

The Neuron

- Unit of structure and function of the nervous system
- More than 100 billion in brain alone
- AKA: “Nerve Cell”, adapted for receiving and sending signals

3 Major regions of Neuron enable the cells to communicate:

1) Cell Body

- Contains a nucleus
- Enclosed by a cell membrane

*Unlike other cells, neurons have tiny fibers extending from cell body

2) Dendrites

- Short fibers extending out from body of neuron
- Receive impulses from other neurons and carry them
- Enable neuron to receive messages

3) Axon

- Very thin—single long fiber that extends from the cell body
- Length varies 1-2 inches up to 3 feet long
- Carries outgoing messages
- **Action Potential** = electrical charge that travels down the axon when a message is sent
- Group of axons bundled together like electrical cable is called a **nerve**

Myelin sheath

- Fatty covering that surrounds axon
- Not all axons are covered
- Provides insulation
- Improves efficiency
- Continues to be added until about 25 years
- Multiple Sclerosis: caused by myelin sheath degenerating
- **Nodes of Ranvier** = gaps in myelin sheath
- **Schwann’s Cells** = cells that produce myelin, located within the myelin

The Neural Impulse → Electrical

- When neuron is resting= **resting potential**
 - *Semi-liquid solutions both inside/outside of neuron
 - Outside neuron = mostly positive charge
 - Inside neuron = mostly negative charge
- This is how it stays when at resting state
- When stimulated by incoming message
 - Cell membrane open and the positive ions rush in when enough has entered to make the inside more positive than the outside. The cell membrane closes again. This opens/close of cell membrane occurs along the length of the neural membrane creating the neural impulse that travels down the axon = like a fuse burning.
 - When this happens they say the neuron is fired
 - A neuron does not fire at every incoming message—it must be a strong enough message. All or nothing, never a partial fire
 - After it has fired it takes a short period of time to set up again before it can fire again = **Absolute Refractory Period**
 - No matter how strong the message it will not fire

The Synapse

- Area between neurons
- Area where messages “cross” from one neuron to another

How does the message get from one neuron to the next?

- 1) Dendrite picks up a signal and if strong enough neuron fires
- 2) Impulse (signal) starts down axon until it reaches the end (axon terminal or synaptic end)
- 3) Gap (called synaptic space or cleft) between axon terminal and next dendrite
- 4) Axon terminals contain tiny, oval sacs (**synaptic vesicles**) which contain chemicals known as **neurotransmitters**.
- 5) These neurotransmitters cross the synaptic space

*Synaptic vesicles and neurotransmitters are other two parts needed for a synapse.

*Several types of neurotransmitters and each has matching receptor site on the other end of the synaptic space

*Too much or too little of these neurotransmitters have been linked to several problems:

- Alzheimer's
- Huntington's Disease
- Parkinson's Disease

***Neurotransmitters (2 Types)**

1) **Excitatory** –

- excite the next neuron making it more likely to fire
- like hitting the accelerator

2) **Inhibitory** –

- making it less likely to fire
- like pushing the break

*All neurons relay information – but the type of information determines the type of neuron

2. **Sensory neurons**: collect messages from sense organs and carry them to the spinal cord or brain
3. **Motor neurons**: carry messages from the spinal cord or brain to the muscles and glands
4. **Interneurons**: neurons that carry messages from one neuron to another = 99.7% of neurons in the Central Nervous System