

University of Central Florida (UCF) PCB3233 Immunology Practice Exam 1 (Sample)

Study Guide



Everything you need from our exam experts!

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SAMPLE

Questions

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1. What does 'CR' in CR1 stand for?
 - A. Cell receptor
 - B. Cytokine response
 - C. Complete receptor
 - D. Complement receptor
2. What role do basophils primarily play in the immune system?
 - A. Involved in the response to bacterial infections
 - B. Participate in allergic reactions
 - C. Engage in phagocytosis of pathogens
 - D. Regulate immune cell activity
3. Which molecules are considered anaphylatoxins and what is their primary function?
 - A. C3a and C5a - cause inflammation
 - B. C4b and C5a - cause apoptosis
 - C. C3b and C4a - inhibit inflammation
 - D. C5a and C5b - promote cell division
4. What key feature differentiates MHC class I from MHC class II?
 - A. Cell type restriction
 - B. Type of antigens presented
 - C. Both features
 - D. None of these
5. What is an antigen?
 - A. A substance that can invoke an immune response
 - B. A type of immune cell that remembers infections
 - C. A protein produced by B cells
 - D. A component of plasma that fights infections

6. Where are follicular dendritic cells (FDCs) mainly located?

- A. Bone marrow
- B. Thymus gland
- C. Germinal centers of secondary lymphoid tissues
- D. Spleen red pulp

7. What does MCP stand for?

- A. Major Complement Protein
- B. Membrane Cofactor Proteins
- C. Macrophage Co-factor Protein
- D. Membrane Control Protein

8. Which proteins do CR3 and CR4 receptors recognize?

- A. C3b
- B. C5a
- C. iC3b
- D. C3d

9. How do autoantibodies typically affect the body?

- A. They enhance infection resistance
- B. They can target and damage self-tissues
- C. They aid in pathogen identification
- D. They contribute to increased antibody synthesis

10. C-reactive protein binds with which part of C1q?

- A. Globular heads
- B. Stalks
- C. Both C1q tails
- D. N-terminal regions

Answers

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

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Explanations

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1. What does 'CR' in CR1 stand for?

- A. Cell receptor
- B. Cytokine response
- C. Complete receptor
- D. Complement receptor

The 'CR' in CR1 stands for 'Complement Receptor.' CR1 is a protein that plays a critical role in the immune system, particularly in the complement pathway. It is found on the surface of various immune cells, including B cells, monocytes, and macrophages. This receptor binds to complement components, specifically C3b, which is important for opsonization and clearance of pathogens and cellular debris. The presence of CR1 on immune cells enhances their ability to recognize and respond to pathogens coated with complement. This process is essential for promoting phagocytosis and facilitating communication between different components of the immune system. Thus, the term 'Complement Receptor' accurately reflects its function in mediating interactions related to the immune response.

2. What role do basophils primarily play in the immune system?

- A. Involved in the response to bacterial infections
- B. Participate in allergic reactions
- C. Engage in phagocytosis of pathogens
- D. Regulate immune cell activity

Basophils primarily play a crucial role in the immune system by participating in allergic reactions. These cells are a type of granulocyte and are known for their ability to release histamine and other mediators in response to allergens. When the immune system encounters an allergen, basophils become activated and release these substances, which leads to the symptoms commonly associated with allergies, such as inflammation, redness, and swelling. In addition to their role in allergies, basophils also play a part in defense against parasites, particularly during helminth infections. Their involvement in the inflammatory response can help recruit other immune cells to the site of an allergenic challenge or infection. This specificity in function distinguishes basophils from other immune cells that may have broader roles, such as responding to bacterial infections or regulating immune cell activity. This focus on allergic responses is critical for understanding how the immune system interacts with various stimuli and how certain cell types are specialized for particular functions within the broader immune response.

3. Which molecules are considered anaphylatoxins and what is their primary function?

- A. C3a and C5a - cause inflammation
- B. C4b and C5a - cause apoptosis
- C. C3b and C4a - inhibit inflammation
- D. C5a and C5b - promote cell division

C3a and C5a are indeed considered anaphylatoxins, which are small peptides generated during the activation of the complement system. Their primary function is to promote inflammation and recruit immune cells to sites of infection or tissue damage. When the complement system is activated, particularly through the classical or alternative pathways, fragments such as C3a and C5a are released. These anaphylatoxins play a crucial role in enhancing vascular permeability, causing mast cell degranulation (which results in the release of histamine and other inflammatory mediators), and attracting phagocytic cells like neutrophils and macrophages to the affected area. This inflammatory response is essential for controlling infections and initiating tissue repair. The other answer choices do not accurately describe the roles of the specified molecules, focusing instead on unrelated functions or incorrect molecular pairings. This highlights the specific and critical role that C3a and C5a play in mediating inflammatory responses in the immune system.

4. What key feature differentiates MHC class I from MHC class II?

- A. Cell type restriction
- B. Type of antigens presented
- C. Both features
- D. None of these

MHC class I and MHC class II molecules have distinct roles in the immune system, and these differences are highlighted by key features such as cell type restriction and the type of antigens they present. MHC class I molecules are primarily found on the surface of all nucleated cells in the body. They present endogenous antigens, which are typically derived from proteins synthesized within the cell, including those from intracellular pathogens like viruses. This process is crucial for the activation of CD8+ cytotoxic T cells, which are responsible for killing infected or abnormal cells. In contrast, MHC class II molecules are expressed mainly on professional antigen-presenting cells (APCs), such as dendritic cells, macrophages, and B cells. These molecules present exogenous antigens, which are derived from proteins that have been taken up by these cells from the external environment. This is essential for the activation of CD4+ helper T cells, which play a vital role in orchestrating other immune responses. Thus, both the cell type restriction and the nature of the antigens presented serve as critical distinguishing features between MHC class I and MHC class II molecules. Recognizing these differences is key for understanding how the immune system identifies and responds to various challenges, including infections

5. What is an antigen?

- A. A substance that can invoke an immune response
- B. A type of immune cell that remembers infections
- C. A protein produced by B cells
- D. A component of plasma that fights infections

An antigen is defined as a substance that can invoke an immune response. This means that when the immune system encounters an antigen, it recognizes it as foreign or potentially harmful. This recognition triggers the immune system to mount a defense, which may involve the production of antibodies or activation of specific immune cells. Antigens can be derived from a variety of sources, including pathogens like bacteria and viruses, as well as non-infectious substances like pollen or certain proteins from transplanted tissues. The immune system recognizes specific parts of the antigen, known as epitopes, that are distinct and can be targeted for immune action. In the context of the other choices, immune cells that remember infections refer to memory cells, which are responsible for facilitating a quicker immune response upon re-encounter with a pathogen, rather than being the antigen itself. A protein produced by B cells, specifically antibodies, is a component of the immune response to antigens but is not an antigen. Components of plasma that fight infections often refer to various immune factors, including antibodies and complement proteins, which interact with antigens but are distinct from the definition of an antigen itself. Therefore, the correct answer emphasizes the role of an antigen as a key trigger for initiating an immune response.

6. Where are follicular dendritic cells (FDCs) mainly located?

- A. Bone marrow
- B. Thymus gland
- C. Germinal centers of secondary lymphoid tissues
- D. Spleen red pulp

Follicular dendritic cells (FDCs) play a crucial role in the immune response, particularly in the activation and differentiation of B cells during the immune response. They are primarily located in the germinal centers of secondary lymphoid tissues, which include lymph nodes and the spleen. In the germinal centers, FDCs provide a specialized environment for B cells to undergo affinity maturation, which is a process where B cells proliferate and mutate their antibody genes to produce higher affinity antibodies. FDCs express various surface proteins that help trap and retain antigens, allowing B cells to interact with these antigens and their cognate helper T cells effectively. This interaction is essential for promoting class switching and increasing the quality of the antibody response. The other locations listed, such as the bone marrow and thymus gland, are primarily associated with the development and maturation of hematopoietic cells and T cells, respectively. The spleen's red pulp is mainly associated with filtering the blood and the removal of old or damaged red blood cells, rather than being the primary site for FDCs. Thus, attributing the primary location of follicular dendritic cells to the germinal centers aligns with their critical function in the adaptive immune response.

7. What does MCP stand for?

- A. Major Complement Protein
- B. Membrane Cofactor Proteins
- C. Macrophage Co-factor Protein
- D. Membrane Control Protein

MCP stands for Membrane Cofactor Proteins. These proteins play a crucial role in the regulation of the complement system, which is a part of the immune response. Specifically, Membrane Cofactor Proteins serve as co-factors for factor I in cleaving C3b and C4b, thereby preventing the excessive activation of the complement system on the surface of host cells. This mechanism is essential for protecting host tissues from damage while allowing for effective immune responses against pathogens. Additionally, these proteins help to maintain immune homeostasis by promoting the clearance of apoptotic cells and by facilitating the removal of complement-opsonized pathogens. Understanding the role of MCPs is vital in immunology as they exemplify the balance between immune activation and regulation, highlighting the complexity of the immune system.

8. Which proteins do CR3 and CR4 receptors recognize?

- A. C3b
- B. C5a
- C. iC3b
- D. C3d

CR3 (Complement Receptor 3) and CR4 (Complement Receptor 4) are important components of the immune system that play a key role in the recognition of pathogens and the activation of immune responses. These receptors specifically recognize fragments of the complement component C3, which is involved in the opsonization and clearance of pathogens. The correct answer, which is iC3b, refers to an intermediate form of the complement protein C3 that is generated during the complement activation process. When C3 is cleaved by factors such as C3 convertase, it produces C3b, and upon further cleavage, iC3b is formed. The iC3b fragment still retains the ability to bind to receptors like CR3 and CR4, which enhances phagocytosis and helps immune cells to identify and eliminate pathogens more effectively. In contrast, C3b is primarily recognized by CR1 and does not bind to CR3 and CR4 as effectively as iC3b. C5a is a potent chemotactic factor but does not interact with CR3 or CR4, and C3d, while important for B cell activation, is primarily recognized by receptors such as CR2, not CR3 or CR

9. How do autoantibodies typically affect the body?

- A. They enhance infection resistance
- B. They can target and damage self-tissues
- C. They aid in pathogen identification
- D. They contribute to increased antibody synthesis

Autoantibodies are immunoglobulins produced by the immune system that mistakenly target and bind to one's own tissues or organs. This misdirected immune response can lead to a variety of autoimmune diseases, where the immune system's activity causes inflammation and damage to healthy tissues. The presence of autoantibodies indicates a breakdown in the normal tolerance mechanisms of the immune system, leading to conditions such as lupus, rheumatoid arthritis, and multiple sclerosis, among others. Their primary role in eliciting tissue damage can occur through various mechanisms, including complement activation, direct cellular damage, and the induction of inflammatory responses. Such action can compromise the functionality and integrity of the affected organs and tissues, contributing to the overall pathology of autoimmune diseases. Understanding this aspect of autoantibodies is crucial in immunology, as it highlights the delicate balance the immune system must maintain between protecting the body and avoiding self-damage.

10. C-reactive protein binds with which part of C1q?

- A. Globular heads
- B. Stalks
- C. Both C1q tails
- D. N-terminal regions

C-reactive protein (CRP) is an acute-phase protein that plays a significant role in the immune response, particularly in the recognition and opsonization of pathogens. When CRP is present in the blood, it can bind to C1q, which is the first component of the classical complement pathway. The interaction between CRP and C1q is primarily facilitated by the stalks of C1q. The stalks are crucial because they serve as structural linking components that help connect the globular heads of C1q to the rest of the complement system. When CRP binds to the stalks of C1q, it triggers the activation of the complement cascade, which ultimately leads to enhanced phagocytosis of pathogens and clearing of damaged cells. Recognizing this binding specificity is important because it highlights the role that CRP plays in innate immunity by activating the complement system through its interaction with C1q. Therefore, the binding of CRP to the stalks of C1q is a key step in the regulation and enhancement of the immune response.