22.4D: Bacterial Foodborne Diseases

LEARNING OBJECTIVES

• Give examples of bacterial foodborne diseases in humans

Prokaryotes are everywhere. They readily colonize the surface of any type of material. Food is not an exception. Most of the time, prokaryotes colonize food and food-processing equipment in the form of a biofilm. Outbreaks of bacterial infection related to food consumption are common. A foodborne disease (colloquially called “food poisoning”) is an illness resulting from the consumption of pathogenic bacteria, viruses, or other parasites that contaminate food. Although the United States has one of the safest food supplies in the world, the U.S. Centers for Disease Control and Prevention (CDC) has reported that “76 million people get sick, more than 300,000 are hospitalized, and 5,000 Americans die each year from foodborne illness.”

The characteristics of foodborne illnesses have changed over time. In the past, sporadic cases of botulism, the potentially fatal disease produced by a toxin from the anaerobic bacterium *Clostridium botulinum*, were relatively common. Some of the sources for this bacterium were non-acidic canned foods, homemade pickles, and processed meat and sausages. The can, jar, or package created a suitable anaerobic environment where *Clostridium* could grow. However, proper sterilization and canning procedures have reduced the incidence of this disease.

While people may tend to think of foodborne illnesses as associated with animal-based foods, most cases are now linked to produce. There have been serious, produce-related outbreaks associated with raw spinach in the United States and with vegetable sprouts in Germany. These types of outbreaks have become more common. The raw spinach outbreak in 2006 was produced by the bacterium *E. coli* serotype O157:H7. A serotype is a strain of bacteria that carries a set of similar antigens on its cell surface. There are often many different serotypes of a bacterial species. Most *E. coli* are not particularly dangerous to humans, but serotype O157:H7 can cause bloody diarrhea and is potentially fatal.
All types of food can potentially be contaminated with bacteria. Recent outbreaks of *Salmonella* reported by the CDC occurred in foods as diverse as peanut butter, alfalfa sprouts, and eggs. A deadly outbreak in Germany in 2010 was caused by *E. coli* contamination of vegetable sprouts. The strain that caused the outbreak was found to be a new serotype not previously involved in other outbreaks, which indicates that *E. coli* is continuously evolving.

![Figure 1](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/22%3A_Pr…)

**Figure 
): Bacterial illnesses from food**: (a) Vegetable sprouts grown at an organic farm were the cause of an (b) *E. coli* outbreak that killed 32 people and sickened 3,800 in Germany in 2011. The strain responsible, *E. coli* O104:H4, produces Shiga toxin, a substance that inhibits protein synthesis in the host cell. The toxin (c) destroys red blood cells, resulting in bloody diarrhea. Deformed red blood cells clog the capillaries of the kidney, which can lead to kidney failure, as happened to 845 patients in the 2011 outbreak. Kidney failure is usually reversible, but some patients experience kidney problems years later.

### Key Points

- Food and food-processing equipment are usually colonized by biofilms.
- A foodborne disease is an illness resulting from the consumption of pathogenic bacteria, viruses, or other parasites that contaminate animal or plant-based food.
- Proper sterilization techniques and canning procedures have reduced the incidence of botulism.
- *E. coli* outbreaks have become more common as new strains continue to evolve.

### Key Terms

- **serotype**: a group of microorganisms characterized by a specific set of antigens
- **botulism**: poisoning caused by the toxin from *Clostridium botulinum*, a type of anaerobic bacteria that grows in improperly-prepared food

---

**LICENCES AND ATTRIBUTIONS**

**CC LICENSED CONTENT, SHARED PREVIOUSLY**

- Curation and Revision. **Provided by**: Boundless.com. **License**: [CC BY-SA: Attribution-ShareAlike](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/22%3A_Pr…)

**CC LICENSED CONTENT, SPECIFIC ATTRIBUTION**

- OpenStax College, Biology. October 16, 2013. **Provided by**: OpenStax CNX. **Located at**: [http://cnx.org/content/m44607/latest...ol11448/latest](http://cnx.org/content/m44607/latest...ol11448/latest). **License**: [CC BY: Attribution](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/22%3A_Pr…)

- OpenStax College, Biology. October 23, 2013. **Provided by**: OpenStax CNX. **Located at**: [http://cnx.org/content/m44607/latest...ol11448/latest](http://cnx.org/content/m44607/latest...ol11448/latest). **License**: [CC BY: Attribution](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/22%3A_Pr…)


---

https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/22%3A_Pr…

Updated: Fri, 16 Oct 2020 02:08:04 GMT

Powered by

OpenStax College, Bacterial Diseases in Humans. October 16, 2013. Provided by: OpenStax CNX. Located at: http://cnx.org/content/m44607/latest/Figure_22_04_02.jpg. License: CC BY: Attribution

OpenStax College, Bacterial Diseases in Humans. October 16, 2013. Provided by: OpenStax CNX. Located at: http://cnx.org/content/m44607/latest/Figure_22_04_01.jpg. License: CC BY: Attribution

OpenStax College, Bacterial Diseases in Humans. October 16, 2013. Provided by: OpenStax CNX. Located at: http://cnx.org/content/m44607/latest/Figure_22_04_03.jpg. License: CC BY: Attribution


OpenStax College, Bacterial Diseases in Humans. October 16, 2013. Provided by: OpenStax CNX. Located at: http://cnx.org/content/m44607/latest...e_22_04_05.jpg. License: CC BY: Attribution