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| 3A-1 |
| **Basic Science Question:** |
| What makes up a neuron and how does it transmit signals in the brain? |
| **Report:** |
| Neurons are the functional units of the brain that are specialized to fire action potentials in response to other neurons. Action potentials are produced from the activation of voltage-sensitive ion channels in the cell membrane by depolarization resulting from synaptic activation. The specialized structures of a neuron that allow for information to be sent and received include the cell body (soma), dendrites, axon, and axon terminals.  The cell body contains a nucleus. Extending from the cell body are short, branched processes called dendrites that receive information through numerous receptors located in their membrane. Chemical signals from the axon terminals of other neurons are what are converted by the dendrites into small electrical impulses that are transmitted in the direction of the cell body. The axon extends from the axon hillock which is attached to the cell body. An action potential originates at the axon hillock and conducts down the axon to the axon terminals. Myelin sheaths wrap around the axon and are essential for electrical insulation to speed up the action potential. Axon terminals are at the end of an axon and convert the electrical signal into a chemical signal known as the process synaptic transmission.  Synapses are the specialized sites of neuronal communication. Synapses are between the axon terminal from a presynaptic cell and the dendrite or cell body of the post synaptic cell of another neuron. In a chemical synapse, the axon terminal of the presynaptic cell contains vesicles filled with a particular neurotransmitter. When an action potential reaches the axon terminal in the presynaptic cell, Ca2+ in the cytosol rises which causes some of the vesicles to fuse with the plasma membrane releasing contents into the synaptic cleft. The neurotransmitters diffuse across the synaptic cleft (separates the plasma membranes of the presynaptic and postsynaptic cells) and bind to the receptors on postsynaptic cells. |
| **References:** |
| Lodish H, Berk A, Zipursky SL, et al. Molecular Cell Biology. 4th edition. New York: W. H. Freeman; 2000. Section 21.1, Overview of Neuron Structure and Function. |