"We need real people from the community to get out there and say, ‘You know, I was able to conquer this. I was able to do something about it, and so can you.’"

—Dr. Amelie G. Ramirez, a behavioral research expert and a member of the Susan G. Komen Breast Cancer Foundation’s National Hispanic/Latino Advisory Council, speaking about breast cancer

**TEST YOUR DISEASE IQ**

**True or False?**

1. **Allergies are contagious.**
   
   **FALSE:** Unlike the common cold, you cannot catch allergies from another person. However, the symptoms are quite similar to those of the common cold.

2. **Cardiovascular disease kills more people than cancer each year.**
   
   **TRUE:** Cardiovascular diseases (CVD), such as heart disease and stroke, are the number one and number three leading causes of death in the United States.

3. **Diabetes is an “old person’s” disease.**
   
   **FALSE:** Type II diabetes, which used to be considered an adult disease, now affects many teenagers. A sedentary lifestyle, along with a high-fat diet, are considered the main reasons why teenagers are more at risk for developing diabetes.

**Smoking and Health**

**Research** In 1964, the Surgeon General released the first report on the health consequences of smoking. Since then, other reports have included information about specific groups of people and smoking. Research Surgeon General reports on child and teen smoking, and present the results of your research to the class.
Visit www.glencoe.com to find regularly updated statistics on the flu. Using the information provided, research the answer to this question: How many Americans contracted the flu last year?

Visit www.glencoe.com to use Your Health Checklist, an interactive tool that helps you determine your health status.
What You’ll Learn

1. Explain how the immune system responds when a pathogen enters the body. (p. 485)
2. Discuss ways to develop active and passive immunity. (p. 485)
3. Identify types of pathogens that cause disease, and give examples of the types of diseases caused by the types of pathogens. (p. 487)
4. Discuss ways pathogens are spread. (p. 488)
5. Analyze strategies to prevent infection with communicable diseases. (p. 488)

Why It’s Important

Diseases affect people of all ages, races, and genders. Many of these diseases can be prevented when the facts about these diseases are known.

Key Terms

- lymphocytes
- B cell
- antibody
- helper T cell
- macrophage
- vaccine
- pathogen
- bacteria
- fungi
- protozoa

Avoiding Communicable Diseases

- I will choose behaviors that reduce my risk of infection with communicable diseases.
- I will be aware of immunizations that protect health.

Most teens have a few colds a year. Colds are caused by a virus, one of several pathogens that can cause disease. In this lesson, you will learn about communicable diseases.

Writing About Containing Pathogens

Suppose you are working outdoors in a garden. You come into your home for lunch, and a sandwich is waiting for you. You are hungry and want to eat it immediately. After reading the information on containing pathogens on page 488, write an entry in your health journal about how you could avoid becoming infected with pathogens.
The Immune System

The system that removes harmful organisms from the blood and combats pathogens is the **immune system**. The immune system is composed of body organs, tissues, cells, and chemicals. Unbroken skin acts as a barrier to prevent pathogens from entering the body. Tears, perspiration, saliva, and oils on skin kill many pathogens. Mucus and hairs that line the inside of the nose also trap and destroy pathogens. Other pathogens that are swallowed are destroyed by stomach acids.

**Protection Inside the Body**

**The immune system** White blood cells that help the body fight pathogens are **lymphocytes**. When a pathogen enters the body, lymphocytes multiply in lymph tissue to fight infection. Two types of lymphocytes are B cells and helper T cells. A **B cell** is a white blood cell that produces antibodies. An **antibody** is a special protein that helps fight infection. A **helper T cell** is a white blood cell that signals B cells to produce antibodies.

Soon after a pathogen invades the body, helper T cells send signals to B cells to produce antibodies. B cells enter the lymph nodes and other lymph tissues. Antibodies then travel through the blood to destroy the pathogen. Antibodies can make pathogens ineffective and sensitive to macrophages. A **macrophage** (MA krüh fahzh) is a white blood cell that surrounds and destroys pathogens. Antibodies attach to pathogens and make them easier for macrophages to destroy. Destroyed pathogens enter lymph, are filtered in lymph nodes, and removed by the spleen.

**Immunity** The immune system helps people develop immunity. **Immunity** is defined as the body's resistance to disease-causing agents. Resistance to disease due to the presence of antibodies is called **Active immunity**. For example, after a person recovers from the chicken pox virus, the chicken pox antibody remains in the body and protects him or her from developing chicken pox again.

Active immunity also can result from being given a vaccine. A **vaccine** is a substance containing dead or weakened pathogens that is introduced into the body to give immunity. Vaccines are either given by injection or orally.

Vaccines cause the body to make antibodies for a specific pathogen. If these pathogens enter the body again, the antibodies destroy them. People should be immunized against diphtheria, pertussis (whooping cough), tetanus, measles, mumps, rubella (German measles), polio, hepatitis A, hepatitis B, and chicken pox.

**Passive immunity** is immunity that results from introducing antibodies into a person's bloodstream. The antibodies may be from another person's blood. This type of immunity is short-term and is used when the risk of developing a disease is immediate.
What do a cold, the chicken pox, and rabies have in common? They are all caused by viruses. A virus is a structure that consists of genetic material enclosed in a protein coat. Viruses are not considered to be living organisms because they cannot reproduce independently. Viruses can only reproduce by invading another cell and taking over that cell’s organelles. In the process of viral replication, the host cell is destroyed.

**Diseases caused by viruses** Viruses, such as the Ebola virus, polio virus, and the human immunodeficiency virus (HIV), are responsible for some of the most serious diseases known to humans. Viruses are spread in the same way as bacteria and other pathogens—through the air and water, through handling contaminated objects, and through carriers such as mosquitoes and ticks. Viruses can affect the gastrointestinal systems, the respiratory systems, and the nervous systems of humans and other animals. Antibiotics, which are used to fight bacterial infections, are not effective against viruses.

**History of viruses** Viruses, which are microscopic, were first defined by scientists in the 1930s. Early work on viruses was done using a virus that affects plants, the tobacco mosaic virus. Viruses are grouped together in families and classified based on characteristics, such as the type of genetic material they have (DNA or RNA), the method by which they reproduce, and their shape. Today, much of the research on viruses focuses on trying to develop medications that will be effective against viruses such as HIV and the common cold.

**New viruses** Emerging viruses, those that are new or changing, also are cause for concern in the scientific and medical communities. Diseases, such as AIDS, hantavirus pulmonary syndrome, and severe acute respiratory syndrome (SARS) are examples of diseases caused by viruses that were previously unrecognized until the outbreaks occurred in 1981, 1993, and 2003, respectively.

Sometimes, as in the case of HIV, it takes several years of research to be able to identify and describe an unknown virus. Learning information about a virus’s structure, how it is transmitted, and what body systems it affects can all help in the development of possible vaccines or medications that fight the virus.

Some viruses have been linked to certain types of cancer. There is strong evidence that the hepatitis B virus plays a role in the development of liver cancer. Several viruses that affect the human immune system’s T cells are known to cause leukemia and lymphoma. It is estimated that up to 10 percent of cancers are induced by viruses.

Visit [www.glencoe.com](http://www.glencoe.com) to research more information about viruses.

- What is a prion? What diseases are caused by prions?
- Describe research currently being done in the development of antiviral medications.

Choose one virus and research its history. When was it first identified? What disease does it cause in humans, and what are the symptoms? In what area of the world is it most prevalent? Write a report about the virus and present it to your class.
A germ that causes disease is a **pathogen**. An illness caused by pathogens that can be spread from one living thing to another is a **communicable disease**, or **infectious disease**. Some pathogens are spread more readily than others. There are many types of pathogens that cause disease.

## What to Know About Types of Pathogens

### Bacteria

There are many types of **bacteria**, or single-celled microorganisms. Most bacteria are beneficial, but some are known to cause disease. Bacteria cause disease by releasing **toxins**, or poisonous substances. Some diseases caused by bacteria are strep throat, tuberculosis, tetanus, diphtheria, Lyme disease, syphilis, and gonorrhea. **Rickettsia** (rih KET see uh) are intracellular parasites that are classified as bacteria. Two diseases caused by rickettsia are typhus and Rocky Mountain spotted fever.

### Fungi

Another category of pathogen includes single- or multi-celled parasitic organisms called fungi. **Fungi** obtain their food from organic materials, such as plant, animal, or human tissue. Fungi can live on the skin, mucous membranes, and lungs and cause disease in the process. Some diseases caused by fungi are athlete’s foot, ringworm, jock itch, nail infections, and thrush.

### Viruses

One of the smallest known pathogens is a **virus**. When a virus enters a cell, it takes over the cell and causes it to make more viruses. Newly produced viruses are released and take over other cells. In this way, viruses spread rapidly. Some viral diseases are the common cold, mumps, hepatitis, mononucleosis, chicken pox, and influenza.

### Protozoa

Tiny, single-celled organisms that produce toxins that cause disease are called **protozoa**. Malaria, African sleeping sickness, and dysentery are diseases caused by protozoa. A **helminth** is a parasitic worm. People can become infected with helminthes when they eat undercooked pork or fish or practice poor hygiene. Some helminthes, such as tapeworms, pinworms, and hookworms, can infect the human digestive tract. Other helminthes can infect muscle tissue and blood.

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**Reading Review**

1. How do vaccines prevent disease?
2. What are the different types of pathogens that cause diseases?
Practicing Healthful Behaviors: Avoiding Spreading Pathogens

Follow the tips below to avoid spreading pathogens to keep yourself and your community healthy.

How pathogens are spread Pathogens may be spread from person to person through direct contact, shaking hands, intimate kissing, sexual intercourse, receiving a transfusion of the person’s blood, touching ulcers or sores, or handling bodily fluids, such as blood or urine. They may be spread through the air by coughing or sneezing. Contact with contaminated objects can spread pathogens. This includes sharing a needle with an infected person to inject drugs or get a tattoo and using objects such as combs, toothbrushes, razors, or eating utensils touched by an infected person. Handling or being bitten by an infected insect or animal also spreads pathogens. Other ways pathogens are spread include contact with contaminated food and water by drinking infected water, eating infected food, undercooking meats and other foods, improperly canning or preparing foods, and not washing hands after using the restroom.

1 If you are going to make a health behavior contract, write your name and the date. Writing the date will help you keep track of your start date.

2 Write the healthful behaviors you want to practice as health goals. Always wash your hands for 10–20 seconds with soap and water after you use the restroom; blow your nose; handle raw meat, poultry, or fish; take out the garbage; or tend to someone who is sick.

3 Only drink water that you know is safe, such as tap water and bottled water. This is especially important while traveling or out in nature. Get appropriate vaccinations.

4 Write specific statements that describe how this healthful behavior reduces health risks. Avoid crowded places, such as work, school, or sports events, if you are not feeling well and encourage others who are ill to do the same. Cover your mouth when you cough or sneeze.

5 Keep hot foods hot and cold foods cold to avoid bacteria growth, and wash fruits and vegetables before serving them.

6 Do not eat raw eggs, even in cookie dough.

7 Make a specific plan for recording your progress and complete an evaluation of how the plan helped you accomplish the health goal. The evaluation will help you determine if you need to alter your plan to fully meet your health goal.

Make the Connection
Respiratory Diseases
For more information on respiratory diseases, see page 491 in Lesson 45.

Drinking water that you know is safe will help keep you healthy.
Key Terms Review
Complete these fill-in-the-blank statements with the lesson Key Terms on the left. Do not write in this book.

1. A special protein in the body that helps fight infection is a(n) _____.
2. Single- or multi-celled parasites are called _____.
3. The general term for a germ that causes disease is a(n) _____.
4. A white blood cell that produces antibodies is a(n) _____.
5. A white blood cell that helps the body fight pathogens is a(n) _____.
6. _____ are single-celled organisms that produce toxins.
7. Single-celled microorganisms, most of which are beneficial, are _____.
8. A(n) _____ is made up of dead or weakened viruses injected into the body.
9. A white blood cell that signals B cells to produce antibodies is a(n) _____.
10. A white blood cell that surrounds and destroys pathogens is a(n) _____.

Recalling the Facts
11. How is the risk of catching a cold reduced when someone covers his or her mouth when coughing?
12. Why are viruses so hard to control?
13. Why is cooking food thoroughly a good way to reduce the risk of disease caused by eating certain foods?
14. How can a person become ill just by shaking another person’s hand?
15. Why is sharing a needle to inject drugs or get a tattoo a risk factor for HIV infection?
16. Why can perspiration be helpful in preventing disease?
17. Why is the spleen an important part of the immune system?
18. How does the immune system fight infection?

Critical Thinking
19. What can happen to a person who has a low helper T cell count?
20. Analyze how strategies can be used in different settings to prevent the spread of disease.
21. If a person had a raised white blood cell count, what would that signify? Explain your answer.
22. When might passive immunity occur naturally?

Real-Life Applications
23. Why do you think diseases spread so quickly in developing countries?
24. Why might drinking water in another country make you sick, but not make the people who live there sick?
25. Why do you think antibiotics are not effective in fighting viruses?
26. Why do you think some vaccinations are required for children to begin school?

Activities

Responsible Decision Making
27. Inform Suppose you have a cold or the flu. Your friend had planned to come to your home to study with you. You really need her help. What should you do? Refer to the Responsible Decision-Making Model on page 61 to review the steps involved in making responsible decisions.

Sharpen Your Life Skills
28. Advocate for Health Prepare an advertisement for a TV show in which you promote reducing the risk of the flu spreading. Describe what students in your school can do to reduce the risk. Analyze how these strategies can be effective. Show the advertisement to your classmates.