Defense in Motion

Trace inflammation, lymph flow, and immune memory

HAP.7 "Obtain, evaluate, and communicate information describing the structure of lymph nodes and primary cells of the immune system (neutrophils, lymphocytes, monocytes, macrophages, eosinophils..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each step in the fluid's route from blood vessels back to veins, and circle each immune cell name with a brief margin note about its role.

What Happens After a Scrape?

1. A runner scrapes a knee on a gravel path. Damaged tissue releases chemical signals, and nearby blood vessels widen and become leakier. Extra blood and fluid bring warmth, redness, and swelling, signs of inflammation. Neutrophils leave the blood and quickly engulf invading bacteria. Monocytes also leave the blood; in tissues, many become macrophages, which engulf microbes and damaged cells. Basophils release histamine, a chemical that helps increase blood vessel leakiness. Eosinophils are especially useful against parasitic worms and can take part in allergic inflammation. These responses help contain threats, but swelling can also make the knee sore.

2. Some fluid that leaks from blood vessels enters lymphatic capillaries and becomes lymph. Lymph vessels carry it through lymph nodes, then return it to veins near the heart. A node has an outer cortex with clusters of B lymphocytes, a deeper area rich in T lymphocytes, and an inner medulla. As lymph passes through, macrophages trap and engulf material from the scrape. B and T lymphocytes recognize specific antigens, molecules that signal a possible threat. Activated B cells can produce antibodies, while some T cells coordinate defenses or kill infected cells. Thus, the lymphatic system links tissue fluid, blood circulation, and immune surveillance.

3. Weeks earlier, the runner received a vaccine containing a harmless piece of a particular virus. That piece acts as an antigen without causing the disease itself. Immune cells respond, and some B and T lymphocytes become memory cells. If the matching virus enters later, memory cells help mount a faster, stronger response. A vaccine against that virus does not train memory cells to recognize every bacterium in the scrape. To evaluate a claim about protection, check whether it names the vaccine's target and describes memory rather than promising instant or universal defense. Vaccination prepares specific defenses; inflammation and circulating immune cells still respond to new injuries.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do neutrophils and monocytes that become macrophages help defend the scraped knee?

2. Where are B and T lymphocytes found in a lymph node, and what do macrophages do as lymph passes through?

3. A student claims, “The runner’s virus vaccine prevents any infection in the scrape.” Evaluate this claim using the passage.

4. Trace the leaked fluid from the blood vessels until it returns to the blood. How does this route help immune defense?

3 YOUR TURN

Your own words

Imagine a splinter introduces bacteria into a finger in someone vaccinated against a particular virus. In 5 to 6 sentences, trace inflammation and the fluid’s route through a lymph node back to the blood, describe the roles of at least four immune cell types, and explain why the vaccine cannot be assumed to protect against these bacteria.

Defense in Motion

PART 1 · READ AND MARK

Underline each step in the fluid's route from blood vessels back to veins, and circle each immune cell name with a brief margin note about its role. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do neutrophils and monocytes that become macrophages help defend the scraped knee?	**Neutrophils quickly engulf bacteria. Monocytes can enter tissue and become macrophages, which engulf microbes and damaged cells.**
2	Where are B and T lymphocytes found in a lymph node, and what do macrophages do as lymph passes through?	**B lymphocytes cluster in the outer cortex, and T lymphocytes are common in a deeper area. Macrophages trap and engulf material carried in the lymph.**
3	A student claims, "The runner's virus vaccine prevents any infection in the scrape." Evaluate this claim using the passage.	**The claim is not supported. The vaccine prepares memory cells to respond to a particular virus, not to every bacterium that might enter the scrape.**
4	Trace the leaked fluid from the blood vessels until it returns to the blood. How does this route help immune defense?	**Fluid enters lymphatic capillaries, travels as lymph through lymph vessels and nodes, and returns to veins near the heart. In the nodes, immune cells encounter and respond to material carried in the lymph.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

After a splinter brings bacteria into a finger, basophils release histamine, helping nearby blood vessels become leakier. Neutrophils leave the blood and engulf bacteria, while monocytes enter the tissue and can become macrophages that engulf microbes. Some leaked fluid enters lymphatic capillaries and travels as lymph through lymph vessels to a lymph node. There, macrophages trap material, and B and T lymphocytes in different node regions may recognize bacterial antigens. Lymph eventually returns to veins near the heart, linking tissue drainage with blood circulation. Memory cells trained by a vaccine against a particular virus cannot be assumed to recognize these bacteria.

Accept accurate alternatives that distinguish rapid inflammatory responses from antigen-specific lymphocyte responses. For Part 3, check for 5 to 6 sentences, four named cell types with roles, the complete fluid route, and a target-specific explanation of vaccine protection.