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Physiology

Nervous system

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Nervous System

The Nervous System controls and coordinates all the functions of the body It is the major controlling and communicating system of the body.

- The Nervous System consists of two main sub-divisions:

♣ **Central Nervous System (CNS):** consist of **brain** and **spinal cord**

♣ **Peripheral Nervous System (PNS):** is the nerves **outside** the **brain** and **spinal cord** divided into two sub-divisions:

♣ **Somatic** - **voluntary** (sensory and motor)

♣ **Autonomic** - **involuntary** (sympathetic and parasympathetic)

Somatic ------ convey messages from the sense organs to the CNS and from the CNS to the muscles and glands.

Autonomic ----- a set of neurons that control the heart, the intestines, and other organs

Type of neurons :

Neurons : are the cells in our body that are responsible for transmitting electrical signals through the nervous system. The ability to move or feel the world around us all starts as an impulse sent by a neuron. This process helps us see, taste, touch, and move. In order to instantly facilitate these bodily processes, highly specialized neurons are used to transmit these signals and coordinate the body.

❖ Based on Structure :

1. **Unipolar neurons**: These neurons have a single long axon that is responsible for sending electrical signals. The axon in unipolar neurons is myelinated, which allows for rapid signal transmission.
2. **Multipolar neurons**: These neurons can receive impulses from multiple neurons via dendrites. The dendrites transmit the signals through the neuron via an electrical signal that is spread down the axon.
3. **Bipolar neurons**: These neurons send signals and receive information from the world. Examples include the neurons in the eye that receive light and then transmit signals to the brain.
4. **Pseudo-unipolar neurons**: These neurons relay signals from the skin and muscles to the spinal cord. They are the primary neurons responsible for coordinating the movement of the arms and legs using input from the brain.

❖ Based on function :

1. **Sensory neurons (afferent):** send information from sensory receptors (e.g., in skin, eyes, nose, tongue, ears) TOWARD the central nervous system.
2. **Motor neurons (efferent):** carries impulses from the CNS to organs, muscles and glands.
3. **Interneurons:** send information **BETWEEN sensory** neurons and **motor** neurons. Most interneurons are located in the central nervous system.

Anatomical structures:

• **Cell body:** which contains the nucleus and is the metabolic center of the cell.

- **Dendrites:** highly branched processes that conduct electrical currents towards the cell body (receive input from many other neurons).

- **Axon:** a long process extending out from the neuron cell body. It conducts impulses away from the cell body to other cells.

- **Myelin:** It is a wax like membrane that covers the longest nerve fibers. Myelin protects and insulates the fibers and increases the transmission rate of nerve impulses.

- **Schwann cells:** Specialized supporting cells that wrap tightly around the axon.

- **Synaptic vesicle:** secreted acetylcholine.

- **Neurotransmitter:** It is a chemical substance secreted by axon terminals into the extra cellular space when the impulses reach the axon terminals.

Brain ventricles:

It is a system of four communicating cavities within the brain and continuous with the central canal of the spinal cord. The four ventricles consist of the

A. **Two lateral ventricles :** The lateral ventricles are two cavities located within the cerebrum. The lateral ventricles communicate with the third ventricle through the interventricular foramen (opening).
B. **Third ventricle :** is a narrow cavity located between the two hemispheres , is a median (midline) cavity in the brain that is bounded by the thalamus and hypothalamus on either side.
C. **Fourth ventricle:** is the most inferior (lowest) of the four ventricles of the brain. It has a characteristic diamond shaped cavity located behind the Pons and medulla oblongata.

Function of ventricles:

The ventricles are filled with cerebrospinal fluid, which is formed by structures called choroid plexuses located in the walls and roofs of the ventricles.

1) Forms the central canal of the spinal cord
2) Protects the brain from trauma

Hydrocephalus : also known as "**water on the brain**" is a medical condition in which there is an abnormal accumulation of cerebrospinal fluid (CSF) in the ventricles of the brain. This may cause increased intracranial pressure inside the skull and progressive enlargement of the head, convulsion, and mental disability. Hydrocephalus can also cause death. Although it does occur in older adults, it is more common in infants.