Connective tissue

- Most diverse and abundant tissue
- Main classes:
  - General connective tissue or connective tissue proper
  - Specialized connective tissue:
    - Blood
    - Cartilage
    - Bone tissue

Components of connective tissue:

1. **Cells** (varies according to tissue)
2. **Matrix**
   A. Fibers (varies according to tissue: collagen, elastic, and reticular fibers.)
   B. Ground substance (varies according to tissue)
      - dermatin sulfate, hyaluronic acid, keratin sulfate, chondroitin sulfate…

➢ Common embryonic origin – mesenchyme

Classes of Connective Tissue

Common embryonic origin:	**Mesenchyme**			
Cellular descendants:	**Fibroblast**	**Chondroblast**	**Osteoblast**	**Hematopoietic stem cell**
	Fibrocyte 	**Chondrocyte** 	**Osteocyte** 	**Blood cells* (and macrophages)** 
Class of connective tissue resulting:	**Connective tissue proper**	**Cartilage**	**Osseous (bone)**	**Blood**
Subclasses:	**1.** Loose connective tissue Types: Areolar, Adipose, Reticular **2.** Dense connective tissue Types: Regular, Irregular, Elastic	**1.** Hyaline cartilage **2.** Fibrocartilage **3.** Elastic cartilage	**1.** Compact bone **2.** Spongy (cancellous) bone	** Blood cell formation and differentiation are quite complex. Details are provided in Chapter 17.*

Connective Tissue Proper

- Loose Connective Tissue
  - Areolar
  - Reticular
  - Adipose
- Dense Connective Tissue
  - Regular
  - Irregular
  - Elastic

Areolar connective tissue

- Description
  - Gel-like matrix with:
    - All three **fiber** types (collagen, reticular, elastic) for support.
    - **Ground substance** is made up by glycoproteins also made and secreted by the fibroblasts.
    - **Cells** – fibroblasts, macrophages, mast cells, white blood cells.

Areolar connective tissue

- Underlies epithelial tissue.
- Surrounds small nerves and blood vessels.
- Has structures and functions shared by other connective tissues.
- Borders all other tissues in the body .

Areolar connective tissue

Function

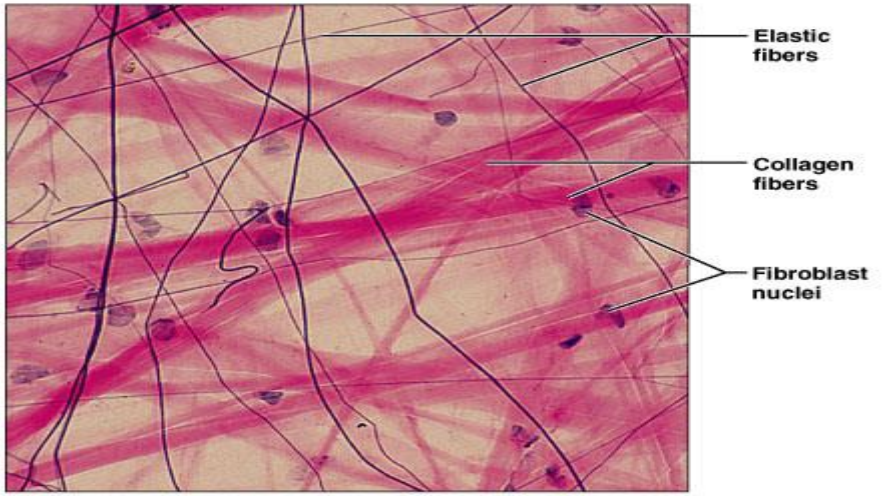
- Support, wraps and cushions organs.
- Holds and conveys body fluid.
- Important role in inflammation ,main battlefield in fight against infection.
- Storing nutrients as fat

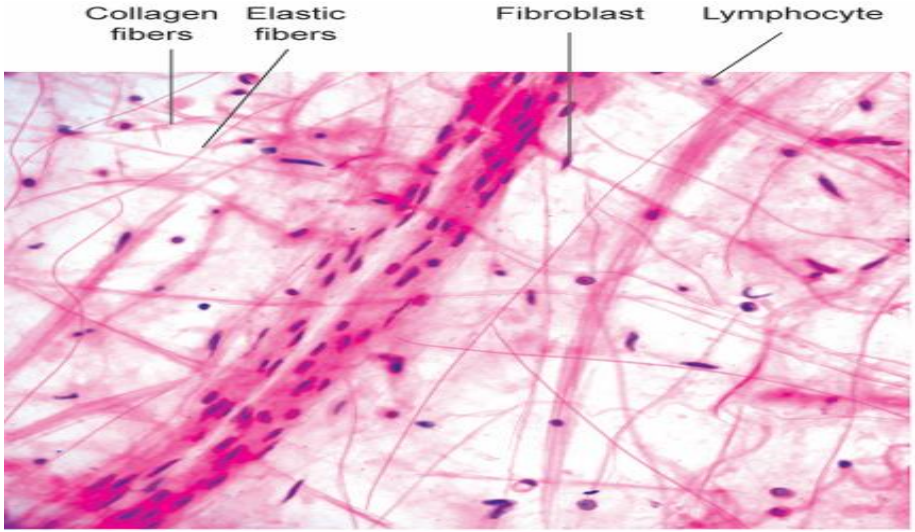
- Defenders gather at infection sites
  - Macrophages
  - Plasma cells
  - Mast cells
  - Neutrophils, lymphocytes, and eosinophils

Areolar connective tissue

Location

- Widely distributed under epithelia
- Packages organs
- Surrounds capillaries





Adipose Tissue

Description

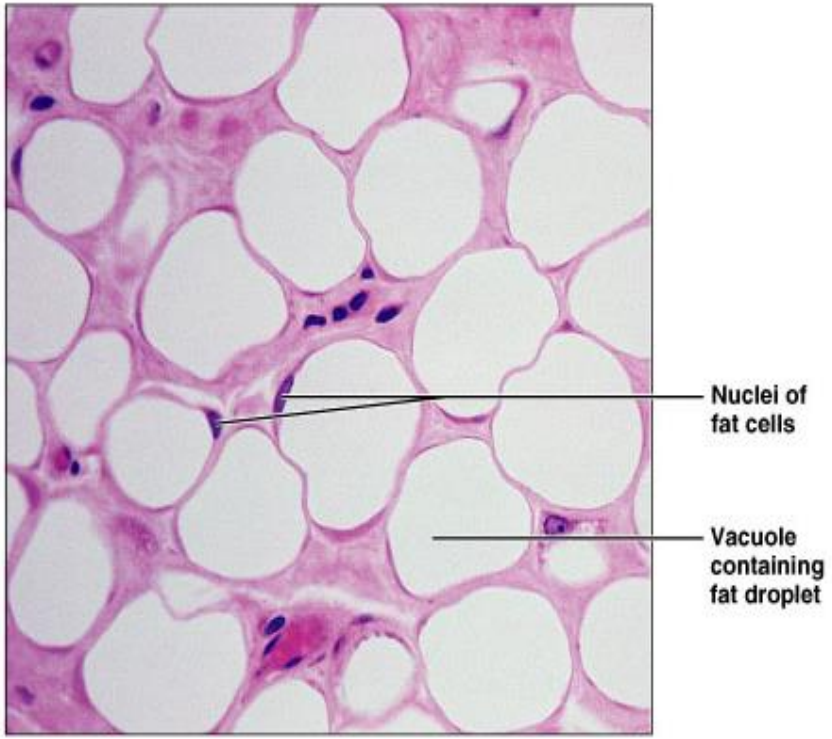
- Closely packed adipocytes
- Have nucleus pushed to one side by fat droplet

Locations

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

Functions

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



Reticular Connective Tissue

Description

- Network of reticular fibers in loose ground substance

Location

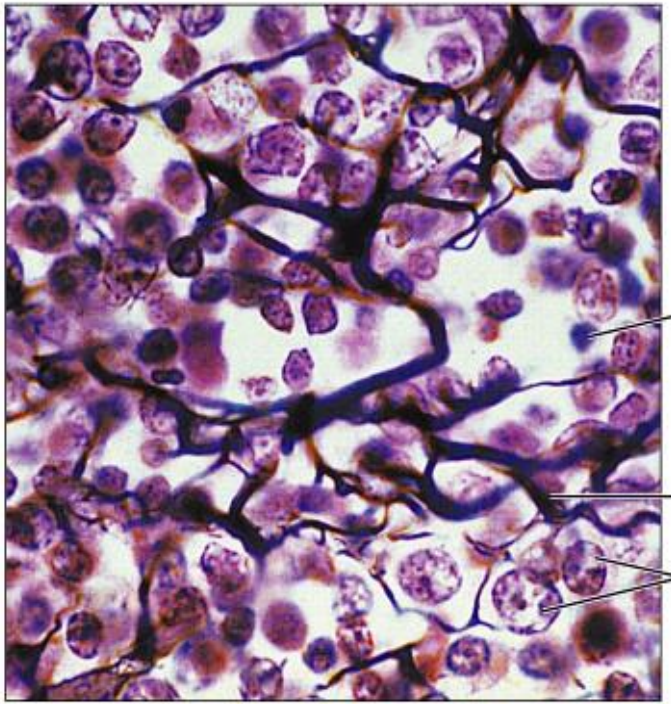
- lymphoid organs

  Lymph nodes,

- bone marrow, and spleen.

Function

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



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

Dense Regular Connective Tissue

Description

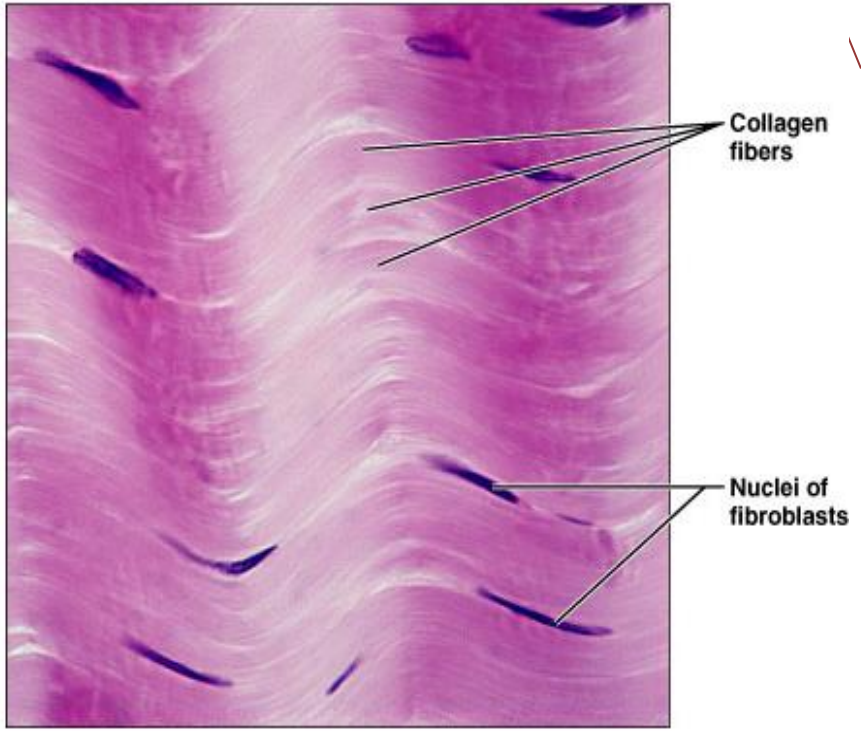
- Primarily *parallel* collagen fibers
- Fibroblasts and some elastic fibers
- Poorly vascularized

Location

- Tendons and ligaments
- Aponeuroses
- Fascia around muscles

Function

- Attaches muscle to bone
- Attaches bone to bone
- Withstands great stress in one direction



Cartilage

Characteristics:

- Firm, flexible tissue
- Contains no blood vessels or nerves
- Matrix contains up to 80% water
- Cell type – chondrocyte

Types:

- Hyaline
- Elastic
- Fibrocartilage

Hyaline Cartilage

Description

- Imperceptible collagen fibers (hyaline = glassy)
- Chodroblasts produce matrix
- Chondrocytes lie in lacunae

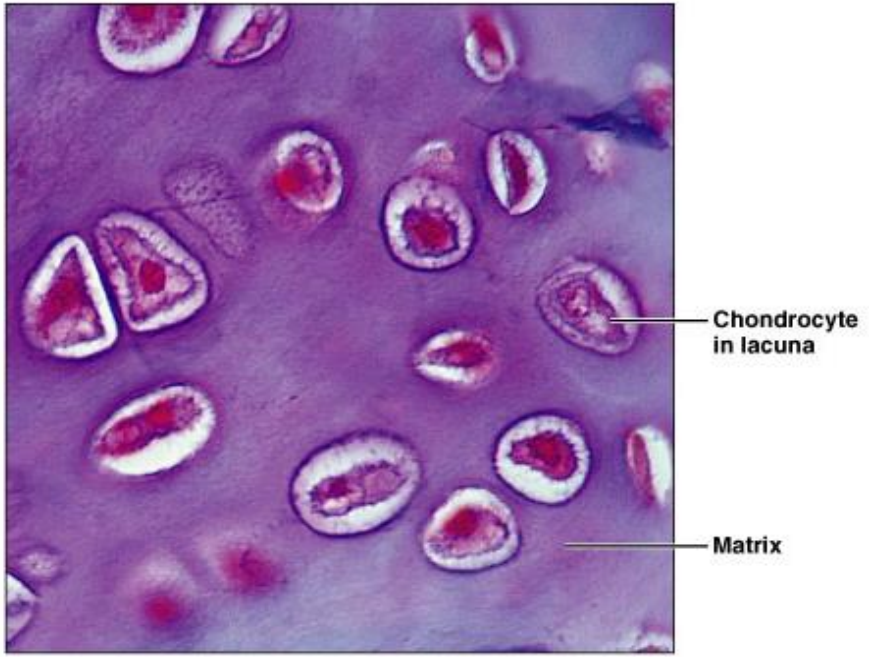
Function

- Supports and reinforces
- Resilient cushion
- Resists repetitive stress

Hyaline Cartilage

Location

- Fetal skeleton
- Ends of long bones
- Costal cartilage of ribs
- Cartilages of nose, trachea, and larynx



Photomicrograph: Hyaline cartilage from the trachea (300×).

Elastic Cartilage

Description

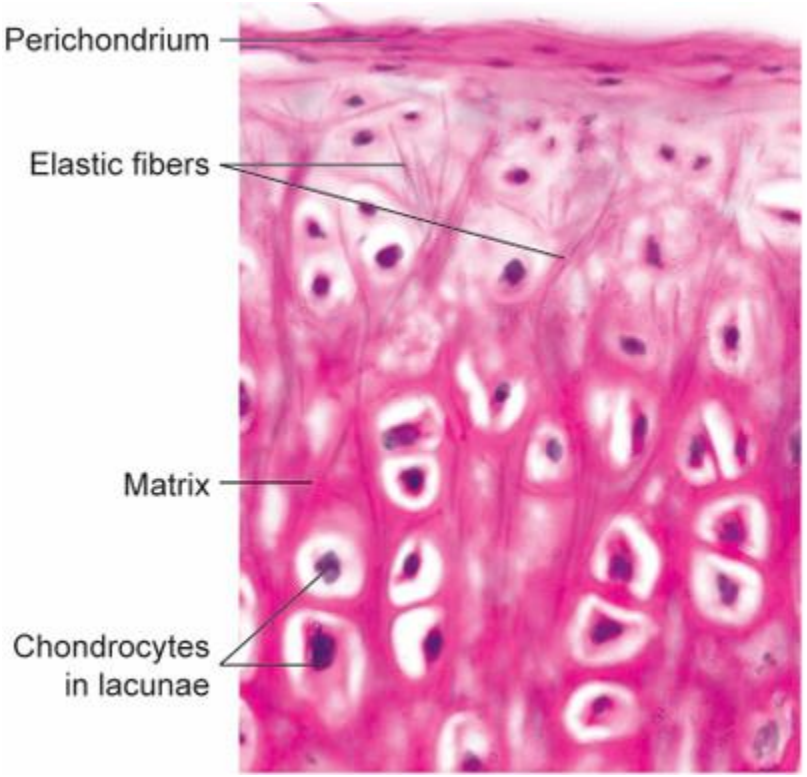
- Similar to hyaline cartilage
- More elastic fibers in matrix

Location

- Supports external ear
- Epiglottis

Function

- Maintains shape of structure
- Allows great flexibility



Fibrocartilage

Description

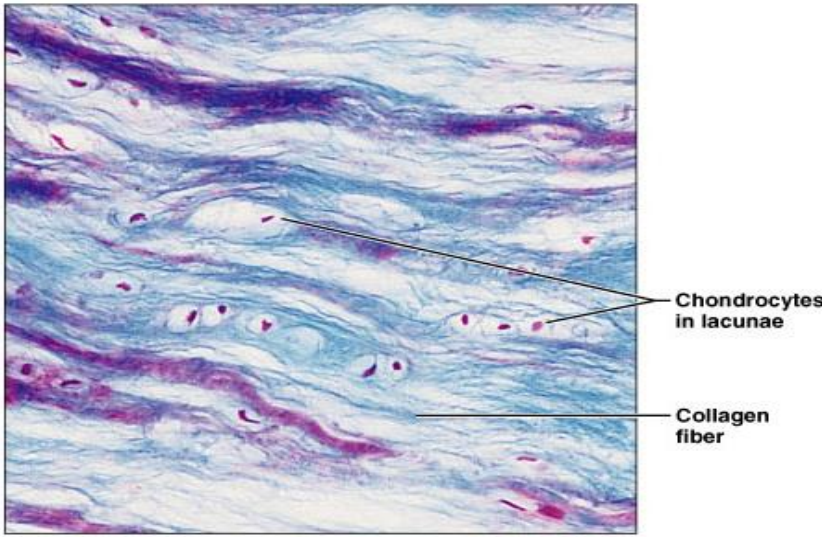
- Matrix similar, but less firm than hyaline cartilage
- Thick collagen fibers predominate

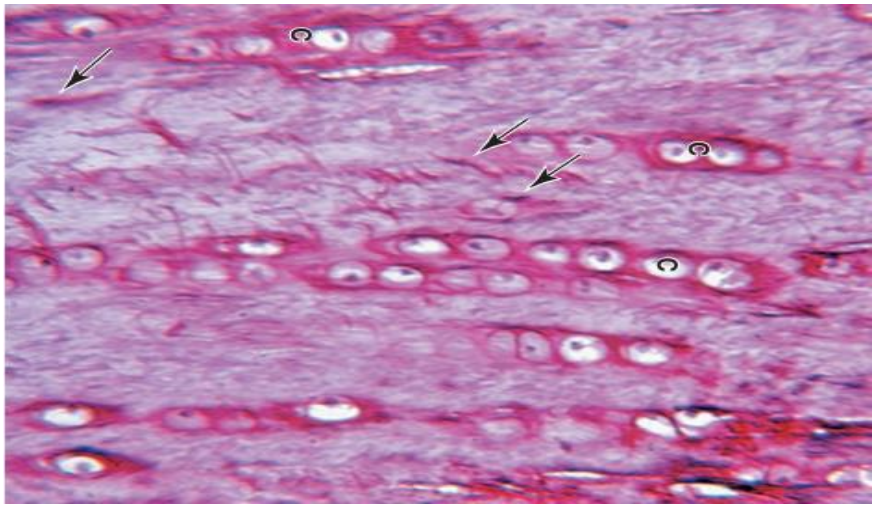
Location

- Intervertebral discs
- Pubic symphysis
- Discs of knee joint

Function

- Tensile strength and ability to absorb compressive shock





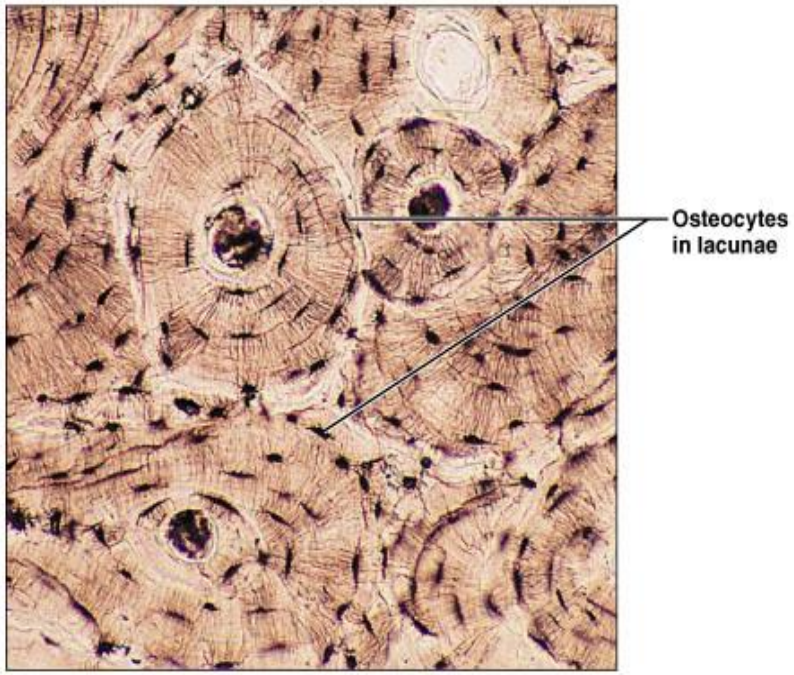
Bone Tissue

Location

- Bones

Function

- Supports and protects organs
- Provides levers and attachment site for muscles
- Stores calcium and other minerals
- Stores fat
- Marrow is site for blood cell formation



Blood Tissue

Description

- red and white blood cells in a fluid matrix

Location

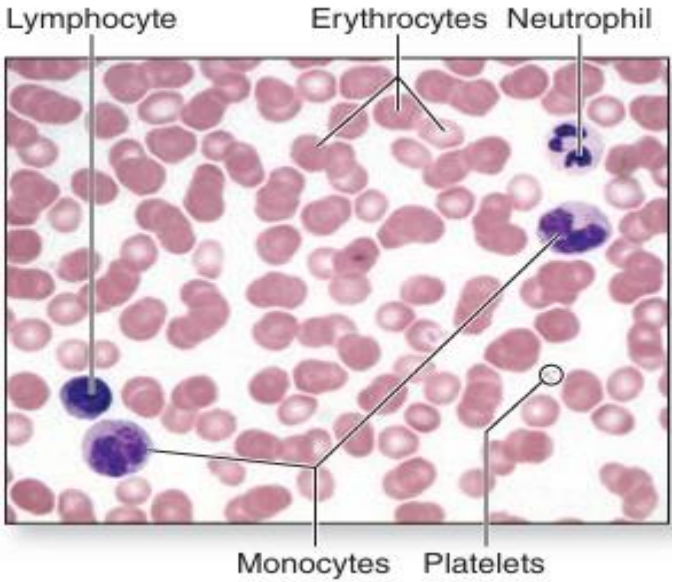
- within blood vessels

Function

- transport of respiratory gases, nutrients, and wastes

Characteristics

- An atypical connective tissue
- Develops from mesenchyme
- Consists of cells surrounded by nonliving matrix



Thank you