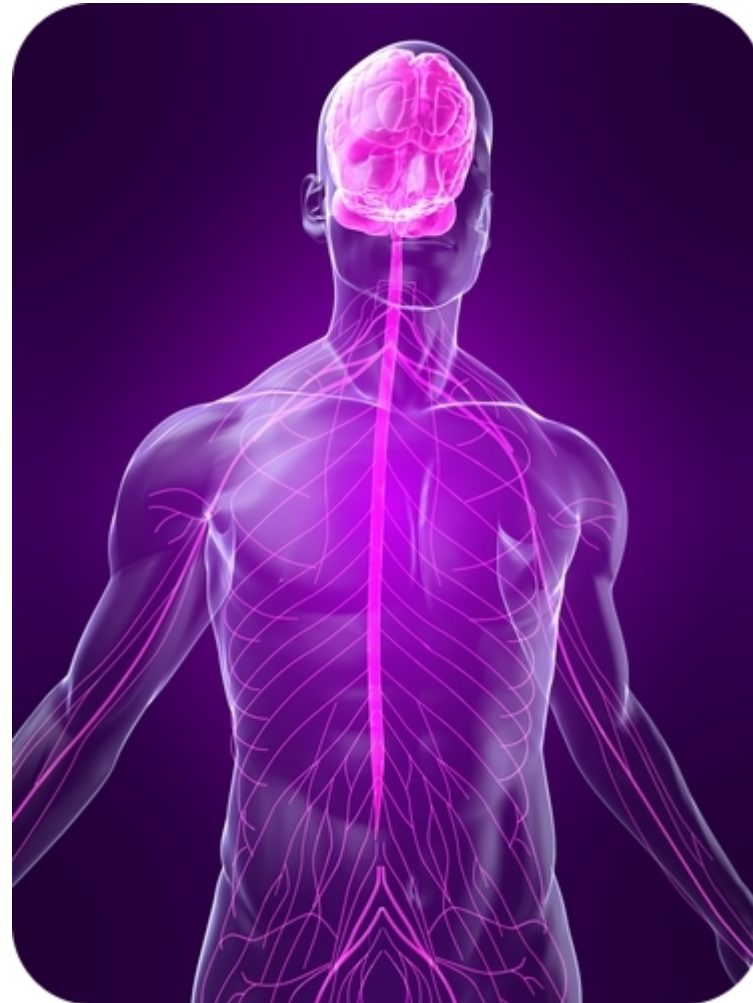


THE CENTRAL NERVOUS SYSTEM



Gray matter: consists of unmyelinated nerve cell bodies, dendrites and axons.

White matter: is mostly myelinated axons and contains very few cell bodies. Its pale color comes from myelin sheaths that surrounds axon.

Three layers of membrane called **meninges** lie between the bones and tissues of the CNS. They protect it from bruising against bones.

Starting from the bones;

Dura mater is the thickest associated with veins that drain blood through vessels.

Arachnoid mater is loosely tied to the inner membrane leaving a subarachnoid membrane which contains cerebrospinal fluid.

Pia mater is a thin membrane that adheres the surface of the brain and spinal cord. It contains arteries that supply blood to the brain.

The final protective component is ECF.

Blood,

interstitial fluid (inside pia mater) and

cerebrospinal fluid (between pia mater and arachnoid membrane).

Choroid Plexus

It transport ions and nutrients from the blood into the CSF. It is selective so CSF is different from plasma. It contains lower K and higher H.

Contains very little protein and no blood cells.

Blood Brain Barrier

Final layer of protection between interstitial fluid and blood. Isolates main control center from potentially harmful substances and pathogens in the blood. Highly selective permeability of capillaries.

Spinal cord is the major pathway for information flowing back and forth between the brain and rest of the body.

Each region is divided into segments and each segment has a pair of spinal nerves.

Just before a spinal nerve joins the spinal cord divides into two branches called roots.

Dorsal root carries incoming sensory information.

Ventral root carries information from CNS to muscles and glands.

In cross section, it has a butterfly-shaped core of gray matter which surrounds white matter.

Spinal cord can function as a self-contained integrating center for spinal reflexes. Signals pass from a sensory neuron to an efferent neuron. Plays a role in the coordination of body movement.

Principal Parts of the Brain

1. Cerebrum
2. Diencephalon
 1. Thalamus
 2. Hypothalamus
3. Cerebellum
4. Brainstem
 1. Medulla
 2. Pons
 3. Midbrain

Brainstem forms the connection between the brain and the spinal cord, maintains vital control of the heart and lungs, and coordinates many important reflexes.

Medulla controls a number of (autonomic) involuntary functions and main function is to process information to and from the spinal cord and the cerebellum.

Pons is a bridge between the cerebellum and cerebrum, which are both parts of the brain.

Midbrain is a small regions, serves important functions in motor movement, particularly movements of the eye

Cerebellum is the second largest structure in the brain. The specialized function of it is to process sensory information and coordinate movement.

Diencephalon contains centers for homeostasis.

Cerebrum is the largest part of the brain and fills most of the cranial cavity. It is composed of two hemispheres which are divided into four lobes.

Mouse brain



Human brain



Cerebral cortex is the outer layer of cerebrum.
Basal ganglia or nuclei controls the
movement.

Limbic system acts as the link between
cognitive functions (reasoning) and emotional
responses (fear).

Sensory receptors convert chemical, mechanical, thermal and light energy into electrical signals that pass along sensory neurons to CNS control centers. The brain processes and filters incoming signals.

Classification of Sensory System by Structural Complexity

Somatic (= general) senses

1. Touch
2. Temperature
3. Nociception
4. Itch
5. Proprioception

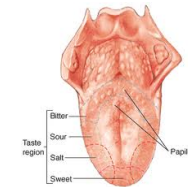
Special senses

1. Vision
2. Hearing
3. Taste
4. Smell
5. Equilibrium

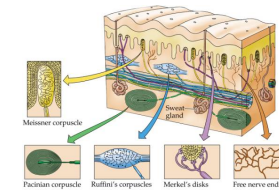
Proprioception is the awareness of body movement and position in space and is mediated by muscle and joint sensory receptors called proprioceptors.

4 Types of Sensory Receptors

1. **Chemo-** (specific ligands) and **Osmo-** (conc. of solutes)

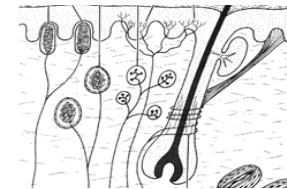


2. **Mechano-** (touch, pressure, vibration, stretch)



3. **Thermo-** (temp. change)

- Cold receptors** lower than body temp. (**krause**)
- Warm receptors** (37 - 45°C) (**ruffini**)



4. **Photo-** (light) (**rod/cone**)

