Two Ways to Defend

Trace how immune cells respond to a virus over time.

HAP.11.5 "Differentiate the role of B-lymphocytes and T-lymphocytes in the development of humoral and cell-mediated immunity and primary and secondary immune responses."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline B-cell actions and circle T-cell actions in the passage. Write 1 beside details of the primary response and 2 beside details of the secondary response so you can compare the defenses.

The Virus at the Concert

1. At a crowded school concert, a respiratory virus enters Maya's nose. Some viral particles drift between cells, while others enter airway cells and make more virus. These are two different targets. B lymphocytes, or B cells, recognize a matching viral antigen and, with signals from helper T cells, can become plasma cells. Plasma cells release antibodies into body fluids. The antibodies bind viral particles outside cells, helping block infection and clear those particles. This antibody-based defense is called humoral immunity. Antibodies cannot reach a virus that is making copies inside an intact airway cell.

2. To deal with infected airway cells, the immune system uses cell-mediated immunity. Cytotoxic T lymphocytes, also called killer T cells, recognize viral pieces displayed on the surface of infected cells. They kill those cells, interrupting virus production. Helper T cells support this process by activating other immune cells, including cytotoxic T cells and B cells. During Maya's first encounter with this virus, finding and expanding the right B and T cells takes time. This slower primary response allows the virus to multiply before enough antibodies and killer T cells are ready to limit it.

3. After the first response, some matching B and T cells remain as memory cells. Months later, Maya meets the same virus again at another concert. Her memory B cells help produce matching antibodies faster and often in greater amounts than during the first encounter. Memory T cells also respond more quickly, supporting B cells or attacking infected cells, depending on the T-cell type. This faster, stronger secondary response may stop the virus before Maya notices symptoms, though protection is not always complete. The difference depends on immune memory from the earlier encounter, not on antibodies entering infected cells.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare how B cells and killer T cells deal with Maya's virus. Name the type of immunity each helps provide.

2. Why can helper T cells contribute to both humoral and cell-mediated immunity in Maya's response?

3. How do memory B cells and memory T cells change Maya's second response compared with her first?

4. A classmate says that more antibodies alone will stop virus production inside cells that are already infected. Use the passage to correct this claim.

3 YOUR TURN

Your own words

Kai has never met a certain virus, but Lee recovered from the same virus last year. They are exposed on the same day. Write five sentences comparing their likely defenses: explain what B cells, helper T cells, killer T cells, and memory cells do, and distinguish the primary from the secondary response.

Two Ways to Defend

PART 1 · READ AND MARK

Underline B-cell actions and circle T-cell actions in the passage. Write 1 beside details of the primary response and 2 beside details of the secondary response so you can compare the defenses. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare how B cells and killer T cells deal with Maya's virus. Name the type of immunity each helps provide.	**B cells become plasma cells that release antibodies against virus outside cells, providing humoral immunity. Killer T cells destroy infected cells, providing cell-mediated immunity.**
2	Why can helper T cells contribute to both humoral and cell-mediated immunity in Maya's response?	**Helper T cells activate B cells involved in antibody production and cytotoxic T cells that kill infected cells.**
3	How do memory B cells and memory T cells change Maya's second response compared with her first?	**Memory B cells help produce matching antibodies faster and often in greater amounts. Memory T cells respond faster, making the secondary response faster and stronger than the primary response.**
4	A classmate says that more antibodies alone will stop virus production inside cells that are already infected. Use the passage to correct this claim.	**Antibodies bind virus outside cells but cannot reach virus inside intact cells. Killer T cells destroy infected cells and interrupt virus production.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Kai has never encountered this virus, so his primary response takes time while matching B and T cells multiply. His helper T cells activate B cells, which make antibodies that bind free virus, and killer T cells destroy infected cells. Lee's earlier infection left memory B and T cells that recognize the same virus. Lee's secondary response should produce antibodies sooner and bring T-cell defenses into action sooner than Kai's primary response. Antibodies do not remove virus already inside cells, so killer T cells still matter for both patients.

Accept explanations that distinguish antibodies acting on virus outside cells from killer T cells destroying infected cells. Lee's response should be described as faster, not guaranteed to prevent illness.