

AAB Medical Technologist (MT) - Immunology Practice Exam (Sample)

Study Guide



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Questions

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- 1. Which immune response primarily involves IgM production?**
 - A. Primary response**
 - B. Secondary response**
 - C. Humoral response**
 - D. Cell-mediated response**
- 2. After an antibody has been fragmented by papain, which term denotes the antigen-binding fragment?**
 - A. Fc**
 - B. Fv**
 - C. Fab**
 - D. Fab'2**
- 3. What is the principle of the antistreptolysin O (ASO) tube test?**
 - A. Hemolysis-inhibition**
 - B. Affinity chromatography**
 - C. Immunofluorescence**
 - D. Western blotting**
- 4. Which type of substance is known to be the most potent antigen?**
 - A. Nucleic acids**
 - B. Proteins**
 - C. Carbohydrates**
 - D. Fats**
- 5. Which immunoglobulin increases during the convalescence phase of infection?**
 - A. IgA**
 - B. IgE**
 - C. IgM**
 - D. IgG**

- 6. Which cells are primarily responsible for the differentiation of B cells?**
- A. Macrophages**
 - B. Thymus cells**
 - C. T helper cells**
 - D. Cytotoxic T cells**
- 7. What is the primary function of Factor D in the complement system?**
- A. Activation of C3**
 - B. Cleavage of Factor B**
 - C. Formation of C1 complex**
 - D. Stabilization of C3 convertase**
- 8. What type of immunodeficiency is typically characterized by normal T cell activity paired with absent or reduced antibody responses?**
- A. Common Variable Immunodeficiency (CVID)**
 - B. Hyper-IgM syndrome**
 - C. DiGeorge syndrome**
 - D. X-Linked Agammaglobulinemia**
- 9. In the context of infectious diseases, what is the significance of heterophil antibodies?**
- A. They are unique to bacterial infections**
 - B. They indicate viral infections like mononucleosis**
 - C. They are always present in healthy individuals**
 - D. They are specific for autoimmune diseases**
- 10. Which organs or systems are mainly responsible for producing specific lymphocytes and plasma cells in response to circulating antigens?**
- A. Liver and kidneys**
 - B. Lymph nodes and spleen**
 - C. Heart and lungs**
 - D. Skin and mucous membranes**

Answers

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

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Explanations

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1. Which immune response primarily involves IgM production?

- A. Primary response**
- B. Secondary response**
- C. Humoral response**
- D. Cell-mediated response**

The primary immune response is characterized by the initial production of antibodies, primarily IgM, in response to a new antigen. When the immune system first encounters a pathogen, naïve B cells become activated and differentiate into plasma cells that produce IgM antibodies as their first line of response. This initial phase typically takes longer, from a few days to a couple of weeks, before antibody levels peak. In contrast, the secondary immune response involves memory B cells that have been previously activated and are capable of quickly producing higher affinity antibodies, mainly of the IgG class, upon re-exposure to the same antigen. While both the humoral and cell-mediated responses are important components of the adaptive immune system, the humoral response refers broadly to antibody-mediated immunity and involves different antibody classes beyond just IgM. Cell-mediated responses, on the other hand, primarily involve T cells and do not directly involve IgM production. Thus, focusing specifically on IgM, the primary response is correctly identified as the phase where its production is most pronounced.

2. After an antibody has been fragmented by papain, which term denotes the antigen-binding fragment?

- A. Fc**
- B. Fv**
- C. Fab**
- D. Fab'2**

The term that denotes the antigen-binding fragment after an antibody has been fragmented by papain is "Fab." When antibodies undergo proteolytic cleavage by enzymes such as papain, they are cleaved into three main fragments: two Fab fragments and one Fc fragment. Each Fab fragment consists of the variable region and part of the constant region of the heavy and light chains, and it is responsible for specific binding to the antigen. This is crucial in immunology, as it is the Fab portion of the antibody that directly interacts with antigens, enabling the immune response. The Fc fragment, on the other hand, is the portion of the antibody that does not bind antigen but is involved in effector functions, such as binding to Fc receptors on immune cells. The Fab'2 fragment refers to a dimer of Fab fragments, which can occur under different conditions and does not represent the simple antigen-binding capability of the individual Fab fragments. Thus, the designation "Fab" is specifically used to describe the antigen-binding domains generated by papain cleavage.

3. What is the principle of the antistreptolysin O (ASO) tube test?

- A. Hemolysis-inhibition**
- B. Affinity chromatography**
- C. Immunofluorescence**
- D. Western blotting**

The principle of the antistreptolysin O (ASO) tube test is based on hemolysis-inhibition. In this test, the presence of antistreptolysin O antibodies in a patient's serum is detected by mixing the serum with a streptolysin O preparation, which would normally cause hemolysis of red blood cells. If anti-ASO antibodies are present, they will bind to the streptolysin O and inhibit its hemolytic activity. This results in a lack of hemolysis, indicating a positive test result. The hemolysis-inhibition principle is particularly useful in the diagnosis of streptococcal infections, such as post-streptococcal glomerulonephritis or rheumatic fever, where the body produces these antibodies in response to infection. Thus, detecting their presence through this method helps in clinical evaluations related to streptococcal infections.

4. Which type of substance is known to be the most potent antigen?

- A. Nucleic acids**
- B. Proteins**
- C. Carbohydrates**
- D. Fats**

The classification of antigens by their potency reveals that proteins are recognized as the most potent antigens. This is primarily due to their complex structure and the ability to present a diverse array of epitopes. Proteins are composed of long chains of amino acids, which can fold into intricate three-dimensional shapes, allowing them to interact with a range of receptors on immune cells, including B and T cells. The immune system is particularly adept at recognizing these diverse structural features of proteins, which can trigger robust immune responses. In contrast, while nucleic acids, carbohydrates, and fats can also serve as antigens, they generally do not elicit the same level of immune response as proteins. Nucleic acids are less immunogenic, carbohydrates often require a certain level of complexity to be recognized effectively, and fats are usually not antigenic unless they are bound to a carrier, such as a protein. Thus, the prominence of proteins as the most potent antigens underscores their crucial role in immunology and vaccine development, as they are key components in the generation of immunogenic responses.

5. Which immunoglobulin increases during the convalescence phase of infection?

- A. IgA**
- B. IgE**
- C. IgM**
- D. IgG**

During the convalescence phase of an infection, the immune system continues to respond to the pathogen, and the levels of immunoglobulin G (IgG) rise significantly. This increase in IgG is a crucial aspect of the immune response as it is primarily responsible for providing long-term immunity and establishing memory against the specific antigen. IgG is produced in response to an infection or vaccination and typically reaches its peak during the later stages of an immune response. After an initial infection, IgM is initially produced which is indicative of a recent infection, but as recovery progresses, the immune system shifts to producing more IgG. This transition is pivotal in establishing a robust and lasting defense, ensuring that if the pathogen is encountered again, the body can respond more effectively and quickly. While other immunoglobulins like IgA and IgE have their roles in mucosal immunity and allergic responses, respectively, they do not correlate specifically with the convalescence phase of infection in the same way that IgG does. Understanding these dynamics is crucial for interpreting immune responses and the roles of different immunoglobulins.

6. Which cells are primarily responsible for the differentiation of B cells?

- A. Macrophages**
- B. Thymus cells**
- C. T helper cells**
- D. Cytotoxic T cells**

The correct choice highlights the crucial role that T helper cells play in the differentiation of B cells, which is a vital part of the adaptive immune response. When B cells encounter an antigen, they require assistance to fully activate and differentiate into plasma cells that produce antibodies. T helper cells, particularly those that express CD4, provide necessary signals through direct cell-cell interactions and by secreting cytokines. These signals not only promote B cell proliferation but also guide B cells in undergoing class switching, allowing them to produce different types of antibodies according to the needs of the immune response. While other cell types, such as macrophages, can present antigens and contribute to the immune response, they do not have the specific role of directly facilitating B cell differentiation. Thymus cells are primarily involved in the maturation of T cells and do not differentiate B cells. Cytotoxic T cells are directly involved in killing infected or cancerous cells but do not participate in the differentiation of B cells, focusing instead on targeting and eliminating cells that display foreign antigens.

7. What is the primary function of Factor D in the complement system?

- A. Activation of C3**
- B. Cleavage of Factor B**
- C. Formation of C1 complex**
- D. Stabilization of C3 convertase**

Factor D plays a critical role in the complement system by cleaving Factor B, which is essential for the formation of the alternative pathway C3 convertase. When Factor D encounters the complex of C3b and Factor B, it catalyzes the cleavage of Factor B into two fragments: Ba and Bb. This cleavage is pivotal because the Bb fragment then combines with C3b to form the C3 convertase (C3bBb), which is crucial for the activation of C3, leading to enhanced opsonization, inflammation, and cell lysis. Understanding the mechanism of Factor D emphasizes its importance in regulating and advancing the cascade of events that occurs during immune responses. This role is fundamental in recognizing how the complement system can amplify its effects against pathogens, highlighting the interconnected nature of the components within the immune system.

8. What type of immunodeficiency is typically characterized by normal T cell activity paired with absent or reduced antibody responses?

- A. Common Variable Immunodeficiency (CVID)**
- B. Hyper-IgM syndrome**
- C. DiGeorge syndrome**
- D. X-Linked Agammaglobulinemia**

The type of immunodeficiency characterized by normal T cell activity while having absent or reduced antibody responses is known as Common Variable Immunodeficiency (CVID). In CVID, individuals have a defect in the B cells that prevents them from producing adequate immunoglobulins (antibodies), which leads to an increased susceptibility to infections. Despite the presence of normal or even sometimes elevated levels of T cell functioning, the impaired ability of B cells to mature into plasma cells and produce antibodies is what defines this disorder. CVID is a diagnosis that often occurs later in life and can vary widely in its presentations, making it distinct from other immunodeficiencies like Hyper-IgM Syndrome, which specifically involves high levels of IgM but absent IgG, IgA, and IgE due to a different mechanism affecting T-B cell interactions. DiGeorge syndrome typically features a deficiency in T cell production due to thymic aplasia, and X-Linked Agammaglobulinemia is characterized by the absence of B cells leading to a complete lack of antibody production, rather than just reduced responses. Thus, the characteristic of CVID—normal T cell activity paired with an inability to produce sufficient antibodies—effectively underscores its unique place within immunode

9. In the context of infectious diseases, what is the significance of heterophil antibodies?

- A. They are unique to bacterial infections**
- B. They indicate viral infections like mononucleosis**
- C. They are always present in healthy individuals**
- D. They are specific for autoimmune diseases**

Heterophil antibodies are significant in the context of infectious diseases, particularly because they are often associated with viral infections, with infectious mononucleosis being the most well-known condition linked to them. These antibodies are produced by the immune system in response to certain viral infections, especially Epstein-Barr virus (EBV), which is the causative agent of mononucleosis. The presence of heterophil antibodies can help in the diagnosis of infectious mononucleosis, as they typically appear in the blood and can be detected through specific laboratory tests, such as the heterophil agglutination test. Their presence is a marker indicating that the body is mounting an immune response to an active viral infection. The other options identifying heterophil antibodies do not capture this specific role accurately. They are not unique to bacterial infections or autoimmune diseases, and while some antibodies may be present in healthy individuals, the heterophil antibodies are not typically found in the normal healthy population without an underlying infection. This diagnostic feature makes option B the most relevant concerning the role of heterophil antibodies in disease.

10. Which organs or systems are mainly responsible for producing specific lymphocytes and plasma cells in response to circulating antigens?

- A. Liver and kidneys**
- B. Lymph nodes and spleen**
- C. Heart and lungs**
- D. Skin and mucous membranes**

The lymph nodes and spleen play pivotal roles in the immune response by producing specific lymphocytes and plasma cells when exposed to circulating antigens. Lymph nodes are strategically located throughout the body and act as filters for lymph fluid, where they trap pathogens and foreign particles. They contain specialized areas where B cells and T cells can be activated and proliferate in response to antigens. The spleen serves a similar function for blood-borne antigens, filtering the blood and facilitating responses to pathogens. In both organs, B lymphocytes can differentiate into plasma cells, which produce antibodies against specific antigens. This antibody production is crucial for the adaptive immune response, providing long-term immunity. Other organs mentioned, such as the liver and kidneys, primarily have roles in metabolic processes and waste elimination rather than direct involvement in the immune response to antigens. The heart and lungs are vital for circulation and gas exchange, but they do not produce lymphocytes or plasma cells. The skin and mucous membranes act as physical barriers and can initiate immune responses, but they are not the primary production sites for lymphocytes and plasma cells, which is why the lymph nodes and spleen are the correct answer.