



جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

College of Science, Department of biology
Zoology
Frist stage

By
Prof. Dr. Raad Abbas Kadhim

Lecture: 9

Nervous tissue

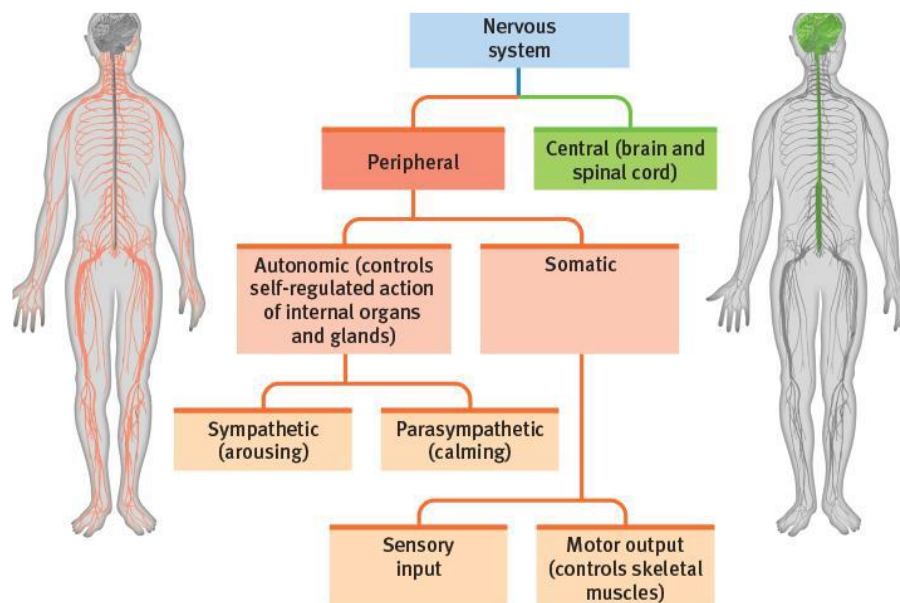
Nervous tissue, also called **neural tissue**, is one of four major classes of tissues and the main tissue component of the nervous system . There are two major functions of nervous tissue. (Integration and communication).

In general nervous tissue contains two kinds of cells: **neurons and neuroglia**.

- **Neurons** are highly specialized nerve cells that generate and conduct nerve impulses.
- **Neuroglia** are supporting cells that provide physical support, remove debris, and provide electrical insulation for neurons

The nervous system consists of two parts: as in figure (1)

- The central nervous system (CNS) : includes the brain and spinal cord
- Peripheral nervous system (PNS): included autonomic and somatic neurons.



Neurons

Neurons are highly specialized nerve cells that generate and conduct nerve impulses. A typical neuron consists of three parts **dendrites**, the **cell body**, and an **axon**.

The cell body or soma

Is like a factory for the neuron. It produces all the proteins and contains specialized organelles such as nucleus, granules and Nissles bodies and other organelles that found in any cell like endoplasmic reticulum, Golgi apparatus and mitochondria.

Dendrites

Dendrites are responsible for responding to stimuli; they receive incoming signals towards the cell body. Dendrites are motor neurons that are short and have a large surface area for receiving signals from other neurons. Dendrites convey incoming messages towards the cell body and are therefore called the **receptive input region**.

The axon

Arises from the cone shaped portion of the cell body called the **axon hillock**. Functionally, axons are responsible for transmitting impulses over long distances from cell body. The axon is the conducting region of the neuron and is responsible for generating and transmitting impulses typically away from the cell body.

Neurons are classified both functionally and structurally.

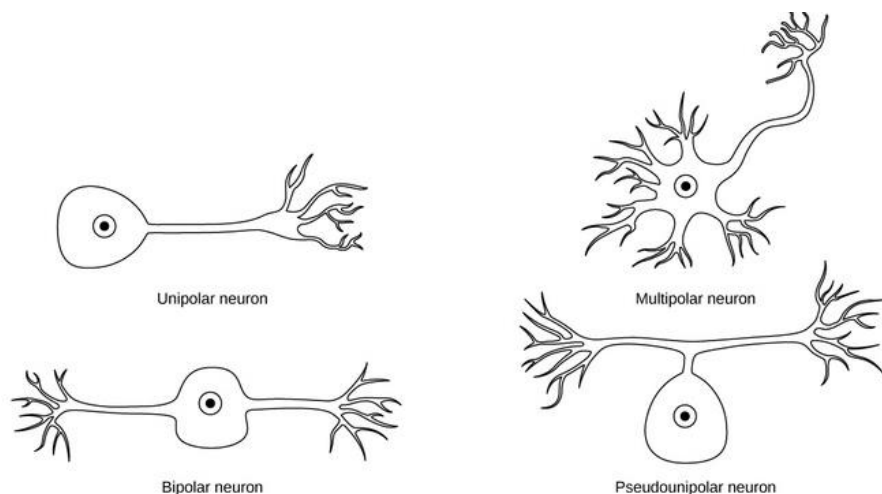
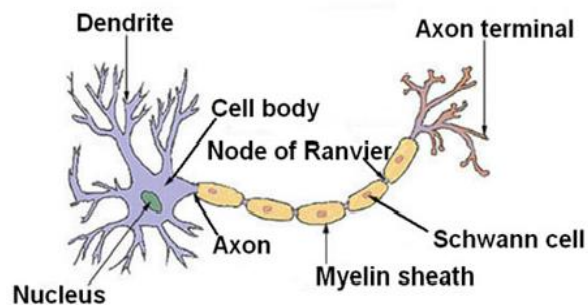
Functional classification:

- **Sensory neurons** (afferent): carry of information (the form of an **action potential** (nerve impulse) from the PNS to the CNS.
- **Motor neurons** (efferent): carry action potential out of the CNS to the proper effector (muscles, glands).
- **Interneurons**: Cells that form connections between neurons and whose processes are limited to a single local area in the brain or spinal cord.

Structural classification:

- **Multipolar neurons:** Have three or more processes coming off the **soma** (cell body). They are the major neuron type in the CNS and include interneurons and motor neurons.
- **Bipolar neurons:** Sensory neurons that have two processes coming off the soma, one dendrite and one axon
- **Pseudounipolar neurons:** Sensory neurons that have one process that splits into two branches, forming the axon and dendrite
- **Unipolar cells:** Unipolar neurons have only one structure extending from the soma. These are found in the granular layer of the cerebellum.

Structure of a Typical Neuron



Neuroglial cells are classified as follows:

- **Microglial cells:** Microglia are macrophage cells that make up the primary immune system for the CNS. They are the smallest neuroglial cell.
- **Astrocytes:** Star-shaped macroglial cells with many processes found in the CNS. They are the most abundant cell type in the brain, and are intrinsic to a healthy CNS.
- **Oligodendrocytes:** CNS cells with very few processes. They form myelin sheaths on the axons of a neuron, which are lipid-based insulation that increases the speed at which the action potential, can travel down the axon.
- **Schwann cells:** The PNS equivalent of oligodendrocytes, they help maintain axons and form myelin sheaths in the PNS.
- **Satellite glial cell:** Line the surface of neuron cell bodies in ganglia (groups of nerve body cells bundled or connected together in the PNS)
- **Enteric glia:** Found in the enteric nervous system, within the gastrointestinal tract.

Spinal cord

The spinal cord is composed of nervous tissue. The interior of the spinal cord consists of neurons, nervous system support cells called glia, and blood vessels.

Neurons and their dendrites are contained within an **H-shaped** region of the spinal cord called gray matter. Surrounding the gray matter area is a region called white matter. The white matter section of the spinal cord contains axons that are covered with an insulating substance called myelin.

