SYSTEM:

TEST BANK

subject: Physiology-HLS

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A 3-year-old child who has had frequent ear infections is found to have reduced immunoglobulin levels and is unresponsive to vaccination with tetanus toxoid. However, the child has normal skin test reactivity (delayed redness and induration) to a common environmental antigen. Which cell lineage is not functioning normally?

A) Macrophages
B) Helper T cells
C) Cytotoxic T cells
D) B cells

D) The presence of normal skin test reactivity, which is T cell–mediated, indicates normal function of macrophages and other antigen-presenting cells, helper T cells, and cytotoxic T cells. This information, and the reduction in antibody production, localizes the defect to the B-cell lineage.

Patients with human immunodeficiency virus (HIV) exhibit abnormal functioning of which of the following mechanisms?

A) Antibody production only
B) T cell–mediated cytotoxicity only
C) Degranulation of appropriately stimulated mast cells
D) Both antibody production and T cell–mediated cytotoxicity

D) Patients with HIV have specific loss of T-helper cells, resulting in a loss of T-cell help for both antibody production and activation/proliferation of cytotoxic T cells. Assuming that mast cells can be appropriately stimulated (i.e., bear sufficient residual surface-bound IgE and are exposed to relevant antigen), their processes for degranulation are intact.

Presentation of antigen on major histocompatibility complex (MHC)-I by a cell will result in which of the following?

A) Generation of antibodies
B) Activation of cytotoxic T cells
C) Increase in phagocytosis
D) Release of histamine by mast cells

B) Presentation of an antigen on an infected cell will result in activation of the cytotoxic T cells to kill the infected cell. Presentation of an antigen by macrophages will activate helper T cells, which can promote antibody production and support proliferation of both helper and cytotoxic T cells.

Which of the following applies to patients with acquired immunodeficiency virus (AIDS)?

A) Able to generate a normal antibody response
B) Increased helper T cells
C) Increased secretion of interleukins
D) Decrease in helper T cells

D) Helper T cells are destroyed by the AIDS virus, leaving the patient unprotected against infectious diseases.

What will occur after presentation of antigen by a macrophage?

A) Direct generation of antibodies
B) Activation of cytotoxic T cells
C) Increase in phagocytosis
D) Activation of helper T cells

D) Presentation of an antigen on the surface of macrophages or dendritic cells results in the activation of helper T cells. Activation of helper T cells then initiates the release of lymphokines that stimulate proliferation and activation of helper and cytotoxic T cells and B cells and the generation of antibodies.

CD4 is a marker of which of the following?

A) B cells
B) Cytotoxic T cells
C) Helper T cells
D) An activated macrophage
E) A neutrophil precursor

C) CD4 helper T cells recognize the MHC class II + peptide on the presenting cell. CD8 T cells recognize the MHC class I + peptide on the infected cell.

What is the function of IL-2 in the immune response?

A) Binds to and presents antigen
B) Stimulates proliferation of T cells
C) Kills virus-infected cells
D) Is required for an anaphylactic response

B) IL-2 is secreted by helper T cells when the T cells are activated by specific antigens. IL-2 plays a specific role in the growth and proliferation of helper, cytotoxic, and suppressor T cells.

Which of the following is true about helper T cells?

A) They are activated by the presentation of antigen by an infected cell
B) They require the presence of a competent B-cell system
C) They destroy bacteria by phagocytosis
D) They are activated by the presentation of antigen by macrophage or dendritic cells

D) Helper T cells are activated by the presentation of antigens on the surface of antigen-presenting cells. Helper T cells activate B cells to form antibodies, but B cells are not required for activation of helper T cells. Helper T cells help macrophages with phagocytosis but do not have the capability to phagocytize bacteria.

Which of the following applies to cytotoxic T cells?

A) They require the presence of a competent B-lymphocyte system
B) They require the presence of a competent suppressor T-lymphocyte system
C) They are activated by the presentation of antigen by an infected cell
D) They destroy bacteria by initiating macrophage phagocytosis

C) Cytotoxic cells act on infected cells when the cells have the appropriate antigen located on the surface. The cytotoxic T cells are stimulated by lymphokines generated by activation of helper T cells. Cytotoxic T cells destroy an infected cell by releasing proteins that punch large holes in the membrane of the infected cells. There is no interaction between cytotoxic T cells and B cells.

A 9-year-old girl has nasal discharge and itching of the eyes in the spring every year. An allergist performs a skin test using a mixture of grass pollens. Within a few minutes the girl exhibits a focal redness and swelling at the test site. This response is most likely due to

A) Antigen–antibody complexes being formed in blood vessels in the skin
B) Activation of neutrophils due to injected antigens
C) Activation of CD4 helper cells and the resultant generation of specific antibodies
D) Activation of cytotoxic T lymphocytes to destroy antigens

A) Because the person has demonstrated allergic reactions, the initial reaction would be due to an antigen-antibody reaction and the activation of the complement system. Influx of neutrophils, activation of T-helper cells, and sensitized lymphocytes would take some time.

Activation of the complement system results in which action?

A) Binding of the invading microbe with IgG
B) Inactivation of eosinophils
C) Decreased tissue levels of complement
D) Generation of chemotactic substances

D) Activation of the complement system results in a series of actions, including opsonization and phagocytosis by neutrophils, lysis of bacteria, agglutination of organisms, activation of basophils and mast cells, and chemotaxis. Fragment C5a of the complement system causes chemotaxis of neutrophils and macrophages.

Which statement is true concerning erythroblastosis fetalis (hemolytic disease of the newborn [HDN])?

A) HDN occurs when an Rh-positive mother has an Rh-negative child
B) HDN is prevented by giving the mother a blood transfusion
C) A complete blood transfusion after the first birth will prevent HDN
D) The father of the child must be Rh positive

D) HDN occurs when an Rh-negative mother gives birth to a second Rh-positive child. Therefore, the father must be Rh positive. The mother becomes sensitized to the Rh antigens after the birth of the first Rh-positive child. HDN is prevented by treating the mother with antibodies against Rh antigen after the birth of each Rh-positive child. This treatment will destroy all fetal RBCs in the mother and prevent the mother from being sensitized to the Rh antigen. A transfusion of the first child after the birth will not accomplish anything because the mother has been exposed to the Rh-positive antigen during the birth process.

Which statement is true?

A) In a transfusion reaction, agglutination of the recipient blood occurs

B) Shutdown of the kidneys after a transfusion reaction occurs slowly

C) Blood transfusion of Rh-positive blood into any Rh-negative recipient will result in an immediate transfusion reaction

D) A person with type AB Rh-positive blood is considered a universal recipient

D) The recipient blood has the larger amount of plasma and thus antibodies. These antibodies will act on the donor RBCs. The donor's plasma will be diluted and have minimal effect on the recipient's RBCs. With any antigen–antibody transfusion reaction a rapid breakdown of RBCs occurs, releasing hemoglobin into the plasma, which can cause rapid acute renal shutdown. Transfusion of Rh-positive blood will only result in a transfusion reaction if the Rh-negative person has previously undergone a transfusion or been exposed to Rh-positive antibodies. Type AB Rh-positive people have no antibodies to the A, B, or Rh(D) antigens in their plasma, so they can receive any blood type.

A woman whose blood type is A, Rh positive, and a man whose blood type is B, Rh positive, come to the clinic with a 3-year-old girl whose blood type is O, Rh negative. What can be said about the relationship of these two adults to this child?

A) The woman can be the child's natural mother, but the man cannot be the natural father

B) The man can be the child's natural father, but the woman cannot be the natural mother

C) Neither adult can be the natural parent of this child

D) This couple can be the natural parents of this child

D) Each parent needs only a single allele for either the A or B antigen or the Rh(D) antigen to express these antigens on their blood cells and other cell types. Thus, if each parent also carries an allele for blood type O, as well as a null allele for the Rh(D) antigen, then the child can be homozygous for the recessive O allele and the Rh(D)-negative allele.

What is the appropriate treatment for an infant born with severe HDN (erythroblastosis fetalis)?

A) Passive immunization with anti-Rh(D) immuno- globulin

B) Immunization with Rh(D) antigen

C) Exchange transfusion with Rh(D)-positive blood

D) Exchange transfusion with Rh(D)-negative blood

D) The appropriate treatment is repetitive removal of Rh-positive blood, replacing it with Rh-negative blood (an exchange of about 400 milliliters over 90 minutes). This treatment may be performed several times over a few weeks. Maternal antibodies disappear over 1 to 2 months, so the newborn's endogenous Rh-positive cells cease to be a target. Exchange transfusions can actually be initiated in utero when there is evidence of an active immune reaction against the fetus's blood cells.

Chronic allograft rejection results primarily from the actions of what effector cell type?

A) Activated macrophages

B) Helper T lymphocytes

C) Cytotoxic T lymphocytes

D) Dendritic cells

C) Allograft rejection occurs primarily through the actions of cytotoxic T cells. T-helper cells promote this reaction but are not the effector cells. Both macrophages and dendritic cells may present antigen that promotes the immune response, but the key effector cells are cytotoxic T cells.

Which of the following transfusions will result in an immediate transfusion reaction?

A) O Rh-negative whole blood to an O Rh-positive patient

B) A Rh-negative whole blood to a B Rh-negative patient

C) AB Rh-negative whole blood to an AB Rh-positive patient

D) B Rh-negative whole blood to a B Rh-negative patient

B) Transfusion of Rh-negative blood into an Rh-positive person with the same ABO type will not result in any reaction. Type A blood has A antigen on the surface and type B antibodies. Type B blood has B antigens and A antibodies. Therefore, transfusing A blood into a person with type B blood will cause the A antibodies in the type B person to react with the donor blood.

Which blood unit carries the least risks for inducing an immediate transfusion reaction into a B-positive (B, rhesus positive) recipient?

A) Whole blood A positive

B) Whole blood O positive

C) Whole blood AB positive

D) Packed red blood cells O positive

E) Packed red blood cells AB negative

D) In any patient, transfusion of O-type packed cells will minimize a transfusion reaction because the antibodies will be removed with the plasma removal. Matching the Rh factor will also minimize transfusion reaction. Therefore, in a patient with type B-positive blood, a B-positive transfusion or an O-positive transfusion will elicit no transfusion reaction.

Which transfusion will result in a transfusion reaction? Assume that the patient has never had a transfusion.

A) Type O Rh-negative packed cells to an AB Rh-positive patient

B) Type A Rh-positive packed cells to an A Rh-negative patient

C) Type AB Rh-positive packed cells to an AB Rh-positive patient

D) Type A Rh-positive packed cells to an O Rh-positive patient

D) Type O RBCs are considered to be universal donor blood. Reactions occur between the recipient's antibody and donor antigen as shown in the following table.

Donor	Donor Antigen	Recipient	Recipient Antibody	Reaction
O-negative	None	AB-positive	None	None
A-positive	A, Rh	A-negative	B	None
AB-positive	A, B, Rh	AB-positive	None	None
A-positive	A, Rh	O-positive	A, B	A (antigen) and A (antibody)

Which antigens must be matched optimally between donors and recipients of solid organ transplants?

A) Class I human leukocyte antigen (HLA) antigens only

B) Class II HLA antigens only

C) Class I and Class II HLA antigens only

D) Class I and Class II HLA antigens and ABO antigens

D) Unmatched donor HLA antigens of both classes are recognized as foreign by recipient T cells. In addition, blood group (ABO) antigens are expressed on the cells of solid organs and can lead to strong organ rejection.

A woman whose blood type is A positive and who has always been healthy just delivered her second child. The father's blood type is O negative. Because the child's blood type is O negative (O, Rh negative), what would you expect to find in this child?

A) Erythroblastosis fetalis due to rhesus incompatibility

B) Erythroblastosis fetalis due to ABO blood group incompatibility

C) Both A and B

D) The child would not be expected to have HDN

D) HDN occurs when the mother is Rh negative and the father is Rh positive, resulting in an Rh-positive child. Because the child is O negative and the father is Rh negative, HDN would not be expected to develop.

A 45-year-old man presents to the emergency depart- ment with a 2-week history of diarrhea that has gotten progressively worse during the past several days. He has minimal urine output and is admitted to the hospital for dehydration. His stool specimen is positive for parasitic eggs. Which type of WBC would have an elevated number?

A) Eosinophils

B) Neutrophils

C) T lymphocytes

D) B lymphocytes

E) Monocytes

A) Eosinophils constitute about 2% of the total WBC count, but they are produced in large numbers in people with parasitic infections.

A 24-year-old man came to the emergency depart- ment with a broken leg. A blood test revealed his WBC count to be 22 × 103/µl. Five hours later, a second blood test revealed values of 7 × 103/µl. What is the cause of the increased WBC count in the first test?

A) Increased production of WBCs by the bone marrow

B) Release of pre-formed, mature WBCs into the cir- culation

C) Decreased destruction of WBCs

D) Increased production of selectins

B) The majority of WBCs are stored in the bone marrow, waiting for an increased level of cytokines to stimulate their release into the circulation. However, trauma to bone can result in a release of WBCs into the circulation. This increase in WBC count is not primarily due to any inflammatory response, but instead is attributed to mechanical trauma and associated stress responses.

A 62-year-old man who was known to have a normal blood cell count and differential count 3 months ago presents with pallor, bone pain, bruising, and a WBC count of 42,000. Eighty-five percent of cells in the circulation appear to be immature granulocytes. What is the diagnosis?

A) Acute lymphocytic leukemia

B) Acute myelocytic leukemia

C) Chronic lymphocytic leukemia

D) Chronic myelocytic leukemia

B) The WBC count of 42,000 is higher than the range usually seen as a response to infection and suggests leukemia. The patient's florid clinical presentation suggests an acute process, and findings of a normal CBC 3 months previously confirm that this patient has an acute leukemia. Granulocytes are myeloid cells, and the fact that they are in the circulation while still being immature is wholly compatible with leukemia. Thus the patient has acute myelocytic (also referred to as "myelogenous" or "myeloid") leukemia.

A 65-year-old alcoholic experienced chest pain and cough with an expectoration of sputum. A blood sample revealed that his WBC count was 21,000/µl. What is the origin of these WBCs?

A) Pulmonary alveoli

B) Bronchioles

C) Bronchi

D) Trachea

E) Bone marrow

E) All WBCs originate from the bone marrow from myelocytes or lymphocyte precursors.

An 8-year-old boy frequently comes to the clinic for persistent skin infections that do not heal within a normal time frame. He had a normal recovery from the measles. A check of his antibodies after immunizations yielded normal antibody responses. A defect in which of the following cells would most likely be the cause of the continual infections?

A) B lymphocytes

B) Plasma cells

C) Neutrophils

D) Macrophages

E) CD4 T lymphocytes

C) For the acquired immune response, T and B lymphocytes and plasma cells, along with macrophages, are needed. Neutrophils are needed for routine infections.