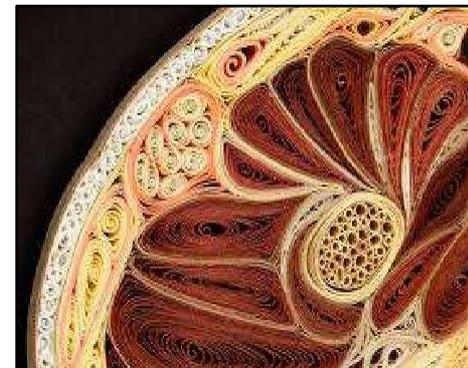
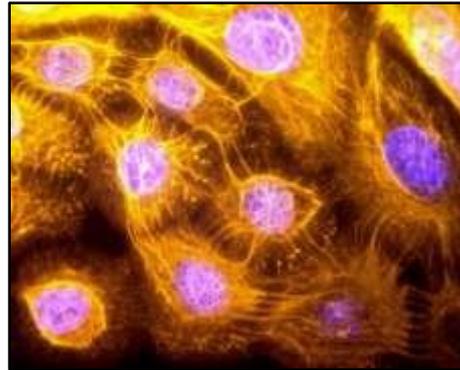


# Tissue



**Human anatomy  
Unit III**

# Definition of Tissues

**Biological tissue** is a collection of interconnected cells that perform a similar function within an organism.

In other words, it is a group of cells working together mainly inside an organ.

# Classification of Tissues

Human body is composed of  
4 basic types of tissue:

- Epithelial tissue
- Connective tissue
- Muscular tissue
- Nervous tissue

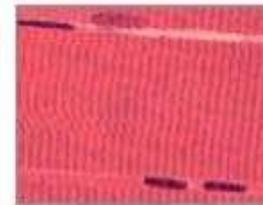
Four types of tissue



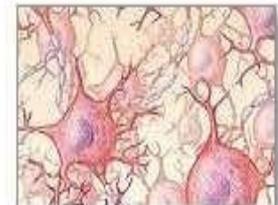
Connective tissue



Epithelial tissue



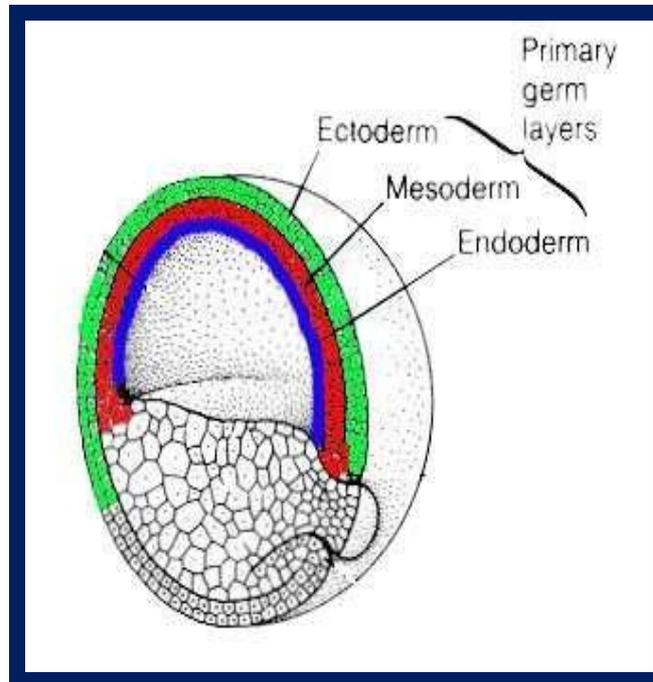
Muscle tissue



Nervous tissue

# Origin of Tissue

A fertilized egg divides to produce 3 primary germ cell layers. These layers differentiate to form the tissues of the body.



# Epithelial Tissue

Epithelial cells cover or line all body surfaces, cavities and tubes. So, These are called *covering epithelia*.

Epithelial cells form the functional units of secretory glands. So, These are called *glandular epithelia*.

# General Characteristic

- ✓ Closely attached to each other forming a protective barrier.
- ✓ Always has one free (apical) surface open to outside the body or inside (cavity) an internal organ.
- ✓ Always has one fixed (basal) section attached to underlying connective tissue.
- ✓ Has no blood vessels but can soak up nutrients from blood vessels in connective tissue underneath.
- ✓ Can have lots of nerves in it (innervated).
- ✓ Very good at regenerating (fixing itself). i.e. sunburn, skinned knee.

# Functions

- ❑ To protect the tissues that lie beneath it from radiation, desiccation, toxins, invasion by pathogens, and physical trauma.
- ❑ The regulation and exchange of chemicals between the underlying tissues and a body cavity.
- ❑ The secretion of hormones into the blood vascular system, and/or the secretion of sweat, mucus, enzymes, and other products that are delivered by ducts glandular epithelium.
- ❑ To provide sensation.
- ❑ Absorbs stomach and intestinal lining (gut).
- ❑ Filters the kidney.
- ❑ Forms secretory glands.

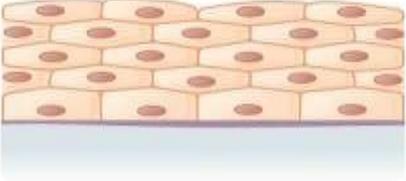
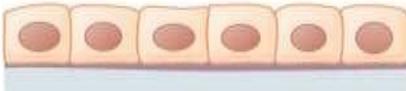
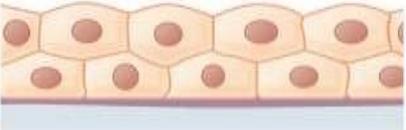
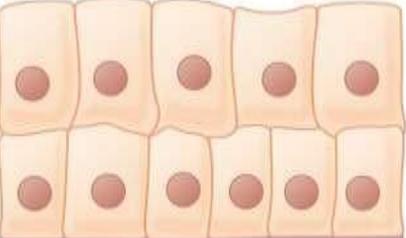
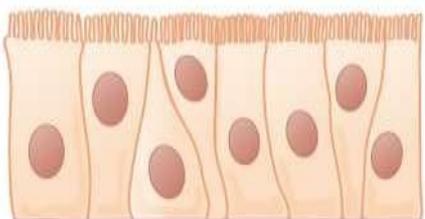
# Classification of Epithelia

## According to thickness

- ✓ “simple” - one cell layer
- ✓ “stratified” – more than one layer of cells (which are named according to the shape of the cells in the apical layer)

## According to shape

- ✓ “squamous” – wider than tall
- ✓ “cuboidal” – as tall as wide
- ✓ “columnar” - taller than wide

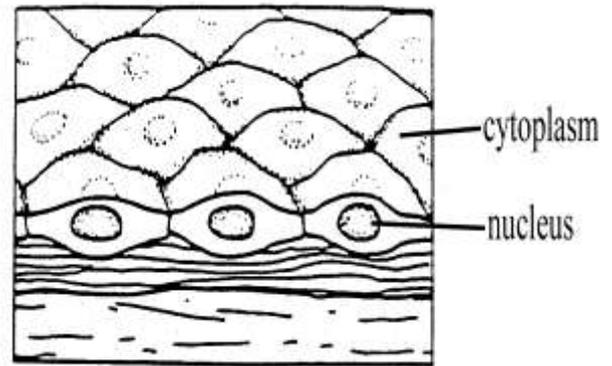
	Simple	Stratified	
<b>Squamous</b>	 <p>Simple squamous epithelium</p>	 <p>Stratified squamous epithelium</p>	
<b>Cuboidal</b>	 <p>Simple cuboidal epithelium</p>	 <p>Stratified cuboidal epithelium</p>	
<b>Columnar</b>	 <p>Simple columnar epithelium</p>	 <p>Stratified columnar epithelium</p>	<b>Pseudostratified</b>
			 <p>Pseudostratified columnar epithelium</p>

# Simple squamous epithelium

**Description:** Single layer of flattened cells with disc-shaped central nuclei and sparse cytoplasm; the simplest of the epithelia.

**Function:** Passive transport of gases and fluids.

**Location:** Alveoli of lungs, lining body cavities (mesothelium), lining blood vessels (endothelium)

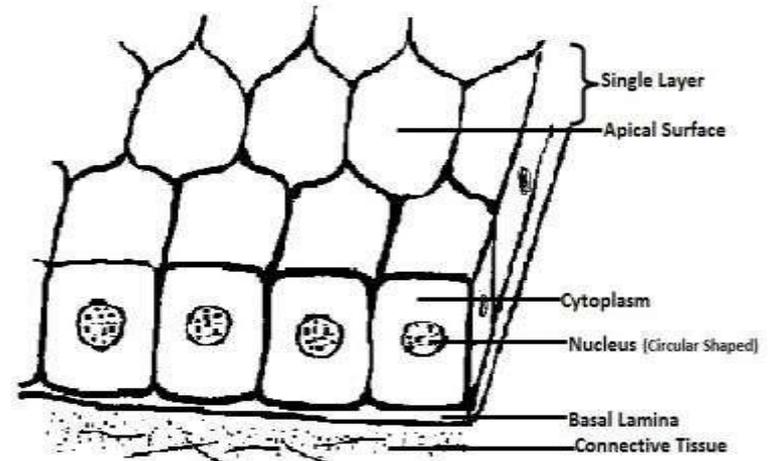


# Simple cuboidal epithelia

**Description :** Single layer of cubelike cells with large, spherical central nuclei.

**Function :** Secretion and absorption.

**Location:** Kidney tubules; ducts and secretory portions of small glands; ovary surface.



# Simple columnar epithelia

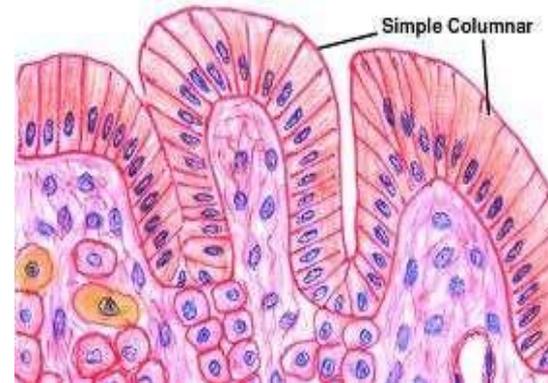
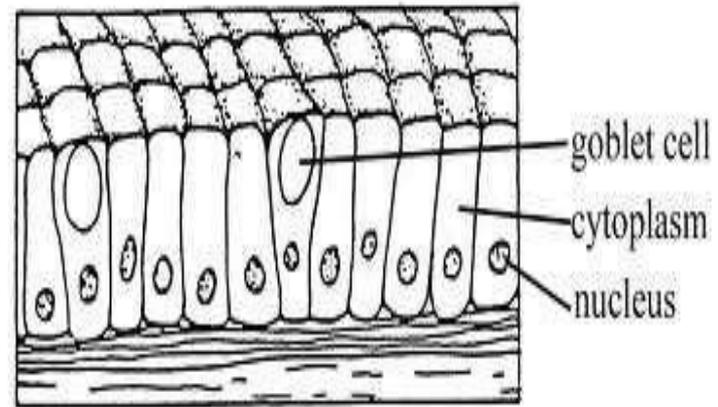
**Description:** Single layer of tall cells with round to oval nuclei.

**Types:** (i) Ciliated columnar epithelia.

(ii) Non-ciliated columnar epithelia.

**Function:** Absorption; secretion of mucus, Enzymes and other substances.

**Location:** Digestive tract, gall bladder etc.



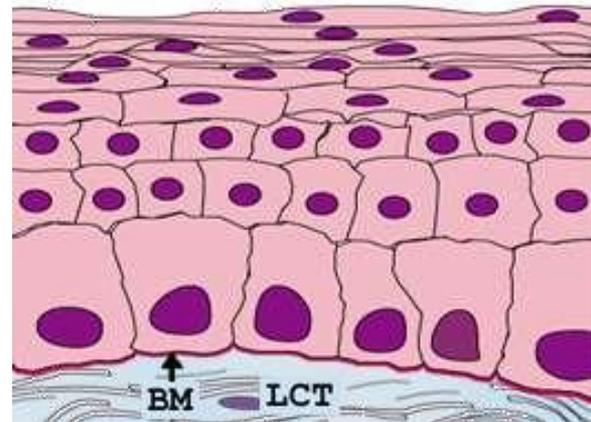
# Stratified squamous epithelia

## Description:

Multilayered, surface cell are squamous, basal cells are cuboidal and divided constantly.

Function: Protection.

Location: Oral cavity, cervix, anal canal.

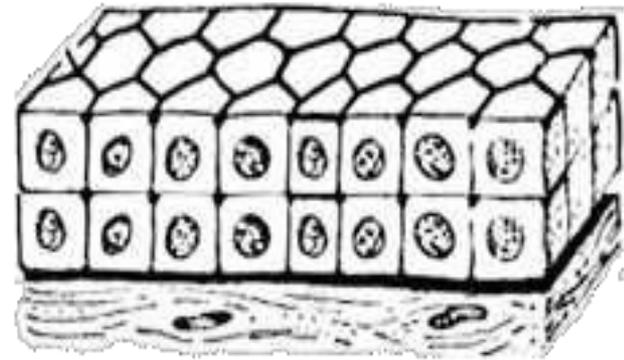


# Stratified cuboidal epithelia

**Description:** Generally two layers of cube-like cells.

**Function:** Protection.

**Location:** Large ducts of sweat glands, mammary glands, and salivary glands.

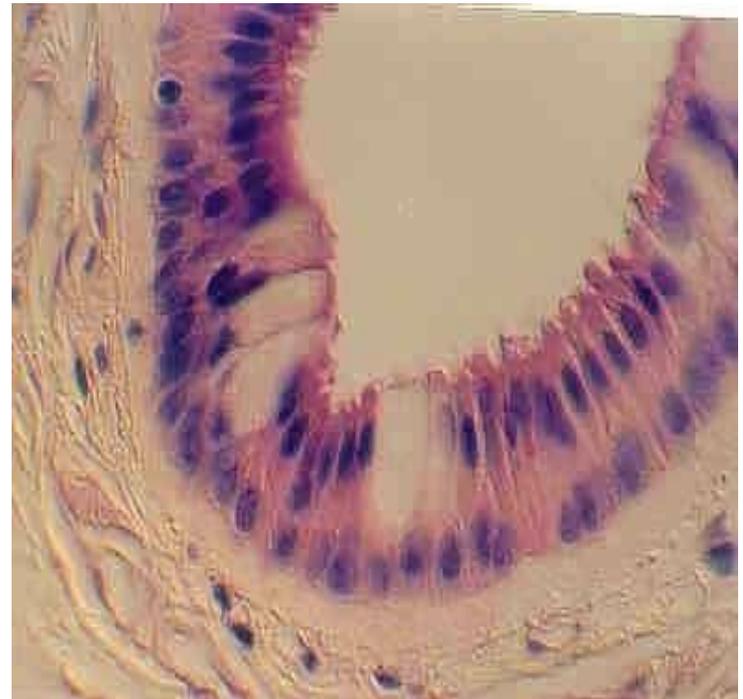


# Stratified columnar epithelia

**Description:**  
Multilayered, superficial cells elongated and columnar.

**Function:** Protection;  
secretion.

**Location:** Rare in the body;  
small amount in the male  
urethra.

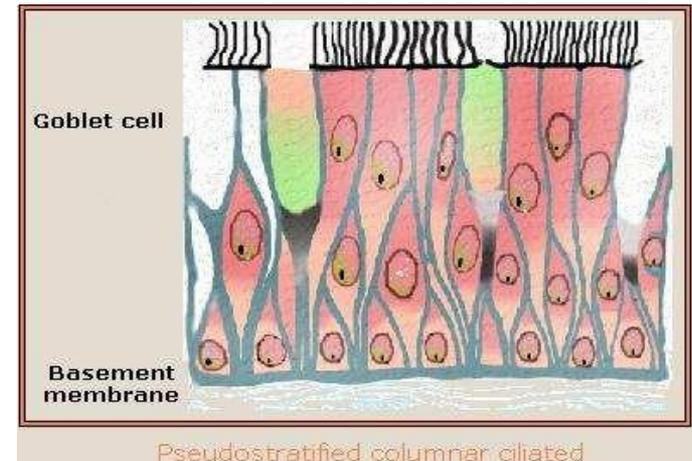


# Pseudo stratified columnar epithelia

**Description:** Single cell layered, all cell attach to the basement membrane but not all reach the free surface. Nuclei at varying depth.

**Function:** Secretion of mucus, propulsion of mucus by ciliary action.

**Location:** Lines of trachea.

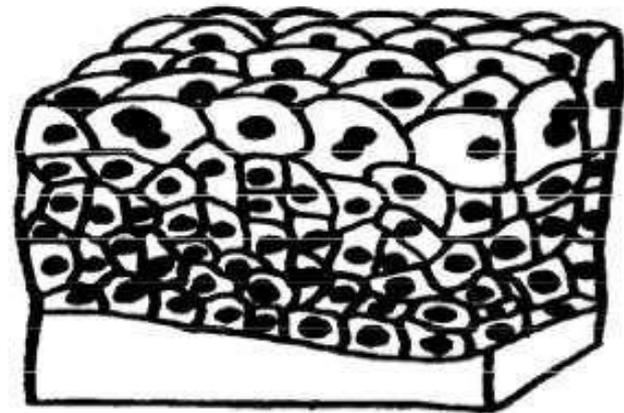


# Transitional epithelia

**Description:** Characterized by domelike cells that are neither squamous nor columnar. The form of the cells changes.

**Function:** Stretching and protection.

**Location:** Bladder and part of urethra.



# Connective Tissues

The tissues that connect the different parts of the body together are called connective tissues.

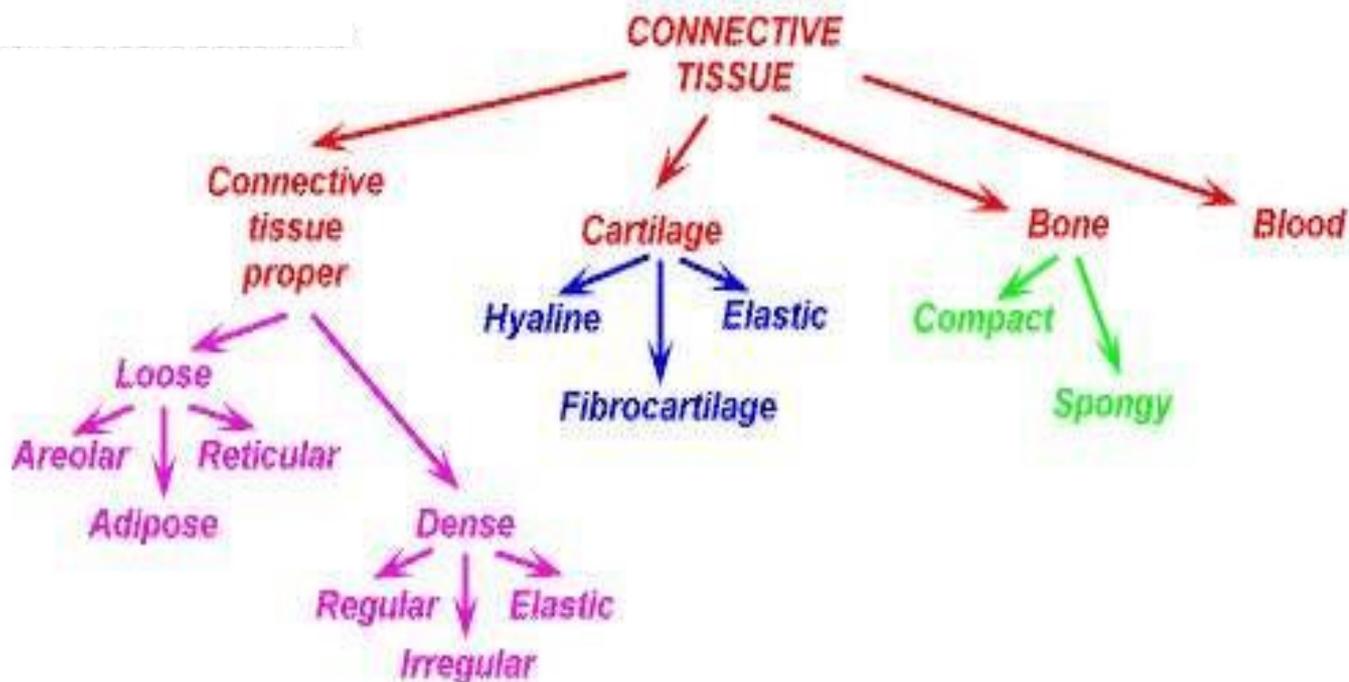
# General characteristic

- ✓ The intercellular material is maximum where as the cellular component is minimum.
- ✓ Unlike the other tissues, (e.g. epithelium, muscle and nerve) which are formed mainly by cells, the major constituent of connective tissue is ECM (Extra-cellular matrix).
- ✓ Possess cells, fibers and ground substances.

# Basic Functions

- ❑ Support and binding of other tissues
- ❑ Holding body fluids
- ❑ Defending the body against infection
  - macrophages, plasma cells, mast cells, WBCs
- ❑ Storing nutrients as fat

# Classification of connective tissues

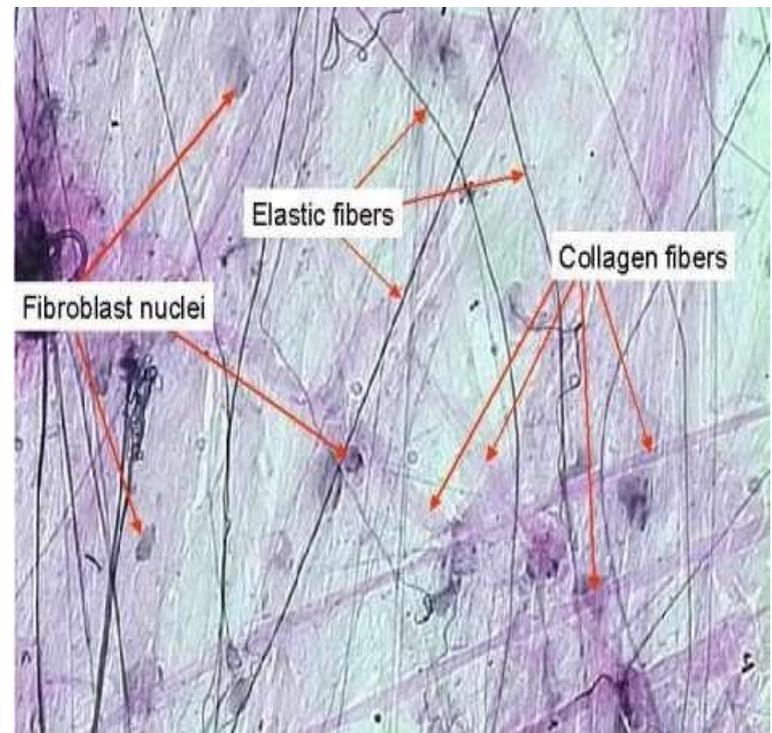


# Connective tissue proper : Loose CT ; Areolar

**Description:** Gel like matrix with all three fiber types ; cells: fibroblasts, macrophages, mast cells, and white blood cells.

**Function:** Its macrophages phagocytize bacteria ; plays important role in inflammation ; holds and conveys tissue fluid.

**Location:** Distributed under epithelia of body; surrounds capillaries.

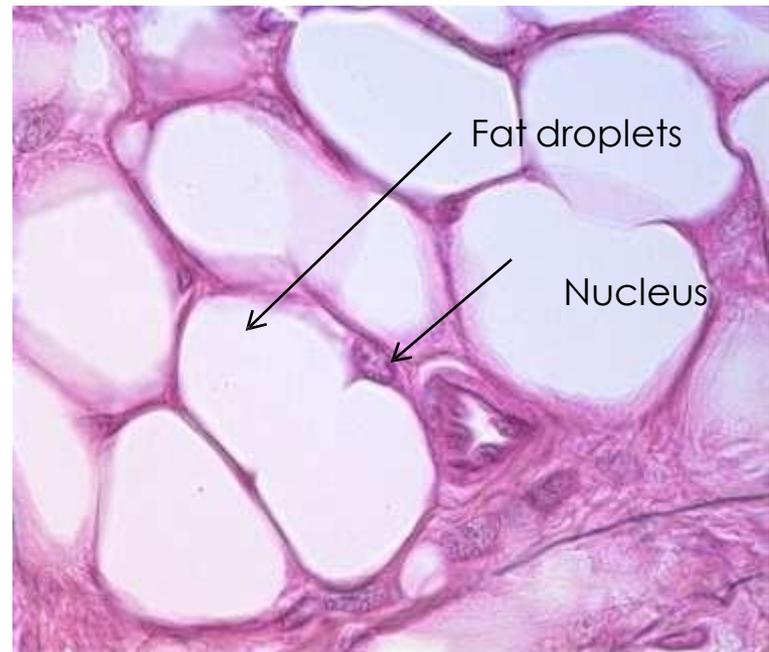


# CT proper : Loose CT ; Adipose

**Description:** Matrix as in areolar, but very sparse; closely packed adipocytes, or fat cells, have nucleus pushed to the side by large fat droplet.

**Function:** Provides reserve food fuel; insulates against heat loss; supports and protects organs.

**Location:** Under skin; around kidneys and eyeballs; within abdomen; in breasts.

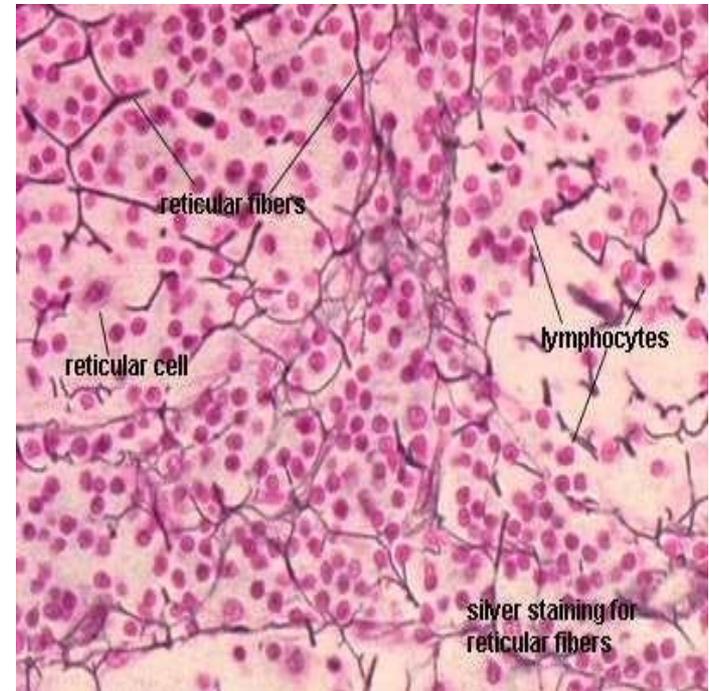


# CT proper: Loose CT; reticular

**Description:** Network of reticular fibers in a typical loose ground substance; reticular cells lie on the network.

**Function:** Fibers form a soft internal skeleton that supports other cell types including white blood cells, mast cells, and macrophages.

**Location:** Lymphoid organs(lymph nodes, bone marrow, and macrophages).

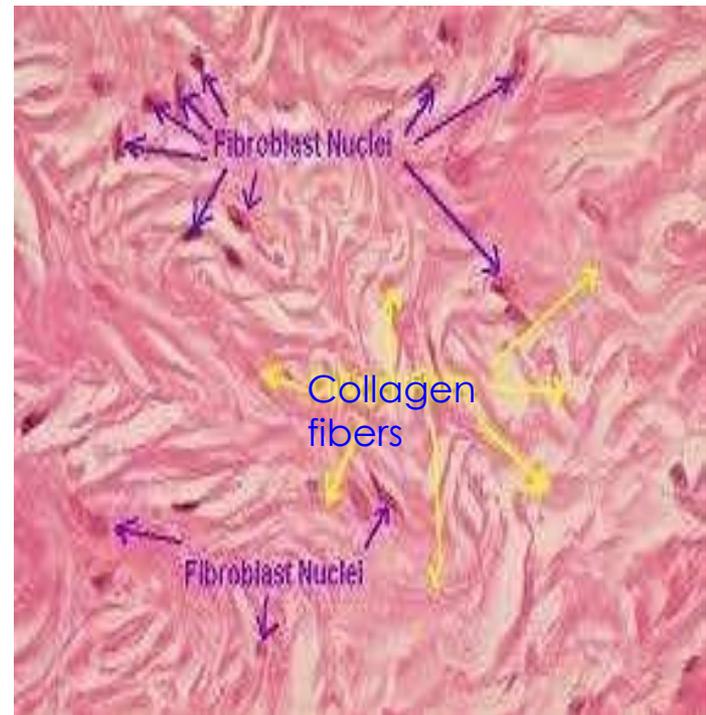


# CT proper: dense CT; Irregular

**Description:** Primarily irregularly arranged collagen fibers; some elastic fibers; major cell type is the fibroblast.

**Function:** Elasticity and structural support.

**Location:** Dermis of the skin; submucosa of digestive tract and joints.

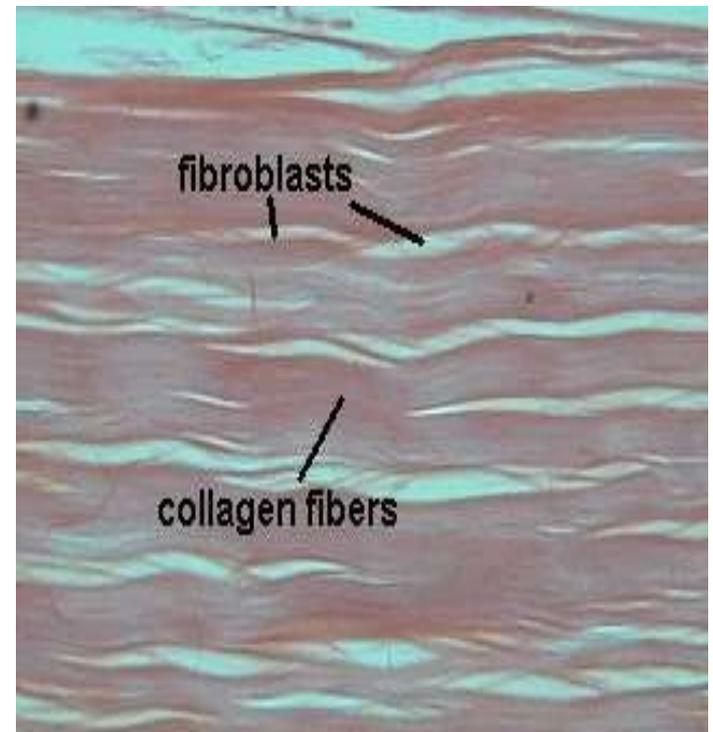


# CT proper: dense CT; Regular

**Description:** Primarily parallel collagen fibers; a few elastin fibers; major cell type is the fibroblast.

**Function:** Attaches muscles to bones and bones to bones.

**Location:** Tendons and in most ligaments.



# Cartilage: Hyaline

**Description:** Amorphous but firm matrix; chondroblasts produce the matrix and when mature lie in lacunae.

**Function:** Supports and reinforces; resists compressive stress.

**Location:** Forms most of the embryonic skeleton; ends of long bones; cartilages of nose.

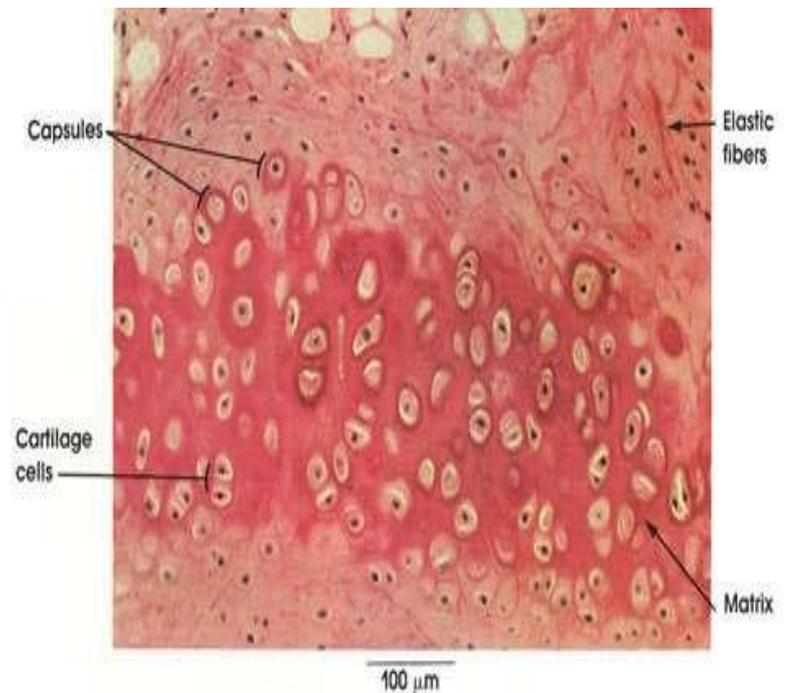


# Cartilage: Elastic

**Description:** Similar to hyaline cartilage, but more elastic fibers in matrix.

**Function:** Maintains the shape and allows flexibility.

**Location:** Supports the external ear (pinna).

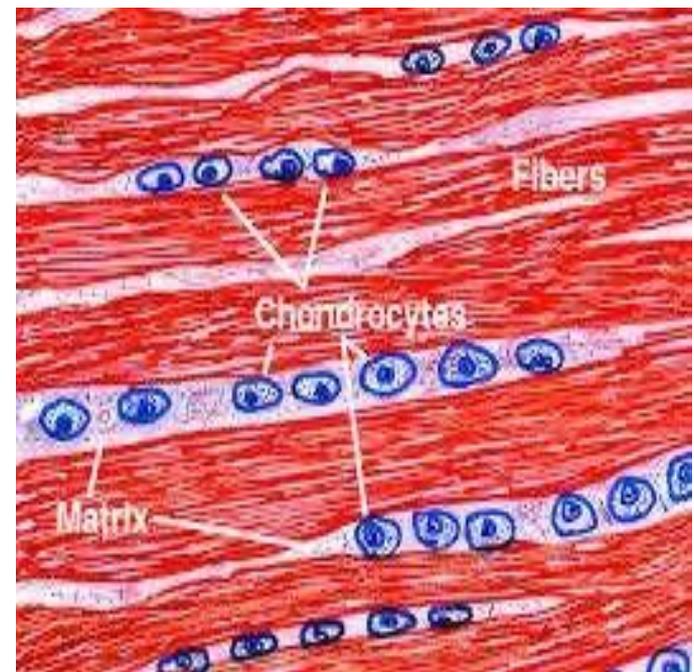


# Cartilage : Fibrocartilage

Description : Collagen fibers are predominant ; matrix is as hyaline but less firm.

Function: High tensile strength, compressive shock absorb.

Location: Intervertebral disc; discs of knee joint.

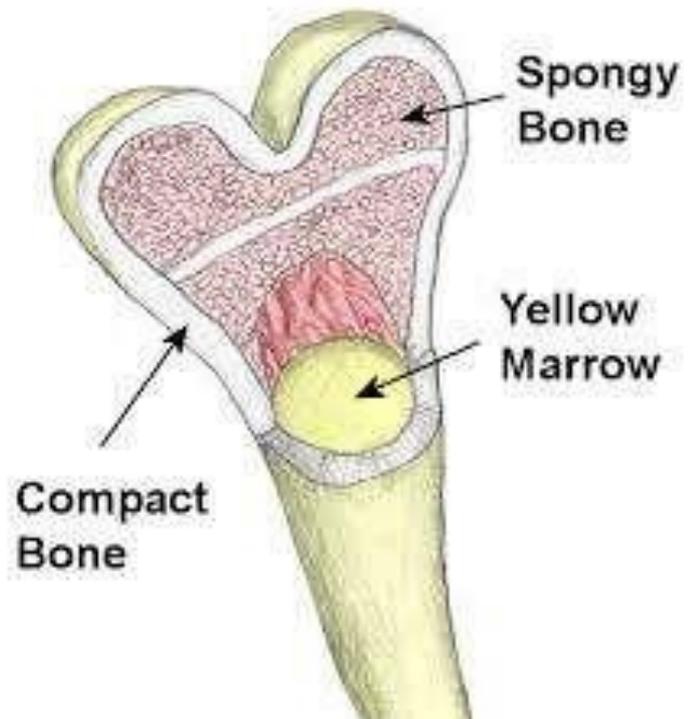


# Bone

**Description:** Hard, calcified matrix containing many collagen fibers. Very well vascularized.

**Function:** Bone supports and protects; provides levers for the muscles to act on; stores calcium and other minerals and fat; bone marrow is the site of blood cell formation.

**Location:** Skeleton.

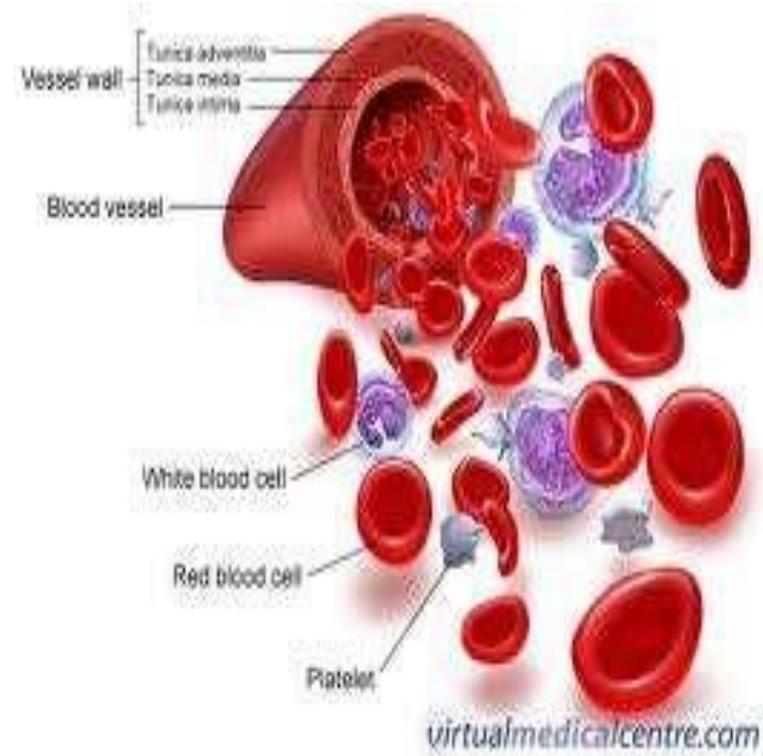


# Blood

**Description:** Liquid connective tissue, red and white blood cells in fluid matrix.

**Function:** Transport respiratory gases, nutrients, wastes and other substances.

**Location:** In the blood vessels.



# Muscle Tissue

- Muscle is one of our 4 tissue types and muscle tissue combined with nerves, blood vessels, and various connective tissues.
- Muscles are quite complex and as we'll find out, they are a marvel of both biology and physics.

# General characteristics

## 1. Excitability

- The ability to receive and respond to a stimulus
  - **In skeletal muscle**, the stimulus is a neurotransmitter (chemical signal) release by a neuron (nerve cell).
  - **In smooth muscle**, the stimulus could be a neurotransmitter, a hormone, stretch,  $\Delta\text{pH}$ ,  $\Delta\text{Pco}_2$ , or  $\Delta\text{Po}_2$ .
  - **In cardiac muscle**, the stimulus could be a neurotransmitter, a hormone, or stretch.
- The response is the generation of an electrical impulse that travels along the plasma membrane of the muscle cell.

## 2. Contractility

- The ability to shorten forcibly when adequately stimulated.
- This is the defining property of muscle tissue.

## 2. Extensibility

- The ability to be stretched (Extended)

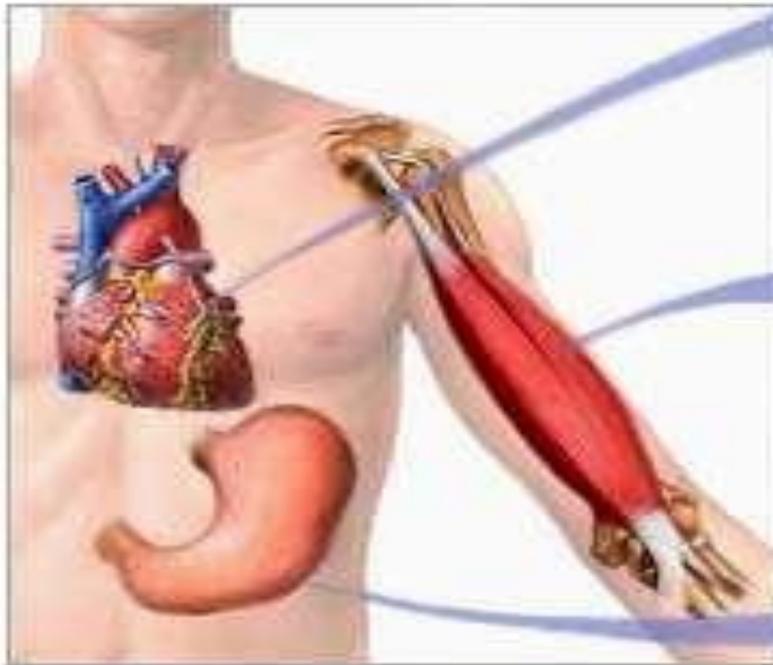
## 4. Elasticity

- The ability to recoil and resume original length after being stretched.

# Functions

- Movement
- Locomotion
- Maintains posture
- Produces heat
- Facial expressions
- Pumps blood
- Peristalsis

# 3 Types of Muscle Tissue



Cardiac muscle cell



Skeletal muscle cell



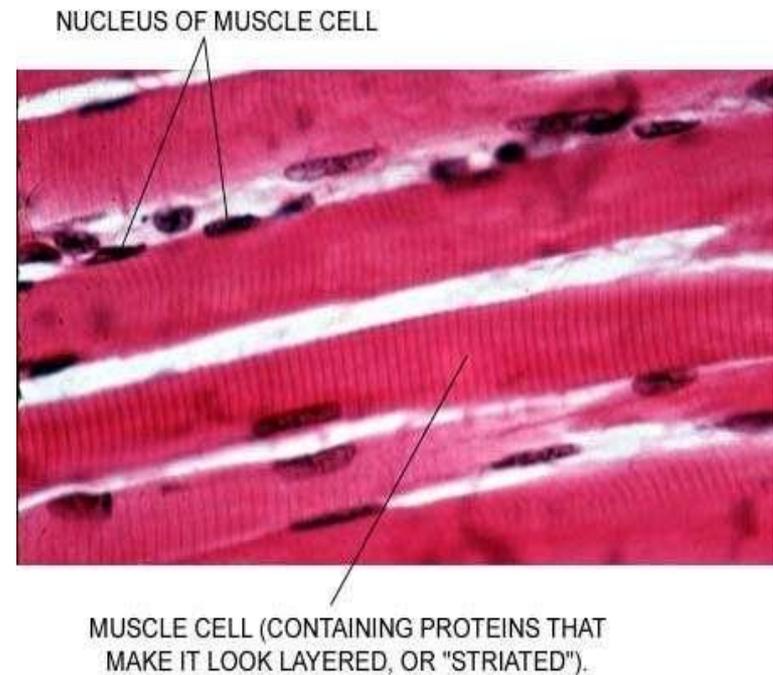
Smooth muscle cell

# Skeletal Muscle Tissue

**Description:** Long striated cells with multiple nuclei.

**Function:** Contraction for voluntary movements.

**Location:** In skeletal muscle.

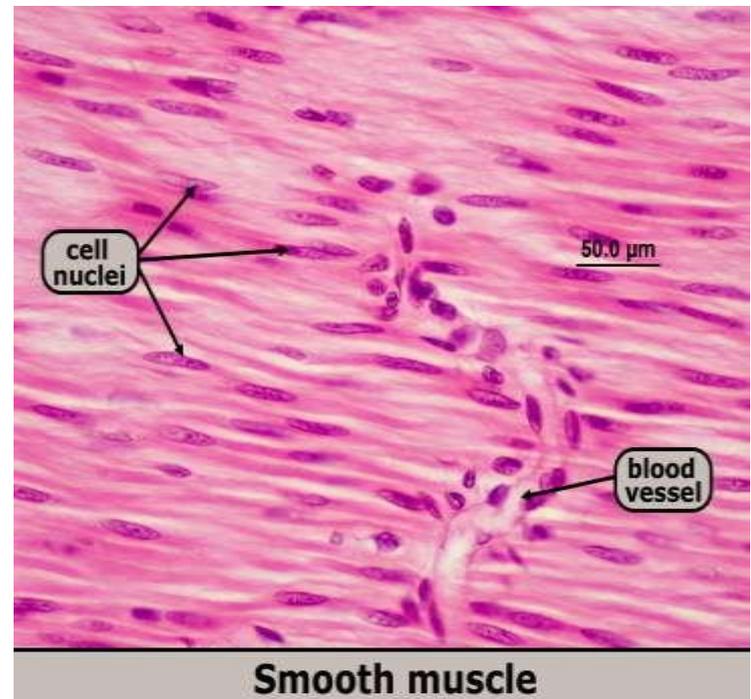


# Smooth Muscle Tissue

**Description:** Long, spindle-shaped cells, each with a single nucleus.

**Function:** Propulsion of substances along internal passageways.

**Location:** In hollow organs(e.g. stomach)



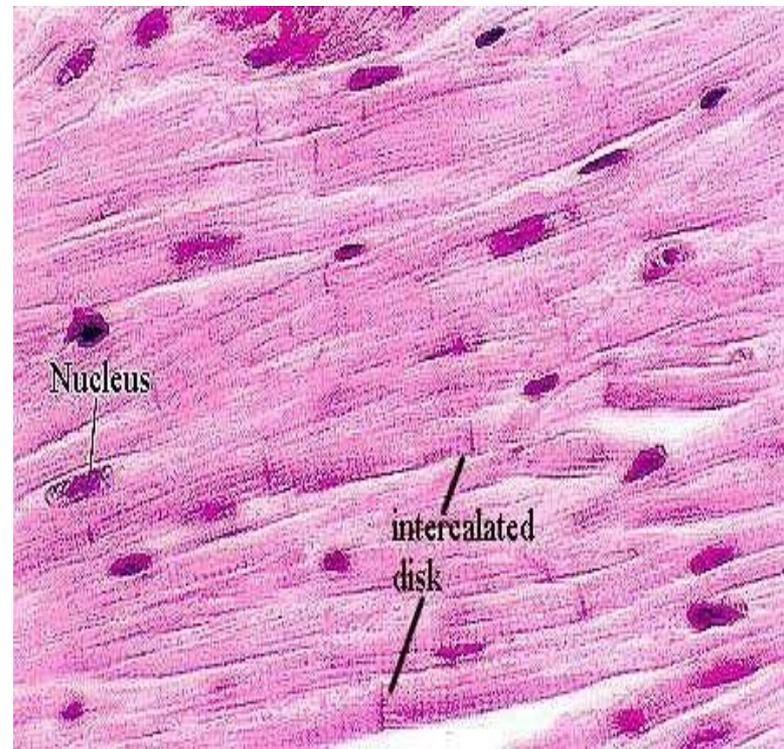
# Cardiac Muscle tissue

**Description:**

Branching, striated cells fused at plasma membranes.

**Function:** Pumping of blood in the circulatory system.

**Location:** Wall of heart.



# Nerve Tissue

By far the most complex tissue in the human body is nerve tissue.

Formed by a network of more than 100 million nerve cells, assisted by many more glial cells.

Each neuron has, on an average , at least a thousand interconnection with other neurons forming a very complex nervous system.

# Functions

- ✓ **Regulates & controls body functions**
- ✓ **Generates & transmits nerve impulses**
- ✓ **Supports, insulates and protects impulse  
generating neurons.**

# Composition of Nerve Tissue

The nerve tissue is composed of two elements:

1. The nerve cell or neuron
2. The neuroglia

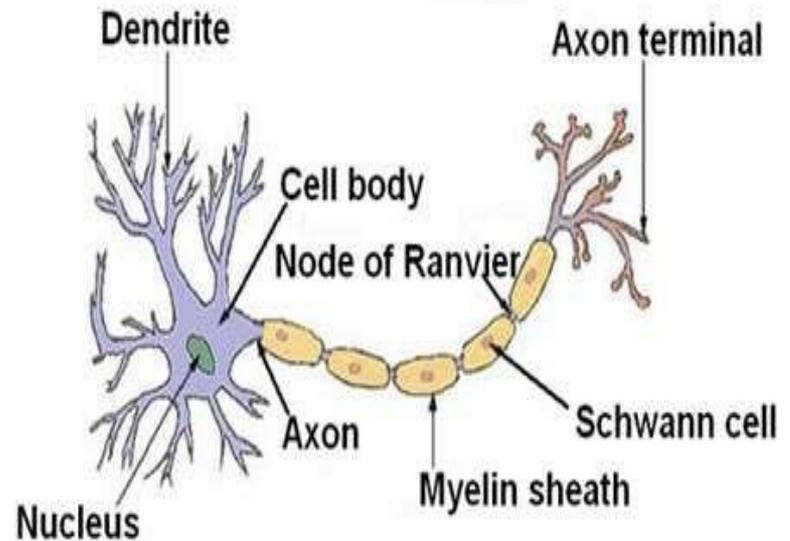
# Neuron

**Description:** Neurons are branching cells; cell processes that may be quite long extend from the nucleus-containing cell body.

**Function:** Transmit electrical signals from sensory receptors and to effectors (muscles and glands) that control their activity.

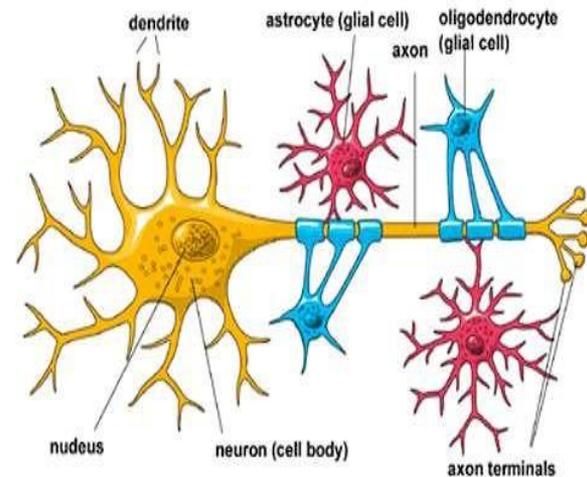
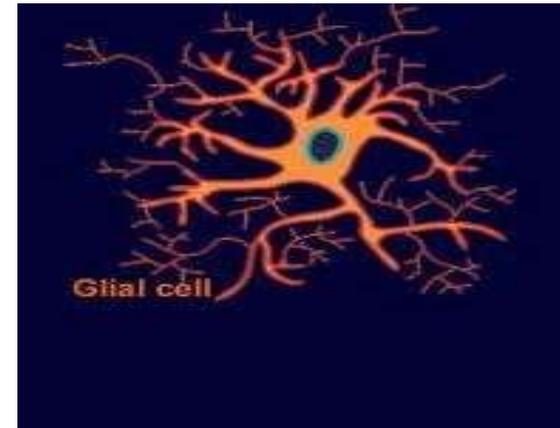
**Location:** Brain, spinal cord and nerves.

## Structure of a Typical Neuron



# Glial cells

Glia carry nutrients, speed repair, provide myelin for axons, support the blood-brain barrier, and may form their own communication network. They are also involved in neurogenesis.





Thank  
you!!