

□ Chapter 12: Nervous Tissue

□ Overview of the Nervous System

- Endocrine and Nervous systems maintain internal coordination
 - Endocrine System: Communicates by means of chemical messengers (hormones) secreted into the blood
 - Nervous System: Employs electrical and chemical means to send messages from cell to cell
- Nervous System carries out its tasks in 3 basic steps:
 - 1. Receives sensory information about changes in the body and the external environment via sensory receptors and sends coded messages up spinal cord to the brain
 - Ex: The sound of a dog barking
 - 2. Processes sensory information in the brain and spinal cord, relates it to past experiences, and determines what response is appropriate to the circumstances
 - Ex: Deciding how close the dog barking is and whether it is a threat to you
 - 3. Receives motor commands from brain and sends it down spinal cord to be sent out throughout the body (i.e. muscles and glands) and carry out a response
 - Ex: Ignoring the dog barking, running away, etc. (reaction)

□ Subdivisions of the Nervous System

- Central Nervous System (CNS): Brain and spinal cord
 - Enclosed by cranium and vertebral column
- Peripheral Nervous System (PNS): Nerves and ganglia
 - Nerve: A bundle of nerve fibers (axons) wrapped in fibrous connective tissue
 - Ganglion: A knot-like swelling in a nerve where neuron cell bodies are concentrated
 - Divided into two divisions—Sensory division and motor division
 - Sensory (Afferent) Division: Carries sensory signal from various receptors to the CNS and informs the CNS of stimuli within or around the body

- Visceral Sensory Division: Carries signals from the viscera of the thoracic and abdominal cavities
 - Internal organs (i.e. heart, lungs, stomach, and urinary bladder)
 - Somatic Sensory Division: Carries signals from receptors in the skin, muscles, bones and joints
 - Everywhere else (anything that you can feel without involvement of internal organs)
 - Ex: Feeling texture, softness, roughness, pain, temperature, etc.
 - Motor (Efferent) Division: Carries signals from the CNS to gland and muscle cells that carry out the body's response
 - Effectors: Cells and organs that respond to commands from the CNS
 - Visceral Motor Division (Autonomic Nervous System/ANS): Carries signals to glands, cardiac muscle, and smooth muscle
 - Involuntary muscle contraction
 - Visceral Reflexes: Responses of ANS and its receptors
 - Two division:
 - 1. Sympathetic Division: Arousing the body for action
 - Ex: Fright
 - Increase in heart rate, increase in respiration, inhibition of digestive and urinary systems
 - 2. Parasympathetic Division: Calming the body and bringing it back to normal
 - Slows heart rate and breathing
 - Stimulates digestive and urinary system
 - Somatic Motor Division: Carries signals to skeletal muscles

- Output produces both voluntary and involuntary muscular contraction
- Somatic Reflexes: Involuntary muscle contractions

Nervous Tissue

- Two cell types in nervous tissue:
 - 1. Neurons: Excitable
 - 2. Glial Cells: Support cells for nervous system—Provide structural, immune, protective support
- Universal Properties of Nerves/Neurons:
 - 1. Excitability (Irritability): Ability to respond to stimuli (environmental changes)
 - 2. Conductivity—Neurons respond to stimuli by producing electrical signals that are quickly conducted to other cells at distant locations
 - 3. Secretion—When electrical signal reaches end of nerve fiber, a chemical neurotransmitter is secreted that crosses the gap and stimulates the next cell

Classes of Neurons

- 1. Sensory (Afferent) Neurons: Specialized to detect stimuli
 - Transmit information to the CNS
 - Begin in almost every organ of the body and end in CNS
 - Afferent: Conducting signals toward CNS
- 2. Interneurons (Association) Neurons: Lie entirely within the CNS
 - Receive signals from many neurons and carry out the integrative function
 - Integrative Function: Process, store and retrieve information and make decisions that determine how the body will respond to stimuli
 - 90% of all neurons are interneurons
 - Lie between and interconnect incoming sensory pathways/outgoing motor pathways of CNS
- 3. Motor (Efferent) Neurons: Send information/command out to effectors (i.e. muscles and glands)
 - Motor because most of them lead to muscles
 - Efferent neurons: Conduct signals away from CNS