

Preparation for the Case Study: “Virus Versus Vaccine: The Mechanics of the Immune System”

by

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Preparation

Answer the questions below after watching the following video, which reviews how T cells are activated during an immune response, including antigen presentation and signaling between immune cells.

- *Immune Response Explained: T-Cell Activation*. Running time: 6:52 min. Produced by Demystifying Medicine McMaster, 2020. <<https://youtu.be/6eMh0Vpyoik>>

Questions

1. What is a pathogen?
2. The immune system is divided into two branches, the adaptive and innate. Which system “learns” that it remembers and responds faster (and stronger) the second time it encounters a pathogen?
 - a. Adaptive
 - b. Innate
 - c. Both
3. The immune system contains a variety of cell types. Which of the following cells are considered lymphocytes? (Select all that apply.)
 - a. B cells
 - b. Basophils
 - c. Eosinophils
 - d. Macrophages
 - e. Natural killer cells
 - f. T cells
4. For each of the following statements, decide whether they are true of CD4⁺ T-cells or CD8⁺ T-cells. Write “4” beside statements true for CD4⁺ T-cells and “8” for statements true for CD8⁺ T-cells.
 - a. ___ Activate cytotoxic T-cells
 - b. ___ Activate macrophages
 - c. ___ Enhance the antibody production

- d. ___ Promote B-cell maturation
 - e. ___ Recognize antigens attached to MHC-I
 - f. ___ Recognize antigens attached to MHC-II
 - g. ___ They are also called cytotoxic T cells
 - h. ___ They are also called helper T cells
 - i. ___ Release perforins into infected cells
5. Cytotoxic T-cells release perforins. What role do perforins play?
- a. Killing bacteria
 - b. Killing infected or cancerous cells
 - c. Phagocytosis of infected cells
6. Which of the following cells act as antigen presenting cells (APCs)? (Select all that apply.)
- a. B cells
 - b. Dendritic cells
 - c. Macrophages
 - d. Neutrophils
 - e. Cytotoxic T cells
7. True or false? CD8⁺ T cells destroy infected cells directly.
8. True or false? Helper T cells release cytokines to activate other immune cells.
9. True or false? MHC I molecules are found only on antigen-presenting cells.
10. True or false? T cells can be activated by free-floating antigens.
11. How do cytotoxic CD8⁺ T-cells recognize infected cells?
- a. They recognize viral antigens presented on MHC I molecules.
 - b. They recognize free-floating viral particles in the bloodstream.
 - c. They recognize viral antigens presented on MHC II molecules.
 - d. They are activated by complement proteins binding to the infected cell.
12. A cancer vaccine is created to fight against tumor antigens by increasing the amount of CD8⁺ activity. Should the vaccine also include components that activate CD4⁺ T cells as well? Why or why not?
13. Explain why T-cell activation requires both antigen recognition and costimulation. What could happen if costimulation were bypassed?