

UNIT-1 SYNAPSE

Synapse is the junction between two neurons. It is not an anatomical continuation. But, it is only a physiological continuity between two nerve cells.

Classification of synapse

Synapse is classified by two methods

A. Anatomical classification

B. Functional classification

Anatomical classification

Synapse is formed by axon of one neuron ending on the cell body, dendrite or axon of the next neuron. Depending upon **ending of axon**, synapse is classified into three types:

- **Axoaxonic synapse** in which axon of one neuron terminates on axon of another neuron
- **Axodendritic synapse** in which the axon of one neuron terminates on dendrite of another neuron
- **Axosomatic synapse** in which axon of one neuron ends on soma (cell body) of another neuron

Functional classification

Functional classification of synapse is on the basis of **mode of impulse transmission**.

According to this, synapse is classified into two categories:

1. Electrical synapse
2. Chemical synapse.

Electrical Synapse

- Electrical synapse is the synapse in which the physiological continuity between the presynaptic and the post synaptic neurons is provided by **gap junction** between the two neurons.
- There is **direct exchange** of ions between the two neurons through the gap junction. Because of this reason, the action potential reaching the terminal portion of presynaptic neuron directly enters the postsynaptic neuron.
- Important feature of electrical synapse is that the synaptic delay is very less because of the direct flow of current. Moreover, the impulse is transmitted in either direction through the electrical synapse.
- This type of impulse transmission occurs in some tissues like the cardiac muscle fibers, smooth muscle fibers of intestine and the epithelial cells of lens in the eye.

Chemical Synapse

- Chemical synapse is the junction between a nerve fiber and a muscle fiber or between two nerve fibers, through which the signals are transmitted by the release of chemical transmitter.
- In the chemical synapse, there is no continuity between the two neurons because of the presence of a space called **synaptic cleft** between the two neurons. Action potential reaching the presynaptic terminal causes release of neurotransmitter substance from the vesicles of this terminal.
- Neurotransmitter reaches the postsynaptic neuron through synaptic cleft and causes the production of potential change.
- Neuron from which the axon arises is called the **presynaptic neuron** and the neuron on which the axon ends is called **postsynaptic neuron**.

- Axon of the presynaptic neuron divides into many small branches before forming the synapse. These branches are known as presynaptic **axon terminals**. Presynaptic axon terminal has a definite intact membrane known as **presynaptic membrane**.
- Axon terminal has two important structures:
 - i. **Mitochondria**, which help in the synthesis of neurotransmitter substance
 - ii. **Synaptic vesicles**, which store neurotransmitter substance.
- Membrane of the postsynaptic neuron is called **postsynaptic membrane**. It contains some **receptor proteins**. Small space in between the presynaptic membrane and the postsynaptic membrane is called **synaptic cleft**. The **basal lamina** of this cleft contains **cholinesterase**, which destroys **acetylcholine**.
- Main function of the synapse is to transmit the impulses, i.e. action potential from one neuron to another. However, some of the synapses inhibit these impulses. So the impulses are not transmitted to the postsynaptic neuron.

Properties of synapse

- One way conduction – Bell-Magendie law
- Synaptic delay
- Fatigue
- Summation
- Electrical property