ASCP Technologist in Immunology (I) Practice Exam (Sample)

Study Guide

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Questions

1. What type of reaction does a heterophile antibody typically produce?

A. Specific immunity

B. Cross-reactivity

C. Allergic response

D. Autoimmunity

2. To calculate the absolute count of B lymphocytes from total WBC, which formula is used?

A. WBC x Total Lymphocytes x B Lymphocytes percentage

B. WBC x Neutrophils x T Lymphocytes percentage

C. WBC x Monocytes x Lymphocytes percentage

D. WBC x Eosinophils x B Lymphocytes percentage

3. What qualities characterize acquired immunity?

A. Specificity and memory

B. Innate and adaptive function

C. Immediate response and flexibility

D. Speed and efficiency

4. What is the target microorganism detected in the direct fluorescent antibody test for primary syphilis?

A. Treponema pallidum

B. Borrelia burgdorferi

C. Mycoplasma pneumoniae

D. Chlamydia trachomatis

5. What is the term for a combined immunodeficiency disease characterized by loss of muscle coordination?

A. Ataxia telangiectasia

B. Severe combined immunodeficiency

C. Wiskott-Aldrich syndrome

D. Adenosine deaminase deficiency

6. Anti-RNA antibodies are typically found in individuals showing which type of immunofluorescent pattern?

A. Peripheral

B. Speckled

C. Nucleolar

D. Homogenous

7. Which immunoglobulin class is known to produce anaphylactic reactions following blood transfusion?

A. IgM

B. IgE

C. IgG

D. IgA

8. Which type of hypersensitivity is characterized by antibody-mediated cell damage?

A. Type I

B. Type II

C. Type III

D. Type IV

9. Why are IgM antibodies frequently hemolytic?

A. Their structural configuration

B. Their efficient ability to fix complement

C. Their rapid production in response to infection

D. Their presence in high concentrations in the bloodstream

10. The wheal and flare response in allergy testing is primarily due to the release of?

A. Histamine

B. Serotonin

C. Cytokines

D. Prostaglandins

Answers

1. B
2. A
3. A
4. A
5. A
6. C
7. D
8. B
9. B
10. A

Explanations

1. What type of reaction does a heterophile antibody typically produce?

A. Specific immunity

B. Cross-reactivity

C. Allergic response

D. Autoimmunity

A heterophile antibody typically produces a reaction characterized by cross-reactivity. These antibodies are not specific to a particular antigen but can bind to multiple antigens that may share structural similarities. Heterophile antibodies are often involved in various immunological responses where they can react with antigens from different species or even different classes of antigens. For instance, a well-known example of a heterophile antibody is the one produced in response to the Epstein-Barr virus (EBV), which can sometimes react with antigens from animal sources, leading to a positive test in certain types of infections like infectious mononucleosis. This illustrates the notion of cross-reactivity, where the antibody's response is not limited to a single, specific pathogen. The other response options do not align with the nature of heterophile antibodies: specific immunity refers to a targeted response against a specific pathogen; an allergic response involves antibodies such as IgE that typically respond to allergens; and autoimmunity involves the immune system mistakenly targeting the body's own tissues. Thus, the nature of the interaction that heterophile antibodies facilitate is best understood as cross-reactivity.

2. To calculate the absolute count of B lymphocytes from total WBC, which formula is used?

A. WBC x Total Lymphocytes x B Lymphocytes percentage

B. WBC x Neutrophils x T Lymphocytes percentage

C. WBC x Monocytes x Lymphocytes percentage

D. WBC x Eosinophils x B Lymphocytes percentage

The formula to calculate the absolute count of B lymphocytes involves multiplying the total white blood cell (WBC) count by the percentage of lymphocytes and then further by the percentage of B lymphocytes. This method accurately reflects the number of specific cell types within the total WBC population. When you take the total WBC count, which gives the overall number of white blood cells in a given blood volume, multiplying this figure by the percentage of lymphocytes provides the total number of lymphocytes. From there, applying the percentage of B lymphocytes allows you to determine the count specific to B cells. This process is foundational in immunology and hematology for assessing various immune responses and can help diagnose conditions linked to immune system malfunctions. The other options involve incorrect combinations that do not relate to B lymphocyte counting, such as using Neutrophils, Monocytes, or Eosinophils percentages, which are irrelevant to the calculation of B lymphocytes' absolute count.

3. What qualities characterize acquired immunity?

A. Specificity and memory

B. Innate and adaptive function

C. Immediate response and flexibility

D. Speed and efficiency

Acquired immunity is characterized primarily by specificity and memory. Specificity refers to the ability of the immune system to recognize specific antigens, which are typically foreign substances like pathogens or toxins. This allows the immune response to target and eliminate specific threats effectively. Memory indicates that once the immune system has been exposed to a particular antigen, it retains the information about that antigen. If the same pathogen is encountered again in the future, the immune system can respond more rapidly and effectively thanks to these memory cells. This characteristic is fundamental to the effectiveness of vaccines, which aim to train the immune system to recognize and remember specific pathogens. The other options describe qualities relevant to different aspects of the immune system or different types of immune responses. Innate and adaptive functions, for instance, refer to the two main branches of the immune response, with innate immunity being the first line of defense and adaptive immunity being the more specialized and acquired response. Immediate response and flexibility are features more commonly associated with innate immunity, which acts quickly upon infection. Speed and efficiency pertain to the overall performance of the immune response but do not specifically capture the defining traits of acquired immunity like specificity and memory do.

4. What is the target microorganism detected in the direct fluorescent antibody test for primary syphilis?

A. Treponema pallidum

B. Borrelia burgdorferi

C. Mycoplasma pneumoniae

D. Chlamydia trachomatis

The direct fluorescent antibody test for primary syphilis specifically targets Treponema pallidum, the causative agent of syphilis. This test utilizes fluorescently labeled antibodies that bind directly to the Treponema pallidum organisms present in tissue samples, typically obtained from a chancre. The specificity of the test for this spirochete allows for rapid and accurate identification of syphilis during its early stages when the infection is most treatable. Other options represent different microorganisms associated with various diseases and are not relevant to primary syphilis. For instance, Borrelia burgdorferi is the pathogen responsible for Lyme disease, Mycoplasma pneumoniae is linked to atypical pneumonia, and Chlamydia trachomatis causes chlamydia infections. Therefore, the direct fluorescent antibody test is appropriate for detecting only Treponema pallidum in the context of primary syphilis.

5. What is the term for a combined immunodeficiency disease characterized by loss of muscle coordination?

A. Ataxia telangiectasia

B. Severe combined immunodeficiency

C. Wiskott-Aldrich syndrome

D. Adenosine deaminase deficiency

Ataxia telangiectasia is indeed the correct term for the described combined immunodeficiency disease characterized by loss of muscle coordination. This condition arises due to a genetic mutation that affects the ATM (Ataxia-telangiectasia mutated) gene, which is crucial for DNA repair processes. Individuals with ataxia telangiectasia exhibit progressive neurological problems, particularly ataxia, which is a loss of motor control leading to difficulties with movement and coordination. Alongside these neurological symptoms, they also experience immunodeficiency, making them more susceptible to infections. Additionally, they may develop characteristic features such as telangiectasia, which are small, dilated blood vessels visible on the skin. The other options represent distinct immunodeficiencies that do not primarily involve loss of muscle coordination. Severe combined immunodeficiency results in a profound defect in both T- and B-lymphocyte systems, Wiskott-Aldrich syndrome is characterized by eczema, thrombocytopenia, and immune deficiency, and adenosine deaminase deficiency leads to severe combined immunodeficiency due to toxic metabolite accumulation without the coordination issues typical of ataxia telangiectasia.

6. Anti-RNA antibodies are typically found in individuals showing which type of immunofluorescent pattern?

A. Peripheral

B. Speckled

C. Nucleolar

D. Homogenous

Anti-RNA antibodies are typically associated with a speckled immunofluorescent pattern. This speckled pattern is indicative of the presence of antibodies against small nuclear RNA (snRNA) and some other ribonucleoproteins. In individuals with conditions like systemic lupus erythematosus (SLE), speckled patterns are commonly found due to the presence of various autoantibodies, including anti-RNA antibodies. Understanding the immunofluorescent patterns is crucial, as these patterns help in the differential diagnosis of autoimmune diseases. The homogenous pattern is generally linked to antibodies against double-stranded DNA or histones, while the nucleolar pattern is associated with specific antibodies to nucleolar components, and the peripheral pattern is linked to specific anti-DNA antibodies. Therefore, identifying the speckled immunofluorescent pattern is particularly relevant to the presence of anti-RNA antibodies in a clinical context.

7. Which immunoglobulin class is known to produce anaphylactic reactions following blood transfusion?

A. IgM

B. IgE

C. IgG

D. IgA

The immunoglobulin class that is primarily associated with anaphylactic reactions, particularly in the context of blood transfusions, is IgE. This immunoglobulin is responsible for mediating hypersensitivity reactions, including anaphylaxis, by triggering mast cells and basophils to release histamine and other inflammatory mediators upon re-exposure to an allergen or antigen. In the case of blood transfusions, if a patient has pre-existing antibodies (often due to previous exposure or sensitization), these antibodies can react with transfused materials that contain the respective antigens, leading to a severe allergic response. This process is particularly true for allergic reactions that are rapid and life-threatening, which is the hallmark of anaphylactic responses. Given the context of IgE's role, it becomes clear why it is the correct answer when considering reactions associated with blood transfusions. IgM and IgG are involved in different types of immune responses and are more associated with delayed-type or acute hemolytic reactions rather than anaphylaxis. IgA is predominantly found in mucosal areas and secretions but does not typically play a role in the immediate hypersensitivity reactions seen in anaphylaxis related to blood transfusions.

8. Which type of hypersensitivity is characterized by antibody-mediated cell damage?

A. Type I

B. Type II

C. Type III

D. Type IV

The type of hypersensitivity characterized by antibody-mediated cell damage is Type II hypersensitivity. This type occurs when the immune system produces antibodies against specific antigens present on the surface of cells. These antibodies can lead to cell destruction through various mechanisms, such as activating the complement cascade or facilitating phagocytosis by immune cells. An example of Type II hypersensitivity is hemolytic anemia, where antibodies target red blood cells, leading to their destruction and resulting in anemia. This process is distinct from other types of hypersensitivity. Type I hypersensitivity, also known as immediate hypersensitivity, involves IgE antibodies and is associated with allergic reactions such as hay fever or anaphylaxis. Type III hypersensitivity involves immune complex formation, where antigen-antibody complexes deposit in tissues, leading to inflammation and damage. Type IV hypersensitivity is delayed-type and primarily driven by T cells rather than antibodies, as seen in conditions like contact dermatitis or graft-versus-host disease.

9. Why are IgM antibodies frequently hemolytic?

A. Their structural configuration

B. Their efficient ability to fix complement

C. Their rapid production in response to infection

D. Their presence in high concentrations in the bloodstream

The high hemolytic capacity of IgM antibodies is primarily due to their efficient ability to fix complement. IgM is a pentameric antibody, which means it consists of five subunits. This unique structural configuration allows IgM to effectively bind to antigens on the surface of pathogens or red blood cells. When IgM binds to an antigen, it activates the complement system, leading to a cascade of reactions that can result in the formation of the membrane attack complex. This complex creates pores in the target cell membrane, leading to cell lysis and hemolysis. Additionally, the large size of the IgM molecule enables cross-linking of antigens, which further enhances the activation of the complement system. Unlike other immunoglobulin classes, IgM is the first antibody produced in the initial response to an antigen and is present in high concentrations during this stage, which also contributes to its hemolytic potential. While other factors such as their rapid production in response to infection and presence in high concentrations might influence their overall functionality, it is the ability of IgM to activate the complement pathway and facilitate cell lysis that primarily accounts for its hemolytic properties.

10. The wheal and flare response in allergy testing is primarily due to the release of?

A. Histamine

B. Serotonin

C. Cytokines

D. Prostaglandins

The wheal and flare response observed during allergy testing is primarily due to the release of histamine from mast cells in the skin. When an allergen is introduced, it binds to IgE antibodies that are already bound to mast cells, leading to the degranulation of these cells and the subsequent release of histamine. Histamine acts as a potent vasodilator, increasing the permeability of blood vessels in the area of allergen exposure, which causes the characteristic redness (flare) and swelling (wheal) in the skin. This immunological reaction is a part of the body's hypersensitivity response and is crucial for the immediate allergic reactions observed in conditions such as hay fever or atopic dermatitis. While serotonin, cytokines, and prostaglandins play roles in various immune responses, they do not primarily cause the immediate wheal and flare reaction specific to allergy testing. Therefore, histamine is the key mediator responsible for this classic allergic response.