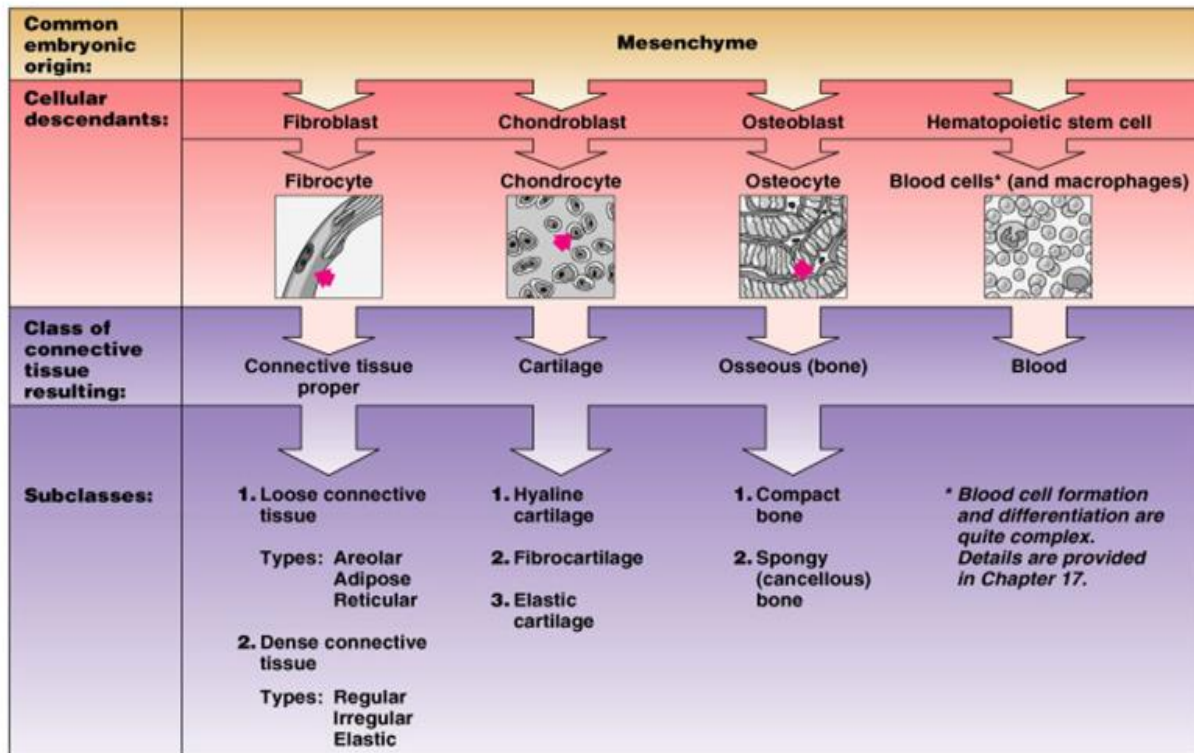


# Connective Tissue

- Most diverse and abundant tissue
- Main classes
  - Connective tissue proper
  - Cartilage
  - Bone tissue
  - Blood
- Components of connective tissue:
  - Cells (varies according to tissue)
  - Matrix
    - Fibers (varies according to tissue)
    - Ground substance (varies according to tissue)
    - Dermatin sulfate, hyaluronic acid, keratin sulfate, chondroitin sulfate...
- Common embryonic origin – mesenchyme

All connective tissues originate from embryonic mesenchyme, a tissue developing mainly from the middle layer of the embryo, the mesoderm

## Classes of Connective Tissue



- Connective tissue proper
  - Loose connective tissue

### ❖ Location

- Forming a layer beneath the epithelial lining of many organs
- Filling the spaces between fibers of muscle and nerve

Also called **areolar tissue**

### ❖ Components

- Cells (fibroblasts, macrophages, mast cells, white blood cells)
- Fibers (Collagen fibers predominate, but elastic and reticular fibers are also present)
- Ground substance (moderate amount of ground substance).

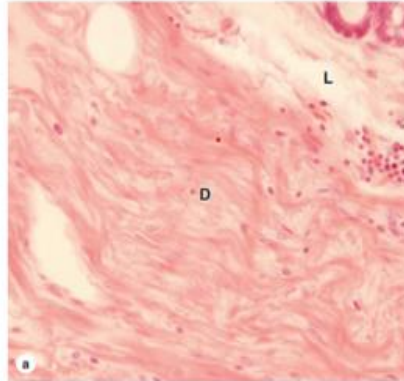
Have nerves and small blood vessels.

## ❖ Functions

- Support and binding of other tissues
- Holding body fluids
- Defending body against infection
- Storing nutrients as fat

### ■ Defenders gather at infection sites

- Macrophages
- Plasma cells
- Mast cells
- Neutrophils, lymphocytes, and eosinophils



## Adipose Tissue

### ■Description

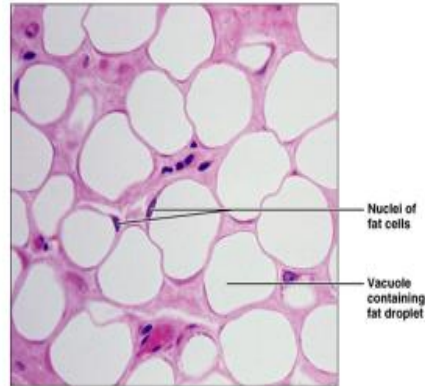
- Closely packed adipocytes
- Have nucleus pushed to one side by fat droplet

#### Function

- Provides reserve food fuel
- Insulates against heat loss
- Supports and protects organs

### ■Location

- Under skin
- Around kidneys
- Behind eyeballs, within abdomen and in breasts



## 2- Dense connective tissue

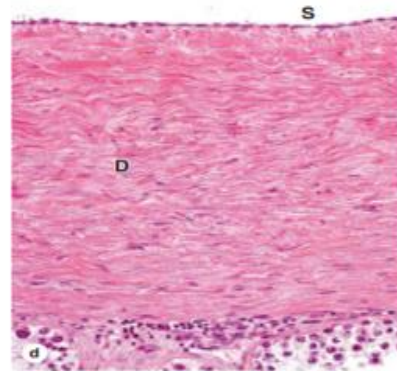
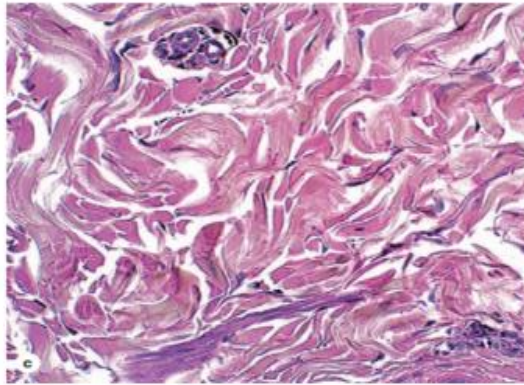
Dense connective tissue has similar components as loose connective tissue, but with fewer cells, mostly fibroblasts, and a clear predominance of bundled type I collagen fibers over ground substance. The abundance of collagen here protects organs and strengthens them structurally.

### Dense irregular connective tissue

bundles of collagen fibers appear randomly interwoven, with no definite orientation. The tough three-dimensional collagen network provides resistance to stress from all directions

#### Location

- deep dermis layer of skin
- capsules surrounding most organs

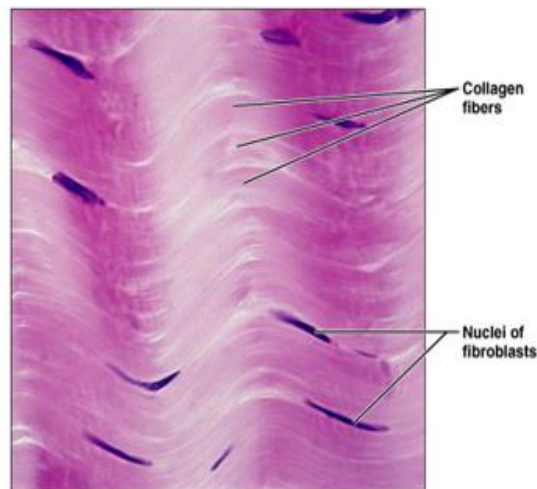


### Dense regular connective tissue

consists mostly of type I collagen bundles and fibroblasts aligned in parallel for great resistance to prolonged or repeated stresses from the same direction

#### Location

- Tendons
- Ligaments





## Cells of connective tissue proper

Cell Type	Major Product or Activity
Fibroblasts (fibrocytes)	Extracellular fibers and ground substance
Plasma cells	Antibodies
Lymphocytes (several types)	Various immune/defense functions
Eosinophilic leukocytes	Modulate allergic/vasoactive reactions and defense against parasites
Neutrophilic leukocytes	Phagocytosis of bacteria
Macrophages	Phagocytosis of ECM components and debris; antigen processing and presentation to immune cells; secretion of growth factors, cytokines, and other agents
Mast cells and basophilic leukocytes	Pharmacologically active molecules (eg, histamine)
Adipocytes	Storage of neutral fats

## Reticular Connective Tissue

### ■ Description

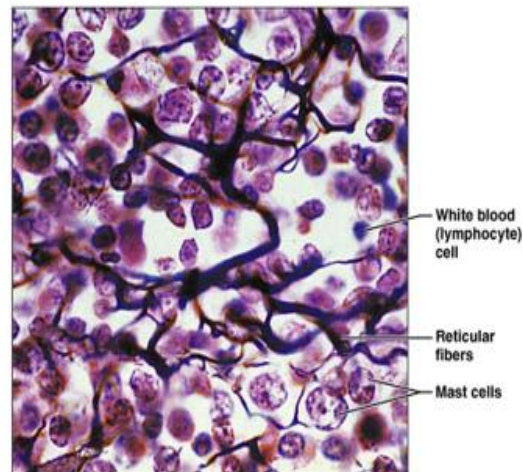
- network of reticular fibers in loose ground substance

### ■ Function

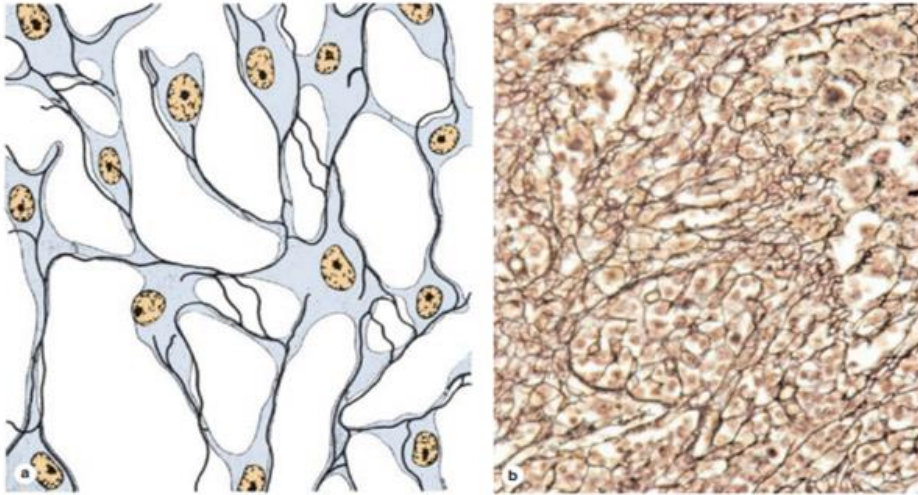
- form a soft, internal skeleton (stroma) – supports other cell types

### ■ Location

- lymphoid organs  
(Lymph nodes, bone marrow, and spleen)



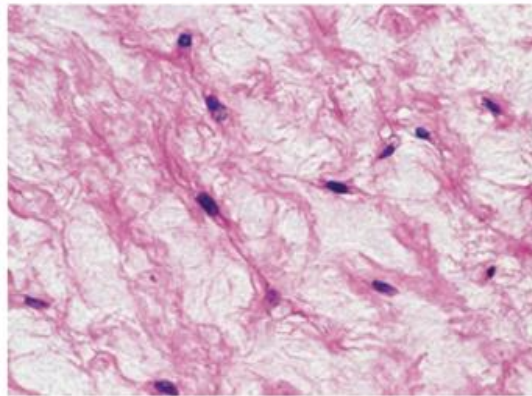
**Photomicrograph:** Dark-staining network of reticular connective tissue fibers forming the internal skeleton of the spleen (350 $\times$ ).



## Mucoid tissue

- Mucoid tissue is a gel-like connective tissue with few cells found most abundantly around blood vessels in the umbilical cord

FIGURE 5-22 Mucoid tissue.



## Medical Laboratory Techniques Department

### Lec 6: Connective tissue

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**TABLE 5–6** Classification of connective or supporting tissues.

	General Organization	Major Functions	Examples
<b>Connective Tissue Proper</b>			
Loose (areolar) connective tissue	Much ground substance; many cells and little collagen, randomly distributed	Supports microvasculature, nerves, and immune defense cells	Lamina propria beneath epithelial lining of digestive tract
Dense irregular connective tissue	Little ground substance; few cells (mostly fibroblasts); much collagen in randomly arranged fibers	Protects and supports organs; resists tearing	Dermis of skin, organ capsules, submucosa layer of digestive tract
Dense regular connective tissue	Almost completely filled with parallel bundles of collagen; few fibroblasts, aligned with collagen	Provide strong connections within musculoskeletal system; strong resistance to force	Ligaments, tendons, aponeuroses, corneal stroma
<b>Embryonic Connective Tissues</b>			
Mesenchyme	Sparse, undifferentiated cells, uniformly distributed in matrix with sparse collagen fibers	Contains stem/progenitor cells for all adult connective tissue cells	Mesodermal layer of early embryo
Mucoid (mucous) connective tissue	Random fibroblasts and collagen fibers in viscous matrix	Supports and cushions large blood vessels	Matrix of the fetal umbilical cord
<b>Specialized Connective Tissues</b>			
Reticular connective tissue (see Chapter 14)	Delicate network of reticulin/collagen III with attached fibroblasts (reticular cells)	Supports blood-forming cells, many secretory cells, and lymphocytes in most lymphoid organs	Bone marrow, liver, pancreas, adrenal glands, all lymphoid organs except the thymus