



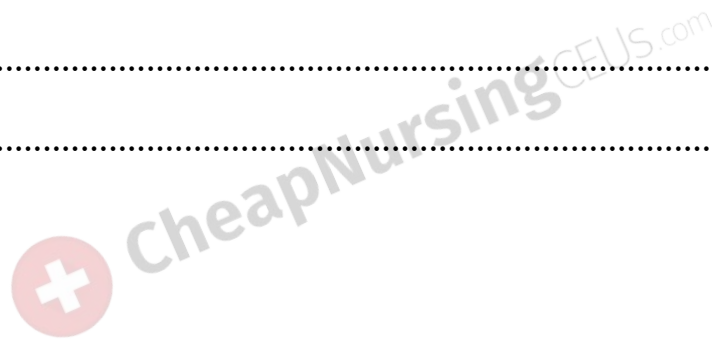
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# Foodborne Illness



Introduction.....	3
Section 1: Foodborne Illness.....	3
What is a foodborne illness? .....	3
What are the risk factors for foodborne illnesses?.....	3
What are the most common symptoms of foodborne illness? .....	4
What are the most severe symptoms of foodborne illness? .....	4
When do foodborne illness symptoms start?.....	4
What are the foods that are typically associated with foodborne illness?.....	4
How can food become contaminated?.....	4
Who is at risk for foodborne illnesses? .....	5
What are the patient populations that are at high risk for foodborne illnesses?.....	5
How may adults and older adults describe a foodborne illness? .....	6
How may pediatric patients describe a foodborne illness?.....	7
What are the pathogens that typically lead to foodborne illness?.....	8
How is a foodborne illness diagnosed? .....	16
How is a foodborne illness treated? .....	16
Are there treatment recommendations for foodborne illnesses?.....	17
How can health care professionals report information and/or obtain information about foodborne illnesses? .....	18
How can health care professionals obtain information on recalls, market withdrawals, and safety alerts? .....	18
Section 1 Summary.....	19
Section 1 Key Concepts .....	19
Section 1 Key Terms.....	20

Section 1 Personal Reflection Question.....	20
Section 2: Case Studies .....	20
Case Study 1 .....	21
Case Study 1 Review.....	21
Case Study 2 .....	24
Case Study 2 Review.....	24
Section 2 Summary.....	28
Section 2 Key Concepts .....	28
Section 2 Key Terms.....	28
Section 2 Personal Reflection Question.....	28
Conclusion .....	28
References .....	29



# Introduction

The Centers for Disease Control and Prevention (CDC) estimates that 48 million people are affected by foodborne illnesses each year in the U. S. Therefore, health care professionals should possess insight into foodborne illnesses in order to optimize patient care. This course reviews foodborne illnesses and foodborne illness care to build awareness among health care professionals. This course also reviews foodborne illness case studies.

## Section 1: Foodborne Illness

This section of the course will review concepts central to foodborne illnesses, while highlighting the pathogens that typically lead to foodborne illnesses. The information found within this section of the course was derived from materials provided by the Centers for Disease Control and Prevention (CDC) unless, otherwise, specified (Centers for Disease Control and Prevention [CDC], 2022).

### What is a foodborne illness?

A foodborne illness, also referred to as food poisoning, may refer to an illness caused by the consumption of food, beverages, or water that is contaminated with bacteria, viruses, parasites, or toxins.

### What are the risk factors for foodborne illnesses?

The risk factors for foodborne illnesses include the following: eating food that was not adequately washed; eating raw food (e.g., meat; poultry); eating undercooked food; eating shellfish from contaminated water; eating food that is past its expiration date; eating inadequately stored food; eating foods prepared by individuals with poor hand hygiene; drinking raw milk; drinking unpasteurized juice; drinking contaminated water; drinking beverages containing contaminated water (note: hand hygiene may refer to a process of cleaning the hands in order to prevent contamination and/or the spread of infectious agents).

## **What are the most common symptoms of foodborne illness?**

The most common symptoms of foodborne illness include the following: diarrhea, stomach pain, cramps, fever, nausea, and vomiting.

## **What are the most severe symptoms of foodborne illness?**

The most severe symptoms of foodborne illness include the following: diarrhea that lasts for more than three days, bloody diarrhea, high fever (e.g., temperature over 102°F), vomiting to the point that one cannot keep liquids down, and dehydration.

Health care professionals should note the following signs/symptoms of dehydration: dry mouth, dry throat, dry skin, dizziness, lightheadedness, dark urine, and a decrease in urine production.

## **When do foodborne illness symptoms start?**

Foodborne illness symptoms can start within minutes, hours, or days after consuming food, beverages, or water that is contaminated with bacteria, viruses, parasites, or toxins.

## **What are the foods that are typically associated with foodborne illness?**

The foods that are typically associated with foodborne illness include the following: raw or undercooked meat and poultry, raw or lightly cooked eggs, unpasteurized (raw) milk, raw shellfish, fruits, and vegetables.

## **How can food become contaminated?**

- Food can become contaminated during food production, processing, distribution, and/or preparation.
- Food production may refer to the activities related to food cultivation (e.g., growing plants; raising animals). The following is an example of how food can be contaminated during the food production phase: a field of crops is sprayed with contaminated water, and then harvested.

- Food processing may refer to the transformation of agricultural products (e.g., plants; animals) into food. The following is an example of how food can be contaminated during the food processing phase: contaminated ice is used to wash and pack fruit, and the fruit is then shipped to a market.
- Food distribution may refer to the process of supplying food. The following is an example of how food can be contaminated during the food distribution phase: food that is meant to be stored in a refrigerator is stored in a warm warehouse.
- Food preparation may refer to the process of preparing food for consumption. The following is an example of how food can be contaminated during the food preparation phase: an individual uses a knife and cutting board to prepare chicken; the individual uses the same knife and the same cutting board to prepare an avocado.

## Who is at risk for foodborne illnesses?

Everyone is at risk for foodborne illnesses, especially those individuals who eat raw foods and foods that were inadequately stored (e.g., refrigerated foods that were not refrigerated).

Health care professionals should note that some patient populations may be at high risk for foodborne illnesses.

## What are the patient populations that are at high risk for foodborne illnesses?

The patient populations that are at high risk for foodborne illnesses include the following: children younger than five years, pregnant women, immunocompromised individuals, and older adults (note: the term immunocompromised individual may refer to an individual with a weakened immune system; the term older adult may refer to an individual 65 years or older). Specific information regarding the patient populations that are at high risk for foodborne illnesses may be found below.

- **Children younger than five years** - children younger than five years have immune systems that are still developing so they might not be able to prevent foodborne illnesses. Health care professionals should note that children younger than five years are at increased risk for foodborne illness-related diarrhea, and,

subsequently, dehydration. Health care professionals should also note the following signs/symptoms of dehydration in children: a child is feeling thirsty; a child is lethargic; a child appears less active than usual; a child appears pale; a child has sunken eyes; a child's hands and/or feet feel cold; increased heart rate; irritability; drowsiness; and confusion.

- **Pregnant individuals** - changes during pregnancy alter pregnant individuals' immune system, making them more susceptible to foodborne illnesses. Health care professionals should note the following: foodborne illness during pregnancy can lead to a miscarriage, premature delivery, stillbirth, sickness, or the death of a newborn baby (U.S. Food and Drug Administration [FDA], 2020).
- **Immunocompromised individuals** - due to diabetes, liver disease, kidney disease, alcoholism, HIV/AIDS, chemotherapy, and/or radiation therapy, some individuals may be immunocompromised. Those immunocompromised individuals are more likely to experience foodborne illnesses when compared to other adults.
- **Older adults** - due to the aging process, older adults are more likely to experience foodborne illnesses when compared to adults. Additionally, older adults are at increased risk for some of the complications associated with foodborne illnesses (e.g., dehydration).

## How may adults and older adults describe a foodborne illness?

Adults and older adults may use the wording found below when describing a foodborne illness. Health care professionals should note the following: when evaluating an adult or older adult patient for a foodborne illness, health care professional should note any signs/symptoms of a foodborne illness (e.g., diarrhea, stomach pain, cramps, fever, nausea, and vomiting), and any patient language that may describe food, eating, restaurants, takeout food, traveling, and/or "eating, then feeling sick."

- I ate something, and now I feel sick
- After eating I felt sick
- I am not sure what happened; I went out to eat, and the next thing I knew I was sick
- I think it was the food I ate at the restaurant

- I knew I should not have eaten at that restaurant
- I knew I should not have ate that
- I got sick after takeout
- I think it was something I ate
- I know it was the food I ate
- I think the food I ate was expired
- The meat I ate smelled odd
- The meat I ate smelled bad
- The food I ate had an odd smell
- The food I ate had a bad smell
- I cannot keep anything down
- I have traveler's diarrhea
- I got sick after returning from a trip
- I have diarrhea
- I cannot stop going to the bathroom
- I have stomach cramps

### **How may pediatric patients describe a foodborne illness?**

Pediatric patients may use the wording found below when describing a foodborne illness. Health care professionals should note the following: when evaluating pediatric patients for a foodborne illness, health care professional should note any signs/symptoms of a foodborne illness (e.g., diarrhea, stomach pain, cramps, fever, nausea, and vomiting), and any pediatric patient langue that may describe food, eating, restaurants, takeout food, traveling, and/or "eating then feeling sick."

- My tummy hurts



- My belly feels bad
- I went to the bathroom in my pants
- I ate, and now I feel sick
- I started feeling sick after I ate
- My mommy and daddy took me to a restaurant, and now I feel sick
- The food made me sick
- The food made me feel bad
- The food smelled
- The food was bad

## What are the pathogens that typically lead to foodborne illness?

The pathogens that typically lead to foodborne illness include the following: *Bacillus cereus*, *Campylobacter jejuni*, *Clostridium botulinum*, *Clostridium perfringens*, *Cryptosporidium*, *Cyclospora cayentanensis*, *Escherichia coli* (E. coli), *E. coli* O157:H7, hepatitis A, *Listeria monocytogenes*, Noroviruses, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Vibrio parahaemolyticus*, and *Vibrio vulnificus*. Specific information regarding the aforementioned pathogens may be found below. The information found below was derived from materials provided by the U.S. Food and Drug Administration (FDA) (U.S. Food and Drug Administration [FDA], 2022).

### ***Bacillus cereus***

Pathogen notes - *Bacillus cereus* is a Gram-positive, rod-shaped bacterium that may lead to *B. cereus* food poisoning.

Typical food sources - the typical food sources for *B. cereus* food poisoning include the following: meats, stews, gravies, and vanilla sauce.

Signs and symptoms - the signs and symptoms of *B. cereus* food poisoning include the following: abdominal cramps, watery diarrhea, and nausea.

Time to onset - the signs and symptoms of *B. cereus* food poisoning typically begin 10 - 16 hours after ingestion.

Duration - the signs and symptoms of *B. cereus* food poisoning typically last for 24 - 48 hours.

### ***Campylobacter jejuni***

Pathogen notes - *Campylobacter jejuni* is a species of pathogenic bacterium that may lead to campylobacteriosis.

Typical food sources - the typical food sources for *campylobacteriosis* food poisoning include the following: raw poultry, undercooked poultry, unpasteurized milk, and contaminated water.

Signs and symptoms - the signs and symptoms of *campylobacteriosis* food poisoning include the following: diarrhea, bloody diarrhea, cramps, fever, and vomiting.

Time to onset - the signs and symptoms of *campylobacteriosis* food poisoning typically begin 2 - 5 days after ingestion.

Duration - the signs and symptoms of *campylobacteriosis* food poisoning typically last for 2 - 10 days.

### ***Clostridium botulinum***

Pathogen notes - *Clostridium botulinum* is a Gram-positive, rod-shaped bacterium that may lead to botulism food poisoning.

Typical food sources - the typical food sources for *botulism* food poisoning include the following: improperly canned foods, fermented fish, and baked potatoes prepared in aluminum foil.

Signs and symptoms - the signs and symptoms of *botulism* food poisoning include the following: nausea, vomiting, diarrhea, blurred vision, double vision, difficulty in swallowing, and muscle weakness (note: *Botulism* can result in respiratory failure and death).

Time to onset - the signs and symptoms of *botulism* food poisoning typically begin 12 - 72 hours after ingestion.

Duration - the duration of the signs and symptoms of *botulism* food poisoning can vary.

### ***Clostridium perfringens***

Pathogen notes - *Clostridium perfringens* is a Gram-positive, rod-shaped pathogenic bacterium that may lead to perfringens food poisoning.

Typical food sources - the typical food sources for *perfringens* food poisoning include the following: meats, poultry, gravy, dried foods, precooked foods, and temperature-abused foods.

Signs and symptoms - the signs and symptoms of *perfringens* food poisoning include the following: cramps, intense abdominal cramps, and watery diarrhea.

Time to onset - the signs and symptoms of *perfringens* food poisoning typically begin 8 - 16 hours after ingestion.

Duration - the signs and symptoms of *perfringens* food poisoning typically last for approximately 24 hours.

### ***Cryptosporidium***

Pathogen notes - *Cryptosporidium* is a microscopic parasite that may lead to intestinal cryptosporidiosis food poisoning.

Typical food sources - the typical food sources for intestinal *cryptosporidiosis* food poisoning include the following: uncooked food, food contaminated by an ill food handler after cooking, and contaminated drinking water.

Signs and symptoms - the signs and symptoms of intestinal *cryptosporidiosis* food poisoning include the following: diarrhea, watery diarrhea, stomach cramps, upset stomach, and fever.

Time to onset - the signs and symptoms of intestinal *cryptosporidiosis* food poisoning typically begin 2 - 10 days after ingestion.

Duration - the signs and symptoms of intestinal *cryptosporidiosis* food poisoning may be remitting and relapsing over weeks to months.

## ***Cyclospora cayetanensis***

Pathogen notes - *Cyclospora cayetanensis* is a microscopic parasite that may lead to cyclosporiasis food poisoning.

Typical food sources - the typical food sources for *cyclosporiasis* food poisoning include various types of fresh produce.

Signs and symptoms - the signs and symptoms of *cyclosporiasis* food poisoning include the following: diarrhea, watery diarrhea, loss of appetite, substantial loss of weight, cramps, nausea, vomiting, and fatigue.

Time to onset - the signs and symptoms of *cyclosporiasis* food poisoning typically begin 1 -14 days after ingestion (note: the signs and symptoms of *cyclosporiasis* food poisoning typically occur within one week after ingestion).

Duration - the signs and symptoms of *cyclosporiasis* food poisoning may be remitting and relapsing over weeks to months.

## ***Escherichia coli (E. coli)***

Pathogen notes - *E. coli* is a microscopic parasite that may lead to *E. coli* food poisoning, also referred to as traveler's diarrhea.

Typical food sources - the typical food sources for *E. coli* food poisoning includes water or food contaminated with human feces.

Signs and symptoms - the signs and symptoms of *E. coli* food poisoning include the following: watery diarrhea, abdominal cramps, and vomiting.

Time to onset - the signs and symptoms of *E. coli* food poisoning typically begin 1 - 3 days after ingestion.

Duration - the signs and symptoms of *E. coli* food poisoning typically last for 3 - 7 days or more.

## ***E. coli O157:H7***

Pathogen notes - *E. coli O157:H7* is a serotype of the bacterial species that may lead to *hemorrhagic colitis* or *E. coli O157:H7* infection, also referred to as travelers diarrhea.

Typical food sources - the typical food sources for *hemorrhagic colitis/E. coli O157:H7* infection include the following: undercooked beef (e.g., hamburger), unpasteurized milk, unpasteurized juice, raw fruits, raw vegetables (e.g. sprouts), and contaminated water.

Signs and symptoms - the signs and symptoms of *hemorrhagic colitis/E. coli O157:H7* infection include the following: severe diarrhea, severe bloody diarrhea, abdominal pain, vomiting, and fever (note: fever can occur in pediatric patients; *E. coli O157:H7* infection may lead to kidney failure).

Time to onset - the signs and symptoms of *E. coli* food poisoning typically begin 1 - 8 days after ingestion.

Duration - the signs and symptoms of *E. coli* food poisoning typically last for 5 - 10 days or more.

## **Hepatitis A**

Pathogen notes - *Hepatitis A* is a contagious liver infection caused by the hepatitis A virus that may lead to hepatitis.

Typical food sources - the typical food sources for *hepatitis* include the following: raw produce, contaminated drinking water, uncooked foods, cooked foods that are not reheated after contact with an infected food handler, and shellfish from contaminated waters.

Signs and symptoms - the signs and symptoms of *hepatitis* include the following: diarrhea, dark urine, jaundice, and flu-like symptoms (e.g., fever, headache, nausea, and abdominal pain).

Time to onset - the signs and symptoms of *hepatitis* typically begin approximately 28 days after ingestion.

Duration - the signs and symptoms of *hepatitis* can vary (e.g., two weeks; three months).

## **Listeria monocytogenes**

Pathogen notes - *Listeria monocytogenes* is a pathogenic bacteria that may lead to listeriosis.

Typical food sources - the typical food sources for *listeriosis* food poisoning include the following: unpasteurized milk, soft cheeses made with unpasteurized milk, and ready-to-eat deli meats.

Signs and symptoms - the signs and symptoms of *listeriosis* food poisoning include the following: fever, muscle aches, nausea, and diarrhea. Health care professionals should note the following: pregnant women may experience a mild flu-like illness; infection may lead to premature delivery or stillbirth; older adults may develop bacteremia or meningitis; immunocompromised individuals may develop bacteremia or meningitis.

Time to onset - gastro-intestinal signs and symptoms of *listeriosis* food poisoning typically begin 9 - 48 hours after ingestion; other signs and symptoms of *listeriosis* food poisoning may develop 2 - 6 weeks after ingestion.

Duration - the duration of the signs and symptoms of *listeriosis* food poisoning can vary.

## **Noroviruses**

Pathogen notes - *Noroviruses* are a group of related viruses that may lead to food poisoning referred to as one of the following: viral gastroenteritis, winter diarrhea, acute non-bacterial gastroenteritis, and food infection.

Typical food sources - the typical food sources for *norovirus*-related food poisoning include the following: raw produce, contaminated drinking water, uncooked foods, cooked foods that are not reheated after contact with an infected food handler, and shellfish from contaminated water.

Signs and symptoms - the signs and symptoms of *norovirus*-related food poisoning include the following: nausea, vomiting, abdominal cramping, diarrhea, fever, and headache. Health care professionals should note the following: diarrhea is more prevalent in adults; vomiting is more common in children.

Time to onset - the signs and symptoms of *norovirus*-related food poisoning typically begin 12 - 48 hours after ingestion.

Duration - the signs and symptoms of *norovirus*-related food poisoning typically last for 12 - 60 hours.

## **Salmonella**

Pathogen notes - *Salmonella* is a bacteria that may lead to *salmonellosis* food poisoning.

Typical food sources - the typical food sources for *salmonellosis* food poisoning include the following: eggs, poultry, meat, cheese, contaminated raw fruits, vegetables, unpasteurized milk, and unpasteurized juice.

Signs and symptoms - the signs and symptoms of *salmonellosis* food poisoning include the following: diarrhea, fever, abdominal cramps, and vomiting.

Time to onset - the signs and symptoms of *salmonellosis* food poisoning typically begin 6 - 48 hours after ingestion.

Duration - the signs and symptoms of *salmonellosis* food poisoning typically last for 4 - 7 days.

## **Shigella**

Pathogen notes - *Shigella* is a bacteria that may lead to *shigellosis* or *bacillary dysentery* food poisoning.

Typical food sources - the typical food sources for *shigellosis/bacillary dysentery* food poisoning include the following: raw produce, contaminated drinking water, uncooked foods, and cooked foods that are not reheated after contact with an infected food handler.

Signs and symptoms - the signs and symptoms of *shigellosis/bacillary dysentery* food poisoning include the following: abdominal cramps, fever, and diarrhea. Health care professionals should note that stools from an infected patient may contain blood and mucus.

Time to onset - the signs and symptoms of *shigellosis/bacillary dysentery* food poisoning typically begin 4 - 7 days after ingestion.

Duration - the signs and symptoms of *shigellosis/bacillary dysentery* food poisoning typically last for 24 - 48 hours.

## ***Staphylococcus aureus***

Pathogen notes - *Staphylococcus aureus* is a Gram-positive, spherically shaped bacterium that may lead to staphylococcal food poisoning.

Typical food sources - the typical food sources for *staphylococcal* food poisoning include the following: unrefrigerated meats, improperly refrigerated meats, potato salads, egg salads, and cream pastries.

Signs and symptoms - the signs and symptoms of *staphylococcal* food poisoning include the following: nausea, vomiting, abdominal cramps, diarrhea, and fever. Health care professionals should note that infected patients may experience a sudden onset of severe nausea and vomiting.

Time to onset - the signs and symptoms of *staphylococcal* food poisoning typically begin 1 - 6 hours after ingestion.

Duration - the signs and symptoms of *staphylococcal* food poisoning typically last for 24 - 48 hours.

## ***Vibrio parahaemolyticus***

Pathogen notes - *Vibrio parahaemolyticus* is a Gram-negative bacterium that may lead to *V. parahaemolyticus* food poisoning.

Typical food sources - the typical food sources for *V. parahaemolyticus* food poisoning include undercooked or raw seafood, such as shellfish.

Signs and symptoms - the signs and symptoms of *V. parahaemolyticus* food poisoning include the following: watery diarrhea, bloody diarrhea, abdominal cramps, nausea, vomiting, and fever.

Time to onset - the signs and symptoms of *V. parahaemolyticus* food poisoning typically begin 4 - 96 hours after ingestion.

Duration - the signs and symptoms of *V. parahaemolyticus* food poisoning typically last for 2 - 5 days.



## ***Vibrio vulnificus***

Pathogen notes - *Vibrio vulnificus* is a Gram-negative, pathogenic bacteria that may lead to *V. vulnificus* food poisoning.

Typical food sources - the typical food sources for *V. vulnificus* food poisoning include undercooked or raw seafood, such as shellfish (e.g., oysters).

Signs and symptoms - the signs and symptoms of *V. vulnificus* food poisoning include the following: vomiting, diarrhea, and abdominal pain. Health care professionals should note that *V. vulnificus* may lead to a bloodborne infection, and, subsequently, fever, bleeding within the skin, and ulcers that may require surgical removal. Health care professionals should also note that *V. vulnificus* infection can be fatal to patients with liver disease or weakened immune systems.

Time to onset - the signs and symptoms of *V. vulnificus* food poisoning typically begin 1 - 7 days after ingestion.

Duration - the signs and symptoms of *V. vulnificus* food poisoning typically last for 2 - 8 days.

### **How is a foodborne illness diagnosed?**

A foodborne illness is diagnosed by a health care professional using tests that may require a stool sample from a patient.

Health care professionals should note that specific diagnostic processes may vary depending on patient symptoms and, ultimately, the potential pathogen that lead to the foodborne illness. Health care professionals should also note that many foodborne illnesses go undiagnosed because individuals may not require health care for their specific foodborne illness.

### **How is a foodborne illness treated?**

Often individuals with a foodborne illness do not require health care. However, some individuals with a foodborne illness may require IV fluids and/or antibiotics (e.g., patients suffering from infectious diarrhea) (note: infectious diarrhea may refer to diarrhea related to an infection; diarrhea related to a foodborne illness) .

Health care professionals should note that foodborne illness treatment may depend on patients' symptoms and type of infection.

## Are there treatment recommendations for foodborne illnesses?

Yes, the Infectious Diseases Society of America (IDSA) provides treatment recommendations for foodborne illnesses and infectious diarrhea. The IDSA's recommendations for foodborne illnesses and infectious diarrhea are highlighted below. The information found below was derived from materials provided by the American Academy of Family Physicians (American Academy of Family Physicians, 2018).

- A detailed patient history should be obtained by a health care professional from any patient with diarrhea; diarrhea caused by foodborne illness is especially important to identify to help prevent outbreaks; local reporting recommendations should be followed if a patient with diarrhea works in a child care center, long-term care facility, health care center, food service, or a recreational water venue (e.g., pools, lakes).
- Patients with fever or bloody diarrhea should be evaluated for enteropathogens for which antimicrobial agents may be beneficial, including the following: *Salmonella enterica*, *Shigella*, and *Campylobacter*.
- Enteric fever should be considered in those with fever, with or without diarrhea, and a relevant history (e.g., recent travel to an endemic area).
- All patients with diarrhea should be assessed and evaluated for dehydration.
- Health care professionals should evaluate patients with diarrhea for postinfectious and extraintestinal manifestations associated with enteric infections, such as: reactive arthritis, erythema nodosum, or glomerulonephritis.
- Choice of empiric therapy for bloody diarrhea depends on local susceptibility patterns and the patient's travel history; options for adults include a fluoroquinolone (e.g., ciprofloxacin) or azithromycin (Zithromax); options for pediatric patients include a third-generation cephalosporin for infants younger than three months and for those with neurologic involvement, or azithromycin.

- Patients with clinical features of sepsis and suspected enteric fever should be treated empirically with broad-spectrum antimicrobials after blood, stool, and urine culture collections are completed.
- Health care professionals should consider empiric antibacterial therapy for patients who are immunocompromised and have bloody diarrhea or severe illness; however, empiric treatment of bloody diarrhea is not recommended in immunocompetent patients while waiting for test results unless: the patient is an infant younger than three months and a bacterial etiology is suspected; the patient has a fever documented in a health care setting, abdominal pain, and bacillary dysentery presumably caused by *Shigella* infection; or the patient has recently traveled internationally and has a body temperature of at least 101.3°F (38.5°C) or has signs of sepsis.
- Health care professionals should observe and monitor patients accordingly.
- Health care professionals should complete effective health care documentation; health care documentation may refer to a digital or an analog record detailing the administration of health care to patients; in order for health care documentation to be considered effective, the health care documentation must function as a viable form of communication, as well as a means to establish a detailed record of health care administration.

## **How can health care professionals report information and/or obtain information about foodborne illnesses?**

Health care professionals can report information and/or obtain information about foodborne illnesses by contacting CDC INFO at 1-800-CDC-INFO (1-800-232-4636).

Health care professionals can also contact local, state, and federal government agencies to report information and/or obtain information about foodborne illnesses and foodborne illness outbreaks (e.g., FDA).

## **How can health care professionals obtain information on recalls, market withdrawals, and safety alerts?**

Health care professionals can obtain information on recalls, market withdrawals, and safety alerts at <https://www.fda.gov/safety/recalls-market-withdrawals-safety-alerts>.

## Section 1 Summary

A foodborne illness, also referred to as food poisoning, may refer to an illness caused by the consumption of food, beverages, or water that is contaminated with bacteria, viruses, parasites, or toxins. The most common symptoms of foodborne illnesses include the following: diarrhea, stomach pain, cramps, fever, nausea, and vomiting. Health care professionals should consider foodborne illness treatment recommendations when caring for patients suffering from a foodborne illness.

## Section 1 Key Concepts

- The most severe symptoms of foodborne illness include the following: diarrhea that lasts for more than three days, bloody diarrhea, high fever (e.g., temperature over 102°F), vomiting to the point that one cannot keep liquids down, and dehydration.
- Foodborne illness symptoms can start within minutes, hours, or days after consuming food, beverages, or water that is contaminated with bacteria, viruses, parasites, or toxins.
- The foods typically associated with foodborne illness include the following: raw or undercooked meat and poultry, raw or lightly cooked eggs, unpasteurized (raw) milk, raw shellfish, fruits, and vegetables.
- Food can become contaminated during food production, processing, distribution, or preparation.
- Everyone is at risk for foodborne illnesses, especially those individuals who eat raw foods and foods that were inadequately stored.
- The patient populations that are at high risk for foodborne illnesses include the following: children younger than five years, pregnant women, immunocompromised individuals, and older adults.
- The pathogens that typically lead to foodborne illness include the following: *Bacillus cereus*, *Campylobacter jejuni*, *Clostridium botulinum*, *Clostridium perfringens*, *Cryptosporidium*, *Cyclospora cayetanensis*, *Escherichia coli* (*E. coli*), *E. coli* O157:H7, hepatitis A, *Listeria monocytogenes*, Noroviruses, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Vibrio parahaemolyticus*, and *Vibrio vulnificus*.

## Section 1 Key Terms

Foodborne illness (also referred to as food poisoning) - an illness caused by the consumption of food, beverages, or water that is contaminated with bacteria, viruses, parasites, or toxins

Hand hygiene - a process of cleaning the hands in order to prevent contamination and/or the spread of infectious agents

Food production - activities related to food cultivation

Food processing - the transformation of agricultural products into food

Food distribution - the process of supplying food

Food preparation - the process of preparing food for consumption

Immunocompromised individual - an individual with a weakened immune system

Older adult - an individual 65 years or older

Infectious diarrhea - diarrhea related to an infection; diarrhea related to a foodborne illness

Health care documentation - a digital or an analog record detailing the administration of health care to patients

## Section 1 Personal Reflection Question

Why is it important for health care professionals to identify patients suffering from a foodborne illness?

## Section 2: Case Studies

Foodborne illness case studies are presented in this section to review the concepts found in this course. A case study review will follow each case study. The case study review includes the types of questions health care professionals should ask themselves when considering foodborne illnesses. Additionally, reflection questions will be posed, within the case study review, to encourage further internal debate and consideration

regarding the presented case study and foodborne illnesses. The information found within the case studies and the case study reviews was derived from materials provided by the CDC unless, otherwise, specified (CDC,2022).

## **Case Study 1**

A 54-year-old, male patient presents to a health care facility. The patient reports the following signs/symptoms: vomiting, diarrhea, blurred vision, difficulty in swallowing, and muscle weakness. Upon questioning from a health care professional, the patient reports that he is "having trouble keeping anything down." The patient also reports that he eats "a lot of canned food." Further questioning from a health care professional reveals that the patient is "HIV positive." The patient goes on to report that he acquired HIV "several years ago" when he was "addicted to drugs." The patient also tells the health care professional that he believes that he also had a sex addiction, and he often engaged in "unprotected sex with many men." While the patient is discussing his HIV medications, the patient tells the health care professional that he "does not always take" his HIV medications. The patient also tells the health care professional that he is nauseous, and may "throw up." Finally, the patient tells the health care professional that he has been "throwing up for hours."

## **Case Study 1 Review**

**What patient details may be relevant to a foodborne illness?**

The following patient details may be relevant to a foodborne illness: the patient is a 54-year-old male; the patient reports the following signs/symptoms: vomiting, diarrhea, blurred vision, difficulty in swallowing, and muscle weakness; the patient reports that he is "having trouble keeping anything down;" the patient reports that he eats "a lot of canned food;" the patient reports that he is "HIV positive;" the patient reports that he acquired HIV "several years ago" when he was "addicted to drugs;" the patient tells the health care professional that he "does not always take" his HIV medications; the patient tells the health care professional that he is in nauseous, and may "throw up;" the patient tells the health care professional that he has been "throwing up for hours."

*Are there any other patient details that may be relevant to a foodborne illness; if so, what are they?*

**How are each of the aforementioned patient details relevant to a foodborne illness?**

Each of the previously highlighted patient details may be relevant to the presence of a foodborne illness. The potential relevance of each patient detail may be found below.

The patient is a 54-year-old male - the previous patient detail is relevant to identifying high risk patients. Health care professionals should note the following patient populations that are at high risk for foodborne illnesses: children younger than five years, pregnant women, immunocompromised individuals, and older adults.

The patient reports the following signs/symptoms: vomiting, diarrhea, blurred vision, difficulty in swallowing, and muscle weakness - the previous patient detail is relevant to identifying the pathogen that potentially led to the foodborne illness. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information regarding patient signs/symptoms.

The patient reports that he is "having trouble keeping anything down" - the previous patient detail is relevant to identifying patient signs/symptoms. Health care professionals should attempt to obtain information regarding patient signs/symptoms. Health care professionals should be sure to document patient signs/symptoms, as well as other relevant patient information. Health care professionals should note the following: patients may use different types of wording to describe a foodborne illness (e.g., I cannot keep anything down; I have traveler's diarrhea; I cannot stop going to the bathroom).

The patient reports that he eats "a lot of canned food" - the previous patient detail is relevant to identifying the pathogen that potentially led to the foodborne illness. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information regarding what the patient ate and/or drank before presenting to a health care facility.

The patient reports that he is "HIV positive" - the previous patient detail is relevant to identifying high risk patients. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information that can be used to identify high risk patients. Health care professionals should note that the patient is an immunocompromised individual, and, therefore, is a high risk patient.

The patient reports that he acquired HIV "several years ago" when he was "addicted to drugs" - the previous patient detail is relevant because it provides context for the patient's HIV status.

The patient tells the health care professional that he "does not always take" his HIV medications - the previous patient detail is relevant to a medication reconciliation. A medication reconciliation may refer to a process of comparing the medications an individual is taking (or should be taking) with newly ordered medications (Joint Commission, 2023). Health care professionals should note the following information regarding medication reconciliations: medication reconciliations are intended to identify and resolve medication discrepancies; medication reconciliations should address medication duplications, omissions, and interactions, and the need to continue current medications; the type of information health care professionals should use to reconcile medications include (among others) medication name, dose, frequency, route, and purpose; health care professionals should identify the information that needs to be collected in order to reconcile current and newly ordered medications and to safely prescribe medications in the future (Joint Commission, 2023). Health care professionals should also note that medication reconciliations may be especially relevant if a patient requires medications to treat a foodborne illness.

The patient tells the health care professional that he is nauseous, and may "throw up" - the previous patient detail is relevant to identifying patient signs/symptoms.

The patient tells the health care professional that he has been "throwing up for hours" - the previous patient detail is relevant to sign/symptom onset. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information regarding patient sign/symptom onset (i.e., when the patient started experiencing the signs/symptoms of a foodborne illness). Health care professionals should note that sign/symptom onset will depend on the pathogen that led to the foodborne illness.

*What other ways, if any, are the patient details relevant to a foodborne illness?*

**Is the patient in Case Study 1 suffering from a foodborne illness, if so, what is the foodborne illness?**

Based on the information presented in Case Study 1, it does appear the patient is suffering from a foodborne illness. Based on the information presented in Case Study 1 (e.g., the patient reports the following signs/symptoms: vomiting, diarrhea, blurred vision, difficulty in swallowing, and muscle weakness; the patient reports that he eats "a lot of canned food"), it appears the patient is suffering from botulism food poisoning. Health care professionals should note that botulism food poisoning is caused by *Clostridium botulinum*, which is a Gram-positive, rod-shaped bacterium.



*How can a health care professional potentially gather additional patient information to help confirm the possible presence of a foodborne illness?*

## **Case Study 2**

A 44-year-old male patient presents to a health care facility. The patient reports the following signs/symptoms: nausea, vomiting, and abdominal cramps. The patient also reports that he is "slightly dizzy and lightheaded." Upon questioning from a health care professional, the patient reveals that he ate a zeppole to celebrate St. Joseph's day, and "the next thing" he knew he was "vomiting." The patient also reveals that he did not eat or drink anything else "all day," with the exception of "an espresso first thing in the morning." Upon further questioning, the patient reveals that a zeppole is an Italian cream-filled pastry. The patient also reveals that he obtained the pastry from Nunzio's Bakery. The health care professional documents the relevant patient information.

Shortly after seeing the previous patient, another patient presents to the health care facility. The patient is a 24-year-old female. The patient reports the following signs/symptoms: nausea, vomiting, and abdominal cramps. Additionally, the patient reports that she ate a zeppole from Nunzio's Bakery.

While the health care professional is examining the 24-year-old female, a 33-year-old male patient presents, with what he refers to as "extreme diarrhea." The 33-year-old male patient also reports that he ate a zeppole from Nunzio's Bakery.

A group of health care professionals begin to note a trend regarding recent patients. Several patients are reporting that they ate a zeppole from Nunzio's Bakery to celebrate St. Joseph's day, which is an Italian holiday. A health care professional contacts a local government agency to report the potential foodborne illness outbreak, and another health care professional contacts CDC INFO at 1-800-CDC-INFO (1-800-232-4636). The group of health care professionals document cases of foodborne illness related to zeppoles from Nunzio's Bakery as they present.

## **Case Study 2 Review**

**What patient details may be relevant to a foodborne illness?**

The following patient details may be relevant to a foodborne illness: a 44-year-old male patient presents to a health care facility; the 44-year-old male patient reports the

following signs/symptoms: nausea, vomiting, and abdominal cramps; the 44-year-old male patient reports that he is "slightly dizzy and lightheaded;" the 44-year-old male patient reveals that he ate a zeppole to celebrate St. Joseph's day, and "the next thing" he know he was "vomiting;" The 44-year-old male patient reveals that he did not eat or drink anything else "all day," with the exception of "an espresso first thing in the morning;" the 44-year-old male patient reveals that a zeppole is an Italian cream-filled pastry; the 44-year-old male patient reveals that he obtained the pastry from Nunzio's Bakery; a 24-year-old female patient reports the following signs/symptoms: nausea, vomiting, and abdominal cramps; the 24-year-old female patient reports that she ate a zeppole from Nunzio's Bakery; a 33-year-old male patient presents, with what he refers to as "extreme diarrhea;" the 33-year-old male patient reports that he ate a zeppole from Nunzio's Bakery; a health care professional contacts a local government agency to report the potential foodborne illness outbreak, and another health care professional contacts CDC INFO at 1-800-CDC-INFO (1-800-232-4636); the group of health care professionals document cases of foodborne illnesses related to zeppoles from Nunzio's Bakery as they present.

*Are there any other patient details that may be relevant to a foodborne illness; if so, what are they?*

### **How are each of the aforementioned patient details relevant to a foodborne illness?**

Each of the previously highlighted patient details may be relevant to the presence of a foodborne illness. The potential relevance of each patient detail may be found below.

A 44-year-old male patient presents to a health care facility - the previous patient detail is relevant to identifying high risk patients.

The 44-year-old male patient reports the following signs/symptoms: nausea, vomiting, and abdominal cramps - the previous patient detail is relevant to identifying patient signs/symptoms.

The 44-year-old male patient reports that he is "slightly dizzy and lightheaded" - the previous patient detail is relevant to the possible presence of dehydration. Health care professionals should note that dehydration is a complication associated with foodborne illness. Health care professionals should note the following signs/symptoms of dehydration: dry mouth, dry throat, dry skin, dizziness, lightheadedness, dark urine, and a decrease in urine production. Health care professionals should also note the following: foodborne illnesses may lead to hemolytic uremic syndrome (HUS); hemolytic uremic

syndrome (HUS) may refer to a syndrome that affects the blood and blood vessels, which may lead to anemia.

The 44-year-old male patient reveals that he ate a zeppole to celebrate St. Joseph's day, and "the next thing" he know he was "vomiting" - the previous patient detail is relevant to identifying the pathogen that potentially led to the foodborne illness.

The 44-year-old male patient reveals that he did not eat or drink anything else "all day," with the exception of "an espresso first thing in the morning" - the previous patient detail is relevant to identifying the pathogen that potentially led to the foodborne illness. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information regarding what the patient ate and/or drank before presenting to a health care facility; asking follow-up questions regarding what a patient ate and/or drank before presenting to a health care facility can help narrow down or identify the pathogen that potentially lead to the foodborne illness.

The 44-year-old male patient reveals that a zeppole is an Italian cream-filled pastry - the previous patient detail is relevant to identifying the pathogen that potentially led to the foodborne illness. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information regarding what the patient ate and/or drank before presenting to a health care facility; if a health care professional is not familiar with a specific food item, he or she should ask patients follow-up questions to obtain relevant information.

The 44-year-old male patient reveals that he obtained the pastry from Nunzio's Bakery - the previous patient detail is relevant to a potential foodborne illness outbreak. When evaluating patients for foodborne illnesses, health care professionals should attempt to obtain information relevant to a foodborne illness outbreak (e.g., the point of origin of a specific food item).

A 24-year-old female patient reports the following signs/symptoms: nausea, vomiting, and abdominal cramps - the previous patient detail is relevant to identifying patient signs/symptoms.

The 24-year-old female patient reports that she ate a zeppole from Nunzio's Bakery - the previous patient detail is relevant to a potential foodborne illness outbreak.

A 33-year-old male patient presents, with what he refers to as "extreme diarrhea" - the previous patient detail is relevant to identifying patient signs/symptoms.

The 33-year-old male patient reports that he ate a zeppole from Nunzio's Bakery - the previous patient detail is relevant to a potential foodborne illness outbreak.

A health care professional contacts a local government agency to report the potential foodborne illness outbreak, and another health care professional contacts CDC INFO at 1-800-CDC-INFO (1-800-232-4636) - the previous patient detail is relevant to a potential foodborne illness outbreak. When there is a potential foodborne illness outbreak, health care professionals should contact local, state, and federal government agencies to report information and/or obtain information about foodborne illness outbreaks (e.g., FDA). Health care professionals can also report information and/or obtain information about foodborne illnesses by contacting CDC INFO at 1-800-CDC-INFO (1-800-232-4636).

The group of health care professionals document cases of foodborne illnesses related to zeppoles from Nunzio's Bakery as they present - the previous patient detail is relevant to a potential foodborne illness outbreak. When there is a potential foodborne illness outbreak, health care professionals should document information that may be relevant to local, state, and federal government agencies, as well as patient care.

*What other ways, if any, are the patient details relevant to a foodborne illness?*

**Are the patients in Case Study 2 suffering from a foodborne illness, if so, what is the foodborne illness?**

Based on the information presented in Case Study 2, it does appear the patients are suffering from a foodborne illness. Based on the information presented in Case Study 2 (e.g., the patients' symptoms include: nausea, vomiting, abdominal cramps, and diarrhea; it seems like a cream-filled pastry lead to the foodborne illness), it appears the patients are suffering from staphylococcal food poisoning. Health care professionals should note the following: staphylococcal food poisoning is caused by *Staphylococcus aureus*, which is a Gram-positive, spherically shaped bacterium; the typical food sources for staphylococcal food poisoning include the following: unrefrigerated meats, improperly refrigerated meats, potato salads, egg salads, and cream pastries.

*How can a health care professional potentially gather additional patient information to help confirm the possible presence of a foodborne illness?*

## Section 2 Summary

Health care professionals should work to identify patients suffering from a foodborne illness. Health care professionals should ask patients questions to obtain relevant patient details that may help with foodborne illness diagnosis, and, ultimately, required care. Finally, health care professionals should contact local, state, and federal government agencies to report information and/or obtain information about foodborne illness outbreaks, when applicable.

## Section 2 Key Concepts

- Patient exams and interviews may reveal vital information required for diagnosis and care.

## Section 2 Key Terms

Medication reconciliation - a process of comparing the medications an individual is taking (or should be taking) with newly ordered medications (Joint Commission, 2023)

Hemolytic uremic syndrome (HUS) - a syndrome that affects the blood and blood vessels, which may lead to anemia

## Section 2 Personal Reflection Question

How can health care professionals effectively identify patients suffering from a foodborne illness?

## Conclusion

Millions of Americans are affected by foodborne illnesses every year. Therefore, health care professionals should work to identify patients potentially suffering from a foodborne illness, especially people at high risk for foodborne illnesses. Finally, health care professionals should contact local, state, and federal government agencies to report information and/or obtain information about foodborne illness outbreaks, when applicable.

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