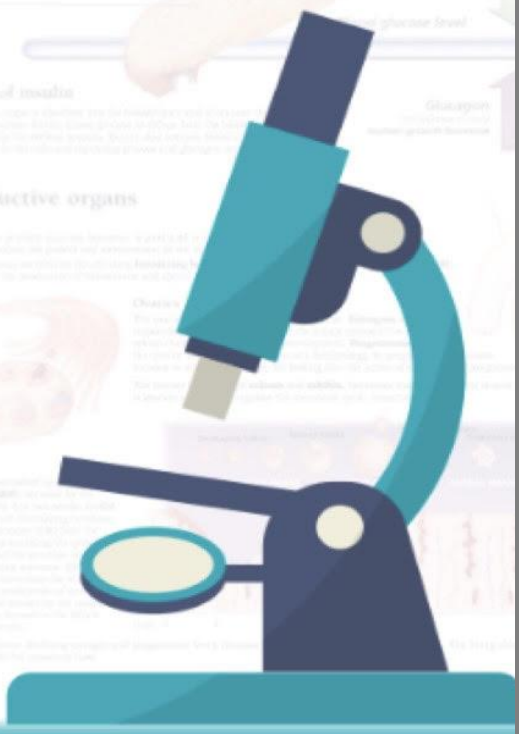
Doctor 022

Histology

Sheet no.8



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THE NERVOUS TISSUE:

- We could classify nerve tissue base on structure and function.
- Structure means where it is and from what it made of, so Structure is divided into :1-central 2- peripheral.

Structure Wise:

1-CENTRAL NERVES SYSTEM (CNS):the brain(inside the cranial cavity) and the spinal cord (inside the vertebral cavity).

2-PERIPHERAL NERVES SYSTEM (PNS): anything outside these two cavities like: cranial nerves (from the brain), spinal nerves (from the spinal cord) and ganglia.

Ganglia (single: ganglion): collection of neurons outside the CNS.

- The difference between Cranial and Spinal nerves: افهمها وركز على المظلل

In **spinal** nerve **every neuron** can **send motor** command and **receive sensation**(mixed), but in **cranial** nerve we have neurons that **only send motor** command (pure motor), neurons that **only receive sensation** (pure sensory) and neurons can **send motor and receive sensation at the same time**(mixed).

- Nerves is composed of bundles of axons (which it is a part of the nerve)
- Neurons: have numerous long processes (these are the ones in charge of initiating, starting, proportion and sending neural impulses).
- Glial cells: whose function is protection and support. Properties of Glial:

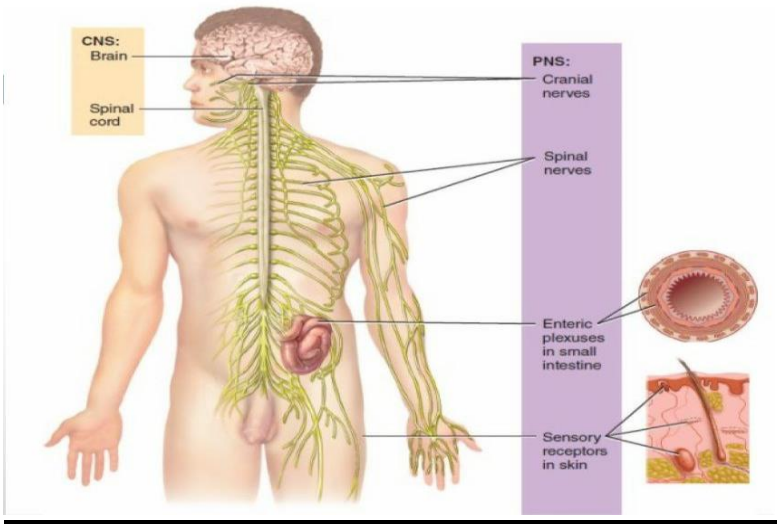
1-there number is larger than neurons.

2-they are smaller than neurons

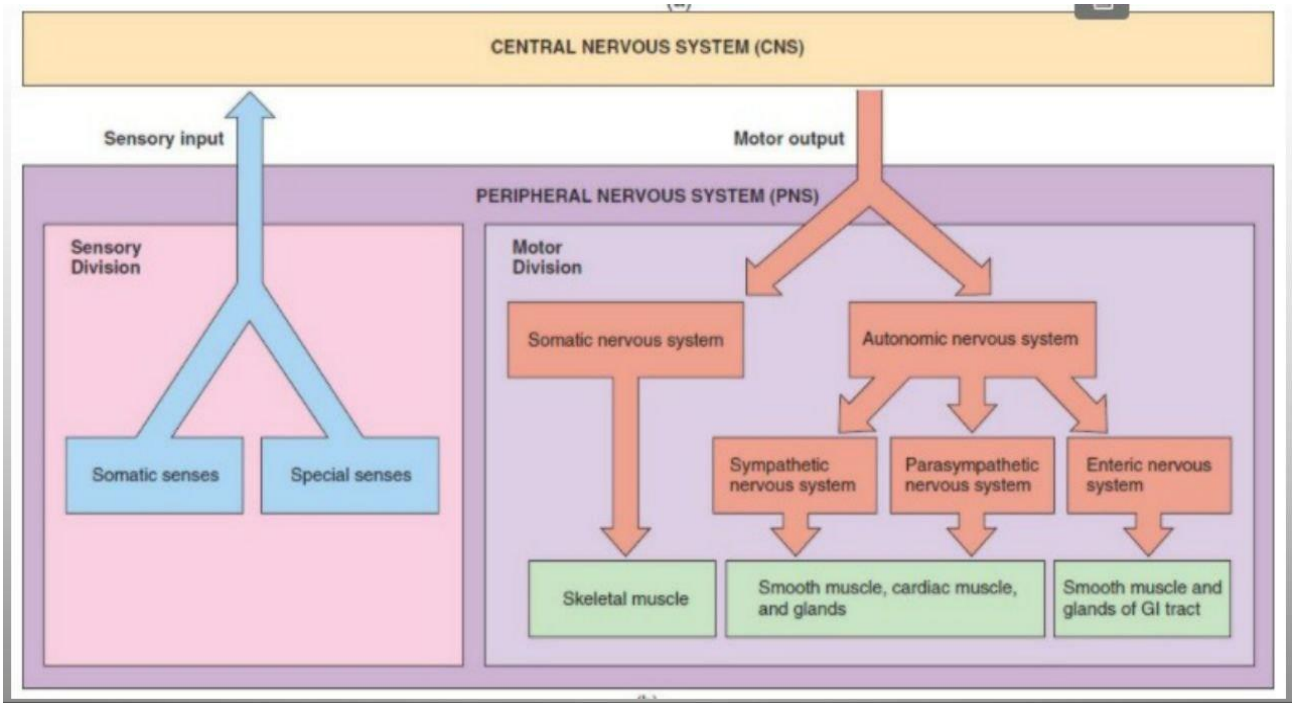
3-they can regenerate (divide).

4-They have short processes

While neurons can't divide (This is one of the bad properties of the nervous system because if lose the neuron we lose the function of it, the ones that remains might try to correct a little bit, but it will not be restore like it was before (the higher the order the higher the impact))



Functional Wise: ركّز على الصورة!!!!!!



- Somatic: anything that I have motor over (aware of).
- We have somatic sensory and somatic motor as well as Autonomic we have sensory and motor.
- Now Sensory: somatic senses and special senses.

If I put my hand on the laptop I can feel if the temperature is raised or know the smooth of its surface and if there something on it, so this is sensation I'm aware of and we call it **somatic sensory.**

As well as we have something like them called special senses like vision, smell, hearing, tasting……etc.

NOW, why we are separating the somatic and special senses??

Because in the brain We have different areas each one goes to.

- All the somatic senses go to specific sensation area while each one of the special senses goes to its specific area.

That tells us how complicated and precise this is to the point that we need specific region for it, so we have more neurons process in special senses if we compare it with somatic senses.

Now let's talk about the motor output:

- "Somatic Motor Nerve", so these are the motor command that we have control over. (They go to the **Skeletal Muscles**)
- What left from the motor the Autonomic nervous system goes to it which divide into:1-sympathetic 2-parasympathetic.

We will talk now about the examples in the picture:

1-cardiac muscle: the heart is not fully controlled by ANS because it can contract by itself with no need to any nerve, but the ANS modulating heart rate and regulating the force of contraction (بعَلِّي او بوَطِّي).

2-Glands: their secretion is depending on the ANS.

3-smooth muscles: also, not all of them is regulated by peripheral.

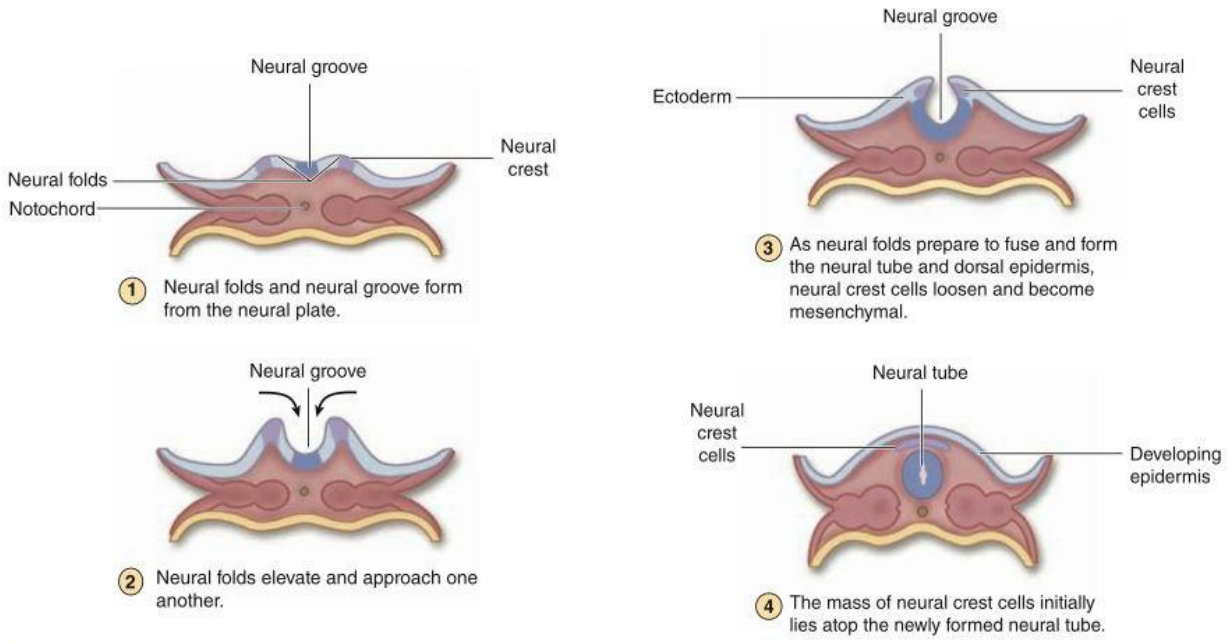
ENTERIC NERVOUS SYSTEM: we can say: it is a local controller of the GI (gastrointestinal) tract, work on the smooth muscles and the glands that are there, but it can't play alone so it is under the control of the other major 2 branches of the ANS which is the sympathetic and parasympathetic. (somehow its similar to SA node in the heart)

- We'll have more details about ANS later.

DEVELOPMENT OF NERVE TISSUE: اخذناه بال Embryology

- in the trilaminar stage of embryonic development (third week of gestation) we have 3 primary germ layers:
- **1-**Ectoderm: which is on the surface**/2-**mesoderm/3-Endoderm

During early embryonic development, the neural groove forms as a result of the thickening and elongation of a region called the neural tube. This neural groove eventually closes along the midline, transforming into a hollow structure known as the neural tube. As the neural tube forms, it separates from the overlying surface ectoderm, which will develop into the outermost layer of the skin and other surface structures. The neural tube remains inside the embryo and undergoes further differentiation, to give rise to the brain and the spinal cord and nerves, Within the spinal cord, the central canal is formed derived from the lumen of the neural tube and runs longitudinally through the center of the spinal cord.



Stages in the process of **neurulation**, by which cells of the CNS and PNS are produced, are shown in diagrammatic cross sections of a 3- and 4-week human embryo with the extraembryonic membranes removed. Under an inductive influence from the medial notochord, the overlying layer of ectodermal cells thickens as a bending **neural plate,** with a medial neural groove and lateral neural folds **(1)**. All other ectoderm will become epidermis. The plate bends further, making the **neural folds** and **groove** more prominent **(2)**. The neural folds rise and fuse at the midline **(3)**, converting the groove into the **neural tube (4)**, which is large at the cranial end of the embryo and much narrower caudally. The neural tube will give rise to the entire CNS.

As the neural tube detaches from the now overlying ectoderm, many cells separate from it and produce a mass of mesenchymal cells called the **neural crest**. Located initially above the neural tube, neural crest cells immediately begin migrating laterally. Cell derived from the neural crest will form all components of the PNS and also contribute to certain non-neural tissues.

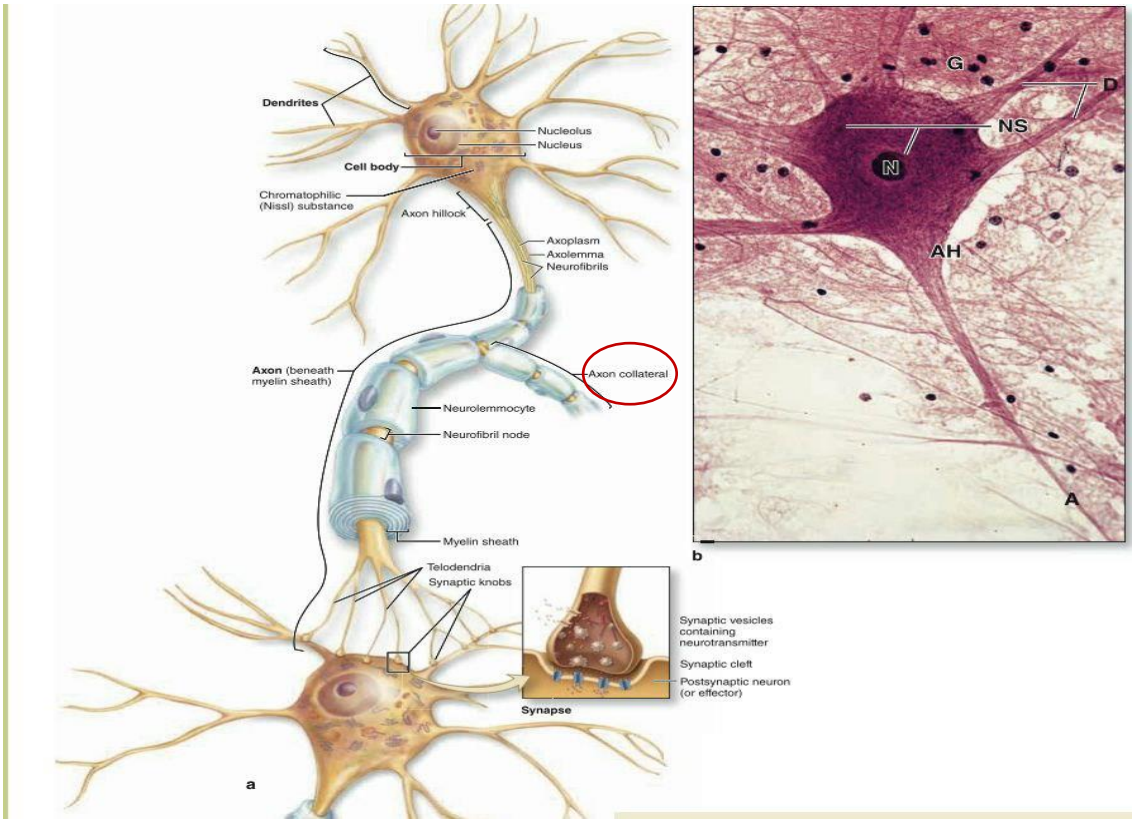
NEURONS: IN THE BRAIN, SPINAL CORD, AND GANGLIA.

- The functional unit in both the CNS and PNS, they are the most important because they make initiating to action potential 11:15
- Neurons have 3 parts:

1-Cell body (perikaryon or soma): the part that are similar to the other cells and we call the branches from it dendrites or axons.

2- Dendrites: numerous elongated processes extending from the perikaryon and specialized to receive stimuli from other neurons. and they are usually many.(All neural cells have dendrites the least number is one)

3- Axons: a single long process (or doesn't exist) ending at synapses specialized to generate and conduct nerve impulses to other cells (nerve, muscle, and gland cells). Not all neurons have axons.(depends on the type)



- The cell body is the one that has the nucleus and most of the organelles.
- Serves as the synthetic or trophic center for the entire neuron.
- The dendrites function is to receive synapses from other neurons.
- The axon function is to sending stuff out and the dendrites function is to brining stuff in. What is the thing that we bring in and out? Neural impulses.
- The input of the Dendrites usually is from other neurons or sensory nerve ending. (Which it is dendrites)

إنّي لَيُتعِبُني يأسي وأُتعِبُهُ إذْ أَنَّ ما زادَ يأسي زادَ آمالي

NEURON CLASSIFICATION-STRUCTURALLY:

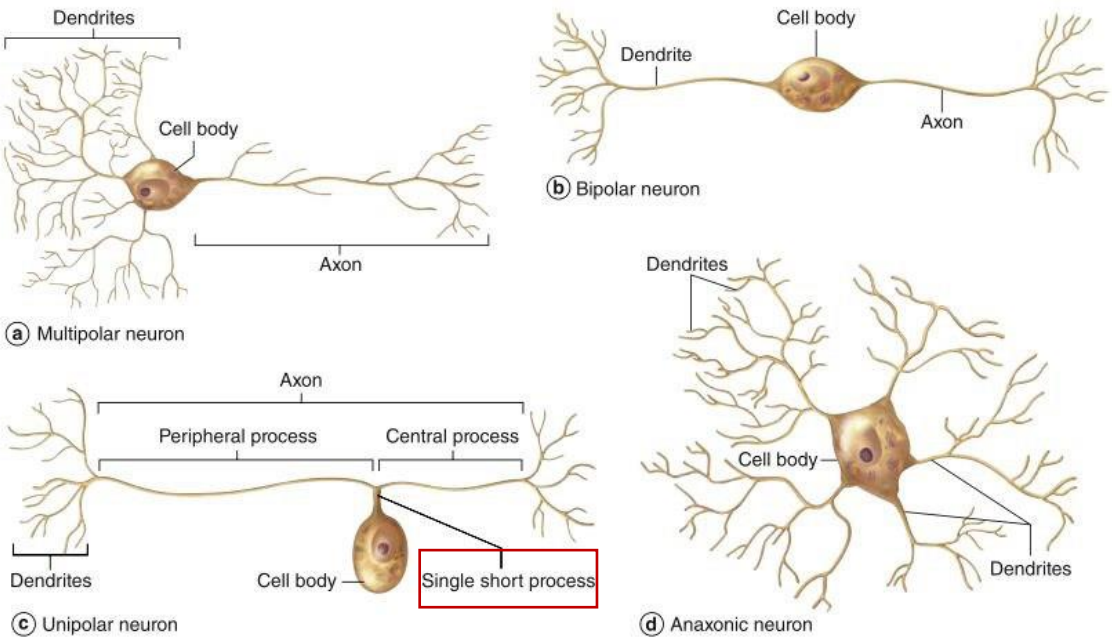
- We have 4 types of neurons. (على زمن الدكتورة كانوا 3 وحديثا اكتشفوا الرابع)

1- Multipolar neurons: one axon and two or more dendrites, most common. We find it in motor neurons or interneurons.

2- Bipolar neurons: one dendrite and one axon, sensory neurons of the **RETINA**, the **OLFACTORY** epithelium, and the **INNER EAR**. (Special sensory neurons).

3- Unipolar or pseudo unipolar neurons: single process that bifurcates close to the perikaryon; longer branch extending to a peripheral ending and the other toward the CNS. All other sensory neurons, except the three that we mention before.

4- Anaxonic neurons: many dendrites but no true axon, do not produce action potentials, but regulate electrical changes(so it does really have an influence of there neural impulses)(**Receive** and protect just, don't send) of adjacent CNS neurons.(AN: axon بتنفي انه عنده)



Shown are the four main types of neurons, with short descriptions. **(a)** Most neurons, including all motor neurons and CNS interneurons, are **multipolar**. **(b)** **Bipolar neurons** include sensory neurons of the retina, olfactory mucosa, and inner ear. **(c)** All other sensory neurons are **unipolar** or **pseudounipolar**. **(d)** **Anaxonic** neurons of the CNS lack true axons and do not produce action potentials, but regulate local electrical changes of adjacent neurons.

1-Multipolar:

- Many processes and each one eventually will have many tiny divisions we call them dendrites (these are the inputs) and these dendrites could make up to 200,000 synapses. (200,000 neuron could synapse to one neuron).
- Have one axon and the axon is usually longer than the dendrites.
- The dimeter of an axon almost uniform along its length.
- In some of the axons we might see branches we call it COLLATERALS; we can see it in interneurons and motor neurons.
- WE HAVE mainly 2 types of neurons Motor and Sensory but the thing that connect between these 2 types pr other central type is interneuron. (Act as a bridge between sensory and motor neurons)
- The most type that we can see branching(**Collaterals**) in the axon.

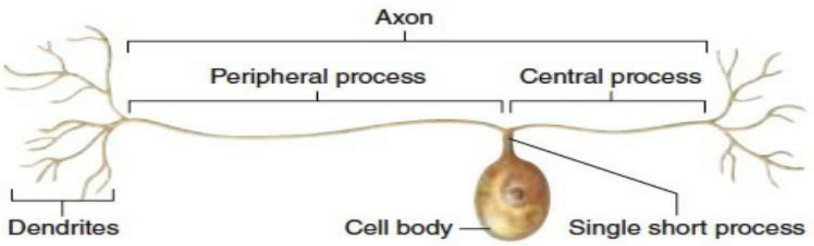
2-Bipolar:

- We have 2 process one is axon, and the other is dendrite.
- It is sensory neuron.
- We can find it 1- **RETINA** 2- **INNER EAR 3- OLFACTORY** (I repeat them because doctor said they are important).

3- Unipolar or pseudo unipolar neurons:

- There is one short process that is divided into 2 (bifurcates) (it's not a 2 it's just one) Why we called it pseudo? Cuz it's one but divided into 2.
- During its formation in Embryo, they were 2 and they fuse to form one.
- Most of it is axon, on end is the dendrites(in pathway) and the other is the axon (out pathway).

The longer process(branch) extends to a peripheral ending while the other one (shorter one) extends to the CNS.



© Unipolar neuron

Not the real process.

4- Anaxonic:

- Doesn't create action potential.
- Their function is similar to Galil cells but it's not neuro Glial cells.
- They are neurons that don't have axons and work in electrical regulation of the other neurons.
- The Glial cells have no relation with electrical activity of the neurons where this one does.
- Their origin is the neural tube just like the other neurons.
- So many dendrites don't initiate an action potential, doesn't deliver one because it is involved in electrical regulation of other neurons.

- Sensory neurons (afferent), receiving stimuli from receptors throughout the body.
- Motor neurons (efferent): sending impulses to effector organs muscle fibers and glands. ME! (Motor Efferent) رابط عشان تحفظها
- 1. Somatic motor nerves--- voluntary -- skeletal muscle.

- 2.Autonomic motor nerves-- involuntary or unconscious--- glands, cardiac muscle, and smooth muscle.
- Interneurons :establish relationships among other neurons, forming complex functional networks or circuits in the CNS. Interneurons are either multipolar or Anaxonic and comprise 99% of all neurons in adults.

ALL NEURONS HAVE DENDRITES BUT NOT ALL NEURONS HAVE AXONS!!

تمَّ بحَمْدِ الله تعالى

نراكم بعد الفاينل :)

Order has to match what going on, so it could be trimmed to be precise 100%, So in some conditions when you raise your arm (for example) it shakes(ترتعش)because there's mistake between the parts involved.

Medical condition: Parkinson

"It's not a muscular problem, the problem in what controls the muscles.

>> MEDICAL APPLICATION

Parkinson disease is a slowly progressing disorder affecting muscular activity characterized by tremors, reduced activity of the facial muscles, loss of balance, and postural stiffness. It is caused by gradual loss by apoptosis of dopamine-producing neurons whose cell bodies lie within the nuclei of the CNS substantia nigra. Parkinson disease is treated with **L-dopa** (L-3,4-dihydroxyphenylalanine), a precursor of dopamine which augments the declining production of this neurotransmitter.

زدنا معلومة بصفحة 7 الي هي اخر جملة بالصفحة:V2

عدلنا كلمة Anaxonicبال

Neural crest صارت Neural Tube in page 8