Signals and Support

Trace a nerve signal and the cells that help it travel

HAP.6.2 "Analyze the structure and function of neurons and their supporting neuroglia cells (e.g., astrocytes, oligodendrocytes, Schwann cells, microglial)."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each neuron part and the job it performs. Circle each type of neuroglial cell and draw an arrow to its support job.

When Your Foot Finds a Pebble

1. A bare foot lands on a sharp pebble. Pain-sensing endings in the skin start a signal that travels toward the spinal cord through a sensory neuron. Neurons carry information using electrical signals along their membranes. In many neurons, branching dendrites receive input, and the cell body contains the nucleus and keeps the cell working. An axon carries a signal away from the cell body. At its terminals, the neuron releases chemical messengers across a tiny gap called a synapse. A nearby neuron can then start its own electrical signal. These parts give a message a route instead of letting it spread at random.

2. In the spinal cord, a sensory neuron passes the message to other neurons, which help activate a motor neuron. The motor neuron sends a signal to leg muscles, pulling the foot away. Speed matters here. Many axons are wrapped in myelin, a fatty insulating layer that helps electrical signals travel quickly. Schwann cells make myelin around sections of axons in peripheral nerves, outside the brain and spinal cord. Oligodendrocytes make myelin around sections of axons inside the brain and spinal cord. One oligodendrocyte can support sections of several axons, while a Schwann cell wraps one section of one axon.

3. Myelin is not the only kind of help neurons need. In the spinal cord, astrocytes surround synapses and help control the chemical environment around neurons, including levels of ions and chemical messengers. This helps neurons communicate reliably. Microglia patrol the brain and spinal cord and remove damaged cells and other debris. If the pebble cuts the skin, microglia would not clean the cut because they work in the central nervous system, not at the skin. If tissue in the spinal cord is damaged, however, microglia can clear debris there. Neuroglia support the signaling cells without replacing the neurons' job of carrying messages.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do an axon and its terminals work together to pass a message to another neuron?

2. How are the jobs of Schwann cells and oligodendrocytes alike, and how do their locations differ?

3. Why would astrocytes help neurons communicate, while microglia would help after spinal cord tissue is damaged?

4. An axon in the spinal cord loses myelin, but the nerves in the leg keep theirs. Which glial cell's work is disrupted, and why might the foot withdrawal slow?

3 YOUR TURN

Your own words

A student hears a bike bell and moves one hand to steer away. In four sentences, trace how neuron parts carry the message from ear to hand, explain where Schwann cells and oligodendrocytes support that route, and predict what could happen if myelin in a peripheral nerve were damaged.

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PART 1 · READ AND MARK

Underline each neuron part and the job it performs. Circle each type of neuroglial cell and draw an arrow to its support job. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do an axon and its terminals work together to pass a message to another neuron?	**The axon carries a signal away from the cell body. Its terminals release chemical messengers across a synapse, where another neuron can start a signal.**
2	How are the jobs of Schwann cells and oligodendrocytes alike, and how do their locations differ?	**Both make myelin around axons. Schwann cells do so in peripheral nerves, while oligodendrocytes do so in the brain and spinal cord.**
3	Why would astrocytes help neurons communicate, while microglia would help after spinal cord tissue is damaged?	**Astrocytes control the chemical environment near synapses so neurons can communicate reliably. Microglia remove damaged cells and debris.**
4	An axon in the spinal cord loses myelin, but the nerves in the leg keep theirs. Which glial cell's work is disrupted, and why might the foot withdrawal slow?	**An oligodendrocyte's work is disrupted because it makes myelin in the spinal cord. Without that myelin, a signal along the axon may travel more slowly.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Sound information travels from the ear along sensory neurons to the brain, where neurons help plan a movement of the hand. Dendrites receive signals, cell bodies keep neurons working, and axons send signals to terminals that pass messages across synapses. Oligodendrocytes make myelin around axons in the brain, while Schwann cells make myelin around axons in peripheral nerves leading to the hand. If myelin on a peripheral axon were damaged, its signal might travel more slowly and delay the steering movement.

Accept descriptions that correctly connect each cell's structure or location to its function. A student may note that the effect of myelin damage depends on which peripheral nerve is affected.