

# The Anatomy of a Nerve Impulse

## Image I: The Anatomy of Neurons →

Neurons form elaborate networks through which nerve impulses—action potentials—travel. Each neuron has as many as 15,000 connections with neighboring neurons.

Neurons do not touch each other; instead, neurons interact at contact points called **synapses**: a junction within two nerve cells, consisting of a miniature gap which impulses pass by a neurotransmitter. A neuron transports its information by way of a nerve impulse called an **action potential**. The action potential can originate in the cell body when it has received a stimulus, then it moves down the axon of that neuron. When an action potential arrives at the synapse, it stimulates the release of **neurotransmitters**. These neurotransmitters are released into the synaptic cleft to bind to the receptors of the adjacent cell.

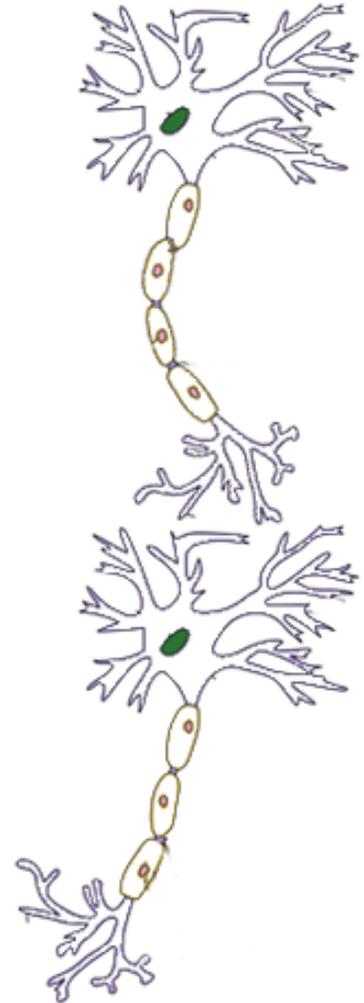
On the image to the right: Color the cell body and the dendrites yellow.

Color the axon (and myelin sheaths) blue.

Highlight the synapse with green.

Use an arrow to show movement of the action potential.

On a cellular level, the neuron cell has vesicles that contain the neurotransmitters. Each neurotransmitter can carry a different type of message. Some neurotransmitters, like serotonin, regulate appetite, sleep and mood. Serotonin is thought to be associated with certain types of depression and anxiety disorders.



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## Image II - The Anatomy of a Synapse

The image on the backside shows how serotonin is released from the neuron and how a drug called SSRI (selective serotonin reuptake-inhibitors) is used to treat mood disorders. The neuron, like most cells of the body, have mitochondria which provide the energy the cell needs to function.

Color the mitochondria (A) orange  and the axon on the presynaptic nerve cell (X) blue.

The axon area contains the vesicles that store the neurotransmitters. These neurotransmitters are released into the synaptic cleft where they cross the gap and land on the receptors of the dendrites of the next neuron.

Color the neurotransmitters (E) red.  Color the vesicles (B) pink.

Color the receptors (D) green.  Color the dendrite of postsynaptic neuron (Y) yellow.

The neurotransmitters are returned to the original cell through transporters, a process called reuptake. As long as the neurotransmitter remains in the cleft, the receptors will continue to be stimulated. Certain drugs, called

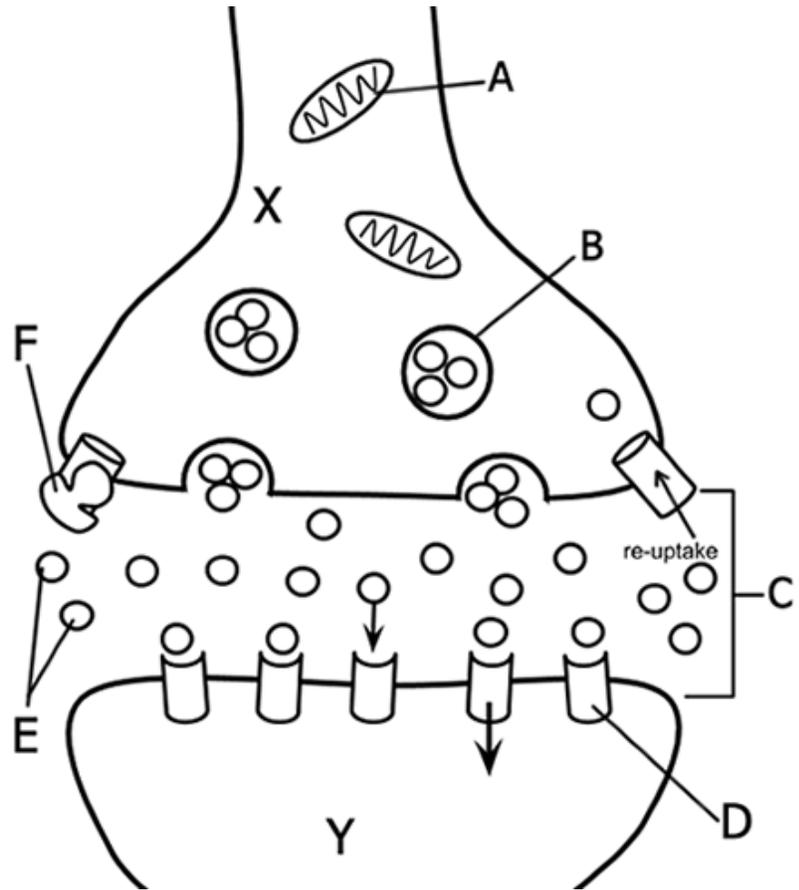
**SSRI's** can inhibit the reuptake process, leaving the serotonin neurotransmitter active for longer within the cleft. This has an effect of elevating the person's mood or reducing anxiety and depression. Many antidepressants are marketed as SSRI's.

Color the transporter (reuptake area) purple.

Color the inhibitor (F) brown.

Identify each of the letters:

- A \_\_\_\_\_
- B \_\_\_\_\_
- C \_\_\_\_\_
- D \_\_\_\_\_
- E \_\_\_\_\_
- F \_\_\_\_\_
- X \_\_\_\_\_
- Y \_\_\_\_\_



**Questions:**

1. What is the relationship between a receptor and a neurotransmitter?
  
2. Where are neurotransmitters stored in the cell?
  
3. What happens if the reuptake transporter is blocked?
  
4. What is an SSRI? What does this type of drug treat?