Nervous system

Introduction the nervous system and neurons

What is the nervous system?

It is a collection of neurons and supporting tissue.

- The nervous system is the organization of these signaling cells.
- The central nervous system is made up of the brain and spinal cord
- The peripheral nervous system are made up of neurons with "projections" or exons that leave or enter the spinal cord. (Anything outside the spinal cord)

What are neurons?

They are specialized cells capable of generating and passing on a message to the body and from the body to the brain. Messages can be electrical or chemical (i.e. neurotransmitters)

Cells of the body

- **Neurons**

  It promotes rapid communication of electrical signals and passes on electrical signals usually via the release of neurotransmitter across a synapse.

- **Glial cells (support cells):**
  Support cells provide an appropriate environment for neuronal activity.

Peripheral nervous system contains:

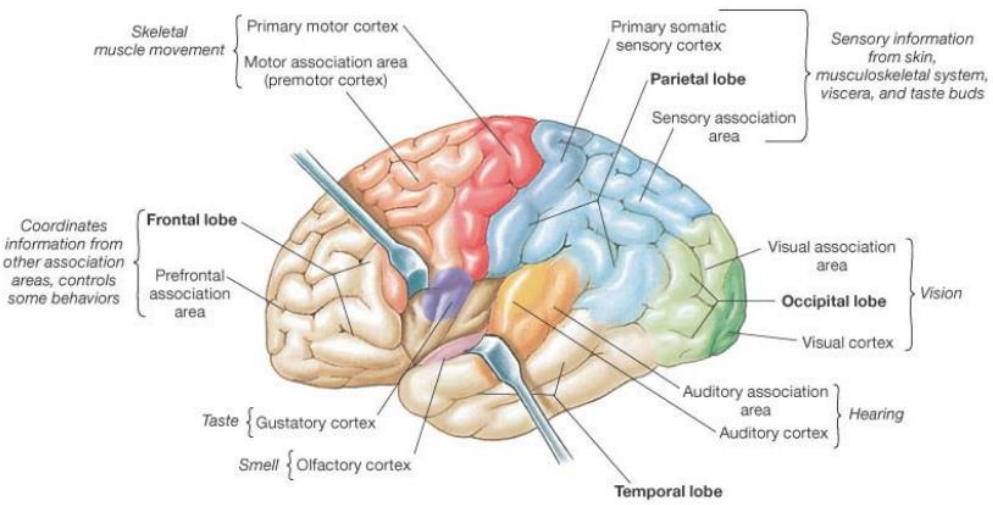
- Schwann cells: Secrete neurotrophic factors and form the myelin sheaths.
- Satellite cells: Support the cell body

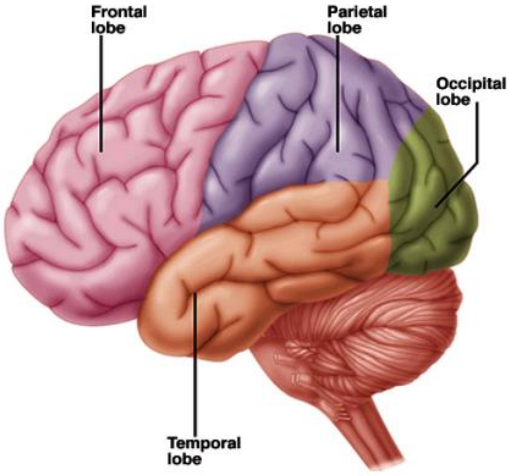
Central nervous system contains:

- Oligodendrocytes: Form the myelin sheaths
- Astrocytes: They form support for the central nervous system, help form blood-brain barrier, secrete neurotrophic factors and take up K+ neurotransmitters.
- Microglia: They are modified immune cells and acts as scavengers
- Ependymal cells: It creates barriers between compartments.

The cerebral cortex is divided into lobes with different functions.

Cerebral cortices: Frontal, parietal, temporal and occipital





Functional areas of the cerebral cortex

A better way to divide up the cortex is to group functions

- Sensory areas receive sensory information. Sensation is converted to awareness and perceptions.
- Motor areas direct movement, planning and execution
- Association areas integrate information from multiple sources and direct behavior

Frontal lobe: Coordinates information from other association areas and controls some behaviors.

- Primary motor cortex
- Motor association area (premotor cortex)

Parietal lobe: Detects sensory information from skin, musculoskeletal system, viscera and taste buds.

- Primary sensory cortex
- Sensory association area

Occipital lobe: Related to vision

- Visual cortex
- Visual association area
    - **Temporal lobe:** Includes hearing, taste and smell
    - **Hearing:** Auditory cortex and auditory association area
    - **Taste:** Gustatory cortex
    - **Smell:** Olfactory cortex

Noradrenergic transmission

- α adrenergic receptor for example are on blood vessels and cause constriction
- β adrenergic receptor for example are within the heart and increase rate and force.
- Noradrenaline (norepinephrine) is released from sympathetic nerves, adrenaline (epinephrine) is a hormone released from the adrenal medulla.

Parasympathetic neurotransmission

- Receptor for acetylcholine (Ach): N and M

Nicotinic	**Muscarinic**
Ligand gated ion channel	G-protein coupled receptor
All autonomic ganglia	Most parasympathetic neuroeffector junctions
Skeletal neuromuscular junction	Some sympathetic neuroeffector junctions

Generalizations

- All preganglionic (S or PS) neurons release Ach which acts on N receptors at the autonomic ganglia
- All postganglionic PS neurons release Ach which acts on M receptors at the neuroeffector junction
- Most postganglionic S neurons release NA which acts on α or β adrenoreceptors at the neuroeffector junction
    - Exception – Sympathetic cholinergic fibres innervating sweat glands and blood vessels of the head and neck.
- The actions of S and PS nervous systems are usually opposite
    - Exceptions: most blood vessels only have sympathetic innervation
    - S and PS nerve produce similar effects in some organs e.g. Salivary glands or complimentary effects e.g. reproduction