

**AFIP MINIBOARD EXAMINATION  
MAY 2007**

**GENERAL PATHOLOGY**

1. Which is the best indicator of irreversible cell injury?
  - A. Clumping of chromatin
  - B. Inactivation of sodium pump
  - C. Severe mitochondrial damage
  - D. Changes in nuclear structure and function
  - E. Damage to the rough endoplasmic reticulum
  
2. Which apoptotic pathway is involved of the deletion of cytotoxic lymphocytes:
  - A. FAS
  - B. RIP
  - C. TNF
  - D. TRADD
  - E. Caspase-3
  
3. All are true about survivin, EXCEPT:
  1. It is widely expressed in normal adult tissues
  2. Its expression in neoplasms is associated with a poorer prognosis
  3. It is expressed primarily in the G1 phase of the cell cycle
  4. The BIR domain is critical for its antiapoptotic function
  5. It is important in embryonic development
  - A. 1
  - B. 1, 2, 3
  - C. 1, 3
  - D. 2, 4
  - E. 2, 4, 5

4. The protein that keeps  $\beta$ -catenin levels low in the cytoplasm of resting cells is:
- A. ABL
  - B. APC
  - C. ERM
  - D. INK
  - E. MYC
5. Regarding Natural Killer (NK) cells, all of the following are true EXCEPT:
- A. NK cells destroy target cells by releasing perforin and granzymes
  - B. NK cells attack tumor cells expressing high levels of MHC class I molecules
  - C. NK cells are distinguished from T cells and B cells by CD56
  - D. NK cells are distinguished from other lymphoid cells by CD16
  - E. NK cells participate in antibody-dependent cell-mediated cytotoxicity
6. All of the following are CC chemokines EXCEPT:
- A. IL-8
  - B. RANTES
  - C. MCP-1
  - D. MIP-1 alpha
  - E. Eotaxin

7. Which of the following has homology with epidermal growth factor and binds to EGFR:
- A. HGF
  - B. VEGF
  - C. TGF- $\alpha$
  - D. TGF- $\beta$
  - E. PDGF
8. The multiplicity of stem cell differentiation options is termed:
- A. Transdifferentiation
  - B. Asymmetric replication
  - C. Multipotent progenitoration
  - D. Tissue-proliferative activity
  - E. Developmental plasticity
9. A passive process resulting from impaired blood outflow from a tissue is:
- A. Edema
  - B. Congestion
  - C. Hyperemia
  - D. Hemostasis
  - E. Hemorrhage

10. All of the following are antithrombotic EXCEPT:
- A. Antithrombin III
  - B. Endothelial prostacyclin
  - C. Adenosine diphosphatase
  - D. Tissue factor pathway inhibitor
  - E. Plasminogen activator inhibitors (PAI)
11. Regarding vascular leakage and the formation of endothelial gaps, all are true EXCEPT:
- A. Formation of endothelial gaps is the most common mechanism of vascular leakage
  - B. It can be elicited by histamine, bradykinin and leukotrienes
  - C. It affects venules and arterioles
  - D. It is usually reversible
  - E. It is short-lived
12. Put the following steps of leukocyte extravasation in the correct order.
- 1. Rolling
  - 2. Migration in interstitium
  - 3. Adhesion
  - 4. Transmigration across endothelium
  - 5. Margination
- A. 1, 5, 3, 4, 2
  - B. 5, 1, 3, 4, 2
  - C. 3, 1, 5, 2, 4
  - D. 1, 3, 2, 5, 4
  - E. 3, 1, 5, 4, 2

13. All of the following are pro-apoptotic EXCEPT:
- A. Bak
  - B. Bid
  - C. Bim
  - D. Bcl-x
  - E. C&D
14. Which of the following are important in recognition of apoptotic cells for phagocytosis?
- A. C3b
  - B. Thrombospondin
  - C. Thrombomodulin
  - D. Phosphatidylserine
  - E. B&D
15. The chemical class considered to be highly potent procarcinogens is:
- A. Phorbol esters
  - B. Acylating agents
  - C. Alkylating agents
  - D. Estrogenic compounds
  - E. Polycyclic aromatic hydrocarbons

16. The molecule that complexes with cyclin D to allow cell cycle progression through the G<sub>1</sub> restriction point is:
- A. CDK1
  - B. CDK2
  - C. CDK3
  - D. CDK4
  - E. CDK5
17. The lungs are considered the anaphylactic shock organ for all of the following EXCEPT:
- A. Cattle and sheep
  - B. Horses
  - C. Pigs
  - D. Dogs
  - E. Cats
18. The ligand for Toll-like receptor 4 (TLR4) is:
- A. Lipoproteins
  - B. Peptidoglycan
  - C. Lipoarabinomannan
  - D. Flagellin
  - E. Lipopolysaccharide

19. “Contact inhibition,” the inhibition of cell proliferation that occurs when cells touch each other, is mediated by:
- A. Cadherins and catenins
  - B. Catenins and selectins
  - C. Selectins and fibronectin
  - D. Fibronectin and integrins
  - E. Integrins and cadherins
20. During angiogenesis, new vessel “stabilization” involves all of the following EXCEPT:
- A. Angiopoietin 1
  - B. *Tie2*
  - C. PDGF
  - D. SPARC
  - E. TGF- $\beta$
21. All of the following are fibrinolytic EXCEPT:
- A. Plasmin
  - B. Activated Factor XII
  - C. Bacterial streptokinase
  - D. Tissue plasminogen activator (tPA)
  - E. Plasminogen activator inhibitors (PAIs)

22. Platelet dense bodies contain all of the following EXCEPT:
- A. Adenine nucleotides (ADP)
  - B. Ionized calcium
  - C. Fibrinogen
  - D. Histamine
  - E. Serotonin
23. The major source of histamine is:
- 1. Neutrophils
  - 2. Mast cells
  - 3. Basophils
  - 4. Platelets
  - 5. Macrophages
- A. 1
  - B. 2, 3
  - C. 2, 3, 4
  - D. 3, 4
  - E. 4, 5
24. Regarding the complement system, all of the following are true EXCEPT:
- A. Complement proteins are found mostly in the plasma
  - B. It functions only in innate immunity
  - C. The critical step in the cascade is the activation of C3
  - D. C5a is a powerful chemotactic agent of neutrophils
  - E. The alternative pathway can be triggered by microbial surface molecules

25. What inhibits Fas-FasL mediated apoptosis by binding to pro-caspase 8?
- A. bid
  - B. FLIP
  - C. bcl-x
  - D. NF-kB
  - E. TRADD
26. What is the function of the ubiquitin-proteasome pathway?
- A. Apoptosis
  - B. Protein degradation
  - C. Intracellular signaling
  - D. Receptor mediated signaling
  - E. Alternative method of complement activation
27. The enzyme responsible for causing compaction of chromatin in the resting cell is:
- A. PI-3 kinase
  - B. Histone deacetylase
  - C. CDC25 phosphatase
  - D. Dihydrofolate reductase
  - E. Chromatin 3'-phosphatase

28. The function of the lethal factor (LF) subunit of anthrax toxin is to:
- A. Convert ATP to cAMP
  - B. Destroy MAPK kinases
  - C. Induce actin polymerization
  - D. Bind calcium and calmodulin
  - E. Form a selective channel in the endosome membrane
29. All of the following are considered part of the innate immune system EXCEPT:
- A. Epithelial barriers
  - B. Phagocytic cells
  - C. Proteins of the complement system
  - D. T lymphocytes
  - E. Natural killer cells
30. Which immunoglobulins constitute the antigen binding component of the B-cell receptor complex and are present on the surface of all naïve B cells:
- 1. IgA
  - 2. IgG
  - 3. IgM
  - 4. IgD
  - 5. IgE
- A. 1, 2, and 3
  - B. 2 and 3
  - C. 3 and 4
  - D. 1, 3, and 4
  - E. 3, 4, and 5

31. During wound healing, collagenase secretion is promoted by all of the following EXCEPT:
- A. PDGF
  - B. FGF
  - C. EGF
  - D. TNF
  - E. TGF- $\beta$
32. Mechanical force on a cell causes activation of intracellular signal transduction pathways due to linkages of:
- A. Integrin, focal adhesion complexes, and actin
  - B. Tissue fibronectin, laminin, and PI3-kinase
  - C. Receptor-ligand complex, GRB2, RAF
  - D. Proteoglycans, integrins, and selectin
  - E. EGF, EGFR, and PLC- $\gamma$
33. Synthesis of all the following factors is dependent on Vitamin K EXCEPT:
- A. Factor XII
  - B. Factor VII
  - C. Factor IX
  - D. Factor II
  - E. Factor X

34. Glanzmann's thrombasthenia is characterized by a deficiency or absence of:
- A. von Willebrand factor (vWF)
  - B. Gp IIb-IIIa complex
  - C. Fibrinogen
  - D. Protein C
  - E. Gp Ib
35. The prostaglandins PGI<sub>2</sub>, PGE<sub>1</sub>, PGE<sub>2</sub> and PGD<sub>2</sub> predominately cause:
- A. Vasodilation
  - B. Vasoconstriction
  - C. Increased vascular permeability
  - D. Chemotaxis
  - E. Leukocyte adhesion
36. All of the following are present in the azurophil granules of neutrophils EXCEPT:
- A. Myeloperoxidase
  - B. Lysozyme
  - C. Elastase
  - D. Alkaline phosphatase
  - E. Acid hydrolases

37. All of the following are true regarding apoptosis EXCEPT:
- A. Apaf-1 inactivates Caspase-9
  - B. Caspase-8 and Caspase-9 are initiator caspases
  - C. Caspase-3 and Caspase-6 are executioner caspases
  - D. Typically does not initiate an inflammatory response
  - E. B&C
38. The transition from respiratory epithelium to stratified squamous epithelium with vitamin A deficiency is an example of:
- A. Atrophy
  - B. Dysplasia
  - C. Metaplasia
  - D. Hypertrophy
  - E. B&D
39. Which cell is the most important antigen-presenting cell for initiating primary immune responses against protein antigens:
- A. Follicular dendritic cell
  - B. Macrophage
  - C. Natural killer cell
  - D. Interdigitating dendritic cell
  - E. B cell

40. Which of the following hypersensitivity reactions involve T cell-mediated cytotoxicity:
- A. Type I hypersensitivity reaction
  - B. Type II hypersensitivity reaction
  - C. Type III hypersensitivity reaction
  - D. Type IV hypersensitivity reaction
  - E. None of the above
41. In neutrophils, all of the following are involved in the *respiratory burst of phagocytosis*, EXCEPT:
- A. Increased glucose metabolism via the hexose monophosphate shunt
  - B. Increased *NRamp1*-mediated nitric oxide production
  - C. Increased cellular oxygen consumption
  - D. Increased hydrogen peroxide formation
  - E. Increased superoxide anion generation
42. The correct sequence of events in leukocyte activation and stimulus-response coupling is:
1. Membrane phosphoinositol turnover
  2. Phospholipase C activation
  3. Protein kinase activation
  4. G-protein activation
- A. 1 > 3 > 4 > 2
  - B. 3 > 1 > 2 > 4
  - C. 2 > 3 > 1 > 4
  - D. 1 > 2 > 4 > 3
  - E. 4 > 2 > 1 > 3

43. All of the following are important mediators in vascular repair EXCEPT:

- A. Vascular endothelial growth factor (VEGF)
- B. Platelet-derived growth factor (PDGF)
- C. Transforming growth factor- $\beta$  (TGF- $\beta$ )
- D. Epidermal growth factor (EGF)
- E. Protease nexin II

44. All of the following cause increased microvascular permeability EXCEPT:

- A. Histamine
- B. Bradykinin
- C. Leukotrienes
- D. Annexin II
- E. Substance P

45. All of the following initiate cell proliferation in epithelia EXCEPT:

- A. EGF
- B. TGF-B
- C. KGF
- D. NGF
- E. HGF

46. Which inflammatory cell is often present in chronic inflammatory lesions because of its production of proteolytic enzymes such as chymase and tryptase?
- A. Mast cells
  - B. Neutrophils
  - C. Macrophages
  - D. Lymphocytes
  - E. Plasma cells
47. All of the following can cause metastatic calcification EXCEPT:
- A. Lymphoma
  - B. Renal failure
  - C. Osteosarcoma
  - D. *Cestrum diurnum*
  - E. *Mycobacterium bovis*
48. All of the following are true regarding reactive amyloid (AA) EXCEPT:
- A. Induced by IL-1 and IL-6
  - B. Formed from SAA secreted by the liver
  - C. Form found in equine nasal amyloidosis
  - D. Most commonly deposited in the space of Disse in birds
  - E. Form found in hereditary amyloidosis in Shar-Pei dogs and Abyssinian cats

49. Regarding equine severe combined immunodeficiency, all of the following are true EXCEPT:
- A. There is a defect in DNA-dependent protein kinase catalytic subunit
  - B. There are normal numbers of functional T cells
  - C. There are normal numbers of functional NK cells
  - D. Foals cannot produce antibodies and are agammaglobulinemic
  - E. There are no functional B cells
50. The pivotal event in the mitochondrial pathway of apoptosis is:
- A. Transcription of Bax and Bak
  - B. Activation of APAF-1
  - C. Activated caspase-9 cleavage of caspase-3 and caspase-7
  - D. Mitochondrial outer membrane permeabilization
  - E. Sequestration of Smac and Omi in the mitochondrial intermembrane space