

CONNECTIVE TISSUE

DR. DIGVIJAY SHARMA
DEPARTMENT OF PHYSIOTHERAPY
U.I.H.S
KANPUR

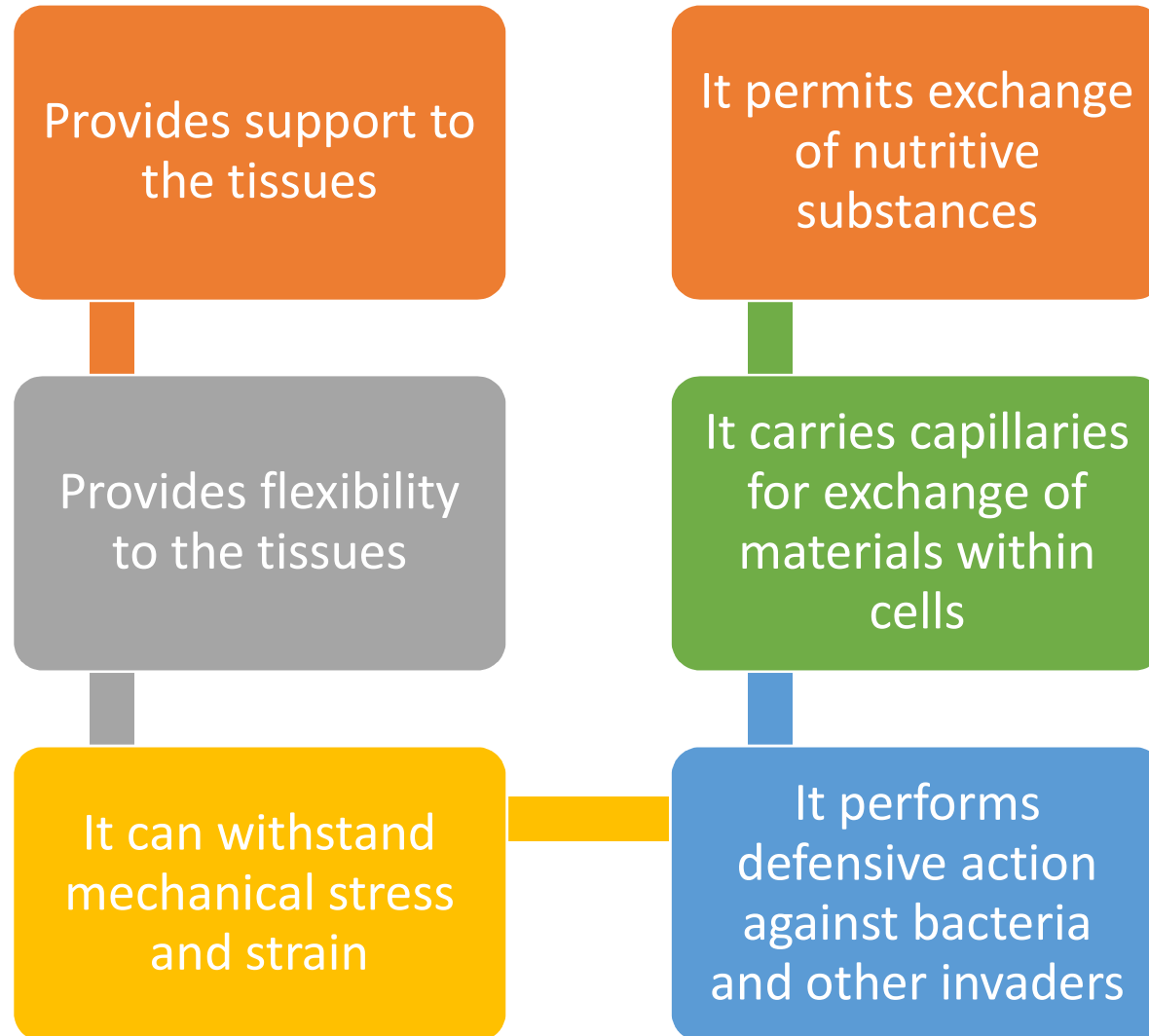
CONNECTIVE TISSUE

Definition: Connective tissues are a type of mesodermal tissue and consists of large amount of intercellular substance secreted by these cells.

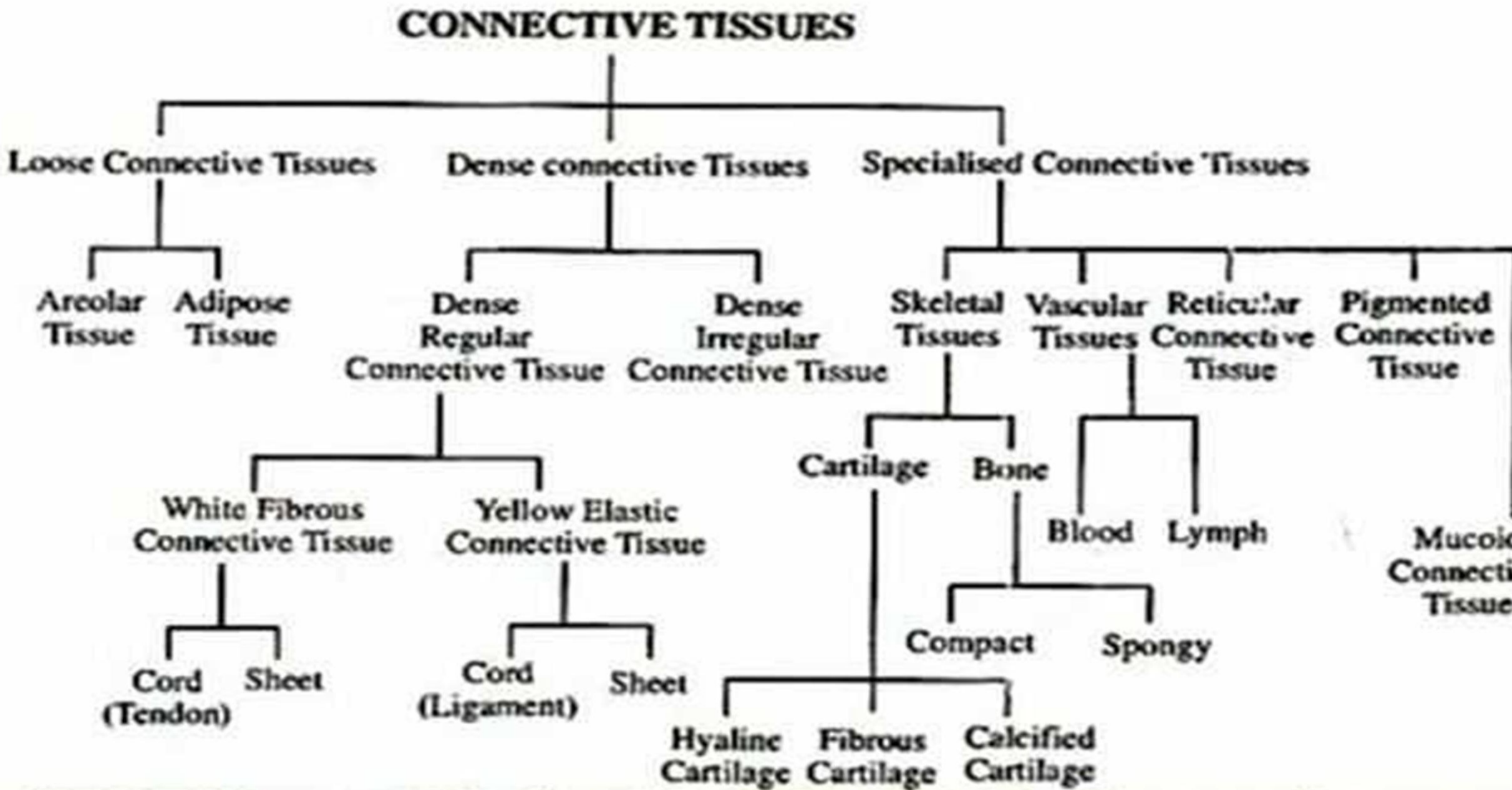
Features:

- ✓ They consists of connective tissue cells.
- ✓ They consist of large amount of intercellular substances
- ✓ The intercellular substances are made up of matrix, ground substances and fibres

FUNCTIONS OF CONNECTIVE TISSUE



CLASSIFICATION OF CONNECTIVE TISSUE



FIBROBLAST

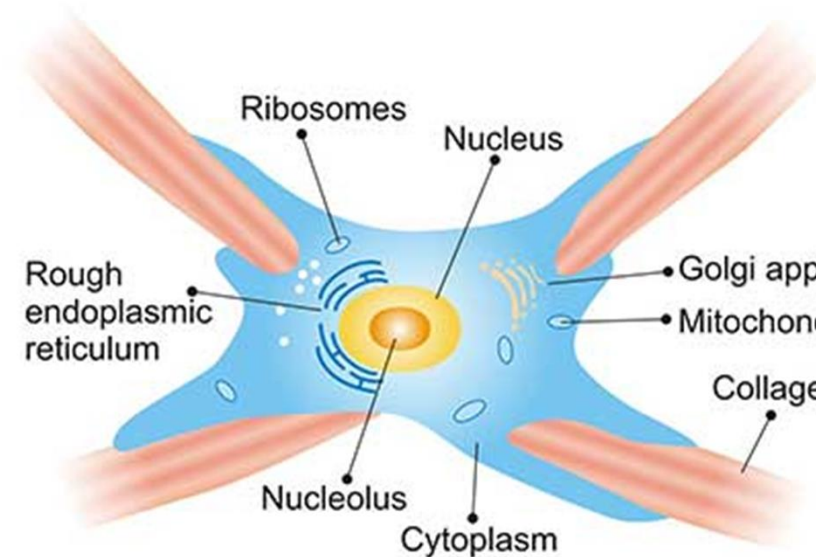
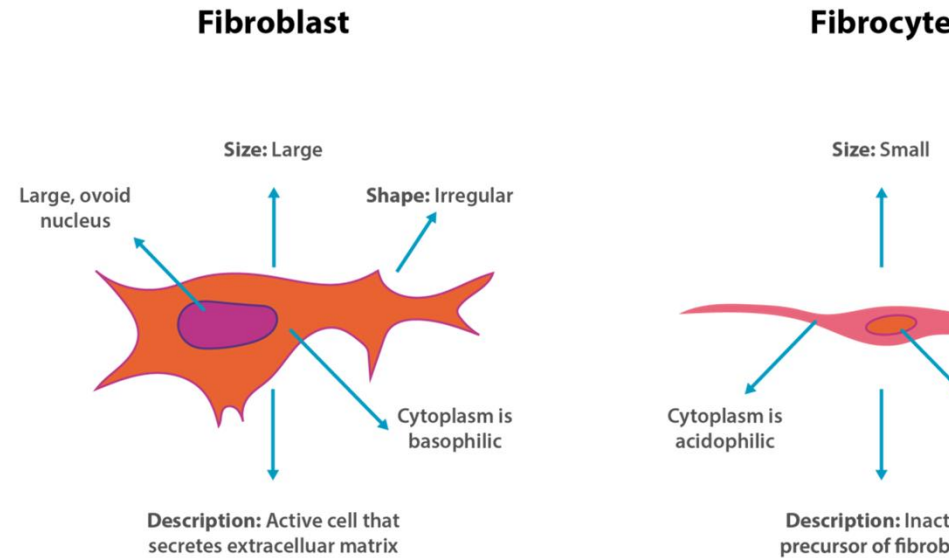
Definition: The flat shaped connective tissue cell which is either fusiform or spindle shaped. They may be irregular and provided with processes

The cytoplasm is scanty and clear. The nucleus is large, oval and central

Quiescent fibroblast are known as cyte or fibrocyte which contain less cytoplasm with flattened nucleus.

Young cells are called blast cells or fibroblasts

Under electron microscope, there is presence of rough endoplasmic reticulum indicating protein synthesis and a well developed golgi body apparatus.



FUNCTIONS OF FIBROBLASTS



Production of collagen reticulum fibrils and mucopolysaccharides as ground substance

Produces scar tissue for healing of wounds

Production of stem cells for generation of other cells of connective tissues

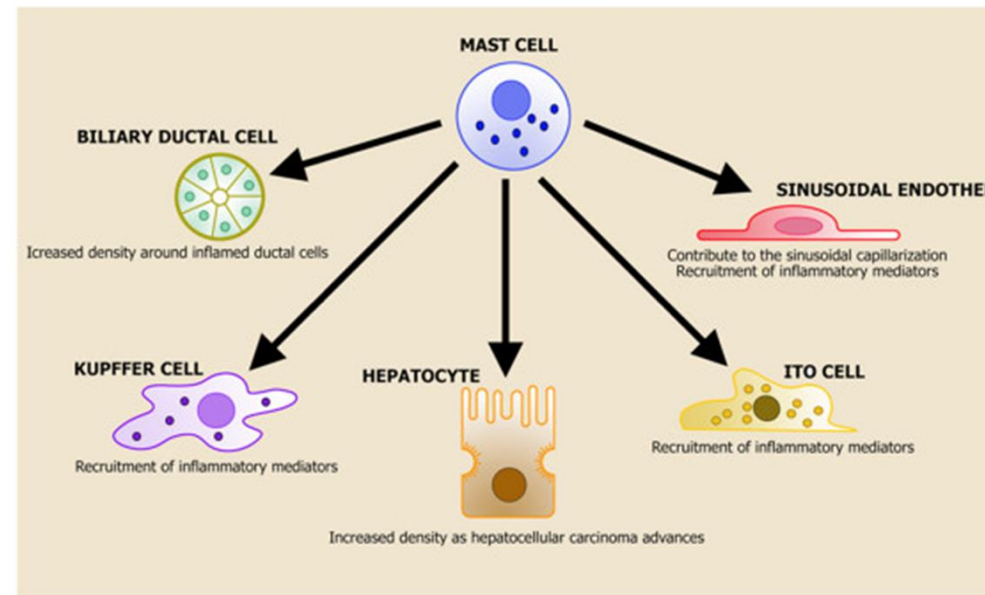
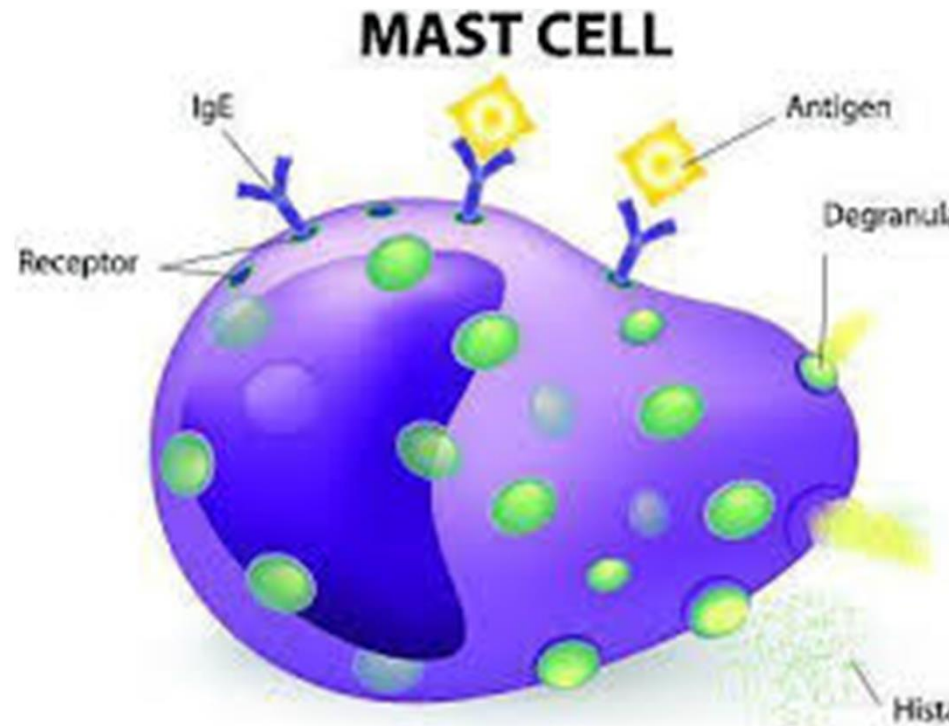
MAST CELL

Definition: These are found in groups, around the blood vessels which are large, round and oval in shape.

Cytoplasm contain large basophilic granules.

Nucleus is small, central, and may be hidden.

Function: Production of heparin, production of histamine, serotonin and hyaluronic acid in case of allergies.



HISTOCYTES

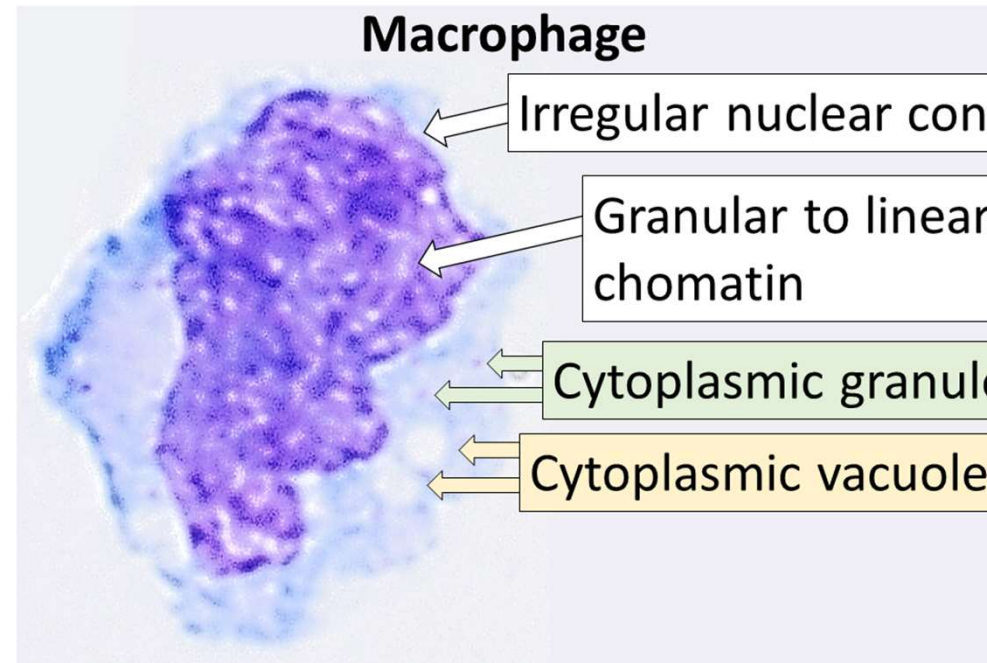
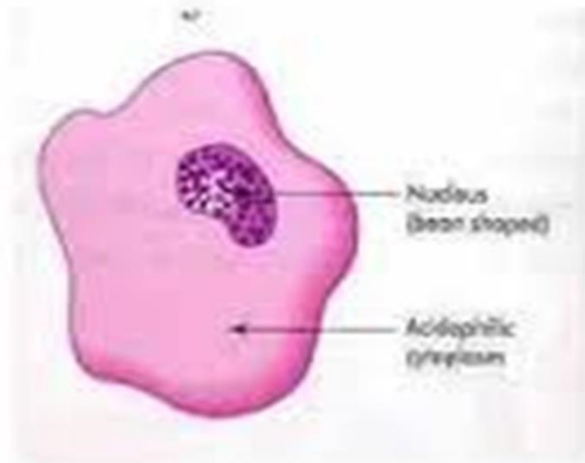
Definition: These are the connective tissues that contain small vacuoles and are large and irregular in shape.

It contains small and oval nucleus.

The cytoplasm is granular and vacuolated.

Macrophages (Histiocytes)

- Free and Fixed type,
- Fixed Cells-
- Irregular Shape
- filopodia process,
- Dark indented **eccentric nucleus**,
- Derived from **monocyte**
- Involved in **phagocytosis**
- Fused to form **giant cell**,
- Free Cells- rounded, no filopodia



DISTRIBUTION OF HISTOCYTE

They are found in areolar tissue of the vascular region, mucous membrane of gastro-intestinal tract

They form main component of reticular endothelium system

FUNCTIONS OF HISTOCYTE

- Phagocytosis which is important for local and general defence mechanism
- Immunological functions by drawing antigen competent cells forming antibodies against antigen
- Destruction of Red Blood cells

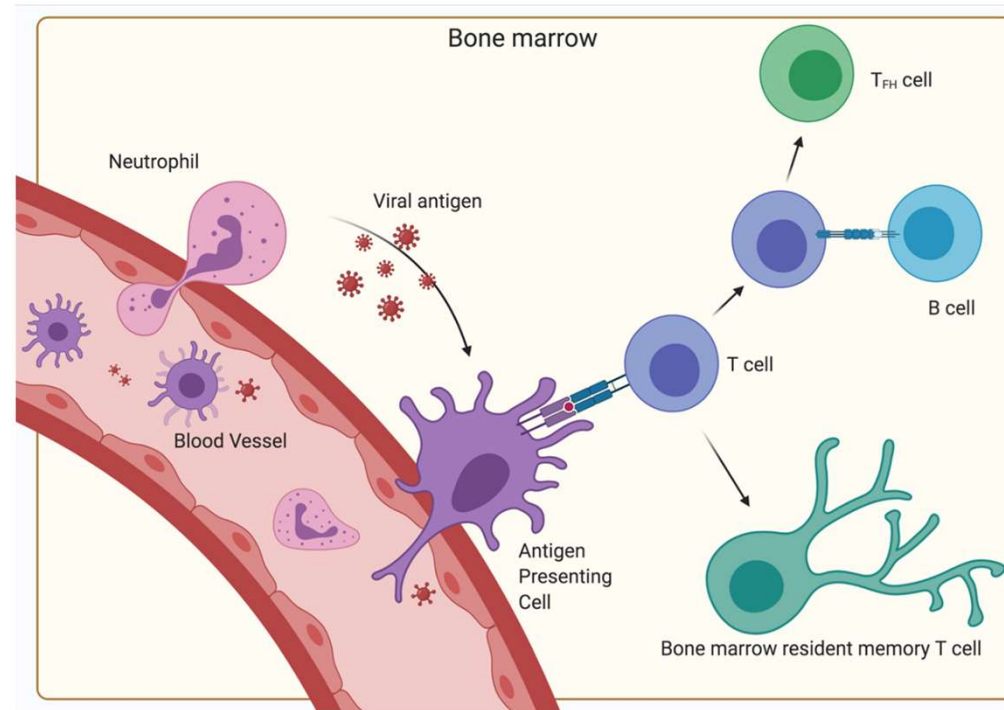
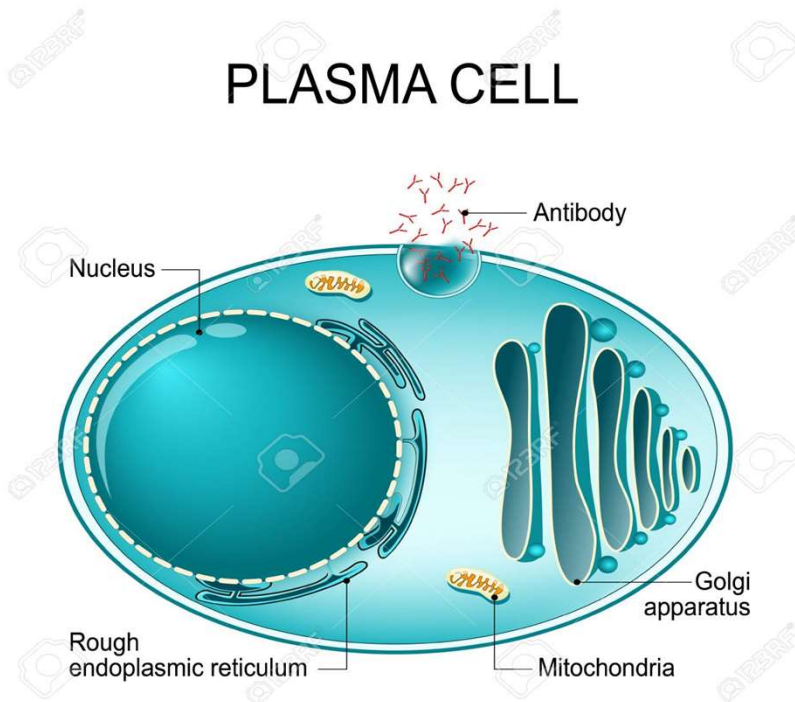
PLASMA CELL

Definition: these are the connective tissues found in serous membrane and lymphoid tissue with a small and round shape.

The cytoplasm is homogenous, nucleus is small and acentric in position.

The chromatin granules are radially arranged giving a cart wheel appearance.

Function: It serves as defence mechanism by formation of antibodies or immunoglobulins



FAT CELL

Definition: These are the connective tissues with central fatty substance and peripheral nucleus found usually near the blood vessels.

Shape of the cell: Round when single and polyhedral when in groups

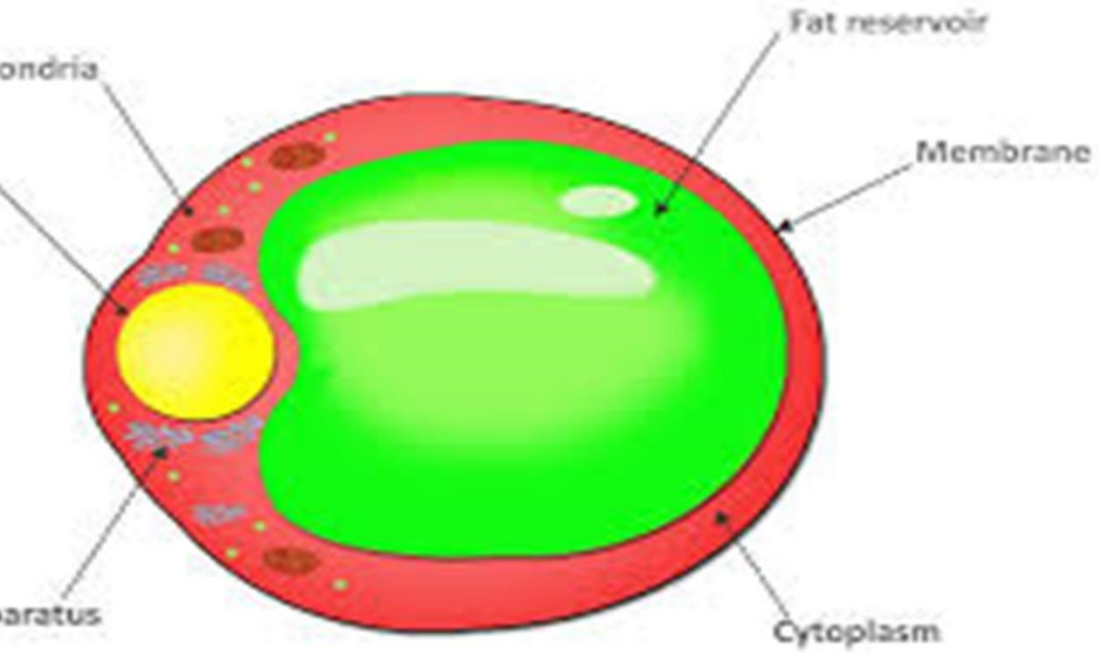
Cytoplasm: Thick and peripheral surrounded by a central fatty substance

Nucleus: Peripheral

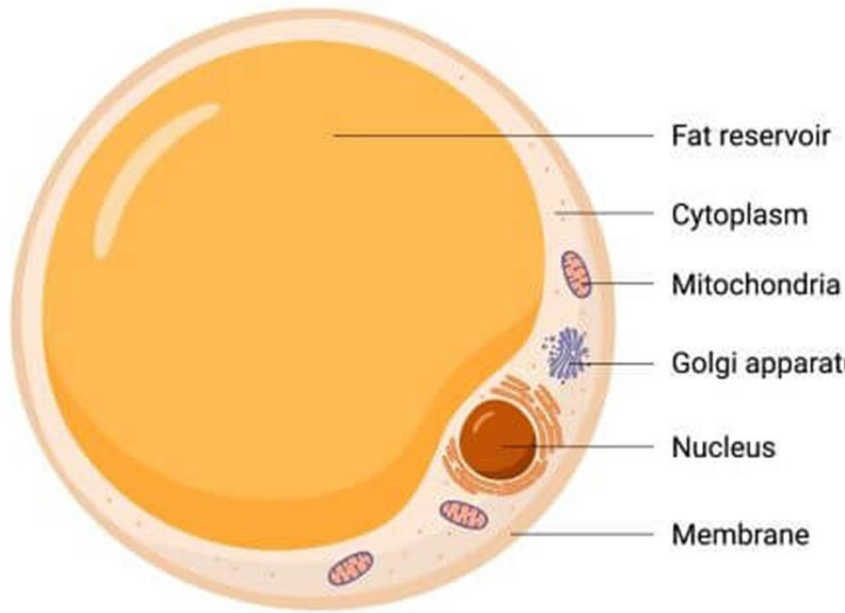
When fat cells are arranged in loop, they form adipose tissue

Function: they can act as store house of free fatty acids and lipids

FAT CELL



ADIPOCYTE



PIGMENT CELL

Distribution of Cell: Dermis of the cell, iris of eye, choroid plexus, piamater of brain, arachnoid mater of brain

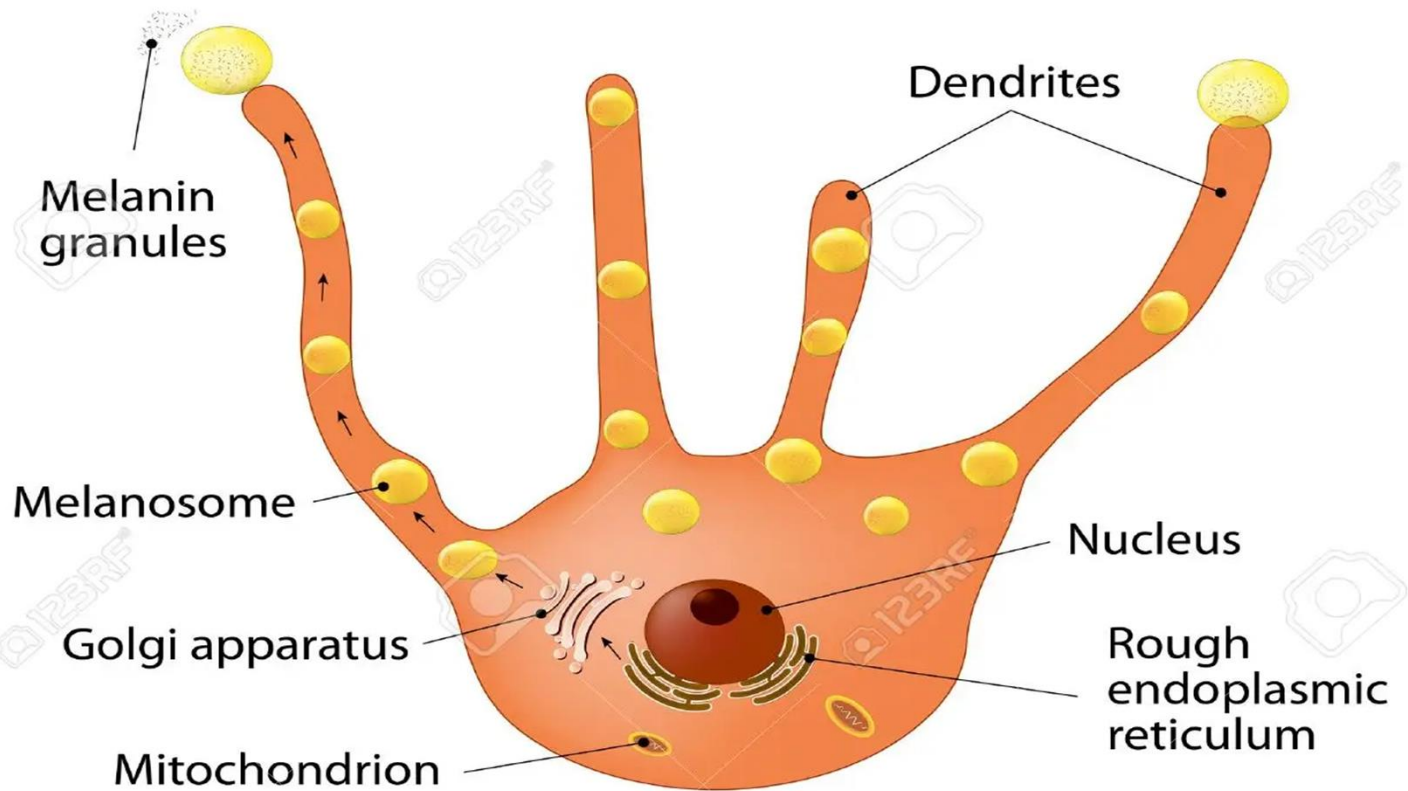
Shape of the cell: Satellite cells with branching process functionally they are two types melanocytes which produce pigment melanin and protect against cosmic rays

Cytoplasm: Contains melanin

Melanophores: These are the cells store melanin and carry them to the site where it is required.

PIGMENT CELL

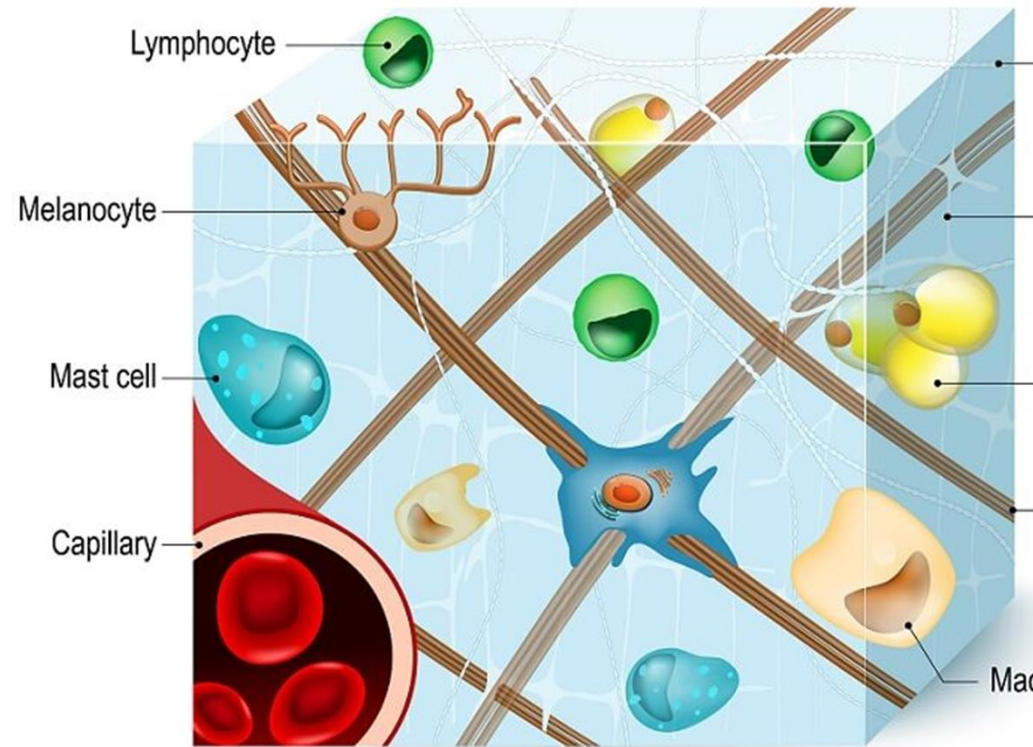
MELANOCYTE



AMORPHOUS OR GROUND SUBSTANCE

DEFINITION: It is component of a connective tissue between the cells and fibers, supports cells, binds them together, and provides a medium through which substances are exchanged.

Ex. Hyaluronic Acid



FUNCTIONS OF GROUND SUBSTANCES



Gives morphology and framework to the tissues

Protection and binding of the cells within tissues

Storage of water molecules

Diffusion of metabolites needed by cells

EXTRACELLULAR MATRIX

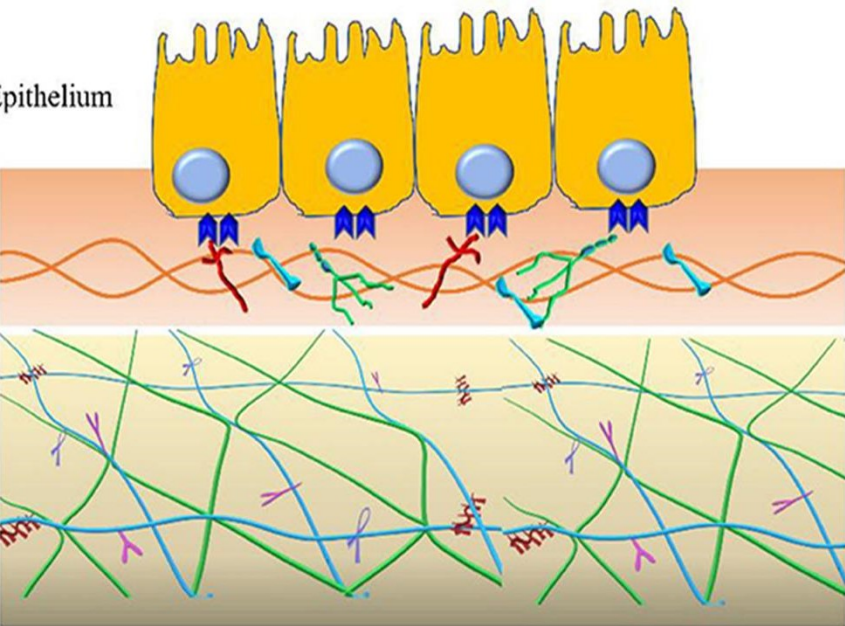
Definition: The **extracellular matrix (ECM)** is a three-dimensional network of extracellular macromolecules, such as collagen, enzymes, and glycoproteins.












Functions:

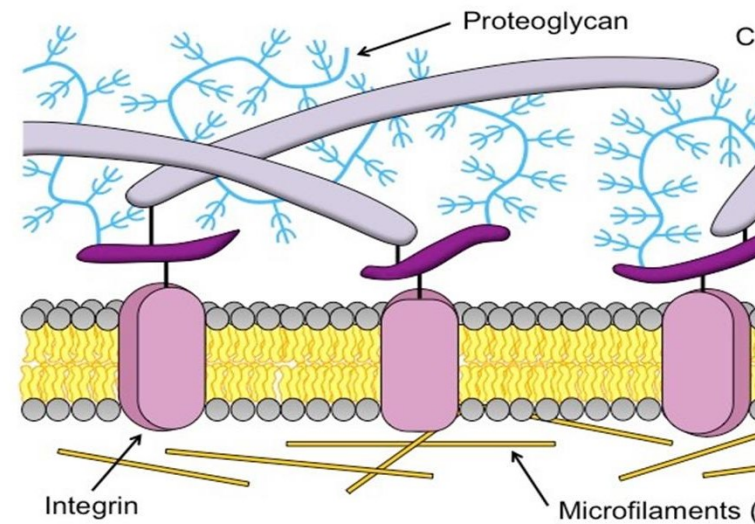
- Provides structural and biochemical support to surrounding cells.
- Cell adhesions and cell-to-cell communication with differentiation are common functions of the ECM.

is the part of connective tissue outside of the cells.

EXTRACELLULAR MATRIX



-  Enterocyte
-  Integrins
-  Non-fibrillar collagen
-  Laminin
-  Nidogen
-  Perlecan
-  Fibrillar collagen
-  Fibronectin
-  Elastin
-  Decorin
-  Hyaluronic acid



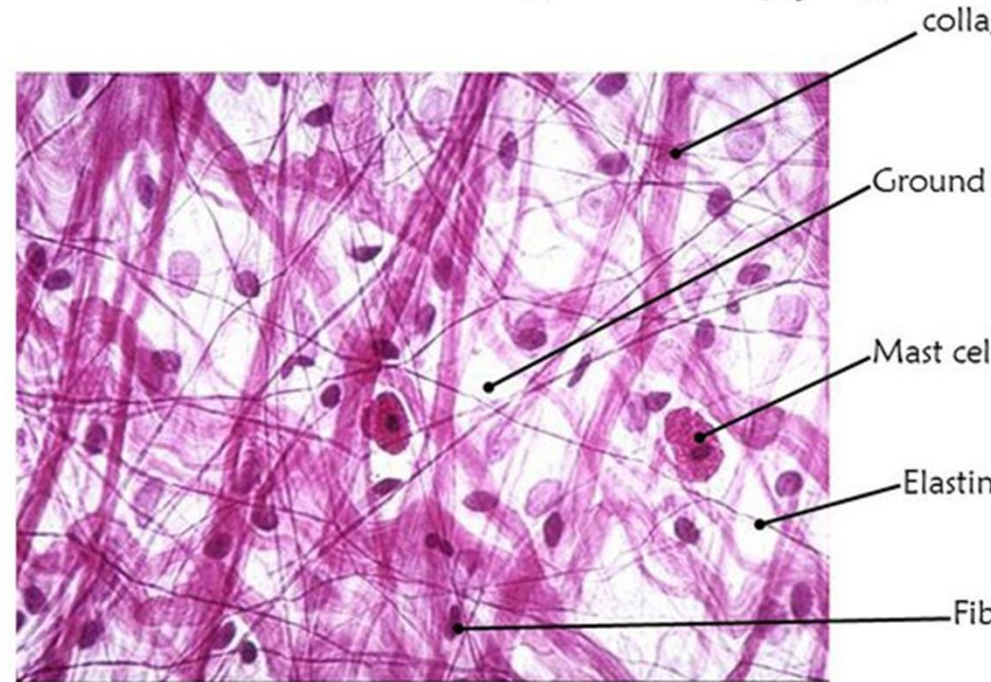
AREOLAR CONNECTIVE TISSUE

Definition: These are one of the most widely distributed loose connective tissues in the body.

It contains fibroblasts, macrophages, plasma cells, mast cells, adipocytes and few white blood cells as well as all 3 types of fibers

It helps to form the subcutaneous layer

Areolar (Prototype)



AREOLAR CONNECTIVE TISSUE

FEATURES

It is soft and spongy

It is a network of thin collagen and elastic fibre

It spreads in all directions

It gives tensile strength and elasticity

SITE

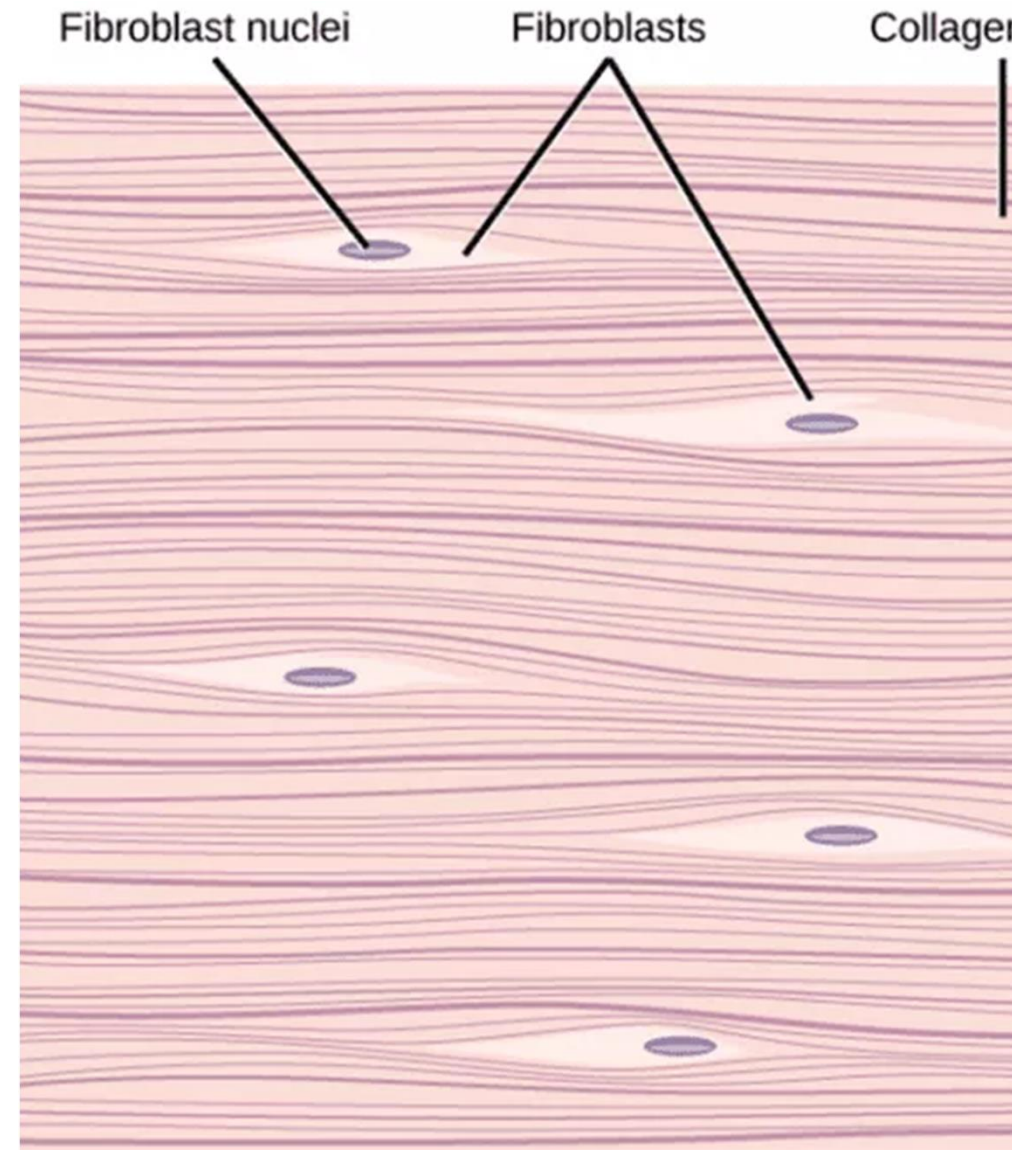
- In regions where there is no fat
- Eye
- Some mucosa of digestive tract
- Sheath of blood vessels
- Nerves and muscles

DENSE CONNECTIVE TISSUE

Definition: These are connective tissues that contain numerous, thicker and denser fibers but fewer cells than loose connective tissue.

They are broadly divide into 4 types:

1. White fibrous tissue
2. Elastic tissue
3. Adipose tissue
4. Reticular tissue



WHITE FIBROUS CONNECTIVE TISSUE

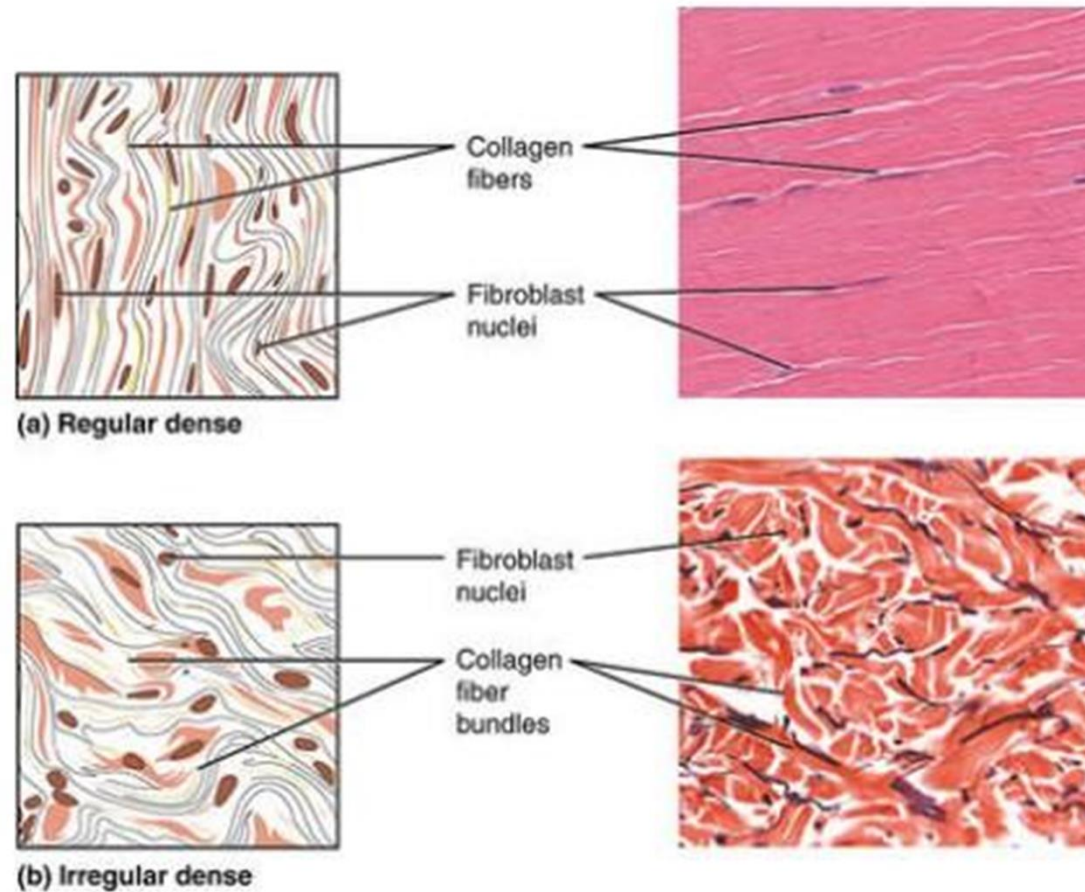
Definition: These are the connective tissues that primarily contain bundles of collagen fibers arranged regularly in parallel patterns that give it strength.

Functions:

They withstand pulling from the ends, but unravels when pulled from the side

These are tough and pliable

Location: Found in tendons, ligaments and membranes of Fascial Sheath



COLLAGEN

Definition: Collagen is the main structure protein, present in extracellular matrix in the various connective tissue in animal bodies.

As the main component of connective tissue, it is most important and abundant protein in mammals.

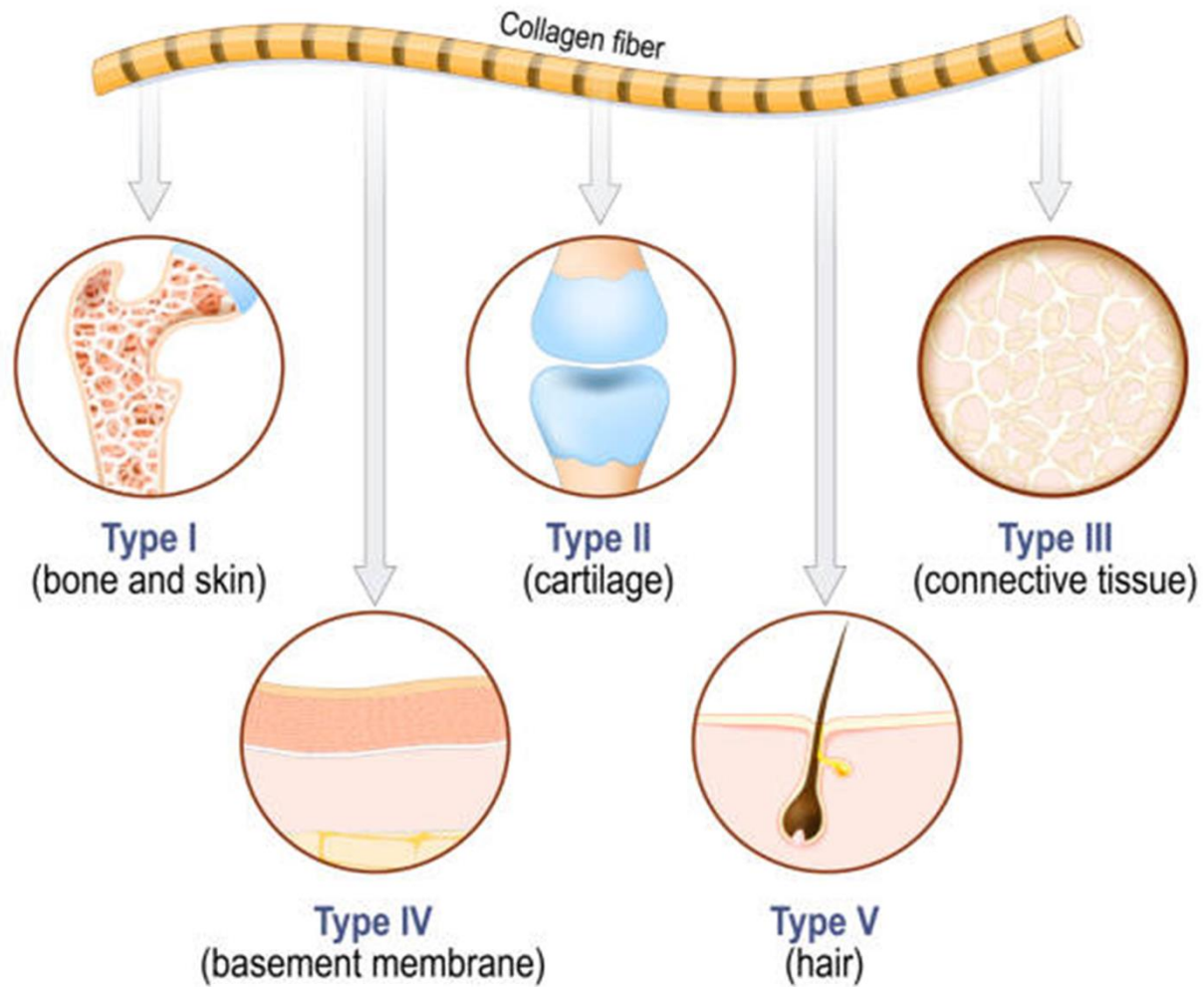
It accounts for 25% to 30% of whole body protein content collagen consists of amino acids wound together to form triple helices to form an elongated fibril.

It is mostly found in fibrous tissue, such as-Tendon, Ligaments, Skin. It is also abundant in corneas, blood vessels, the gut, intervertebral disks and the dentine teeth.

Collagen also has many medical uses in treating complications of bone and skin.

Collagen

The five most common types



ELASTIC CONNECTIVE TISSUE

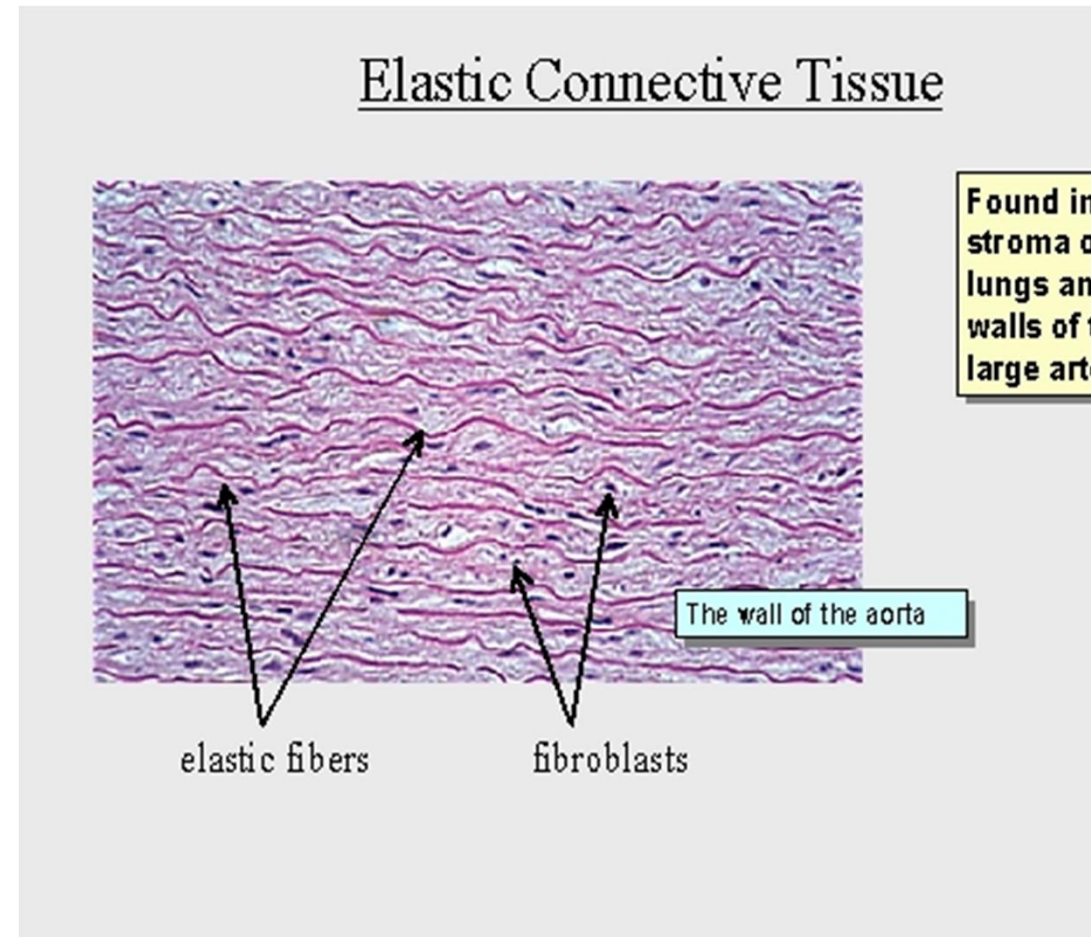
Definition: These are the connective tissues that contain branching elastic fibers and fibroblasts and are also known as Yellow Elastic Fibers

Features:

- Yellowish in color
- Strong, can regain shape after stretching
- The intracellular matrix is made up of mainly elastic fibers

Location: Found in lungs, arteries, skin

Functions: These are found in regions which are under mechanical stress

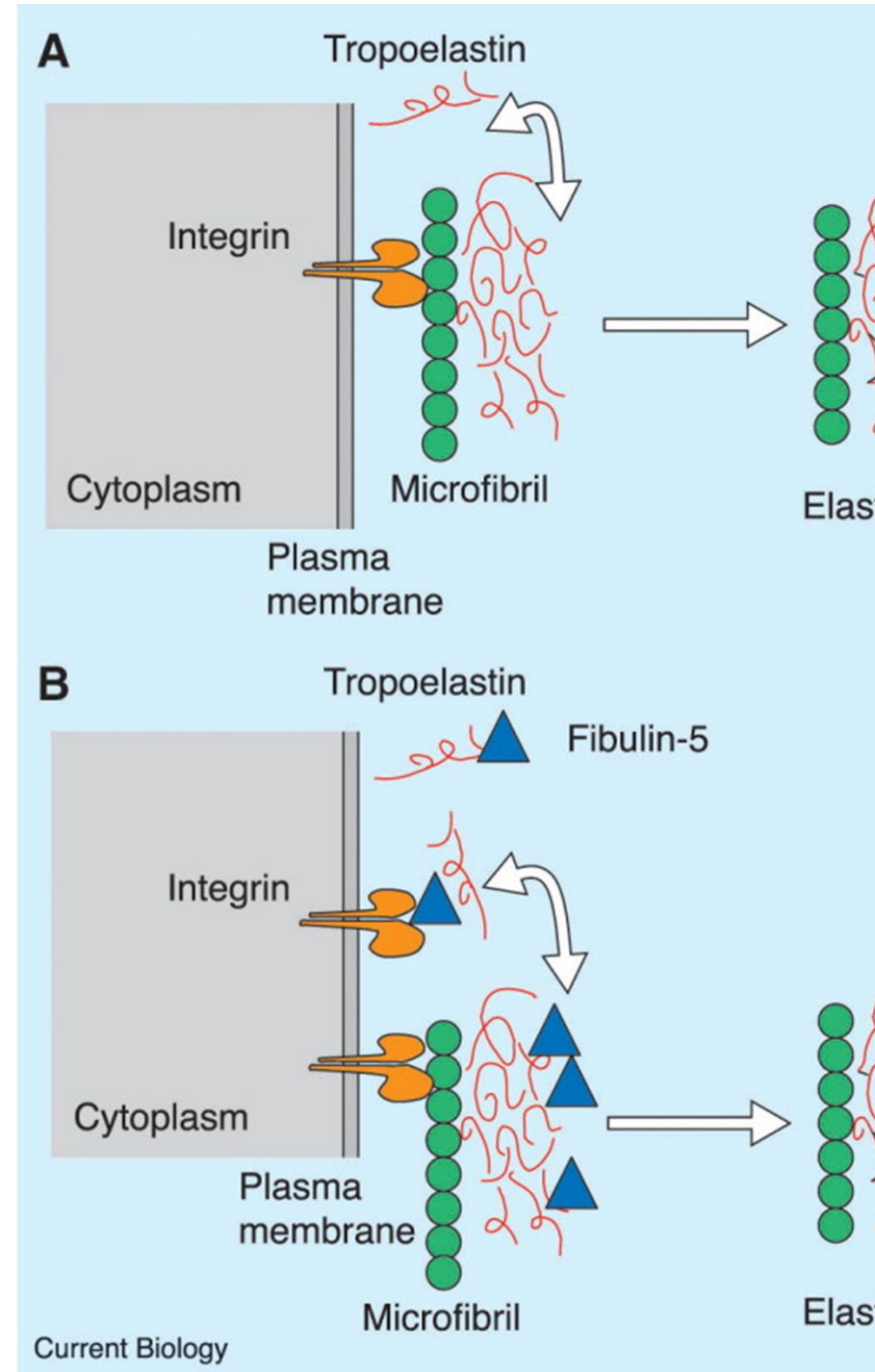


ELASTIN FIBER

Elastin makes up a smaller protein of the fibrous component in the extracellular matrix than collagen.

They can stretch up to 1-5 times their length and snap back to their include- elastin , elaurin

The aorta contains approximal 30% elastin and 20% collagen, the ligamemtum nuchue has 75% elastin and 15% collagen



DISTRIBUTION OF ELASTIC FIBERS

1. *ELASTIC FIBRIS ARE FOUND IN-*
2. *SKIN.*
3. *LUNGS.*
4. *ARTERIES.*
5. *VEINS.*
6. *ELASTIC CARTILAGE.*
7. *FETAL TISSUE.*
8. *CONNECTIVE TISSUE PROPER.*
9. *PERIODONTAL LIGAMENT.*

RETICULAR CONNECTIVE TISSUE

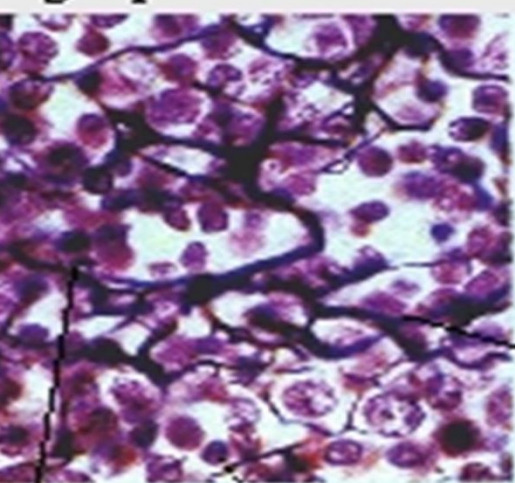
Definition: These are the connective tissues which are composed of reticular fibres and tissues

Regions present: These tissues are basically present at the inner lining of soft organs like Spleen, Liver, Kidneys, Lymph nodes and Bone marrow

Can be of high power and low power depending upon the quality and quantity of reticular fibres at the regions where these are present.

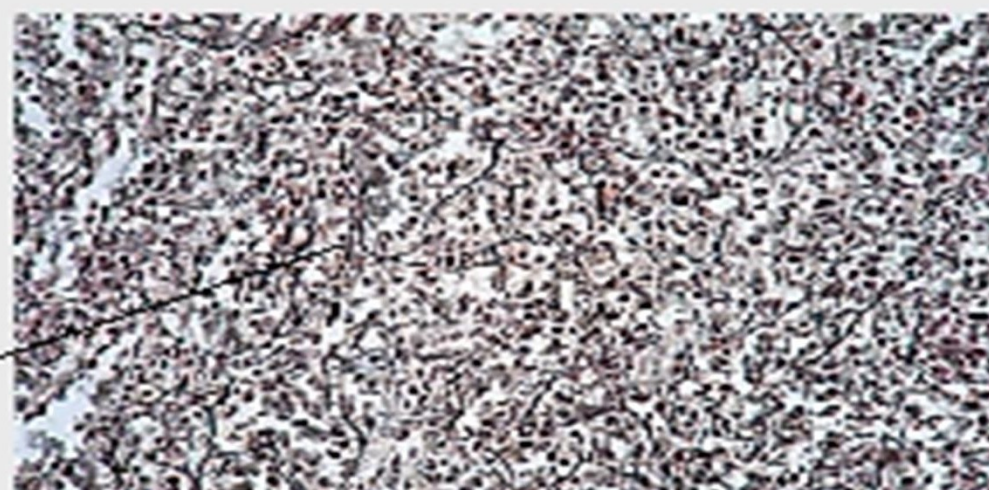
Reticular Connective Tissue

High power



Section of lymph node

reticular fibers



Low power

fibroblast

lymphocyte

Forms the internal stroma of the soft organs such as the spleen and lymph nodes.