

Aim: Microscopic study of muscular and nervous tissue

Reference:

1. Tortora, G. J., & Derrickson, B. H. (2018). Principles of Anatomy and Physiology (15th ed.). Wiley.
2. Kandel, E. R., Schwartz, J. H., & Jessell, T. M. (2013). Principles of Neural Science (5th ed.). McGraw-Hill Education.

1. Muscular Tissue

Muscular tissue is specialized tissue in animals that facilitates movement and force generation through contraction. It is essential for various physiological functions, including locomotion, maintaining posture, respiration, and circulation. Muscular tissue comprises elongated cells called muscle fibers, which contain actin and myosin filaments, the primary proteins responsible for muscle contraction.

Types of Muscular Tissue

1. Skeletal Muscle

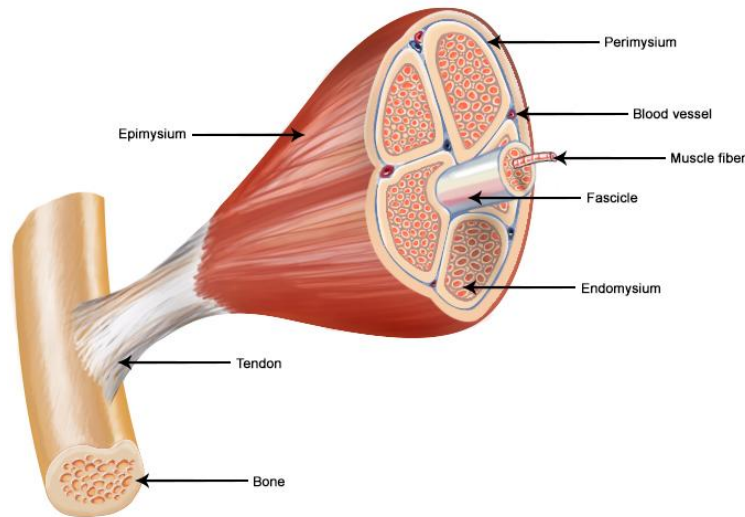
Structure: Skeletal muscle is made of long, cylindrical, multinucleated fibers with a striated (striped) appearance due to the arrangement of actin and myosin filaments.

Location: Attached to bones via tendons.

Function: Responsible for voluntary movements, such as walking, writing, and facial expressions.

Control: Voluntary, controlled by the somatic nervous system.

Structure of a Skeletal Muscle



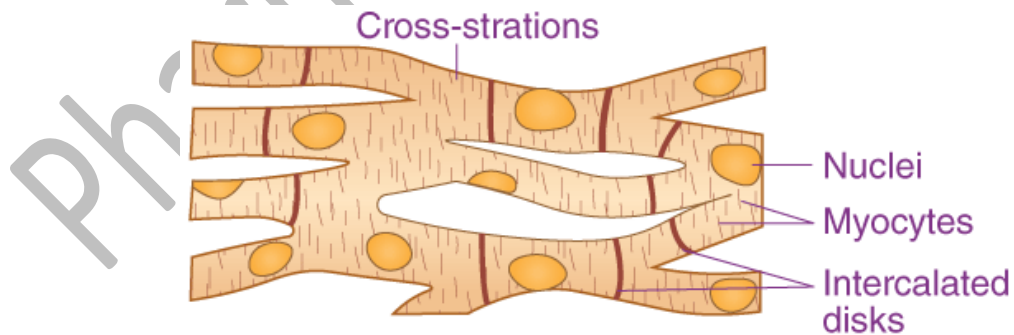
2. Cardiac Muscle

Structure: Cardiac muscle fibers are short, branched, and typically contain one or two nuclei. They also display striations and contain intercalated discs, which allow synchronized contraction.

Location: Found only in the heart.

Function: Pumps blood throughout the body by rhythmic, involuntary contractions.

Control: Involuntary, controlled by the autonomic nervous system and influenced by hormonal signals.



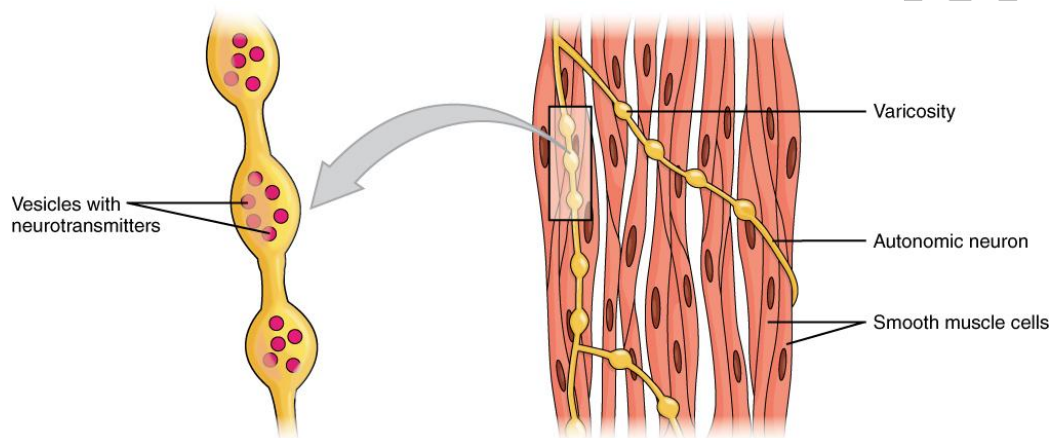
3. Smooth Muscle

Structure: Composed of spindle-shaped, single-nucleated fibers lacking striations, giving it a smooth appearance.

Location: Walls of hollow organs, such as the intestines, blood vessels, bladder, and uterus.

Function: Controls involuntary movements like digestion, regulation of blood flow, and bladder control.

Control: Involuntary, regulated by the autonomic nervous system.



Functions of Muscular Tissue

Muscle contractions move body parts, stabilize posture, and produce heat to help regulate body temperature. Cardiac muscle pumps blood, while skeletal and smooth muscles support breathing and blood flow regulation.

Nervous Tissue

Nervous tissue is specialized tissue in the nervous system responsible for transmitting electrical and chemical signals throughout the body. It is fundamental for sensory perception, response to stimuli, and coordination of bodily functions. Nervous tissue consists primarily of neurons, the signaling cells, and glial cells, which provide structural and functional support to neurons.

Structure of Nervous Tissue

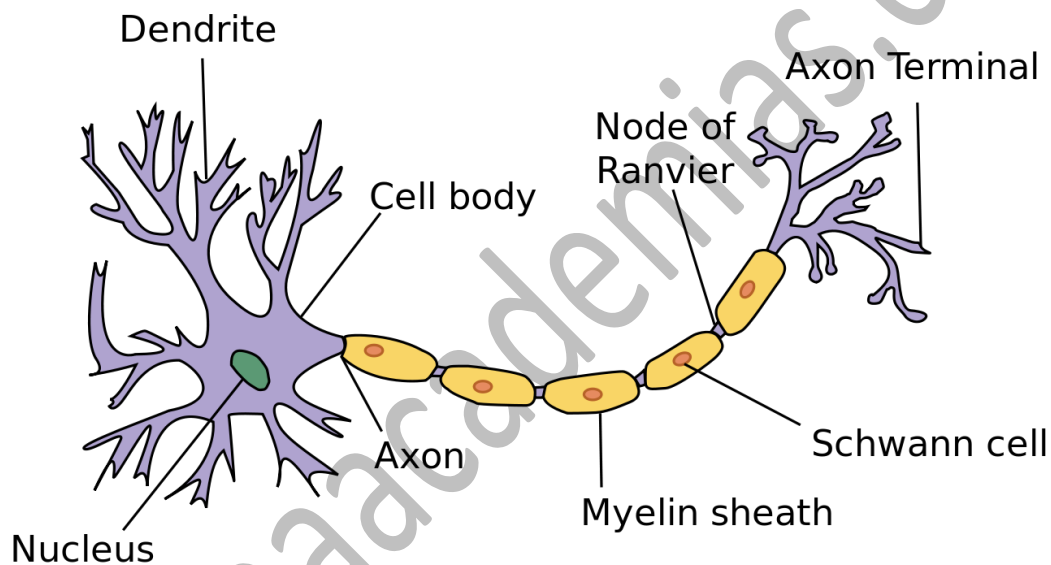
1. Neurons

Cell Body (Soma): Contains the nucleus and organelles, acting as the metabolic center of the neuron.

Dendrites: Short, branched extensions that receive signals from other neurons and relay them to the cell body.

Axon: A long, singular projection that transmits impulses away from the cell body to other neurons or effector cells (e.g., muscles or glands).

Synaptic Terminals: Endings of the axon that release neurotransmitters, chemicals that relay signals to the next cell across the synapse (the gap between neurons).



2. Neuroglia (Glial Cells)

Astrocytes: Supportive cells in the central nervous system (CNS) that regulate the extracellular environment, supply nutrients, and maintain the blood-brain barrier.

Oligodendrocytes: Produce the myelin sheath in the CNS, which insulates axons and speeds up signal transmission.

Schwann Cells: Similar to oligodendrocytes but located in the peripheral nervous system (PNS), they produce the myelin sheath around PNS axons.

Microglia: Act as immune cells in the CNS, removing waste and damaged neurons.

Ependymal Cells: Line the ventricles of the brain and produce cerebrospinal fluid (CSF), which cushions and nourishes the CNS.

Types of Nervous Tissue

1. Gray Matter

Composed primarily of neuron cell bodies, dendrites, and unmyelinated axons. Found in the brain's outer layers (cortex) and deeper nuclei, as well as in the spinal cord's central region. Processes and integrates information.

2. White Matter

Consists mainly of myelinated axons, which give it a whitish appearance. Located beneath the gray matter in the brain and surrounding the gray matter in the spinal cord. Responsible for transmitting signals rapidly between different areas of the nervous system.

Functions of Nervous Tissue

Neurons detect environmental changes (e.g., touch, light, sound), and the CNS processes sensory information to make decisions. Neurons control muscles and glands, managing movement and secretions. Nervous tissue regulates body functions like temperature, heart rate, and blood pressure, while the brain's complex structure enables thought, memory, and emotions.

Nervous tissue, with its highly specialized cells and complex organization, is central to the body's communication system, integrating various physiological functions, regulating responses to external and internal stimuli, and enabling higher mental functions.