

IMMUNOLOGY

1. The formation of memory immune responses is the objective of vaccination. Immunological memory is predominantly the function of which of the following?

- A. The complement system.
- B. Cells bearing pattern-recognition receptor molecules.
- C. Cells of the adaptive immune system.
- D. Molecules comprising the chemical barrier.
- E. All of the above

2. Which of the following convey the longest lasting immunity to an infectious agent?

- A. Naturally acquired passive immunity
- B. Artificially acquired passive immunity
- C. Naturally acquired active immunity
- D. All of the above
- E. None of the above

3. Which of the following substances will not stimulate an immune response unless they are bound to a larger molecule?

- A. Antigen
- B. Virus
- C. Hapten
- D. Miligen
- e. Antibody

4. B and T cells are produced by stem cells that are formed in:

- A. Bone marrow
- B. The liver
- C. The circulatory system
- D. The spleen
- E. The lymph nodes

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5. B cells mature in the..... while T cells mature in the.....

- A. Thymus/bone marrow and gut associated lymphoid tissue (GALT)
- B. Spleen/bone marrow and GALT
- C. Bone marrow and GALT/Thymus
- D. Liver/Kidneys
- E. GALT and Thymus

6. Which of the following immune cells/molecules are most effective at destroying intracellular pathogens?

- A. T helper cells
- B. B cells
- C. Antibodies
- D. Complement
- E. T cytolytic cells

7. A living microbe with reduced virulence that is used for vaccination is considered:

- A. A toxoid
- B. Dormant
- C. Virulent
- D. Attenuated
- E. Denatured

8. B cells that produce and release large amounts of antibody are called:

- A. Memory cells
- B. Basophils
- C. Plasma cells
- D. Killer cells
- E. Neutrophils

9. The specificity of an antibody is due to:

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- A. its valence
- B. The heavy chains
- C. The Fc portion of the molecule
- D. The variable portion of the heavy and light chain
- E. All of the above

10. In agglutination reactions, the antigen is a.....

in precipitation reactions, the antigen is a.....

- A. whole cell/soluble molecule
- B. Soluble molecule/whole cell
- C. Bacterium/virus
- D. Protein/carbohydrates
- E. Protein/Antibody

11. B Cells are activated by:

- A. Complement
- B. Antibody
- C. Interferon
- D. Memory cells
- E. Antigen

12. Fusion between a plasma cell and a tumor cell creates a:

- A. Myeloma
- B. Natural killer cell
- C. Lymphoblast
- D. Lymphoma
- E. Hybridoma

13. Monoclonal antibodies recognize a single:

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- A. Antigen
- B. Bacterium
- C. Epitope
- D. B cell
- E. Virus

14. Cell mediated immunity is carried out by..... while humoral immunity is mainly carried out by.....

- A. B cells/T cells
- B. Epitopes/Antigens
- C. T cells/B cells
- D. Antibodies/Antigens
- E. Antibodies/Phagocytes

15. The ability of the immune system to recognize self antigens versus non self-antigen is an example of:

- A. Specific immunity
- B. Tolerance
- C. Cell mediated immunity
- D. Antigenic immunity
- E. Humoral immunity

16. All the following is required in B-cell class switch, except?

- A. Peptide Antigen.
- B.Th1 Cytokines profile.
- C.CD40-CD40L
- D. MHC II-TCR
- E. IL4-IL5

17. A 24 months old boy with recurrent superficial infections, and lymphadenopathy.Presented with fever, left leg pain, swelling, erythema and inguinal lymphadenopathy. You diagnosis was cellulitis.

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After admission and IV antibiotics an inguinal lymph node biopsy was taken for acid-fast stain and culture. Pathology reports a non-caseating granuloma and culture growing Serratia Spp. What is the diagnosis?

- A. Chronic granulomatous disease.
- B. ataxia telangiectasia.
- C. SCID.
- D. Wiscott-Aldrich syndrome.
- E. Bruton's syndrome (X-linked agammaglobulinemia)

18. In all the following vaccines which one doesn't produce longstanding memory cells?

- A. Pneumococcal polysaccharide vaccine (PPSV)
- B. Haemophilus influenzae type B vaccine (Hib)
- C. heptavalent pneumococcal conjugate vaccine (PCV 7)
- D. measles mumps and rubella vaccine (MMR)
- E. HPV vaccine

19. In severe combined immune deficiency (SCID), the patients are deficient in:

- A. B cells
- B. T cells
- C. both A and B
- D. IgA
- E. NK cells

20. A 2-year-old child with a sore throat is tested for antistreptococcal antibody to see if the infection is due to this bacterium. The child is found to have only IgG antibodies to this organism with no detectable IgM. This indicates which of the following?

- A. Remote, not a current, infection with streptococcus.
- B. Passive transfer of maternal IgG across the placenta.
- C. An immunodeficiency disease in which only IgM is lacking.

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D. Overwhelming infection with streptococcus.

E. None of the above

21. The sibling of a child with strep throat is tested for antistreptococcal antibodies and found to have none (neither IgM nor IgG). Which of the following is one possible interpretation of these results?

A. The sibling has a memory response.

B. The sibling had previous exposure to the bacteria.

C. The sibling was tested during the latent period.

D. The sibling recovered quickly from the infection, already clearing the bacteria

E. Need further testing, cannot tell from the antistreptococcal antibodies test

22. A patient is treated with humanized monoclonal antibody against his tumor cells. This antibody molecule is genetically engineered such that the mouse portion that determines antigen specificity is transcribed and translated with the remainder of the antibody molecule derived from human. The portion from mouse antibody would be found in which of the following?

A. μ chain only.

B. Allotype.

C. Variable region.

D. kappa chain.

E. Isotype.

23. You enter a dusty room, feel an itch in your nose, and sneeze. This is an example of the operation of which of the following innate immune mechanism?

A. The released granular contents of your granulocytes.

B. The low pH of the environment.

C. The physical barrier produced by hairs.

D. Phagocytosis by macrophages.

E. Mucus combined with the movement of cilia of the lining cells

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24. When they infect a cell, some viruses cause downregulation of the cell membrane major histocompatibility complex (MHC) class I molecules. This is a mechanism to evade cytotoxic T cells, which recognize infected cells displaying virus-derived peptides bound to MHC. However, downregulation of MHC class I molecules makes the virally infected cell a target of which of the following?

- A. Macrophages.
- B. Neutrophils.
- C. Natural killer (NK) cells.
- D. B cells.
- E. Dendritic cells.

25. When an individual encounters Gram-negative bacteria (if the organisms survive the physical and chemical barriers), they may be recognized on first encounter by the innate immune system via which of the following?

- A. Antibodies.
- B. Coagulation cascade components.
- C. Toll-like receptors (TLRs).
- D. The membrane attack complex (MAC).
- E. NK cells

26. The inability of very young children to respond to the measles vaccine due to the persistence of maternal antibody is similar in principle to and exploited in which of the following?

- A. Low dose tolerance regimens.
- B. Tolerance to self antigens.
- C. Neonatal inability to respond to T-independent antigens.
- D. Passive immunization as a means of preventing active sensitization (e.g., Rhogam injections).
- E. All of the above

27. The parents of a child with X-linked agammaglobulinemia (Bruton's agammaglobulinemia) g've a family history of a male cousin dying following vaccination. Which vaccine could have caused this catastrophic result?

- A. Diphtheria

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- B. Oral polio vaccine (Sabin)
- C. Hepatitis B vaccine
- D. Pertussis vaccine
- E. Pneumococcus vaccine

28. A patient with hepatitis B chronic infection inquires about receiving the hepatitis B vaccine to cure him of the virus. You explain that this will not work because of which of the following?

- A. His immune system cannot respond to the virus as documented by the fact that he is infected.
- B. The virally infected liver cells will not express viral antigen.
- C. The vaccine stimulates the production of antibody, which prevents infection of host cells.
- D. Virus-specific CTLs will kill his liver cells
- E. All of the above

29. Some tumor cells characteristically re-express antigens found only early in normal development of that cell type. One example of this is which of the following protein/tumor pairs?

- A. CD20 and B cell neoplasm.
- B. Prostate-specific antigen (PSA) and prostatic adenocarcinoma.
- C. E6/E7 and cervical carcinoma.
- D. alpha-fetoprotein (AFP) and hepatocellular carcinoma.
- E. Human epidermal growth factor receptor (HER) and breast carcinoma.

30. Immunosuppressed patients are uniquely more susceptible to the development of tumors caused by which of the following?

- A. Familial genetic mutations.
- B. Proto-oncogene mutation.
- C. Oncogenic virus.
- D. Chemical carcinogens.
- E. UV radiation.

31. Patients with advanced stage chronic lymphocytic leukemia, a B-cell neoplasm, were treated with anti-CD20 Fab fragment bound to a radioactive molecule for directed killing. Surprisingly, use of an

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intact anti-CD20 molecule without attached toxin or radioactive molecule was found to be as effective as the radioactive preparation with less toxicity on normal cells (radioactivity killed surrounding normal hematopoietic cells in the bone marrow). The intact immunoglobulin was needed to do which of the following?

- A. Bind more effectively to the tumor cells.
- B. Provide Fc biological properties (complement binding; opsonization).
- C. Allow targeting by CTLs.
- D. Block CTLA4 on T cells.
- E. Recruit NK cells

32. Currently, the only successful preventive antitumor vaccine is directed at which of the following?

- A. Preventing the establishment of a viral infection.
- B. Increasing the antigenicity of tumor cells.
- C. Blocking T cell suppression.
- D. Augmenting ADCC.
- E. Increasing antibody from B cells

33. An 8-year-old girl is suffering from hyper-IgM syndrome due to a mutation in AID. In contrast to male patients with X-linked hyper-IgM syndrome, this girl is expected to have which of the following?

- A. Normal immunoglobulin responses to viral vaccines.
- B. Normal numbers of IgA⁺ plasma cells in mucosal-associated lymphoid tissue (MALT).
- C. Normal T cell proliferative responses to mitogens.
- D. Normal DTH responses to commonly encountered fungal antigens such as Candida.
- E. Both A and C

34. A patient with severe symptoms from rheumatoid arthritis is treated with anti-TNF α immunotherapy. This iatrogenically imposed immunodeficiency state may lead to which of the following?

- A. Reactivation of latent tuberculosis (TB).
- B. Reactivation of hepatitis C.
- C. Reactivation of herpes zoster (shingles).

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D. Reactivation of influenza.

E. All of the above

35. In contrast to congenital immunodeficiencies based on mutations in signaling molecules, those based on most single cytokine deficiencies are extremely rare or have never been documented. This lack of clinical phenotype is due to which of the following?

A. Embryonic lethality.

B. Redundancy of action among most cytokines.

C. The presence of intact cytokine receptors.

D. The independence of immune responses on cytokines

E. None of the above

36. Boys with X-linked agammaglobulinemia have a congenital loss-of-function mutation in Btk. An acquired gain-of-function mutation in this molecule may contribute to:

A. B-cell lymphoma development.

B. T-cell immunodeficiency.

C. Tolerance to transplanted organs.

D. Hyper-IgM syndrome.

E. Lack of serum Ig A

37. A pharmaceutical company approaches you for advice. They have developed a new drug that decreases bcl-2 protein synthesis and that, in combination with standard chemotherapy, shows promising results in follicular lymphoma. They would like to use it in other malignancies. Based on the mechanism of action of the drug and the molecular basis and pathophysiology of the diseases, which of the following would be the next best candidate malignancy to test to drug on?

A. Adult T-cell leukemia/lymphoma

B. CLL/small lymphocytic lymphoma (SLL), del 13q12 subset

C. Mantle cell lymphoma

D. Pre-B acute lymphocytic leukemia (ALL)

E. Pre-T ALL

38. A patient with longstanding Sjogren's syndrome calls for an appointment in addition to her normal checkups. She complains of increased swelling on one side in spite of feeling relatively well on her

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mild immunosuppressive therapy. The doctor sends her for a biopsy (small sample) of the parotid gland, which is where the swelling is. The pathology report indicates that it is a lymphoma. What type of lymphoma is most likely to occur in this patient?

- A. Burkitt's lymphoma
- B. Diffuse large B cell lymphoma
- C. MALT lymphoma
- D. Mantle cell lymphoma
- E. Non-Hodgkin's lymphoma

39. An HIV+ patient with poor compliance to medication develops a diffuse large B cell lymphoma. Which of the following is the mechanism believed to underlie the development of this malignancy?

- A. B-cell infection by the abundant HIV now present.
- B. B-cell stimulation by concurrent fungal and bacterial infections.
- C. Uncontrolled expansion and transformation of Epstein–Barr virus (EBV)-infected B cells.
- D. Lack of homeostatic control of B-cell numbers by T cells.
- E. A and B only

40. The most frequent translocation partner seen in lymphoid malignancies involves which of the following genes?

- A. BCR
- B. BCL-2
- C. CCND1 (for cyclin d1).
- D. CD19
- E. c-MYC

41. A patient with a long history of gastric complaints and noncompliance with antibiotics for Helicobacter presents with increased symptoms. A stomach biopsy reveals predominantly small lymphocytes infiltrating the glandular structures. These cells are likely to do which of the following?

- A. Express BCR.
- B. Express CD5.
- C. Express IL-2R α .

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- D. Produce IL-6.
- E. Produce myelin basic protein

42. Pre-T ALL is likely to display which of the following characteristics?

- A. High-density CD3 expression.
- B. High levels of CD25.
- C. Coexpression of CD4 and CD8.
- D. t(11;14) translocation.
- E. None of the above

43. A patient with leukocyte adhesion deficiency (LAD) type I and an abscess (infection) of the skin would be expected to have which of the following?

- A. Neutropenia.
- B. A hypocellular marrow.
- C. Few neutrophils in the abscess.
- D. Giant granules in the neutrophils.
- E. A mutation in a gene for nicotinamide adenine dinucleotide phosphate (NADPH).

44. Organisms and agents most likely to induce a granulomatous DTH response are characterized by which of the following?

- A. They stimulate allergies.
- B. They can be broken down into small peptides for stimulation.
- C. They are indigestible by macrophages.
- D. They bind to self proteins as carriers.
- E. None of the above

45. An individual with hypothyroidism and blocking antibodies specific for thyroid-stimulating hormone receptor has an autoimmune disease based on which type of immune reaction? [Questions 45 and 45 are linked]

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- A. type I
- B. type II
- C. type III
- D. type IV
- E. DTH

46. An individual with hyperthyroidism and stimulating antibodies specific for thyroid-stimulating hormone (TSH) receptor has an autoimmune disease based on which type of immune reaction?

- A. type I
- B. type II
- C. type III
- D. type IV
- E. DTH

47. Untreated pharyngeal infection with β hemolytic streptococci may resolve but may lead to several serious sequelae. One is carditis and a second is post-streptococcus glomerulonephritis. These are examples of which types of hypersensitivity reactions, respectively?

- A. type II and type III
- B. type III and type II
- C. type I and type III
- D. type II and type I
- E. Type II only

48. A 25-year-old man was stung by a bee and had no reaction. The second time he was stung, 6 months later, he had local swelling immediately. There was no reaction the first time because of which of the following? [Questions 48 and 49 are linked]

- A. He was tolerant to bee venom.
- B. He produced only IgM antibodies specific for bee venom.
- C. He had no preformed IgE molecules specific for bee venom.
- D. He had blocking IgG antibodies to bee venom.
- E. He had no mast cells

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49. This same man is stung a third time and goes into anaphylactic shock. This severe reaction is due to which of the following?

- A. a breakdown in tolerance.
- B. cross-reactivity of bee venom with bacterial antigens.
- C. the attenuation of the IgG levels in the time elapsed between challenges.
- D. the higher titers of venom-specific IgE now present in this patient.
- E. A and D

50. The most rapid effects of exposure to an allergen may be due to which of the following?

- A. Leukotrienes.
- B. Granulocytic infiltration.
- C. Metabolites of arachadonic acid.
- D. Histamine.
- E. Kinins

51. A child presents with a history of multiple bacterial infections. You suspect a complement deficiency, specifically C3. You test each individual component of the immune system to see if its function is intact. If you are correct, you will find that which of the following is true?

- A. The patient's macrophages are unable to phagocytize.
- B. The patient's B cells are unable to produce complement-fixing antibodies.
- C. The patient's eosinophils are unable to respond to chemotactic agents.
- D. A, B and C only
- E. The patient's serum is unable to assist in antibody-mediated lysis.

52. Renal disease is very common in SLE but occurs in less than 25% of patients with C3 deficiency. A difference between the patient groups would be which of the following?

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- A. In SLE, the immune complexes in the kidney would contain C3, and in C3 deficiency they would not.
- B. In active SLE, serum C3 levels would be normal, and in C3 deficiency they would be low.
- C. In inactive SLE, serum C3 levels would be high, and in C3 deficiency they would be low.
- D. In active SLE, immune complexes could deposit in joints and skin, and in C3 deficiency they would be only in the kidneys.
- E. A and C

53. The role of complement in rapid response to a first exposure to a variety of organisms involves which of the following?

- A. Fixing to immunoglobulin.
- B. Activation by mannan-binding lectin.
- C. Participation in immune complex formation.
- D. Activation of C1.
- E. Opsonization of antigen

54. Which of the following is part of the mechanism for inducing central tolerance in B cells by clonal deletion?

- A. The presence of soluble antigen.
- B. The ability to undergo receptor editing.
- C. The display of self-antigen in a membrane-bound form.
- D. The activity of a functional autoimmune regulator (AIRE) gene
- E. All of the above

55. A common mechanism required for activating T or B cells in the periphery is which of the following?

- A. Presentation of antigen in the context of MHC.
- B. Presentation of the particulate multivalent form of the antigen.
- C. High avidity of the lymphocyte's receptor for the antigen.
- D. A,B and C
- E. Interaction through costimulatory molecules as a second signal.

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54. Rejection of solid organ transplants may involve either humoral or cell-mediated immunity or both. In order to prevent T cells of organ transplant recipients from reacting to the transplanted tissue and to possibly induce tolerance in the recipient, numerous biological therapeutic agents have been developed and tried. Which of the following is one that might achieve that goal?

- A. Decoy molecule for CD28.
- B. Blocking antibody for CD40-CD40L.
- C. BAFF inhibitor.
- D. Fas inhibitor.
- E. TGF- β

55. A patient seeing a rheumatologist for the first time is asked to fill out forms that include questions about family history. She recalls many family members with "arthritis," including her grandmother and great-aunt. Her mother has systemic lupus erythematosus (SLE) with arthritis symptoms and renal disease. Her mother's siblings are healthy, as are the patient's father and younger sister. This family history is most suggestive of which of the following?

- A. A microbial infection common to all afflicted family members.
- B. X-linked Mendelian genetics.
- C. An environmental exposure that her mother encountered while growing up.
- D. Bad luck.
- E. A genetic predisposition.

56. Injection of myelin basic protein (MBP) with adjuvant into mice produces experimental autoimmune encephalomyelitis (EAE), an animal model of multiple sclerosis. Pretreatment of the mice with low oral doses of MBP alone prevents disease development. This suggests the production of which of the following?

- A. Blocking antibodies.
- B. TH₁₇ cells.
- C. TH₁ cell predominance.
- D. T_{reg} cells.
- E. NK cells

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57. Hormonal systems are commonly characterized by feedback inhibition. In contrast to hormones, many cytokines amplify responses by upregulation of their own receptors on target cells. An example of this mechanism is seen in which of the following?

- A. The differential cytokine expression of TH1 and TH2 cells.
- B. The chemokine concentration gradient resulting in chemotaxis.
- C. The stimulation of CD4+ T cells by IL-2.
- D. The effect of cytokines on osteoblastic differentiation.
- E. None of the above

58. A patient presents with a bacterial infection characterized by fever. This fever is due to which of the following?

- A. Proliferation of the bacteria.
- B. Antibody responses to the bacteria.
- C. Bacterial infection of the hypothalamus.
- D. Opsonization of the bacteria.
- E. Cytokines produced by phagocytes

59. Following a skin abrasion and local minor infection, scar tissue is normally formed. This is due to proliferation of fibroblasts and deposition of extracellular material and is stimulated by which of the following?

- A. Granulocyte-colony stimulating factor (G-CSF).
- B. IL-1.
- C. TGF- β .
- D. IL-17.
- E. TNF- α

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60. Patients suffering from toxic shock syndrome are found to have which of the following as the causative mechanism?

- A. High levels of bacterial toxins.
- B. Excessive levels of bacterial-specific antibodies.
- C. Antigen–antibody complex formation.
- D. Generation of bacterial-specific cytotoxic T cells.
- E. Massive stimulation of helper T cells irrespective of antigenic specificity.

61. Patients with Hodgkin's lymphoma frequently have eosinophils associated with the malignant cells in the lymph nodes and eosinophilia (high eosinophil levels) in their blood. This is due to the increased production of which cytokine by the malignant cells?

- A. IL-1.
- B. IL-10.
- C. TNF- α .
- D. IL-5.
- E. IL-4

62. Attempts were made to treat patients with plasma cell myeloma with anti-IL-6 because IL-6 functions as an autocrine stimulator of the malignant plasma cells. These efforts were discontinued due to the side effects of the treatment, including proliferation of mesangial cells of the kidney. This phenomenon is an example of which of the following?

- A. The redundancy of cytokine function.
- B. The pleiotropic nature of cytokine function.
- C. The cross-reactivity of anti-IL-6 with molecules in kidney cells.
- D. Renal toxicity of the drug
- E. All of the above

63. All of the following are important functions of INF- α/β EXCEPT that they:

- A. Induce resistance to viral infections
- B. Promote MHC class I expression
- C. Are elicited in response to viral infections
- D. Are important growth and proliferation factors for T cells

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E. Are part of the innate defense mechanisms

64. IL-12 is important for which of the following

A. Eosinophil differentiation

B. CD 28 expression

C. TNF production

D. IFN- γ production

E. CD 56 expression

65. Upon her return from South America, an otherwise normal 12 yo boy is found to be infected with a helminth parasite. He is not doing well because of endogenous TH1 rather than a TH2 type cytokine response. Which of the following would you expect to see?

A. Ig E

B. IFN- α/β production

C. IL-5

D. Eosinophilia

E. IL-2 and CD4 T cell IFN- γ production

END