Two Lines of Defense

Compare fast, broad defenses with targeted immune memory.

HS-AP9-3 "Differentiate between innate and acquired immunity."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two details showing that innate defenses act quickly or broadly, circle two details showing that acquired defenses target specific antigens or remember them, and write 1 beside a sentence showing how the defenses work together.

What Happens After a Cut?

1. While repairing a bicycle, Mara gets a small cut on her finger. Bacteria from the handlebar enter through the broken skin. Unbroken skin usually blocks many microbes, but this barrier has been breached. Within minutes, nearby blood vessels widen and fluid moves into the tissue, making the area red and swollen. Neutrophils leave the blood and engulf bacteria; macrophages also engulf invaders and damaged cells. These defenses are part of innate immunity. They act quickly and respond to broad features shared by many microbes rather than recognizing one particular bacterium from an earlier encounter.

2. Some immune cells carry pieces of the bacteria, called antigens, to a nearby lymph node. There, the pieces help activate lymphocytes that recognize those particular antigens. B cells can develop into plasma cells that release antibodies, which bind matching targets. Certain T cells help coordinate the response. If a microbe infects body cells, other T cells can kill those infected cells. These targeted actions are acquired immunity, also called adaptive immunity. On a first encounter, building a strong acquired response usually takes days. Innate defenses keep working during that time, so the two systems cooperate rather than taking turns.

3. After the bacteria are cleared, some B and T cells remain as memory cells. If the same bacterial antigens appear again, these cells can support a faster, stronger acquired response. Memory is tied to the antigens recognized, not to every germ a person might meet. Vaccines use this feature by presenting a pathogen antigen, or instructions to make one, without requiring infection with the full-strength pathogen. A vaccine can prepare an acquired response before exposure to that pathogen, while skin and fast innate defenses still provide everyday protection against many kinds of microbes.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why is unbroken skin an innate defense rather than an acquired defense?

2. Neutrophils reach Mara's cut within minutes, while plasma cells later release matching antibodies. Which action is innate, which is acquired, and what is one difference between them?

3. If Mara encounters the same bacterial antigens again, which type of immunity can respond faster than it did the first time? Why might a different germ not trigger that faster response?

4. How does the protection prepared by a vaccine differ from the response that makes Mara's cut red and swollen?

3 YOUR TURN

Your own words

Imagine you breathe in a virus you have never encountered or been vaccinated against, then encounter the same virus months later. In four or five sentences, compare what innate and acquired immunity do on the first and second encounters, using specificity and memory.

ANSWER KEY

Two Lines of Defense

PART 1 · READ AND MARK

Underline two details showing that innate defenses act quickly or broadly, circle two details showing that acquired defenses target specific antigens or remember them, and write 1 beside a sentence showing how the defenses work together. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why is unbroken skin an innate defense rather than an acquired defense?	**Skin blocks many microbes without recognizing a particular antigen or relying on memory of an earlier encounter.**
2	Neutrophils reach Mara's cut within minutes, while plasma cells later release matching antibodies. Which action is innate, which is acquired, and what is one difference between them?	**Neutrophils engulfing bacteria is innate: it acts quickly and broadly. Plasma cells releasing matching antibodies is acquired: it targets particular antigens and takes longer to build on a first encounter.**
3	If Mara encounters the same bacterial antigens again, which type of immunity can respond faster than it did the first time? Why might a different germ not trigger that faster response?	**Acquired immunity can respond faster because memory cells remain. Those cells recognize particular antigens, which a different germ might not share.**
4	How does the protection prepared by a vaccine differ from the response that makes Mara's cut red and swollen?	**A vaccine prepares antigen-specific acquired immunity and memory. The redness and swelling are part of a fast, broad innate response.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

When I first breathe in the virus, innate defenses respond quickly to broad signs of an invader. Acquired immunity takes longer to build a response that targets the virus's antigens. Some B and T cells remain as memory cells after the virus is cleared. Months later, innate defenses still respond broadly, but memory cells help acquired immunity target the same antigens faster and more strongly.

Accept descriptions of innate immunity as fast and broad and acquired immunity as antigen-specific with memory. For the open task, students should distinguish both encounters rather than suggest that innate defenses develop antigen-specific memory.