



# 1 Keeping Food Safe

# Foodborne Illnesses

**A foodborne illness is a disease transmitted to people through food.**

**An illness is considered an outbreak when:**

- Two or more people have the same symptoms after eating the same food
- An investigation is conducted by state and local regulatory authorities
- The outbreak is confirmed by laboratory analysis

# Challenges to Food Safety

## Challenges include:

- Time
- Language and culture
- Literacy and education
- Pathogens
- Unapproved suppliers
- High-risk customers
- Staff turnover

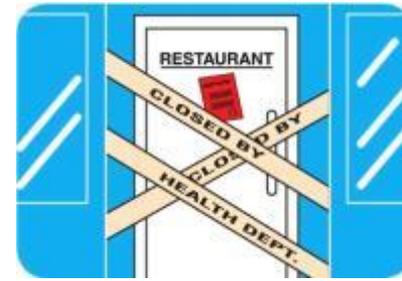


# The Costs of Foodborne Illnesses

## Costs of a foodborne illness to an operation:



Loss of customers and sales



Loss of reputation



Negative media exposure



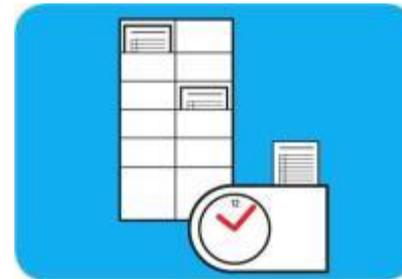
Lowered staff morale

# The Costs of Foodborne Illnesses

## Costs of a foodborne illness to an operation:



Lawsuits and legal fees



Staff missing work



Increased insurance premiums

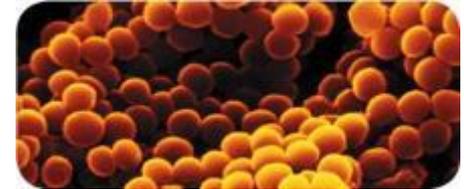


Staff retraining

# How Foodborne Illnesses Occur

## Unsafe food is the result of contamination:

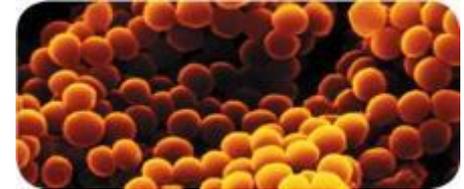
- Biological
- Chemical
- Physical



# Contaminants

## Biological contaminants:

- Bacteria
- Viruses
- Parasites
- Fungi



# Contaminants

## Chemical contaminants:

- Cleaners
- Sanitizers
- Polishes



# Contaminants

## Physical hazards:

- Metal shavings
- Staples
- Bandages
- Glass
- Dirt
- Natural objects (e.g., fish bones in a fillet)



# How Food Becomes Unsafe

## Five risk factors for foodborne illness:

1. Purchasing food from unsafe sources
2. Failing to cook food correctly
3. Holding food at incorrect temperatures
4. Using contaminated equipment
5. Practicing poor personal hygiene

# How Food Becomes Unsafe



Time-temperature abuse



Cross-contamination



Poor personal hygiene



Poor cleaning and sanitizing

# How Food Becomes Unsafe

## Time-temperature abuse:

- When food has stayed too long at temperatures good for pathogen growth



# How Food Becomes Unsafe

## Food has been time-temperature abused when:

- It has not been held or stored at correct temperatures
- It is not cooked or reheated enough to kill pathogens
- It is not cooled correctly



# How Food Becomes Unsafe

## Cross-contamination:

- When pathogens are transferred from one surface or food to another



# How Food Becomes Unsafe

## Cross-contamination can cause a foodborne illness when:

- Contaminated ingredients are added to food that receives no further cooking
- Ready-to-eat food touches contaminated surfaces
- Contaminated food touches or drips fluids onto cooked or ready-to-eat food
- A food handler touches contaminated food and then touches ready-to-eat food
- Contaminated wiping cloths touch food-contact surfaces



# How Food Becomes Unsafe

## Poor personal hygiene can cause a foodborne illness when food handlers:

- Fail to wash their hands correctly after using the restroom
- Cough or sneeze on food
- Touch or scratch wounds and then touch food
- Work while sick



# How Food Becomes Unsafe

## Poor cleaning and sanitizing:

- Equipment and utensils are not washed, rinsed, and sanitized between uses
- Food-contact surfaces are wiped clean instead of being washed, rinsed, and sanitized
- Wiping cloths are not stored in a sanitizer solution between uses
- Sanitizer solutions are not at the required levels to sanitize objects



# Food Most Likely to Become Unsafe

TCS food:



# Food Most Likely to Become Unsafe

TCS food:



# Ready-to-Eat Food

**Ready-to-eat food is food that can be eaten without further:**

- Preparation
- Washing
- Cooking

**Ready-to-eat food includes:**

- Cooked food
- Washed fruit and vegetables (whole and cut)
- Deli meat
- Bakery items
- Sugar, spices, and seasonings

# Populations at High Risk for Foodborne Illnesses

**These people have a higher risk of getting a foodborne illness:**

- Preschool-age children
- Elderly people
- People with compromised immune systems



# Keeping Food Safe

## Focus on these measures:

- Purchasing from approved, reputable suppliers
- Controlling time and temperature
- Preventing cross-contamination
- Practicing personal hygiene
- Cleaning and sanitizing





# 2 Understanding the Microworld

# Biological Contamination

## Microorganism:

- Small, living organism that can be seen only with a microscope

## Pathogen:

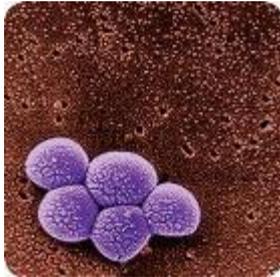
- Harmful microorganism
- Makes people sick when eaten or produces toxins that cause illness

## Toxin:

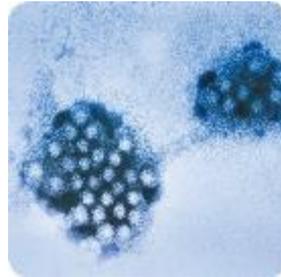
- Poison

# Biological Contamination

Four types of pathogens can contaminate food and cause foodborne illness:



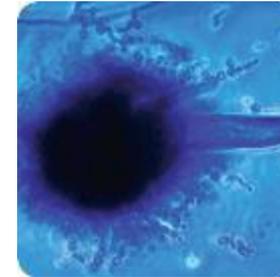
**Bacteria**



**Viruses**



**Parasites**



**Fungi**

# How Contamination Happens

## People can contaminate food when:

- They don't wash their hands after using the restroom
- They are in contact with a person who is sick
- They allow ready-to-eat food to touch surfaces that have come in contact with raw meat, seafood, and poultry
- They sneeze or vomit onto food or food-contact surfaces
- They touch dirty food-contact surfaces and equipment and then touch food
- They store food incorrectly



# Symptoms of a Foodborne Illness

## Common symptoms of foodborne illness:

- Diarrhea
- Vomiting
- Fever
- Nausea
- Abdominal cramps
- Jaundice (yellowing of skin and eyes)

## Onset times:

- Depend on the type of foodborne illness
- Can range from 30 minutes to six weeks



# The Big Six

**These pathogens are highly infectious and can cause severe illness:**

- *Salmonella* Typhi
- *Shigella* spp.
- Nontyphoidal *Salmonella* (NTS)
- Shiga toxin-producing *Escherichia coli* (STEC), also known as *E.coli*
- Hepatitis A
- Norovirus

**The “Big Six”:**

- Are often found in very high numbers in an infected person’s feces
- Can be transferred to food easily
- Can make a person sick in small doses

# General Information about Bacteria

## Detection:

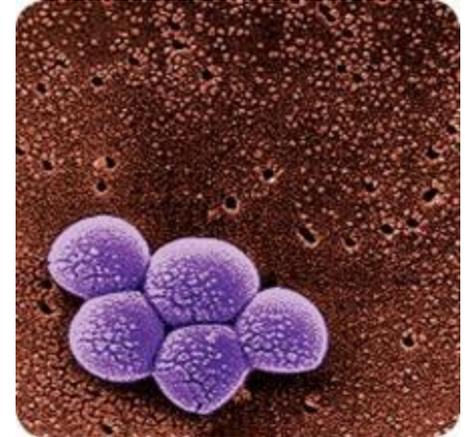
- Cannot be seen, smelled, or tasted

## Growth:

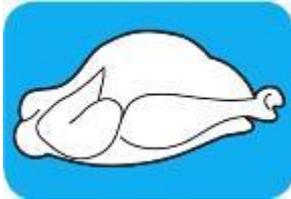
- Will grow rapidly if conditions are correct
- Some can change into spores to keep from dying when they don't have enough food
- Some make toxins in food as they grow and die

## Prevention:

- Control time and temperature

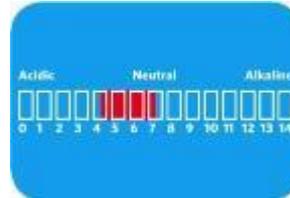


# What Bacteria Need to Grow



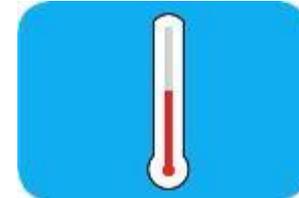
**F**

Food



**A**

Acidity



**T**

Temperature



**T**

Time



**O**

Oxygen



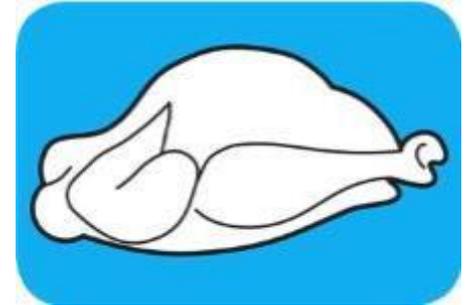
**M**

Moisture

# What Bacteria Need to Grow

## Food:

- Most bacteria need nutrients to survive
- TCS food supports the growth of bacteria better than other types of food
  - This includes meat, poultry, dairy products, and eggs



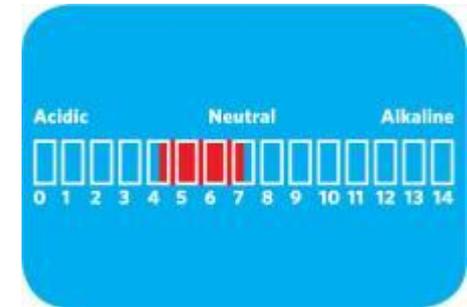
**F**

**Food**

# What Bacteria Need to Grow

## Acidity:

- Bacteria grow best in food that contains little or no acid

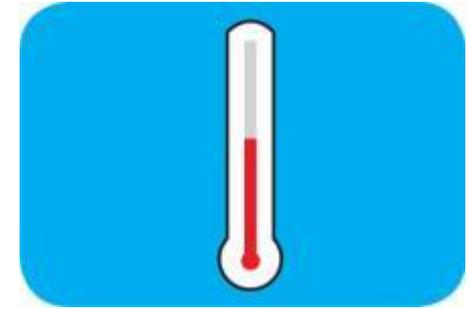


**A**  
Acidity

# What Bacteria Need to Grow

## Temperature:

- Bacteria grow rapidly between 41°F and 135°F (5°C and 57°C)
  - This range is known as the temperature danger zone
  - Bacteria grow even more rapidly from 70°F to 125°F (21°C to 52°C)
- Bacteria growth is limited when food is held above or below the temperature danger zone



**Temperature**

# What Bacteria Need to Grow

## Time:

- Bacteria need time to grow
- The more time bacteria spend in the temperature danger zone, the more opportunity they have to grow to unsafe levels



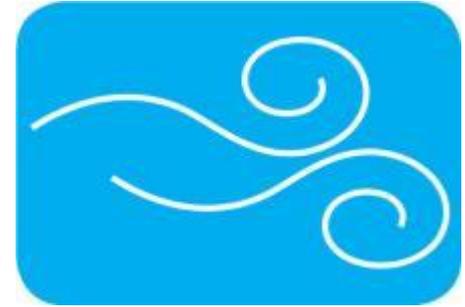
**T**

**Time**

# What Bacteria Need to Grow

## Oxygen:

- Some bacteria need oxygen to grow, while others grow when oxygen isn't there



Oxygen

# What Bacteria Need to Grow

## Moisture:

- Bacteria grow well in food with high levels of moisture
- $a_w$  = water activity; the amount of moisture available in food for bacterial growth
- $a_w$  scale ranges from 0.0 to 1.0
- Water has a water activity of 1.0



**M**

**Moisture**

# What Bacteria Need to Grow

## The conditions you can control:

- Temperature
  - Keep TCS food out of the temperature danger zone
- Time
  - Limit how long TCS food spends in the temperature danger zone



# Major Foodborne Bacteria

## Bacteria:

- *Bacillus cereus*
- *Listeria monocytogenes*
- Shiga toxin-producing *E. coli*
- *Campylobacter jejuni*
- *Clostridium perfringens*
- *Clostridium botulinum*
- Nontyphoidal *Salmonella*
- *Shigella* spp.
- *Staphylococcus aureus*
- *Vibrio vulnificus*

# Major Foodborne Bacteria

Controlling time and temperature can keep these bacteria from causing a foodborne illness:

- *Bacillus cereus*
- *Listeria monocytogenes*
- Shiga toxin-producing *E. coli*
- *Campylobacter jejuni*
- *Clostridium perfringens*
- *Clostridium botulinum*

# Bacillus cereus



**Bacteria:** *Bacillus cereus* (Diarrhea Illness)

**Illness:** *Bacillus cereus* gastroenteritis

## Commonly Linked Food

## Most Common Symptoms

Cooked vegetables

Watery diarrhea

Meat products

No vomiting

Milk

# Bacillus cereus



**Bacteria:** *Bacillus cereus* (Vomiting Illness)

**Illness:** *Bacillus cereus* gastroenteritis

## Commonly Linked Food

### Cooked rice dishes including:

- Fried rice
- Rice pudding

## Most Common Symptoms

Nausea

Vomiting

# *Bacillus cereus*

## Most important prevention measure:

- Control time and temperature

## Other prevention measures:

- Cook food to minimum internal temperatures
- Hold food at the correct temperatures
- Cool food correctly

# Listeria monocytogenes



**Bacteria:** *Listeria monocytogenes*

**Illness:** Listeriosis

## Commonly Linked Food

## Most Common Symptoms

Raw meat

**Pregnant women:**

Miscarriage

**Ready-to-eat food such as:**

**Newborns:**

- Deli-meat
- Hot dogs
- Soft cheese

Sepsis

Pneumonia

Meningitis

Unpasteurized dairy products

# Listeria monocytogenes

## Most important prevention measure:

- Control time and temperature

## Other prevention measures:

- Throw out any product that has passed its use-by or expiration date
- Cook raw meat to minimum internal temperatures
- Prevent cross-contamination between raw or undercooked food and ready-to-eat food
- Avoid using unpasteurized dairy products

# Shiga toxin-producing *E. coli*



**Bacteria:** Shiga toxin-producing *Escherichia coli*, also known as *E. coli*, including: O157:H7, O26:H11, O111:H8, and O158:NM

**Illness:** Hemorrhagic colitis

## Commonly Linked Food

## Most Common Symptoms

Ground beef (raw and undercooked)

Diarrhea (becomes bloody)

Contaminated produce

Abdominal cramps

Kidney failure (in severe cases)

# Shiga toxin-producing *E. coli*

## Most important prevention measure:

- Control time and temperature

## Other prevention measures:

- Cook food, especially ground beef, to minimum internal temperatures
- Purchase produce from approved, reputable suppliers
- Prevent cross-contamination between raw meat and ready-to-eat food
- Keep staff with diarrhea who have been diagnosed with hemorrhagic colitis out of the operation

# Campylobacter jejuni



**Bacteria:** *Campylobacter jejuni*

**Illness:** Campylobacteriosis

## Commonly Linked Food

## Most Common Symptoms

Poultry	Diarrhea (May be watery or bloody)
Water contaminated with the bacteria	Abdominal cramps
Meat	Fever
Stews/gravies	Vomiting Headaches

# *Campylobacter jejuni*

## **Most important prevention measure:**

- Control time and temperature

## **Other prevention measures:**

- Cook food, particularly poultry, to required minimum internal temperatures
- Prevent cross-contamination between raw poultry and ready-to-eat food

# *Clostridium perfringens*



**Bacteria:** *Clostridium perfringens*

**Illness:** *Clostridium perfringens* gastroenteritis

## Commonly Linked Food

## Most Common Symptoms

Meat

Diarrhea

Poultry

Severe abdominal pain

Dishes made with meat and poultry, such as stews and gravies

# *Clostridium perfringens*

## **Most important prevention measure:**

- Control time and temperature

## **Other prevention measures:**

- Cool and reheat food correctly
- Hold food at the correct temperatures

# Clostridium botulinum



**Bacteria:** *Clostridium botulinum*

**Illness:** Botulism

## Commonly Linked Food

## Most Common Symptoms

Incorrectly canned food

**Initially:**

Nausea and vomiting

Reduced-oxygen packaged (ROP) food

**Later:**

Weakness

Temperature-abused vegetables, such as baked potatoes

Double vision

Untreated garlic-and-oil mixtures

Difficulty speaking and swallowing

# *Clostridium botulinum*

## **Most important prevention measure:**

- Control time and temperature

## **Other prevention measures:**

- Hold, cool, and reheat food correctly
- Inspect canned food for damage

# Major Foodborne Bacteria

Preventing cross-contamination can keep these bacteria from causing a foodborne illness:

- Nontyphoidal *Salmonella*
- *Salmonella* Typhi

# Nontyphoidal *Salmonella*



**Bacteria:** Nontyphoidal *Salmonella*

**Illness:** Salmonellosis

## Commonly Linked Food

## Most Common Symptoms

Poultry and eggs

Diarrhea

Dairy products

Abdominal cramps

Produce

Vomiting

Fever

# Nontyphoidal *Salmonella*

## Most important prevention measure:

- Prevent cross-contamination

## Other prevention measures:

- Cook poultry and eggs to minimum internal temperatures
- Prevent cross-contamination between poultry and ready-to-eat food
- Keep food handlers who are vomiting or have diarrhea and have been diagnosed with salmonellosis out of the operation

# Salmonella Typhi



**Bacteria:** *Salmonella Typhi*

**Illness:** Typhoid Fever

## Commonly Linked Food

## Most Common Symptoms

Ready-to-eat food

High fever

Beverages

Weakness

Abdominal pain

Headache

Loss of appetite

Rash

# Salmonella Typhi

## Most important prevention measure:

- Prevent cross-contamination

## Other prevention measures:

- Exclude food handlers who have been diagnosed with an illness caused by *Salmonella Typhi* from the operation
- Wash hands
- Cook food to minimum internal temperatures

# Major Foodborne Bacteria

Practicing personal hygiene can keep these bacteria from causing a foodborne illness:

- *Shigella* spp.
- *Staphylococcus aureus*

# Shigella spp.



**Bacteria:** *Shigella* spp.

**Illness:** Shigellosis

## Commonly Linked Food

**Food easily contaminated by hands, including:**

Salads containing TCS food (potato, tuna, shrimp, macaroni, chicken)

Food in contact with contaminated water, such as produce

## Most Common Symptoms

Bloody diarrhea

Abdominal pain and cramps

Fever (occasionally)

# Shigella spp.

## Most important prevention measure:

- Practice personal hygiene

## Other prevention measures:

- Exclude food handlers who have diarrhea and have been diagnosed with an illness caused by *Shigella* spp. from the operation
- Wash hands
- Control flies inside and outside the operation

# Staphylococcus aureus



**Bacteria:** *Staphylococcus aureus*

**Illness:** Staphylococcal gastroenteritis

## Commonly Linked Food

**Food requiring handling during prepping, including:**

Salads containing TCS food (egg, tuna, chicken, macaroni)

Deli meat

## Most Common Symptoms

Nausea

Vomiting and retching

Abdominal cramps

# *Staphylococcus aureus*

## **Most important prevention measure:**

- Practice personal hygiene

## **Other prevention measures:**

- Wash hands, particularly after touching the hair, face, or body
- Cover wounds on hands and arms
- Hold, cool, and reheat food correctly

# Major Foodborne Bacteria

Purchasing food from approved, reputable suppliers can keep these bacteria from causing a foodborne illness:

- *Vibrio vulnificus*
- *Vibrio parahaemolyticus*

# Vibrio vulnificus & Vibrio parahaemolyticus



**Bacteria:** *Vibrio vulnificus*  
*Vibrio* gastroenteritis  
*vulnificus* primary septicemia

**Illness:**  
*Vibrio*

## Commonly Linked Food

## Most Common Symptoms

Oysters from contaminated water

Diarrhea

Abdominal cramps and nausea

Vomiting

Low-grade fever and chills

# *Vibrio vulnificus* & *Vibrio parahaemolyticus*

## **Most important prevention measure:**

- Purchase from approved, reputable suppliers

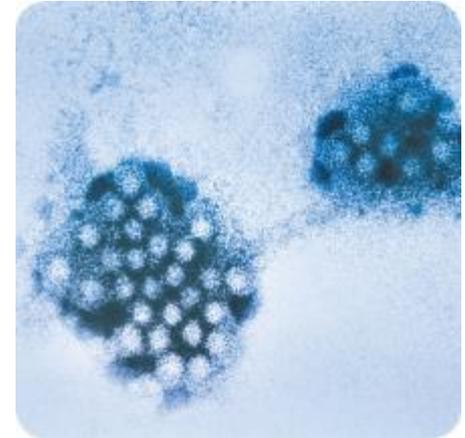
## **Other prevention measures:**

- Cook oysters to minimum internal temperatures

# General Information About Viruses

## Location:

- Carried by human beings and animals
  - Require a living host to grow
  - Do not grow in food
  - Can be transferred through food and remain infectious in food



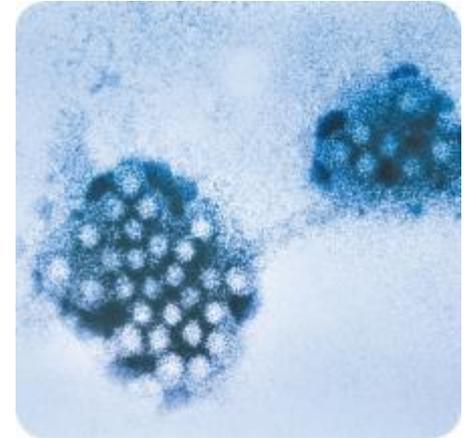
## Sources:

- Food, water, or any contaminated surface
- Typically occur through fecal-oral routes

# General Information About Viruses

## Transfer:

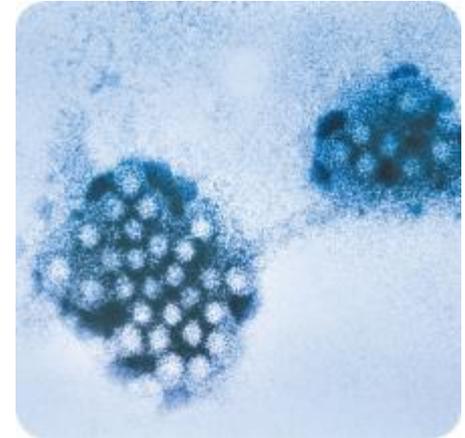
- Viruses can be transferred from
  - Person to person
  - People to food
  - People to food-contact surfaces
  
- People
  - Carry viruses in their feces
  - Can transfer them to their hands after using the restroom



# General Information About Viruses

## Prevention:

- Not destroyed by normal cooking temperatures
- Good personal hygiene must be practiced when handling food and food-contact surfaces
- Quick removal and cleanup of vomit is important



# Major Foodborne Viruses

Practicing personal hygiene can keep these viruses from causing a foodborne illness:

- Hepatitis A
- Norovirus

# Hepatitis A



**Virus:** Hepatitis A

**Illness:** Hepatitis A

## Commonly Linked Food

Ready-to-eat food

Shellfish from contaminated water

## Most Common Symptoms

Fever (mild)

General Weakness

Nausea

Abdominal pain

Jaundice (appears later)

# Hepatitis A

## Most important prevention measure:

- Practicing personal hygiene

## Other prevention measures:

- Exclude staff who have been diagnosed with hepatitis A from the operation
- Exclude staff who have jaundice from the operation
- Wash hands
- Avoid bare-hand contact with ready-to-eat food
- Purchase shellfish from approved, reputable suppliers

# Norovirus



**Virus:** Norovirus

**Illness:** Norovirus gastroenteritis

## Commonly Linked Food

## Most Common Symptoms

Ready-to-eat food

Vomiting

Shellfish from contaminated water

Diarrhea

Nausea

Abdominal cramps

# Norovirus

## Most important prevention measure:

- Practicing personal hygiene

## Other prevention measures:

- Exclude staff who are vomiting or have diarrhea and have been diagnosed with Norovirus from the operation
- Wash hands
- Avoid bare-hand contact with ready-to-eat food
- Purchase shellfish from approved, reputable suppliers

# Characteristics of Parasites

## Location:

- Require a host to live and reproduce

## Source:

- Seafood, wild game, and food processed with contaminated water, such as produce



# Characteristics of Parasites

## Prevention:

- Purchase food from approved, reputable suppliers
- Cook food to required minimum internal temperatures
- Fish that will be served raw or undercooked must be frozen correctly by the manufacturer



# Major Foodborne Parasites

Purchasing from approved, reputable suppliers can keep these parasites from causing a foodborne illness:

- *Anisakis simplex*
- *Cryptosporidium parvum*
- *Giardia duodenalis*
- *Cyclospora cayetanensis*

# *Anisakis simplex*



**Parasite:** *Anisakis simplex*

**Illness:** Anisakiasis

## Commonly Linked Food

**Raw and undercooked fish, including:**

- Herring
- Cod
- Pacific salmon
- Halibut
- Mackerel

## Most Common Symptoms

Tingling in throat

Coughing up worms

# *Anisakis simplex*

## **Most important prevention measure:**

- Purchase from approved, reputable suppliers

## **Other prevention measures:**

- Cook fish to minimum internal temperatures
- If serving raw or undercooked fish, purchase sushi-grade fish that has been frozen to the correct time-temperature requirements

# Cryptosporidium parvum



**Parasite:** *Cryptosporidium parvum*

**Illness:** Cryptosporidiosis

## Commonly Linked Food

## Most Common Symptoms

Contaminated water

Watery diarrhea

Produce

Abdominal cramps

Nausea

Weight loss

# *Cryptosporidium parvum*

## **Most important prevention measure:**

- Purchase from approved, reputable suppliers

## **Other prevention measures:**

- Use correctly treated water
- Keep food handlers with diarrhea out of the operation
- Wash hands

# Giardia duodenalis



**Parasite:** *Giardia duodenalis*  
(*G. lamblia* or *G. Intestinalis*)

**Illness:** Giardiasis

## Commonly Linked Food

Incorrectly treated water

Produce

## Most Common Symptoms

**Initially**

Fever

**Later**

Diarrhea

Abdominal cramps

Nausea

# *Giardia duodenalis*

## **Most important prevention measure:**

- Purchase from approved, reputable suppliers

## **Other prevention measures:**

- Use correctly treated water
- Keep food handlers with diarrhea out of the operation
- Wash hands

# Cyclospora cayetanensis



**Parasite:** *Cyclospora cayetanensis*

**Illness:** Cyclosporiasis

## Commonly Linked Food

Incorrectly treated water

Produce such as berries, lettuce, or basil

## Most Common Symptoms

Nausea

Abdominal cramps

Mild fever

Diarrhea alternating with constipation

Loss of weight

Loss of appetite

# *Cyclospora cayetanensis*

## **Most important prevention measure:**

- Purchase from approved, reputable suppliers

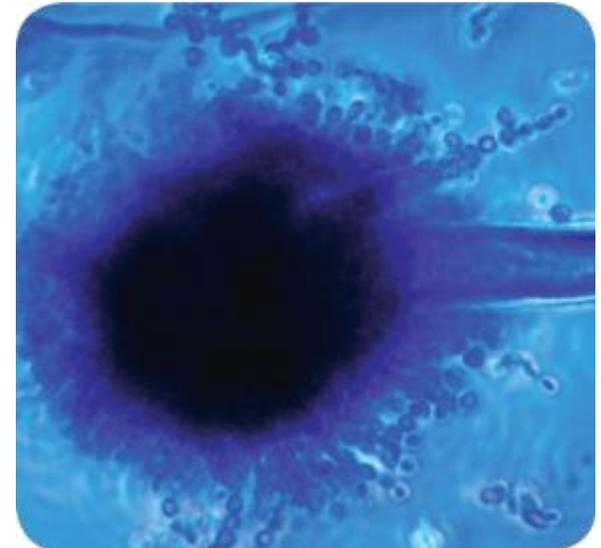
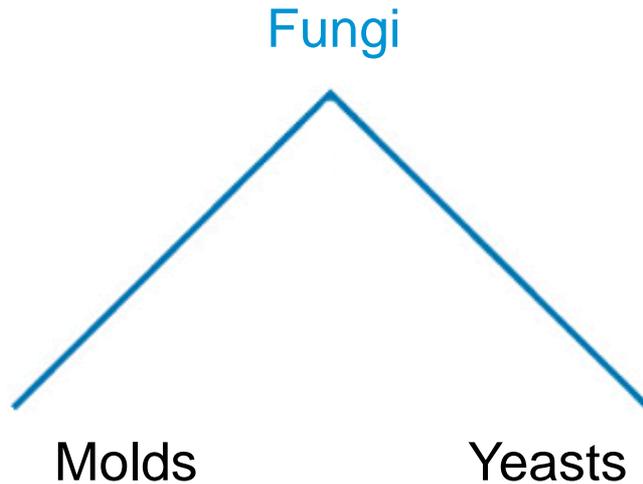
## **Other prevention measures:**

- Purchase produce from approved, reputable suppliers
- Keep food handlers with diarrhea out of the operation
- Wash hands

# Fungi

## Fungi:

- Commonly cause food spoilage and sometimes illness



## Basic characteristics of mold:

- Spoil food and sometimes cause illness
- Some produce toxins
- Grow well in almost any condition, especially in acidic food with low water activity
- Are only slowed not destroyed by cooler or freezer temperatures



## Prevention:

- Throw out all moldy food unless the mold is a natural part of the food

# Yeast

## Basic characteristics of yeast:

- Can spoil food quickly
- May produce a smell or taste of alcohol as it spoils food
- May look like a white or pink discoloration or slime and may bubble
- Grow well in acidic food with little moisture

## Prevention:

- Food containing yeast should be thrown out



# Biological Toxins

## Origin:

- Naturally occur in certain plants, mushrooms, and seafood

## Seafood toxins:

- Produced by pathogens found on certain fish
- Occur in certain fish that eat smaller fish that have consumed the toxin



# Major Fish Toxins

Purchasing from approved, reputable suppliers can keep these fish toxins from causing a foodborne illness:

- Histamine
- Ciguatoxin

# Histamine



**Toxin:** Histamine

**Illness:** Scombroid poisoning

## Commonly Linked Food

## Most Common Symptoms

Tuna

Bonito

Mackerel

Mahimahi

### Initially

Reddening of the face and neck

Sweating

Headache

Burning or tingling sensation in the mouth or throat

### Possibly later

Diarrhea

Vomiting

# Histamine

## Most important prevention measure:

- Purchase from approved, reputable suppliers

## Other prevention measures:

- Prevent time-temperature abuse during storage and preparation

# Ciguatoxin



**Toxin:** Ciguatoxin

**Illness:** Ciguatera fish poisoning

## Commonly Linked Food

**Predatory tropical reef fish from Pacific Ocean, Western Indian Ocean, and Caribbean Sea:**

- Barracuda
- Grouper
- Jacks
- Snapper

## Most Common Symptoms

Reversal of hot and cold sensations

Nausea

Vomiting

Tingling in fingers, lips, or toes

Joint and muscle pain

## Most important prevention measure:

- Purchase predatory tropical reef fish from approved, reputable suppliers

# Major Shellfish Toxins

**Purchasing from approved, reputable suppliers can keep these shellfish toxins from causing a foodborne illness:**

- Saxitoxin
- Brevetoxin
- Domoic acid

# Saxitoxin



**Toxin:** Saxitoxin

**Illness:**

Paralytic shellfish poisoning (PSP)

## Commonly Linked Food

**Shellfish found in colder waters such as those of the Pacific and New England coasts:**

- Clams
- Mussels
- Oysters
- Scallops

## Most Common Symptoms

Numbness

Tingling in mouth, face, arms, and legs

Dizziness

Nausea

Vomiting

Diarrhea

## Most important prevention measure:

- Purchase shellfish from approved, reputable suppliers

# Brevetoxin



**Toxin:** Brevetoxin

**Illness:**

Neurotoxic shellfish poisoning (NSP)

## Commonly Linked Food

**Shellfish in warmer waters of west coast of Florida, Gulf of Mexico, and Caribbean Sea:**

- Clams
- Mussels
- Oysters

## Most Common Symptoms

Tingling and numbness of the lips, tongue, and throat

Dizziness

Reversal of hot and cold sensations

Vomiting

Diarrhea

## Most important prevention measure:

- Purchase shellfish from approved, reputable suppliers

# Domoic acid



**Toxin:** Domoic acid  
**Illness:** Amnesic shellfish poisoning (ASP)

## Commonly Linked Food

**Shellfish found in coastal waters of Pacific Northwest and east coast of Canada:**

- Clams
- Mussels
- Oysters
- Scallops

## Most Common Symptoms

### **Initially**

Vomiting  
Diarrhea  
Abdominal pain

### **Possibly later**

Confusion  
Memory loss  
Disorientation  
Seizure  
Coma

# Domoic acid

## Most important prevention measure:

- Purchase shellfish from approved, reputable suppliers

# Mushroom Toxins

## Foodborne illnesses linked with mushrooms:

- Are caused by eating toxic wild mushrooms
- Occur when toxic mushrooms are mistaken for edible ones
- Can be prevented by purchasing from approved, reputable suppliers



## Foodborne illnesses linked with plant toxins:

- Usually happen when plants are purchased from unapproved suppliers
- Can happen when certain plants aren't cooked correctly (i.e., undercooked kidney beans)
- Can be prevented by purchasing plants from approved, reputable suppliers



# 3 Contamination, Food Allergens, and Foodborne Illness

# Physical Contaminants

## Sources:

- Common objects that get into food
  - Metal shavings from cans
  - Wood
  - Fingernails
  - Staples
  - Bandages
  - Glass
  - Jewelry
  - Dirt
- Naturally occurring objects such as fruit pits and bones



# Physical Contaminants

## Symptoms:

- Mild to fatal injuries are possible
- Cuts, dental damage, and choking
- Bleeding and pain

## Prevention:

- Purchase food from approved, reputable suppliers
- Closely inspect food received
- Take steps to prevent physical contamination, including practicing good personal hygiene

# Chemical Contaminants

## Sources:

- Cleaners, sanitizers, polishes, machine lubricants, and pesticides
- Certain types of kitchenware and equipment (items made from pewter, copper, zinc, and some types of painted pottery)
- Deodorizers, first-aid products, and health and beauty products (hand lotions, hairsprays, etc.)



# Chemical Contaminants

## Symptoms:

- Vary depending on chemical consumed
- Most illnesses occur within minutes
- Vomiting and diarrhea are typical

## If an illness is suspected:

- Call the emergency number in your area
- Call the Poison Control number
- Consult the chemical's MSDS

# Chemical Contaminants

## Prevention:

- Only use chemicals approved for use in foodservice operations
- Purchase chemicals from approved, reputable suppliers
- Store chemicals away from prep areas, food-storage areas, and service areas
  - Chemicals must be separated from food and food-contact surfaces by spacing and partitioning
- Chemicals must **NEVER** be stored above food or food-contact surfaces
- Use chemicals for their intended use and follow manufacturer's directions



# Chemical Contaminants

## Prevention:

- Only handle food with equipment and utensils approved for foodservice use
- Make sure the manufacturers' labels on original chemical containers are readable
- Keep MSDS current, and make sure they are accessible to staff at all times
- Follow the manufacturer's directions and local regulatory requirements when throwing out chemicals



# The Deliberate Contamination of Food

## Groups who may attempt to contaminate food:

- Terrorists or activists
- Disgruntled current or former staff
- Vendors
- Competitors

## FDA defense tool:

- A.L.E.R.T.

# The Deliberate Contamination of Food

- Assure** Make sure products received are from safe sources
- Look** Monitor the security of products in the facility
- Employees** Know who is in your facility
- Reports** Keep information related to food defense accessible
- Threat** Develop a plan for responding to suspicious activity or a threat to the operation

# Food Allergens

## Food allergen:

- A protein in a food or ingredient some people are sensitive to
- These proteins occur naturally
- When an enough of an allergen is eaten, an allergic reaction can occur



# Allergy Symptoms

## Allergy symptoms:

- Nausea
- Wheezing or shortness of breath
- Hives or itchy rashes
- Swelling of various parts of the body, including the face, eyes, hands, or feet
- Vomiting and/or diarrhea
- Abdominal pain

## Allergic reactions:

- Symptoms can become serious quickly
- A severe reaction, called anaphylaxis, can lead to death

# Food Allergens

## The Big Eight food allergens:

- Milk
- Eggs
- Fish
- Crustacean shellfish, including lobster, shrimp, and crab
- Wheat
- Soy
- Peanuts
- Tree nuts, such as almonds, walnuts, and pecans



# Food Allergens

## Know How to Read Food Labels

- Check food labels for allergens

Calories per gram:  
Fat 9 • Carbohydrate 4 • Protein 4

**INGREDIENTS:** CHICKEN BROTH, CONTAINS OF THE FOLLOWING: SALT, DEXTROSE, MONOSODIUM GLUTAMATE, HYDROLYZED NATURAL FLAVORS, AUTOLYZED YEAST EXTRACT JUICE CONCENTRATE, MONO AND DIGLYCERIN MONOOLATE, ONION JUICE CONCENTRATE.

**CONTAINS: WHEAT.**

# Preventing Allergic Reactions

## Service staff:

- Describe menu items to guests and identify any allergens in the item
- Suggest menu items without the allergens
- Clearly mark the guest's order for kitchen and service staff
- Deliver food separately to prevent cross-contact



# Preventing Allergic Reactions

## Kitchen staff:

- Avoid cross-contact
  - Do **NOT** cook different types of food in the same fryer oil
  - Do **NOT** put food on surfaces that have touched allergens



# Preventing Allergic Reactions

## Kitchen staff:

- Avoid cross-contact
  - Check recipes and ingredient labels
  - Wash, rinse, and sanitize cookware, utensils, and equipment before preparing an allergen special order
  - Make sure the allergen doesn't touch anything for customers with food allergies (food, beverages, utensils, etc.)
  - Wash your hands and change gloves before prepping food
  - Label food packaged on-site for retail use

