

CHAPTER 47—THE BODY'S DEFENSE SYSTEMS

MULTIPLE CHOICE

1. Which of the following is the final step in using Koch's postulates to demonstrate that a particular agent causes a disease?
 - a. A healthy animal inoculated with the disease agent contracts the disease.
 - b. The disease agent is found in animals that have the disease but not in animals that are free of the disease.
 - c. An animal infected by injecting the suspected disease agent from an animal with the disease is found to also have the disease agent in its tissues, because a pathogen cultured from the second animal is found to be the same as the pathogen cultured from the first.
 - d. The disease agent is collected from a sick animal and cultured in the laboratory.

ANS: C DIF: 1 OBJ: 47-1.1

2. Which of the following is true about the release of histamine from cells in nasal passages?
 - a. It occurs during an allergic reaction.
 - b. It causes nearby capillaries to swell.
 - c. It may cause increased secretion by mucous membranes.
 - d. All of the above

ANS: D DIF: 1 OBJ: 47-1.2

3. The body's first line of defense against infection includes all of the following *except*
 - a. skin.
 - b. mucous membranes.
 - c. acids in the stomach.
 - d. interleukin-1.

ANS: D DIF: 1 OBJ: 47-1.2

4. The skin repels pathogens by
 - a. functioning as a barrier.
 - b. producing antibodies.
 - c. using chemical defenses.
 - d. Both a and c

ANS: D DIF: 1 OBJ: 47-1.2

5. Mucous membranes
 - a. cover all the body's surfaces.
 - b. line internal body surfaces that are in contact with the environment.
 - c. produce antibodies to combat infection.
 - d. secrete sweat, which has antibacterial enzymes.

ANS: B DIF: 1 OBJ: 47-1.2

6. Mucous membranes
 - a. are moist epithelial layers that are impermeable to most pathogens.
 - b. line the nasal passages, mouth, lungs, digestive tract, urethra, and vagina.
 - c. contain glands that secrete mucus, a sticky fluid that traps pathogens.
 - d. All of the above

ANS: D DIF: 1 OBJ: 47-1.2

7. The first line of defense against infection includes
- a. mucous membranes.
 - b. neutrophils.
 - c. cytotoxic T cells.
 - d. antibodies.

ANS: A DIF: 1 OBJ: 47-1.2

8. All of the following have mucous membranes *except*
- a. the digestive tract.
 - b. the surface of the skin.
 - c. the nasal passages.
 - d. the vagina.

ANS: B DIF: 1 OBJ: 47-1.2

9. Mucus is produced by the cells lining the walls of the bronchi and bronchioles
- a. only when a person has a severe respiratory infection.
 - b. to allow oxygen to diffuse into the blood more efficiently.
 - c. as a lubricant for the expulsion of food that might “go down the wrong tube.”
 - d. to protect against microbes that might be inhaled.

ANS: D DIF: 1 OBJ: 47-1.2

10. The stomach is involved in defense against infection by
- a. regurgitating any pathogen that might be swallowed.
 - b. secreting mucus that is carried away by cilia.
 - c. containing acids that destroy potential pathogens that are swallowed.
 - d. sending potential pathogens to the liver for destruction.

ANS: C DIF: 1 OBJ: 47-1.2

11. Which of the following is (are) a nonspecific defense against pathogens?
- a. B cells
 - b. antibodies
 - c. helper T cells
 - d. the inflammatory response

ANS: D DIF: 1 OBJ: 47-1.3

12. When the inflammatory response is triggered,
- a. damaged or infected cells release chemical alarm signals.
 - b. more fluid than normal leaks from capillaries near the injury, and swelling results.
 - c. white blood cells attack invading pathogens.
 - d. All of the above

ANS: D DIF: 1 OBJ: 47-1.3

13. When a puncture wound becomes infected,
- a. damaged cells release chemicals that promote the immune response.
 - b. the temperature around the wound increases.
 - c. white blood cells move into the injured area.
 - d. All of the above

ANS: D DIF: 1 OBJ: 47-1.3

14. The redness and swelling associated with an inflammatory response is caused by
- secretion of antibodies.
 - expansion of local blood vessels.
 - complement activity.
 - natural killer cells destroying bacteria.

ANS: B DIF: 1 OBJ: 47-1.3

15. Phagocytes, such as macrophages,
- produce strong antibiotics.
 - secrete interferon.
 - shut down immune responses.
 - ingest and destroy pathogens.

ANS: D DIF: 1 OBJ: 47-1.4

16. White blood cells that engulf invading microbes and cellular debris resulting from microbial attacks are called
- macrophages.
 - histamine cells.
 - natural killer cells.
 - complement cells.

ANS: A DIF: 1 OBJ: 47-1.4

17. Which of the following engulfs foreign cells?
- a helper T cell
 - a B cell
 - a macrophage
 - an antibody

ANS: C DIF: 1 OBJ: 47-1.4

18. neutrophils : ingesting pathogens ::
- macrophages : releasing chemicals
 - natural killer cells : releasing chemicals
 - natural killer cells : puncturing membranes of infected cells
 - macrophages : puncturing membranes of infected cells

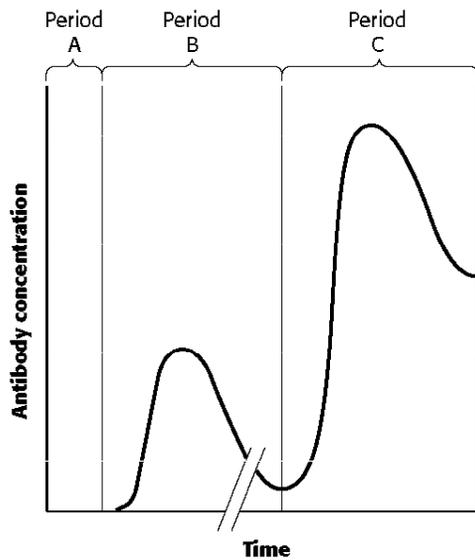
ANS: C DIF: 2 OBJ: 47-1.4

19. Moderate fevers (below 103°F)
- damage essential proteins in your body.
 - inhibit the growth of pathogens and stimulate macrophage action.
 - occur late in the disease process, after the pathogen is almost eliminated.
 - require emergency treatment.

ANS: B DIF: 1 OBJ: 47-1.5

20. Which of the following is (are) *not* part of the immune system?
- lymph nodes
 - spleen
 - thymus
 - alveoli

ANS: D DIF: 1 OBJ: 47-2.1



21. Refer to the illustration above. During which time period are the first antibodies to the pathogen produced?
- a. A
 - b. B
 - c. C
 - d. None of the above

ANS: B DIF: 1 OBJ: 47-2.3

22. Refer to the illustration above. Which time period would be characterized by the most rapid division of B cells?
- a. A
 - b. B
 - c. C
 - d. None of the above

ANS: C DIF: 1 OBJ: 47-2.3

23. Antibodies
- a. prevent diseases caused by vaccines.
 - b. are produced by bacteria that infect animals.
 - c. help destroy microbes that invade the body.
 - d. cause viruses to infect bacterial cells.

ANS: C DIF: 1 OBJ: 47-2.3

24. Once stimulated by antigens on the surface of macrophages, helper T cells may
- a. stimulate cytotoxic T cells to attack viruses directly.
 - b. stimulate B cells to divide and develop into plasma cells.
 - c. repair macrophages.
 - d. cause fever.

ANS: B DIF: 1 OBJ: 47-2.3

25. The role of helper T cells in immune responses is to
- secrete interleukin-1.
 - stimulate macrophages to initiate an “alarm signal.”
 - initiate the activities of neutrophils.
 - activate two different types of immune system cells.

ANS: D DIF: 1 OBJ: 47-2.3

26. Cytotoxic T cells recognize cells that have been infected by viruses
- only after the infected cells have been ingested by macrophages.
 - because the infected cells have the pathogen’s antigens on their surfaces.
 - when the infected cells have been coated with complement.
 - at the same time that neutrophils release their toxins into damaged tissue.

ANS: B DIF: 1 OBJ: 47-2.2

27. All of the following are white blood cells that are involved in immune responses *except*
- B cells.
 - T cells.
 - macrophages.
 - megakaryocytes.

ANS: D DIF: 1 OBJ: 47-2.3

28. Which of the following pairs is *incorrectly* associated?
- cytotoxic T cells—attack and kill infected cells
 - helper T cells—activate killer T cells and B cells
 - B cells—engulf cells that are infected with microbes
 - macrophages—consume pathogens and infected cells

ANS: C DIF: 1 OBJ: 47-2.3

29. When B cells encounter a pathogen, they
- secrete interleukin-2, which stimulates cytotoxic T cells.
 - divide and produce large amounts of antibody.
 - initiate an inflammatory response.
 - attack the cell by making a hole in its membrane.

ANS: B DIF: 1 OBJ: 47-2.3

30. A few B cells that have encountered a pathogen
- become killer T cells.
 - are ingested by macrophages.
 - have viral protein on their cell membrane surface.
 - become memory cells.

ANS: D DIF: 1 OBJ: 47-2.3

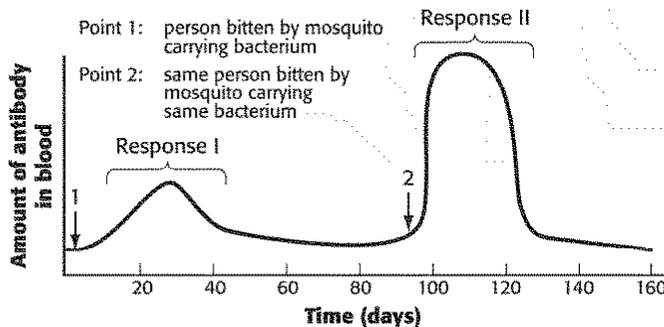
31. B cells
- sometimes remain in the blood for years.
 - secrete antibodies.
 - are stimulated by helper T cells.
 - All of the above

ANS: D DIF: 1 OBJ: 47-2.3

32. After the initial immune response subsides, B cells that patrol body tissues for long periods of time
- are called helper T cells.
 - develop into phagocytes.
 - are called memory cells.
 - cannot react to the original antigen.

ANS: C DIF: 1 OBJ: 47-2.3

33.



Refer to the illustration above. The most likely reason for Response II being greater than Response I is that

- more bacteria entered at point 2 than at point 1.
 - memory cells were produced during Response I.
 - antibodies from Response I still remained in the blood.
 - macrophages increased their production of antibodies.
34. pathogenic bacteria and viruses : enemies of humans ::
- B cells and T cells : mucous membrane cells
 - helper T cells and cytotoxic T cells : skin cells
 - cytotoxic T cells and macrophages : pathogens
 - cytotoxic T cells and B cells : white blood cells

ANS: B DIF: 1 OBJ: 47-2.3

35. macrophages : helper T cells ::
- cytotoxic T cells : macrophages
 - helper T cells : cytotoxic T cells and B cells
 - B cells : cytotoxic T cells and macrophages
 - mucous membrane cells : helper T cells and B cells

ANS: B DIF: 2 OBJ: 47-2.3

36. Vaccines are effective in preventing disease because they
- interfere with the release of suppressor T cells.
 - are antibodies directed against specific pathogens.
 - contain specific B cells and T cells.
 - trigger antibody formation.

ANS: D DIF: 1 OBJ: 47-2.4

37. Secondary exposure to a pathogen
- results in very rapid production of antibodies.
 - stimulates memory cells to divide quickly.
 - may result in destruction of the pathogen before a person knows he or she is infected.
 - All of the above

ANS: D DIF: 1 OBJ: 47-2.3

38. All vaccines are produced from killed or weakened
- phagocytes.
 - pathogens.
 - antigens.
 - allergens.

ANS: B DIF: 1 OBJ: 47-2.4

39. John and James are identical twins. During the summer following their fifteenth birthday, they went on a vacation and stayed in a cabin with two of their cousins. One of the cousins came down with chicken pox during the vacation. Chicken pox is caused by a virus. Two weeks later, John came down with chicken pox. James, however, never developed any symptoms of the disease. Which of the following is the best explanation for the different responses John and James had to exposure to the same disease?
- John and James are not really identical twins. James inherited an immunity to chicken pox but John did not.
 - Even though John and James are identical twins, they produce different kinds of immune system cells. James had cytotoxic T cells that could recognize and destroy the chicken pox viruses, while John did not.
 - James had been exposed to chicken pox at an earlier age and developed the disease. His body produced memory cells that protected him from further infections of the disease. John did not get exposed to chicken pox at an earlier age.
 - James had a cold at the time he was exposed to the chicken pox virus. The cold virus had stimulated his body to produce lots of B cells, which were then also able to recognize and bind to the chicken pox viruses. John did not have a cold at the time he was exposed to the chicken pox.

ANS: C DIF: 2 OBJ: 47-2.3

40. A misdirected immune system response against a harmless antigen is called
- an autoimmune disease.
 - a secondary immune reaction.
 - an allergic reaction.
 - a vaccination reaction.

ANS: C DIF: 1 OBJ: 47-2.5

41. Autoimmune diseases occur when
- cells release antihistamine.
 - a person is infected with HIV.
 - the immune system attacks the organism's own cells.
 - a person receives a blood transfusion of the wrong type.

ANS: C DIF: 1 OBJ: 47-2.5

42. An autoimmune disease in which the immune system attacks myelinated nerves is
- multiple sclerosis.
 - rheumatoid arthritis.
 - Crohn's disease.
 - lupus erythematosus.

ANS: A DIF: 1 OBJ: 47-2.5

43. Which of the following is true about the release of histamine from cells in the nasal passages?
- It occurs during an allergic reaction.
 - It causes nearby capillaries to swell.
 - It may cause increased secretion by mucous membranes.
 - All of the above

ANS: D DIF: 1 OBJ: 47-2.5

44. Which of the following describes the actions of HIV?
- HIV attacks and cripples the immune system.
 - HIV invades macrophages and helper T cells.
 - HIV kills large numbers of helper T cells.
 - All of the above

ANS: D DIF: 1 OBJ: 47-3.2

45. Scientists think that practically everyone infected with HIV
- can be cured with vaccines.
 - will die of AIDS within one year of diagnosis of the virus.
 - will live a normal life if they don't smoke and if they eat a balanced diet.
 - will eventually develop AIDS.

ANS: D DIF: 1 OBJ: 47-3.1

46. A person infected with HIV may
- develop the disease called AIDS.
 - have viruses reproducing in helper T cells.
 - be more susceptible to a variety of pathogens.
 - All of the above

ANS: D DIF: 1 OBJ: 47-3.1

47. HIV causes AIDS by attacking and destroying
- helper T cells.
 - B cells.
 - neutrophils.
 - antibodies.

ANS: A DIF: 1 OBJ: 47-3.2

48. The debilitating effects of AIDS are due to inability of the immune system to
- activate B cells and cytotoxic T cells.
 - produce antibodies against pathogens.
 - recognize and destroy infected cells.
 - All of the above

ANS: D DIF: 1 OBJ: 47-3.2

49. HIV can be transmitted
- through sexual intercourse with an infected person.
 - by the transfer of body fluids containing HIV or HIV-infected cells.
 - by sharing contaminated hypodermic needles and syringes.
 - All of the above

ANS: D DIF: 1 OBJ: 47-3.3

50. Which of the following is used to determine whether a person has been infected with HIV?
- determining whether the person has had sexual intercourse with an infected person
 - determining whether the person has antibodies to HIV in his or her blood
 - determining whether the person has AIDS
 - determining whether the person is an intravenous drug user

ANS: B DIF: 2 OBJ: 47-3.3

51. Which of the following explains why HIV evolves rapidly?
- The genes that code for its surface proteins mutate rapidly.
 - Each new chemical used in treatment induces mutations in the virus.
 - Its DNA mutates rapidly when the virus enters human body cells.
 - All of the above

ANS: A DIF: 1 OBJ: 47-3.4

COMPLETION

1. Sweat is protective because it contains lysozyme, a(n) _____ that attacks some bacteria.

ANS: enzyme

DIF: 1 OBJ: 47-1.2

2. Moist epithelial layers that line internal body surfaces and are barriers to many pathogens are called _____.

ANS: mucous membranes

DIF: 1 OBJ: 47-1.2

3. The _____ acts as a barrier to keep foreign organisms and viruses out of the body.

ANS: skin

DIF: 1 OBJ: 47-1.2

4. At the site where a splinter punctures the skin, redness, swelling, and an increase in temperature would be signs of a(n) _____ response.

ANS: inflammatory

DIF: 1 OBJ: 47-1.3

5. _____ are the most abundant type of phagocyte and travel throughout the body, killing pathogens by ingesting them.

ANS: Neutrophils

DIF: 1 OBJ: 47-1.4

6. Moderate _____ occurring in the early phases of an infection inhibits the growth of pathogens and stimulates macrophage action.

ANS: fever

DIF: 1 OBJ: 47-1.5

7. _____ are defensive proteins found in the body of an organism that label infectious microbes for destruction before they can cause disease.

ANS: Antibodies

DIF: 1 OBJ: 47-2.3

8. An “alarm signal” is emitted by macrophages in the form of a protein called _____, which activates helper T cells.

ANS: interleukin-1

DIF: 1 OBJ: 47-2.3

9. Interleukin-2 is produced by _____ cells.

ANS: helper T

DIF: 1 OBJ: 47-2.3

10. B cells produce proteins called _____ that can mark pathogens for destruction.

ANS: antibodies

DIF: 1 OBJ: 47-2.3

11. After a primary exposure to a pathogen, the bloodstream contains _____ cells that can be specifically recalled to defend against that particular pathogen.

ANS: memory

DIF: 1 OBJ: 47-2.3

12. _____ is the process by which a dead or disabled pathogen (or proteins from that pathogen) is introduced into the body so that an immune response results without an actual infection.

ANS: Vaccination

DIF: 1 OBJ: 47-2.4

13. _____ is a chemical released from cells during an allergic reaction.

ANS: Histamine

DIF: 1 OBJ: 47-2.5

14. A disease in which the body's immune system attacks the body's own cells is called a(n) _____ disease.

ANS: autoimmune

DIF: 1 OBJ: 47-2.5

15. A(n) _____ is a misdirected immune system response against a harmless antigen.

ANS: allergy

DIF: 1 OBJ: 47-2.5

16. The most effective treatment for AIDS is now considered to be the administration of several different antiviral drugs to patients, because it is unlikely that the virus would have mutated to develop _____ to all of the drugs.

ANS: resistance

DIF: 1 OBJ: 47-3.4

ESSAY

1. Describe three components of the first line of defense that the body uses to prevent infections. Write your answer in the space below.

ANS:

The skin prevents a pathogen from entering the body. In addition, oils and sweat produced by glands in the skin create an environment unfavorable to pathogens. Sweat also contains enzymes that destroy some bacteria. Mucous membranes line internal body surfaces that are exposed to the environment. They secrete mucus, which is a sticky substance for trapping pathogens. In the respiratory tract, cilia lining the respiratory tract sweep trapped pathogens up to the pharynx, where they are swallowed and travel to the stomach, where stomach acids destroy the pathogens.

DIF: 1 OBJ: 47-1.2

2. Briefly describe how a cell that has been infected by a virus can be recognized and destroyed. Write your answer in the space below.

ANS:

Macrophages contact infected cells and release interleukin-1. This protein activates helper T cells that secrete another protein, interleukin-2. This substance, in turn, stimulates cytotoxic T cells, which bind to the infected cell using surface receptor molecules that recognize traces of viral protein on the surface of the infected cell. This interaction causes damage to the cell membrane of the infected cell, resulting in its destruction.

DIF: 1 OBJ: 47-2.3

3. What is the function of memory cells in immune response? Write your answer in the space below.

ANS:

After a primary immune response, some B and T cells capable of recognizing a particular antigen remain in circulation. If the individual is again exposed to the same antigen, these cells will begin to divide rapidly, forming a new generation of antibody-producing cells.

DIF: 1 OBJ: 47-2.3

4. HIV is a fatal infection, but victims are not always killed by the virus itself. They generally die from other diseases that a healthy individual could resist successfully. Explain why this is true. Write your answer in the space below.

ANS:

The human immunodeficiency virus (HIV) disables the immune system of the infected person, making the individual susceptible to other pathogens. HIV destroys the immune system by attacking helper T cells, without which the immune system is unable to stimulate B cells or killer T cells.

DIF: 1 OBJ: 47-3.1