

CHAPTER 1

Nervous Tissue

By the end of this chapter, the student should be able to:

1. Describe the different classifications of neurons.
2. Describe the histological structure of the neuron.
3. Compare between dendrites and axon at structural and functional levels.
4. Differentiate between spinal and sympathetic ganglia.
5. Describe the degeneration and the process of regeneration of nerve fibres and state the stains used to observe degeneration.
6. Describe some clinical considerations related to structure of nervous tissue.
7. Classify synapses and discuss their histological structure.
8. Describe histological structure and functions of neuroglial cells.
9. Describe nerve endings in epithelial, connective, and muscular tissues.

- ✚ Nervous tissue is the tissue specialized to **receive** information from external and internal stimuli, **integrating** and **analyzing** it to produce a proper **response**.
- ✚ It consists of **nerve cells** (neurons) and **glial cells** (neuroglial cells).
- ✚ Reception of stimuli is the function of the **sensory** component of **peripheral nervous system (PNS)**.
- ✚ The processes of integration, analysis and response are performed by **central nervous system (CNS)**.
- ✚ The transmission of the response to the effector organ is carried by the **motor component of the PNS**

Neurons

Definition:

Structural and functional unit of nervous system, constitute >100 million cells.

Histological Structure: Most of neurons consist of 2 parts;

A- **Cell body (Perikaryon)** is a part of the neuron receptive to stimuli and is containing nucleus and surrounding cytoplasm.

Size: varies from **4µm** as in **granular cells in cerebellar cortex** to **100µm** as in **motor neurons in spinal cord**.

Shape: depends on the number of cell processes; Unipolar is **globular** shape, bipolar is **fusiform** shape as well as multipolar is **stellate, pyramidal** or **pyriform** shape.

Nucleus: It is usually large, spherical, pale with a prominent nucleolus reflecting intense synthetic activity.

Cytoplasm: I. Organelles:

1. Highly developed rough endoplasmic reticulum and numerous free ribosomes (synthesize both structural proteins and proteins for transport). Under light microscope, they appear as basophilic granular areas called **Nissl bodies**. Their number varies according to neuronal type & function.

2. **Golgi complex:** present around nucleus.
3. **Mitochondria:** are scattered in cytoplasm
4. **Neurofilaments:** intermediate filaments (10nm in diameter) are abundant in perikaryon and processes. They bundle together by action of **fixatives** to form neurofibrils (2µm in diameter) that are visible by light microscope (stained brown by Ag). They provide structural support.
5. **Microtubules:** (20-28 nm in diameter) are arranged in parallel bundles in perikaryon and processes. They are involved in axonal transport of neurotransmitter substances, enzymes and other constituents.

6. **Centrioles:** Not seen as neurons cannot divide.

II. Inclusions in form of:

- **Lipofuscin pigment** (golden brown) is a residue of undigested material by lysosomes. It increases with aging.
- **Melanin pigment** (dark brown or black) is found in some neurons.
- **Lipid droplets** in cytoplasm as energy reserve or products of abnormal metabolism.

