Neuron Action Potential Propagation

Neuron action potential propagation describes how the action potential generated at the axon hillock travels down the axon towards the nerve terminal. The depolarization wave is unidirectional, meaning signals can only travel down an axon and not back up. There is an absolute refractory period associated with the preceding sodium channels, which prevents depolarization of the same neuron region and channels from occurring rapidly. This allows for salt concentration gradients to be re-established. Neighboring voltage-gated channels open because of the initial sodium-influx, allowing for the depolarization and repolarization to propagate down the axon. They travel through the nodes of Ranvier, because these are non-insulated areas of the axon, and action potentials can only be generated at these locations. In general, the axon is myelinated, which provides insulation and increases propagation speed. The action potential jumping from a node of Ranvier to the next node is a form of transmission referred to as "saltatory conduction."

PLAY PICMONIC

Characteristics

Unidirectional Depolarization

Unicorn D-polar-bear

Depolarization in neurons occurs in only one direction, meaning the signal can only travel down the neuron towards the next neuron.

Absolute Refractory Period In Preceding Na+ Channels

Cracked Absolute Salt-shakers

The previous sodium channels have an absolute refractory period during which that area of the neuron cannot depolarize again. Typically, the concentration gradient is re-established at this time.

Neighboring Voltage Gate Channels Open

Voltage-spikes Opening the Salt-shaker Gate

Voltage-gated channels open near the initial site of action potential generation. This is because the sodium influx of the initial region causes late depolarization in nearby regions.

Nodes of Ranvier

Noses of Reindeer holding up Salt shaker Cages

Nodes of Ranvier are gaps in the myelin sheath. Because these are uninsulated areas, action potentials can be generated here, and these areas are the sites of propagation. The electrical signal is said to "jump" from node to node.

Myelination Increases Propagation Speed

Myelin-sheaths with Speed-pads

Myelination of the axon increases propagation speed by providing insulation and decreasing loss of electrical signal.

Saltatory Conduction

Salt-can Conducting

The electrical signal hops from one node of Ranvier to the next node. This type of transmission is called saltatory conduction.