

The People's Democratic Republic of Algeria
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TD 07 – Immunology

Exercise 01:

Write the answer to each clue in the space provided

1. The protein complex designated by the symbol C that plays a role in opsonisation and inflammatory response
2. Cellular process by which phagocytes ingest solid foreign particles on a micrometric scale
3. Cytokine that acts on nearby cells surrounding the secreting cell
4. Receptor present on T helper cells that responds to antigen with MHC II
5. The stage of phagocytosis where the phagosome fuses with lysosomes
6. Cell type that bridges innate and adaptive immunity; presents antigen to T cells
7. Pore-forming complex made of complement components C5 through C9
8. Pro-inflammatory cytokine; the major factor in lymphocyte growth and proliferation
9. Soluble glycoproteins produced in response to an antigen that specifically bind to that antigen
10. The process by which leukocytes cross blood vessel walls to reach infected tissue

Exercise 02:

Read each clinical scenario carefully and answer the questions that follow. Apply your knowledge of innate and adaptive immunity to explain the underlying immune mechanisms.

Case 1: Bacterial Skin Infection

A 28-year-old construction worker arrives at the emergency department with a deep laceration on his left forearm sustained at the work site. The wound was not cleaned immediately. Two days later, the area around the wound has become red, swollen, warm to the touch, and increasingly painful. The patient reports a fever of 38.5°C. Blood tests reveal elevated white blood cell count, increased C-reactive protein (CRP), and elevated levels of C3a and C5a in the serum.

- a. Identify the innate immune barriers that were bypassed when the injury occurred.
- b. Explain the inflammatory mechanisms responsible for the redness, swelling, heat, and pain observed. Include the roles of specific cells and chemical mediators.

Case 2: Recurrent Viral Infections

A 5-year-old child has been experiencing recurrent severe viral infections, including multiple episodes of influenza and persistent herpes simplex infections. Laboratory tests show normal B lymphocyte counts and normal antibody levels, but a significantly reduced number of CD8+ T cells. NK cell activity is also below normal. The child has received all recommended vaccinations, but antibody responses to vaccines appear normal.

- a. Which branch of the adaptive immune system is primarily affected in this patient? Justify your answer.

b. Why does the patient still have normal antibody responses despite having recurrent infections? Explain using the concept of cell cooperation.

Exercise 03:

For each process below, arrange the events in the correct chronological order by numbering them 1 through 5.

Sequence A: Classical Complement Activation

Number each event in the correct order:

- ___ C1s cleaves C4 and C2 into C4a, C4b, C2a, C2b
- ___ C3 convertase (C4b2a) cleaves C3 into C3a and C3b
- ___ C5 convertase (C4b2a3b) cleaves C5 into C5a and C5b
- ___ C1q binds to Fc fragment of IgM or IgG antibodies
- ___ C5b recruits C6, C7, C8, and (C9)_n to form the MAC

Sequence B: Phagocytosis

Number each event in the correct order:

- ___ Digestion: phagosome fuses with lysosomes to form phagolysosome
- ___ Adhesion: phagocyte recognizes the pathogen via surface receptors
- ___ Exocytosis: waste materials are expelled from the cell
- ___ Ingestion: pathogen is internalized into a phagosome through endocytosis
- ___ Opsonisation: C3b or antibodies coat the pathogen surface

Sequence C: Inflammatory Response

Number each event in the correct order:

- ___ Diapedesis: granulocytes and monocytes cross vessel walls toward the infection
- ___ Skin injury allows pathogens to bypass natural barriers
- ___ Phagocytosis: macrophages ingest and digest the microorganisms
- ___ Recognition: sentinel cells identify the pathogen and produce chemical mediators
- ___ Vasodilation: blood capillaries dilate, causing erythema and edema