**Lecture 15**

**Nervous Tissue**

**Introduction**

Nervous tissue is a specialized type of tissue that plays a critical role in the communication and coordination of bodily functions. It is composed primarily of neurons and supporting cells known as neuroglia. In this lecture, we will explore the structure of a neuron, the various types of neuroglial cells, and the composition and function of nerve fibers.

**1. Structure of a Neuron**

Neurons are the fundamental units of the nervous system, responsible for transmitting information throughout the body. A typical neuron consists of three main parts:

* **Cell Body (Soma)**:
  + Contains the nucleus and organelles.
  + Responsible for metabolic activities and maintenance of the neuron.
* **Dendrites**:
  + Branch-like structures that extend from the cell body.
  + Receive signals from other neurons and transmit them to the cell body.
* **Axon**:
  + A long, slender projection that conducts electrical impulses away from the cell body.
  + Can be myelinated or unmyelinated, impacting the speed of conduction.
  + Ends in terminal branches that connect to other neurons or target tissues at synapses.

**1.1 Action Potential**

The transmission of signals along the axon is facilitated by action potentials, which are rapid changes in membrane potential that propagate along the neuron.

**2. Neuroglia (Glial Cells)**

Neuroglia are non-neuronal cells that provide support, nourishment, and protection for neurons. They outnumber neurons in the brain and are crucial for maintaining homeostasis. There are several types of neuroglial cells:

* **Astrocytes**:
  + Star-shaped cells that provide structural support and regulate the extracellular environment.
  + Assist in the blood-brain barrier formation.
* **Oligodendrocytes**:
  + Responsible for myelination of axons in the central nervous system (CNS).
  + Help in faster signal conduction.
* **Schwann Cells**:
  + Found in the peripheral nervous system (PNS).
  + Also aid in myelination and play a role in the regeneration of damaged nerves.
* **Microglia**:
  + Act as the immune cells of the CNS.
  + Protect brain tissue from injury and disease through phagocytosis.
* **Ependymal Cells**:
  + Line the ventricles of the brain and spinal canal.
  + Involved in the production and circulation of cerebrospinal fluid (CSF).

**3. Nerve Fibers**

Nerve fibers are classified into groups based on their diameter and conduction velocity:

* **A fibers**:
  + Myelinated, large diameter fibers that conduct impulses quickly.
  + Subdivided into Aα, Aβ, Aγ, and Aδ based on different functions.
* **B fibers**:
  + Myelinated but smaller than A fibers, with moderate conduction velocity.
  + Primarily involved in autonomic functions.
* **C fibers**:
  + Unmyelinated, small diameter fibers that conduct impulses slowly.
  + Associated with pain and temperature sensations.

**3.1 Myelin Sheath**

The myelin sheath is a fatty layer surrounding axons, produced by oligodendrocytes in the CNS and Schwann cells in the PNS. It acts as an insulator, speeding up the transmission of electrical impulses through a process called saltatory conduction.

**Conclusion**

In summary, nervous tissue is essential for the functioning of the nervous system, composed of specialized cells that ensure effective communication within the body. Understanding the structure and function of neurons, neuroglia, and nerve fibers is fundamental to comprehending how the nervous system operates. Continued research in neurobiology will further illuminate the complexities of this vital tissue, leading to advancements in treating neurological disorders.