allowed for use by food handlers in the kitchen. The spray will drift in the air and land on open food, food equipment and food contact surfaces. Find non-chemical solutions for pest control in the kitchen.
   - Only licensed pest control professionals should apply chemical pesticides.
   - Fruits and vegetables should be washed thoroughly to reduce levels of pesticide applied during production.

b) **Cleaning and sanitizing materials** (e.g. detergent, degreaser, acid cleaner, bleach)
   - Cleaners and sanitizers must be stored in an area that is separate from storage of food, food equipment, and food contact surfaces.

- All bottles must be properly labelled so that food handlers can tell which bottles contain cleaners and sanitizers, and which bottles contain ingredients such as water, oil, etc.
- Always use cleaners and sanitizers according to the manufacturer's instructions. Follow the directions for proper use, making dilutions, and whether rinsing is required; these directions may be important to make sure strong residues do not remain on food contact surfaces.
- Food containers should NEVER be used to hold chemicals; chemical containers should not be used to hold food.

c) **Toxic metals** (e.g. lead, tin, copper, brass, zinc, cadmium)

- Sometimes these metals are used to make items such as pots, utensils and containers. If these metal items are used for food, the toxic metal can get into the food and cause a chemical foodborne illness.
- If the food contains a lot of acid (e.g. pickles, fruit juice) the metal will leach out of the container and into the food much more quickly.
- Containers made of metal that contains lead, tin, copper, brass, cadmium, or zinc should never be used to hold food. These include items made of antique pewter (tin + lead) and galvanized metal (zinc coating).
- When a can of food is opened, all of the food should be transferred to a proper storage container instead of left in the open can.

d) **Food additives and preservatives** should be used sparingly.

- MSG (Monosodium glutamate) is a flavour enhancer that is generally considered safe. However, if a lot is added to food, it can cause some people to have dizziness, headaches and nausea.
- Sulphites are preservatives that maintain colour and freshness of fruits and vegetables. For some individuals, sulphites can cause diarrhea, nausea and asthma attacks.

Physical Foodborne Illness

Physical foodborne illness refers to contamination of food by physical objects which may cause illness or injury.

Some common examples of physical contamination are:

- Pieces of various surfaces or equipment in the food establishment - glass, metal, plastic, wood.
- Items coming off of a food handler - hair, artificial nail, band-aid, jewellery.
- Items in the kitchen – thumbtacks, staples, toothpick, bag clip, etc.
- Items intentionally put into the food to cause harm or injury - needles, razor blade, etc.

Allergens

An allergic reaction to food is not considered a foodborne illness; it is a reaction of the body's immune system to a particular protein or irritant. The symptoms range from mild to severe and life-threatening, but vary widely among allergic people and among exposures to the allergens.

- Health Canada has classified ten food allergens as high priority: peanuts, tree nuts, sesame seeds, milk, eggs, seafood, soy, wheat, sulphites and mustard.
- Even trace amounts of these foods can cause a severe or life-threatening reaction in some people.
- Allergic individuals require accurate ingredient information on their food products.
- Health Canada has strict labeling requirements for specific priority allergens, gluten sources and added sulphites in pre-packaged foods sold in Canada.
- Avoid ingredient substitutions and cross contamination of foods that contain allergens.
- For more information on food allergens go to www.healthcanada.gc.ca/foodallergies.

SAMPLE QUIZ - UNIT 3

1. A foodborne infection can result from eating:
    a. Toxins that are present in the food
    b. Mould that grows on cheese
    c. Chemicals
    d. Foods that contain live pathogens

2. Contamination of food can come from pathogens or other substances such as chemicals.
    a. True
    b. False

3. Which of the following is a safe container for salad dressing?
    a. A bowl made of pewter
    b. Container that was used to store soap
    c. Open can
    d. None of the above

4. Raw animal products such as meats, poultry and fish that have been contaminated are always safe to eat once they are cooked.
    a. True
    b. False

5. How can you prevent *Staphylococcus* foodborne intoxication?
    a. Do not handle food if you have an infected cut or boil
    b. Keep food out of the danger zone
    c. Wash your hands frequently
    d. All of the above

6. Foodborne infection usually involves diarrhea and symptoms usually appear very shortly (within a few hours) after eating the contaminated food.
    a. True
    b. False

7. It is not important for food handlers to know information about food allergens because they do not cause any serious health problems.
    a. True
    b. False

8. Physical foodborne illness means:
    a. Illness or injury caused by contamination of food with foreign objects.
    b. Feeling physically ill after finding something gross in your food.
    c. Bacteria from a band-aid grow in the food and produce a toxin that causes illness.
    d. None of the above.

NOTES

Unit 4 – Food Handler Hygiene

Learning Outcomes

- Describe when and how handwashing should take place.
- List personal hygiene practices that food handlers must follow to prepare food safely.
- Explain why food handlers are the most important link in the transmission of foodborne illness.
- Explain the term carrier.

Handwashing

Who? All food handling staff must practice good handwashing – chefs, cooks, servers, bartenders, etc.

What? Designated staff handwashing sinks must have the following:

- Warm water – for maximum comfort which encourages better handwashing.
- Soap – Liquid soap in a dispenser is preferred to bar soap. Antibacterial soap is not necessary.
- Single service paper towel in a dispenser – Avoid air blow dryers for staff hand sinks.

When? Hands must be washed anytime they become contaminated. It is also important to wash hands before directly touching anything that will go into a customer's mouth, such as ready-to-eat foods and utensils.

- **After using the toilet**
- **After diapering a child**
- After handling raw meats and eggs
- After smoking
- After taking the garbage out
- After touching hair or face
- After handling allergenic ingredients
- After wiping brow with hands
- After sneezing, coughing into hands
- After a break
- After cleaning and wiping tables
- Before touching ready-to-eat foods
- Before putting clean dishes away
- Before starting work shift
- Before touching eating utensils
- Before and after eating

Where? Handwashing is so important that food establishments are required to have separate sinks used for staff handwashing only. Handwash sinks have to be available in all food preparation and serving areas. Handwash sinks must always be accessible and convenient for staff to use. No food preparation or utensil washing is allowed at handwashing sinks.

WHY?

Handwashing is the most effective way to prevent the spread of pathogens from food handlers to the food and to customers!

How?

1. Turn on tap.
2. Wet hands with potable, warm running water.
3. Apply liquid soap. (Remember antibacterial soap is not necessary.)
4. Rub soapy hands together - friction helps soap to remove contamination from the skin on your hands and fingers.
5. Wash ALL parts of the hands for a minimum of 20 seconds – pay attention and wash palms, between fingers, wrists, backs of hands, thumbs and especially the fingertips.
6. If available, use a nail brush to wash fingertips and under nails. Keep the nail brush in a small bowl of sanitizer (e.g. 100-200 ppm bleach solution) at the sink.
7. Use running water to rinse the soap and dirt from the nail brush and from your hands into the drain.
8. Take some paper towel to pat dry hands.
9. Use paper towel to turn off taps, exit the washroom, etc.

Practicing Good Personal Hygiene

Humans can carry infectious pathogens in their intestinal tract (e.g. *Salmonella* or norovirus), and on their skin, hair, hands and clothes (e.g. *Staphylococcus*). In the performance of typical kitchen duties, a food handler can easily spread pathogens from their own bodies, or from other sources such as raw meats, dirty surfaces, dirty aprons, etc. The food handler is the most important link in the contamination of foods and in the transmission of diseases that can be spread by food. Proper personal hygiene of the food handler is necessary to protect customers from getting foodborne illness.

There are many ***GOOD*** practices that food handlers need to follow for proper personal hygiene:

- **Handwashing** should be performed thoroughly and frequently, whether or not gloves are worn.

- **Fingernails** should be kept clean and well-trimmed; artificial nails should not be allowed. Also no painted fingernails.

- **Uniforms and aprons**, not street clothes, should be worn by food staff inside the food facility. Use clean uniforms and aprons at the beginning of each shift, and change as often as needed. Do not store clean uniforms and aprons in a bathroom.

- **Hair** will contain high levels of bacteria such as *Staphylococcus aureus*. Hair should be tied back or controlled by wearing a cap or hair-net.

- **Jewellery** should not be worn while handling food. Jewellery is difficult to keep clean and it can fall into the food. Jewellery can also get stuck in moving equipment such as slicers or mixers, and injure the food handler.

There are many ***BAD*** habits a food handler should not do while working with food:

- ***Fail to wash hands properly after using the toilet, or after diapering a child***
- Cough or sneeze into their hands, onto food or food contact surfaces
- Rub, pick, or wipe nose with hands
- Touch the face, or smooth, scratch or fix hair on the head or face (e.g. moustache or beard)
- Smoke, eat, drink, bite fingernails, lick fingers, or any other activity that involves touching the mouth
- Use fingers to taste food, or using the same spoon more than once (i.e. double dipping)

Visitors to a special event in Alberta during 2010 were enjoying several menu items from a food booth, including beef donairs and chicken or lamb souvlaki with lettuce, tomatoes, and mayonnaise on pita bread. Following the event, however, 33 people became ill and tested positive for Salmonella typhimurimin *foodborne infection.*

During the investigation, 2 food handlers from the food booth tested positive for Salmonella *in their stool. One food handler had diarrhea, abdominal cramps and a fever 3 days after serving food at the event. The second food handler had no symptoms, but had been sick with similar symptoms three months earlier and did not seek medical treatment.*

Likely the food handlers did not wash their hands well enough after going to the bathroom, and contaminated the cooked meat and other ingredients or food preparation surfaces with the feces left on their hands. Because they were infected with Salmonella *bacteria, their feces likely contained large numbers of this pathogen. Customers who ate the fecally contaminated food were exposed to* Salmonella *and got sick as a result.*

Food handlers with foodborne illness symptoms of diarrhea, vomiting, fever, abdominal cramps and nausea should not prepare food for others. Even when food handlers do not feel sick, they may still be carrying an infection and easily expose customers to pathogens. Good handwashing is ALWAYS important whether a foodhandler believes he may or may not be contagious.

Bacteria on Hands: Resident vs. Transient Microorganisms

Resident Microorganisms are not harmful and are a normal part of the microorganism population on the human body. These microorganisms help in controlling the growth of pathogenic skin fungi and bad bacteria including *Staphylococcus aureus*.

Transient Microorganisms are picked up by hand contact with other surfaces such as contaminated parts of the body, foods, other people or objects. On healthy, unbroken skin, they usually die within a few hours. However, in the time it takes for transient microorganisms to die, they can easily be transferred from a person's hands to food and can cause illness to customers and other employees.

Proper handwashing reduces the number of transient organisms to a safe level.

Using Gloves in a Food Establishment

Gloves can prevent the contamination of foods and reduce the likelihood of causing foodborne illness in customers. However, the risk of contamination by a gloved hand is the same as a bare hand:

- **Most importantly, glove use does not replace handwashing.**
- **Always wear gloves when wearing a band-aid or other bandage on the hand.** Therefore all food establishments must have gloves available for use by staff when needed.
- Gloves are especially useful for preventing contamination of ready-to-eat foods that do not require cooking, such as salad ingredients, sandwiches, sushi, dry baked goods, etc.
- Change gloves between different tasks. For example change gloves after handling raw meat and before preparing other food.

- Wash hands properly before putting on gloves, and every time that gloves are changed. While gloves are worn, conditions on the skin of the hands are warm and moist – an excellent environment for bacteria to multiply to high numbers.
- Do not wash disposable gloves for reuse – contaminated gloves must be thrown away, hands properly washed, and a new pair of gloves put on.
- Make gloves of different sizes available, to ensure all staff have proper fit and handling control.
- Use high-quality, durable gloves to minimize leaking and tearing. Using non-latex gloves will help staff to avoid developing latex allergies.

Using Hand Sanitizers in a Food Establishment

Hand sanitizer does not replace handwashing. It can be applied to hands as an extra step, after the proper handwashing procedure has been completed. It is important to remember that hand sanitizers do not work well if hands are dirty – microorganisms are protected by the dirt. Also, hand sanitizers are not effective at killing all pathogens (e.g. norovirus is not destroyed by all commercial hand sanitizers).

Don't work when you're sick

People who are sick with a foodborne infection are highly contagious because they pass large numbers of pathogens such as bacteria, viruses, and protozoa from their body through diarrhea and vomit.

A food handler who works while sick is very likely to contaminate the food they handle with pathogens, which in turn is passed on to customers. Infected food handlers are a very common cause of foodborne illness outbreaks.

Allowing employees to continue working while they are sick also puts other staff at risk of becoming sick. This could lead to increased absenteeism, staff shortages, or even higher risk of making customers sick with foodborne illness.

To reduce the risk of causing foodborne illness among customers, the person in charge of the food establishment should have staff restriction and exclusion policies to respond to employee illness.

Exclusion

- The person in charge of the food establishment shall require any employee on duty who is ill with diarrhea, vomiting or jaundice (yellow discoloration of the eyes and skin) to leave the premises immediately. The employee is **excluded** and cannot be present in the food establishment.

- Employees of the food establishment shall not go to work if they are ill with diarrhea, vomiting or jaundice. If they become ill while at work, they must report the illness to their supervisor right away.

- The person in charge of the food establishment shall not schedule an employee to work if he or she is aware that the employee is ill with diarrhea, vomiting or jaundice.

- The employee may report back for duty only after the symptoms have disappeared, or when a doctor has determined that they are not contagious.

In 2005, a supervisor at an Alberta drive-through restaurant came to work suffering from diarrhea. About 3 days later, customers began getting sick with diarrhea caused by E. coli O157:H7*. Seventeen people got sick over the next 25 days, and 1 person ended up with HUS (kidney failure).*

The supervisor was later also diagnosed with an infection of E. coli O157:H7*. Although she never prepared food, she did wash cooking utensils and containers manually in a sink when needed, and she refilled containers with ingredients. She was also reported to have had long, artificial nails. While she was symptomatic with diarrhea, she refilled a container with milkshake flavoring.*

Because E. coli O157:H7 *infections are usually caused by undercooked hamburger, health inspectors did not suspect milkshakes until they were identified as the one common food item shared by all customers that became ill.*

She contaminated the milkshake flavouring with E. coli O157:H7 *from fecal matter left on her hands after using the toilet. Long, artificial nails are harder to keep clean and may have also been a contributing factor.*

Restriction

- Employees who are sick with symptoms of a respiratory or sinus infection (coughing, sneezing, runny nose, etc) can be **restricted** by the supervisor to perform only those duties that do not involve handling exposed food, food equipment, and utensils.

- Food handlers with infected cuts, sores and burns on their hand or wrist should avoid working with food or food contact surfaces, unless hands are properly protected with a bandage and a single use glove.

- Supervisors can restrict the duties of employees with any illness that may negatively impact on food handling or customer service duties.

  However, employees with diarrhea, vomiting, fever or jaundice must be excluded and leave the food establishment.

A **carrier** is a person that is infected with a pathogen, sometimes for many years, but shows no symptoms or signs of illness. Even though a carrier may not feel sick at all, he is still contagious and can spread the pathogen to foods, the environment, and to other people.

There are some foodborne infections that will make a person contagious before that person even feels sick (e.g. hepatitis A). People can also continue to shed pathogens from their bodies after the symptoms of illness have disappeared. Norovirus can continue to pass through a person's feces for many days even though the person has recovered and stopped having diarrhea and other symptoms. It is always important for food handlers to practice excellent personal hygiene - especially proper handwashing *every time* after using the toilet.

Figure 4. "Typhoid Mary"

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*Mary Mallon, also known as Typhoid Mary, was a private cook in the U.S. during the early 1900s. She was the first person identified by medical science as an asymptomatic carrier of the pathogen that causes typhoid fever (*Salmonella enterica).

Mallon was linked to the illness of 53 people, three of whom died, over the course of her career. At the time, there were no public health policies or guidelines for handling this situation; Mallon maintained that she was perfectly healthy, had never had typhoid fever, and could not possibly be the source of her customers' illnesses.

Public-health authorities decided that permanent quarantine was required to prevent Mallon from causing significant future typhoid outbreaks.

Mallon was forcibly quarantined by public health authorities, and remained in quarantine until her death, 30 years later.

SAMPLE QUIZ - UNIT 4

1. Frequent handwashing is not necessary if you wear gloves.
    a. True
    b. False

2. Why is wearing jewelry in the kitchen not safe?
    a. It may fall into food
    b. It can carry pathogens
    c. It may get caught in machinery and cause injury
    d. All the above

3. Why is it not safe for a food handler to work with food when they have a cold?
    a. Pathogens from coughing and sneezing may contaminate food
    b. It will take longer for the food handler to feel better
    c. There is no time for the food handler to blow their nose when they are working
    d. It is safe for a food handler to work when they have a cold

4. Which describes the best way for a food handler to dry hands after handwashing?
    a. Dry hands thoroughly with a single-use towel
    b. Dry hands by wiping them on an apron or wiping cloth
    c. Dry hands with a cloth towel that is kept in the washroom
    d. Use a blow dryer in the customer washroom

5. When working with food, what symptoms should be immediately reported to the supervisor?
    a. Itchy skin
    b. Vomiting and diarrhea
    c. Headache
    d. Muscle ache and pain

6. What should you do as a food handler if you have an infected cut or burn on your hand?
    a. Stay home and do not work in any area of the food establishment
    b. Keep the cut or burn exposed to air and wash it whenever it gets dirty
    c. Properly protect the cut or burn with a waterproof bandage and a single use glove
    d. Wash your hands every ten minutes

7. What is a carrier?
    a. A person who is sick with a contagious disease
    b. A person with an infected cut or burn
    c. A person who transports and delivers food
    d. A person who carries a pathogen but does not show signs or symptoms of the disease

8. An example of a bad habit that every food handler should avoid when handling food includes:
    a. Biting your fingernails
    b. Smoking
    c. Adjusting your cap
    d. All the above

NOTES

Unit 5 – Receiving and Storing Food Safely

Learning Outcomes

- Describe proper way to receive and store foods and other supplies.
- Describe conditions for rejecting food deliveries.
- Describe storage requirements for different types of foods.
- Explain importance of proper stock rotation.

When a supplier's food products arrive at your establishment, you have the opportunity to identify any problems there may be with the food before it enters your facility. Once you accept a food delivery, it becomes your responsibility. It is important the food you accept is safe and free of contamination - you cannot make the food safe later. The following unit describes what to look for when receiving foods and how to put them away correctly into storage.

Inspection of a food delivery

Inspect food deliveries carefully to check for its quality and safety. If the food does not meet your standards, you have the right to refuse it and return it to the supplier.

Here are the details of what to look for when receiving food:

1. General condition of the food

- Look for signs of pests, spoilage, mould, old product, dirty or torn packaging, etc.
- Smell the food for any bad or "off" odours.

2. Damaged food or packaging

Reject and return to supplier any foods that show signs of damage or poor quality, for example:

- Fresh produce that is overripe or has fruit flies.
- Meat that shows discolouration or contamination.

- Leaking food containers.
- Food that shows signs of moisture damage.
- Damaged or torn plastic wrappers.
- Dented or rusted cans may have very small holes that have allowed bacteria inside.
- Bulging cans are dangerous - they may contain harmful bacteria (e.g. *Clostridium botulinum*). Reject or throw away any bulging cans without tasting the contents of the can.

3. Food must be from an approved source

- All food products used in a commercial food establishment must come from an approved supplier. Products from non-approved premises may not be used in a food establishment (e.g. food prepared in unlicensed home kitchens, purchases from unlicensed suppliers).
- All dairy products must be made from pasteurized milk.
- Eggs must be graded and government approved for sale.

In 2004 an Alberta private long-term care facility experienced an outbreak where 15 of the 16 residents became ill with diarrhea and other symptoms caused by a Salmonella enteriditis *infection, leading to the death of 3 of the residents.*

The Health Inspector found manure-covered eggs in the facility's kitchen. Kitchen staff said the eggs were supplied by a local egg producer and delivered in an unrefrigerated truck. When the Health Inspector stopped the staff from continuing to use these eggs, there was no further illness.

Inspections of the unlicensed egg producer found the laying hens and animal facilities in poor condition: a small chicken coop in disrepair with no heating, no ventilation, and no room for the 150 chickens living inside. The eggs would roll out of the chicken cage and directly onto the floor which was covered in manure up to 8 inches deep.

The contamination of the egg shells with the chicken manure was a likely source of the Salmonella *bacteria. However, studies have shown that chickens in poor living conditions are more likely to lay eggs that already have* Salmonella *bacteria on the inside of the shell.*

These un-inspected eggs, served undercooked to a susceptible population, were suspected to be the cause of the outbreak.

4. **Labels**
    - Check all food products for a best before date or expiry date.
    - Check manufacturers' labels of all incoming food products so that you are familiar with its proper handling and storage requirements, e.g. keep refrigerated after opening.

5. **Stamp / tags on meat products**
    - Meat, poultry and fish must be stamped or labelled as government approved. This means a government inspector has determined the animal was free of sickness and fit for human consumption, and approved the meat for sale.
    - Large meat sections, e.g. hinds, will have the stamp on the meat itself.
    - For pre-cut portions, a stamp will be visible on the shipping carton.

6. **Refrigerated and frozen products**
    - Use a thermometer to check the temperature of refrigerated products and check the truck instruments to make sure the perishable products have been transported at 4 ˚C or less.
    - Frozen products should still be frozen solid and show no signs of partial thawing or refreezing. Large ice crystals inside the package usually indicate that the product has been thawed and refrozen.

7. **The delivery vehicle**
    - Supplies should be delivered in a clean vehicle capable of maintaining proper food temperatures, such as a refrigerated truck.
    - Avoid the use of unrefrigerated vans, the back of a pick-up truck, the trunk or the back seat of a car.
    - If you notice unclean conditions or strange smells (e.g. chemical smells) in the vehicle's cargo area, you can ask questions or reject the food.
    - Check if food has been stored close to dangerous chemicals. For example, make sure the delivery truck used to transport food is not also being used to transport chemicals.

In what order should received products be put away?

First **Potentially Hazardous Foods**

(e.g. fresh meat, poultry, fish, eggs, dairy, cooked vegetables or cereals)

The receiver should:

- Refrigerate quickly. Keep cold foods at 4°C (40°F) or less.
- Check for best before or expiry dates.

Second **Frozen Foods**

The receiver should:

- Keep frozen foods at -18°C (0°F) or less.
- Place foods in the freezer soon after receiving.

Third **Non-hazardous perishable (e.g. apples, oranges)**

The receiver should:

- Refrigerate items, if required, to stop spoilage.
- Separate incoming produce from those that have been washed and cleaned.

Fourth **Dried/Canned Foods**

The receiver should:

- Store products in a clean and dry environment.

Last **Chemicals**

What is the safest way to store food products?

Maintain proper temperatures by checking daily to make sure refrigeration, freezer and hot holding equipment is in good working condition.

- Keep cold foods cold, at 4°C (40°F) or less.
- Keep hot foods hot, at 60°C (140°F) or above.
- Check that the door latches securely and that the springs and seals are not damaged.
- There must be a thermometer in each refrigeration unit.

Maintain good air circulation which helps maintain temperatures in refrigerated spaces. Good air circulation also decreases humidity and moisture which helps prevent growth of mould, mildew and bacteria.

- Do not crowd food together - allow for space between food containers.
- Do not line shelves with aluminium foil or cardboard as this restricts air circulation.
- Food will also cool quicker when air flow is not restricted.
- Keep dry foods stored in a dry, cool room.

Practice stock rotation which helps to make sure food products are not stored past their expiry, and helps to prevent breeding of pests.

- Place new product on the back of shelves and push older product forward to be used next.
- Use oldest stock first. This is called **FIFO**, which stands for "**First In, First Out**".
- Check labels for best before or expiry dates.

Storage containers

- Use food safe containers such as those made from glass, stainless steel or plastic.
- Do not use garbage bags, cloths or newspapers to cover food. Do not store food in old chemical containers or opened cans.

Prevent contamination of foods which happens directly and indirectly in storage areas.

- Do not crowd food together - allow for space between food containers.
- Food should always be covered to protect it from contamination – except when cooling hot foods.
- Always store raw foods, especially raw meats, on the lowest shelves. Cooked and ready-to-eat foods such as fruits and vegetables must be stored above raw meats.
- Categorize and group like foods together in storage.
- Store food at least 15 cm (6") off the floor. The bottom shelf should be 20 cm (8”) from the floor (if the shelving is not sealed to the floor). Shelving should be 5 cm (2”) from the wall.
- Clean storage area shelves and walls regularly with detergents and sanitizers.

Store chemicals safely to prevent contamination of foods and food contact surfaces.

- Store cleaners, pesticides and other chemicals in an area separate from food and food equipment.
- Chemicals should be stored in a marked and locked storage area.
- All products should be clearly labelled and similar products grouped together. This will help staff avoid using the wrong product for a particular task.

SAMPLE QUIZ - UNIT 5

1. What should you do if you find a shipment of swollen and bulging cans?
    a. Open the cans and smell the food. If the food smells good, it is ok to eat it.
    b. Send the cans to the food bank
    c. Do not use the cans and tell your manager and supplier about the shipment
    d. Use the food in the cans right away

2. "First in, First Out" or "FIFO" is a stock rotation practice used for all food products.
    a. True
    b. False

3. Food establishments must have thermometers in all cold storage areas.
    a. True
    b. False

4. A food handler is inspecting a shipment of frozen fish and finds large ice crystals inside the package. What do the ice crystals indicate?
    a. The fish has been thawed and refrozen
    b. The fish is ready to be prepared immediately
    c. The fish should be stored in the freezer immediately
    d. The fish should be stored in the fridge immediately

5. Which of the following can be served in a restaurant:
    a. Home-prepared jam and jelly
    b. Ungraded eggs purchased from a truck on the side of the road
    c. Unpasteurized cheese from the Farmer's Market
    d. None of the above.

6. Which of the following is the most important food safety reason for keeping foods separate and not crowded together when stored in refrigerators?
    a. It allows food handlers to easily read the labels on the food
    b. It helps prevent contamination of foods
    c. It allows food handlers to easily clean the shelving units inside the refrigerator
    d. To prevent flavors from different foods blending together

7. When should you inspect deliveries of food products?
    a. Before the food leaves the supplier's warehouse
    b. After the food has been placed in the cooler or freezer
    c. As soon as the food is delivered
    d. Before cooking the food

8. You have just received several orders. On the loading dock are cases of canned peas, frozen chickens, eggs and lettuce. In which order should you store them?
    a. Canned peas, eggs, frozen chicken, lettuce
    b. Eggs, frozen chicken, lettuce, canned peas
    c. Lettuce, eggs, frozen chicken, canned peas
    d. Frozen chicken, lettuce, canned peas, eggs

9. Where should you store detergents, sanitizers, pesticides and other chemicals?
    a. In a marked cupboard or cabinet, preferably one with a lock
    b. In the dry food storage room
    c. In the customer bathroom
    d. It doesn't matter where you store them as long as they are easily accessible

10. What do you do when your supplier delivers boxes of frozen chicken that appears soggy and wet on the outside?
    a. Store the boxes in the freezer immediately
    b. Cook the chicken as soon as possible
    c. Store the chicken in the cooler and allow it to thaw completely before cooking
    d. Reject the boxes of chicken at the time of delivery

11. How should raw hamburger be stored in a walk-in cooler?
    a. Close to the door
    b. On the top shelf of the cooler
    c. On the bottom shelf of the cooler
    d. Above ready-to-eat foods such as fruits and vegetables

12. Food can be stored on the floor as long as it is covered and in a clean container.
    a. True
    b. False

NOTES

Unit 6 – Preparing and Serving Food Safely

Learning Outcomes

- Explain what foods are potentially hazardous / high risk, perishable, and less hazardous / low risk.
- List the required temperatures for safe handling of potentially hazardous foods: freezing, thawing, refrigeration, cooking, cooling, hot holding, cold holding and reheating.
- Explain the time and temperature relationship in the prevention of foodborne illness.
- Discuss the proper way to serve foods, including self-service, buffets, etc.

Potentially Hazardous Foods

Unit 2 explained that potentially hazardous foods (also known as "high-risk foods") are foods that meet all the conditions to allow pathogenic microorganisms to grow and multiply. These foods are high in protein or carbohydrates, do not have a lot of acid, and have lots of moisture.

1) **Meat products** from animals (beef, pork, poultry, etc) provide good conditions for the growth of pathogens. Meats may also be contaminated with pathogens like *Campylobacter, Salmonella* or *E. coli.* These pathogens get on the meat as a result of feces from the animal. The food products may be contaminated directly by the animal feces, or indirectly from the environment, the equipment, and the staff where the food product is made (slaughterhouse, meat packing facility, etc). On many whole meat products, like a steak, the contamination by pathogens is limited to the surface of the meat. The interior of the muscle tissue generally does not contain microorganisms unless there is an infection (e.g. parasites), or unless the meat has been processed in a way to introduce contamination below the surface (deboning, mechanical tenderizing, reconstituted steaks, etc).

The public should be notified of the increased health risk where animal proteins are allowed to be served raw or lightly cooked, such as raw oysters, sushi fish, or steak tartar. A notification can be provided in writing on the menu.

2) **Ground meat** products and meats that are tenderized by puncturing will have pathogens that were on the surface of the meat transferred to the inside. All ground meats must **always** be thoroughly cooked to well done (i.e. no rare hamburgers).

3) **Dairy, or milk and milk products** also contain nutrients, moisture and low acidity that allow pathogens to grow easily. Dairy products (milk, cream, yoghurt, etc) in Canada are required to be made from pasteurized milk. However, raw milk cheese is allowed for sale; the manufacturing process for raw milk cheese helps eliminate pathogens. **Pasteurization** is a heat treatment of the milk which increases shelf life by destroying spoilage microorganisms, but also destroys pathogens such as *E. coli*, *Campylobacter*, *Listeria*, *Staphylococcus*, *Salmonella*, tuberculosis, brucellosis, etc. Many pathogens can be in the milk as a result of direct or indirect contamination by animal feces, infected animal udders, and other sources.

Unpasteurized milk products still continue to cause foodborne illness outbreaks in Canada. Unpasteurized milk products are especially dangerous for susceptible populations (very young, very old, pregnant women and immunocompromised).

In 2002, 30 school-aged children went on a field trip to a local farm where the farmer gave the children unpasteurized milk to drink. Seven days after the field trip, 5 children had diarrheal illness caused by Campylobacter *bacteria.*

Unpasteurized milk may contain enough disease-causing microorganisms to cause foodborne illness, and cannot be sold or distributed in Canada.

Pets and farm animals often have feces and disease-causing microorganisms on their fur or hides, and kids should always wash their hands well after handling animals.

4) **Eggs** are required to be stored under refrigeration as they will also support the growth of microorganisms. The outside of shelled eggs may be contaminated by bacteria such as *Salmonella* and *Campylobacter.* Some hens will lay eggs that have *Salmonella* bacteria on the inside of the shell. Both whole and broken eggs can be sources of pathogens and should be handled the same way as raw meats to avoid direct or indirect contamination of other foods (e.g. wash hands after handling shelled eggs).

   Avoid serving raw or undercooked eggs to customers. For recipes that call for raw or undercooked eggs, e.g. hollandaise sauce, meringue, Caesar dressing, fresh mayonnaise, custards, use a pasteurized egg product (available in grocery stores or through your supplier).

5) **Fish and shellfish** are high protein foods and are suitable for growth of pathogens. Fresh fish and shellfish spoil rapidly and should always be stored as cold as possible without freezing.

6) **Cooked cereals** such as rice, pasta, oats **and cooked vegetables** are soft, moist, nutrient -rich and easily support the growth of pathogens. Once cooked, these foods must be temperature controlled until served (hot or cold holding).

7) **Fruits and vegetables, once cut**, are considered to be potentially hazardous and must be temperature controlled. Rinse (no need for soap) and rub produce under cool running water before peeling or cutting. Don't forget to wash garnishes like kale and parsley too. Use a scrub brush for produce like cantaloupe or potatoes.

Ready-to-eat foods are foods that usually do not require cooking before being served (e.g. sandwiches, salads, sushi, fruit and vegetable trays, cold cuts and cheese trays). Because these foods are not heated to high temperatures before being served, any pathogens that have been transferred to the food will not be destroyed. During preparation or handling of ready-to-eat foods, it is best to avoid directly touching with bare hands by using gloves, tongs, or other utensils.

An Alberta banquet facility was holding 4 separate events over 5 days during 2010. At least 33 people attending these banquets became ill with vomiting and diarrhea caused by norovirus. All the people who became ill had eaten various salads.

Staff with vomiting and diarrhea were preparing salads at the facility. The sick food handlers likely contaminated the salads with their feces, which contained norovirus, by not washing hands well after using the washroom. As the salads were not cooked, the viruses were not killed and guests ate the fecal matter and the live norovirus.

Ready-to-eat foods such as salads, sushi, sandwiches, and others that are not cooked before eating are commonly associated with foodborne illness outbreaks where the pathogen is spread through the fecal-oral-route. There is no cooking step to kill pathogens that may have contaminated the food. Ready-to-eat foods should be handled very carefully – avoid touching these foods with bare hands as much as possible.

A food item will also be more hazardous if it has a larger number of ingredients, a larger number of preparation steps, or is prepared in large batches. These foods are subject to more cross contamination and/or temperature abuse.

A **perishable food** is any food that will spoil or rot under improper or prolonged storage. This includes all potentially hazardous foods (meats, dairy, eggs, fish, cooked cereals and cooked vegetables), but also foods that do not easily support the growth of pathogens. For example, if fresh fruits and vegetables are kept for a long time, they are more likely to rot, get mouldy or slimy, especially if they are not stored in a dry and cool place.

Less hazardous foods (also known as “low-risk foods”) are foods that do not easily support the growth of pathogens. Generally speaking, foods that are very sweet, very salty, very dry or very sour (acidic) are usually less hazardous, because one or more of the conditions needed for pathogen growth is missing (remember FATTOM).

Food Preparation

The growth rate of bacteria depends on the temperature of the food. When foods are left in the danger zone (4°C to 60°C), the temperature allows bacteria to grow rapidly, enough that the food can become unsafe within hours. This means that the numbers of live pathogenic bacteria have multiplied to high levels in the food and can cause a foodborne infection, or that the bacteria have produced enough toxin to cause a foodborne intoxication.

Food handlers must minimize the total time that potentially hazardous foods are left in the danger zone, from the point that ingredients are delivered to the food establishment to the point that the food is served to the customer. Practicing temperature control at all times throughout the flow of food (receiving, storage, preparation, cooking, hot holding, cooling and reheating) will help to ensure that temperature abuse of foods does not exceed **2 hours**.

Thermometers

Using a thermometer to measure temperatures is the only reliable way to know that temperature control is being done correctly. **A proper probe thermometer that allows the food handler to measure the internal temperature of foods is always required wherever potentially hazardous foods are being prepared and served.** Each food handler who is responsible for measuring food temperatures should have their own probe thermometer. Keeping a temperature log or a written record of the temperature readings is also recommended.

When using a probe thermometer, insert the clean and sanitized probe into the thickest part of the food. The thickest part of the food will be the last to cook or the last to cool. Avoid parts of the food with large bones.

It is important to prevent cross contamination of foods by cleaning and sanitizing a probe thermometer between uses and with different foods.

Some thermometers will stop working properly over time. These thermometers require calibration or validation on a regular basis to ensure that temperature readings are correct.

How to Calibrate a Thermometer

For digital thermometers, check the manufacturer's instructions for calibration procedure.

For a non-digital thermometer (e.g. bimetallic probe thermometer) use the following steps:

1) *Add finely crushed ice to a large glass and add water to the top of the ice. Stir the ice water well and let sit for a minute.*
2) *Insert at least 2 inches (5 cm) of the thermometer's probe into the ice bath and wait at least 30 seconds.*
3) *Check the temperature reading – it should read 0°C (32°F). If not reading 0°C, find adjustment nut at the base of the probe, on the back side of the dial.*
4) *While the probe is still submerged in ice water, use a small wrench to adjust the nut until the dial reads 0°C*

Freezing foods does not kill pathogens (except most parasitic worms under strict temperature controls). Pathogens do not grow or multiply in frozen food. It is important to ensure that frozen foods are not allowed to defrost until they are needed. It is recommended that frozen foods be kept at **-18°C** (0°F), or colder.

Thawing frozen foods is also a process that requires temperature control. Depending on the food size and shape, parts of the food can thaw more quickly and be in the danger zone for long periods of time before the rest of the food is entirely thawed (usually the surface thaws first). Therefore foods should be thawed in the refrigerator at 4°C, or under cool running water in a sink. Some frozen foods can be cooked without thawing (e.g. frozen hamburger patties on the grill, frozen vegetables to soup). If a microwave is used to quickly thaw frozen foods, the food should be cooked immediately after thawing. **Do not thaw frozen foods at room temperature**.

Refrigeration or cold holding of potentially hazardous foods and perishable foods will slow the growth of any pathogens or spoilage organisms that are present. When using ice or refrigeration equipment for cold holding, the internal temperature of the food **must be 4°C** (40°F) or colder.

It can be tricky trying to keep food sufficiently cold in inserts in sandwich/pizza prep tables and on buffets. Here are some tips for keeping foods in these environments cold:

- Maintain ice levels. The ice level should be at least as high as the food level in the container.
- Use metal containers as metal is a better conductor than plastic.
- Only fill containers 2/3 full at most, or just enough to get through your next busy period (e.g. lunch rush).
- Cover food inserts when not busy.
- Keep the interior of the prep table as cold as possible, without freezing your produce (i.e. 1-2°C (34-36°F)).
- Do not place cold equipment like prep tables next to heat sources like grills or deep fryers.

Cooking temperature of foods is important to minimize exposure of customers to pathogens, which are destroyed by high heat. Foods need to be cooked to a minimum **internal** temperature of **74°C** (165°F), and held at that temperature for at least **15 seconds**. When done correctly, the cooking process pasteurizes the food and destroys the pathogens that might be present (except bacterial spores and toxins). Health Canada recommends that whole poultry be cooked to an internal temperature of 85°C (185°F). The colour of a food is NOT a good indicator of “doneness”. Stuffing should be cooked and served outside of whole poultry.

A chart outlining detailed cooking temperatures for different types of foods may be found in Appendix 3 and 4 at the back of the textbook.

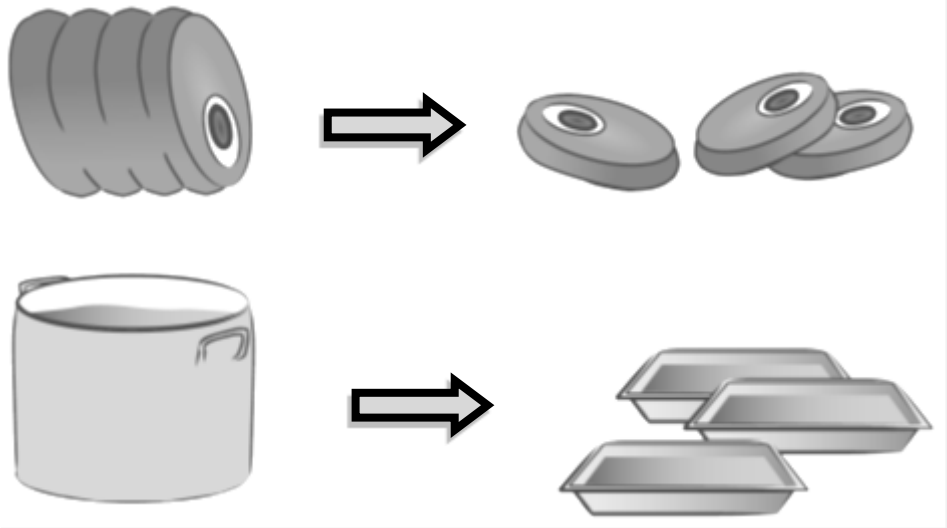
Hot holding is often done if cooked foods are not going to be served right away, but within a few hours, or for buffet style service. The food is kept hot on cooking equipment (e.g. stovetop or oven) or foods are placed in hot holding equipment (e.g. steam table, pizza carousel, crock pot, rice warmer). Foods that are being held hot for any period of time **must be kept at 60°C** (140°F) or hotter. Pathogens will not grow or multiply at this temperature.

Cooling cooked food for storage in the refrigerator means that the food will spend some time in the danger zone. It is important to cool foods as quickly as possible to limit the growth of pathogens. The food handler should chill the foods so that the temperature drops to **20° C** (68°F) **within 2 hours and then to 4° C** (40°F) **within another 4 hours**. This quickly passes the food through the part of the danger zone where temperatures will support the most rapid growth of bacteria.

There are several things a food handler can do to cool foods quickly:

- Large pieces of food can be **divided into smaller portions** before refrigerating.
- Liquid foods like soup, stew, curry, etc., can be transferred from large pots to smaller, **shallow metal pans** (2 to 3 inches deep).

Figure 5. Cooling Foods Quickly



- Fill a sink or large container with ice and water to make an **ice bath**.
- Any hot food will cool faster when it is **stirred often**. An **ice wand or ice paddle** is a device that allows you to freeze water in the shape of a stirring tool.
- Lids on containers will trap heat and prevent cooling. **Do not cover** containers when foods inside are being cooled.

Reheating foods should only be done on proper cooking equipment (e.g. stovetop, oven, microwave), so that the food is reheated quickly, within two hours, and reaches an **internal temperature of 74°C** (165°F) for **15 seconds**. Foods should never be reheated with a steam table or other hot holding equipment. Any leftovers after food has been reheated should be thrown away (i.e. do not reheat foods more than once).

In 2002, an Alberta caterer prepared a wedding banquet for 100 people. 12 hours after eating, 50 guests became violently ill with diarrhea caused by Clostridium perfringens *bacteria.*

Analysis showed the mushroom gravy had made people sick. On Wednesday, the caterer had prepared this gravy using week-old meat drippings, adding other ingredients and reheating the mixture a little bit. The finished gravy was poured into a 20 litre bucket, filling it completely, and then placed in the cooler. On Saturday, the wedding day, the gravy was warmed and then served.

The Clostridium perfringens *bacteria in the meat drippings were not killed because the gravy wasn't heated to 74°C during any of the cooking steps. The gravy cooled very slowly in the 20 litre bucket, allowing bacterial spores to germinate and the live* Clostridium perfringens *bacteria to multiply in danger zone temperatures (4°C to 60°C) for many hours.*

The gravy should have been made on the wedding day if possible. If prepared earlier than that day, the gravy should have been reheated to 74°C when prepared, then properly cooled following the two-step cooling method, and then reheated to 74°C before serving the wedding guests.

If there is ever any doubt as to the safety of a food, **throw it out!**

Serving and Dispensing of Food

Table Setting

After service of customers, all tableware (glasses, plates, utensils, etc.) is considered dirty and must be removed. This includes any table setting that was not used during the service. In other words, if a table is set for 4 customers and only 3 customers are seated, the setting at the unoccupied seat should be removed prior to food service. If the unused table setting was not removed and remains for the duration of that service, the tableware must be treated as dirty, even if it wasn't used.

Glasses and cups should be placed with the mouth down on the table to reduce possible contamination sources such as dust, coughs, sneezes or flies.

Cutlery can be covered or wrapped to indicate that they have not been used and protect them from contamination.

When handling glasses, cups and utensils, avoid touching the "business end" (i.e. the part that touches food or the customer's mouth).

When setting a table, the dishes and utensils should be checked for cleanliness and signs of damage. Utensils that are chipped or cracked cannot be properly washed and sanitized and must not be used. These should be thrown out.

Correct Serving Methods

Avoid touching the food. The bottom of plates should not come in contact with food on another plate. Cups and glasses should be held by the base. Cutlery and serving utensils should be held by the handles. Use a tray or trolley if many plates must be carried at once.

Handling Foods

Avoid touching foods with bare hands whenever possible, but especially when handling ready-to-eat foods. Tongs should be used to pick up butter, buns, bread and ice.

Disposable plastic gloves or disposable plastic bags may be used to cover hands when food is handled, but the use of gloves must never replace handwashing.

Discarding Served Food

Food that is not used by one customer should never be saved for reuse or recycling, it must be put into the garbage. The only exception is food that is individually wrapped, such as creamers, sugar packets, crackers, etc.

Single Service Utensils

Plastic utensils, wooden chopsticks, etc, that are single service are to be used once and thrown away. These items are not made of material that is meant to be cleaned and sanitized for safe reuse.

Buffet and Self Service

Food must be protected from contamination through the use of things like sneeze guards, lids and long handled serving utensils. Temperatures should be checked every 2 hours, and a staff member should always be present to monitor the buffet. Customers need to use a clean plate for every trip to the buffet. Do not refill food inserts on a buffet by pouring new food on top of old food.

SAMPLE QUIZ - UNIT 6

1. Which of the following statements describes the characteristics of potentially hazardous food?
    a. Moist, protein-rich, slightly acidic food
    b. Moist and very acidic food
    c. Lots of hot chili peppers
    d. Dry and slightly acidic food

2. Hot gravies and sauces can be cooled down more quickly by frequent stirring.
    a. True
    b. False

3. Why are meals, such as beef stew or chili, considered hazardous foods?
    a. They often contain several potentially hazardous ingredients
    b. They are handled a lot and can easily become contaminated
    c. They are often prepared in large batches and cooled improperly
    d. All of the above

4. Ground meat products are more hazardous than whole cuts of meat because the ground products have been handled more and contamination is found on the inside.
    a. True
    b. False

5. Cooking food to an internal temperature of 74°C (165°F; hold for 15 seconds) kills most pathogenic bacteria.
    a. True
    b. False

6. Which of the following is *not* an acceptable method for thawing frozen food?
    a. Cooking food from frozen
    b. Thawing frozen food in the fridge
    c. Thawing frozen food under cold running water
    d. Thawing frozen food on the kitchen counter top next to the warm stove.

7. How should cold food be reheated and held before serving?
    a. Slowly reheat to 100°C (212°F) and hold at 74°C (165°F)
    b. Rapidly reheat to 74°C (165°F) and hold at 60°C (140°F)
    c. Rapidly reheat to 60°C (140°F) and hold at 60°C (140°F)
    d. Cold food should never be reheated

8. Cooked or ready-to-eat foods cannot be contaminated.
    a. True
    b. False

9. Re-use of plastic single service utensils is okay if utensils are cleaned and sanitized.
    a. True
    b. False

10. Once a customer leaves, any unused portion of food left on their plate or table:
    a. Must be thrown out
    b. Can be served to another customer if it hasn't been touched
    c. Can be used as an ingredient for another dish if thoroughly cooked
    d. Can be donated to a food bank or shelter for the homeless

11. When handling or serving, a food handler should use utensils:
    a. When food cannot be easily picked up by a server's bare hands
    b. When they prefer
    c. Whenever possible
    d. Only If they are not wearing gloves

NOTES

Unit 7 – Cleaning and Sanitizing

Learning Outcomes

- Explain the difference between cleaning, sanitizing and sterilizing.
- Describe the procedures for proper cleaning and sanitizing of dishes, utensils, equipment and food contact surfaces.
- Describe time, temperatures and concentrations required for chemical and heat sanitizing methods.
- Describe how minimum standards of sanitation can be maintained in a food establishment.

Cleaning and sanitizing dishes, utensils, food equipment and food contact surfaces is critical for the safe operation of a food establishment. When customers eat, they can transfer pathogens from their mouths and hands to the dishes and utensils they are using. Pathogens can also easily be passed from a dirty dish or utensil back to a customer's mouth. Many pathogens can survive for long periods on surfaces, and they can continue to grow on dirty food equipment and be passed onto the next food that it comes in contact with.

What is the Difference between Cleaning and Sanitizing?

Cleaning – Removes grease, dirt and food particles from a surface. Cleaning will remove many microorganisms, but it does not kill them. No matter how well a surface is cleaned, there will always be microorganisms remaining.

Sanitizing – Reduces microorganisms on a surface to a level that is considered to be reasonably safe. When done properly, sanitizers (also known as disinfectants) will destroy most of the microorganisms on a food contact surface.

Sterilizing - Sterilizing is not the same as sanitizing. Sterilization kills 100% of all microorganisms including resistant spores, and requires specialized equipment and training. Sterilizing is not used in a food establishment.

What are the Approved Methods for Sanitizing?

Chemicals and **heat** are effective sanitizing methods to kill microorganisms in a food establishment.

All sanitizing methods have minimum limits that must be met to be effective. These are typically the **concentration** of the sanitizer, the **time** the sanitizer stays in contact with the item or surface being sanitized, and the **temperature** of the sanitizer solution or hot water.

Chemical sanitizers must be used at the correct concentrations, or parts per million (ppm). If they are mixed too strong they can become chemical contaminants of food. If they are mixed too low, they may not destroy microorganisms effectively.

1. **Chlorine** – also known as bleach; depending on the use, must have a concentration of **100 ppm to 200 ppm,**
    - Chlorine bleach is widely available, not expensive and easy to use. However, it is corrosive and will stain clothes and dull finishes on surfaces such as floors and countertops.
    - Household bleach is acceptable, but must not contain perfumes or other additives (e.g. fabric guard).
    - Chlorine sanitizer loses strength over time; new batches will have to be made more often.
    - Chlorine is more effective at killing microorganisms when mixed with warm water.
    - **To make a 100 ppm bleach solution** (measurements are rough calculations)**, add:**
        - ½ teaspoon (2.5 mL) of bleach to a Litre of water, or
        - 1 tablespoon (½ ounce or 15 mL) of bleach to a gallon (4.5L) of water

2. **Quaternary Ammonium Compound** – usually called “Quats”, need to be used at concentration of **200 ppm**, or as indicated in the manufacturer’s specifications. Quats work best at a warm temperature. Always follow the manufacturer’s instructions for making up a solution of quat sanitizer.

3. **Iodine** – must be at a concentration between **12.5 to 25 ppm**. Iodine will work at cooler water temperatures. Follow the manufacturer’s instructions for making up a proper solution of iodine.

4. **Heat** – during manual washing, leave the items in the sanitizing compartment for **2 minutes** at a water temperature of **77°C** (170°F). In a high temperature mechanical dishwasher, the sanitizing cycle must reach a minimum temperature of **82°C** (180°F) for **10 seconds**.

Some substances that are NOT approved for sanitizing are vinegar, borax, ammonia, baking soda, and tea tree oil.

Chemical test papers, obtained from a chemical supply company, are required in food establishments so food handlers can easily test chemical sanitizer concentrations. Concentrations should be checked regularly. Store chemical test strips in a cool and dry location, and use within 6 months.

Dishwashing Procedures

Whether washing is done by hand or by machine, the same basic procedure must be followed:

1 – Scrape and pre-rinse 2 – Wash 3 – Rinse 4 – Sanitize 5 – Air dry

Dirt and soap will affect the ability of chemical sanitizers to kill microorganisms. The order of these steps is important to make sure that surfaces are properly prepared for an effective sanitization.

- Allowing the items to air-dry is acceptable. Towel drying is not permitted, as it can re-contaminate the items that were clean and sanitized.

1. **Manual Washing** (washing by hand)

- For an establishment that is washing **reusable dishes and eating utensils, and does not have a mechanical dishwasher, a three-compartment sink is required.**

- **For establishments that use single service customer items only** (e.g. styrofoam or paper dishware, plastic utensils), **a two-compartment sink is the minimum requirement** for manual washing.

- Whether you are using a three-compartment sink or two-compartment sink, **an additional, separate sink is still required for handwashing.**

- Follow these basic procedures when washing items by hand in a three-compartment sink:
  1) **Scrape** off food residues and **pre-rinse or soak** utensils.
  2) **Wash** in the first sink compartment with soap and warm water at 45°C (113°F).
  3) **Rinse** in the second sink compartment with clean water at 45°C (113°F).
  4) **Sanitize** by letting items soak for a minimum of **2 minutes** in the third compartment, which must contain either an approved chemical sanitizer at the correct concentration, or hot water at 77 °C (170°F).
  5) **Air dry** on drain board or drying rack.

- When suds disappear from the first compartment, replace the soapy water.

- When suds appear in the second compartment, replace the rinse water.

- When chemical sanitizer concentrations fall below the recommended minimum concentration, replace the sanitizing solution.
- Hot water sanitizing for manual washing typically requires the installation of a proper heating element into the sink compartment, to maintain the correct temperature.

Figure 6. Three Sink Manual Dishwashing Method (for reusable utensils)

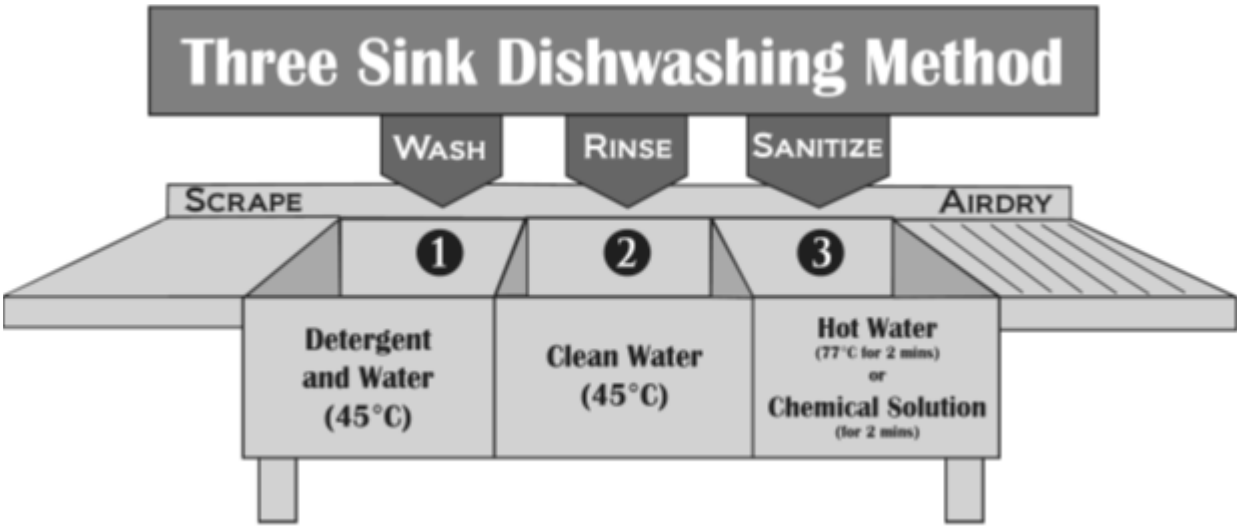
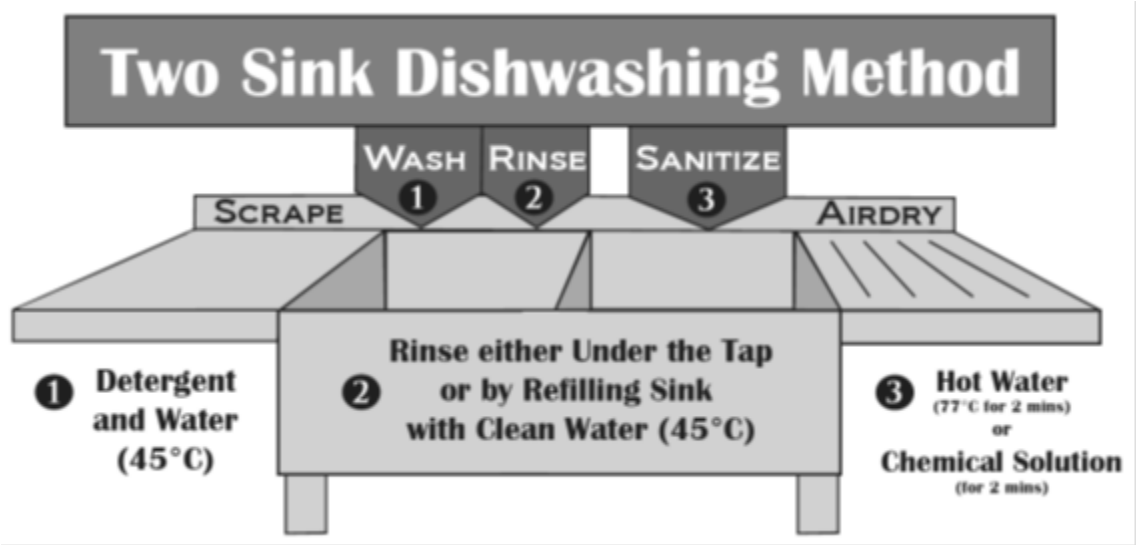


Figure 7. Two Sink Manual Dishwashing Method (no reusable customer utensils)



2. **Mechanical Washing** (using a commercial dishwasher)

a) **High Temperature Dishwasher** – sanitizes with hot water

- During the wash cycle, the water pressure and detergent removes food particles from dishes and utensils. During the final rinse, a hot water temperature of 82°C (180°F) sanitizes items that are being washed.

- A high temperature dishwasher needs a **booster heater** to boost the water temperature to 82°C (180°F).

- There should be a gauge or dial on the dishwasher to indicate the water temperature of the sanitizing cycle is reaching 82°C (180°F). This gauge should be read daily to confirm that booster heater is working properly.

- Before loading a dishwasher follow these steps:

    1) Pre-scrape and/or rinse off dirty dishes.

    2) Soak cutlery and small utensils for 10-15 minutes in a pan of hot, soapy water.

    3) Sort and rack items of the same size and shape that are to be washed, so that everything gets adequate contact with soap, rinse and sanitizer. Avoid nesting of utensils.

b) **Low Temperature Dishwasher** – sanitizes with chemicals

- The machine adds an approved chemical sanitizer during the final rinse. Most low temperature dishwashers use 100 ppm chlorine or 12.5 ppm iodine as the chemical sanitizer.

- Regularly monitor the sanitizer concentration with test papers or a test kit. You can touch the test strip to wet items as they come out of the dishwasher to test sanitizer concentrations.

- Make sure there is always an adequate supply of detergent and sanitizer to the dishwasher.

- Always follow manufacturer's instruction for operating, cleaning and maintaining a dishwasher machine.

3. **Clean-in-place**

- Large pieces of equipment such as meat slicers, counter tops, shelving units, butcher blocks, tables, etc. must be cleaned in place following the same basic procedure of wash, rinse, sanitize and air dry.

- If chlorine bleach is used as a sanitizer when cleaning in place, the concentration should be raised to 200 ppm to increase the effectiveness.

- When meat equipment such as slicers and grinders are going to be used continuously at room temperature, the food debris that builds up in the equipment will allow pathogens to grow to high numbers and can become a source of food contamination. To prevent this from happening, staff must stop to clean and sanitize this equipment every 4 hours.

Sanitation Procedures and Cleaning Schedule

The Alberta Food regulation requires that all food establishments have written procedures designed to ensure the establishment's safe and sanitary operation and maintenance. A health inspector may ask to see these written procedures during an inspection.

The procedures must include:

- the cleaning and sanitizing requirements for the food establishment
- the cleaning and sanitizing requirements for all equipment and utensils in it, if any, that are not normally washed in a dishwasher
- a list of all cleaning and sanitizing agents used in the food establishment, including their concentrations and uses

A cleaning schedule is an important part of these required written procedures, and it is a very useful tool for managing food premises in a sanitary manner.

A cleaning schedule must include all of the items and surfaces in the food establishment, including staff washrooms, ice machine, ceilings, shelving areas, bar and server areas, etc. The cleaning schedule should also be realistic with regards to how often each item needs to be cleaned and sanitized, the amount of time required for each task, number of staff required, etc.

Food establishment operators can use the following steps to create an effective cleaning schedule:

1) Determine tasks to be done and how often they must be done.

2) Provide written detailed information for taking apart, cleaning and sanitizing equipment so staff can quickly look it up.

3) Ensure required cleaning tools and products are available and stored away from food.

4) Collect comments/suggestions from staff members. The success of the sanitation program depends on employees' understanding and acceptance of the program.

5) Evaluate the cleaning schedule on a regular basis to ensure it is working and that staff understand it.

What is the safest way to store clean dishes and equipment?

- Store clean equipment and dishes, including single service dishes and utensils, at least 15 cm (6 inches) off the floor, and away from sources of dirt, dust, moisture, food splatter, garbage, etc.
- Clean and sanitize dish and utensil storage areas, shelving units, bar matting, special carts, containers and racks on a regular schedule or when dirty. Do not line shelving with cloth or paper towels.
- Always wash hands before handling clean dishes. Hold utensils by the handle only. Polishing cutlery is not recommended as the utensils can be recontaminated.
- Turn glasses, cups, bowls, etc, upside down (business ends down).
- Store utensils in containers with handles pointing outwards.
- Check for cracked or damaged dishes, utensils, and food equipment. Throw away damaged items because they cannot be properly sanitized and may also cause injury or be a source of physical contamination.
- Use single service items one time only and then throw away. Do not reuse single service utensils.

What is the proper way to use wiping / cleaning cloths?

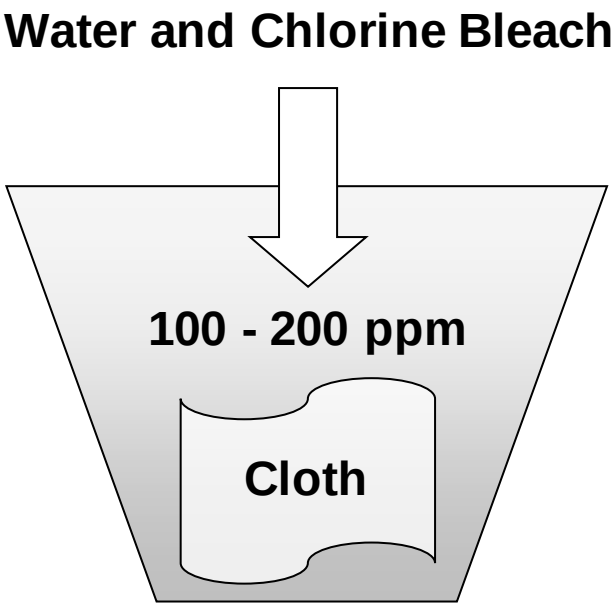
- Clean and sanitize all food contact surfaces before and after use.

- Use single use, disposable wiping cloths, or a reusable cloth stored in a sanitizing solution (100 - 200 ppm chlorine, 200 ppm quats. or 12.5 - 25 ppm iodine). Clearly label the container used to store the wiping cloths.

- Use chemical test papers to measure the concentration of the sanitizing solution at the end of each shift. Change the sanitizing solution when dirty or as often as necessary to maintain the required sanitizer concentration.

- Keep wiping cloths for food surfaces separate from cloths used to clean the floor or other contaminated surfaces. Change wiping cloths on regularly scheduled intervals or when dirty.

Figure 8. Wiping Cloth Storage Between Uses



SAMPLE QUIZ - UNIT 7

1. When washing dishes in a 3 compartment sink, the first sink should be:
    a. Rinse water at 45°C (113°F)
    b. Soapy water at 82°C (180°F)
    c. Soapy water at 45°C (113°F)
    d. Sanitizer at 77°C (170°F)

2. When using a high temperature dishwashing machine, how hot must the water be to properly sanitize the dishes?
    a. At least 40°C (104°F) for 10 seconds.
    b. At least 60°C (140°F) for 2 minutes.
    c. At least 82°C (180°F) for 10 seconds.
    d. At least 100°C (212°F) for 10 seconds.

3. Which of the following is an approved sanitizer?
    a. Ammonia
    b. Detergent
    c. Chlorine bleach
    d. Vinegar

4. In manual dishwashing, utensils must be immersed in the third sink with chlorine bleach at:
    a. 10 ppm for 10 seconds
    b. 30 ppm for 2 minutes
    c. 100 ppm for 2 minutes
    d. 200 ppm for 15 seconds

5. Sanitizers are designed to:
    a. Remove soil, dirt, grease and food residues
    b. Kill all pathogenic microorganisms
    c. Kill spores and toxins
    d. Reduce the number of microorganisms to safe, low levels

6. The effectiveness of the sanitizer is determined by the:
    a. Temperature of the sanitizing solution
    b. Concentration of the sanitizer
    c. Time of contact with the equipment
    d. All of the above

7. After cleaning and sanitizing dishes in a 3-compartment sink or dishwasher, dishes should be:
    a. Air dried
    b. Dried with a paper towel
    c. Dried and polished with a clean cloth towel
    d. All of the above are acceptable

8. Which of the following chemicals effectively removes food residues or soil on the dishes and food equipment?
    a. Chlorine
    b. Quaternary ammonium compounds
    c. Detergent
    d. Iodine

9. Sterilization means to kill all microorganisms and is normally not applied in a food facility.
    a. True
    b. False

NOTES

Unit 8 – Design and Maintenance of a Food Establishment

Learning Outcomes

- Describe basic requirements for the construction of a food facility.
- Explain how the proper equipment and layout relates to food safety.
- Describe proper construction materials for food facilities.

It is important that owners, operators and managers be aware of the requirements and regulations for the design, construction and maintenance of food establishments and equipment. This information will help staff to recognize and correct conditions that may be unsanitary or unsafe.

Construction Considerations

When planning a new food facility, the size of the kitchen space, layout of kitchen areas and equipment are very important considerations that will determine how safe and efficient the kitchen functions. Cross contamination of foods can be reduced through a smart kitchen design.

The layout or kitchen floor plan should consider the "flow of the food." For example, the receiving area can be located close to the walk-in coolers and other storage areas for quick and easy storage of delivered goods. Incompatible activities or tasks should be separated in space. For instance, place the raw meat cutting equipment in an area of the kitchen away from fruit and vegetable washing and preparation.

The size of the kitchen and storage areas will be determined by the number of menu items, number of customer seats, and amount of food preparation that is planned.

Materials used for food contact surfaces, floors, walls and ceilings must be:

- Non-absorbent (does not absorb moisture or grease).
- Durable, lasting a long time and non-corrosive (e.g. does not rust).
- Smooth and easy to clean.
- Food contact surfaces, storage or service equipment must be made of non-hazardous materials. Metals such as lead, cadmium and galvanized metal should not be used.

Basic Requirements

Water Supplies must be potable. "Potable water" means water that is safe to drink – it does not contain pathogens or chemicals that will make people sick. The health department may need to approve new water systems, new water treatment, or approve repaired water distribution lines before they are put into use.

A food establishment may also have a private water system such as a well, spring, lake, etc. Private water system users must submit water samples to the Health Department on a regular basis to show the water is potable. Regardless of water testing requirements or results, some private water systems must install water treatment to ensure that the water supply is safe.

A food establishment with a private water supply may have restrictions on food handling or requirements for water sampling in order to operate.

A backflow prevention device (e.g. vacuum breaker or check valve) may need to be installed on water supply lines when food equipment is connected directly to a potable water supply. When hoses are connected directly to sink faucets, backflow prevention devices are also required.

Sometimes, a **boil water advisory** is issued for a facility or region because of unsatisfactory water results, or because of a potentially hazardous situation with the water

supply. When a boil water advisory has been issued for your facility or your area, do the following:

- Post the boil water advisory notice from the health region by all water fixtures.
- Only use boiled or bottled water for food preparation and drinking.
- Use hand sanitizer after hand washing.
- Turn off equipment like ice machines, water fountains, pop dispensers, and food mister systems (e.g. in produce departments in grocery stores).
- Access the document "What to do when there is a Boil Water Advisory" on the Environmental Public Health website, under "Resources", and then "Drinking Water".

Plumbing and sewage disposal systems must be constructed according to the Alberta Building Code. Alberta Health Services does not approve the installation of the sewage disposal systems, however health inspectors may check to ensure the system is functioning properly. Health inspectors will also respond to sewage complaints, and food establishments can be required to repair or upgrade a failing sewage disposal system. Sewage holding tanks with regular pump-out service may be an alternative in certain regions or circumstances.

Garbage disposal requires proper storage and frequent removal to prevent problems with insects, rodents, odours and other nuisances. Garbage containers should be made of plastic or metal, lined with garbage bags, and have tight-fitting lids available for use when needed. Garbage storage areas must also be kept in good condition, with dumpster covers kept closed to prevent access to pests, and the ground free of debris and grease.

Toilets and handwashing facilities for food handlers should be separate from public facilities. The number and size of public facilities will depend on the number of customer seating in the food establishment. All washrooms require ventilation and doors to washrooms should be self-closing and not open directly into food preparation areas. All washrooms require hand sinks with hot and cold running water, liquid soap in a dispenser,

single service towels or air dryer. Do not store food or clean uniforms or aprons in a bathroom.

Equipment

All equipment should be at least 15 cm (6 inches) off the floor to allow proper cleaning and easy inspection. Wheels on large equipment such as stoves and coolers will allow the equipment to be pulled away from the wall for proper cleaning behind and below. If equipment cannot be moved, it should be sealed to the floor so there is no gap where dirt and debris will collect.

When large equipment (soft ice cream machine, baking equipment, etc.) is designed for in-place cleaning, it is important that detergent and sanitizer can touch all parts, that the equipment is self draining, and that parts can be removed for inspection.

Refrigerators and walk-in coolers should have enough space to prevent overcrowding of food items. This will reduce cross contamination. A thermometer is required in the warmest part (near the door) of the refrigerator and should be checked frequently. The door latch and seals should also be in good repair.

Meat slicers, grinders, etc. should be designed so they can be dismantled and cleaned easily. This is important because this equipment requires frequent washing and sanitizing (i.e. every 4 hours if the equipment is used continuously at room temperature).

Storage containers for food must be made of food-grade material. This can be food-grade plastic, glass, stainless steel or other non-toxic metal. Do not use cloths to cover food in containers. Instead use a proper lid, or food grade materials such as aluminium foil, plastic wrap, or paper that is safe for that purpose (e.g. parchment paper, clean paper towel). Do not store foods in garbage bags, wrapped newspapers, or any container that was previously used to store any chemicals.

Cutting boards must be made of plastic or non-toxic hardwood, like maple. Wooden butcher blocks should be planed regularly to remove cracks and grooves. Separate cutting boards should be used for raw and cooked foods. Color-coded cutting boards are available to help prevent cross contamination.

Clean **ice machines** regularly, both inside and out. Store the ice scoop in a clean and sanitary manner.

Ventilation ensures the safety and comfort of customers and employees by maintaining acceptable indoor air quality. Depending on the type of cooking done, a ventilation system may be required to remove odours, smoke, grease, heat and steam. An exhaust canopy may be required over cooking equipment to prevent an accumulation of grease. Filters should be removed and cleaned regularly. Grease accumulation on walls and surfaces is an indication of poor ventilation. Local building and safety codes will determine the type of ventilation and fire suppression systems required for a food establishment.

Lighting is important to support a safe and efficient operation. Lighting equipment should be shatter-resistant or protected by plastic tubing.

Special Considerations

Smorgasbord, Buffet and Self Serve Salad Bars require extra considerations for:

- Food protection from customers, such as sneeze guards or monitoring by staff
- Hot or cold holding equipment
- Timing (i.e. series or batch cooking)
- Adequate heating and cooling
- Hot or cold holding
- Cleaning and sanitizing of equipment between services

Catering may involve serving large quantities of food within a short period of time. When food is prepared off-site, food-processing steps that are critical would include well-timed food preparation, thorough cooking and rapid cooling, and having enough equipment for proper hot and cold holding of food, which includes during the transport of food.

Mobile or temporary food facilities are usually restricted to the type of food that can be served because of space limitations.

Some mobile food vending unit types require a base of operation, where the unit is kept and serviced between uses. Both the mobile unit and base of operation must be approved by the health inspector. Other mobile food vending units are completely self-contained with all the equipment required for extensive handling of high risk foods. These do not require a base of operation.

Temporary food facilities such as booths at special events may also be visited by a health inspector for approval and inspection.

Other needs include:

- Large enough supply of potable water
- Wastewater tanks that are large enough to accept all sink drainage
- Separate sinks for handwashing and cleaning, or a temporary handwash basin
- Enough proper refrigeration space and cooking or hot holding equipment for the proposed operation

In 2003, an Alberta charity held a large fundraiser, and hired a caterer that didn't have a Food Handling Permit from Alberta Health Services. The caterer prepared a meal for 400 in a tiny, uninspected apartment kitchen. The kitchen did not have enough fridges or hot holding units to keep food out of the danger zone (4°C to 60°C), so most of the food may have been stored at room temperature for days. The Clostridium perfringens *bacteria multiplied in the food, and many of the 400 guests of the fundraiser got sick with diarrhea within 5 days of the event.*

The public health inspector closed the caterer until she found a large, inspected facility with enough equipment to prepare food for large groups safely.

SAMPLE QUIZ - UNIT 8

1. What does potable water mean?
   a. Water that is safe to drink
   b. Water that is used only for dishwashing
   c. Water that is used only for cooking
   d. Water that does not contain any microorganisms

2. The floor in a kitchen does **not** have to be:
   a. Durable
   b. High gloss
   c. Non absorbent
   d. Easy to clean

3. How high off the floor should equipment be raised to allow proper cleaning and inspection for pests?
   a. 1 inch (2.5 cm) off the floor
   b. 3 inches (7.6 cm) off the floor
   c. 6 inches (15 cm) off the floor
   d. 10 inches (25 cm) off the floor

4. Proper ventilation in the food preparation area is important because:
   a. It removes food residues from surfaces
   b. It removes dirt and dust
   c. It removes grease and odors
   d. It blows hot air into the kitchen

5. If you use water from a private source, like a well, who should approve it?
   a. Plumbing inspector
   b. Fire inspector
   c. Building inspector
   d. Health inspector

6. Light fixtures in the food preparation area must be covered.
   a. True
   b. False

7. Garbage containers in the food preparation area should be:
   a. Emptied only when they are full
   b. Covered as much as possible
   c. Made only of metal
   d. All of the above

8. Which of the following containers is acceptable for food storage?
   a. Garbage bags
   b. Stainless steel bowl
   c. Clean chemical container
   d. Newspaper

9. It is acceptable to use a hardwood cutting board in a food facility.
   a. True
   b. False

NOTES

Unit 9 – Pest Control

Learning Outcomes

- List the conditions that attract insects and rodents.
- Identify common pests of concern, their habits and potential hazards.
- List steps to prevent and/or remove a pest infestation.
- Explain the need for hiring a licensed pest control operator.

Food establishments contain all the basic necessities for survival of pests: food, shelter, water. A food source is especially attractive to pests, which is why food establishments must always be diligent about effective pest prevention and control. Food establishments are required by the Food Regulation to keep records of pest control measures that are being done on site.

Pests are a concern for food safety because they may carry pathogens and can become a source of food contamination. Pests are often found looking for food in garbage, sewage, and other filthy environments. Pathogens like bacteria, viruses and parasites are easily spread by pests wherever the pests travel (they do not spread toxins, however). Any pest infestation is a serious concern for a foodservice operation. Foodservice managers should know how to prevent pests from entering the food establishment, how to identify a pest infestation and how to work with the pest control operator to eliminate the problem.

Animals are not allowed in a food facility, unless it is a service animal for those that require them. A health inspector may authorize things that do not pose a nuisance, for example a fish tank.

Common Pests of Concern for Food Establishments

1) Flies spend most of their lives wherever filth exists, such as rotting food, carcasses, sewage, and feces.

- Flies breed in decaying organic matter such as garbage.
- Flies can carry a large number of microorganisms on their hairy bodies, picking up pathogens from whatever surface they land on.
- When flies feed, they vomit their stomach contents onto the surface of food to liquefy it, and then mop up the partially digested fluid with their mouthparts. The stomach contents can spread whatever pathogens were picked up during the previous meal.
- Flies also spread their droppings onto food and food contact surfaces.

2) Rodents such as mice and rats have long been associated with the spread of disease. They are known to carry *Salmonella* in their feces.

- Rodents can easily spread disease, to humans through contamination of food and food contact surfaces with urine and droppings, and by contact with their feet and bodies.
- Fresh rodent droppings, gnaw marks and pathways are indicators that they are present.
- Rodents can pass through very small holes to get into a building– if a hole is large enough to allow a rodent's head to pass, they will squeeze through.
- Rodents can also climb up rough walls to gain entry through a window.

3) Cockroaches also transmit pathogens to food through contact with their bodies and droppings.

- Cockroaches like warm, moist and dark environments where they spend most of their time hiding in small cracks and crevices.
- They like sweet, starchy foods, but will basically eat anything.

- Dead or live cockroaches, egg cases, droppings, and musty odour are indicators that cockroaches are present.
- Signs of a major infestation problem are live cockroaches, both large and small, seen during the day.
- Placing glue boards through out your facility will more accurately identify the size of the infestation.

Pest Control - What can be done to prevent an insect or rodent infestation?

1. Don't Attract them

- Remove conditions that attract pests to your establishment, such as uncontrolled garbage storage, infrequent garbage removal, and clutter and junk piles.

2. Don't let them in

Doors and windows:

- If doors or windows are kept open, they must have tight-fitting screens.
- Screens should have no holes.
- Doors must be tight-fitting with a kickplate to prevent rodents from chewing their way in. A kickplate is an 8 to 10 inch steel plate along the base of the door.

Walls and foundations:

- Repair all cracks, holes and crevices. Steel wool can be used to seal small holes and cracks.
- Seal open spaces where pipes pass through walls, with grouting or steel wool.
- Secure heavy screen mesh over sewer openings (i.e. floor drains) to keep rodents out.

Self-monitoring and traps:

- Inspect incoming food and equipment deliveries and reject if there is evidence of pests.
- Even if you have a monthly contract with a pest control company, you should still conduct weekly inspections of your facility, using a flashlight, to check all likely areas that may contain pests.
- Use glue traps as monitoring devices to see what's crawling around the food establishment.
- Be careful when using fly paper strips – flies and glue may drop into whatever is beneath, so do not place strips above food preparation or food storage areas.

3. Don't feed them

- Proper design, good sanitation and good housekeeping will prevent pests from finding food, water and shelter necessary for them to survive and breed.
- Indoor garbage cans should be lined with plastic bags, have tight-fitting lids, and should be washed frequently.
- Outside storage should be kept on cement and garbage should be removed frequently.
- Don't allow junk to accumulate inside or outside your establishment. Junk piles provide pests with a place to live.
- Good housekeeping involves cleaning up food particles and scraps, especially in hard to reach places such as under stoves, behind shelves and in corners.
- Use insect/rodent proof containers with tight-fitting lids to store foods.

4. Don't let them get comfortable

- Rotate foods in storage to help identify and remove possible breeding areas.
- Do self-inspections. Use the one page "Pest Control Checklist" on the EPH website.
- Use monitoring tools such as glue boards.
- Hire a pest control company.

Why hire a pest control company?

Many food businesses will hire a pest control company to perform monitoring and control measures on a regular basis. When a food establishment already has a pest infestation, the best action is to hire a pest control company right away. Pests multiply quickly, and the infestation can get much worse in a short period of time. Experienced pest control professionals will know best what methods will work for each situation to quickly and effectively manage and rid the establishment of pests.

When choosing a pest control company, be sure to:

- Ask and check for references.
- Accompany the service technician around your facility during their visit.
- Ask the technician for a detailed written pest control report for the establishment's records.

Required records for pest control include:

- Contact information for the pest control company
- What pests are controlled
- When affected areas are cleaned and sanitized
- Use of chemical control
- Use of physical control
- Location of traps

SAMPLE QUIZ – UNIT 9

1. How do flies contaminate food?
    a. With pathogens on their feet and body hairs
    b. With contaminated feces
    c. By vomiting on the food
    d. All of the above

2. Where do cockroaches often hide?
    a. In warm, dark and well protected areas such as cracks and crevices
    b. In bright, well-lit areas
    c. In cold places like a walk-in cooler
    d. In well-ventilated areas

3. Rotating food supplies in the dry storage room helps control insect infestations by:
    a. Making it easier to apply chemical pesticides
    b. Ensuring that food stored in the storage room is less likely to become contaminated
    c. Disturbing the area and moving packages of food that might otherwise be left alone and allow insects to breed
    d. All of the above

4. The receiving door can be left open without a screen to allow for better air circulation in the food establishment.
    a. True
    b. False

5. What is the best way to deal with a pest infestation?
    a. Use the best quality pesticide available
    b. Call a certified pest control operator
    c. Wait until the health inspector visits and let them know about the problem
    d. Cover the floor with glue traps

6. Mice and insects make food unsafe by contaminating it with toxins.
    a. True
    b. False

7. Correct sanitation and housekeeping practices will:
    a. Deprive pests of food, water and shelter
    b. Provide work for staff when business is slow
    c. Kill all pests
    d. All the above

8. How can you seal off small openings from rats and mice?
    a. With steel wool
    b. With newspaper
    c. With insulating foam
    d. All of the above

9. Pests only come out at night.
    a. True
    b. False

NOTES

Unit 10 – Management of Food Safety

Learning Outcomes

- Explain how operating costs can be reduced by good food safety practices.
- Describe the importance of providing a consistent and on-going staff training program.
- Describe how to handle a foodborne illness complaint.
- List the advantages of having a quality assurance program like HACCP.

Food safety practices work best when they are treated as an important part of the food establishment's overall goal of providing quality service to the customer. Consider food safety a best business practice and not simply a legal obligation to comply with the Food Regulation and to respond to the health inspector's instructions.

The public expects to be served clean and safe food. For the operation to remain in business, it must ensure public confidence. Many businesses also see food safety and sanitation as a selling feature that enhances competition with other food establishments.

Safe food handling practices are important for many reasons:

- They affect the establishment's reputation
- They impact the efficiency of the establishment's operation
- It reduces legal liability
- Reduces the risk of closure by health departments

Economics of Food Safety

Foodborne Illness will have costs to the individual, to society and to the food service establishment. There are consequences that may be mild and brief, or severe and long-lasting, including death of customers and permanent closure of businesses.

It is not difficult to understand that foodborne illness has major impacts on the individual. The customer may experience great inconvenience and stress, loss of income, health care costs, and a loss of physical or psychological health.

The actual costs to society are estimated around $12 to $14 billion each year, and include lost profits, decreased productivity due to sick days, cost of health care, legal costs and fines, costs of investigation and increased operating costs. Impacts on the community include loss of jobs and loss of dollars into the local economy.

The operating costs of food establishment are affected by food safety practices in a number of ways:

Clean equipment performs more efficiently and requires less power and maintenance.

Preventative maintenance saves money because equipment will last longer and require less servicing.

Closures are costly. Whenever a product is not available or a business has to close, even for a short period of time, profit is lost.

Discarding food due to contamination or by order of the health inspector can also be costly.

Insurance rates are part of the cost of owning a business. After a foodborne illness, insurance premiums can rise.

Service costs in the defence of lawsuits or investigation of foodborne illness cases and outbreaks include costs from laboratory services, hospitals, doctors and lawyers.

Staff behaviour and productivity will be affected by the attitudes and motivation of management about food safety. Staff morale is impacted by the amount of care taken to run a food establishment in a clean and safe manner.

Food handlers can also get sick from pathogens in the food. Whether or not employees are given paid sick days, absenteeism will increase operating costs.

Business reputation is a very important consideration for food establishments. A clean, well-run establishment will be self-evident to customers. This combined with other factors will help ensure profitability. If the food establishment is closed, or prosecuted, or is involved with a lawsuit, public confidence is lost. One small outbreak of illness can do lasting or irreparable damage to even the most popular businesses.

Public disclosure of inspection records by the health department allows customers to see how food establishments performed on their health inspections and helps them to make their own informed decisions about where to eat.

Food Safety Culture

The concept of actually carrying out what we know about food safety. Knowledge is not enough; we must follow through with our knowledge by practicing food safety at all times in the kitchen. Managers and supervisors must model food safety behaviours at all times. Do you have a positive culture of food safety in your business? If not, think about it and make a plan on how to change this.

There is a book written about this concept if you'd like to learn more. It's called "Food Safety Culture: Creating a Behaviour-Based Food Safety Management System", by Frank Yiannas; 2009.

Staff Training

A good staff training program should stress the importance of food safety as part of the operation's commitment to quality service. While staff training may involve some additional costs, the costs of not properly training staff can be greater in the long run. Untrained employees also do not often feel motivated to work to the best of their ability, which contributes to poor staff morale. Employing untrained staff will increase the number of complaints from customers and increase the number of violations during health inspections.

- Consistency is an important factor in a training program. Staff should learn to expect that attendance and successful completion of training is a regular part of their jobs.

- A training program should be conducted on an on-going basis, and as often as needed.

- Successful training also needs to be specific for different tasks and different positions.

- Trainers should be trained themselves in food safety or other similar training.

- New employees need to be formally trained. Do not allow them to simply "watch and learn" from other employees - errors, ignorance and bad habits may be passed on.

When hiring new employees, the interview process should include an evaluation of the job candidate's understanding of food safety and commitment to providing quality service. Personal appearance and hygiene of the candidate will also help to indicate their suitability for a job as a food handler.

Contact the Environmental Public Health Program of Alberta Health Services for information on what food safety training opportunities are available from health inspectors in your area.

How to Respond to a Customer Complaint about Foodborne Illness

All food establishments receive complaints from customers about a variety of issues. All customer complaints should be referred to the senior staff of the food premises, if available. It is also helpful to have a pre-printed form created and made available to staff for collecting customer complaints.

When a customer contacts a food establishment to explain that they have gotten sick from food served to them, it is important that staff respond in a calm and professional manner.

The following information and actions are important when responding to a customer complaint:

1) Name and contact information of the caller.

2) Number of people sick, their names and contact information.

3) Foods that were consumed during their meal at the food establishment, and date and time they visited.

4) Contact the health department as soon as possible to discuss the complaint and follow-up actions.

5) Isolate and label all suspect foods for microbiological testing. Keep samples refrigerated until a health inspector can take it to the Provincial Laboratory. You may save half of the sample to take to a private laboratory yourself for private testing.

6) If the complaint is valid, review the operation and existing procedures.

7) Take corrective action or implement new procedures.

8) Follow-up and evaluate the current operating procedures to ensure that the problem does not occur again.

There are several things that staff can do to reduce miscommunication during the complaint. This will help to collect important information for a proper and thorough follow-up:

1) *When responding to a customer complaint about foodborne illness, do not admit responsibility.*
2) *Staff can still express sincere concern by saying "I'm sorry to hear that you're feeling unwell."*
3) *Avoid arguments. This may lead the complainant to believe that you are trying to hide something.*
4) *Do not make a diagnosis, suggest treatments, or express opinions. Just get the facts. If they state they are very ill, you may suggest that they go see their doctor or call Health Link.*

Closure of your Food Facility

Many things happen at food facilities when the health inspector isn't onsite. The following circumstances would necessitate the closure of your food facility by your management team:

- Lack of power, water and/or hot water
- Sewer back up
- Excessive filth
- Pest infestation
- Foodborne illness outbreak
- Fire, flood
- No refrigeration

Do not hesitate to call Environmental Public Health for assistance.

Food Safety Program

Large companies and manufacturing plants use food safety programs (also called food safety plan, or quality assurance programs), to ensure the safety of their food.

In the past, quality assurance programs depended largely on final product inspections and testing (e.g. test 1 sandwich out of every 1000 sandwiches prepared to see if quality is acceptable). Not only were these programs expensive, but they were not effective at reducing the likelihood that unsafe products reached the customer.

HACCP is an example of a much more effective quality control method. HACCP, which stands for Hazard – Analysis – Critical – Control – Point, is widely used by the food industry as a systematic preventive approach to food safety at all stages of food handling, from farm to fork.

The Seven Principles of HACCP

Principle 1: Conduct a hazard analysis. Look at menu items, their ingredient lists and recipes to identify food safety hazards and what measures can be put in place to control these hazards. A food safety hazard is any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.

Principle 2: Identify critical control points.
A Critical Control Point (CCP) is a point, step, or procedure in a food handling process where a loss of control could result in a food safety hazard. A critical step is usually the last opportunity for the food handler to prevent, eliminate, or reduce a hazard to an acceptable level before the food reaches the customer.

Principle 3: Establish critical limits for each critical control point.
A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce that hazard to an acceptable level.

Principle 4: Establish critical control point monitoring requirements. Monitoring activities at the critical control points are necessary to ensure that critical limits are met and that the food handling process is under control. Usually managers or supervisors, head chef, etc, have the responsibility for monitoring critical control points or other quality control measures.

Principle 5: Establish corrective actions. Corrective actions instruct staff on the appropriate response when the monitoring step indicates a loss of control at a critical control point. Corrective actions are intended to make sure that no unsafe foods reach the customer.

Principle 6: Establish record keeping procedures. Effective HACCP programs require that certain documents are maintained, including the hazard analysis, written HACCP plan, and records documenting the monitoring of critical control points, critical limits, verification activities, and details of when corrective actions were performed.

Principle 7: Establish procedures to ensure HACCP plan is working as intended. Validation of the HACCP plan means periodically reviewing the plan and checking that it still does what it was intended to do - production of a safe food product. Sometimes the plan needs to be checked when the food establishment gets new equipment, new menu items, new ingredients, or new recipes.

SAMPLE QUIZ – UNIT 10

1. Food safety should be:
    a. Part of the food establishment's overall commitment to providing quality services
    b. Treated as additional work load because it is required by law
    c. Carried out by a few staff members of an establishment who are selected by management
    d. The sole responsibility of management, no input from staff should be included

2. Who is responsible for making sure that food served in a food establishment is safe?
    a. Alberta Health Services
    b. Health inspectors
    c. Occupational health and safety officers
    d. Operator or manager of the food establishment

3. Properly trained and motivated staff will help to prevent foodborne illness in customers.
    a. True
    b. False

4. Inadequate staff training can damage an establishment's profitability because of:
    a. Frequent sanitary violations
    b. Customer complaints
    c. Poor employee morale
    d. All of the above

5. When receiving a foodborne illness complaint, staff should:
    a. Recommend that the customer talk to the chef
    b. Call the customer's doctor and verify the complaint
    c. Refer the customer to the senior staff of the establishment
    d. Offer a free meal to the customer

6. The consequences of a foodborne illness can be:
    a. Financial
    b. Legal
    c. Medical
    d. All of the above

7. The first step in any food safety program, such as HACCP, is:
    a. Clean the facility
    b. Identify the hazards
    c. Cook food thoroughly
    d. Monitor food safety practices

NOTES

Appendix 1

Answers to Sample Quizzes

Unit 1
1b, 2a, 3c, 4d, 5a, 6d, 7d

Unit 2
1b, 2b, 3c, 4d, 5b, 6b, 7c, 8a, 9a, 10a, 11b, 12c, 13b, 14a, 15d, 16b

Unit 3
1d, 2a, 3d, 4b, 5d, 6b, 7b, 8a

Unit 4
1b, 2d, 3a, 4a, 5b, 6c, 7d, 8d

Unit 5
1c, 2a, 3a, 4a, 5d, 6b, 7c, 8b, 9a, 10d, 11c, 12b

Unit 6
1a, 2a, 3d, 4a, 5a, 6d, 7b, 8b, 9b, 10a, 11c

Unit 7
1c, 2c, 3c, 4c, 5d, 6d, 7a, 8c, 9a

Unit 8
1a, 2b, 3c, 4c, 5d, 6a, 7b, 8b, 9a

Unit 9
1d, 2a, 3c, 4b, 5b, 6b, 7a, 8a, 9b

Unit 10
1a, 2d, 3a, 4d, 5c, 6d, 7b

Appendix 2 - Foodborne Diseases Chart (Sources: US FDA Bad Bug Book, 2nd Edition; US CDC)

Name of Pathogen	Foodborne Illness Type	Common Causes	Incubation Period	Symptoms	Prevention
Salmonella	Infection	Cross contamination involving poultry, eggs or egg products. Potentially hazardous foods that have not been cooked thoroughly. Fecal-oral-route (infected food handler).	6-72 hours	Nausea, vomiting, stomach cramps, diarrhea, fever, headache	Do not work with food if ill. Wash hands after using the toilet. Keep hands, utensils and surfaces clean and sanitized. Avoid cross-contamination. Cook foods (esp. poultry) thoroughly.
Campylobacter jejuni	Infection	Cross contamination involving poultry, and other raw meat products. Potentially hazardous foods that have not been cooked thoroughly.	2-5 days	Stomach cramps, diarrhea (can be bloody), vomiting, fever	Keep hands, utensils and surfaces clean and sanitized. Avoid cross-contamination. Cook foods (especially poultry) thoroughly.
Norovirus	Infection	Fecal-oral-route (infected food handler). Raw or under-cooked seafood harvested from sewage-polluted waters.	Usually 24 to 48 hours. Can start at 12 hours.	Vomiting, diarrhea, stomach cramps, nausea	Use food from approved sources. Do not work with food if ill. Wash hands after using the toilet.
Hepatitis A	Infection	Fecal-oral-route (e.g. infected food handler). Raw or under-cooked seafood harvested from sewage-polluted waters.	Usually 30 days. (Range 15-50 days.)	Fever, nausea, vomiting, diarrhea, jaundice. Jaundice usually occurs 5-7 days after gut symptoms.	Use food from approved sources. Do not work with food if ill. Wash hands after using the toilet. Cook seafood thoroughly. Food handlers can get vaccinated, especially in preparation for international travel.
Giardia lamblia	Infection	Fecal-oral-route (infected food handler). Drinking from Untreated surface water sources (rivers, streams, lakes, etc).	1-2 weeks	Diarrhea, stomach cramps, gas. Can also have no symptoms.	Do not work with food if ill. Wash hands after using the toilet. Use treated water for all potable purposes.

Name of Pathogen	Foodborne Illness Type	Common Causes	Incubation Period	Symptoms	Prevention
Shigella	Infection	Fecal-oral-route (infected food handler).	8 to 50 hours	Cramps, diarrhea, fever, vomiting	Do not work with food if ill. Wash hands after using the toilet.
Listeria monocytogenes	Infection	Ready-to-eat foods contaminated with Listeria bacteria (e.g. cantaloupe, cold cuts, smoked fish, cheese, unpasteurized milk).	Gut symptoms in a few hours to 3 days. Can be up to 3 months.	Fever, muscle aches, nausea, vomiting, diarrhea. Can lead to nervous system symptoms. Can cause fetus to abort or be stillborn.	For high risk groups: do not eat hot dogs or deli meats unless heated. Do not eat refrigerated pate or meat spreads, unpasteurized cheeses/milk, refrigerated smoked seafood.
Trichinella spiralis	Infection	Historical concern with raw or insufficiently cooked pork. Currently, in North America it is limited to cases where meat of carnivorous animals (e.g. bear, coyote, seal) had been consumed, usually by hunters. Raw pork may still pose a risk of trichinosis in other parts of the world.	1 day to 8 weeks	Swollen eyelids, diarrhea, muscle soreness, thirst, sweating, chills, weakness, high fever, neurological symptoms, tissue damage, death.	Wild game flesh, especially from meat-eating animals, must be cooked thoroughly. Avoid undercooked or raw pork products outside of North America.
Anisakis worms	Infection	Raw or undercooked fish. Raw fish that has not undergone proper freezing process (in the case of sushi-grade products).	24 hours – 2 weeks	Stomach pain, nausea, vomiting, diarrhea	Purchase fish from approved sources. Practice thorough cooking. If serving/eating raw, use proper sushi-grade or smoked fish only.
Staphylococcus aureus	Intoxication	Foods contaminated by contact with food handler's nose / throat secretions or by infected wound, and then temperature abused for several hours.	1-7 hours	Nausea, vomiting, diarrhea, abdominal cramps	Practice good personal hygiene (wash hands, cover coughs/sneezes, cover cuts/burns with bandage and glove). Practice good temperature control of ingredients during prep, cooking, cooling, thawing, cold/hot holding.

Name of Pathogen	Foodborne Illness Type	Common Causes	Incubation Period	Symptoms	Prevention
Clostridium botulinum	Intoxication	Potentially hazardous foods that are packaged in such a way that they are not exposed to oxygen (e.g. home canning, vacuum packed meat, garlic in oil mixture).	Usually 18-36 hours. (Range 4 hours – 8 days)	Initial: double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, muscle weakness. If untreated, can progress to paralysis of arms, legs, trunk, and respiratory muscles.	Do not use home canned low acid foods (e.g. home canned meat or home canned fish). Temperature control potentially hazardous foods, even if they are in air-tight packages such as vacuum or modified atmosphere packs. Do not feed honey to kids under 1 year old.
E. coli 0157:H7	Toxico-infection	Cross contamination involving raw meat (especially beef) products. Potentially hazardous foods that have not been cooked thoroughly. Fecal-oral-route (infected food handler).	Usually 3-4 days. (range 1-9 days)	Abdominal cramps, diarrhea (can be bloody), nausea or vomiting	Do not work with food if ill. Wash hands after using the toilet. Keep hands, utensils and surfaces clean and sanitized. Avoid cross-contamination. Cook foods (especially ground meats) thoroughly.
Clostridium perfringens	Toxico-infection	Foods that have been temperature abused for several hours.	About 16 hours.	Watery diarrhea and mild stomach cramps.	Practice good temperature control of ingredients during prep, cooking, cooling, thawing, cold/hot holding. Check refrigeration and hot holding equipment at least daily. Do not reheat cold foods in hot holding units.
Bacillus cereus	Toxico-infection	Foods that have been temperature abused for several hours. E.g. taking too long to cool hot foods, or inadequate cold / hot holding temperatures.	30 minutes to 15 hours	Diarrhea, abdominal pain, nausea, and vomiting.	Practice good temperature control of ingredients during prep, cooking, cooling, thawing, cold/hot holding. Check refrigeration and hot holding equipment at least daily. Do not reheat cold foods in hot holding units.

Appendix 3

Cooking Temperatures

(Source: AB Food Retail and Foodservices Code, and Health Canada)

Food Type	Internal Temperature (hold for 15 seconds)
Ground meat and meat mixtures	
Beef, Pork, Veal, Lamb	71°C (160°F)
Turkey, Chicken	74°C (165°F)
Fresh Beef, Veal, Lamb (see Appendix 4 for variations)	
Medium Rare	63°C (145°F)
Medium	71°C (160°F)
Well Done	77°C (170°F)
Poultry (e.g. chicken, turkey, duck)	
Whole	85°C (185°F)
Pieces	74°C (165°F)
Stuffing (cooked alone or in bird)	74°C (165°F)
Fresh Pork (see Appendix 4 for variations)	
Pieces and whole cuts	71°C (160°F)
Pre-cooked ham (to reheat)	74°C (165°F)
Eggs and Egg Dishes	
Egg dishes and casseroles	74°C (165°F)
Seafood	
Fish	68°C (154°F)

Appendix 4

Detailed time-temperature guidelines for whole cuts of beef, pork, lamb and veal

(Source: AB Food Retail and Foodservices Code)

Whole cuts shall be cooked:

1) In an oven that is preheated to the temperature specified for the roast's weight in the following chart and that is held at that temperature:

Oven Type	Oven Temperature Based on Weight	
	Less than 4.5 kg (10 lbs)	4.5 kg (10 lbs) or more
Still dry	177°C (350°F) or more	121°C (250°F) or more
Convection	163°C (325°F) or more	121°C (250°F) or more
High Humidity[1]	121°C (250°F) or less	121°C (250°F) or less

[1] high humidity greater than 90% for at least 1 hour as measured in the cooking chamber or exit of the oven; or in a moisture-impermeable bag that provides 100% humidity.

And:

2) As specified in the following chart, to heat all parts of the food to a temperature and for the holding time that corresponds to that temperature:

Temperature °C (°F)	Time in Minutes	Temperature °C (°F)	Time in Seconds
54.4 (130)	112	63.9 (147)	13.4
55.0 (131)	89	65.0 (149)	85
56.1 (133)	56	66.1 (151)	54
57.2 (135)	36	67.2 (153)	34
57.8 (136)	28	68.3 (155)	22
58.9 (138)	18	69.4 (157)	14
60.0 (140)	12	70.0 (158)	0
61.1 (142)	8		
62.2 (144)	5		
62.8 (145)	4		

Appendix 5

Glossary of Food Safety Terms

A

Aerobic bacteria: bacteria that require oxygen in order to grow.

Allergen: something that causes an allergic reaction.

Allergic reaction: what one experiences after eating certain foods like eggs, shellfish or nuts. People often suffer from itching, sneezing, or difficulty with breathing.

Anaerobic bacteria: bacteria that require an oxygen-free environment in order to grow.

Approved food: food that has been inspected by the government

Asymptomatic: a person who is carrying a pathogen but does not look or feel sick.

B

Bacteria/bacterium: a tiny living thing that you can only see through a microscope and you cannot smell or taste. Some bacteria are helpful and other bacteria cause illness. Bacteria are one type of microorganism.

Biological hazard: a microorganism or toxin that can cause foodborne illness. A biological hazard may include bacteria, viruses, fungi and parasites.

Booster heater: a device that is part of a high temperature dishwasher that heats up water to at least 82°C in order to sanitize dishes.

C

Carrier: a person who does not look or feel sick but carries a pathogen that can be passed on to other people or food.

Chemical hazard: harmful chemicals that can get into food. Examples of chemical hazards may include cleaning products, toxic metals and pesticides (bug killing chemicals).

Chemical foodborne illness: food poisoning caused by a chemical hazard, such as a cleaning product or toxic metal that got into the food.

Chlorine: commonly known as bleach and used as a sanitizer in food facilities.

Clean: to remove dirt, food residues or any soil that you can see from dishes, countertops, cutting boards and other food contact surfaces. To clean is **NOT** to sanitize.

Cooling unit/cold unit/ refrigerator/fridge/chillers/freezers/walk-ins: equipment used to keep food cold.

Contaminant: something that gets into food, naturally or by accident and can cause illness.

Contamination: when harmful microorganisms, chemicals or foreign objects get into food.

Critical control point: a step in preparing food at which control must be applied in order to prevent, eliminate or reduce a hazard to the food. For example, in order to eliminate Salmonella in chicken, all chicken must be cooked to an internal temperature of 74°C for at least 15 seconds.

Cross contamination: the transfer of pathogens or allergens from one food to another. This can happen through contaminated cutting boards, knives, hands, etc. It usually happens when pathogens from raw foods get into cooked or ready to eat foods.

D/E

Danger zone: temperatures between 4°C (40°F) and 60°C (140°F). Bacteria in food grow and multiply the fastest at these temperatures.

Date marking: marking the date on food when it is received at a food facility.

Dehydrating: a drying process that reduces the water activity in foods.

Detergent: a chemical used for cleaning.

Direct contamination: the transfer of a contaminant from a source directly to food. Sources can include raw food, insects, coughing, etc.

F/G

FATTOM: **F**ood, **A**cidity, **T**emperature, **T**ime, **O**xygen, **M**oisture. Bacteria need these six things to grow.

Fecal matter / feces: solid waste produced by humans and animals that is commonly known as “poop”.

Fecal oral route: the transfer of pathogens from the feces to the mouth. This can cause illness. This can happen when food workers do not wash their hands correctly and then prepare food.

Finger cot: a protective rubber covering that is worn over a finger bandage or wound.

First In First Out (FIFO): stock rotation or rotating food supplies so that the oldest food is used first.

Food: any raw, cooked, or processed edible substance including ingredients such as water or ice that is intended to be eaten by people.

Foodborne illness: a sickness caused by eating contaminated food. It is also known as food poisoning.

Foodborne infection: foodborne illness caused by eating food that contains living pathogens. The pathogens grow and multiply inside the body.

Foodborne intoxication: foodborne illness caused by eating food that contain toxins (poison) produced by bacteria. It can also be caused by food containing chemicals or eating naturally toxic plant or animal material such as certain mushrooms, rhubarb leaves or blow fish.

Food contact surface: any surface that comes into contact with food. Examples include food containers, counter tops, cutting boards, knives, etc.

Food establishment: any place where food is stored, prepared, or served to people. These include restaurants, hot dog carts, hospitals, prisons, bakeries, etc.

Food grade: refers to materials that can safely contact food such as stainless steel counter tops and plastic cutting boards. Plastic garbage bags and newspapers are **NOT** food grade.

Food handler: any person who handles food, utensils, or food equipment.

Food Regulation: the Alberta Food Regulation is a set of rules that must be followed by people who operate food businesses.

Fungi: yeast, moulds and mushrooms. Some of these can cause foodborne illness. Fungi are one type of microorganism.

H

Hazard: a biological, chemical or physical property that may make food unsafe to eat.

High-risk food: see potentially hazardous food.

Host: an animal or plant on or in which a parasite lives or a virus grows and multiplies.

Hot holding: keeping properly cooked hot foods above the danger zone (above 60°C (140°F)).

Hot spots: areas in the refrigerator that may be warm.

I/J/K

If in doubt rule: throwing out food if there is any concern that it is not safe. "If in doubt, throw it out".

Immuno-compromised: describes a person who is more likely to get sick because they have an existing medical condition, are pregnant, are very old or are very young.

Incubation period: time from exposure to a pathogen to the time that symptoms show up.

Indirect contamination: there is an intermediate step between the source of the pathogen and the food that becomes contaminated. For example: the pathogens in the raw chicken go from the chicken to the cutting board and then into the lettuce.

Infestation: the presence of pests such as flies, cockroaches or mice in food establishments, where the number of the pests is large enough that food and food contact surfaces can be easily contaminated.

Insecticide: a poison or chemical used to kill insects.

Iodine: an acceptable chemical sanitizer in food facilities.

L

Less hazardous food: food that does not support the growth of bacteria and toxins. These foods can be dry, salty, sweet or acidic. Bread, nuts and dried rice are some examples.

Liquid waste: water that is discharged into the sewer, such as water that goes down the drain from the kitchen sink or is flushed down the toilet.

Low-risk food: see less hazardous food.

M/N

Manual dishwashing: washing dishes, equipment and utensils by hand using the "3 compartment sink" or "3 step" procedure of washing, rinsing and sanitizing dishes.

Mechanical dishwashing: using a commercial dishwasher to wash, rinse and sanitize dishes, equipment and utensils.

Microbes: see microorganisms.

Microbiology: a type of science that deals with microorganisms.

Microorganisms: living things that are so small that they can only be seen with a microscope. They are commonly known as germs and include bacteria, fungi, viruses and parasites.

Modified atmosphere: an environment that extends the shelf life of perishable food. This is done by adding gases like carbon dioxide and nitrogen when food is packaged.

Mould: a type of fungus that looks fuzzy and can spoil food. Some molds produce toxins (mycotoxins) that can make people sick. It can grow on damp surfaces or on food that has moisture.

O

Outbreak: a sudden rise in the number of people who get sick in a very short period of time.

P

Parasite: a microorganism that lives in or on a host such as an animal, person or fish. Some examples are tapeworms and ringworms.

Pasteurization: a process of heating food to high temperatures to kill all pathogens. Milk is normally pasteurized.

Pathogen/pathogenic microorganism: a microorganism that can cause disease or illness.

Perishable food: food that goes bad (spoils) quickly if it is stored at the wrong temperature or for long periods of time.

Personal hygiene: good health and cleaning practices such as washing hands, bathing and wearing clean clothes.

Pesticides: chemicals and poisons used to kill pests such as cockroaches, flies and mice.

Pests: bugs, flies and animals such as cockroaches and mice that can carry diseases and can make people sick.

pH: a measure of acidity or alkalinity of a substance like food.

Physical food adulteration: occurs when an object such as jewelry, glass or plastic pieces gets into food and can cause sickness or injury.

Potable water: water that is safe to drink.

Potentially hazardous food: non-acidic, or slightly acidic, moist and protein foods. These foods can support the growth of fungi and bacteria, including their toxins. Examples include: fish, chicken, dairy products, eggs, cooked cereals and vegetables.

Protozoa: a microorganism that is a one-celled parasite. Some protozoa such as *Giardia lamblia* can cause illness, commonly known as "Beaver Fever."

Q

Quality assurance program: a program in which food safety and sanitation is an important part of each step in the flow of food in a facility. An example is HACCP.

Quaternary ammonium compounds (QUATS): an acceptable chemical sanitizer in food facilities.

R

Raw food: food that is not cooked or heat treated.

Resident bacteria: good or beneficial bacteria that have established themselves in the skin.

Reusable: something that can be used over and over again. Examples are stainless steel containers and china dishes. Reusable is the opposite of single-use.

Rodents: mice and rats.

S

Sanitize: using chemicals or heat to reduce the number of pathogens on a surface to a safe level. Common sanitizers include QUATS, chlorine or bleach, iodine and hot water.

Single service/single-use: something that you can use only once and is then thrown away. Examples include most plastic utensils and paper plates.

Smoked food: food that has been cooked, flavored or preserved by being exposed to smoke. Smoking reduces the water activity of food making the food less perishable.

Spoilage microorganisms: microorganisms that can change the way food looks, feels, tastes and smells. These microorganisms may or may not cause illness.

Spore: a protective coating that some bacteria make when conditions are not right for growth. Spores can protect bacteria from being killed by freezing, cooking and chemical sanitizers. Moulds can also produce spores for reproduction.

Sterilize: to kill all microorganisms, including spores. This is normally done in a medical setting and not in food facilities. Sterilizing is different than sanitizing.

Stock rotation: see First In, First Out.

Surface water: water from a lake, river, dugout or water flowing into a drain or sewer.

T

Thaw: to defrost or unfreeze a frozen food product.

Time and temperature control: to limit the time that potentially hazardous food remains in danger zone temperatures. This time should be no longer than two hours.

Toxico-infection: foodborne illness caused by eating food that contains living bacteria. The bacteria then multiply and produce toxins inside the body.

Toxin: a poisonous waste product produced by some bacteria. Some toxins can be found in certain plants, mushrooms, animals and fish.

Transient bacteria: bacteria that may be harmful and are easily picked up by contact with other surfaces such as parts of the body, food, persons or objects.

Transportation route: how microorganisms move from different sources such as people, animals and plants to food, either directly or indirectly. An example might be: Salmonella in raw chicken gets on to a food handler's hands and then goes into the salad that the food handler touches.

U

Utensil: a tool such as a fork, knife or tongs, used to pick up, stir, serve or eat food.

V

Virus: a type of microorganism that can make people sick. Viruses only grow and multiply in living cells such as inside people and animals.

W/X

Water activity: the amount of available moisture in a food that bacteria and mould can use to grow.

Y

Yeasts: a very small, one-celled fungus. Some yeasts spoil food by forming slime. Others produce powdery films, cloudy sediments or gas bubbles in liquids. Other yeasts are helpful and are used to make foods like wine and bread.