Normal Cells of CNS

- **Editing file**
- **Important**
- **Doctor notes / Extra**

Objectives:

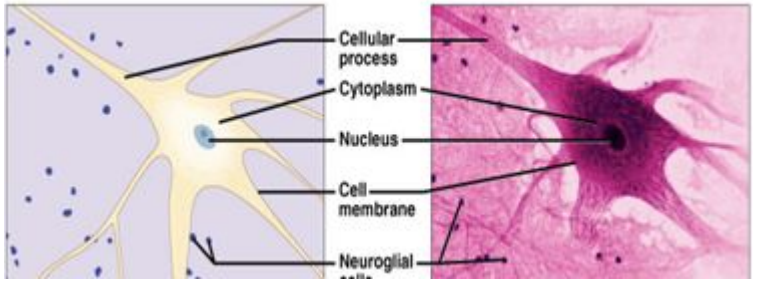
By the end of the lecture, the student should be able to describe the microscopic structure of:

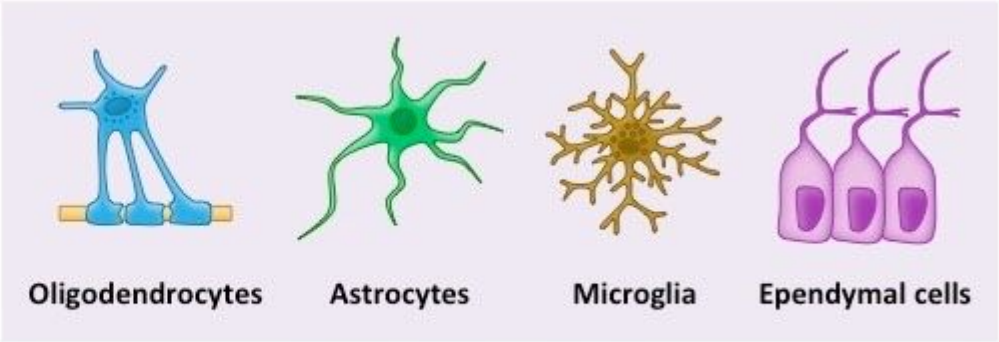
1- Neurons:

- Cell body (perikaryon).
- Processes: An axon and dendrites.

2- Neuroglia:

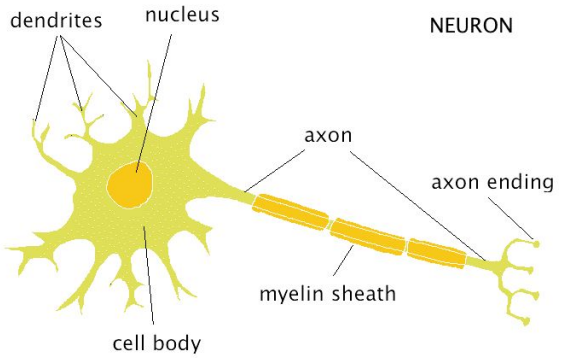
- Astrocytes.
- Oligodendrocytes.
- Microglia.
- Ependymal cells.



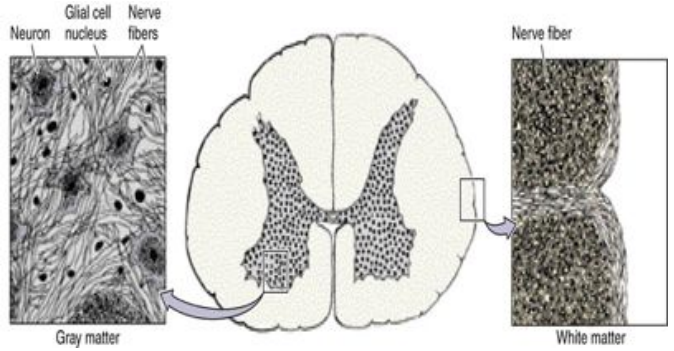


Neuron Components:

- Cell body (Perikaryon)
  - Nucleus: Single, usually central, rounded and vesicular with prominent nucleolus.
  - Cytoplasm
- Processes:
  - An <u>axon</u>: only one
  - <u>Dendrites</u>: one or more



TYPES OF NERVE FIBERS (AXONS AND DENDRITES) IN CNS:



- <u>Unmyelinated</u> without neurilemmal sheath (in grey matter).
- <u>Myelinated</u> without neurilemmal sheath (in white matter).

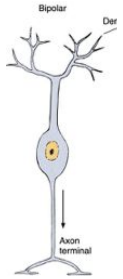
Types of Neurons (Based on number of processes):

Pseudounipolar neurons (Unipolar) (rounded neuron):

- Has one process only, that divides into two branches; one acts as a dendrite and the other as an axon.
- Example: Mesencephalic nucleus of trigeminal nerve and **dorsal root (spinal) ganglion.**

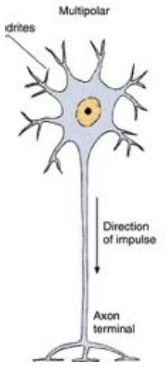
Bipolar neurons:

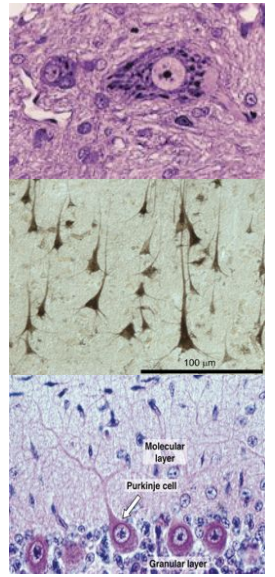
- Has two processes (one arising from each pole of the cell body).
- One of them is the dendrite and the other is the axon.
- The only one that regenerates from basal cells
- Example: retina, olfactory epithelium, spiral ganglia (cochlea).

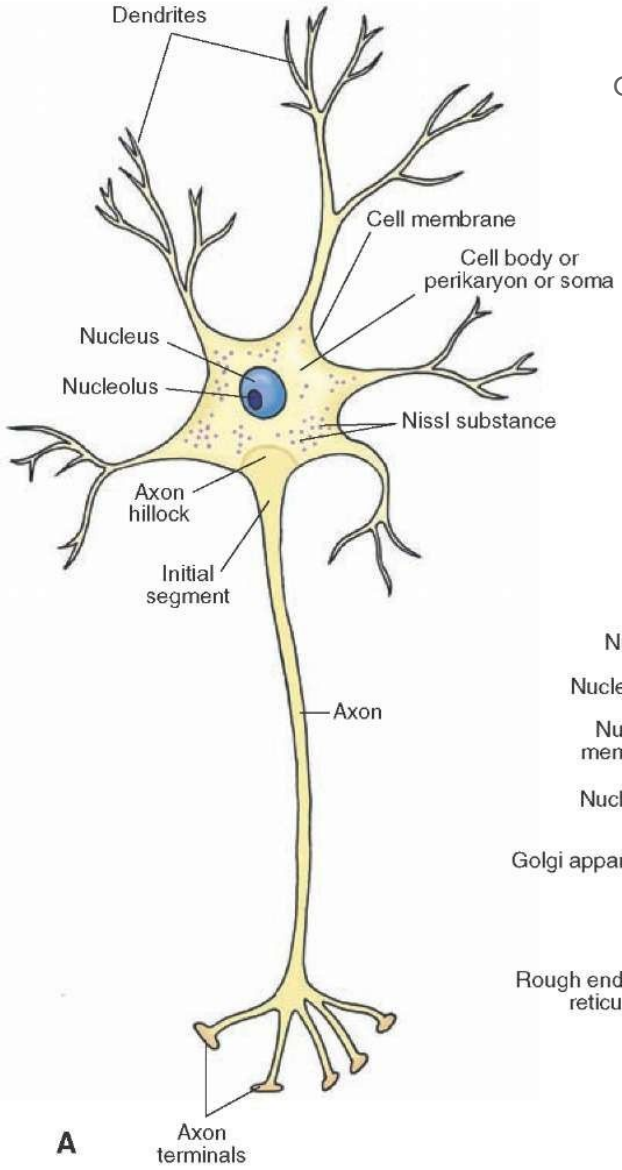


Multipolar neurons:

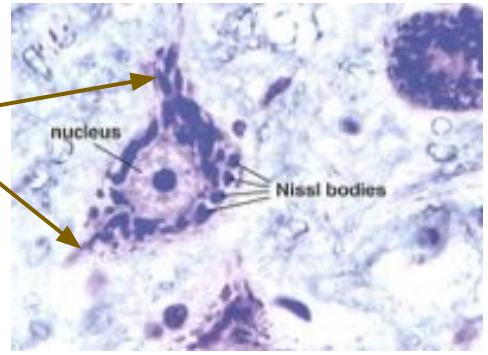
- Has one axon and multiple dendrites.
- **Types of multipolar neurons:**
  a. Stellate neuron (The commonest type):
     - Distributed in most areas of CNS
     - E.g. anterior horn cells of the spinal cord (motor neurons)
  b. Pyramidal neurons: Distributed in **motor area 4 of the cerebral cortex**. and premotor area 6 (have a flat base) (largest nerve cell in the body)
  c. Pyriform neurons: Pear-shaped, e.g. **Purkinje cells of cerebellar cortex**. (have a convex base) one layer only

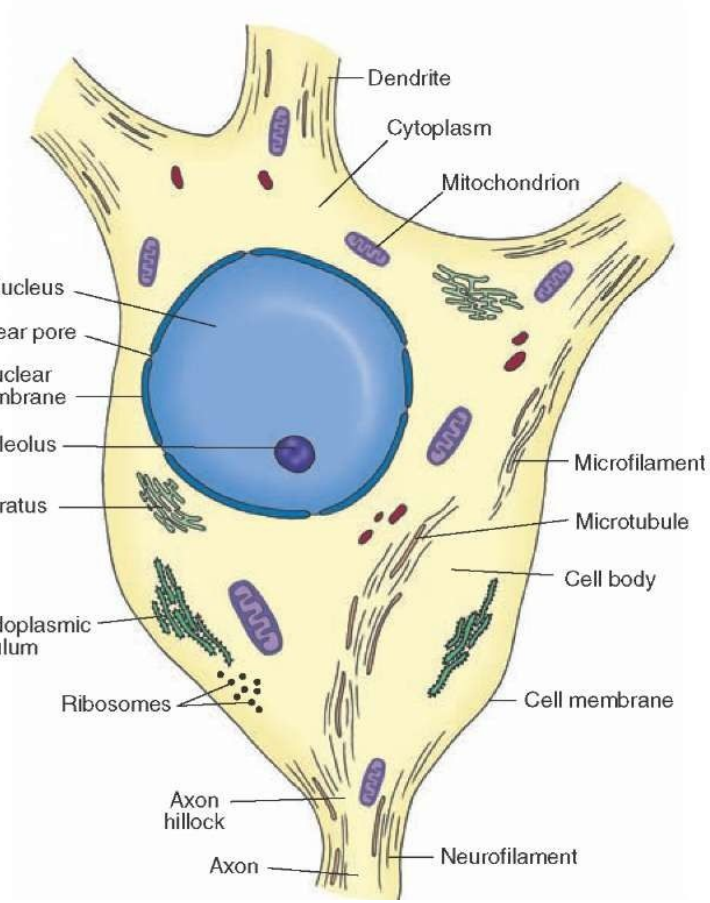


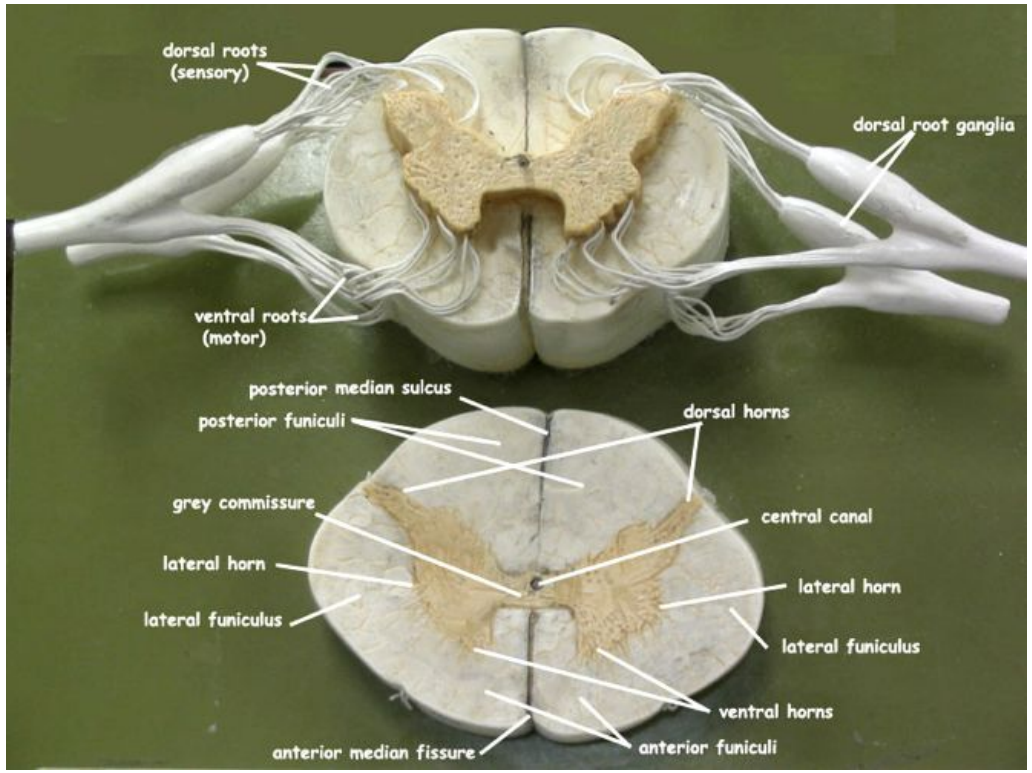


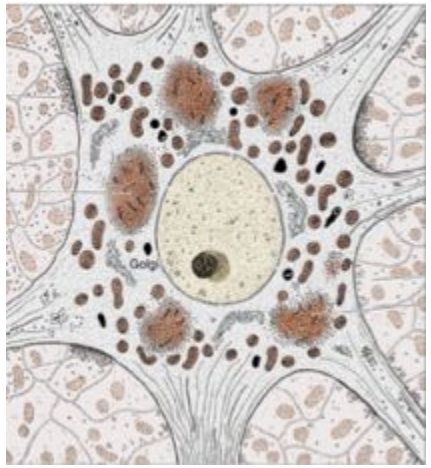


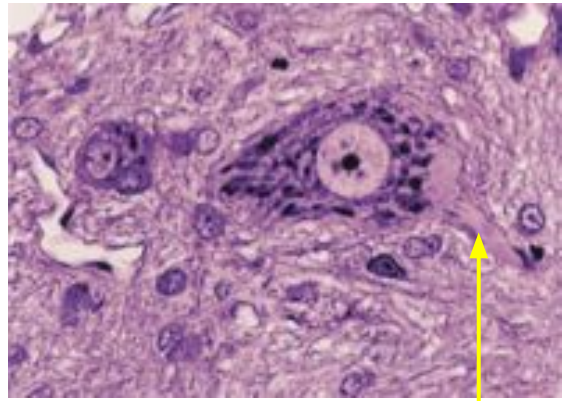
dendrites











Axon

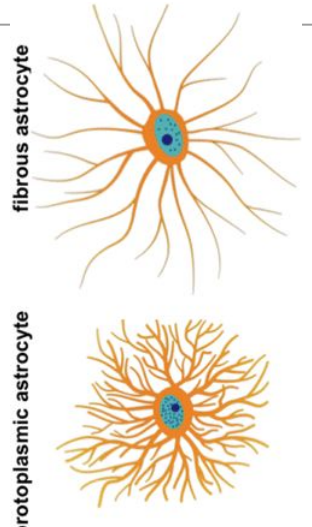
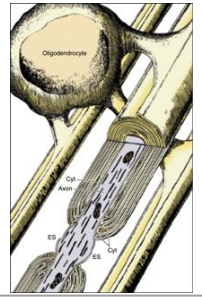
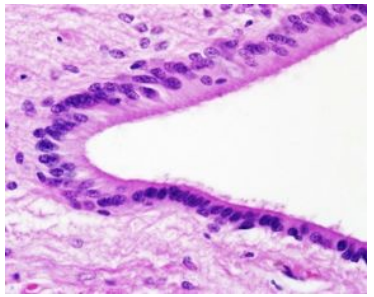
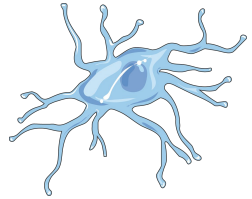
Main **components of the Cytoplasm** of the cell body include:

1. Nissl bodies: Are basophilic patches of rER and free ribosomes in the cell body and bases of wide dendrites. no nissl bodies in axoplasm
2. Neurofilaments: Are intermediate filaments which are bundled together to form neurofibrils. Are found in the cell body, axon and dendrites.
3. Microtubules: Are found in the cell body, axon and dendrites.
4. Golgi apparatus: Surrounds the nucleus all around. (Activate proteins secreted by rER)
5. Mitochondria: Are numerous. (because the neuron is very active so it needs energy)
6. Centriole: Most adult neurons have only one rudimentary centriole, **so they cannot divide.**
7. Some fat and glycogen granules.
8. Pigments:
    a. Lipofuscin pigments (in old age).
    b. Melanin pigments (in neurons of substantia nigra of the midbrain).

    (The other place you'll find melanin in is the Locus Coeruleus, involved in stress and panic responses)

NEUROGLIA: Are group of cells that act as the supportive tissue of CNS.

(No axons and dendrites) ,CT is replaced by neuroglia in the CNS

NEUROGLIA	Astrocytes	Oligodendrocytes	Microglia	Ependyma
	◧ They are the commonest type of neuroglia cells. ◧ They are found in both the grey and white matter. ◧ They are star-shaped cells with numerous long processes. ◧ **Types:** a. Protoplasmic astrocytes: (found in the grey matter of CNS.) Their processes branch extensively. b. Fibrous astrocytes: (found in white matter of CNS.) Their processes have fewer branches but longer. *Astrocytes come after injury and fill the empty space and form a gilial scar. They work as fibrocytes but don't form collagen scars	◧ Are branching cells with few, short processes. ◧ They are distributed in the grey and white matter of CNS. *gray matter = aid in the mechanical support along astrocytes *white matter = formation of myelin sheath 	◧ Are spindle-shaped cells with branching processes raise from each pole of the cell. ◧ Are distributed in the grey and white matter of CNS. ◧ Are rich in **lysosomes**. *arise from monocytes from the red bone marrow not CNS	Are simple columnar epithelial cells (partially ciliated) lining the brain ventricles and the central canal of spinal cord. 
Function	○ **Repair** of injury of CNS tissue (gliosis). (only fills the empty space) ○ **Supportive and nutritive** functions to the neurons. ○ Participate in the formation of **blood-brain barrier**.	○ Formation of **myelin sheath** in the CNS. (PNS is myelinated by schwann cells) ○ **Insulation** of nerve fibers.	Mainly **phagocytosis**. 	○ Ependymal cells are involved in the formation of the Blood-CSF barrier

Quiz

1. Found in old age:
   A. Lipofuscin pigments
   B. Melanin pigments
   C. glycogen granules
   D. Nissl bodies

2. Surrounds the nucleus all around:
   A. Neurofilaments
   B. Microtubules
   C. Golgi apparatus
   D. Centriole

3. Which of the following is the commonest type of multipolar neurons?
   A. Stellate neuron
   B. Pyramidal neurons
   C. Pyriform neurons
   D. rounded neuron

4. Which type of neuron is found in retina & olfactory epithelium?
   A. Pseudounipolar neurons
   B. Bipolar neurons
   C. Multipolar neurons

5. Its function is phagocytosis:
   A. Astrocytes
   B. Oligodendrocytes
   C. Microglia
   D. Ependyma

6. Which of the following isn't a function of Astrocytes?
   A. Repair of injury of CNS tissue (gliosis).
   B. Supportive and nutritive functions to the neurons.
   C. Participate in the formation of blood-brain barrier.
   D. Insulation of nerve fibers.

1.A 2.C 3.A 4.B 5.C 6.D

Special thanks for

- Mohammed Alhuqbani
- Rawan Alzayed

Team Leaders

- Sarah Alflaij
- Abdullah shadid

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Histology438.sarahah.com
Histology438@gmail.com