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University Examinations 2023/2024

FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL LABORATORY

HML 3125: FUNDAMENTALS OF IMMUNOLOGY

DATE: APRIL 2024 **TIME:3 HOURS**

INSTRUCTIONS: Answer all questions

SECTION A: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Which of the following statements best characterizes an antibody?
    a) An antibody contains high molecular weight RNA as its basic structure.
    b) An antibody is composed of protein and cannot be distinguished from the albumin fraction of the serum proteins.
    c) An antibody is composed of four identical protein subunits, which may be caused to dissociate by treatment with urea.
    d) An antibody contains protein as its major chemical component, and its synthesis may be elicited by administering a foreign protein or polysaccharide. Natural killer cells are
2. A positive tuberculin skin test (a delayed hypersensitivity reaction) indicates that
    a) a humoral immune response has occurred.
    b) a cell-mediated immune response has occurred.
    c) both the T and B cell systems are functional.
    d) only the B cell system is functional

3. Idiotypic determinants are located within

a) hyper-variable regions of heavy and light chains.
b) constant regions of light chains.
c) constant regions of heavy chains.
d) the hinge region

4. What effect might the injection of soluble CD4 molecule have on the immune system of an AIDS patient?

a) It might serve to prevent the attachment of mature HIV-I viral particles to the helper T cell membrane.
b) It might bind to CXCR4 chemokine receptors and initiate chemotaxis.
c) It might bind to CD3 molecules and activate T cell function.
d) All of the above.

5. Some forms of autoimmune disease result from autoantibodies that bind to receptors on the cell surface. Antibodies that bind to these receptors can cause disease by

a) Activating complement and causing cell lysis
b) Blocking normal ligand binding to the receptor
c) Providing persistent stimulation through the receptor that is not regulated normally
d) All of the above

6. Autoimmune disease has been treated experimentally by giving a lethal dose of irradiation, followed by injection of bone marrow from a healthy donor. How would you monitor the success of the transplanted material in the regeneration of the immune response in the irradiated host?

a) Measure the ability of cells from the peripheral blood of the patient to proliferate in response to stimulation with lectin.
b) Measure the levels of circulating antibody.
c) Count the number of circulating lymphocytes in the peripheral blood.
d) All of the above

7. All of the following are true about antibodies, EXCEPT which one?

a) They are glycoproteins.
b) They are molecules with a single, defined amino acid sequence.

c) They fix complement.

d) They predominate the primary immune response to antigen

8. When skin is transplanted in syngeneic exchanges there is a stage where the skin can appear pinker than once the graft has become well established. The cause of this change is often a result of

a) vascular leakage and bruising

b) excess capillary overgrowth caused by angiogenic factors

c) increased red pigmentation in the transplanted tissue

d) all of the above

9. HIV infection has been successfully treated in a few human patients by whole body irradiation followed with transplantation of hematopoietic stem cells from a CCR5 mutant donor. Why might this work?

a) the absence of CCR5 means that the patient is unable to sustain any viral infection.

b) since CCR5 is a coreceptor for HIV, the speed ofHIV viral infection is diminished, and normal hematopoiesis by the transplanted immune cells can keep up with cell death caused by the virus

c) CCR5 is responsible for chemotactic movement, enabling rapid responses to the viral infection

d) CCR5 is an important part of class I antigen presentation, enabling CTL killing of virally infected cells

10. Why does anti-CD4 antibody treatment extend the average allograft survival time more than anti-CD8 antibody treatment?

a) because anti-CD4 can kill macrophages

b) because anti-CD4 will disrupt the contribution to many different immune mechanisms that includes CTLs while anti-CD-8 only disrupts CTL function

c) because anti-CD4 antibody is better at activating complement

d) because anti-CD8 activity is an activator of helper T cell ftlnction

11. What is a possible undesirable outcome of transplanting bone marrow to allogeneic recipients that have had whole body irradiation to erase their own immune response?

a) they can develop systemic lupus erythematosus
b) they can develop DiGeorge syndrome
c) they can develop a specific allergic phenotype to peanuts
d) they can develop graft versus host disease

12. Which of the following is NOT true about HIV binding (attachment) to a target cell?

a) GPI 20 binds to a receptor on CD4+ cells
b) Binding triggers fusion of the viral and host cell membranes
c) Nucleoside analogs interfere with GPI 20 rearrangement required for binding
d) CCR5 and CXCR4 mutations can block HIV from entering the cell

13. What kind of event can support tumor growth past a limit imposed by diffusion of nutrients?

a) angiogenesis
b) complement inactivation
c) macrophage activation
d) telomerase inactivation

14. Apoptosis ordinarily serves to prevent the development of an autoimmune response to the dying cells. This is because:

a) The apoptosis of macrophages will limit their ability to present antigen
b) Apoptotic cell death eliminates the inter-digital tissues in the hands of the fetus
c) Apoptosis prevents the release of immunogenic intracellular antigens that would promote inflammation.
d) Necrosis follows the apoptotic process

15. Why does the CD4/CD8 ratio flip as patients progress in AIDS?

a) the number ofCD4 cells increase as the disease progresses
b) CD8 cells are depleted as they attach the virus

c) the number of macrophages expressing CD4 increases with disease progression

d) CD4 cells decrease in number for several reasons, including CTL killing of virally infected target

16. Why would an anti-idiotypic antibody be useful for treatment of a B cell tumor?

a) it might activate complement and kill the specific B cell tumor, leaving other B cells alone

b) it would activate the T cell compartment to kill the tumor

c) it would suppress complement activation

d) it would prevent metastasis it would activate PMN

17. Which immunoglobulin is the principal one found in secretions such as milk?

a) lgA

b) lgE

c) lgG

d) lgM

SECTION B: SHORT ANSWER QUESTIONS (40 Marks)

1. Giving maturity site for each, differentiate between B lymphocytes and T Lymphocytes antibodies (4 Marks)
2. Describe characteristic features of the acquired immune defense mechanism (4 marks)
3. Outline three characteristics of phagocytic cells (6 marks)
4. Differentiate between innate and acquired immunity (4marks)
5. Describe the term apoptosis (4 marks)
6. Describe role of mast cell during an Allergic reaction (6 Marks)
7. Describe the binding forces between antibodies and antigens (6 Marks)
8. Giving examples, describe types of the specific immunity (8 Marks)
9. Describe the term “self and non self recognition” (3 marks)

SECTION C: LONG ANSWER QUESTIONS (40 MARKS)

1. With the AID of a Table showing practical representation, describe the ABO blood grouping Technique (10 Marks)
2. Describe 5 antibody classes clearly showing duties performed by each (10 marks)
3. Describe factors under which the first line immune defense mechanism operate (10 Marks)
4. With the aid of a sketch, describe the humoral and cell mediated pathways (10 Marks)
5. Describe factors that make antigens immunogenic (10 Marks)