



# CONNECTIVE TISSUE

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## Definition

- ▶ It is a basic type of tissue of mesodermal origin which provides **structural and metabolic support** for other tissues and organs throughout the body.
- ▶ It is composed of a **group of cells** embedded in **extracellular matrix**.



# CONNECTIVE TISSUE

## ❖ General characteristics:

- All connective tissues are derived from **mesoderm**
- Highly vascular.
- Responsible for shape and form of the body.
- Widely distributed all over the body.
- The cells of connective tissue are widely separated with large amount of intercellular substance between them.
- It contains blood vessels, nerves and lymphatic supplying the organs.

# GENERAL FUNCTIONS:

- ◉ **Structural support** for tissues and organs throughout the body.
- ◉ **Nutrition** as it mediate the exchange of nutrients and metabolites between tissues and blood capillaries.
- ◉ **Defensive and protection** as it contains all types of defensive cells.
- ◉ **Storage of energy** because it is containing adipose tissue (fat).
- ◉ **Repairs of tissue damage** because it contains fibroblast and fibrocytes.

# CONTENTS:

1-Cells

2-Exteracellular matrix

- ⦿ Fibers

- ⦿ Ground substances



# CELLS

## A. Fixed cells

- ▶ They are permanent presented in the connective tissues such as:
- ▶ Fibroblasts, macrophages, mast cells, adipose cells and undifferentiated mesenchymal cells.

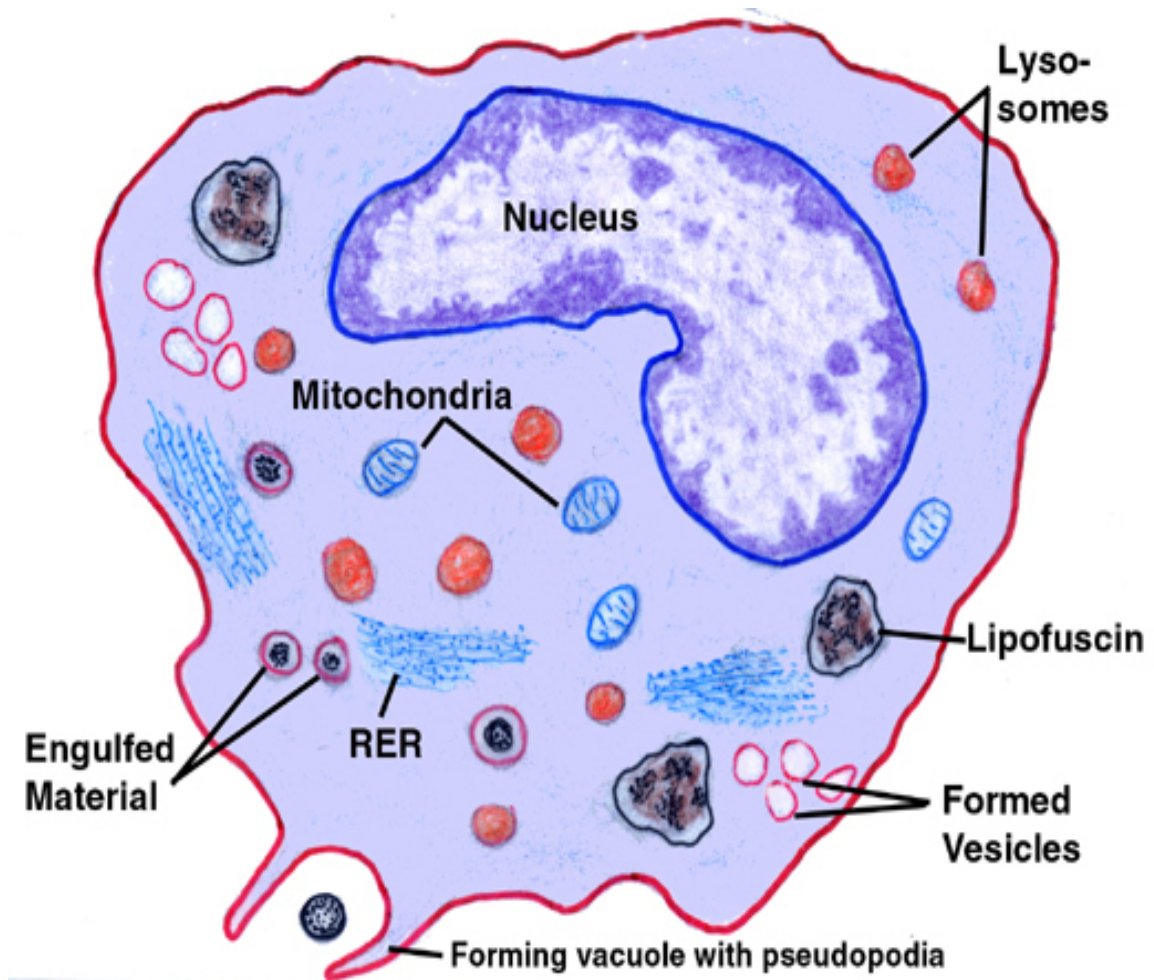
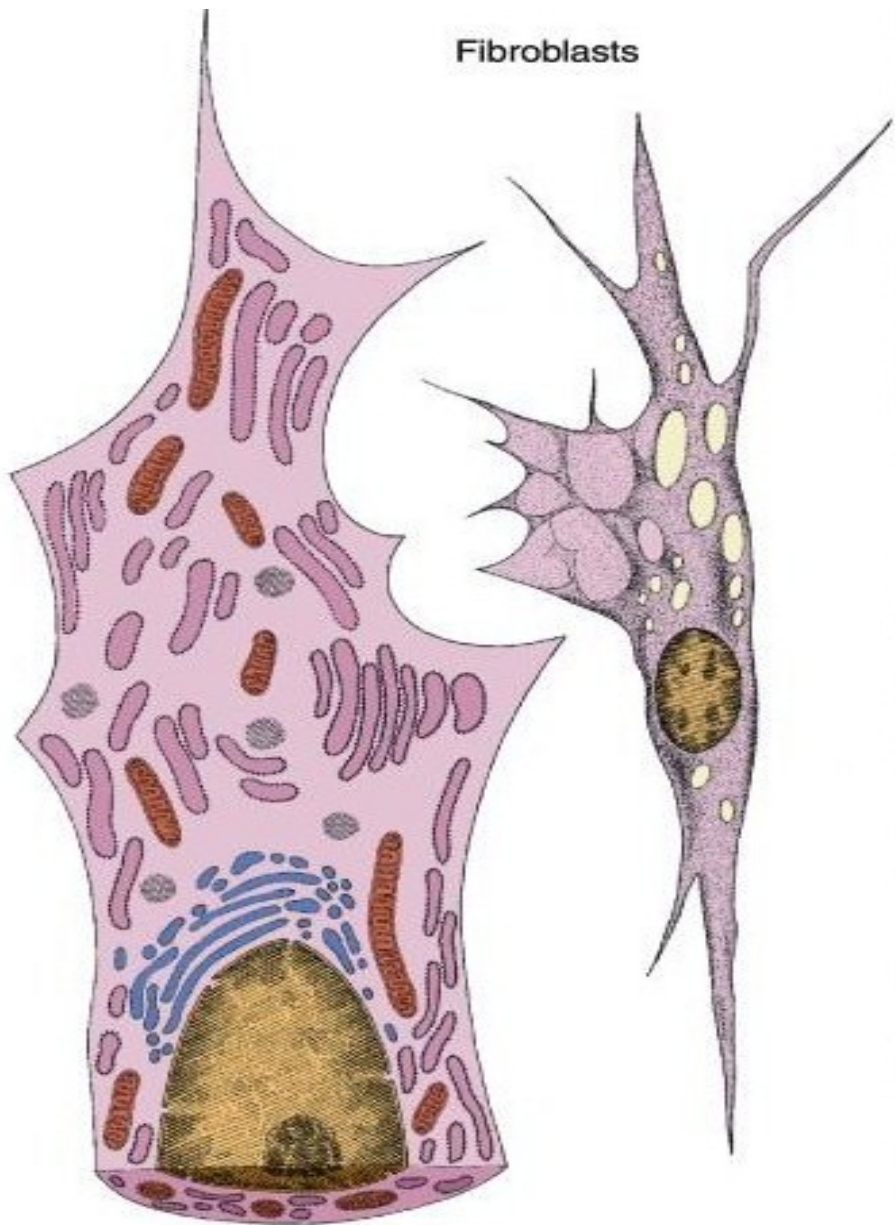
## B. Transient cells

- ▶ They originated in bone marrow then migrate from blood to connective tissues such as:
- ▶ Plasma cells, some macrophages and blood Leukocytes (Neutrophils, eosinophils and basophils).

# CONNECTIVE TISSUE CELLS

- ❖ **Fibroblasts**: Secrete both fibers and ground substance of the matrix
- ❖ **Macrophages**: Phagocytes that develop from Monocytes
- ❖ **Plasma Cells**: Antibody secreting cells that develop from B Lymphocytes
- ❖ **Mast Cells**: Produce histamine that help dilate small blood vessels in reaction to injury .
- ❖ **Adipocytes**: Fat cells that store triglycerides, support, protect and insulate
- ❖ **Pigment cell**: They are small cells with many branching processes. The nucleus is small and rounded, they carry melanin pigments.

Fibroblasts





Connective tissue cells

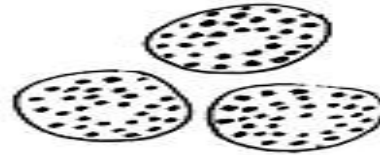
**Undifferentiated mesenchymal cell**



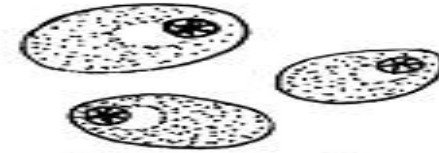
**Fibroblasts and fibrocytes**



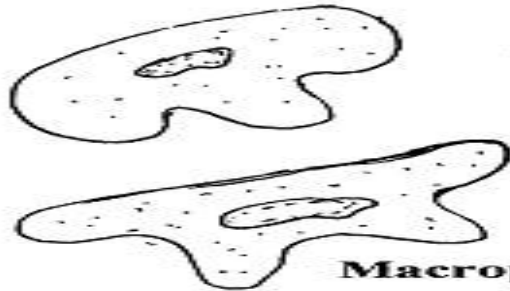
**Adipose (fat) cells**



**Mast cells**



**Plasma cells**



**Macrophages**

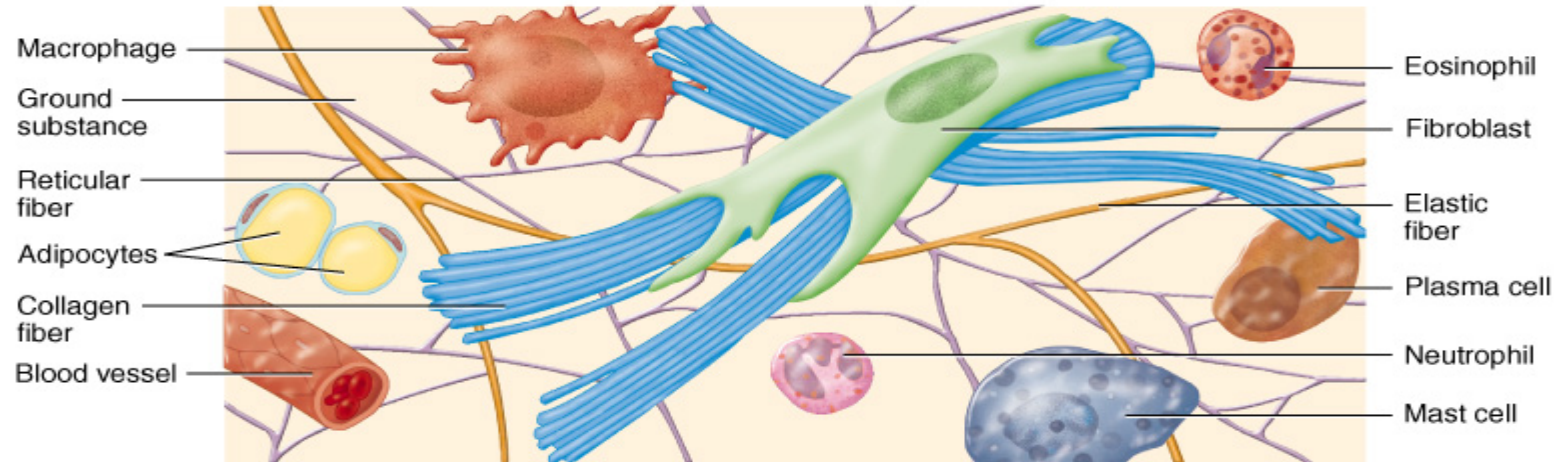
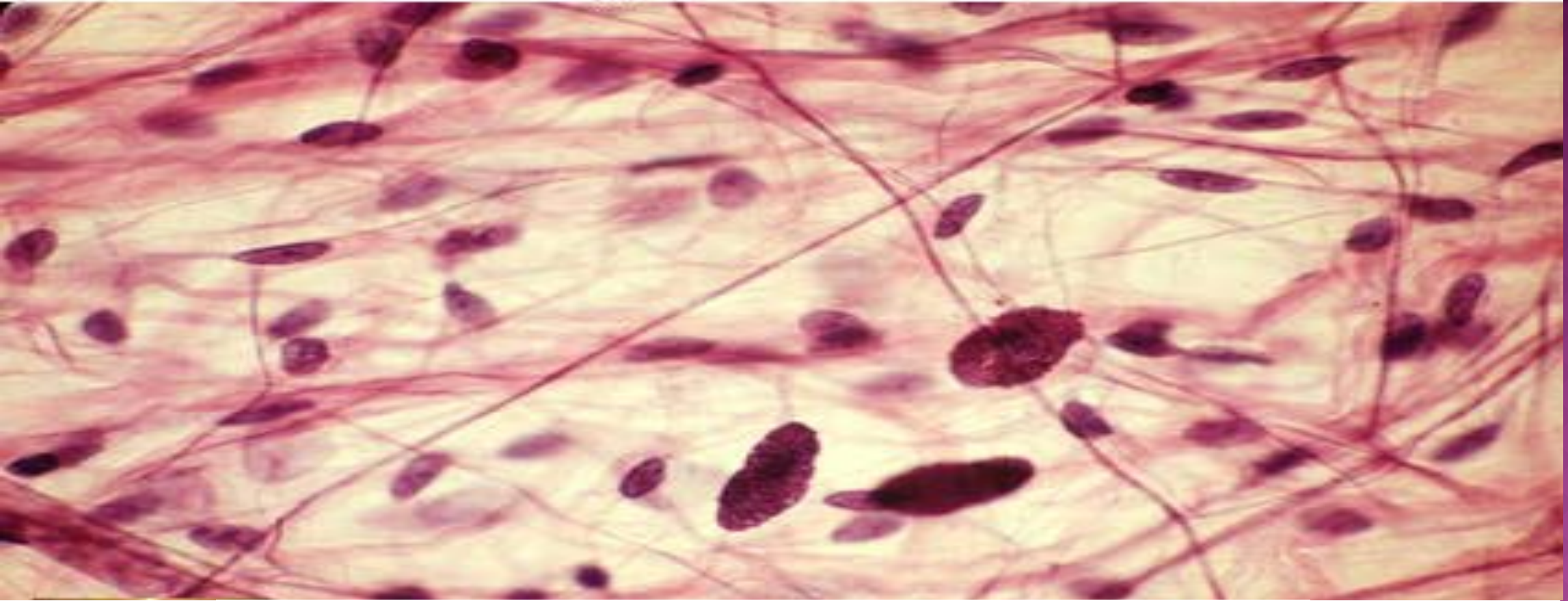


**neutrophils**



**eosinophils**





# EXTRACELLULAR MATRIX

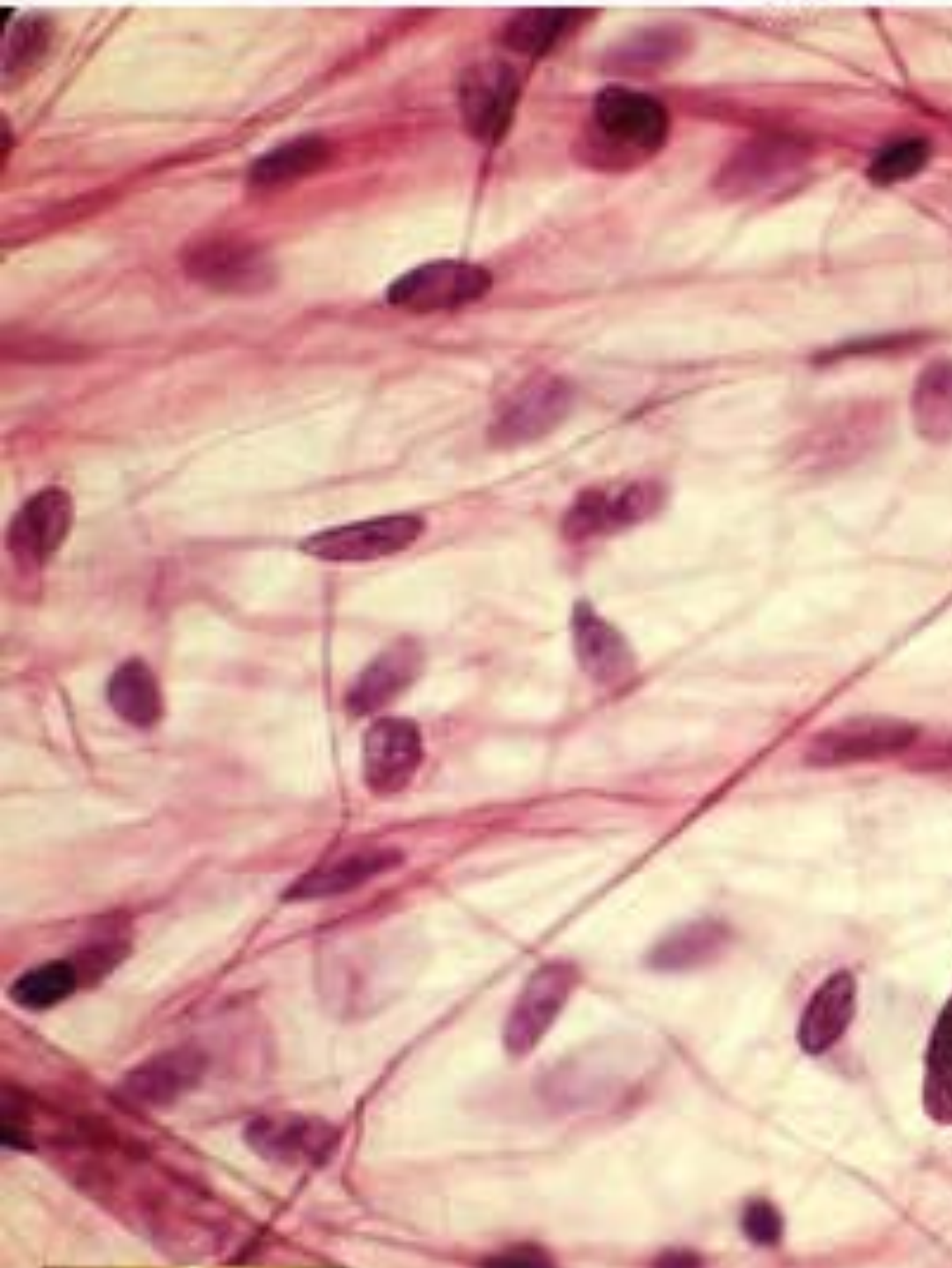
## A- Connective tissue fibers:

- 1- Collagen fibers.
- 2- Elastic fibers.
- 3- Reticular fibers.



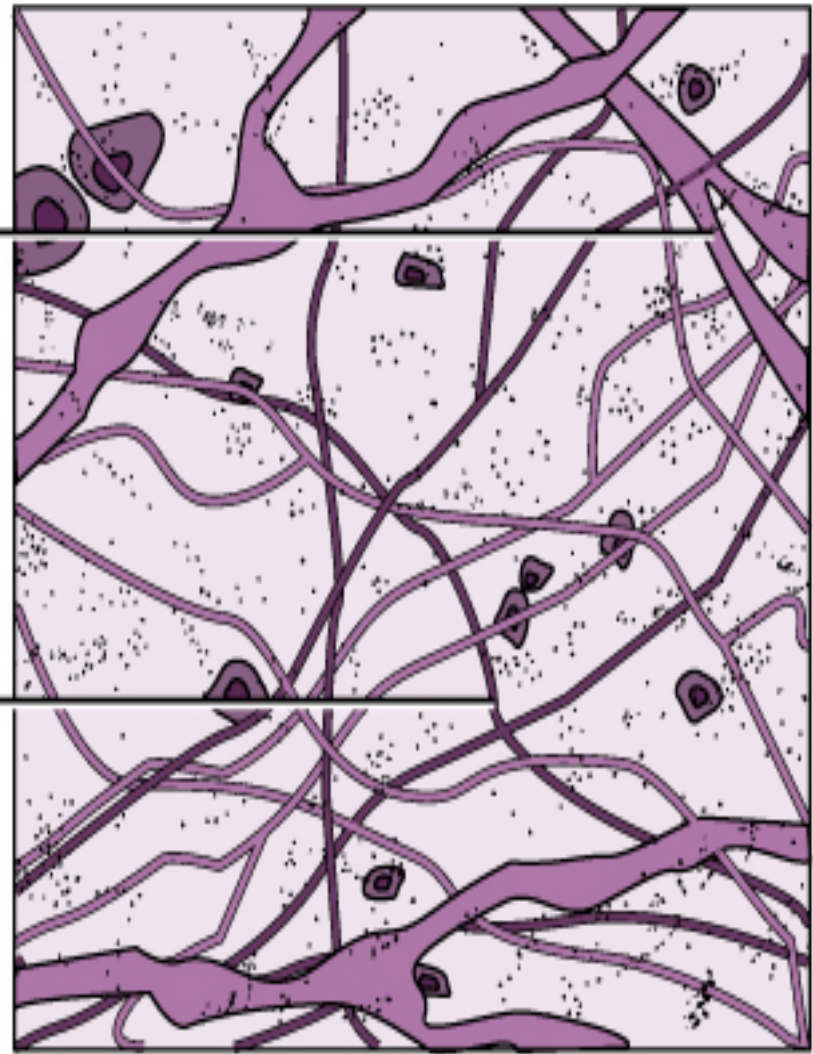
# 1-COLLAGEN FIBERS

- ◉ Collagen produced by :
- ◉ Fibroblast, chondroblast, osteoblast and cementoblast in tooth produce **collagen type I**.
- ◉ Smooth muscle, reticular and Schwann cell in nervous tissue, hepatocytes form **collagen type III**.
- ◉ Endothelial, epithelial cells, muscle and Schwann cells form **collagen type IV**.



Collagen  
fibers

Elastic  
fibers

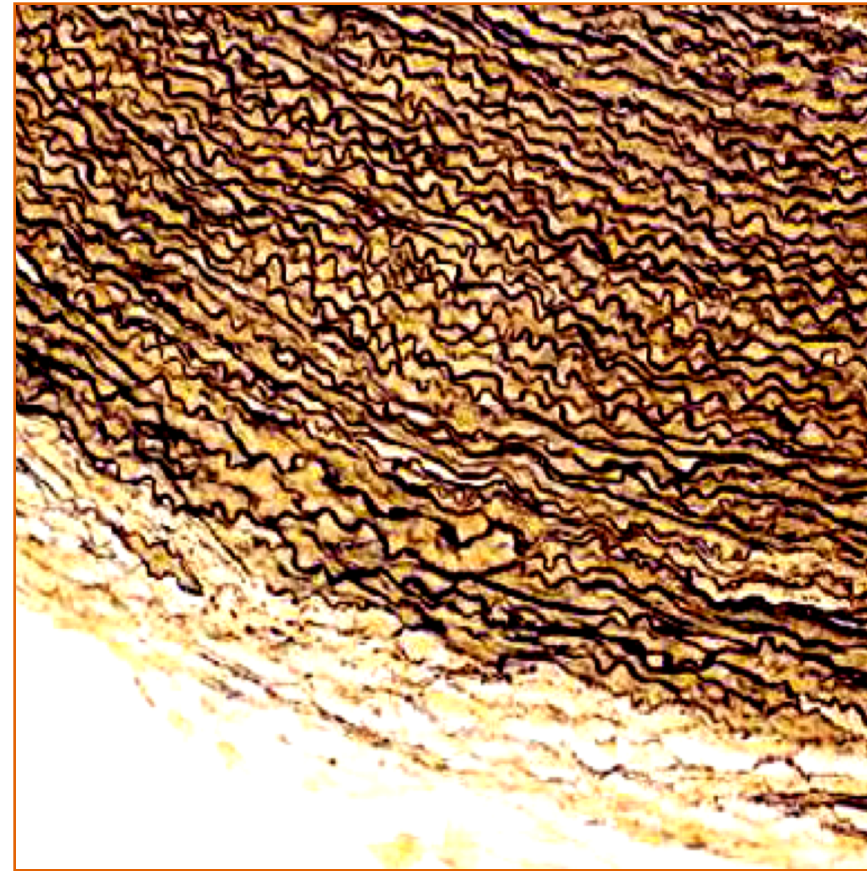
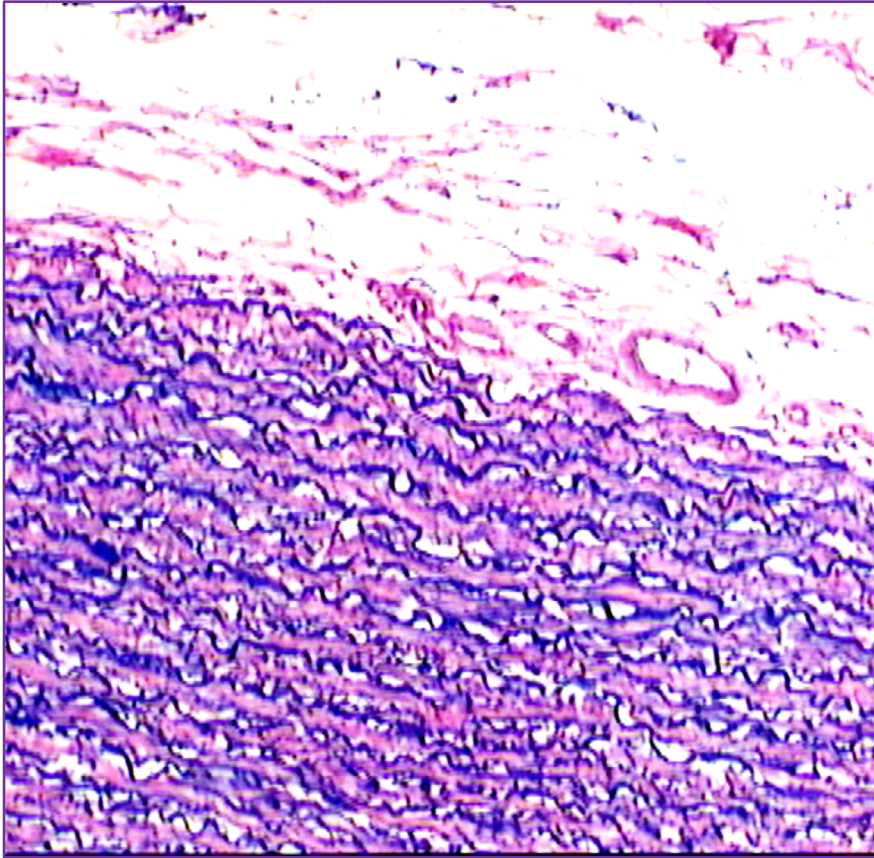


Areolar connective tissue

## 2- ELASTIC FIBERS ( YELLOW FIBERS):

- ◉ Appeared yellow in fresh state.
- ◉ formed of a protein called **elastin**.
- ◉ Not form bundles.
- ◉ Its fibers are fine and highly branched.
- ◉ It is very stretchable (elastic) fibers.
- ◉ Return into their original length after stretching.
- ◉ It is synthesized by smooth muscle fibers and fibroblasts.
- ❖ *By light microscope (LM):*
  - ◉ By H &E stain (refractile pink fibers).
  - ◉ By Orcein stain (Brown fibers).
  - ◉ By Van Gieson stain (yellow).
- ❖ *Sites:*  
Lung , skin, aorta and some ligament.





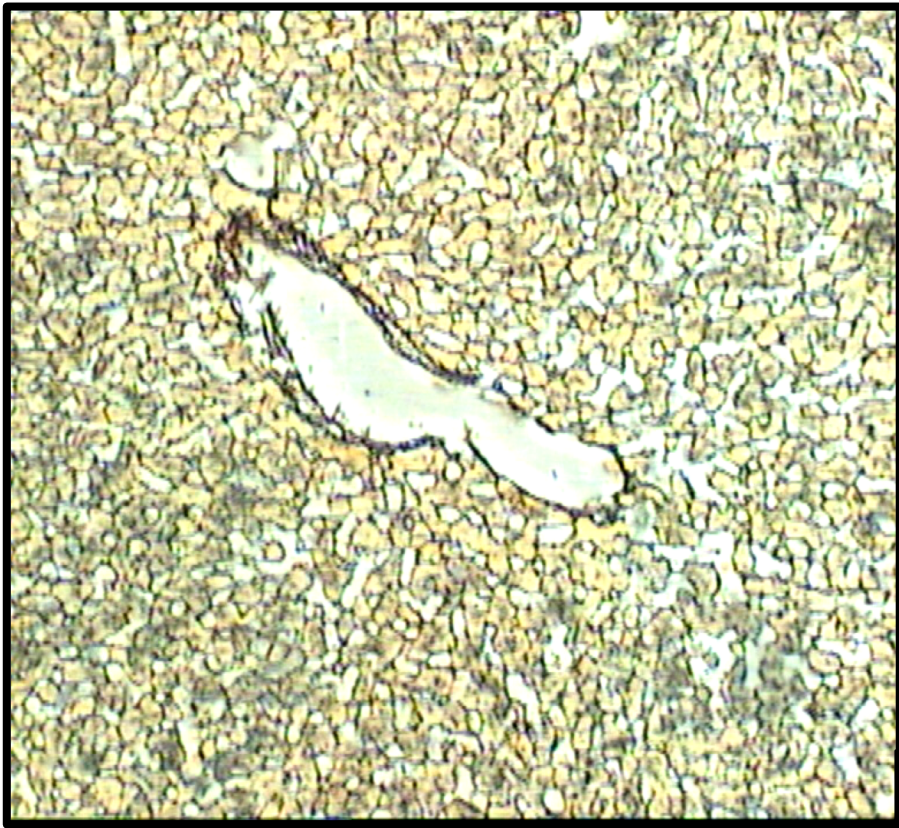
### **ELASTIC FIBERS:**

- a) Thinner than collagen fiber .
- b) Short wavy fibers form continuous lamina.
- c) Stained brown with orcein.
- d) Site : elastic artery .

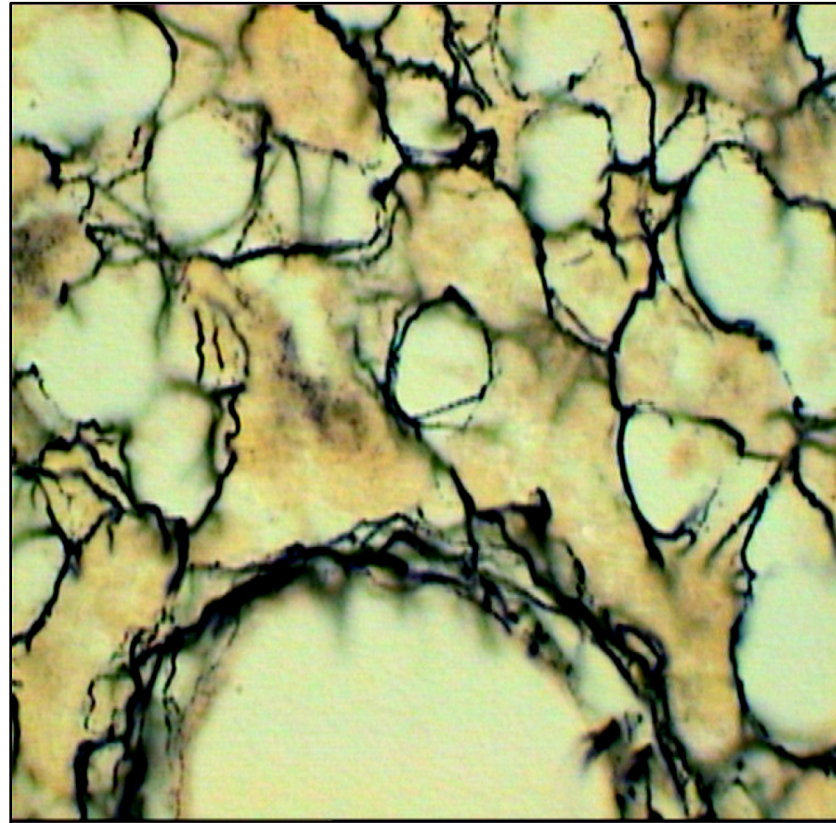
# 3- RETICULAR FIBERS:

- Very thin and highly branched and anastomosed to form delicate network.
- They provide a supporting framework for the cellular constituents of various tissues and organs.
- They are composed mainly of especial type of collagen protein (**Type III & Type IV**).
- ❖ **By light microscope ( LM):**
  - By H &E stain (not visible).
  - By PAS (periodic acid sheif) ( purple red).
  - By Silver stain (**Black**).
- ❖ **Site:**
  - Parenchyma of all endocrine and visceral organs, for example the liver.
  - Parenchyma of lymphatic organs.





X10



X40

### **RETICULAR FIBERS:**

- a) Thin fibers branching & anastomosing forming a network.
- b) Stain black by Silver impregnation .
- c) Site: Support the liver and lymphoid tissues.

## B- GROUND SUBSTANCES

- It is an amorphous substance, present in between the connective tissue cells.
- The connective tissue fibers are embedded in it.
- It is a complex mixture of glycosaminoglycans, glycoproteins and proteoglycans.
- It is colorless, transparent, and homogenous.
- It participates in binding of cells to fibers
- It acts as a barrier and lubricant.
- It is synthesized by fibroblasts.

# CLASSIFICATION OF CONNECTIVE TISSUE

- ◉ A-Connective tissue proper:

- 1- Loose C.T(areolar).

- 2- Dense C.T:

- a) Regular

- b) Irregular



## **B-Connective tissue with special properties:**

- 1- Adipose C.T
- 2- Elastic C.T.
- 3- reticular CT
- 4-Mucous tissue

## **C-Supportive connective tissue:**

### 1-Cartilages:

- 1- Hyaline cartilage
- Elastic cartilage
- Fibro cartilage

### 2-Bones;

- 1- Compact bones
- 2- Cancellous (spongy bone)

# REFERENCES

- Jonquiere's Basic Histology Text and Atlas 13th Edition.
- <http://www.histologyguide.com/about-us/license.html>
- <https://courses.lumenlearning.com/boundless-ap/chapter/connective-tissue/>

*Thank You!*