

Viruses and Bacteria • Section Summary

Viruses

Guide for Reading

- How do viruses differ from living things?
- What is the basic structure of a virus?
- How do viruses multiply?

A virus is a tiny, nonliving particle that enters and then reproduces inside a living cell. Biologists consider viruses to be nonliving because viruses are not cells. Viruses do not use energy to grow or to respond to their surroundings.

Although viruses can multiply, they do so differently than organisms. Viruses can only multiply when they are inside a living cell. The organism that a virus enters and multiplies inside is called a host. A host is an organism that provides a source of energy for a virus or another organism. Organisms that live on or in a host and cause harm to the host are called parasites. Most viruses are like parasites because they destroy the cells in which they multiply.

Viruses vary in shape and size. Viruses can be round, or rod-shaped, or shaped like bricks, threads, or bullets. Some viruses, including bacteriophages, have complex, rod-like shapes. A bacteriophage is a virus that infects bacteria. Viruses are much smaller than cells.

Scientists may name a virus after the disease it causes, the organisms they infect, the place where it was first found, or the scientists who first identified it.

All viruses have two basic parts: a protein coat that protects the virus and an inner core made of genetic material. Some viruses are surrounded by an additional membrane envelope. Each virus contains unique proteins on its outer surface. The shape of these proteins allows the virus to attach to, or lock onto, only certain host cells.

After a virus attaches to a host cell, it enters the cell. Once inside a cell, a virus's genetic material takes over many of the cell's functions. It instructs the cell to produce the virus's proteins and genetic material. These proteins and genetic material then assemble into new viruses.

An active virus immediately takes over the cell's functions, and the cell quickly begins to produce the virus's proteins and genetic material. These parts are assembled into new viruses. When it is full of new viruses, the host cell bursts open and releases the new viruses.

When a hidden virus enters a host cell, the virus's genetic material becomes part of the cell's genetic material. The virus's genetic material may stay inactive for a long time. Then, the virus's genetic material suddenly becomes active and takes over the cell's functions and replicates. Once the host cell is full of new viruses, it bursts open to release them.

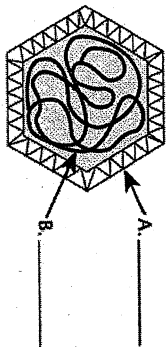
Viruses and Bacteria • Review and Reinforce

Viruses

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Viruses are considered to be nonliving. How are viruses similar to living organisms? How are they different?
2. How are viruses similar to parasites?
3. How do hidden viruses differ from active viruses?
4. In the diagram below, identify the two structural parts of the virus. Explain the function of each part.



Building Vocabulary

Write a definition for each of the following terms on the lines below.

5. virus

6. bacteriophage

7. parasite

8. host

Viruses and Bacteria • Section Summary

Bacteria

Guide for Reading

- How do the cells of bacteria differ from those of eukaryotes?
- What do bacteria need to survive?
- Under what conditions do bacteria thrive and reproduce?
- What positive roles do bacteria play in people's lives?

Bacteria are single-celled organisms. Bacteria are prokaryotes. The genetic material in their cells is not contained in a nucleus. Bacterial cells have one of three basic shapes: spherical, rodlike, or spiral.

Most bacterial cells are surrounded by a rigid cell wall that helps to protect the cell. Inside the cell wall is the cell membrane that controls what materials pass into and out of the cell. Cytoplasm is the gel-like material inside the cell membrane. Inside the cytoplasm are tiny structures called ribosomes that are the chemical factories where proteins are produced. The cell's genetic material is also located in the cytoplasm, and contains the instructions for all the cell's functions. Some bacteria have flagella. A flagellum is a long, whiplike structure that extends from the cell membrane and out through the cell wall. A flagellum helps a cell to move.

All bacteria need certain things to survive. Bacteria must have a source of food and a way of breaking down the food to release its energy. Some bacteria are autotrophs and make their own food. Others are heterotrophs that obtain food by consuming autotrophs or other heterotrophs. The process of breaking down food to release its energy is called **respiration**.

When bacteria have plenty of food, the right temperature, and other suitable conditions, they thrive and reproduce frequently. Bacteria reproduce by binary fission, a process in which one cell divides to form two identical cells. Binary fission is a form of asexual reproduction. Asexual reproduction is a reproductive process that involves only one parent and produces offspring that are identical to the parent. Some bacteria perform a simple form of sexual reproduction called **conjugation**. Sexual reproduction involves two parents who combine their genetic material to produce a new organism that differs from both parents. During conjugation, one bacterium transfers some of its genetic material into another. After the transfer, the cells separate.

Many bacteria can survive harsh conditions by forming endospores. An endospore is a small, rounded, thick-walled, resting cell that forms inside a bacterial cell.

Some bacteria cause diseases and other harmful conditions. However, most bacteria are either harmless or helpful to people. Bacteria are involved in oxygen and food production, environmental recycling and cleanup, and health maintenance and medicine production. Helpful bacteria produce foods such as cheese and pickles. However, some bacteria cause food to spoil. One method to slow down food spoilage is pasteurization, where food is heated to a temperature that is high enough to kill most harmful bacteria without changing the taste of the food. Heterotrophic bacteria in the soil break down materials for reuse. These bacteria are decomposers—organisms that break down large chemicals in dead organisms into small chemicals.

Viruses and Bacteria • Review and Reinforce

Bacteria

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. How are bacterial cells different from the cells of eukaryotes?
2. List four ways that bacteria are helpful to people.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

- _____ 3. cytoplasm
- _____ 4. endospore
- _____ 5. binary fission
- _____ 6. decomposer
- _____ 7. sexual reproduction
- _____ 8. flagellum
- _____ 9. asexual reproduction
- _____ 10. conjugation
- _____ 11. respiration
- _____ 12. ribosome

- a. where two parents combine their genetic material to produce a new organism that differs from both parents
- b. where one bacterium divides to form two identical bacterial cells
- c. a small, thick-walled resting cell that forms inside a bacterial cell
- d. the region inside the cell membrane
- e. organism that breaks down the large chemicals in dead organisms into small chemicals
- f. where one bacterium transfers genetic material into another bacterial cell
- g. the cell's chemical factories where proteins are produced
- h. the process of breaking down food to release energy
- i. whiplike structure that helps a cell to move
- j. where one parent reproduces offspring identical to that parent