

Immune System and Diseases

Nonspecific Defenses: True or False

Write true if the statement is true or false if the statement is false.





- _____ 1. Pathogens are physically forced out of the respiratory tract when a person coughs.
- _____ 2. In a healthy human, the skin's surface contains no bacteria.
- _____ 3. Pathogen is a technical term for germ.
- _____ 4. All immune system responses are specific; there are no nonspecific defenses.
- _____ 5. The common cold is caused by a bacterium.
- _____ 6. Strep throat is caused by a virus.
- _____ 7. Athlete's foot is caused by a fungus.
- _____ 8. Tuberculosis is caused by a bacterium.
- _____ 9. Cold sores are caused by a fungus.
- _____ 10. Some mushrooms contain chemicals harmful to humans.
- _____ 11. Mucus made by the respiratory system is one kind of immune system defense.
- _____ 12. Cilia move pathogens into the bloodstream.
- _____ 13. The main function of red blood cells is to make antibodies.
- _____ 14. Histamines reduce inflammation.
- _____ 15. Some types of white blood cells secrete histamines.

Critical Reading

Read this passage from the lesson and answer the following questions.

First Line of Defense

The immune system has three lines of defense. The first line of defense includes a variety of barriers against pathogens that keep most pathogens out of the body. Pathogens are disease-causing agents, such as bacteria and viruses. Defenses in the first line are the same regardless of the type of pathogen. This is why they are called nonspecific defenses. Several types of pathogens that are common causes of human disease can be seen in the Figure below.

| Type of pathogen | | Description | Human Disease caused by pathogens of that type |
|------------------------------|--|--|--|
| Bacteria Escherichia coli |  | Single - celled organisms without a nucleus | Strep throat, staph infections, tuberculosis, food poisoning, tetanus, pneumonia, syphilis |
| Viruses Herpes simplex |  | Non living particles that reproduce by taking over living cells | Common cold, flu, genital herpes, cold sores, measles, AIDS, genital warts, chicken pox, small pox |
| Fungi Death Cap mushroom |  | Simple organisms, including mushrooms and yeasts, that grow as single cells or thread like filaments | Ringworm, athlete's foot, tineas, candidiasis, histoplasmosis, mushroom poisoning |
| Giardia Lamblia |  | Single celled organism with a nucleus | Malaria, "traveller's diarrhea" giardiasis, typhoid fever, typhus, "sleeping sickness" |

Mechanical Barriers

Mechanical barriers physically block pathogens from entering the body. The skin is the most important mechanical barrier. In fact, it is the single most important defense of the body against pathogens. It forms a physical barrier between the body and the outside world. The outer layer of the skin is a tough, nearly water-proof coating that is very difficult for pathogens to penetrate.

At body openings, such as the mouth and nose, the body has a different mechanical barrier. Instead of skin, mucous membranes line these and other organs that are exposed to the outside environment. They include the organs of the respiratory, gastrointestinal, and urinary tracts. Mucous membranes secrete mucus, a slimy substance that coats the membranes and traps pathogens. Mucous membranes also have cilia, which are tiny projections that have wavelike motions. The movements of cilia sweep mucus and trapped pathogens toward body openings to be removed from the body.

Pathogens are removed from the respiratory tract when you sneeze or cough. In addition, tears wash pathogens from the eyes, and urine flushes pathogens out of the urinary tract.

Chemical Barriers

Chemical barriers are proteins that destroy pathogens at the body's surface. The skin and mucous membranes secrete proteins that kill many of the pathogens with which they come into contact. For example, enzymes called lysozymes—which are found in sweat, mucus, tears, and saliva—kill pathogens by breaking open their cell walls. Urine and vaginal

secretions are too acidic for many pathogens, and semen contains zinc, which most pathogens cannot tolerate. Hydrochloric acid secreted by mucous membranes lining the stomach kills pathogens that enter the stomach in food or water.

Biological Barriers

Biological barriers involve living organisms that compete with pathogens. Human skin is covered by millions of bacteria. Millions more colonize the gastrointestinal, urinary, and genital tracts. Most of these bacteria are helpful or at least not harmful. They are important in defense because they help prevent harmful bacteria from becoming established in or on the body. They do this by competing with harmful bacterial for food and space. Helpful bacteria may also change pH or other factors and make conditions less suitable for harmful bacteria.

Questions

1. Name and briefly describe the immune system's first line of defense.
2. How can the skin be considered part of the immune system?
3. What are mucous membranes? Where are they found?
4. Are all bacteria that live in the human body harmful? Why or why not?
5. What is the purpose of the cilia of the cells that line the respiratory lining?

Immune Response: True or False

Write true if the statement is true or false if the statement is false.

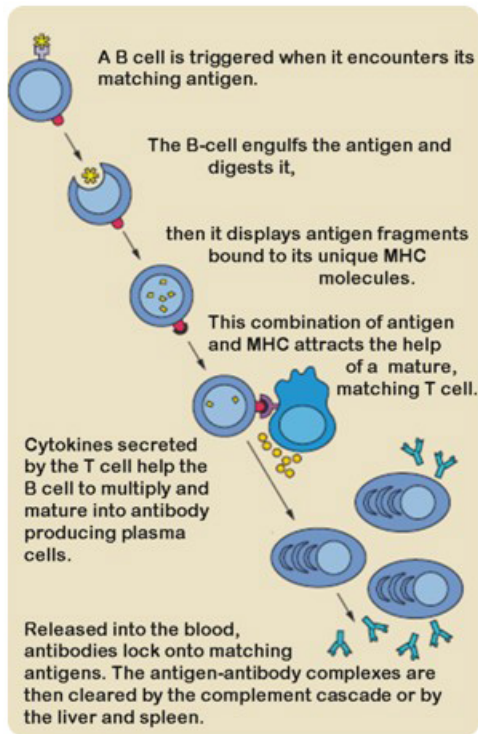
- ____ 1. The third line of defense is nonspecific.
- ____ 2. The lymphatic system is not part of the immune system.
- ____ 3. The lymphatic system transports fatty acids out of the bloodstream.
- ____ 4. The lymphatic system produces white blood cells.
- ____ 5. Another name for white blood cell is leukocyte.
- ____ 6. The red bone marrow is part of the lymphatic system.
- ____ 7. T cells mature in the thymus.
- ____ 8. The spleen makes new red blood cells.
- ____ 9. Humans cannot survive without tonsils.
- ____ 10. Lymph is pumped through the lymphatic vessels by the lymphatic pumping organ.
- ____ 11. B cells mature in the thymus.
- ____ 12. A major function of the humoral immune system is to destroy proteins that are nonself.
- ____ 13. Both T cells and B cells have receptors that bind specifically to a particular antigen.
- ____ 14. Helper T cell cytokines stimulate the development of B cells into mature antibody-producing cells.
- ____ 15. The base of a Y-shaped antibody is the part of the protein that binds specifically to an antigen.

Critical Reading

Read this passage from the lesson and answer the questions that follow.

B Cell Activation

Naïve B cells are activated by an antigen in the sequence of events shown in Figure below. A B cell encounters its matching antigen and engulfs it. The B cell then displays fragments of the antigen on its surface. This attracts a helper T cell (which you will read about below). The helper T cell binds to the B cell at the antigen site and releases cytokines. Cytokines are chemical signals used to communicate between cells. Cytokines from the helper T cell stimulate the B cell to develop into plasma cells or memory cells.



|author=Courtesy of the National Institutes of Health and DO11.10 |title= |license=Public Domain |url=http://en.wikipedia.org/wiki/File:B_cell_activation.png |date= |other=

Questions

1. What is the first step in the activation of a naïve B cell?
2. What is the second step in the activation process?
3. Define antigen display as illustrated in the above figure.
4. Describe the basis of the T cell binding to the B cell in the above figure.
5. What stimulates the maturation of B cells? What do mature B cells produce?

Immune System Diseases:

True or False: *Write true if the statement is true or false if the statement is false.*

- _____ 1. Inflammation of the skin can result from a bee sting.
- _____ 2. An allergen is any antigen that causes an allergic reaction in a sensitive person.
- _____ 3. A person is either allergic to many antigens, or to none.
- _____ 4. All allergies are severe.
- _____ 5. Histamines stimulate inflammation.
- _____ 6. One symptom of an allergy can be itchy eyes.
- _____ 7. Anaphylaxis is the most severe response to an allergen, and is potentially fatal.
- _____ 8. An antidote to anaphylaxis is immediate injection of epinephrine.
- _____ 9. HIV is an example of an autoimmune disease.
- _____ 10. Multiple sclerosis is an example of an autoimmune disease.
- _____ 11. Joint inflammation is a typical symptom of both Type I diabetes and multiple sclerosis.
- _____ 12. Congenital immunodeficiency is usually caused by a mutation.
- _____ 13. The absence of a thymus (thymic aplasia) results from a genetic defect.
- _____ 14. People who have received an organ transplant often are treated with drugs that suppress their immune system.
- _____ 15. People who have AIDS are susceptible to certain types of pathogens that don't often infect healthy people.

Critical Reading

Read this passage and answer the questions that follow.

Contact with Poison Ivy: A Classic Example of a Delayed Hypersensitivity Response



Have you every heard the saying “Leaves of three, let them be?” That admonition refers to poison ivy. Poison Ivy grows in the 48 contiguous states of the United States. Depending upon the particular variety and its environment, poison ivy can be a fuzzy, climbing vine, a short, trailside plant, or shrub-like. Leaves are arranged in groups of three. The exact shape and color of the leaves can vary (they can be green, green with a reddish tinge, shiny, or not). The variation in appearance is probably one reason why so many people brush against poison ivy without knowing. They then suffer from an intensely itchy red rash that results from contact with poison ivy’s leaves or stems. Such a rash is a classic example of a delayed hypersensitivity response. This response is also a form of allergic contact dermatitis.

You may be wondering, what is it in poison ivy that causes the rash? Is poison ivy contagious? The answer to the first question is: urushiol, an oil that the plant makes, causes the angry red rash. People get the rash when they touch or brush up against part of the plant, and some of the urushiol gets transferred to their skin. Urushiol can also be transferred to garden tools, clothes, and pet fur. It can be inactivated with lots of soap and water. However, if you touch poison ivy you must wash it off immediately, since the hypersensitivity response begins in as little as a few minutes after exposure.

Now let’s answer to the second question: is poison ivy contagious? If you touch someone who still has urushiol on their skin or clothes, or a pet who has urushiol on its fur, then yes, you can contract the poison ivy rash this way. However, if you touch a poison ivy rash on someone else, you will not get a rash.

References:

<http://www.cdc.gov/niosh/topics/plants/><http://www.cdc.gov/niosh/topics/plants/>

<http://www.ipm.uconn.edu/IPM/homegrnd/htms/poivy2.htm><http://www.ipm.uconn.edu/IPM/homegrnd/htms/poivy2.htm>

Poison Ivy from

<http://www.cdc.gov/niosh/topics/plants/><http://www.cdc.gov/niosh/topics/plants/>

1. What type of contact would touching garden tools, clothes, pet fur, or someone with urushiol on their skin be considered?
2. Which immunoglobins would be activated in this type of immune response?
3. What type of immune response is responsible for the appearance of the rash?