Contact with animals or insects

Animals and insects can spread pathogens. For example, animals that carry the rabies virus can infect other animals and humans if they bite them. A deer tick’s bite can spread the virus that causes Lyme disease. Mosquitoes infected with the West Nile virus can spread that virus to birds, horses, and humans.

Reading Check
Explain What are six ways that communicable diseases can be spread?

Mosquitoes can infect humans with the West Nile virus. Controlling mosquito populations is one way to help control the spread of the West Nile virus. What other ways can communities help prevent the spread of diseases spread by animals?

Lesson 1 Review

After You Read
Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. Vocabulary Define communicable disease and pathogen. Write a sentence using both terms.
2. Identify What is an infection?
3. Give Examples What are three kinds of pathogens? Give an example of a disease caused by each kind.
4. Explain Why is it important to clean kitchen cutting boards carefully?

Thinking Critically
5. Analyze How does keeping insect populations down help keep people healthy?
6. Apply Aaron wants a drink of water. He finds a plastic cup on the table but does not know if it has been used or not. Should Aaron use the cup? Explain your answer.

Applying Health Skills

7. Goal Setting List three ways that you can prevent the spread of pathogens. Use the goal-setting steps to create a plan, and write a paragraph describing the results.

Keeping Pathogens Out

You can’t escape pathogens; they are everywhere! Pathogens are in the air you breathe, the water you drink, and on every surface you touch. You can pick them up on your skin when you come in contact with a person who has an infection. You can even catch them from insects. And yet, there is nothing to be afraid of. After all, you aren’t sick all of the time, are you? This is because your body protects you. It can block, trap, or break down most pathogens before they make you sick. Your body uses five major barriers to block pathogens. These barriers are shown in Figure 13.2. They are: tears, saliva, skin, mucous membranes, and stomach acid.

These five barriers are your body’s first line of defense. If a pathogen gets past the barriers, your body’s immune system goes to work. Your immune (ih-MYOON) system is a combination of body defenses made up of the cells, tissues, and organs that fight pathogens in the body. Your immune system has two responses: the nonspecific response and the specific response.

Reading Check
List What are the five barriers that keep pathogens out of your body?
The Immune System’s Nonspecific Response

When you get a splinter in your finger, dirt and pathogens on the splinter also enter your system. Your body responds with a nonspecific immune response. This is called nonspecific because it is the same no matter what foreign matter enters the body.

You may have noticed that the skin around a splinter soon becomes swollen and red. This is known as inflammation. **Inflammation** is the body’s response to injury or disease, resulting in a condition of swelling, pain, heat, and redness.

Why does the area become inflamed? After the splinter breaks the skin, circulation to the area slows down. Fluids trapped in the area leak into the surrounding tissues. White blood cells called phagocytes (FAY-uhh-sytes) surround the pathogens and destroy them. **Figure 13.3** shows how a phagocyte works.

Your body has other nonspecific immune responses as well. When you have an infection, the body begins producing a protein called interferon (in-TER-ahn). Interferon boosts the body’s immune system to help stop viruses from multiplying. A fever is another nonspecific immune response. When your body temperature rises, it’s harder for pathogens to reproduce.

**Reading Check** Explain How does your immune system react when a splinter gets under your skin?
The Immune System's Specific Response

When you get a splinter in your finger, dirt and pathogens on the splinter also enter your system. Your body responds with a nonspecific immune response. This is called nonspecific because it is the same no matter what foreign matter enters the body.

You may have noticed that the skin around a splinter soon becomes swollen and red. This is known as inflammation. Inflammation is the body's response to injury or disease, resulting in a condition of swelling, pain, heat, and redness.

Why does the area become inflamed? After the splinter breaks the skin, circulation to the area slows down. Fluids trapped in the area leak into the surrounding tissues. White blood cells called phagocytes (FAH-guh-sytz) surround the pathogens and destroy them. Figure 13.3 shows how a phagocyte works.

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Reading Check

Explain how does your immune system react when a splinter gets under your skin?

The Lymphatic System

The lymphatic system is a secondary circulatory system that helps the body fight pathogens and maintains its fluid balance. The fluid circulating in the lymphatic system is called lymph (LIMF). Macrophages (MA-kruh-fay-juhs) are also found in the lymph. Like phagocytes, macrophages surround and destroy foreign substances in the body. After they have destroyed the foreign substance, they help the lymphocytes identify it. Lymphocytes (LIM-fuh-sytz) are special white blood cells in the blood and lymphatic system.

There are three main kinds of lymphocytes: B cells, T cells, and NK cells. B cells and T cells are named for where the body makes them. B cells form in the bone marrow, and T cells form in the thymus gland. NK stands for "natural killer" cells. NK cells attack cancers and viruses.
Antigens and Antibodies

All three types of lymphocytes are activated when the body recognizes a part of a pathogen known as an antigen. Antigens (AN·ti·genz) are substances that send the immune system into action. For example, substances on the surface of a bacterium can be antigens. Blood cells of a different blood type than your own have different antigens on their surfaces.

Your body reacts to antigens by making more B cells and T cells. Some of the B cells make antibodies. Antibodies are specific proteins that attach to antigens, keeping them from harming the body. B cells produce specific antibodies to fight a particular type of antigen. Some of the new B cells and T cells don't react to the first encounter with a pathogen. They wait to react if the same kind of pathogen invades the body again. These cells are called memory B cells and memory T cells. A complete explanation of the immune response is found in Figure 13.4.
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Immunity

Immunity is the ability to resist the pathogens that cause a particular disease. Healthy mothers pass immunity to their babies during pregnancy and through breastfeeding after birth. These immunities last for a few months. At that time, the baby’s immune system can begin fighting pathogens on its own.

Your body also builds immunity when it responds to pathogens and when you get certain diseases. When your body encounters an antigen, it produces memory B cells and T cells. Scientists learned many years ago how to help the immune system prepare memory cells for specific diseases without making a person sick. A vaccine (vak-SEEN) is a preparation of dead or weakened pathogens that is introduced into the body to cause an immune response. This process is called immunization.

Immunization works because dead or weakened pathogens have the same antigens as live or active pathogens. However, they can’t make you sick. Your immune system “learns” what a harmless pathogen looks like. It creates memory cells in response to the vaccine. If your body should meet the harmful version of the pathogen, the memory cells attack it. There are vaccines for many diseases, such as polio, measles, chicken pox, and tetanus.

Reading Check
Explain How do babies fight pathogens before they can respond to pathogens on their own?

Lesson 2 Review

After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. Vocabulary Define immune system. Name three kinds of blood cells that are part of the immune system.
2. Restate What is immunity?
3. Describe Briefly explain the steps of the immune system’s specific response to infection.
4. Apply How can a fever help fight infection?

Thinking Critically

5. Explain How are antigens and antibodies like a lock and key?
6. Analyze Why is stomach acid considered a barrier to foreign objects?

Applying Health Skills

7. Accessing Information Research the two kinds of polio vaccines. Find out who developed each kind, when each became available, and how they differ.