

## Immune System

## Key Words

|                               |  |
|-------------------------------|--|
| <b>pathogens:</b>             | substances that cause disease  |
| <b>inflammatory response:</b> | process in which special white blood cells move into the tissue where the pathogen lies and destroy the invading pathogen. |
| <b>antigens:</b>              | proteins or chemicals that are foreign to the body   |
| <b>antibodies:</b>            | proteins produced by the body to fight off specific pathogens  |
| <b>T-cells:</b>               | special white blood cells that fight off specific pathogens  |

## KEY IDEAS

The immune system protects the body from disease. The system uses both nonspecific and specific defenses for destroying disease-causing substances. If the immune system does not work well, the body is not protected.

Have you ever canned vegetables? If so, you probably followed a very specific set of directions to ensure that your vegetables did not contain bacteria that cause disease. Some of the steps you followed, such as boiling the container, kill bacteria. The human body also has ways of killing these disease-causing organisms.

Right now, pathogens surround your body. **Pathogens** (PATH-uh-juhn-z) are substances that cause disease. Your body works to fight off these pathogens. The constant struggle to protect the body from disease is the job of the immune system.

**Nonspecific Defenses.** The immune system consists of both nonspecific and specific defenses. Nonspecific defenses are not directed at a particular type of pathogen. They guard against all disease-causing substances. Nonspecific defenses are the first to protect you from disease-causing substances that enter your body.

The skin is part of the first line of nonspecific defenses. Very few pathogens can get through this barrier. Natural openings to the body, such as the mouth and nose, contain other nonspecific defenses. Mucus and hairs that line the inside of your nose trap pathogens. This keeps the pathogens from moving into the body.

Cilia and mucus in other parts of the respiratory system also trap pathogens. Recall that cilia are tiny hairs.

Digestive juices in the stomach break apart pathogens that enter the digestive system. Body secretions, such as tears, saliva, and sweat, also contain enzymes that break down pathogens.

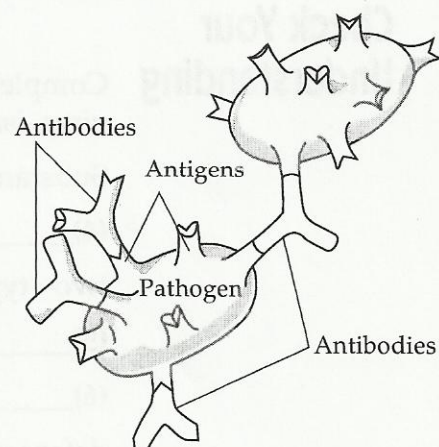
**Inflammatory Response.** Despite these defenses, pathogens do get into the body. When this occurs, the body's second line of nonspecific defenses attacks the pathogen. This type of defense is called the inflammatory response. The **inflammatory response** (in-FLAM-uh-toh-ree ree-SPAHNS) is a process in which special white blood cells move from the blood into the tissue where the pathogen lies. The white blood cells then surround and destroy the pathogen. This causes swelling, or inflammation, in the area of the attack.

- ✓ 1. List five nonspecific defenses that help protect the body from pathogens. \_\_\_\_\_

**Antigens and Antibodies.** Sometimes, a pathogen is able to survive both the first and second line of nonspecific defenses. If this occurs, chemicals on the surface of the pathogen then alert the immune system to begin a specific defense. A specific defense is a response of the immune system to a specific pathogen. The surface of a pathogen has chemicals that the body recognizes as foreign. These foreign chemicals are called **antigens** (AN-tuh-juh-nz). The body reacts to the presence of antigens by producing antibodies. **Antibodies** (AN-tih-bahd-eez) are special proteins that fight off pathogens.

One pathogen can have a number of different antigens on its surface. Each kind of antibody works against only one kind of antigen. The body recognizes the antigen and produces the proper antibody. Sites on the antibody are shaped to fit together with sites on a certain antigen. As Fig. 48-1 shows, the antibodies bond with the antigens. Once the antibodies bond with the antigen, they can help destroy the pathogen.

Fig. 48-1



**T-cells.** The immune system fights some pathogens with another specific defense called T-cells. **T-cells** (TEE-sehlz) are special white blood cells. Some T-cells directly attack the cells of pathogens. The T-cells transfer proteins directly into the cell membrane of the pathogen. This causes the pathogen cell to burst and die. Other T-cells search for and identify pathogens. The T-cells then alert the immune system, which sends antibodies to attack the pathogen. T-cells also help control the immune system so that the system responds only when necessary.

**AIDS.** AIDS is a disease in which the immune system cannot protect the body from infection. A virus, called HIV, causes this deadly disease. HIV attacks the immune system. Once it enters the body, HIV virus destroys

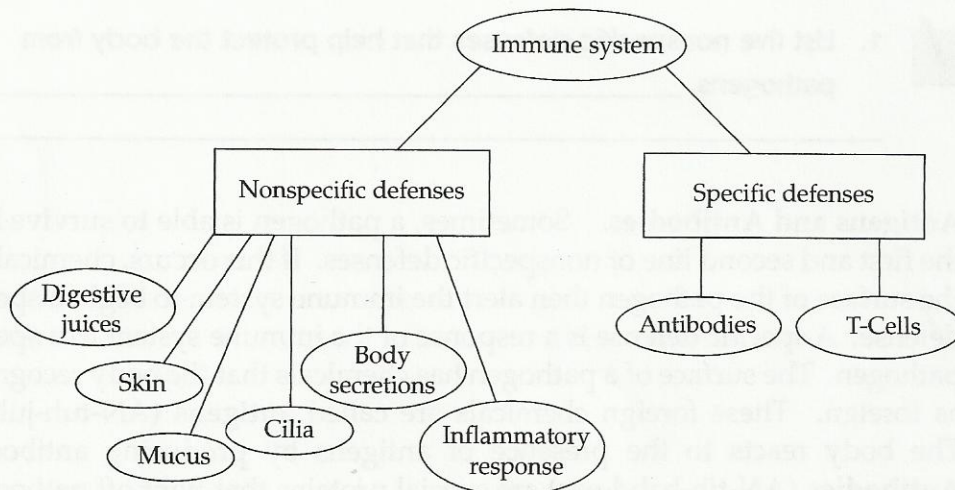
white blood cells that identify antigens, produce antibodies, or destroy invading antigens. As the virus takes over the cells of the immune system, the infected person is no longer able to fight disease. Diseases that the body normally can fight off become deadly.

✓ 2. What causes AIDS? \_\_\_\_\_

**TAKE  
ANOTHER  
LOOK**

Fig. 48-2 summarizes the relationship among the nonspecific and specific defenses of the immune system.

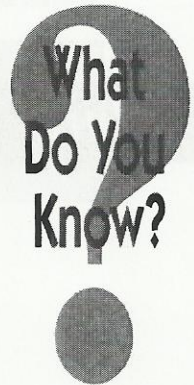
Fig. 48-2



**Check Your  
Understanding**

Complete the paragraph with the following terms: *antibodies, antigens, HIV virus, immune system, nonspecific, pathogens, skin, specific.*

Substances that cause disease are called (3)\_\_\_\_\_. The (4)\_\_\_\_\_ protects the body from these substances. There are two types of defense mechanisms that work against pathogens. (5)\_\_\_\_\_ defenses guard against all types of pathogens. The (6)\_\_\_\_\_ belongs to this line of defense. (7)\_\_\_\_\_ defenses attack certain types of pathogens. This reaction is triggered when the body detects a foreign chemical or (8)\_\_\_\_\_. The immune system reacts by producing special proteins called (9)\_\_\_\_\_. The antibodies bond with the antigens to destroy the pathogen.



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10. What is the difference between the nonspecific defenses and specific defenses of the immune system? \_\_\_\_\_

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11. Why are tears considered to be a nonspecific mechanism of the immune system? \_\_\_\_\_

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12. What is the inflammatory response? \_\_\_\_\_

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13. How do T-cells help fight disease? \_\_\_\_\_

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14. What effect does HIV have on the immune system? \_\_\_\_\_

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15. Why is a common disease, such as a cold, extremely dangerous for a person with AIDS? \_\_\_\_\_

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