

The People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
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TD 02 – Molecular & Cellular Immunology

Exercise 1: True or False Statements

Indicate whether the statement is true or false. Correct the false statements.

1. Dendritic cells are the most effective APCs at activating naïve T lymphocytes.
2. Macrophages only present antigens to B lymphocytes.
3. B lymphocytes can act as APCs by presenting antigens via MHC-II.
4. All nucleated cells in the body are professional APCs.
5. The primary role of an APC is to produce antibodies.

Exercise 2: Multiple Choice Questions

Choose the best answer.

1. **What is the main function of Antigen-Presenting Cells (APCs)?**
 - a) To produce antibodies.
 - b) To directly kill infected cells.
 - c) To capture, process, and present antigens to T lymphocytes.
 - d) To produce complement proteins.
2. **Which APC is specialized in capturing antigens in peripheral tissues and then migrating to lymph nodes to present them?**
 - a) Macrophage
 - b) B Lymphocyte
 - c) Dendritic Cell
 - d) Neutrophil
3. **Which type of Major Histocompatibility Complex (MHC) is primarily used by professional APCs to present exogenous antigens and activate CD4⁺ T helper cells?**
 - a) MHC-I
 - b) MHC-II
 - c) MHC-III
 - d) CD1
4. **Which receptor is crucial for the migration of dendritic cells from peripheral tissues to the lymph nodes after they capture an antigen?**
 - a) CD40
 - b) TLR4
 - c) CCR7
 - d) BCR
5. **What allows B cells to capture antigens with high specificity before presenting them?**
 - a) Toll-like Receptors (TLRs)
 - b) Their phagocytic capability
 - c) The B Cell Receptor (BCR)
 - d) Complement Receptors (CRs)

Exercise 3:

Match each type of APC with its defining characteristic.

1. Dendritic Cell	A. Can present antigens after specific capture via its B Cell Receptor (BCR).
2. Macrophage	B. Considered the most effective "sentinels"; key link between innate and adaptive immunity.
3. B Lymphocyte	C. Phagocytoses pathogens and presents antigens; also plays a major role in tissue repair.

Exercise 4:

Use the following words to complete the sentences below:

MHC-II, costimulation, dendritic cells, macrophages, B lymphocytes, phagocytosis, CCR7, CD80/CD86

- _____ are considered the most professional and effective APCs for initiating a T-cell response.
- _____ is the key process used by macrophages to ingest and destroy pathogens.
- _____ can present antigens to CD4+ T cells via _____ after capturing them with their BCR.
- The _____ receptor is essential for guiding activated dendritic cells to the lymph nodes.
- Molecules like _____ provide the necessary _____ signal for full T-cell activation, preventing anergy.

Exercise 5: Compare and Contrast

Complete the table to compare the three main professional APCs.

Characteristic	Dendritic Cell	Macrophage	B Lymphocyte
Primary role in antigen presentation			
Main MHC molecule used for T-cell activation			
Key mechanism of antigen capture			
Presence of co-stimulatory molecules (e.g., CD80/86)			
Migration to lymph nodes after antigen capture			