

NERVOUS SYSTEM

Functions of the Nervous System

1. awareness
2. coordination and control
3. memory and learning
4. establishing patterns of response

Generic nerve cell (neuron)

1. Dendrites - input from environment or other cells
2. Cell Body - nucleus, mitochondria
3. Axon - conducts nerve impulse (myelin)
4. Synaptic terminals (pre-synaptic membrane)
- output to muscle/gland/nerve

Afferent nerves = "sensory nerves"

- brings sensory info to CNS from tissues/organs

Efferent nerves = "motor nerves"

- carry motor commands from CNS to muscles/glands

Organization of the Nervous System

1. CNS - Central nervous system

- a. Brain
- b. Spinal cord

2. PNS - Peripheral nervous system

- a. Cranial nerves= motor and sensory nerves
- b. Spinal nerves = motor and sensory nerves
 - controls skeletal muscle contraction
 - voluntary and involuntary/reflexive control

3. ANS - Autonomic Nervous System

- a. Sympathetic (thoracolumbar) division (speeds heart)
- b. Parasympathetic (craniosacral) division (slows heart)
 - controls smooth muscle contractions (gut)
 - involuntary control

CNS development

1. ectoderm folds inwards to form a hollow neural 'tube'
2. anterior end (brain) exhibits 3 swellings (vesicles)
3. posterior region becomes spinal cord

General structure of brain = Three vesicles:

1. **Forebrain** = *Prosencephalon*
 - a. Telencephalon (Cerebrum, basal ganglia)
 - b. Diencephalon (hypo-, epi-, thalamus)
2. **Midbrain** = *Mesencephalon*
 - a. Mesencephalon (corpora quadrigemina)
3. **Hindbrain** = *Rhombencephalon*
 - a. Metencephalon (cerebellum, pons),
 - b. Myelencephalon (medulla oblongata)

Cavities (Ventricles) of the brain

Regional elaboration of the original neural tube
- filled with cerebrospinal fluid = CSF

Four cavities (**Ventricles**)

- a. lateral ventricles (#1-2) (*forebrain*)
- b. 3rd ventricle (*forebrain*)
- c. 4th ventricle (*hindbrain*)

Ventricles are continuous with each other

- 1+2 (cerebral hemispheres): interventricular foramina
- 1/2 > 3 (thalamus): interventricular foramina
- 3 > 4 (medulla oblongata): mesencephalic aqueduct
- 4 > central canal of spinal cord:

Typical cross section of brain:

1. Grey matter: cell bodies, unmyelinated axons
2. White matter: axons, myelinated axons
3. Cranial nerves (12) project from brainstem

Typical cross section of spinal cord:

1. White matter: myelinated axons
2. Grey matter: cell bodies, unmyelinated axons
3. Dorsal roots contain sensory neurons
4. Ventral roots contain motor neurons

Cavity of the spinal cord

1. central canal is remnant of original neural tube
2. filled with cerebrospinal fluid = CSF

General structure of Spinal Cord

1. Spinal cord is about 18 inches long
2. Diameter varies along length of cord
3. Cervical enlargement: nerves to shoulder girdle & arms
4. Lumbar enlargement nerves to pelvis & legs
5. Posterior median sulcus: shallow longitudinal groove
6. Anterior median fissure: deep longitudinal groove
7. Conus medullaris - tapered conical termination of cord
8. Filum terminale - fiber extending from conus > coccyx