

Advisement Teacher & Room # _____

**Biology
Tutorial
#20**

Student Name _____ Tutor: _____

Biology Teacher's Name _____ Period _____

CA State Standard 10a: Students know the role of the skin in providing nonspecific defenses against infection. 10b: Students know the role of antibodies in the body's response to infection. 10c: Students know how vaccination protects an individual from infectious diseases.

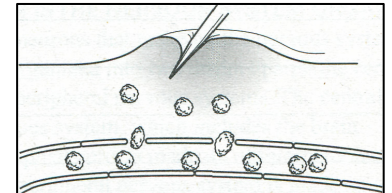
WHAT IS THE SKIN'S ROLE IN FIGHTING INFECTION?

The skin is the first line of defense against diseases because it prevents pathogens from entering the body. Skin physically blocks pathogens. Also, the pores of the skin secrete oil and sweat to create an environment in which most pathogens cannot survive.

NONSPECIFIC DEFENSES

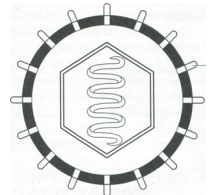
Fever and inflammation are two types of nonspecific defenses. In **fever**, your body temperature increases, causing your white blood cells to mature more quickly.

Inflammation helps your white blood cells get to the site of an infection. A type of white blood cell called mast cells release histamines that trigger inflammation. The chemicals cause blood vessels to become leaky. This allows white blood cells to squeeze out of the circulatory system and toward the site of an infection. The diagram shows an inflammatory response when skin is punctured.



SPECIFIC DEFENSES

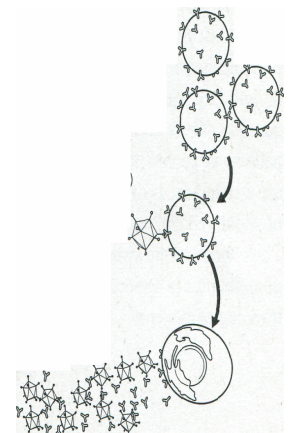
Antigens are proteins on the surface of cells that allow other cells to identify them. For example, viruses have antigens that are different from the proteins in the human body. The body recognizes these proteins as being different and tries to get rid of them. The virus to the right has proteins that cover most of its surface.



Antibodies are proteins made by the body's immune system in response to the antigens on invading pathogens, or disease-causing particles. There are hundreds of kinds of pathogens, each with a specific antigen. There are also hundreds of kinds of antibodies, each of which recognizes only one specific antigen. Thus, the immune system's production of antibodies is a specific defense against invading pathogens.

When pathogens invade the body, the immune system responds in two main ways. In one type of response, cells of the immune system, called **B cells**, produce **antibodies** that destroy invading viruses or bacteria directly. Antibodies are proteins that destroy pathogens by binding to them, causing them to clump together, or by destroying the cell membrane. In the second response, other cells, called **T cells**, bind to body cells that have been infected and cause them to burst.

When a pathogen invades an organism and the organism's immune system responds so quickly that it does not get sick, the organism is said to have immunity against the disease. Organisms get immunity by having memory cells. The body produces memory cells when it fights a pathogen the first time. **Memory cells** are specialized T and B cells that "remember" specific antigens. As a result, they can recognize and destroy invaders before they have a chance to multiply and make an organism feel sick. In this way, the immune response provides immunity to specific pathogens.



VACCINATIONS

Vaccines are made using the same pathogens that they are supposed to protect against. Vaccines contain weakened viruses, antigens, or toxins that bacteria produce. Vaccines stimulate the immune system to make memory cells and produce acquired immunity in the person receiving the vaccine. **Acquired immunity** means that a person cannot get sick twice from the same pathogen. This is because the immune system contains **memory cells** that "remember" that pathogen and act quickly to destroy it. People receiving vaccines do not become sick because the weakened or killed pathogens cannot reproduce or attack cells.

ANSWER THE FOLLOWING QUESTIONS:

1. Which of the following is an example of a role the skin plays in defense against infection?
 - A) It maintains proper body temperature.
 - B) It provides a physical barrier against pathogens.
 - C) It produces a form of vitamin D used by the body.
 - D) It gathers sensory information about the environment.
2. When you get a scrape, white blood cells squeeze out of capillaries and move toward the site of the scrape. How is this response beneficial?
 - A) Platelets form clots to seal the wound.
 - B) Histamines fight infection by secreting acids.
 - C) White blood cells can reach the site and kill pathogens.
 - D) A scab forms while tissue is repaired.
3. If a virus that causes a cold enters the body, antibodies are produced in response. Which immune system cells produce antibodies?
 - A) antigens
 - B) B cells
 - C) phagocytes
 - D) receptor cells
4. Which statement **best** describes the role of antibodies in the immune system?
 - A) They inactivate pathogens, stopping the illness before a person becomes very sick.
 - B) They engulf pathogens, destroying them.
 - C) They prevent infection, keeping pathogens out of the body.
 - D) They release phagocytes, causing pathogens to clump.
5. Antibodies are produced when the immune system detects pathogens. Antibodies are
 - A) proteins.
 - B) carbohydrates.
 - C) lipids.
 - D) nucleic acids.
6. Vaccines are beneficial because they prevent
 - A) antibodies.
 - B) infection.
 - C) pathogens.
 - D) illness.
7. When a patient receives a **vaccine** against pneumonia, the patient's immune system produces memory cells. How do memory cells prevent illness?
 - A) They weaken the pneumonia pathogens.
 - B) They kill the pneumonia pathogens from the vaccine.
 - C) They produce antibodies quickly the next time pneumonia pathogens invade.
 - D) They differentiate into B cells that attack the pathogens.
8. A person who gets measles is immune to the disease after he recovers. What type of immunity keeps a person from getting sick from measles more than once?
 - A) passive immunity
 - B) acquired immunity
 - C) B cell immunity
 - D) memory cell immunity
9. What is a nonspecific defense? Give an example:
10. Explain the difference between an antigen and an antibody:
11. What is contained in a vaccine that triggers an immune response?