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DEPARTMENT: PRECLINICAL SCIENCES

DISCIPLINE: IMMUNOLOGY

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BIBLIOGRAPHY FOR LICENCING EXAMINATION, 2020

1. Michael J. Day and Ronald D. Schultz, Veterinary Immunology Principles And Practice, Manson Publishing Ltd Taylor And Francis; 2011 edition (2011)

Chapter 2: Antigens and Antibody: page 19-29
Chapter 5: Cells and Tissue of the Immune System: page 49-64
Chapter 8: The Biology of T Lymphocytes: page 83-96
Chapter 9: The Biology of B Lymphocytes: page 97-106

2. The digital course (PowerPoint Presentations) for Immunology

1. What is an antigen:
   a) A substance that bind to a lymphocyte receptor
   b) A cell of the immune system
   c) A type of lymphocyte
   d) A protein of the complement system
   e) An antibody

2. The term immunogen refers to:
   a) A substance that does not induce an immune response when injected into an individual.
   b) A substance that induces an immune response when injected into an individual
   c) An activated lymphocyte
   d) A suppressed lymphocyte
   e) A substance that suppresses the activation of the complement system

3. Heteroantigens may include:
   a) Infectious agents
   b) Alloantigens
   c) Xenoantigens
   d) Autoantigens

e) Self-antigens

4. The properties of an antigen that determine the potency of the immune response are referred to as:
a) Immunogen
b) Antigen
c) Antigenicity
d) Heteroantigens
e) Alloantigens

5. The distinct regions within the antigen that are individually capable of interacting with the immune system are called:
a) Epitopes
b) Receptors
c) Paratopes
d) Antibodies
e) Heteroantigens

6. The epitopes that are more effective at inducing an immune response are called:
a) Heteroantigens
b) Carrier
c) Hapten
d) Paratope
e) Immunodominant

7. The small chemical group which, by itself, cannot elicit an immune response is called:
a) Carrier
b) Heteroantigens
c) Hapten
d) Self-antigens
e) Alloantigens

8. A hapten can produce an immune response only when it binds to:
a) Another antigen
b) A carrier protein
c) A heteroantigen
d) An alloantigen
e) A self-antigen

9. A substance which, when combined with antigen, nonspecifically enhances the ensuing immune response to that antigen is called:
a) Carrier protein
b) Epitope
c) Antibody
d) Adjuvant
e) Toxin

10. The fraction of blood that remains fluid after clotting represents:
a) The serum
b) The plasma
c) White blood cells
d) Red blood cells
e) Thrombocytes

11. Immunoglobulins or antibodies are:
   a) Alpha proteins
   b) Beta proteins
   c) Gamma proteins
   d) Proteins of the complement system
   e) Albumins

12. The variable regions containing the greatest degree of variation in amino acid sequence is called:
   a) The hinge region
   b) The Fab region
   c) The Fc region
   d) The light chain
   e) The hypervariable region

13. The IgG molecule comprises of:
   a) A single Y-shaped unit
   b) Two Y-shaped units
   c) Three Y-shaped units
   d) Four Y-shaped units
   e) Five Y-shaped units

14. The dominant form of immunoglobulin found in the serum is:
   a) IgG
   b) IgM
   c) IgA
   d) IgE
   e) IgD

15. The dominant antibody found in the secondary immune response is:
   a) IgG
   b) IgM
   c) IgA
   d) IgE
   e) IgD

16. Which is the largest antibody molecule?
   a) IgG
   b) IgM
   c) IgA
   d) IgE
   e) IgD

17. The IgM molecule comprises of:
   a) A single Y-shaped unit
   b) Two Y-shaped units
   c) Three Y-shaped units
   d) Four Y-shaped units
   e) Five Y-shaped units

18. The Y-shaped units of IgM are linked together by:
   a) An antibody molecule

b) A Joining (J) chain
c) The Fab regions
d) The hinge region
e) The hypervariable region

19. How many constant heavy regions does the IgM molecule has?
a) One
b) Two
c) Three
d) Four
e) Five

20. The dominant antibody found in the primary immune response is:
a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

21. IgA is mainly a:
a) Monomer
b) Dimer
c) Trimer
d) Tetramer
e) Pentamer

22. The highest concentration of IgA is found in:
a) Blood
b) Tissues
c) Mucosal surfaces
d) Brain
e) Heart

23. The only antibody that possesses a secretory component is:
a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

24. IgD is found:
a) On the surface of B cells
b) On the surface of T cells
c) In the blood
d) In tissues
e) In secretions

25. How many heavy constant regions does the IgE molecule has?
a) One
b) Two
c) Three
d) Four

e) Five

26. The major role of IgE is as a participant in the immune response to:
a) Gram positive bacteria
b) Gram negative bacteria
c) Parasites
d) Viruses
e) Toxins

27. Type I hypersensitivity and allergic diseases are mediated by:
a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

28. Which antibody can bind to the surface of mast cells and basophils:
a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

29. The main role of the Fab region of the antibody is:
a) To recognize and bind an epitope
b) To give the antibody its biological behaviour
c) To make the antibody cross the placenta
d) To secrete the antibody on mucosa
e) To bind on the surface of B cells

30. The strength of overall binding between antigen and antibody is called:
a) Antigenicity
b) Avidity
c) Immunogenicity
d) Availability
e) Immunodominant

31. The primary lymphoid tissues are the sites where:
a) Mature lymphoid cells are capable of participating in immune responses
b) Antibodies are produced
c) Lymphoid cells are formed and undergo initial maturation
d) Interleukins are produced
e) Proteins of the complement system are produced

32. The secondary lymphoid tissue are the sites where:
a) Mature lymphoid cells are capable of participating in immune responses
b) T lymphocytes are matured
c) T lymphocytes are trained
d) Proteins of the complement system are produced
e) Interleukins are produced

33. The bone marrow is:
a) The site were antibodies are produced

b) The site were T cells are trained and matured
c) A secondary lymphoid organ
d) A primary lymphoid organ
e) The site were proteins of the complement system are produced

34. What is the role of the bone marrow?
a) To produce antibodies
b) To produce interleukins
c) To produce the proteins of the complement system
d) To mature and train T cells
e) To produce all the cells of the immune system

35. Maturation of B cells in birds is done in:
a) The thymus
b) The bone marrow
c) The secondary lymphoid organs
d) The bursa of Fabricius
e) Mucosa associated lymphoid tissue

36. The thymus is:
a) A primary lymphoid organ
b) A secondary lymphoid organ
c) Mucosa associated lymphoid tissue
d) Site of B cell maturation
e) Site of B cell maturation in birds

37. What is the role of the thymus?
a) The site were red blood cells are destroyed
b) The site were B cells undergo final maturation
c) The site were B cells undergo final maturation in birds
d) The site of the immune response
e) The site were T cells undergo final maturation

38. T cell development in the thymus is enhanced by cytokines produced by:
a) Thymic epithelial cells
b) Hassall's corpuscles
c) Dendritic cells
d) Macrophages
e) Capsule

39. Apoptotic T lymphocytes in the thymus are phagocytosed by:
a) Hassall's corpuscles
b) Dendritic cells
c) Macrophages
d) Thymic epithelial cells
e) Neutrophils

40. Lymph nodes are:
a) Primary lymphoid organs
b) Secondary lymphoid organs
c) Mucosal lymphoid aggregates
d) Unencapsulated lymphoid organs

e) Lymphoid tissues that involutes as you grow older

41. Spleen is:
a) An encapsulated primary lymphoid organ
b) An encapsulated secondary lymphoid organ
c) An unencapsulated secondary lymphoid organ
d) Site of T cell maturation
e) Site of B cell maturation

42. The mucosa-associated lymphoid tissue is:
a) A primary encapsulated lymphoid organ
b) A secondary encapsulated lymphoid tissue
c) A secondary unencapsulated lymphoid tissue
d) The site for T cell maturation
e) The site for T cell destruction

43. The follicular aggregates in the cortex of the lymph nodes are composed of:
a) B lymphocytes
b) T lymphocytes
c) Neutrophils
d) Macrophages
e) Dendritic cells

44. The paracortex of the lymph nodes is composed of:
a) B lymphocytes
b) T lymphocytes
c) Neutrophils
d) Macrophages
e) Dendritic cells

45. The splenic substance comprises of:
a) Cortex and paracortex
b) Cortex, paracortex and medullary sinus
c) Red pulp and white pulp
d) Mucosa-associated lymphoid tissue
e) It has a non-specific structure

46. The red pulp of the spleen is:
a) A reservoir of blood
b) Splenic lymphoid tissue
c) Splenic follicles
d) MALT
e) GALT

47. The white pulp of the spleen is composed of:
a) Erythrocytes
b) T and B lymphocytes
c) Neutrophils
d) Dendritic cells
e) Macrophages

48. T lymphocytes in the spleen form the:
a) Mucosa-associated lymphoid tissues (MALT)

b) Gastro-intestinal associated lymphoid tissue (GALT)
c) Periarteriolar lymphoid sheath (PALS)
d) Primary follicles
e) Secondary follicles

49. Peyer's patches are:
a) Primary encapsulated lymphoid organs
b) Primary unencapsulated lymphoid organs
c) Secondary encapsulated lymphoid organs
d) Secondary unencapsulated lymphoid tissue
e) Follicles in the lymph nodes and spleen

50. The epithelium of the Payer's patches contains:
a) M cells
b) B cells
c) T cells
d) Dendritic cells
e) Neutrophils

51. What is a naive lymphocyte?
a) A memory lymphocyte
b) An activated lymphocyte
c) A lymphocyte that has not been previously exposed to an antigen
d) A lymphocyte that produces antibodies
e) A lymphocyte that produces interleukins

52. What is a memory cell?
a) A lymphocyte that has not been previously exposed to an antigen
b) A lymphocyte that has previously participated in an immune response and retains the memory of that event
c) A T lymphocyte that is undergoing training in the thymus
d) A pluripotent stem cell
e) A tissue macrophage

53. What is a plasma cell?
a) An inactivated B cell
b) An early stage of development of B cells
c) A late stage of development of B cells
d) A cell of the innate immune system
e) A pluripotent stem cell

54. What is the function of a plasma cell?
a) To produce interleukins
b) To produce cytokines
c) To participate in cell mediated cytotoxicity
d) To produce antibodies
e) To phagocyte antigens

55. What are vascular addressins:
a) Molecules expressed on the surface of endothelial cells in the cell homing phenomenon

b) Molecules expressed on the surface of T lymphocytes in the cell homing phenomenon
c) Molecules expressed on the surface of B lymphocytes in the cell homing phenomenon
d) Molecules expressed on the surface of dendritic cells in the cell homing phenomenon
e) Molecules expressed on the surface of macrophages in the cell homing phenomenon

56. CD3 surface receptors are specific for:
a) Leukocytes
b) T lymphocytes
c) B lymphocytes
d) Neutrophils
e) Dendritic cells

57. CD4 surface receptor is specific for:
a) Macrophages
b) T helper cells
c) T cytotoxic cells
d) B cells
e) Dendritic cells

58. CD8 surface receptor is specific for:
a) Macrophages
b) T helper cells
c) T cytotoxic cells
d) B cells
e) Dendritic cells

59. MHC class II stimulates only:
a) $CD4^+$ T helper cells
b) $CD8^+$ T cytotoxic cells
c) B cells
d) Plasma cells
e) Macrophages

60. MHC class I stimulates only:
a) B cells
b) Plasma cells
c) Macrophages
d) $CD4^+$ T helper cells
e) $CD8^+$ T cytotoxic cells

61. For the T lymphocytes to be activated, how many signals are necessary?
a) 1 signal
b) 2 signals
c) 3 signals
d) 4 signals
e) 5 signals

62. What is the role of T helper cells?
a) Coordinates the activity of the entire immune system
b) Produces antibodies
c) It is a cytotoxic cell
d) It is a phagocyte

e) It differentiates into a plasma cell

63. What are the main cytokines produced by Th1 helper cells:
a) IL-4 and IL-5
b) IL-9 and IL-13
c) IL-4 and IL-9
d) IL-5 and IL-13
e) IL-2 and interferon-γ (IFN-γ)

64. What antibody can Th1 helper cell help B cells produce?
a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

65. What is the main role of Th1 helper cells?
a) Stimulate IgM production
b) Stimulate cell-mediated immune response
c) Stimulate humoral immune response
d) Stimulate IgE production
e) Stimulate IgA production

66. What are the main cytokines produced by Th2 helper cells:
a) IL-2
b) Interferon-γ
c) IL-21
d) IL-4, IL-5, IL-9 and IL-13
e) IL-22

67. What is the role of Th2 helper cells?
a) Stimulate cell-mediated immune response
b) Stimulate antibody-dependent cell mediated cytotoxicity
c) Stimulate humoral immune response
d) Stimulates phagocytosis
e) Stimulates tissue regeneration

68. What cytokine produced by Th1 cells is inhibitory for Th2 cells?
a) IFN-γ
b) IL-1
c) IL-2
d) IL-4
e) IL-5

69. What cytokine produced by Th2 cells is inhibitory for Th1 cells?
a) IL-4 and IL-5
b) IL-9 and IL-13
c) IL-4 and IL-13
d) IL-5 and IL-13
e) IL-5 and IL-9

70. The common precursor cell of Th1 and Th2 is:
a) Th0

b) Th17
c) Th9
d) Th22
e) B cell

71. NK cells are:
a) Cells of the adaptive immune system
b) Phagocytes
c) Cells of the innate immune cells
d) Phagocytes
e) Antigen presenting cells

72. What is the function of NK cells?
a) Phagocytosis
b) Cytotoxic response
c) Antigen presenting
d) Antibody production
e) Tissue regeneration

73. NK cells take part in:
a) Humoral immune response
b) Phagocytosis
c) Antibody production
d) Antibody-dependent cell mediated cytotoxicity
e) Formation of the membrane attack complex (MAC)

74. The killer inhibitory receptors (KIRs) on NK cells are activated by:
a) MHC class I
b) MHC class II
c) PAMPs
d) PRRs
e) NKR

75. The only self-cells that can be attacked by NK cells are cells that:
a) Up-regulated MHC class I expression
b) Down-regulated MHC class I expression
c) Up-regulated MHC class II expression
d) Down-regulated MHC class II expression
e) Present PAMPs

76. Cytotoxicity mediated by $CD8^+$ T cells is:
a) An MHC class I restricted phenomenon
b) An MHC Class II restricted phenomenon
c) Antibody-dependent cell mediated cytotoxicity
d) Frustrated phagocytosis
e) Complement mediated lysis

77. Cytotoxic $CD8^+$ cells contains granules with:
a) Heparin
b) Histamine
c) Perforin
d) Cytokines

e) Antibodies

78. Cytotoxic $CD8^+$ cells can secrete:
a) IFN-γ and TNF-α
b) IL-2 and IFN-γ
c) IL-4 and IL-5
d) IL-9 and IL-13
e) IL-8

79. Cytotoxic CD8+ cells can induce apoptosis through:
a) Fas ligand
b) Production of IL-2 and IFN-γ
c) Production of IL-4 and IL-5
d) Production of IL-9 and IL-13
e) Production of IL-8

80. IFN-γ and TNF-α production by Cytotoxic $CD8^+$ cells leads to:
a) Phagocytosis
b) Cytotoxicity
c) Assemble of the MAC
d) Antibody production
e) Apoptosis of target cell

81. Natural Killer T cells are:
a) $CD8^+$
b) $CD4^+$
c) $CD8^+$ and $CD4^+$
d) $CD1d^+$
e) $CD21^+$

82. How do B cells interact with the antigen?
a) B cell has no requirement for antigen processing and may directly recognize antigen
b) B cell requires antigen processing by antigen presenting cells
c) B cell recognize antigen only through MHC class I
d) B cell recognize antigen only through MHC class II
e) B cell recognize antigen only if presented by Th cells

83. How many signals are necessary for the activation of B lymphocytes:
a) One signal
b) Two signals
c) Three signals
d) Four signals
e) Five signals

84. The third signal of B lymphocyte activation consists of:
a) recognition of antigenic epitope by the surface membrane BCR
b) Intermolecular interactions with Th cells
c) Co-stimulatory cytokine released by the Th cell
d) B cells transforms morphologically to become a B lymphoblast
e) Immunoglobulin class switching

85. The result of B cell activation is:
a) Immunoglobulin class switch

b) Interleukin production
c) Cytotoxicity
d) Phagocytosis
e) Antigen presentation

86. Where is the site for B cell activation:
a) The bone marrow
b) The thymus
c) The lymph nodes
d) In the attacked tissue
e) In Bursa Fabricius

87. What is the name of the area of lymphoid tissue within which B lymphocytes reside?
a) Follicle
b) Periarteriolar lymphoid sheath (PALS)
c) High endothelial venules
d) Red pulp
e) Capsule

88. Which one is the activated follicle?
a) Primary follicle
b) Secondary follicle
c) High endothelial venules
d) Periarteriolar lymphoid sheath (PALS)
e) White pulp

89. Which follicle has a germinal center?
a) Primary follicle
b) Secondary follicle
c) High endothelial venules
d) Periarteriolar lymphoid sheath (PALS)
e) White pulp

90. Which one is the inactivated follicle:
a) Primary follicle
b) Secondary follicle
c) High endothelial venules
d) Periarteriolar lymphoid sheath (PALS)
e) White pulp

91. Where does negative selection of activated B cells carrying low affinity receptors takes place?
a) In the primary follicle
b) In the dark zone of the secondary follicle
c) In the light zone of the secondary follicle
d) In the bone marrow
e) In Bursa Fabricius

92. The heavy chain variable region is encoded by which segments:
a) Variable (V), diversity (D) and joining (J) region
b) Variable (V) and diversity (D) region
c) Variable (V) and joining (J) region
d) Diversity (D) and joining(J) region

e) Variable (V) region

93. The light chain variable region is encoded by which segments:

a) Variable (V) and joining (J) regions
b) Variable (V) and diversity (D) regions
c) Diversity (D) and Joining (J) regions
d) Variable (V), diversity (D) and joining (J) region
e) Variable (V) region

94. Which type of antigen is faster at activating antigen specific B cells:

a) T-dependent antigen
b) T independent antigen
c) Heteroantigens
d) Alloantigens
e) Xenoantigens

95. How many days it takes before specific antibodies are detected in the serum for a T independent antigen?

a) 1-2 days
b) 2-7 days
c) 4-10 days
d) 7-14 days
e) 14-21 days

96. How many days it takes before specific antibodies are detected in the serum for a T-dependent antigen?

a) 1-2 days
b) 2-7 days
c) 4-10 days
d) 7-14 days
e) 14-21 days

97. Which is the first class of antibody to appear in the serum during the primary immune response?

a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

98. Which class of antibodies will primarily appear in the secondary immune response?

a) IgG
b) IgM
c) IgA
d) IgE
e) IgD

99. The primary immune response ends with the formation of:

a) IgM antibodies
b) Memory NK cells
c) Memory T and B cells
d) Antibodies which are going to last forever in the serum
e) Specialized phagocytes

100. The secondary immune response:

a) Is weaker than the primary immune response
b) Is less specific than the primary immune response
c) Has a lower titer of antibodies than the primary immune response
d) Takes longer to achieve the necessary antibody titer than the primary immune response
e) Is more potent than the primary immune response