

BI 10.d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.

Both bacteria (singular: bacterium) and viruses can be pathogens, or agents of disease. However, the two types of pathogens have important differences in their needs. They also cause disease in different ways, and the body responds to them differently as well. In addition, treatments vary for infections caused by bacteria and infections caused by viruses. These differences between bacteria and viruses are summarized in the table.

Bacteria and Viruses as Agents of Infection

Type of Pathogen	What It Is	How It Causes Disease	How the Body Responds	How Infections Are Treated
Virus	Tiny particle containing genetic material	Invades and destroys cells	Interferon production	Antiviral drugs
Bacterium	Single-celled living organism	Breaks down tissues for food or releases toxins	Inflammatory response	Antibiotic drugs

Viruses Viruses are tiny particles that invade and replicate (make copies of themselves) inside living cells. Viruses do not have cells, so they must depend on the cells of living organisms for their needs. A virus attaches to the surface of a cell, inserts its genetic material into the cell, and takes over the cell's structures to produce viral proteins and to replicate. This usually *destroys the infected cell*.

Viruses can infect the cells of nearly every type of organism, including plants, animals, and bacteria. Viruses that infect human cells cause a wide range of diseases. Human diseases caused by viruses include the common cold, influenza, warts, and AIDS.

When viruses enter the human body and infect cells, the infected cells may produce special proteins. The proteins are called interferons, because they "interfere" with the viruses. Interferons do not kill viruses, but they prevent viruses from replicating and infecting other cells. This may slow down and eventually stop the spread of the virus through the body.

Antibiotic drugs have no effect on viruses. However, antiviral drugs have been developed to fight some viruses. The drugs generally prevent viruses from invading and replicating inside cells.

Bacteria Bacteria are microorganisms that lack a cell nucleus. Unlike viruses, bacteria do not need to invade cells in order to replicate. As living cells, bacteria have all the structures they need for reproduction and other vital processes. Instead, bacteria cause disease in other ways—either by breaking down tissues for food or by releasing toxins.

Most bacteria are harmless to humans, but some cause disease. Typically, the diseases caused by bacteria are serious. They include diphtheria, botulism, anthrax, and strep throat.

When bacteria enter the body, the body's first reaction may be the inflammatory response. The inflammatory response is an early, nonspecific reaction to tissue damage caused by injury or infection. As part of the inflammatory response, large white blood cells called phagocytes "eat up" invading bacteria.

Bacterial infections can be treated with antibiotics. Antibiotics are drugs that kill microorganisms such as bacteria without harming the cells of the infected organism. Antibiotics work by interfering with the cell processes of the microorganisms.

Review Questions

- 37. How do viruses cause disease?
 - A by breaking down tissues for food
 - B by invading and destroying cells
 - C by releasing toxins in cells
 - D by interfering with antibiotics
- 38. Cells infected with viruses may produce
 - A interferons.
 - B antibiotics.
 - C phagocytes.
 - D antivirals.
- 39. An example of a human bacterial disease is
 - A AIDS.
 - B warts.
 - C influenza.
 - D strep throat.
- 40. Which statement about antibiotics is true?
 - A Antibiotics do not affect viruses.
 - B Antibiotics do not harm the cells of infected organisms.
 - C Antibiotics kill bacteria.
 - D all of the above

On the back of this sheet, create a Venn diagram illustrating the similarities and differences between bacteria and viruses.