Characteristics of Connective Tissue

- Found everywhere in the body to connect body parts
- Includes the most abundant and widely distributed tissues
- Functions:
  - **Protection**
  - **Support**
  - **Binding**

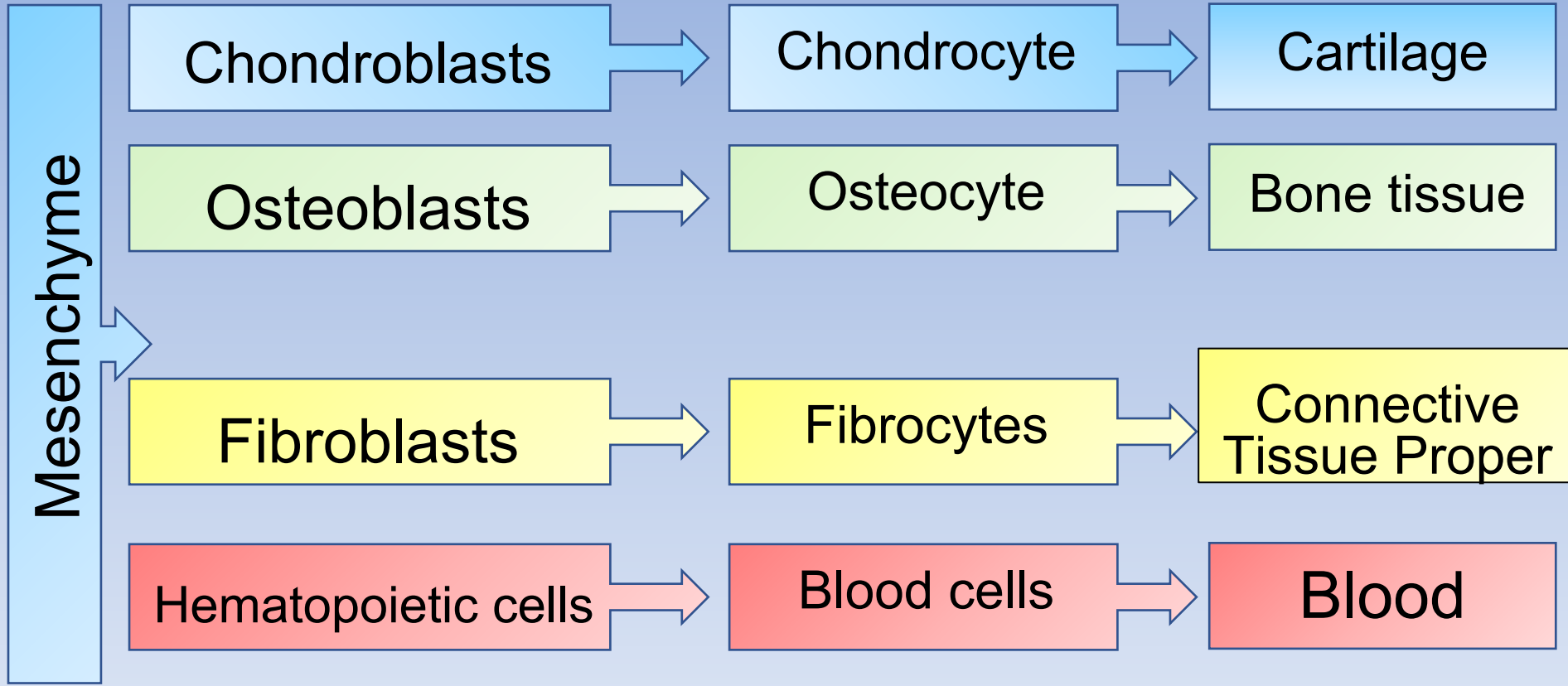
Characteristics of Connective Tissue

- Variations in **blood supply**
  - Some tissue types are well vascularized
  - Some have a poor blood supply or are avascular
- Formed from **mesenchymal stem cells** (stems cells that differentiate to make many different cell types)

Characteristics of Connective Tissue

- **Extracellular matrix**
  - Nonliving material that surrounds living cells
  - Two main elements of the extracellular matrix:
    1. **Ground substance-** mostly water, along with adhesion proteins and polysaccharide molecules
    2. **Fibers**
        a. **Collagen** (white) fibers
        b. **Elastic** (yellow) fibers
        c. **Reticular types** (a type of collagen)

Each type of connective tissue is formed from a special type of stem cell:



Types of Connective Tissue

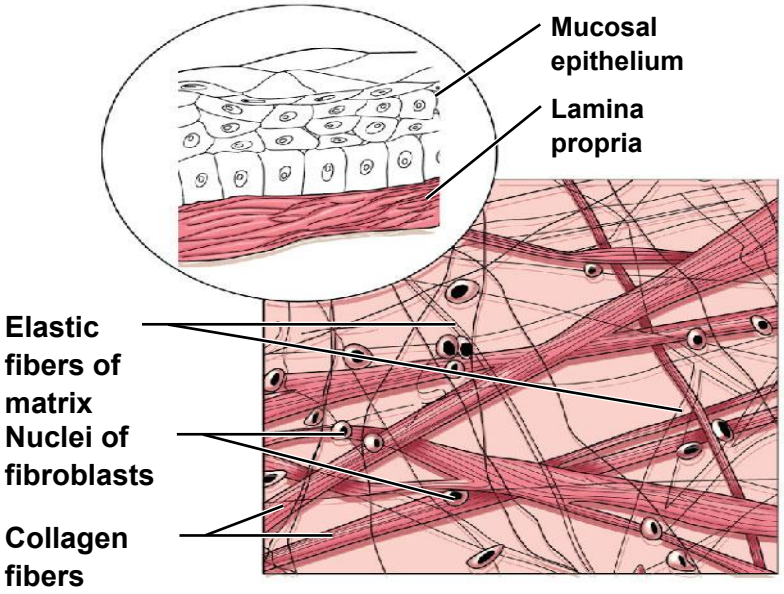
- Types of connective tissue from most rigid to softest, or most fluid:
  - **Bone**
  - **Cartilage**
  - **Dense connective tissue**
  - **Loose connective tissue**
  - **Blood**

Connective Tissue Proper

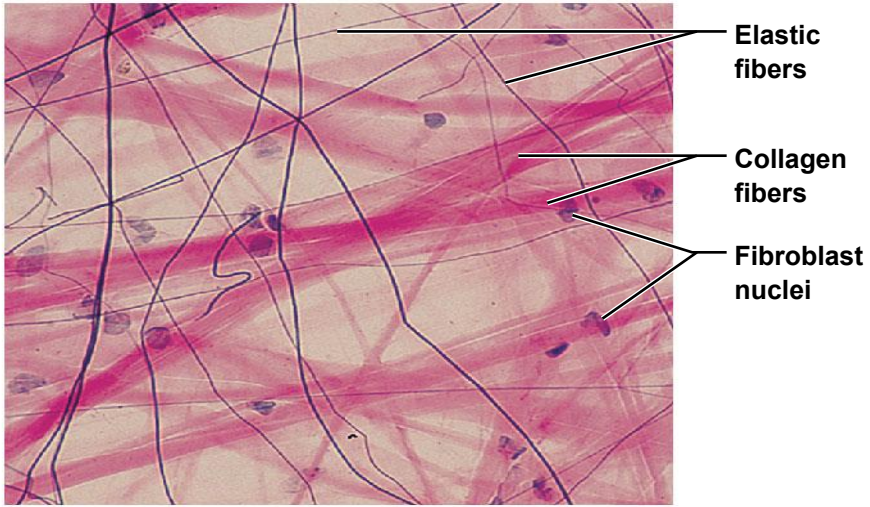
- **Loose** connective tissue
  - Gel-like, have lots of cells, and fewer fibers
  - Types
    - **Areolar**
    - **Adipose**
    - **Reticular**

Connective Tissue Proper

- Areolar (Loose)
  - Structure: Gel-like ground substance with collagen and elastic fibers
  - Function: Wraps and cushions organs
  - Location: Widely distributed under epithelium; Packages organs



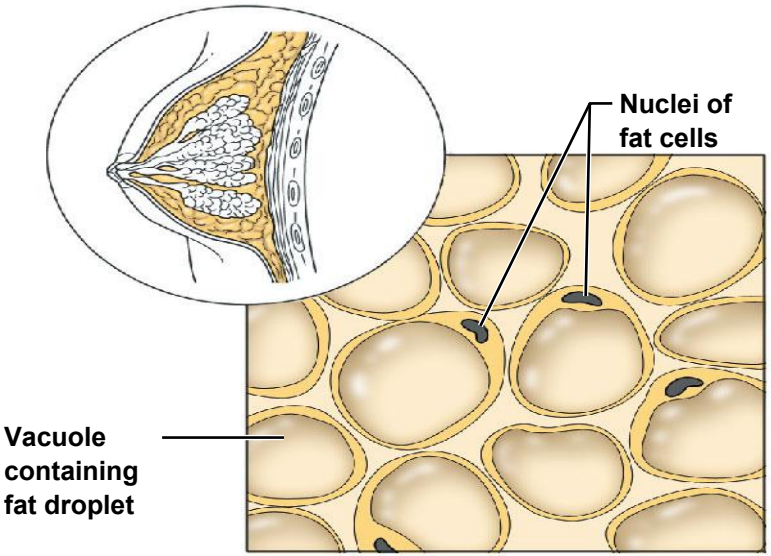
(e) Diagram: Areolar



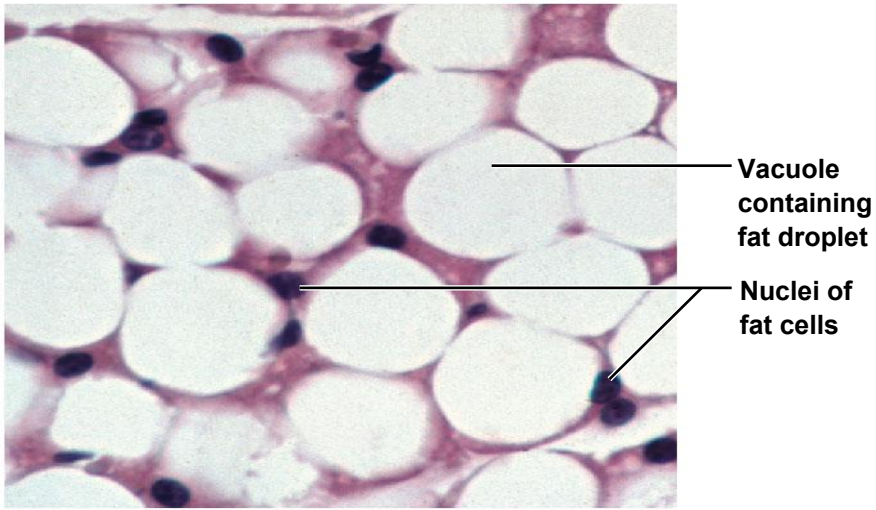
Photomicrograph: Areolar connective tissue, a soft packaging tissue of the body (270×).

Connective Tissue Proper

- Adipose (Loose)
  - Structure: Large vacuoles filled with oil droplets
  - Functions: Protects, Insulates, Provides fuel storage
  - Locations: Subcutaneous layer under skin, abdomen, and breasts



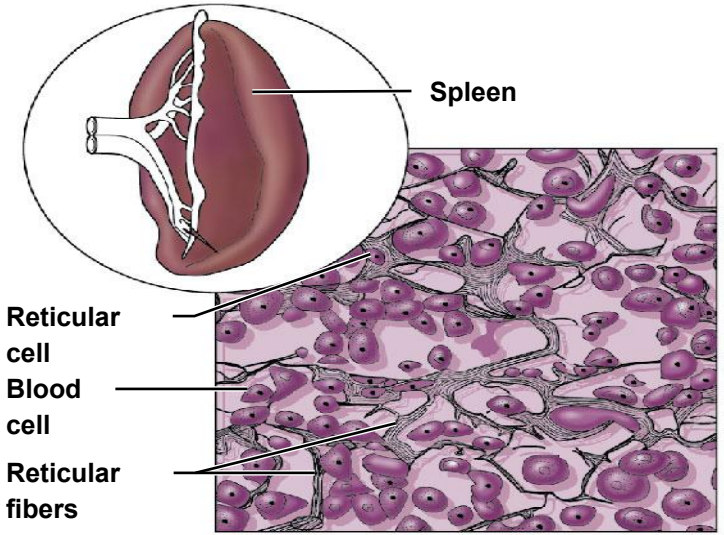
(f) Diagram: Adipose



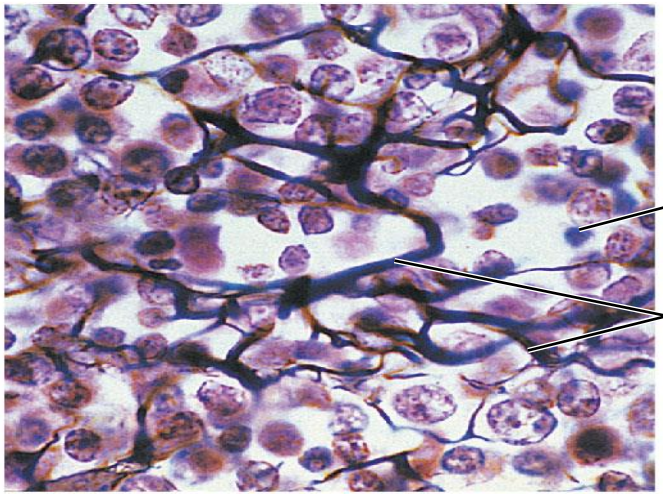
Photomicrograph: Adipose tissue from the subcutaneous layer beneath the skin (570×).

Connective Tissue Proper

- Reticular (Loose)
  - Structure: Thin branched network of fibers
  - Function: Forms internal framework of organs
  - Locations: Lymph nodes, Spleen, Bone marrow



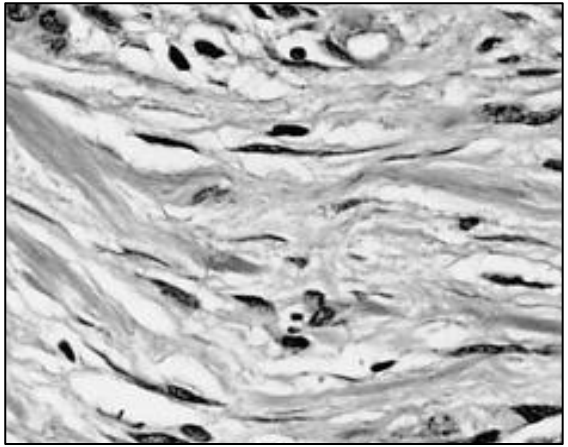
(g) Diagram: Reticular



Photomicrograph: Dark-staining network of reticular connective tissue (400×).

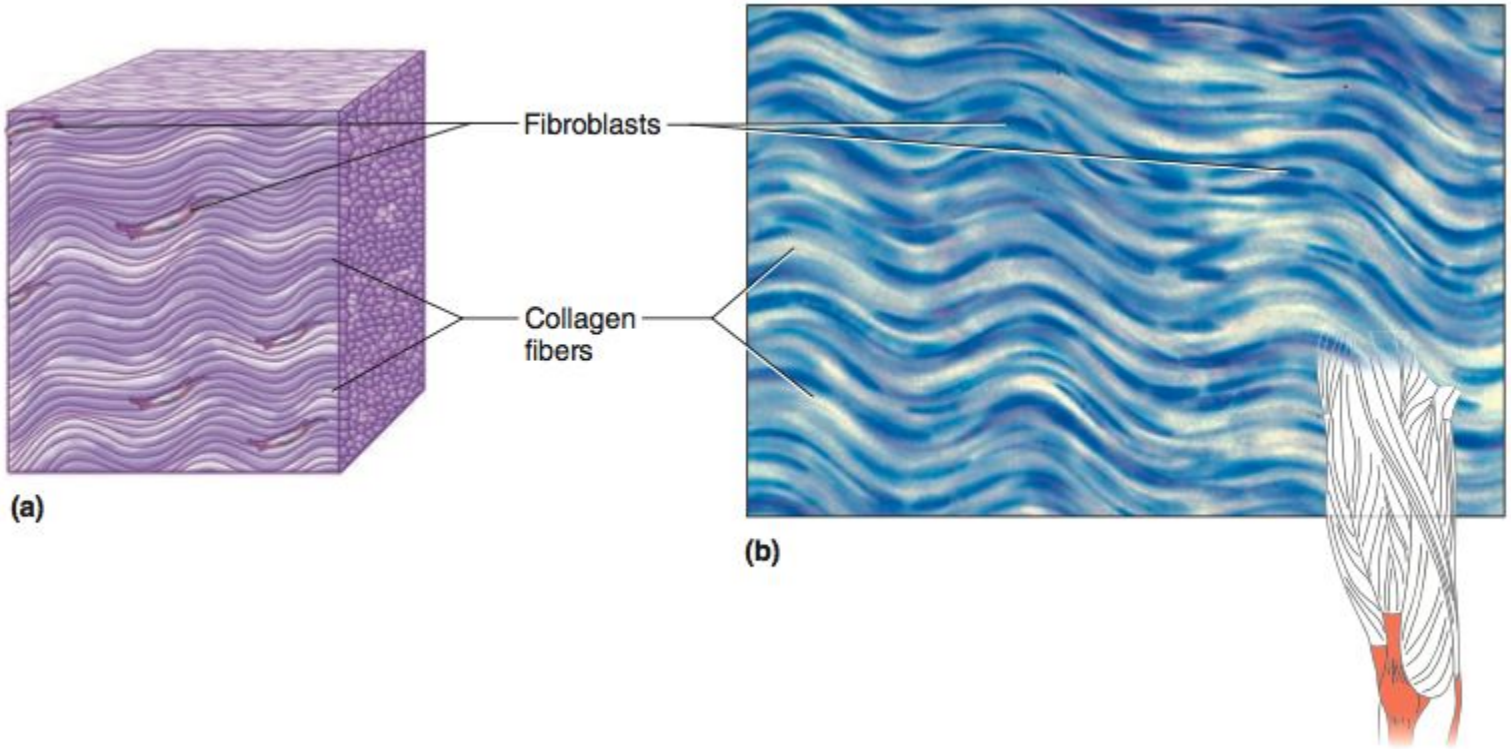
Connective Tissue Proper

- **Dense** connective tissue
  - Many fibers, strong
  - Types:
    - **Regular**
    - **Irregular**
    - **Elastic**



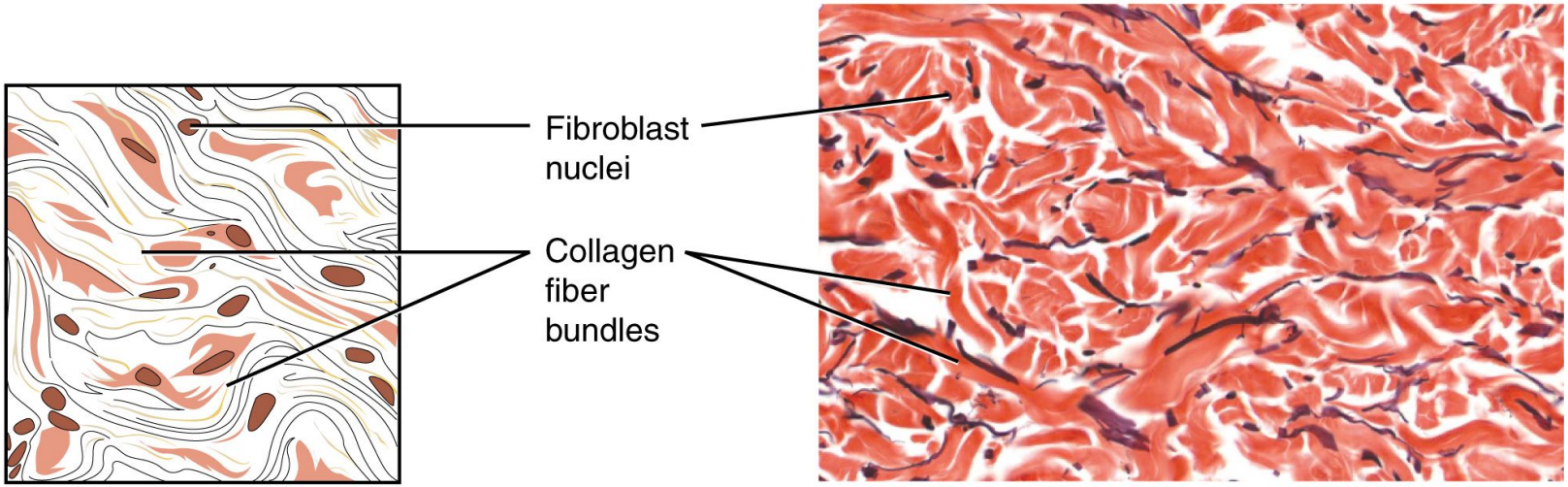
Connective Tissue Proper

- Dense Regular
  - Structure: Closely packed network of collagen and elastic fibers
  - Function: Attach muscle to bone or bone to bone
  - Location: Tendons and Ligaments


Fibroblasts
Collagen fibers
(a)
(b)

Connective Tissue Proper

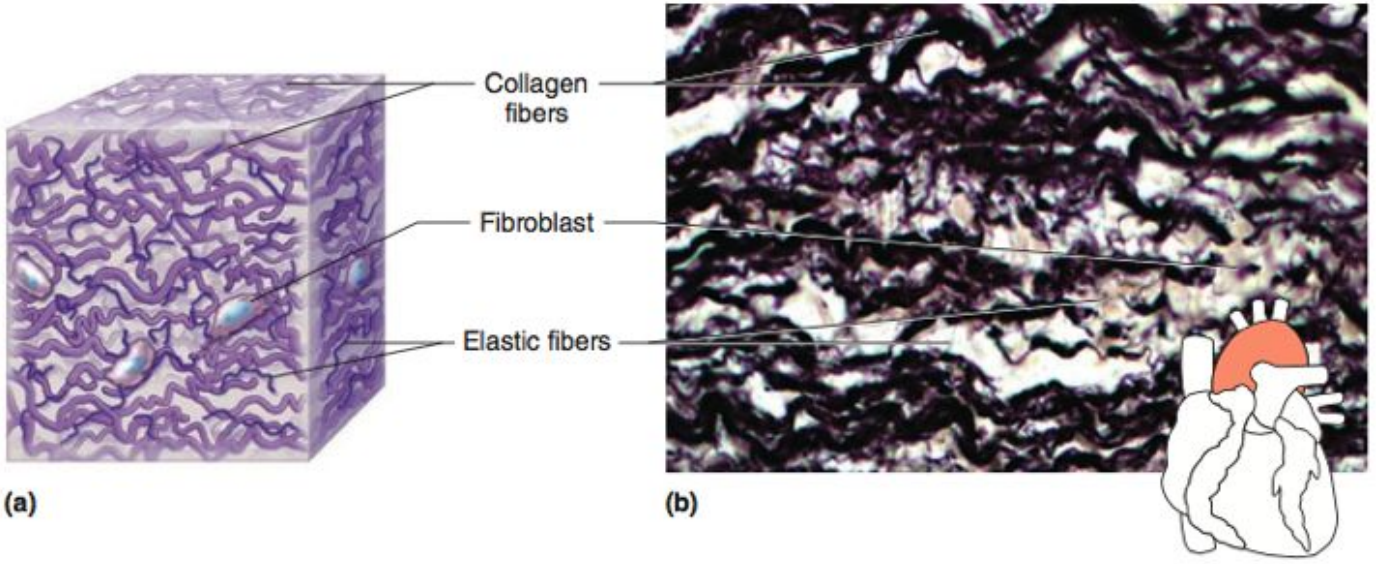
- Dense Irregular
  - Structure: Irregularly arranged collagen fibers
  - Function: Withstands tension in many directions
  - Location: Dermis of the skin



(b) Irregular dense

Connective Tissue Proper

- Dense Elastic
  - Structure: Many elastic fibers with collagen fibers between them
  - Function: Provides elastic quality
  - Location: Walls of arteries and airways

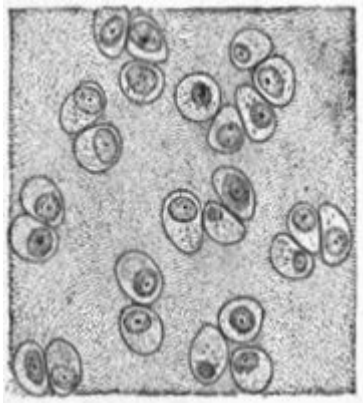

Collagen fibers
Fibroblast
Elastic fibers
(a)
(b)

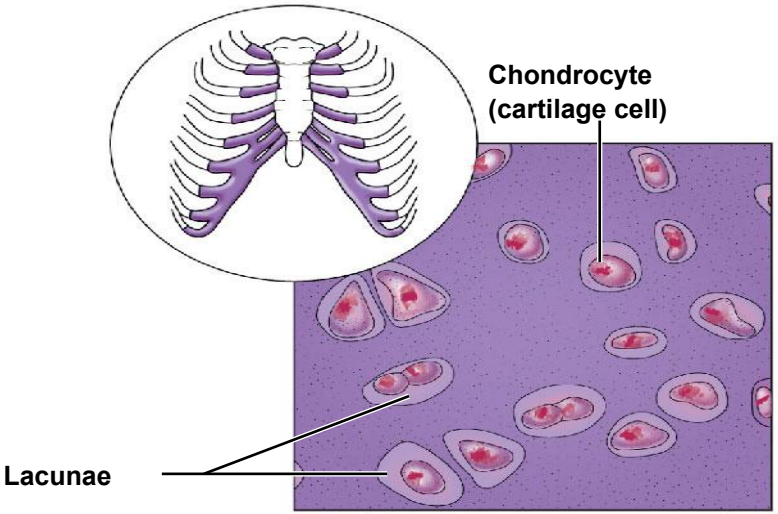
Types of Connective Tissue

- Cartilage
  - Less hard and more flexible than bone
  - Types
    - **Hyaline cartilage**
    - **Fibrocartilage**
    - **Elastic cartilage**

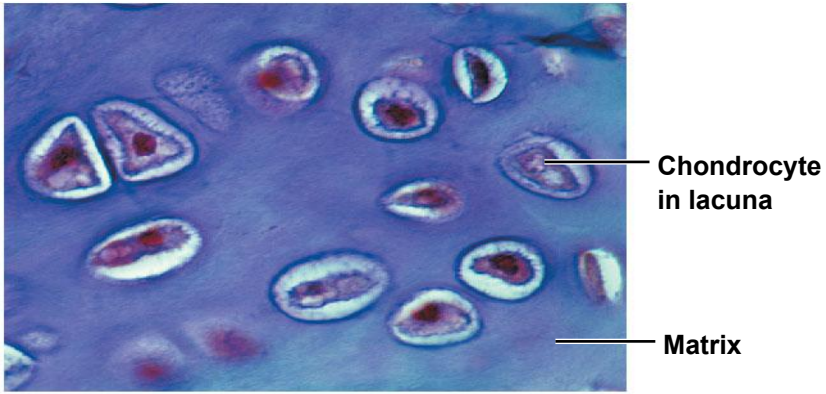
Types of Connective Tissue

- Hyaline cartilage
  - Structure: Glassy matrix that hides collagen fibers; Chondrocytes in lacunae
  - Function: Supports and reinforces
  - Locations: End of long bones, trachea, nose, and ribs





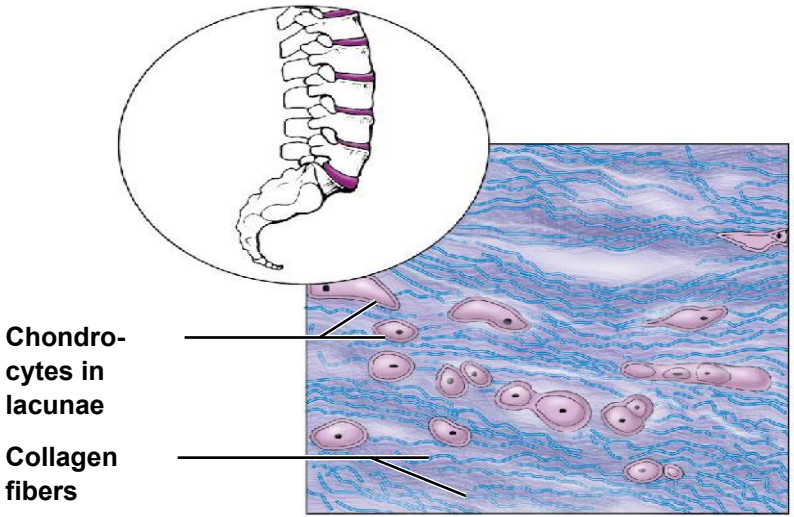
(b) Diagram: Hyaline cartilage



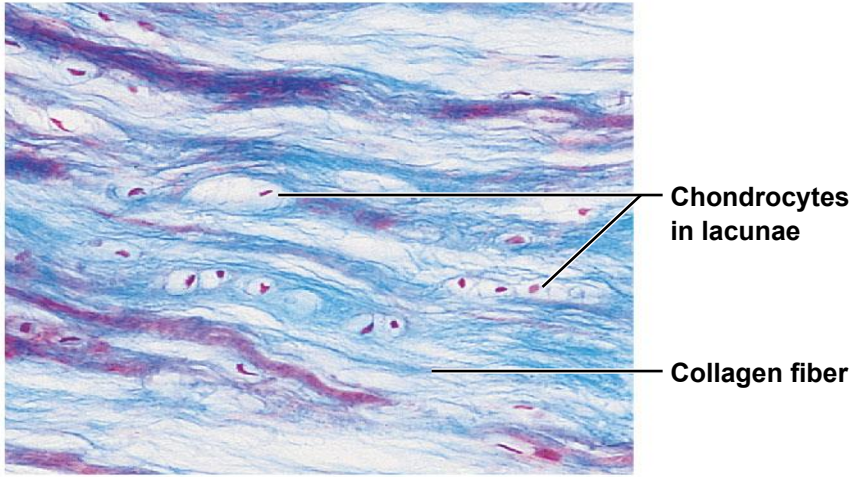
Photomicrograph: Hyaline cartilage from the trachea (400×).

Types of Connective Tissue

- Fibrocartilage
  - Structure: Matrix with thick collagen fibers; Chondrocytes in lacunae
  - Function: Shock absorber
  - Location: Intervertebral disks, parts of the pelvic girdle and knee



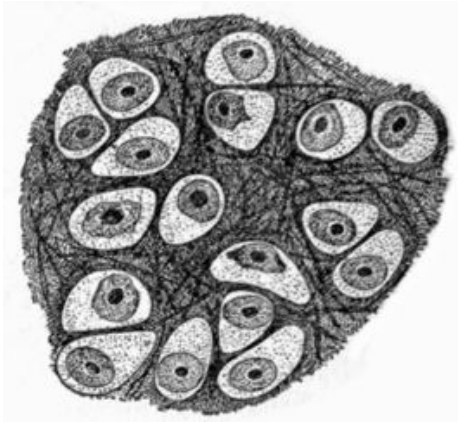
(c) Diagram: Fibrocartilage

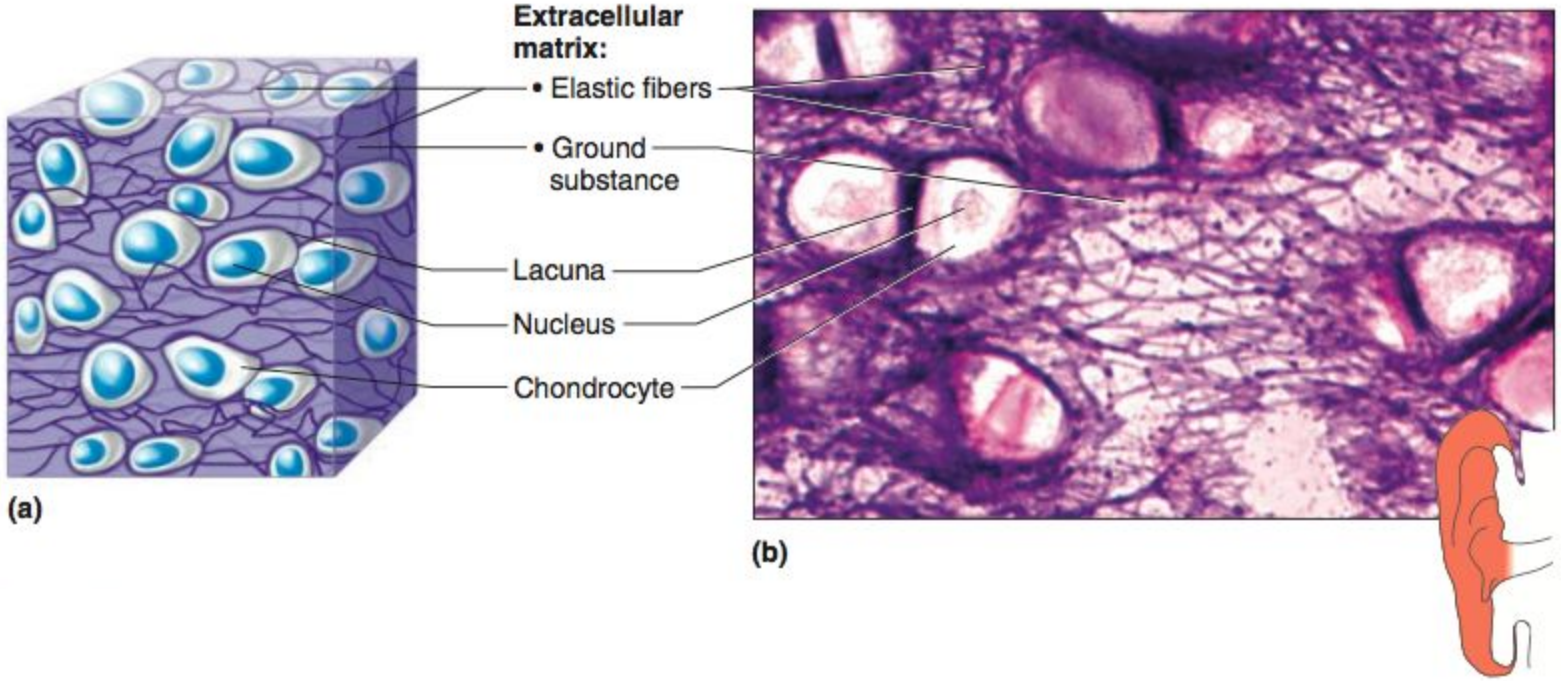


Photomicrograph: Fibrocartilage of an intervertebral disc (150×).

Types of Connective Tissue

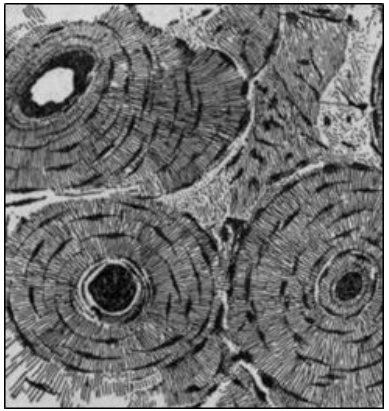
- Elastic cartilage
  - Structure: Dense network of elastic fibers; Chondrocytes in lacunae
  - Function: Allows flexibility while maintaining shape
  - Location: External ear and epiglottis

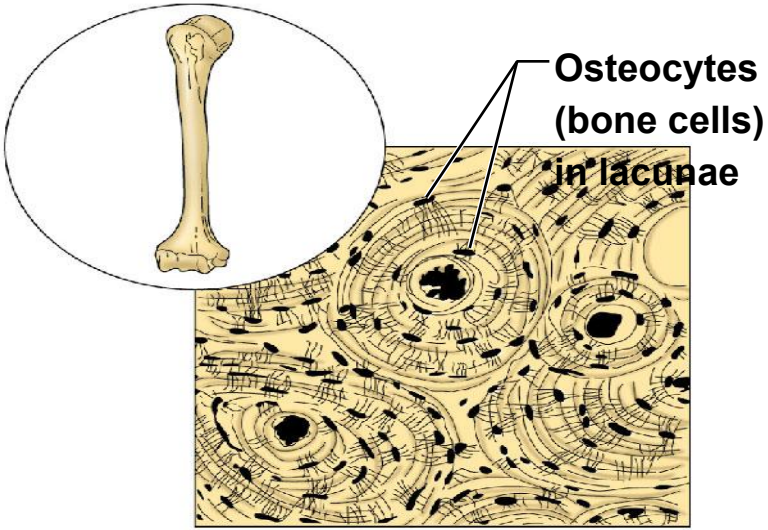



Extracellular matrix:
• Elastic fibers
• Ground substance
Lacuna
Nucleus
Chondrocyte
(a)
(b)

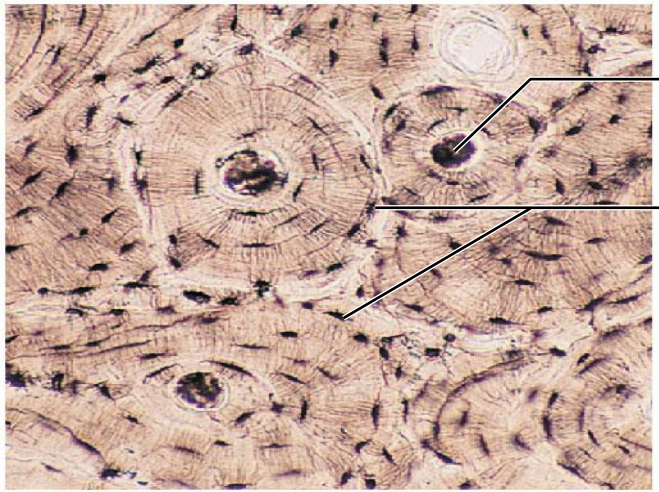
Types of Connective Tissue

- Bone (Osseous tissue)
  - Structure: Hard calcified matrix; Large numbers of collagen fibers; Osteocytes in lacunae
  - Function: Protect and support the body; Stores minerals
  - Location: Bones





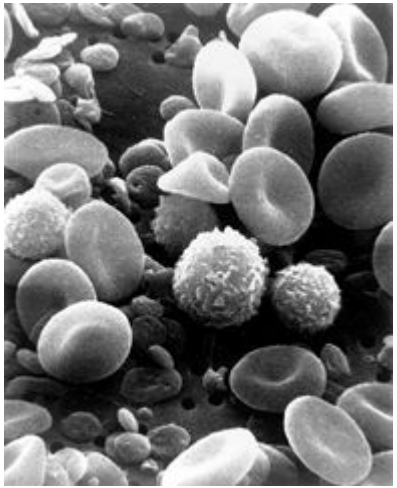
(a) Diagram: Bone

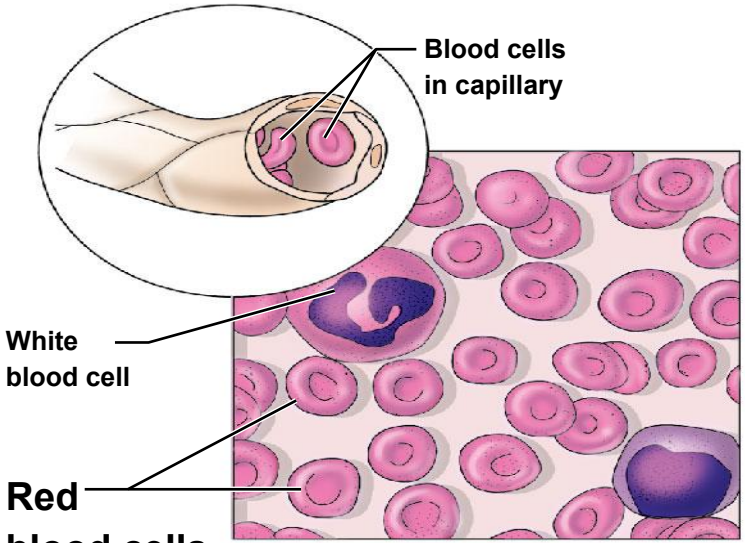


Photomicrograph: Cross-sectional view of bone (165×).

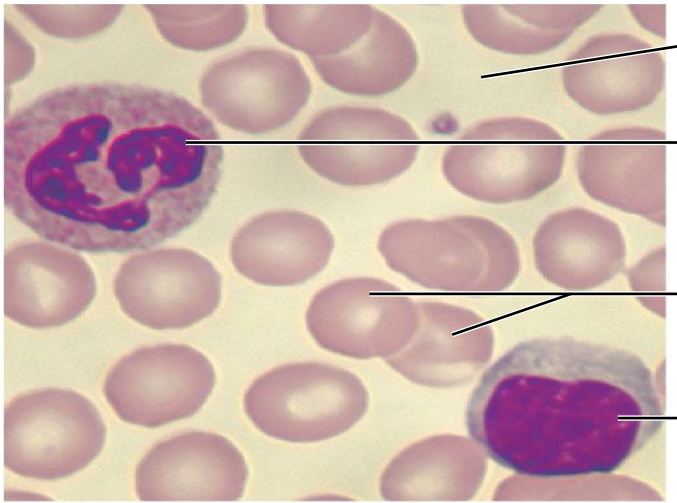
Types of Connective Tissue

- Blood (vascular tissue)
  - Structure: Cells surrounded by fluid matrix (plasma)
  - Function: Transport gases, nutrients, and waste
  - Location: Contained within blood vessels





(h) Diagram: Blood



Photomicrograph: Smear of human blood (1290×)