Chapter 14

Nervous System

Nerve Structure and Function

Neurons-nerve cells

Soma-cell body

Axon and dendrites- process (extensions)

Dendrites- branch extensively like tiny trees

Axon- a single process, carries impulses away from the cell body

Nerve fibers- the dendrites and axons

Nerves- bundles of nerve fibers

Nuclei- groups of neuron cells bodies in the brain and spinal cord

Ganglia- groups of neuron cells bodies outside the brain and spinal cord

Tract- bundles of nerve fibers

Nerve Types

Myelinated- covered with a coat of myelin (fatty material), found in CNS

Non-myelinated- thin layer of myelin, found in ANS

Schwann's sheath- covers peripheral myelinated and nonmyelinated nerves like a continuous tube like membrane.

Microalgia - phagocytic cells that fight infection and help with healing.

Astrocytes- cover the surface of the capillaries of the brain and with the capillary tissue they form the blood-brain barrier.

Oligodendroglia- aids in holding nerve fibers together and forming the myelin sheath in the CNS.

Schwann cells- are found only outside the CNS.

Neuron Groups

Connector neurons- the dendrites and axons are connected to other neurons

Sensory neurons- the dendrites are connected to the receptors (eyes, ears, and other sense organs). The axons are connected to other neurons. The neurons change the information from external sources like light waves and sound vibration to electrical impulses.

Motor neurons -the dendrites are connected to other neurons and the axons are connected to affecters (muscles and glands).

Synapse- the point at which an impulse is transmitted from the axon of one neuron to the dendrite of another.

There is no physical contact of neurons at the synapse.

The electrical impulse does not jump but releases a chemical at the synapse.

The neurotransmitter chemical is released from the vesicles in the axon and activates impulse in the dendrites.

The Meninges

There are the three membranes that envelope the CNS separating the brain and spinal cord from the body cavities.

Dura mater- the outer most layer and is the toughest, hardest, and most fibrous of the three.

SUBDURAL SPACE

Arachnoid- the middle layer which is lese dense and web like in appearance.

SUBARACHNOID SPACE

Pia mater- the innermost, thin, compact membrane that is closely adapted to the surface of the brain and spinal cord. It is very vascular and supplies blood for the CNS tissue.

Meningitis- is the inflammation of the meninges.

The Brain

Contains about 100 billion neurons. There are three division of the brain: forebrain, midbrain, and hindbrain.

Cerebrum

Gyri- folds in the hemisphere

Sulchi- deep furrows

Frontal- controls voluntary movement also called the motor area.

Parietal -collects, recognizes, and organizes the sensations that include pain, temperature, touch, position, and movement.

Temporal- contains awareness for auditory stimuli.

Occipital- controls visual perception and visual memory. This also includes eye movements.

The left hemisphere of the cerebrum control the right side of the body and vice versa.

The left hemisphere seems to be involved in language, logic and analytic thinking, and ordering of events and symbols.

The right side has been linked to imagination, creativity in art and music, and spatial and depth perception.

Rhinencephalon

More developed in animals than in humans. It is associated with smell and sometimes referred to as the olfactory brain.

Hypothalamus

Helps control body temperature, sleep, and behavior for feeding and drinking

The Midbrain

Helps with the auditory, visual, and muscle control. This also assists with body posture and equilibrium.

Cerebellum

Contributes the motor activity and muscle tone.

Medulla oblongata

The cranial continuation of the spinal cord. Respiration and circulation are controlled here. This also helps maintain alertness and awareness.

Spinal Cord

This is an essential extension of the brain.
Sensations received by the sensory nerves are relayed to the spinal cord.
The impulses are relayed to the brain then sent to the motor nerves.
Injury to the spinal cord at any segments can cause loss of function.

The Peripheral Nervous System.

Means of communication by which stimuli are transmitted from receptor organs to the CNS and from the CNS to the organs, muscles, and glands.

Cranial Nerves

There are twelve pairs.

They can be identified by name or number.

Trigeminal- is the largest. (Sensation of head and face)

Vagus- is the longest. (Sensations and movement of the organs)

Spinal Nerves

These leave from the spinal cord and are named after their coordinating vertebrae.

They have two parts the dorsal root and the ventral root.

Dorsal root- carries the sensory impulses to the spinal cord.

Ventral root- carries the impulses to the muscles.

The Autonomic Nervous System

This is an element of the PNS but also part of the entire nervous system.

It functions automatically to control things like smooth muscle, cardiac muscle, and glands.

Sympathetic (fight-or-flight response)

Dilating the pupils

Accommodates the eyes to distant vision.

Dilates the bronchial tubes

Heart quickened

Blood vessels of the sin are constricted so that more blood goes to the muscles.

The GI tract and bladder are relaxed.

Contractions of the sphincters to prevent leakage from the anus or urethra.

Parasympathetic (restful)

Constricts the pupils

Accommodates the eyes to near objects

Constricts the bronchial tubes

Slows the heart

Dilates the blood vessels when stress is passed

The GI tract and bladder are contracted.

The sphincters are relaxed

Reflexes

A reflex is an automatic or unconscious response to a stimulus.

A reflex occurs below the brain level within the spinal cord.

A reflex involves a chain of at least two neurons making a reflex arc. It includes a sensory neuron and motor neuron. Usually one or more connector neurons are involved.

The spinal reflex is the simplest type.

This includes the knee jerk reflex.

This occurs by tapping on the patellar ligament causing the leg to extend.

More complicated reflexes occur with a connection to the brain.