

V- Nervous Tissue

Nervous tissue is composed of two types of cells: **neurons or nerve cells** (20%) and **glial cells or neuroglia** (80%), distributed throughout the body. Nervous tissue is organized into a system, the nervous system. In vertebrates, the nervous system is subdivided into two parts: the central nervous system (CNS) and the peripheral nervous system (PNS).

Nervous tissue enables rapid communication between different regions of the body and a tailored response to the various signals received.

Nervous tissue originates in the **ectodermis**.

V-1- Neurons

V-1-1- General Organization

The neuron is the excitable part of the CNS; it comprises:

a- The cell body

With the nucleus and organelles (Golgi apparatus, mitochondria, Nissl bodies, etc.) essential for the synthesis of structural proteins and neurotransmitters.

b- Cytoplasmic extensions

1- Dendrites

These are cytoplasmic extensions of the cell body, often multiple and branched, whose number and arrangement vary. They contain the same organelles as the cell body, with the exception of the nucleus and the Golgi apparatus.

This branching structure thus provides a larger contact surface area between nerve cells.

2- The axon

Is a single, long extension. It terminates in numerous branches comparable to dendrites, the terminal buds. The axon consists of a sheath, the axolemma, and cytoplasm called axoplasm, the latter lacking Nissl bodies and Golgi apparatus.

The axolemma is covered with a sheath of myelin; this sheath has constrictions called nodes of Ranvier.

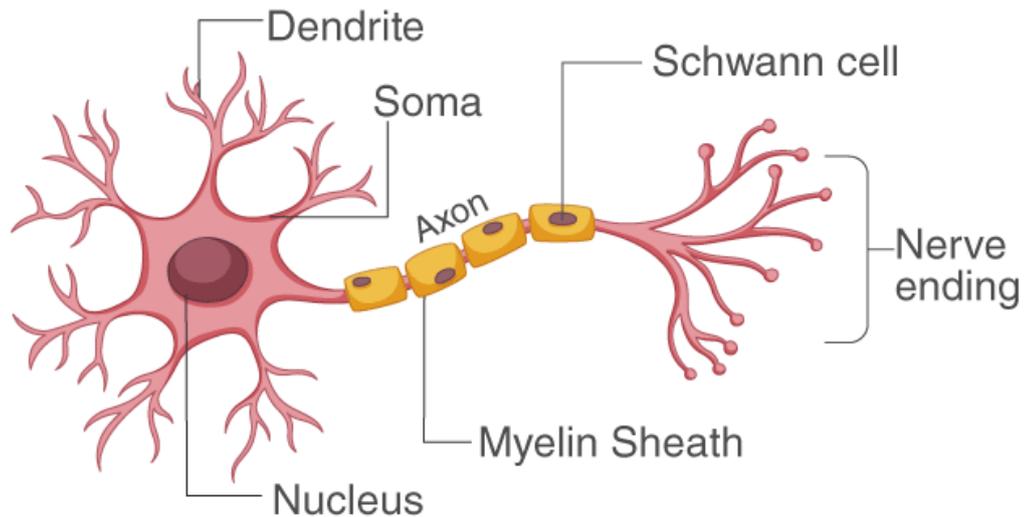


Figure : Neuron

V-1-2-Classification of Neurons

Neurons are classified primarily by their **morphology** (structure) and their **function**.

V-1-2-1- According to Morphology

- According to the Cytoplasmic Extension

a- The Unipolar Neuron

This neuron has only one long extension (the axon) extending from the cell body.

b- The Pseudo-Unipolar Neuron

Whose single dendrite and axon are joined near the cell body before separating (in a T-shape).

c- The bipolar neuron

Whose axon and single dendrite are opposite the cell body.

d- The multipolar neuron

Possessing a single axon and large dendrites (referred to as a "dendritic tree"). Multipolar neurons constitute the majority of neurons in the brain.

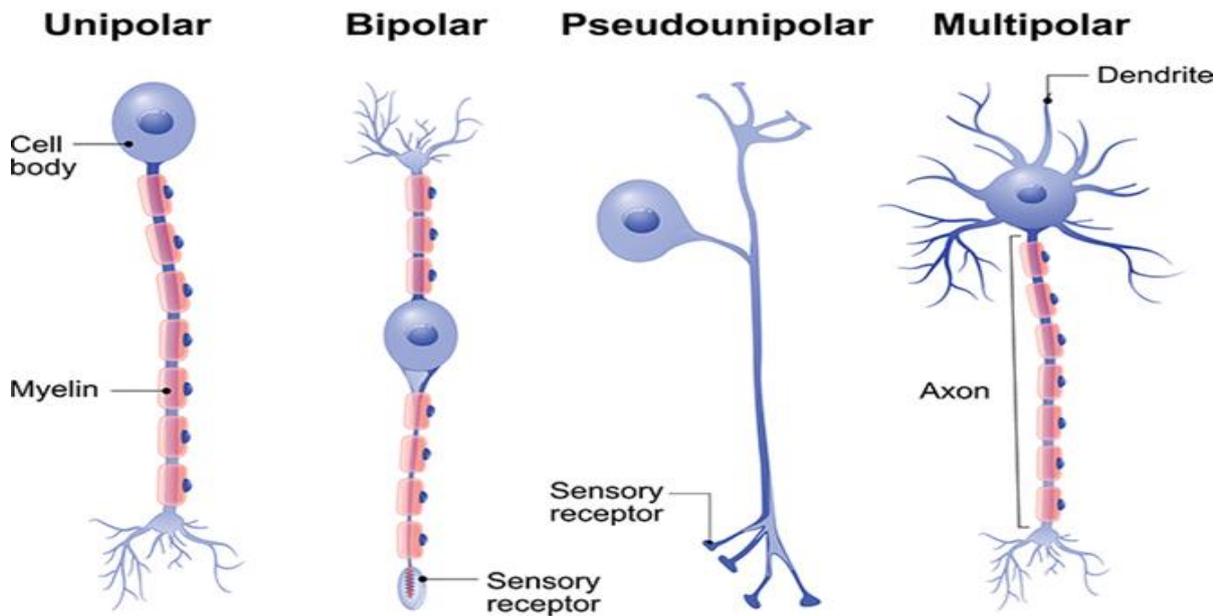


Figure : Different types of neurons depending on their morphology

- Based on the cell body shape:

- a- Polyhedral:** star-shaped.
- b- Fusiform:** often bipolar.
- c- Pyramidal:** neuron of the motor cortex.
- d- Spherical or ovoid.**

V-1-2-2- According to function

- a- Sensory (Afferent) Neurons:** Carry information from sensory receptors (skin, organs) to the central nervous system.
- b- Motor (Efferent) Neurons:** Transmit commands from the central nervous system to muscles or glands (effectors).
- c- Interneurons:** Connect sensory and motor neurons within the central nervous system. They are the most numerous.

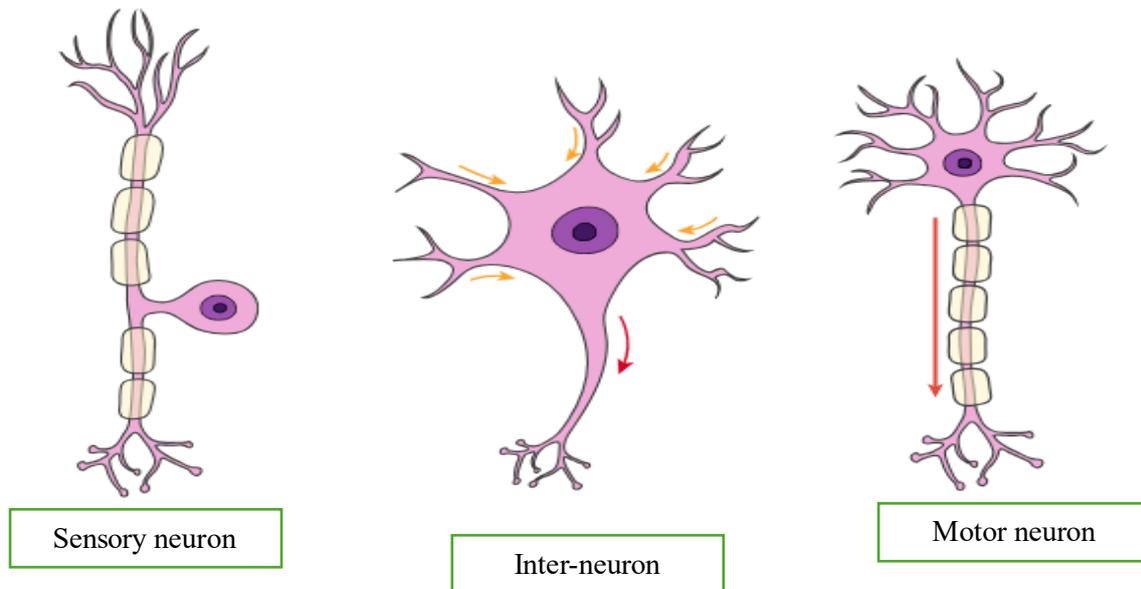


Figure: Different types of neurons depending on their function

V-2-Glial Cells

Glial cells constitute the supporting tissue of the nervous system. They ensure the connection with blood vessels, provide essential nutrients for the metabolic functioning of the nervous system, and respond to tissue damage. Unlike neuronal cells, glial cells can multiply, even proliferate and become cancerous.

From a topographical point of view, we distinguish:

- Central neuroglia:** located in the CNS, i.e., the brain and spinal cord.
- Peripheral neuroglia:** forming the neuroglial tissue of peripheral nerve fibers and ganglion cells.

V-3- Synapses

These are the regions of internorebral articulation, allowing direct communication between nerve cells.

Several types of synapses are distinguished:

- * **Axo-somatic synapses:** where contact is established between the axon of one neuron and the cell body of another neuron.
- * **Axo-dendritic synapses:** where contact is established between the axon of one neuron and the dendrites of another axon.
- * **Axo-axonic synapses:** where contact is established between the axon of one neuron and the axon of another neuron.

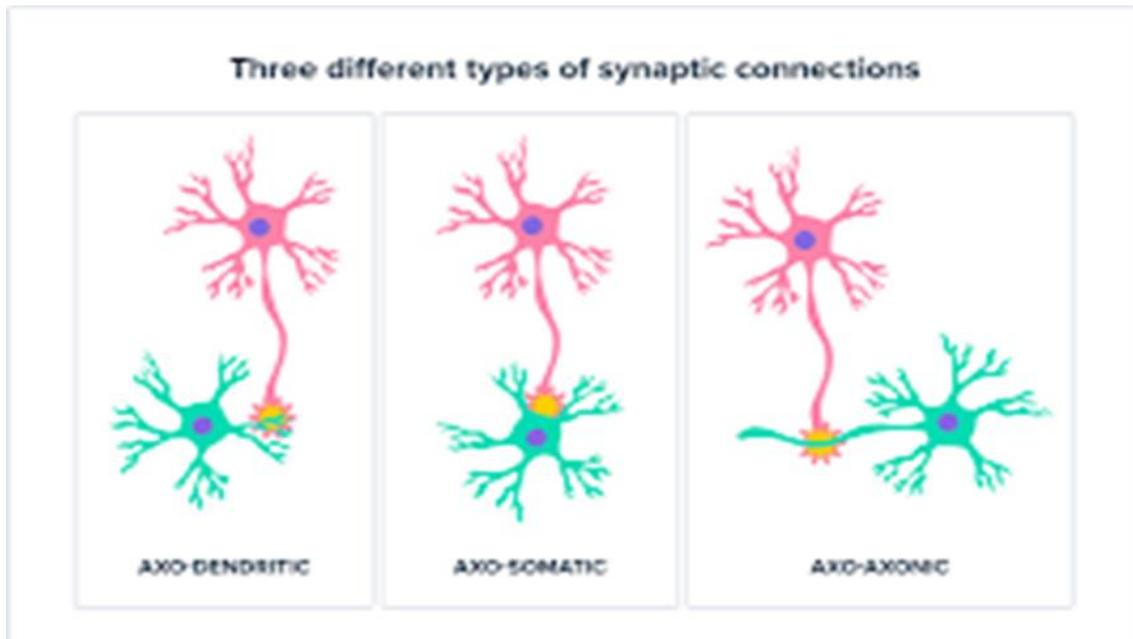


Figure : Type of synapses

The term synaptic complex refers to the **presynaptic element**, the **presynaptic cleft**, and the **postsynaptic element**. Synaptic vesicles are organelles that store neurotransmitters, which can then be released into the synaptic cleft. Opposite them, the postsynaptic membrane is composed of protein structures that serve as anchors for postsynaptic receptors.

Synaptic Transmission

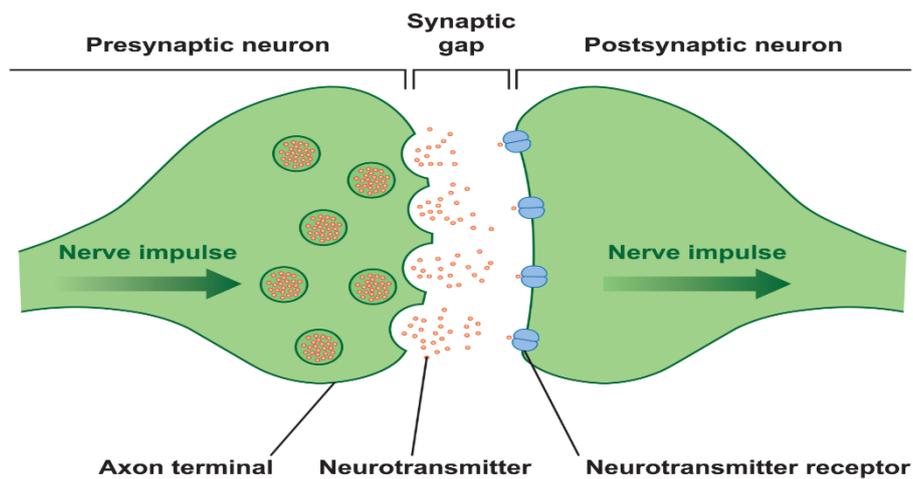


Figure : Synapse