

Making Connections - The Synapse

Neurons have specialized projections called **dendrites** and **axons**. **Dendrites** bring information to the cell body and **axons** take information away from the cell body.

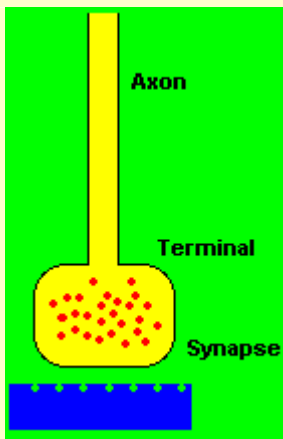
Information from one neuron flows to another neuron across a **synapse**. The **synapse** contains a small gap separating **neurons**. The **synapse** consists of:

1. a pre-synaptic ending that contains neurotransmitters, mitochondria and other cell organelles,
2. a postsynaptic ending that contains receptor sites for neurotransmitters and,
3. a synaptic cleft or space between the pre-synaptic and postsynaptic endings.

Electrical Trigger for Neurotransmission

For communication between neurons to occur, an electrical impulse must travel down an axon to the synaptic terminal.

Neurotransmitter Mobilization and Release



At the synaptic terminal (the presynaptic ending), an electrical impulse will trigger the migration of **vesicles** (the red dots in the figure to the left) containing neurotransmitters toward the presynaptic membrane. The vesicle membrane will fuse with the presynaptic membrane releasing the neurotransmitters into the synaptic cleft. Until recently, it was thought that a neuron produced and released only one type of neurotransmitter. This was called "Dale's Law." However, there is now evidence that neurons can contain and release more than one kind of neurotransmitter.

Diffusion of Neurotransmitters Across the Synaptic Cleft

The neurotransmitter molecules then diffuse across the synaptic cleft where they can bind with receptor sites on the postsynaptic ending to influence the electrical response in the postsynaptic neuron. In the figure on the right, the postsynaptic ending is a dendrite (axodendritic synapse), but synapses can occur on axons (axoaxonic synapse) and cell bodies (axosomatic synapse).

When a neurotransmitter binds to a receptor on the postsynaptic side of the synapse, it changes the postsynaptic cell's excitability: it makes the postsynaptic cell either more or less likely to fire an action potential. If the number of excitatory postsynaptic events is large enough, they will add to cause an action potential in the postsynaptic cell and a continuation of the "message."

Many psychoactive drugs and neurotoxin can change the properties of neurotransmitter release, neurotransmitter reuptake and the availability of receptor binding sites.

