



# NORMAL CELLS OF THE CNS

**Color index:**

Slides.. **Important** ..**Notes** ..Extra..



وَمَنْ يَتَوَكَّلْ عَلَى اللَّهِ فَهُوَ حَسْبُهُ

# Objectives:

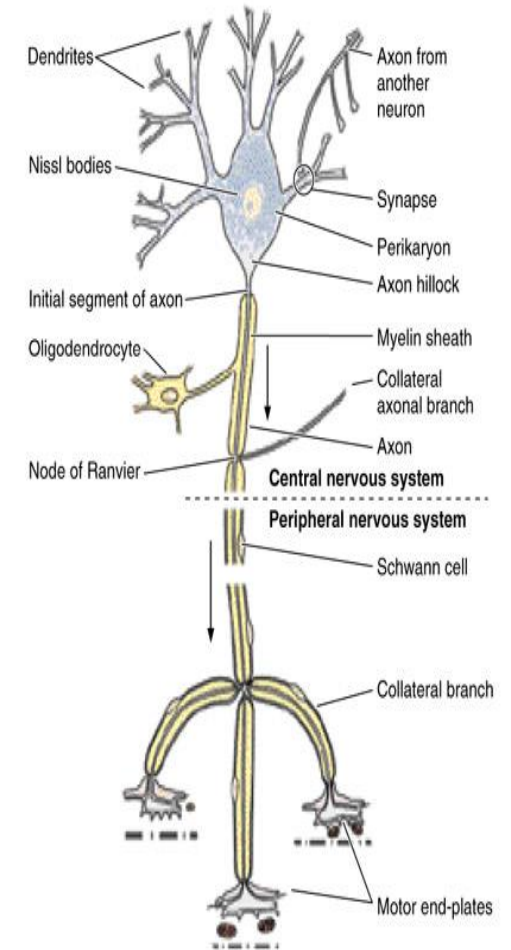
*At the end of this lecture, you should describe the microscopic structure and the function of:*

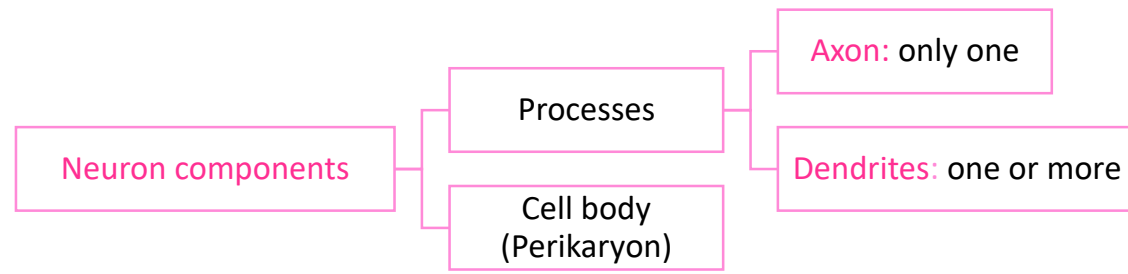
## 1- Neurons:

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

## 2- Neuroglia:

- ✓ *Astrocytes.*
- ✓ *Oligodendrocytes.*
- ✓ *Microglia.*
- ✓ *Ependymal cells.*





## Types of neurons based on number of processes:

<p><b>Unipolar neuron (Pseudounipolar) (rounded neuron)</b></p> <p>Not directly connected to the cell body</p>	<p>Has <u>one process</u> only, that divides into <u>two branches</u>; one acts as a dendrite and the other as an axon.</p> <p><i>e.g. Mesencephalic nucleus of trigeminal nerve and dorsal root (spinal) ganglion.</i></p>		
<p><b>Bipolar Neuron (spindle-shaped neuron)</b></p> <p>like having 2 necks</p>	<p>Has <u>two processes</u> (one arising from each pole of the cell body)</p> <p>One of them is the dendrite and the other is the axon.</p> <p><i>e.g. retina &amp; olfactory epithelium.</i></p>		
<p><b>Multipolar neuron:</b></p> <p>Has one axon and multiple dendrites.</p> <p>-Its outline is irregular in shape</p> <p>-Neuroglial cells are much more number than neurons in the CNS they can divide and regenerate normally.</p>	<p><b>Stellate Neurons (star shape)</b></p> <ul style="list-style-type: none"> <li>- The commonest type.</li> <li>- Distributed in <u>most areas of CNS</u></li> </ul> <p><i>e.g. anterior horn cells of the spinal cord.</i></p>	<p><b>Pyramidal Neurons (wide base)</b></p> <ul style="list-style-type: none"> <li>- Distributed in <u>motor area 4</u> of the cerebral cortex.</li> </ul>	<p><b>Pyriform Neurons</b></p> <ul style="list-style-type: none"> <li>- Pear-shaped</li> </ul> <p><i>e.g. Purkinje cells of cerebellar cortex.</i></p>

# Cell body (perikaryon)

## Cytoplasm:

Cytoplasm with mitochondria and ribosomes and rough ER only in dendrites not in axons  
Its main components include:

## Nucleus:

Single, usually central, rounded and vesicular with prominent nucleolus.

### Nissl bodies

Are basophilic patches of rough Endoplasmic Reticulum (rER) and free ribosomes in the cell body and bases of wide dendrites

### Neuro-filaments

\* Are intermediate filaments which are bundled together to form neurofibrils.  
\* Are found in the cell body, axon and dendrites

### Micro-tubules

Are found in the cell body, axon, & dendrites

### Golgi apparatus

Surrounds the nucleus all around.

### Mito-chondria

Are numerous.

### Centriole

Most adult neurons have only one rudimentary centriole, so they cannot divide.

### Pigments

Depend on age

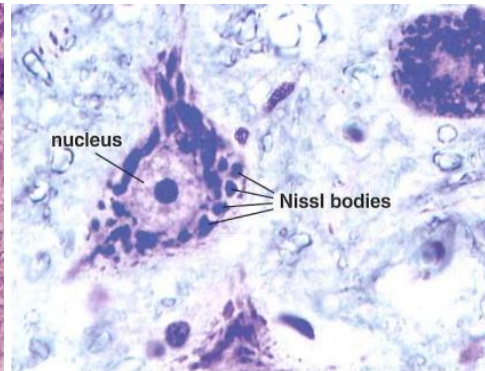
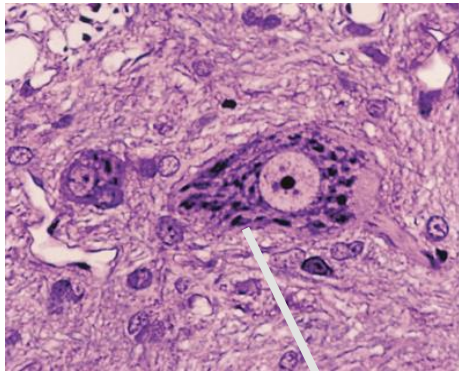
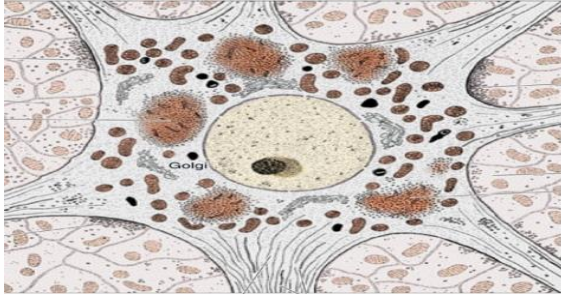
\*lipofuscin pigment: in old age

\*Melanin pigments: in neurons of substantia nigra of the midbrain  
Nigra = Black

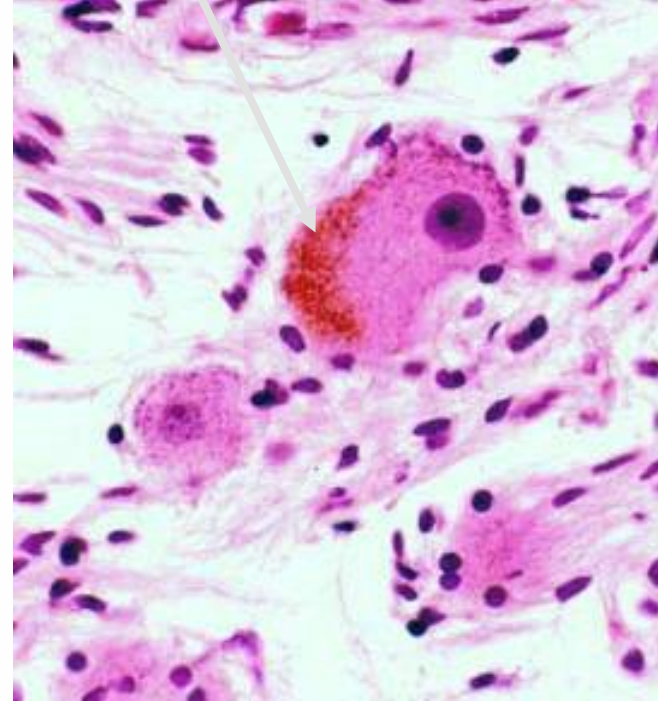
### Other

Some fat and glycogen granules

## Nissl bodies



## Lipofuscin pigments



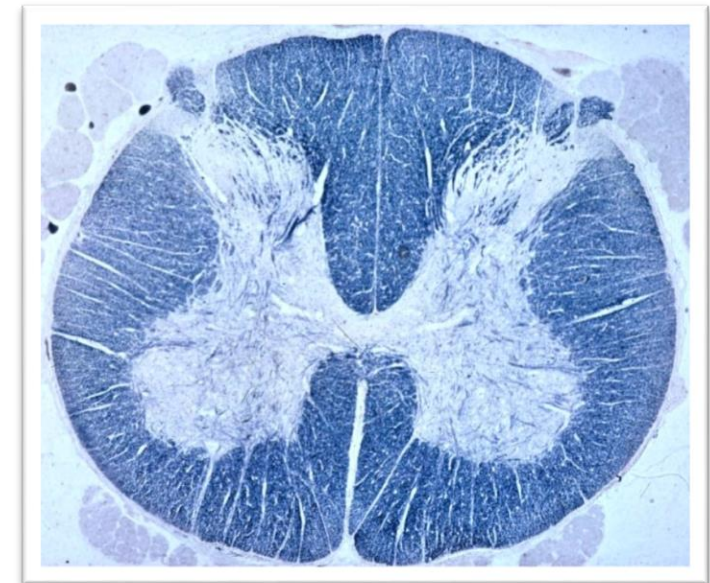
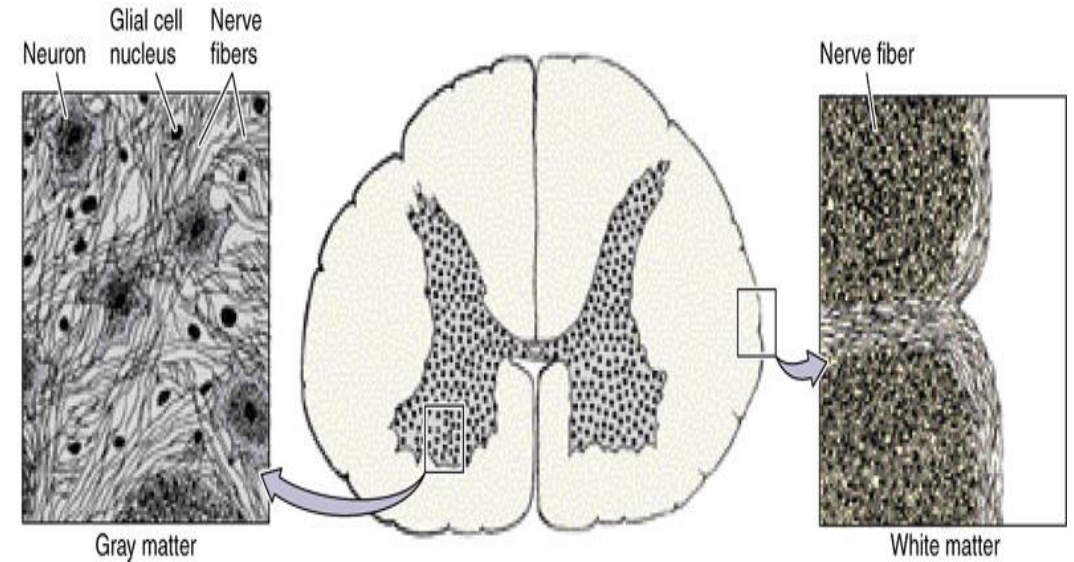
we can differentiate between the axon and the dendrite by Nissl bodies  
\*Axons DO not contain Nissl bodies

# TYPES OF NERVE FIBERS IN CNS

1- Unmyelinated *without* neurilemmal sheath (in grey matter).

2- Myelinated *without* neurilemmal sheath (in white matter).

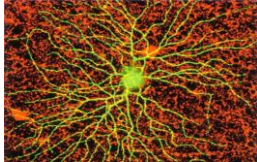
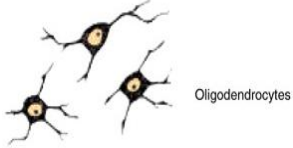
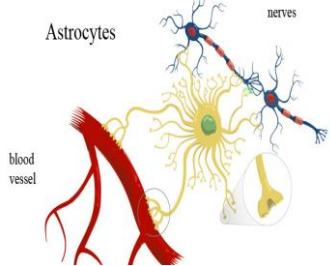
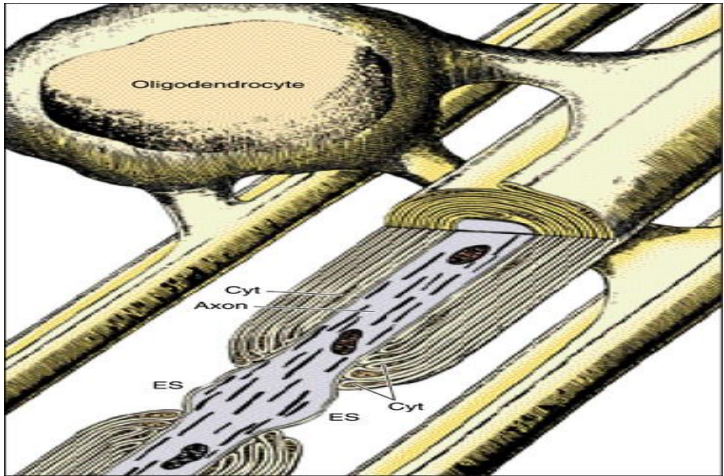
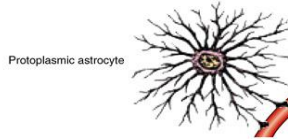
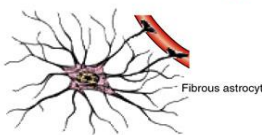
Inside the CNS the oligodendrocytes create the Myelin sheath unlike the PNS we have the Schwann cells which produce myelin sheath



# NEUROGLIA

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


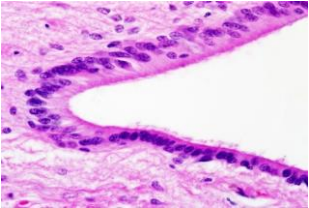
**Types:** 1- Astrocytes 2- Oligodendrocytes 3- Microglia 4- Ependyma

	1. Astrocytes	2. Oligodendrocytes.
General information	<ul style="list-style-type: none"> <li>✓ They are the commonest type of neuroglial cells.</li> <li>✓ They are found in both the grey and white matter.</li> <li>✓ They are star-shaped cells with numerous long processes.</li> </ul> 	<ul style="list-style-type: none"> <li>✓ Are branching cells with few, short processes.</li> <li>✓ They are distributed in the grey and white matter of CNS.</li> </ul> 
Functions	<ol style="list-style-type: none"> <li>1. Repair of injury of CNS tissue (gliosis).</li> <li>2. Supportive and nutritive functions to the neurons.</li> <li>3. Participate in the formation of blood-brain barrier. (acts as a barrier)</li> </ol> 	<ol style="list-style-type: none"> <li>1. Formation of myelin sheath in the CNS.</li> <li>2. Insulation of nerve fibers.</li> </ol> 
Types	<ol style="list-style-type: none"> <li>1. <b>Protoplasmic astrocytes:</b> <ul style="list-style-type: none"> <li>-Are found in the <u>grey matter</u> of CNS.</li> <li>-Their processes branch <u>extensively</u>.</li> </ul>  </li> <li>2. <b>Fibrous astrocytes:</b> <ul style="list-style-type: none"> <li>-Are found in <u>white matter</u> of CNS.</li> <li>-Their processes have <u>fewer branches but longer</u>.</li> </ul>  </li> </ol>	

# NEUROGLIA

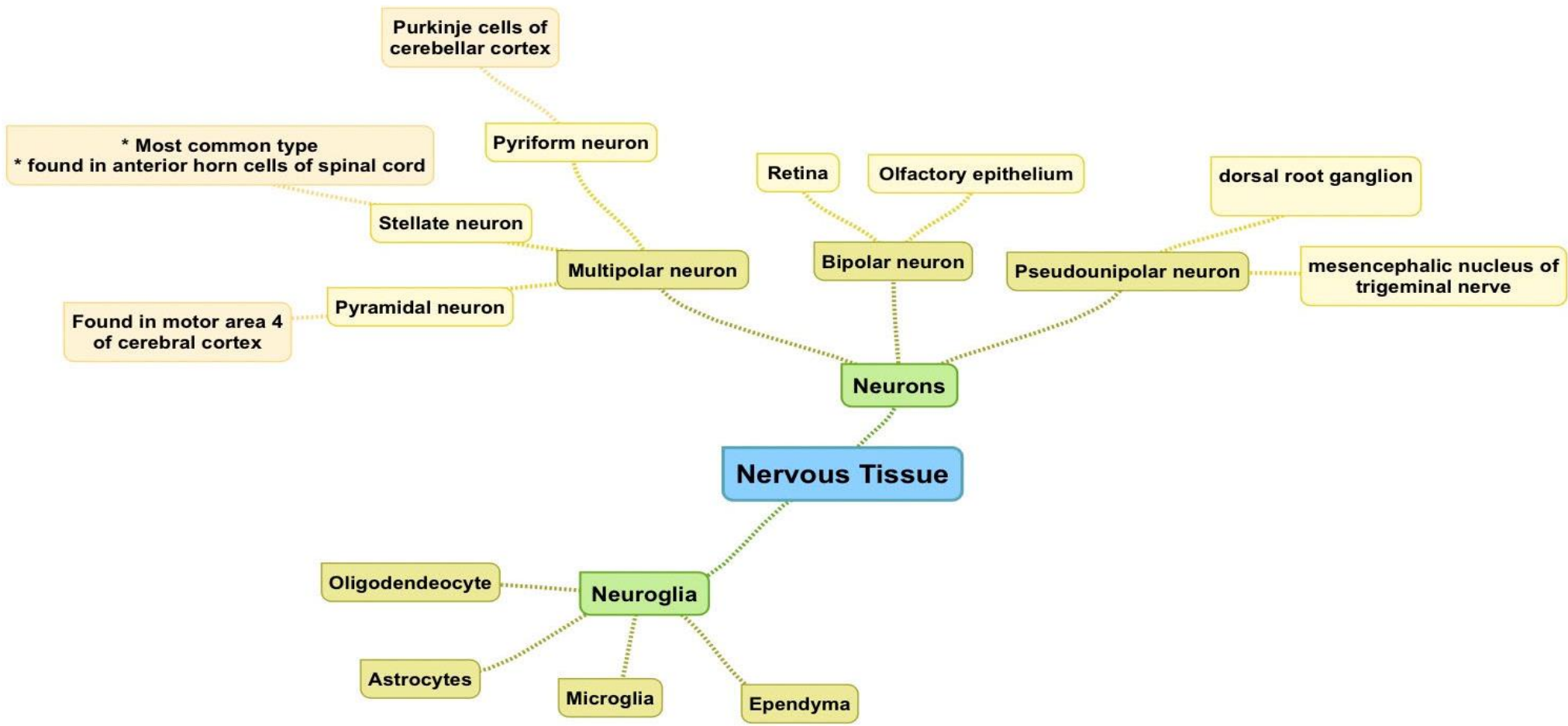
**Definition:** Are group of cells that act as the supportive tissue of CNS.

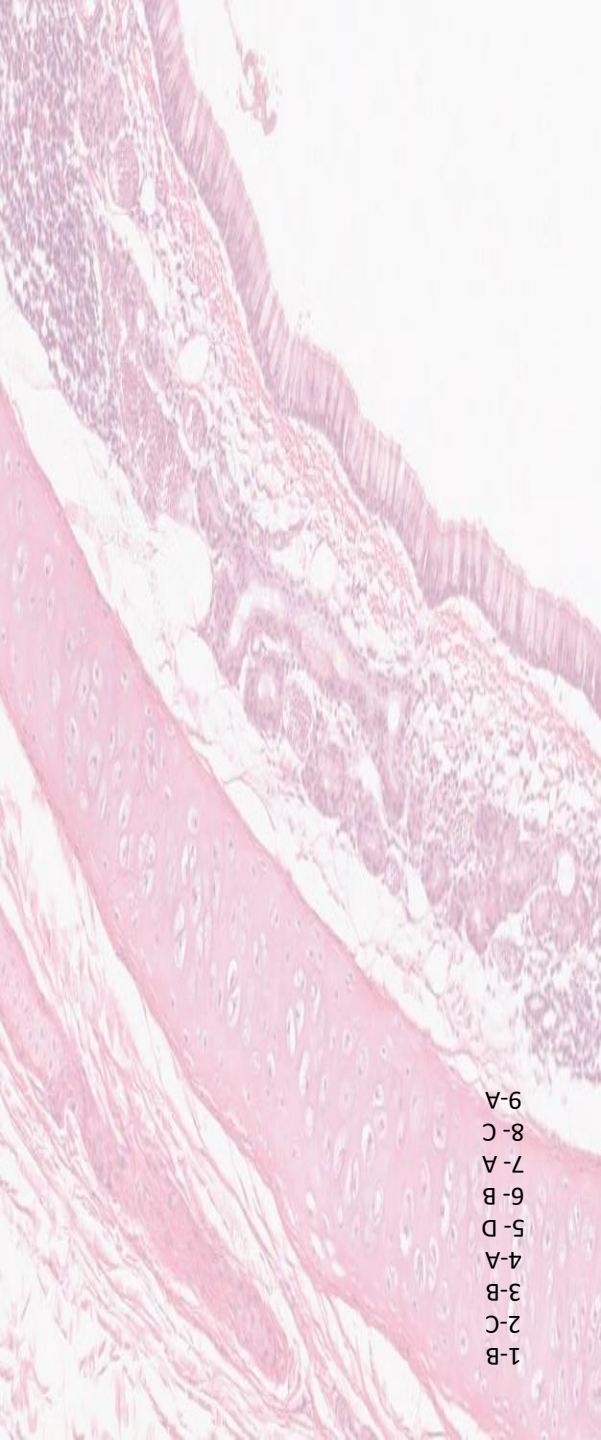
**Types:** 1- Astrocytes 2- Oligodendrocytes 3- Microglia 4- Ependyma

	3. Microglia Same as macrophages	4. Ependyma
General information	<ul style="list-style-type: none"> <li>✓ Are spindle-shaped cells with branching processes that rise from each pole of the cell.</li> <li>✓ Are distributed in the grey and white matter of CNS.</li> <li>✓ Are rich in lysosomes.</li> </ul> 	<ul style="list-style-type: none"> <li>✓ Are simple columnar epithelial cells (partially ciliated) lining the brain ventricles and the central canal of spinal cord.</li> </ul> 
Functions	1. Their main function is <u>phagocytosis</u> .	1. May be formation and circulation of CSF.
Types	_____	_____



# Summary





## MCQ's

### 1- Which of the following contain Nissl Bodies?

- A. Dendrites and axon
- B. Dendrites and cell body
- C. Cell body and axon
- D. Only axon

### 2- Types of nerve fibers that are found inside the CNS are?

- A. Myelinated with neurilemmal sheath
- B. Unmyelinated with neurilemmal sheath
- C. Myelinated and unmyelinated without neurilemmal sheath
- D. Non of above

### 3- Which type of astrocyte is found in the grey matter of the CNS?

- A. Fibrous astrocytes
- B. Protoplasmic astrocytes
- C. Microglia
- D. Oligodendrocytes

### 4- The supportive cells that form gliosis for repairing injuries in the CNS are?

- A. Astrocytes
- B. Oligodendrocytes
- C. Microglia
- D. Ependyma

1-B  
2-C  
3-B  
4-A  
5-D  
6-B  
7-A  
8-C  
9-A

### 5- One of the functions of oligodendrocytes cells?

- A. Forming BBB
- B. Nutritive
- C. Phagocytosis
- D. Formation of myelin sheath

### 6- The type of epithelium in the Ependymal cells is?

- A. Simple squamous non ciliated
- B. Simple columnar partially ciliated
- C. Simple cuboidal
- D. Pseudostratified

### 7- Mesencephalic nucleus of trigeminal nerve and dorsal root ganglion are examples of example of?

- A. Unipolar neuron
- B. Bipolar neuron
- C. Spindle shaped neuron
- D. Multipolar neuron

### 8- "Pyramidal neurons" are a type of multipolar neurons that are found in?

- A. Cerebellum cortex
- B. Brain steam
- C. Cerebral cortex
- D. All above

### 9- Which one of the following is considered as the commonest type of neuron?

- A. stellate neuron
- B. Pyramidal neuron
- C. Pyriform neuron
- D. Bipolar neuron



# *Thank you & good luck*

*- Histology team*

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