

Introduction: It is a group of cell that function together to carry out specific function.

Histology: Branch of science that deals with the study of tissue.

Types:

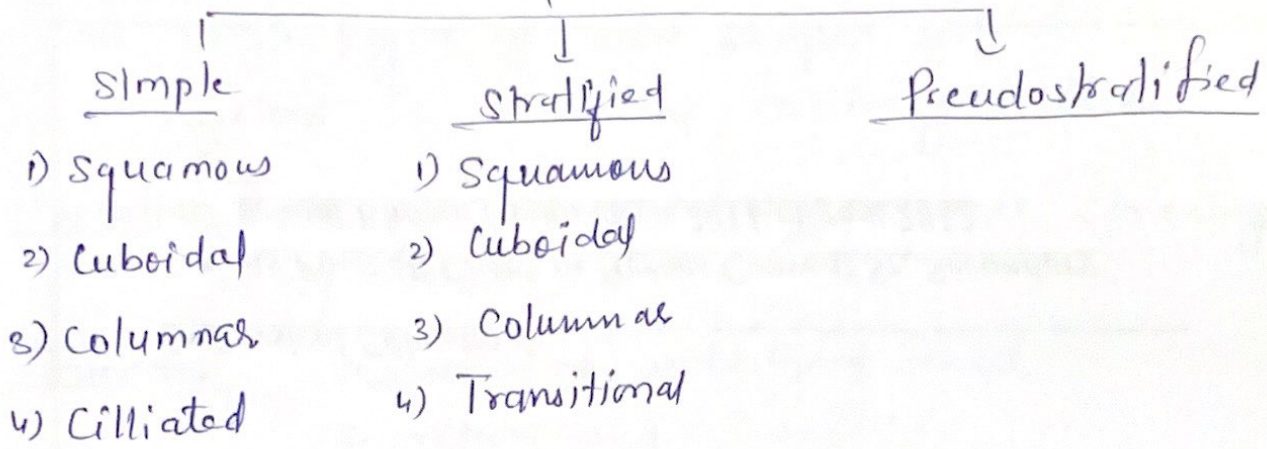
1) Epithelial tissue: It cover the body surface, line of organs, body cavity and duct.

2) Connective tissue: It protect & support body & organs.
→ Energy store, Immunity.

3) Muscle tissue: It generate the physical force needed to generate body heat.

Nervous tissue: It detect changes in the body environment.
→ Generate nerve impulse.

Epithelial tissue



Function:

- 1) It protect the underlying tissue from friction & injury.
- 2) It secrete certain chemical for body.
- 3) At basal side, there is basement membrane for support.

(a) Simple Sq. Epithelium

1) Single layer of flat cells arranged on basement membrane.

→ Nucleus is centrally located.

Location: Line of Heart, B/v, lymphatic vessel, air sac of lungs and glomerular capsule of kidney.

Function: filtration, diffusion, and osmosis.



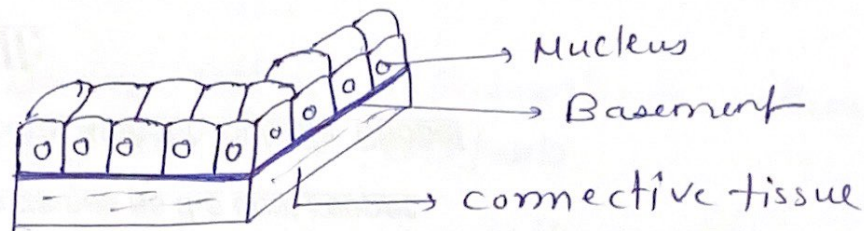
b) Simple cuboidal epi. & p.

(3)

- Single layer of cube shaped cell.
- Nucleus is spherical, centrally located.

Location: It line kidney tubule, pancreas, covering of ovaries.

Function: Protection of underlying tissue, Secretion and absorption.



c) Columnar epi

- Single layer of rectangular cells.
- Nucleus → oval shaped, near basement memb.
- Goblet cells → Present for mucus secretion.

Location: → Nasal passage, Ear
→ eye, Reproductive system
→ Digestive tract, Buccal cavity

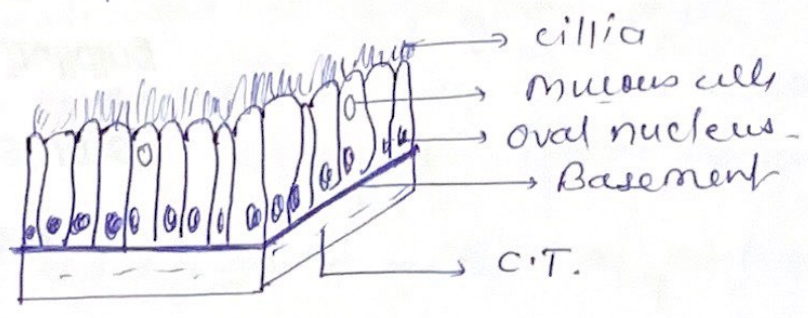
function: Protection,
Secretion,
Absorption
transportation of nutrients

d) Simple ciliated Epithelium

- It is made up of columnar epi cell having hair like projection / as cilia.
- ⇒ Nucleus → oval.
- cells are connected by tight junctions.
- Goblet cells are present.

Location: Lining of upper respiratory tract
 Uterine tube, uterus, central canal of spinal cord.

function: Ciliary action & prevent to adhere foreign particle i.e. bacteria.



2. STRATIFIED EPITHELIUM

- a) Str. sq. epi.
 - b) Str. cubical
 - c) Str. Columnar
 - d) Transitional
- } stratified: multiple layer.

a) Strat. Squamous Epi

- More than one layer of diff. shape.
- apical layer is flat & deep layer vary in size.
- These tissue of two types

(i) keratinized stratified sq. epithelium

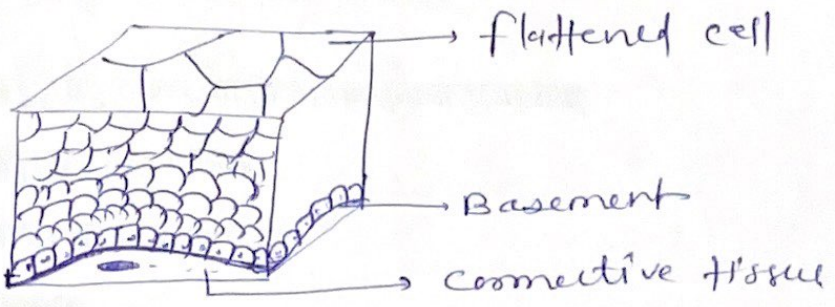
→ Apical & several layer dehydrated & have [keratin protein] (which is a tough fibrous protein)

(ii) Non-keratinized strat. sq. Epi

→ keratin is absent in apical layer
 → cell remain moist.

Location : keratinized → superficial layer of skin
 Non-keratinized → lining of mouth, esophagus, epiglottis, vagina, tongue.

function : Protection against mechanical friction

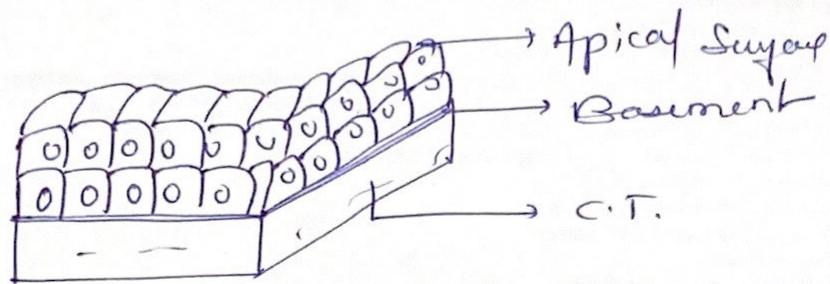


b) Stratified cuboidal epithelium

- Two or more layer of cells.
- Apical layer cuboid in shape.

Location: Lining of duct of sweat glands, male urethra, uterus, and anus.

function: protection, secretion, Absorption.

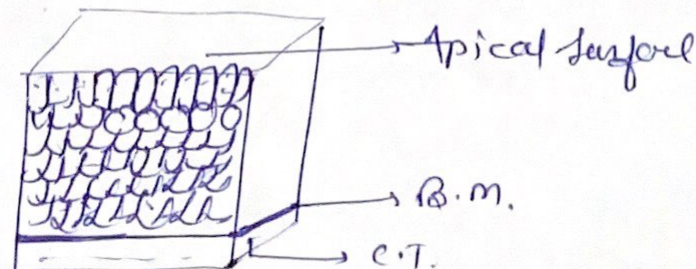


c) Stratified columnar epi

- Several layer of irregular shaped cells.
- columnar cells are present at apical layer.

Location:
✓ line of urethra,
✓ large excretory ducts.
✓ conjunctiva of eye

function: Protection, & secretion.



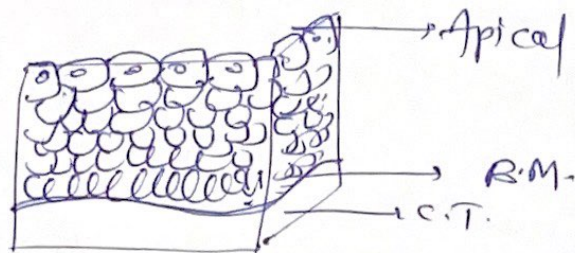
d) Transitional Epithelium

(7)

- Many layers of pear shaped cell
- In relaxed state it looks like stratified cuboid epithelium. when stretched it become squamous shaped

Location: line of hollow organs such as uterus, & urinary bladder.

Functions: It protect underlying structure & permit distension of organs.

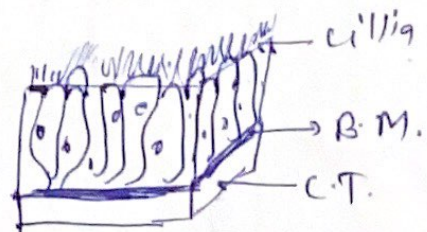


(3) Pseudo stratified Epi

- cells are columnar having cillia.
- ⇒ Nucleus → oval at different position.
- cells attaches to basement membrane but all not reaches to apical

Location: Airway (upper Respiratory tract), glands, epididymis, male urethra.

Function: 1) Secretion
2) movement of mucus by cillia



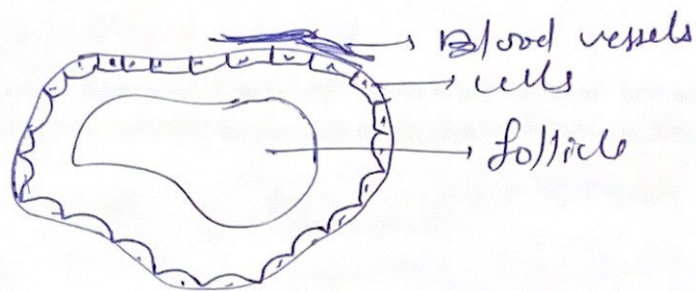
Glandular Epithelium

D) Endocrine

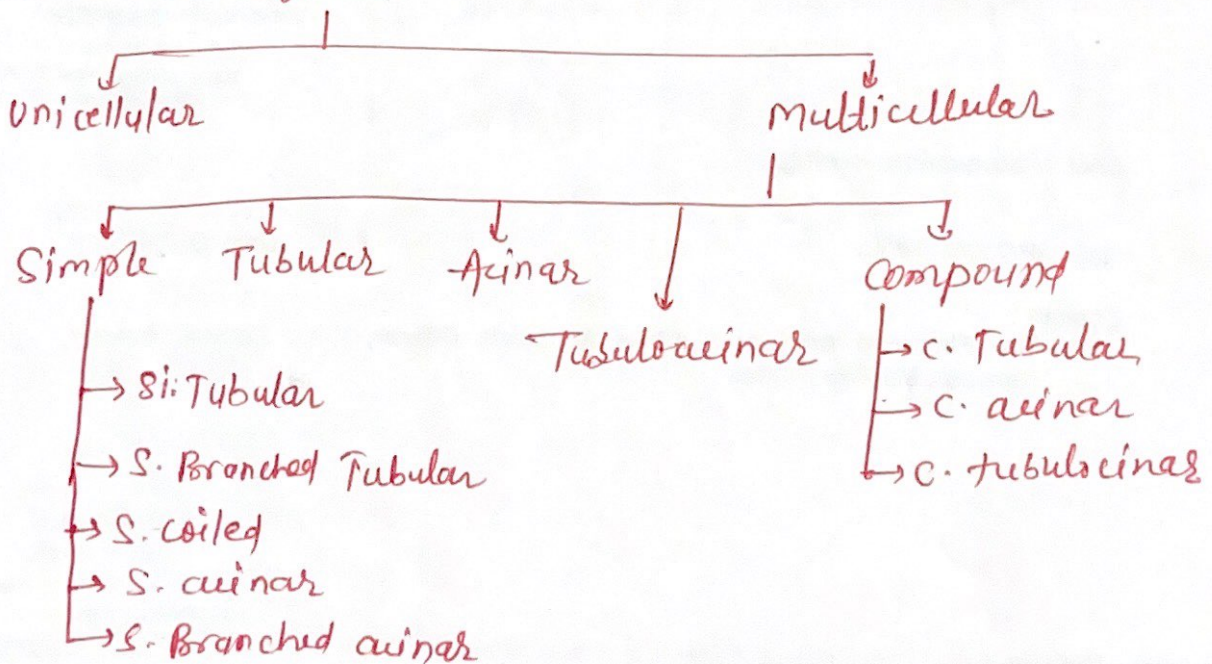
- Ductless gland
- Secretion is directly to blood stream.
- Secretion is called hormones.

Location: Pituitary gland, pineal, Thyroid, Parathyroid
- Adrenal, Pancreas, etc.

Function: Regulation, metabolism, body growth,
Blood sugar level maintenance.



Exocrine gland



(A) Unicellular: → Single epithelial cell
 → lack ducts.
 → Secrete product on surface of body cavity.

(B) Multicellular: → More than one cell
 → have ducts.

ex: sebaceous gland; salivary gland.

(i) Simple gland:
 → If duct is not branched

(ii) Compound → duct is branched

(iii) Tubular Gland → duct is tubular shaped.

(iv) Acinar → duct is round

(v) Tubuloacinar → both tubul + acinar.

(i) Simple Gland

(a) simple tubular



ex. glands of intestine

(b) branched.



Gastric gland

(c) Coiled tubular



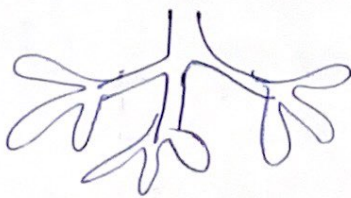
ex. sweat gland

(d) acinar



Glands of urethra

(ii) Compound



comp tubular

Connective Tissue

- widely distributed in the body.
- Made up of fibres, cells, and ground substance.

Classification

(A) Loose Connective tissue : → fibres are loosely woven.

(i) Areolar C.T. :

→ form loose network, not arranged in a pattern.

→ made of collagen fibres, reticular fibres and cells i.e. fibroblast, macrophages, Plasma cells, Adipocytes.

Location : present below skin, fill space b/w muscles, Blood vessels.

Function : Provide strength, elasticity & support tissue.

(ii) Adipose C.T.

→ consist of adipocytes.

Location : present in subcutaneous layer, deep in skin, around heart & kidney, yellow bone marrow.

Function :

- 1) Prevent heat loss from body.
- 2) Reservoir of energy
- 3) Shape to limbs & body.
- 4) Protect underlying organ

(iii) Reticular C.T.

consist of fibres and reticular cells.

Location: Framework of liver, spleen, lymph. nodes, red bone marrow etc.

Functions: It form stroma of organs,

→ binds together smooth muscle tissue,

→ filter worn out blood cells in spleen.

(B) Dense C.T.

→ fibres are densely packed.

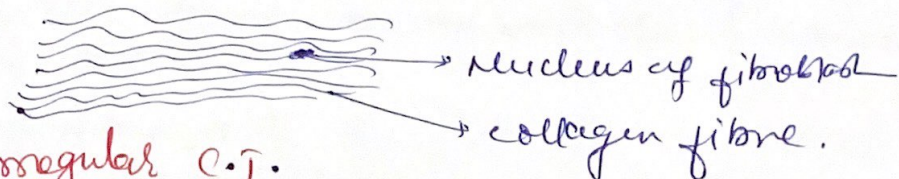
(i) Dense Regular:

→ Bundles of collagen fibre are arranged in parallel patterns.

→ fibroblast are present in rows b/w fibres.

Location: forms tendons (attach muscle to bone) ligament (bone to bone)

function: provide strong attachment to structure



(ii) Dense Irregular C.T.

→ contain collagen fibre that are irregularly arranged, few fibroblast.

Location: beneath skin, dermis, kidney, liver, testes, heart valve etc.

function: provide strength to diff. organs

MUSCULAR TISSUE

Muscular tissue is a specialized tissue that is responsible for generating force and enabling movement in the body. It is made up of muscle cells, or muscle fibers, which can contract and relax. Muscular tissue plays a key role in various functions, such as movement, posture maintenance, and even the movement of substances within organs.

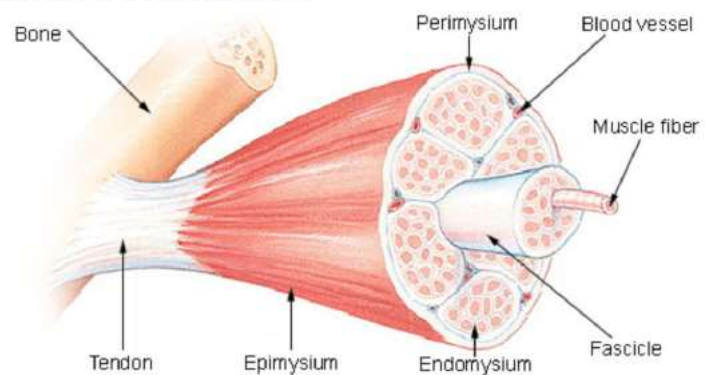
There are three main types of muscular tissue:

1. Skeletal Muscle

- **Structure:**

1. Skeletal muscle fibers are long, cylindrical, multinucleated cells that are striated (striped) due to the organized arrangement of actin and myosin filaments.

Structure of a Skeletal Muscle



2. Skeletal muscle is attached to bones via tendons and is under **voluntary control**, meaning its contraction is consciously controlled by the nervous system.

- **Function:**

1. Responsible for body movements, such as walking, lifting objects, and facial expressions.
2. It also helps in maintaining posture and stabilizing joints.

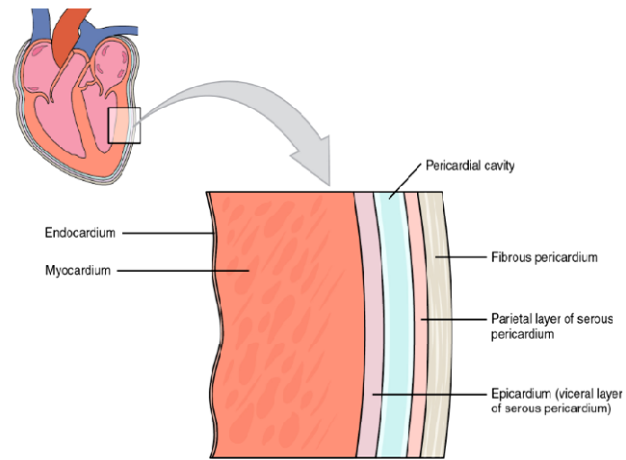
- **Location:**

Attached to the bones of the skeleton and some tissues like the diaphragm.

2. Cardiac Muscle

- **Structure:**

1. Cardiac muscle fibers are branched, striated cells with one or two central nuclei. These fibers are connected by intercalated discs, which contain gap junctions and desmosomes, allowing for synchronized contraction.



Activa
Go to 5

2. Cardiac muscle is under **involuntary control** and is highly resistant to fatigue.

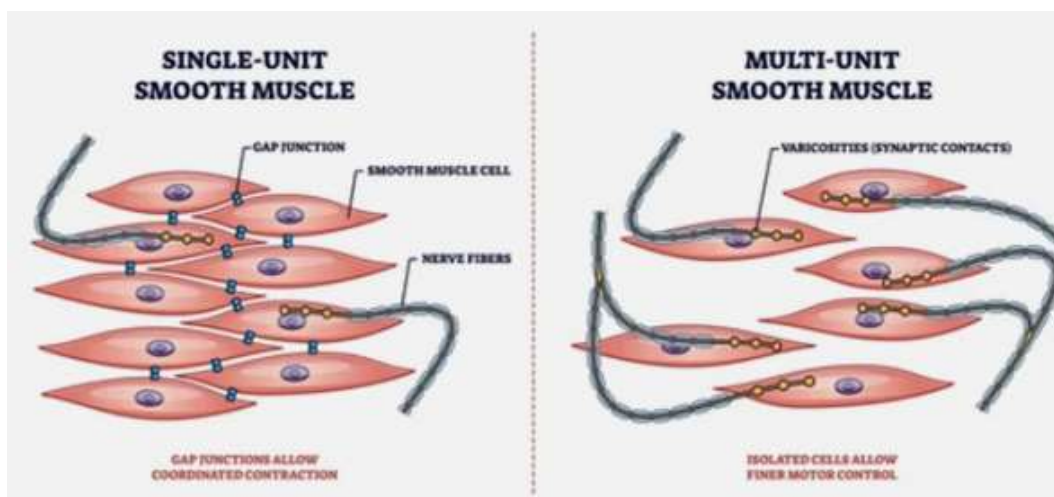
- **Function:**

The primary function is to pump blood throughout the body by contracting and relaxing rhythmically (heartbeat).

- **Location:**

Found exclusively in the heart.

3. Smooth Muscle



- **Structure:**

1. Smooth muscle fibers are spindle-shaped, with a single central nucleus and lack striations because their actin and myosin filaments are not arranged in regular patterns.
 2. Smooth muscle is under **involuntary control**, meaning it is not consciously regulated.
- **Function:**

Responsible for various automatic body functions, such as controlling the movement of substances through hollow organs (e.g., intestines, blood vessels, bladder) via peristalsis.
 - **Location:**

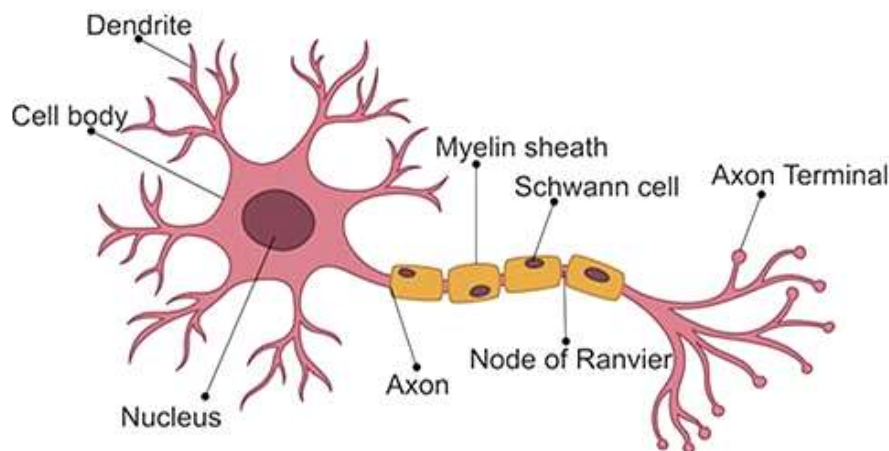
Found in the walls of hollow organs such as the stomach, intestines, blood vessels, bladder, and the uterus.

Characteristics of Muscular Tissue:

- **Excitability:** Ability to respond to stimuli (e.g., nerve signals).
- **Contractility:** Ability to contract and generate force.
- **Extensibility:** Ability to stretch without damage.
- **Elasticity:** Ability to return to its original shape after being stretched or contracted

NERVOUS TISSUE

Nervous tissue is a specialized tissue that is responsible for transmitting and processing information in the body through electrical and chemical signals. It plays a crucial role in coordinating and controlling bodily functions, enabling sensation, movement, and cognition. Nervous tissue forms the nervous system, which consists of the **central nervous system (CNS)**—comprising the brain and spinal cord—and the **peripheral nervous system (PNS)**—which includes all the nerves outside the CNS.



Components of Nervous Tissue:

1. **Neurons (Nerve Cells):** Neurons are the fundamental units of the nervous system, responsible for generating and transmitting electrical impulses (action potentials).

Structure of a Neuron:

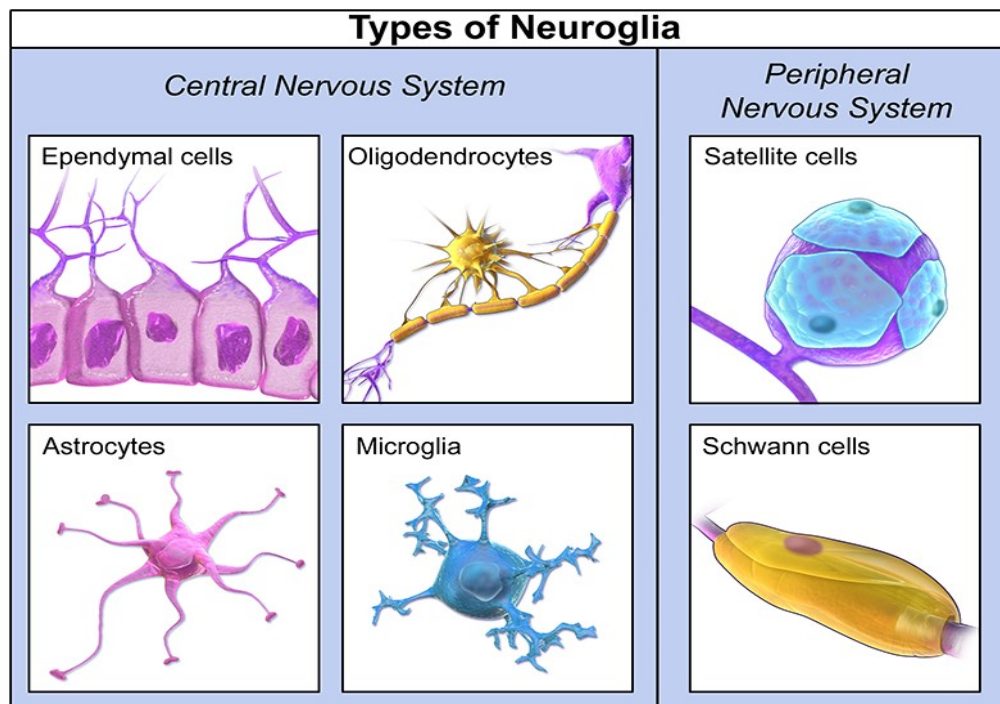
- **Cell Body (Soma):** Contains the nucleus and most of the cell's organelles. It is the metabolic center of the neuron.
- **Dendrites:** Branch-like extensions from the cell body that receive signals from other neurons or sensory receptors and transmit them toward the cell body.
- **Axon:** A long, slender projection that carries electrical impulses away from the cell body toward other neurons, muscles, or glands. Some axons are covered by a **myelin sheath** (produced by Schwann cells in the PNS or oligodendrocytes in the CNS), which helps speed up signal transmission.
- **Axon Terminals:** Branches at the end of the axon that release neurotransmitters into the synapse (the gap between neurons or between a neuron and its target cell) to communicate with other cells.

Function:

- Neurons transmit signals (electrical impulses) to communicate with other neurons, muscles, or glands.
 - They are involved in sensing external stimuli, processing information, and executing responses.
2. **Neuroglial Cells (Glial Cells):** Neuroglia are supporting cells in the nervous system that assist neurons by providing structural support, protection, and nourishment. Glial cells outnumber neurons and play a critical role in maintaining homeostasis and the overall function of nervous tissue.

Types of Glial Cells:

- **Astrocytes:** Found in the CNS, astrocytes provide physical support to neurons, help regulate the blood-brain barrier, and assist in nutrient transport.
- **Oligodendrocytes:** Found in the CNS, these cells produce the myelin sheath that insulates axons, speeding up signal transmission.
- **Schwann Cells:** Found in the PNS, Schwann cells perform the same function as oligodendrocytes by producing the myelin sheath for peripheral nerves.
- **Microglia:** Specialized immune cells in the CNS that protect against pathogens and remove dead or damaged neurons.



- **Ependymal Cells:** Line the ventricles of the brain and the central canal of the spinal cord, producing and circulating cerebrospinal fluid (CSF).

- **Satellite Cells:** Found in the PNS, these cells provide support and nutrition to neurons in ganglia (clusters of neuron cell bodies).

Functions of Nervous Tissue:

1. **Sensory Input:** Nervous tissue detects external or internal stimuli through sensory receptors and transmits signals to the CNS for processing.
2. **Integration:** In the CNS, signals are processed and interpreted, allowing the body to make decisions based on the information received.
3. **Motor Output:** After processing, the CNS sends out signals to effectors (muscles or glands) to generate a response, such as muscle contraction or hormone secretion.
4. **Homeostasis:** Nervous tissue helps regulate and maintain a stable internal environment through the detection and response to changes in temperature, blood pressure, and other factors.
5. **Mental Activity:** Nervous tissue is responsible for higher functions such as learning, memory, thought, and consciousness.

Types of Nervous Tissue:

- **Gray Matter:** Consists mainly of neuron cell bodies, dendrites, and unmyelinated axons. It is involved in processing information and found in the outer layers of the brain (cortex) and the inner part of the spinal cord.
- **White Matter:** Composed of myelinated axons, which allow for faster transmission of electrical signals. It is found in the inner part of the brain and the outer part of the spinal cord.

Properties of Nervous Tissue:

- **Excitability:** Neurons can respond to stimuli and convert it into an electrical signal.
- **Conductivity:** Neurons can transmit electrical signals across long distances.
- **Secretion:** Neurons can release neurotransmitters to communicate with other cells.