**The objectives**

**1-Understand how the nervous system is divided and the types of cells that are found in nervous tissue**

**2-Know the anatomy of a neuron and the structural and functional types of neurons**

**3- Classify the neuron according to the number of processes extending from the cell body**

**4- Numerate the spinal cord parts?**

**4-Nervous Tissue:**

The human nervous system, by far the most complex system in the body, is formed by a network of many billion nerve cells ( neurons) , all assisted by many more supporting cells called glial cells. Each neuron has hundreds of interconnections with other neurons, forming a very complex system for processing information and generating responses.

**The nervous system has two major divisions:**

 ■ Central nervous system (CNS) , consisting of the brain and spinal cord

 ■ Peripheral nervous system (PNS), composed of the cranial, spinal, and peripheral nerves conducting impulses to and from the CNS (sensory and motor nerves, respectively) and ganglia that are small groups of nerve cells outside the CNS.

**Cells in both central and peripheral nerve tissue are of two kinds:**

1- Nerve cells, or neurons, which usually show numerous long processes.

2- Various glial cells (Gr. glia, glue), which have short processes, support and protect neurons, and participate in many neural activities, neural nutrition, and defense of cells in the CNS.

**1-NEURONS** The functional unit in both the CNS and PNS is the neuron or nerve cell. Some neuronal components have special names, such as “neurolemma” for the cell membrane. **Most neurons consist of three main parts**:

 1-The cell body, or perikaryon, which contains the nucleus and most of the cell’s organelles and serves as the synthetic or trophic center for the entire neuron.

2- The dendrites, which are the numerous elongated processes extending from the perikaryon and specialized to receive stimuli from other neurons at unique sites called synapses.

 3-The axon (Gr. axon, axis), which is a single long process ending at synapses specialized to generate and conduct nerve impulses to other cells (nerve, muscle, and gland cells). Axons may also receive information from other neurons, information that mainly modifies the transmission of action potentials to those neurons. Neurons and their processes are extremely variable in size and shape. Cell bodies can be very large, measuring up to 150 μm in diameter.

 ***Neurons can be classified according to the number of processes extending from the cell body*** (Figure 9–4) p164:

 ■ Multipolar neurons, which have one axon and two or more dendrites

 ■ Bipolar neurons, with one dendrite and one axon

 ■ Unipolar or pseudounipolar neurons, which have a single process that bifurcates close to the perikaryon, with the longer branch extending to a peripheral ending and the other toward the CNS.

 ■ Anaxonic neurons, with many dendrites but no true axon, do not produce action potentials, but regulate electrical changes of adjacent neurons.

**2-Glial cells** : support neuronal survival and activities, and are ten times more abundant in the mammalian brain than the neurons. Like neurons, most glial cells develop ***from progenitor cells*** of the embryonic neural plate. In the CNS glial cells surround both the neuronal cell bodies, which are often larger than glial cells, and the processes of axons and dendrites occupying the spaces between neurons. Glial cells substitute for cells of connective tissue in some respects, ***supporting neurons and creating a microenvironment immediately around those cells that is optimal for neuronal activity.***

**Spinal Cord:**

 The spinal cord is composed of two discrete parts; the white matter, which is the outer part of the cord and the grey matter, which is the inner portion of the cord. The white matter is given this name due to its appearance in unfixed histological specimens in which the white nature of the tissue is caused by the myelination of ascending and descending nerve fibers. The grey matter is also named after its unfixed histological appearance and contains the cell bodies of neurons as well as nerve fibers.

 Within the spinal cord the grey matter forms an H-shape where the ***ventral horns of the H are broader than the dorsal horns. The ventral horns of the grey matter contain the cell bodies of motor neurons whilst the dorsal horns contain sensory neurons where the cell bodies are found in the dorsal root ganglia.***

****

**MEDICAL APPLICATION**

**Alzheimer disease**, a common type of dementia in the elderly, affects both neuronal perikarya and synapses within the cerebrum. Functional defects are due to neurofibrillary tangles, which are accumulations of tau protein associated with microtubules of the neuronal perikaryon and axon hillock regions, and neuritic plaques, which are dense aggregates of β-amyloid protein that form around

the outside of these neuronal regions.