**Chapter 17**

**Genetics of Immunity**

**Multiple Choice Questions**

1. The human immune system consists of   
A. about 10,000 cells that increase rapidly to trillions when an infection takes hold.  
B. the heart and blood vessels and the blood cells within the vessels.  
**C.** about 2 trillion cells, their secretions, and the organs where they are produced and stored.  
D. all of the bacteria and viruses that are normally present in our bodies plus our blood cells.

2. An antigen is

**A.**  a molecule that can elicit an immune response.  
B. a nucleic acid only.  
C. a protein or nucleic acid.  
D. a protective protein that the immune system produces.

3.  The new approach to type blood, by identifying the instructions for the cell-surface antigens, is   
A. serology.  
**B.** genotyping.  
C. gene therapy.  
D. phenotyping.

4. The human leukocyte antigen genes are on the   
**A.** short arm of chromosome 6.  
B. long arm of chromosome 18.  
C. short arm of chromosome 2.  
D. long arm of chromosome 6.

5.  The genes of the human leukocyte antigens (HLA) system encode cell surface   
A. phospholipids.  
B. glycolipids.  
**C.** glycoproteins.  
D. histamines.

6.  Major histocompatiblity complex (MHC) genes account for about \_\_\_\_\_ percent of the genetic influence on immunity.   
A. 20  
B. 30  
C. 40  
**D.** 50

7.  Identifying combinations of \_\_\_\_\_ alleles is useful in tissue typing, establishing identity, and estimating disease risk.   
A. HIV  
**B.** HLA  
C. antibody  
D. erythrocyte

8. The two major types of lymphocytes are   
**A.** T and B cells.  
B. A and B cells.  
C. cytokines and antibodies.  
D. RBCs and WBCs.

9.  The difference between innate immunity and adaptive immunity is that   
A.  adaptive immunity attacks pathogens; innate immunity attacks microbes.  
B. innate immunity targets cancers and transplants; adaptive immunity targets viruses and bacteria.  
**C.** innate immunity is fast and generalized; adaptive immunity is slow and specific.  
D. adaptive immunity releases cytokines; innate immunity produces antibodies.

10. Inflammation helps to fight infection by   
**A.** creating an environment in the body that is hostile to pathogens.  
B. producing antibodies that kill viruses and bacteria.  
C. limiting the number of phagocytes at the infection site.  
D.  producing collectins, cytokines, and red blood cells.

11. All of the following are cytokines except   
A. interleukins.  
B. interferons.  
C. tumor necrosis factor.  
**D.** collectins.

12. The three basic characteristics of adaptive immunity are   
A. generality, diversity, and retention.  
**B.** specificity, diversity, and memory.  
C.  prevention, protection, and memory.  
D. suppression, activation, and transference.

 13. People do not develop a secondary immune response to influenza because   
A. the immune system mutates from season to season.  
B. secondary immune responses are only possible against bacteria.  
C. the primary immune response is sufficient to protect against flu.  
**D.**  the causative viruses mutate each season.

14.  The primary function of plasma cells is to   
**A.** secrete antibodies.  
B.  remember immune responses.  
C. secrete cytokines.  
D.  protect phagocytes.

15. Which type of white blood cell secretes specific antibodies?   
A. T cell  
B.  Cytokine  
**C.** B cell

D.Erythrocyte

16.  The simplest type of antibody consists of   
A. a single folded polypeptide chain.  
**B.**  4 polypeptide chains, two heavy and two light.  
C. 2 polypeptide chains, one large and one small.  
D. 4 polypeptide chains of about equal size.

17.  \_\_\_\_\_ bonds hold together the polypeptide chains that form an antibody.   
**A.** Disulfide  
B. Peptide  
C. Hydrogen  
D. Phosphodiester

18. The part of an antigen binding site on an antibody that binds antigen is the   
A. idioblast.  
**B.** idiotype.  
C. epitope.  
D. intron.

19. The constant region of an antibody molecule is   
A. the binding site for antigens.  
B. part of the heavy chains only.  
**C.** the same in all antibodies of a certain type.  
D. the binding site for two antigens.

20. Antibody diversity is a consequence of   
A. the huge number of antibody genes.  
**B.** shuffling of antibody genes into different combinations during B cell development.  
C. differential regulation of antibody gene expression under different circumstances.  
D. the many types of viruses that exist in nature.

21. B cells secrete antibodies when they   
A. bind antigens.  
B. are engulfed by macrophages.  
**C.** are stimulated by activated T cells.  
D. undergo apoptosis.

22. The functions of antibodies include   
**A.** activating complement, inactivating pathogens, and clumping pathogens.  
B. activating macrophages, stimulating mast cells, and increasing the white blood cell count.  
C. creating a warm and swollen area near the site of infection, which harms the pathogens.  
D. causing B cells to bind to T cells, forming clumps that are visible to the immune system.

23. Antibody production begins   
A. in a fetus as its bone marrow develops.  
B. in a fetus in response to maternal antigens.  
C. immediately after birth.  
**D.**  after birth, after exposure to foreign antigens.

24. Helper T cells secrete   
**A.** cytokines.  
B. antibodies.  
C. antigens.  
D. immunoglobulins.

25. Cluster-of-differentiation antigens are found on   
A. B cells, where they determine the antibody types that are made.  
B. B cells, where they make recognition of self antigens on macrophages possible.  
**C.**  T cells, enabling them to recognize foreign antigens on macrophages.  
D.  macrophages, enabling them to link with both B and T cells.

26. Cytotoxic T cells target   
**A.** cancer cells and virally infected cells.  
B. skin cells and blood cells.  
C. bacterial cells and fungal cells.  
D. B cells and macrophages.

27. Severe combined immune deficiencies (SCID) affect both   
**A.** humoral and cellular immunity.  
B. white blood cells and red blood cells.  
C. mast cells and macrophages.  
D. helper B cells and cytotoxic B cells.

28. In a less severe form of combined immune deficiency, the individual   
A. has normal numbers of T and B cells.  
B. has no white blood cells.  
**C.** has some T cells but lacks B cells.  
D.  lacks both T and B cells.

29.  The enzyme \_\_\_\_\_ allows HIV to make a DNA copy of its RNA genome.   
**A.** reverse transcriptase  
B. DNA polymerase  
C. RNA polymerase  
D. DNA transcriptase

30. HIV destroys the immune system by primarily destroying   
A. cytotoxic T cells.  
B. B cells.  
**C.** helper T cells.  
D. erythrocytes.

31. People who cannot become infected with HIV have   
A. extra T cells.  
**B.** deletions in the genes encoding the CCR5 coreceptors.  
C. a gene encoding a protein that attacks the virus.  
D. anti-HIV antigens.

32. An example of an autoimmune disorder is   
A. hay fever.  
B. severe combined immune deficiency.  
**C.** systemic lupus erythematosus.  
D. colon cancer.

33. One way an autoimmune disorder can arise is if   
A.  a person encounters an immunodeficiency virus.  
B.  a person inhales an allergen.  
**C.** a nonself antigen coincidentally resembles a self antigen.  
D. too many T cells die in the thymus.

**True / False Questions**

34. Antigen-presenting dendritic cells are found in the skin and in the linings of the respiratory and digestive tracts.   
**TRUE**

35. The function of dendritic cells is to signal T cells, starting an immune response.   
**TRUE**

36. Experimental gene therapy can be used to treat a form of severe combined immune deficiency, SCID-X1.   
**TRUE**

37. People homozygous recessive for a 32-base deletion in the CCR5 gene do not become infected with HIV.   
**TRUE**

38. Mutation of the CCR5 coreceptor may have enabled people to survive various European plagues during the Middle Ages.   
**TRUE**

39. Research suggests a link between a mutation in the skin protein filaggrin and allergic reaction.   
**TRUE**

40. Vaccinating a substantial portion of the population against an infectious disease establishes "herd immunity."   
**TRUE**

**Multiple Choice Questions**

41. In an allergic reaction, allergens bind \_\_\_\_\_, which release allergy mediators.   
**A.** IgE antibodies on mast cell surfaces  
B. IgG antibodies on B cell surfaces  
C. allergy genes on chromosome 5  
D. histamines on mast cell surfaces

42.  A woman is given RhoGAM to protect future fetuses from hemolytic disease of the fetus and newborn if   
A. she and the fetus are both Rh-.  
B. she is Rh+ and the fetus is Rh-.  
**C.** she is Rh- and the father is Rh+.  
D. she is Rh+ and the father is Rh-.

43. Scleroderma is a disorder that can be caused by   
**A.** retained fetal cells with surfaces that are similar to the mother's cells.  
B. retained fetal cells with surfaces that are very different from those of the mother.  
C. retained fetal cells with surfaces that are similar to the father's cells.  
D. repeated exposure to the scleroderma virus.

44.  Infecting people with \_\_\_\_\_ led to vaccination against smallpox.   
A. chickenpox virus  
B. swine flu virus  
**C.** cowpox  
D. measles virus

45. A vaccine protects by stimulating a person to produce a(n) \_\_\_\_\_ response when a pathogen is encountered.   
A. primary immune  
**B.** secondary immune  
C. tertiary immune  
D. anaphylactic

46. The protection against a specific infectious disease that arises when all or nearly all of a population is vaccinated is termed   
A. immune preparedness.  
B. mandatory vaccination.  
C. government-controlled health care.  
**D.** herd immunity.

47. Monoclonal antibodies are produced by fusing a   
**A.** B cell and a cancer cell.  
B. B cell and a T cell.  
C. mast cell and a macrophage.  
D. T cell and a plasma cell.

48.  Monoclonal implies that the   
A. antibodies come from a twin.  
**B.** antibodies are identical.  
C. cancer cells are all of one type.  
D. antigens are from a single source.

49. Interleukin-2 is used as a drug to activate   
**A.** T cells.  
B. B cells.  
C. mast cells.  
D. erythrocytes.

50. In an allograft, the tissue donor is   
A. the recipient.  
**B.** a non-relative.  
C. a dizygotic twin.  
D. a monozygotic twin.

51. Heart valve replacement in humans using a pig valve is an example of a(n)   
A. autograft.  
B. isograft.  
C. allograft.  
**D.** xenograft.

52. In reverse vaccinology, researchers develop vaccines by   
A. considering how rapidly pathogens divide in laboratory culture.  
B. culturing pathogens in laboratory glassware.  
**C.** targeting genes of pathogens that cannot be cultured.  
D. injecting human antigens into pathogen genomes.

53.  \_\_\_\_\_ is used to track the outbreak of infectious diseases.   
A.  Reverse vaccinology  
**B.**  Genome sequencing  
C.  Vaccination  
D.  Immunotherapy