

Nervous System: CH 13

The Nervous divisions

2 divisions:

- Central nervous system (CNS): brain & spinal cord.
- Peripheral nervous system (PNS):
nerves & ganglia (cell bodies)

The Nervous System - allows for communication between cells through sensory input, integration of data & motor output

2 Cell types: neurons & neuroglia

Expanding on neurons

3 types of neurons:

- Sensory - takes impulses from sensory receptor to CNS
- Interneurons - receive information in the CNS & send it to a motor neuron
- Motor - takes impulses from the CNS to an effector (i.e. gland or muscle fiber)

Neuron Structure (CH 4 review*)

Cell body - main cell where organelles & nuclei reside

Dendrite - many, short extensions that carry impulses to a cell body.

Axon (nerve fiber) - single, long extension that carries impulses away from cell body.

TYPES OF NEURONS

The myelin sheath

- a lipid covering on long axons that act to increase the speed of nerve impulse conduction, insulation, & regeneration in the PNS

- How do neurons generate & send their electrical signal?
The nerve cell resting potential (RP)

Resting potential - when the axon is not conducting a nerve impulse

- more positive ions outside than inside the membrane
- There is a negative charge of -70 mV inside the axon.
- more Na^+ outside than inside
- more K^+ inside than outside

The nerve impulse: action potential

Action potential - rapid change in the electrical potential of an axon membrane that allows a nerve impulse to occur.

depolarization - Sodium gates open letting Na^+ in interior of axon lose negative charge ($+40\text{ mV}$)

repolarization - potassium gates open letting K^+ out interior of axon ~~loses~~ ^{regains} negative charge (-70 mV)

nerve impulse - ~~resting potential~~ wave of depolarization/repolarization travels down the axon

* resting potential is restored by moving potassium inside & sodium outside

Depolarization / Repolarization: The nerve impulse: action potential →

What starts an action potential?

- a stimulus

- from an adjoining nerve

- from a physical force

- light - neurons in the eye

- Pressure - neurons in the ear

- from a chemical

- smell & taste neurons

- Stimuli cause sodium channels to open

- if enough channels are opened (threshold) then an action potential is started.

How does an action potential move from one neuron to another?

- it moves across a synapse

Synapse - a "small gap" between the sending neuron (presynaptic membrane) & the receiving neuron (postsynaptic membrane)

- Transmission accomplished across this gap by a chemical (the neurotransmitter - eg. ACh, dopamine, Serotonin)

- neurotransmitters are stored @ the end of axons in synaptic ~~vesicles~~ vesicles.

A synapse & how it functions

How does transmission across synapse occur?

- nerve impulse reaches axon terminal

- calcium ions enter axon terminal that stimulate the synaptic vesicles to fuse w/ the presynaptic membrane.