Understanding Foodborne Illness (Food Poisoning)
What is a Foodborne Illness?

A foodborne illness is a disease acquired from eating or drinking contaminated food or water.

- Common symptoms include stomach cramps, fever/chills, headache, nausea, vomiting, and diarrhea.

- The length of time it takes for the symptoms to begin will depend on the type of organism which causes the illness, the immune system of the person, and the amount of contaminated food consumed.
Costs of Foodborne Illness

- Personal suffering (illness and/or death)
- Lawsuits from customers/clients who are ill
- Resulting fines and/or court appearances
- Bad publicity will result in loss of business
- Employees will be absent from work resulting in lost wages and staff shortages
- Foodborne illness investigations are time consuming and expensive
Types of Foodborne Illness

1. Micro-organisms
   a) Bacteria
   b) Viruses
   c) Parasites
   d) Mould

2. Chemical
   a) Accidental addition of poisons to food
   b) Poisonous plants and animals

3. Food allergies
Understanding Micro-organisms

- **Micro-organisms** are living single cells invisible to the naked eye.

- Micro-organisms include bacteria, parasites, viruses, moulds, and yeasts.

- **Pathogens** are harmful micro-organisms that can cause disease in humans.

- Pathogens are usually odourless and tasteless.

- Spoilage organisms cause odours and off tastes.

- Some micro-organisms are beneficial to humans such as the ones that are used to make sauerkraut, yogurt and cheese.

- Micro-organisms can be introduced to food from soil, humans, pests, other foods (especially raw meats) and food contact surfaces.

- **Cross-contamination** is the transfer of pathogens, chemicals or unwanted items onto food that may make it unsafe to eat.
Symptoms of a Foodborne Illness

- nausea
- diarrhea
- bloody diarrhea
- cramps
- fever/chills
- vomiting
- muscle soreness
- headaches

The symptoms may occur as quickly as 30 minutes or as long as 6 weeks after eating the contaminated food or drink depending on:

- The type of bacteria
- The number of bacteria consumed
- Susceptibility of the person
Bacteria

- Cause of MOST foodborne illnesses
- Are invisible and found everywhere
- Only pathogenic bacteria can cause foodborne illness
- Can Double in number every 20 minutes

Where do bacteria come from?

- People
- Raw food
- Soil
- Rodents & insects
How Pathogenic Bacteria Grow

- Bacteria reproduce by dividing themselves in two (One cell becomes two, two become four, four become eight).

- They will divide when the conditions of their surroundings are comfortable.

- Bacteria can reproduce every 20 minutes in perfect conditions. The number of bacteria can reach dangerous levels very quickly in a short period of time.

- Some bacteria when exposed to unfavourable conditions such as very hot or very cold temperatures protect themselves by changing into a spore state. The spore protects the bacteria from being destroyed. Bacteria will begin to grow again when conditions become more favourable, for example, food temperatures reach the ‘danger zone’.
What Pathogenic Bacteria Need to Grow

Bacteria need a combination of factors to grow:

F – Food high in protein
A – Acidity, pH
T – Time
T – Temperature
O – Oxygen
M – Moisture

F – Food high in Protein

- Pathogenic bacteria and spoilage bacteria grow best in high protein food such as meat, seafood and dairy products.

A – Acidity, pH

- Acid and base concentrations are measured on a pH scale that ranges from 0 (most acidic) to 14 (most basic).
- Pathogenic bacteria survive best in a neutral environment.
- Tap water has a pH of 7 (neutral), bleach has a pH of 13 (alkaline) and lemon has a pH of 3 (acidic).

T – Time
• Leaving food in the Danger Zone for more than 2 hours may be long enough for pathogenic bacteria to multiply and cause a foodborne illness.

T – Temperature

• Most bacteria grow best in the temperature range between 4°C and 60°C. This range is referred to as the Danger Zone.

• Temperatures below 4°C will not necessarily kill pathogenic bacteria but will slow down their growth.

• At temperatures above 60°C pathogenic bacteria will not grow.

• Appropriate cooking temperatures will ensure pathogenic bacteria are destroyed. (Refer to page 81 for required cooking temperatures)

O – Oxygen

• Most pathogenic bacteria can only grow where there is oxygen present while some can only grow where there is no oxygen. For example, the pathogenic bacteria, *Clostridium botulinum* can grow in canned foods and in flavoured oils where oxygen is absent.

M – Available Water (Moisture)

• Pathogenic bacteria need a water supply to survive.
• The amount of water in food can be reduced by processes such as smoking, drying or adding salt, or sugar.

• Water activity of less than 0.85, decreases the potential for bacteria to grow.

These six factors influence the growth of pathogenic bacteria. By sufficiently changing or eliminating one of the factors, bacterial growth and the risk of foodborne illness can be prevented. Time and Temperature are the easiest factors for food handlers to control.
Potentially Hazardous Foods

- Foods that are able to support the growth of pathogenic bacteria and the production of toxins are considered hazardous.

- However, any food can be the cause of foodborne illness if it becomes contaminated from not handling it safely.

- Foods that are considered most hazardous are those with a high protein and available water (moisture) content.

Examples:

- Poultry
- Beef/Veal
- Pork/Ham
- Fish/Seafood
- Egg Dishes
- Cooked Rice
- Milk and Milk Products
- Other foods that have been implicated as the cause of foodborne illness because of contamination include raw
fruits and vegetables, pastries, desserts, and garlic and oil mixture.

**Bacteria Multiplies by Dividing**
Types of Bacterial Foodborne Illness

The most common micro-organisms that cause foodborne illness are bacteria.

There are two types of bacterial foodborne illness:

1. Bacterial infection
2. Bacterial intoxication
1. Bacterial Infection

- Bacterial *infection* occurs when the food eaten is contaminated with living pathogenic bacteria.

- Bacteria will multiply in the digestive tract and most often cause diarrhea, stomach cramps and fever. The bacteria will pass through your stomach and down into your lower intestine. The bacteria will imbed themselves in the wall of the intestine and begin to multiply. When there are enough bacteria, diarrhea will result, sometimes bloody.

- Symptoms may occur 12 hours to 4 days after eating the contaminated food depending on:
  - type of bacteria consumed
  - the amount of food eaten
  - and the susceptibility of the person

- Examples of infectious bacteria are *Salmonella, Campylobacter, E. coli* and *Shigella*.

- Infectious bacteria can be destroyed by cooking foods to the appropriate cooking temperature.

**Infection:** *Salmonella*

**Source:**

- Intestinal tract and feces of humans and animals, in particular poultry and beef.
Food:

- Meat and meat products such as roast beef, meat pies, sausage, ham, poultry, poultry products, milk and eggs (especially cracked eggs).

The Disease:

- Symptoms occur 6 to 72 hours after eating, usually 24 hours (headache, diarrhea, stomach cramps, fever and occasional vomiting are the usual symptoms).

Prevention:

- *Proper handling to prevent cross-contamination.*
- *Proper handwashing.*
- *Keeping food out of the Temperature Danger Zone.*
- *Do not use un-graded or Grade C eggs.*
- *The use of raw eggs in food that will not be cooked before consumption is strongly discouraged (i.e. eggnog, Caesar salad).*

Please refer to salmonella news stories on pages, 182, 190, 191

Infection: *E. coli 0157:H7 bacteria* is the most harmful strain of *E. coli* bacteria known.

Source:

- Intestinal tract and feces of humans and animals in particular, cattle.
• 10% of cattle are contaminated on their hides and in their intestines.
• Takes as few as 100 bacteria to cause illness.

Food:

• Raw meats such as ground beef, poultry, pork, unpasteurized milk, and contaminated water.

The disease:

• Symptoms may occur 3 to 10 days after eating or drinking, usually 3 to 4 days (bloody or water diarrhea, abdominal cramps).
• *0157:H7* infections may lead to Haemolytic Uremic Syndrome (HUS), with possible permanent kidney damage, even death.

Prevention:

• *Handle foods properly to prevent cross-contamination.*
• *Cook food thoroughly.*
• *Proper handwashing using soap and water.*
• *Use only pasteurized milk and juices.*
• *Use water from a safe water supply.*
• *Wash fruits and vegetables.*

Please refer to E.Coli news stories on pages 184, 184
2. Bacterial Intoxication

- Food poisoning intoxication can occur when the food eaten is contaminated with toxins (poison) or toxin producing bacteria.

- When these bacteria multiply in the food or in the body, a toxin is produced. Not all toxins are destroyed by cooking, therefore it is important to keep foods out of the temperature danger zone.

- Vomiting is the most common and first symptom in intoxications.

- Examples of bacteria which produce toxins are *Staphylococcus aureus*, *Bacillus cereus* and *Clostridium botulinum*.

**Intoxication:  *Staphylococcus aureus***

**Source:**

- Nose, throat, hair, skin, hands, and feces of humans, infected cuts and contaminated dairy (milk and cheese).
- Improper handwashing and poor personal hygiene of food handlers are the main causes of S.aureus intoxication.
- When food has been contaminated with S.aureus through handling and then left in the danger zone, the bacteria grow and produce a toxin. The toxin
cannot be destroyed by high temperatures (e.g. cooking or reheating). Illness can occur when this toxin is ingested.

Food:

- Ham, beef, pork, poultry, potato salad, custard, cream sauces, pudding and fermented dairy products.
- Any hazardous food which is handled a great deal can become contaminated with this bacteria.

The disease:

- Symptoms occur 30 minutes to 8 hours after eating, usually 2 to 4 hours.
- Vomiting, stomach cramps and diarrhea are the usual symptoms.

Prevention:

- Practice good personal hygiene including proper handwashing.
- Keep foods out of the Temperature Danger Zone.
- Cook food thoroughly.
- Use gloves to cover hand cuts or burns if handling foods.
- Never defrost foods at room temperature.
- Wear headgear that confines the hair when handling foods.
Intoxication: *Bacillus cereus*

- *B. cereus* can survive adverse conditions such as extreme dryness by forming a hard protective spore around themselves. When conditions become favorable they can shed the protective coat and begin multiplying and producing toxins.

- This bacteria produces two types of toxins:

  1. A heat stable toxin that may cause vomiting within 30 to 60 minutes.

  - Most commonly associated with cooked rice held at room temperature.

  2. A heat labile toxin (can be destroyed by heat) that may cause diarrhea within 8 hours.

  - Various mishandled foods have been implicated in outbreaks associated with diarrhea.

**Source:**

- These bacteria are found everywhere in the environment, especially in soil and can end up in the food supply.

**Prevention:**

- *Keep cooked foods out of the Temperature Danger Zone.*
• *Keep cooked foods hot above 60°C.*
• *Cool foods quickly and store below 4°C.*

Please refer to Botulism news stories on Pages 186-189
Viruses

- Viruses are micro-organisms that multiply inside living cells and cause illness.

- Viruses do not multiply in food; they are simply passed to humans through food.

- Antibiotics do not work against viruses but some vaccines will help people build immunity against certain viruses.

- Examples of viruses that can be passed through food are *Hepatitis A, Norwalk virus, and Rotavirus*.

- Foods can be contaminated by viruses through unwashed hands, unclean preparation areas, and unsafe water.

- Some viruses can survive on counter tops and food contact surfaces for a long period of time.
Hepatitis A

Source:

• Feces of humans.

Food:

• Any food that may have been contaminated by a sick food handler.
• Contaminated water.
• Shellfish harvested from contaminated waters.

The disease:

• Hepatitis A is a disease affecting the liver. The usual symptoms may include jaundice (showing up first as yellow eyes), dark urine, nausea, fever, fatigue, loss of appetite, stomach ache, and vomiting.
• Only 3 out of 4 people with Hepatitis A exhibit symptoms, most are asymptomatic.

Prevention:

• *Hepatitis A can be prevented by good hygiene and sanitation.*
• *A vaccine is available that will prevent infection from Hepatitis A for life.*
• *Cook shellfish thoroughly before eating.*
• *Drink water from approved sources only.*
Norwalk Virus

Source:

• Environment, i.e., door handles, surfaces, computer keyboard.

Food:

• Ready to eat foods.
• Shellfish harvested from contaminated waters.

The disease:

• Spread via fecal oral route.
• The usual symptoms include vomiting, diarrhea, cramps, nausea.
• Symptoms characteristically last 24-48 hours only.
• Most often a problem in confined settings such as hospitals, long term care facilities and cruise ships.

Please refer to Norwalk news story on page 185
Parasites

- Parasites are organisms that cause illness by living and feeding off a host organism.

- Examples of parasites are *Giardia lamblia*, *Trichinella spiralis* and *Cryptosporidium*.

- Parasites can be transferred to humans through water contaminated with feces and the consumption of un-inspected meat. For example, wild game meats including bear, moose, deer, caribou etc.

- Food handlers infected with these parasites, (may or may not experience symptoms) can contaminate food by not washing their hands after using the washroom and then handling food. Also, washing raw vegetables and fruits with contaminated water can spread parasites.

- Symptoms range from mild stomach cramps, nausea and vomiting to ulcers, anemia, muscle pain with possible muscle damage.
Mould

• Moulds are fungi that grow on a variety of vegetable and animal matter, especially under warm, moist conditions.

• Moulds produce elaborate root networks – for cheese remove at least 1 inch or 2.5 cm.

• Unless mold is a characteristic of the food (e.g., Camembert, Roquefort), when food goes mouldy THROW IT OUT.
Chemical Poisoning

• Chemical food poisoning can occur when chemicals are added to food.

• Vomiting usually occurs within 1 hour after eating the contaminated food.

• Examples of chemicals that can contaminate (poison) food are pest control poisons, cleaners, and degreasers.

• Chemicals must be stored in their original containers or in properly labelled containers, away from food and food preparation areas.

• If space is limited, make sure these items are stored below food to prevent accidental contamination of the food.
Poisonous Plants and Animals

• Some plants and animals are naturally poisonous when consumed. Therefore, foods must be purchased from approved sources.

• Some examples of poisonous plants and animals are:
  a) Solanine in green potatoes
  b) Poisonous mushrooms
  c) Fish and shellfish toxins
Food Allergies and Food Intolerance

- An allergy is an over reaction of the immune system to unwanted substances.

- Allergies can result in a wide range of symptoms. The most common are vomiting, diarrhea, nausea, throat itchiness, and swelling. Symptoms may also include tingling in the mouth, hives, tightness in the throat and chest, wheezing, shallow breathing, coughing/choking, dizziness and abdominal pain.

- Examples of substances that can cause an allergic reaction are peanuts, eggs and seafood.

- Anaphylactic shock or anaphylaxis is the severe form of an allergic reaction. It is a dramatic loss in blood pressure which leads to unconsciousness and can result in death within 3 to 15 minutes.

Food Intolerance

- Some foods (lactose) and food additives (MSG, sulphites) can cause a food intolerance with similar symptoms as food allergies.

- The difference is food intolerances do not affect the immune system.
Allergies and the Role of the Foodservice Industry

- Keep an accurate list of all ingredients that are put into foods.
- Keep ingredient lists from packages of all pre-packaged food.
- If you are not sure of the food’s ingredients, tell the customer that you are not sure.
- Be aware of potential cross-contamination of food when using utensils and equipment like cooking utensils, baking pans, cutting utensils etc.
- Where possible on the menu, substitute with food that will be less likely to cause an allergic reaction (An example is substituting vegetable oil for peanut oil.)
- Call 911 if a customer is having a severe allergic reaction.

Please refer to pages 204-205 for Alternate Allergen Names
What to do if Someone Reports a Possible Foodborne Illness

- Ask the customer what date and time they visited the restaurant and what foods they ate.

- Call the Health Department and advise the customer to call the Health Department.

- Refrigerate, label and keep any leftover food portions from menu item. Inform staff not to use samples.

- Review with the staff how the meal was prepared (using the HACCP system).

- Ask staff if they were ill with similar symptoms.

- Document all information.
Physical Hazards

Protect food from being contaminated with anything that may cause illness, a choking hazard, or other injury.

- Bandages
- Gum
- Hair
- False finger nails
- Jewelry
- Glass
- Metal staples
- Broken equipment or containers
Review Questions

1. Food Intolerance is an immune system reaction:
   
a) True  
b) False

2. Which of the following is a condition that most bacteria can grow well in:
   
a) Dry product  
b) High pH  
c) Temperature at 4°C  
d) Oxygen

3. Which of the following foods are a potentially hazardous food:
   
a) Cereal  
b) Banana  
c) Yogurt  
d) Bagel