Defenses at Work

Compare the immune system's fast and targeted responses

HAP.11.3 "Compare and contrast the body's non-specific and specific lines of defense, including an analysis of the roles of various leukocytes: basophils, eosinophils, neutrophils, monocytes, and lymphocytes."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Read the passage. Underline nonspecific defenses, circle specific defenses, and number each place where one defense helps another.

What Happens After a Scrape?

1. A scrape from a fence breaks the skin, allowing bacteria to enter. Intact skin is a nonspecific barrier: it blocks many invaders without recognizing any one species. After the scrape, local blood vessels widen and become leakier, bringing immune cells into the tissue. Neutrophils arrive early and engulf bacteria. These steps belong to the innate response, which acts quickly. Unlike a targeted defense, it does not need a previous encounter with that bacterium.

2. Basophils release histamine, which promotes blood vessel changes during inflammation and can contribute to allergies. Eosinophils are especially effective against parasitic worms and also take part in allergic reactions. Neutrophils mainly engulf microbes, while monocytes leave the blood and mature into macrophages that engulf microbes and debris. All four are part of nonspecific defense, but their jobs are not interchangeable. A worm and a bacterium can therefore trigger different emphases within the same fast, broad defense.

3. Macrophages can display pieces of an invader, called antigens, to T lymphocytes. This helps start a specific, or adaptive, response aimed at that antigen. Helper T cells coordinate other immune cells, while cytotoxic T cells kill infected body cells. B lymphocytes make antibodies that bind particular antigens. Some B and T cells become memory cells, so a later encounter with the same invader can produce a faster response. Both defenses use white blood cells, but only the specific defense builds this targeted memory.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do intact skin and a neutrophil defend differently, and why are both nonspecific?

2. How do basophils and eosinophils differ in their roles, and where do their roles overlap?

3. How can a monocyte help connect nonspecific and specific defenses?

4. Compare a neutrophil's response to bacteria with a B lymphocyte's response to an antigen. Which defense can respond faster after a later encounter?

3 YOUR TURN

Your own words

A student inhales a virus they have had before. In four sentences, compare early nonspecific and specific defenses, name a role for monocytes and for both B and T lymphocytes, and explain how memory changes the response.

Defenses at Work

PART 1 · READ AND MARK

Read the passage. Underline nonspecific defenses, circle specific defenses, and number each place where one defense helps another. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do intact skin and a neutrophil defend differently, and why are both nonspecific?	**Skin blocks many invaders from entering. Neutrophils engulf microbes after they enter. Neither defense targets one particular species.**
2	How do basophils and eosinophils differ in their roles, and where do their roles overlap?	**Basophils release histamine during inflammation. Eosinophils are especially effective against parasitic worms. Both can take part in allergic reactions.**
3	How can a monocyte help connect nonspecific and specific defenses?	**A monocyte can become a macrophage that engulfs microbes and displays their antigens to T lymphocytes, helping start a specific response.**
4	Compare a neutrophil's response to bacteria with a B lymphocyte's response to an antigen. Which defense can respond faster after a later encounter?	**A neutrophil engulfs bacteria as part of a fast, nonspecific response. A B lymphocyte makes antibodies that bind a particular antigen. Specific defense can respond faster later because some B and T cells become memory cells.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Early nonspecific defenses act quickly, and monocytes can become macrophages that engulf microbes and debris. Those macrophages can display viral antigens to T lymphocytes, linking early and specific defenses. B lymphocytes make antibodies that bind the virus's antigens, while cytotoxic T lymphocytes kill infected body cells. Because memory B and T cells formed during the first illness, the specific response can begin faster this time.

Accept answers that distinguish broad, fast innate action from antigen-targeted adaptive action. For the open task, students may describe helper T cells coordinating immune cells instead of cytotoxic T cells killing infected cells.