Connective tissue

Connective tissue (CT) is formed by three classes of components:

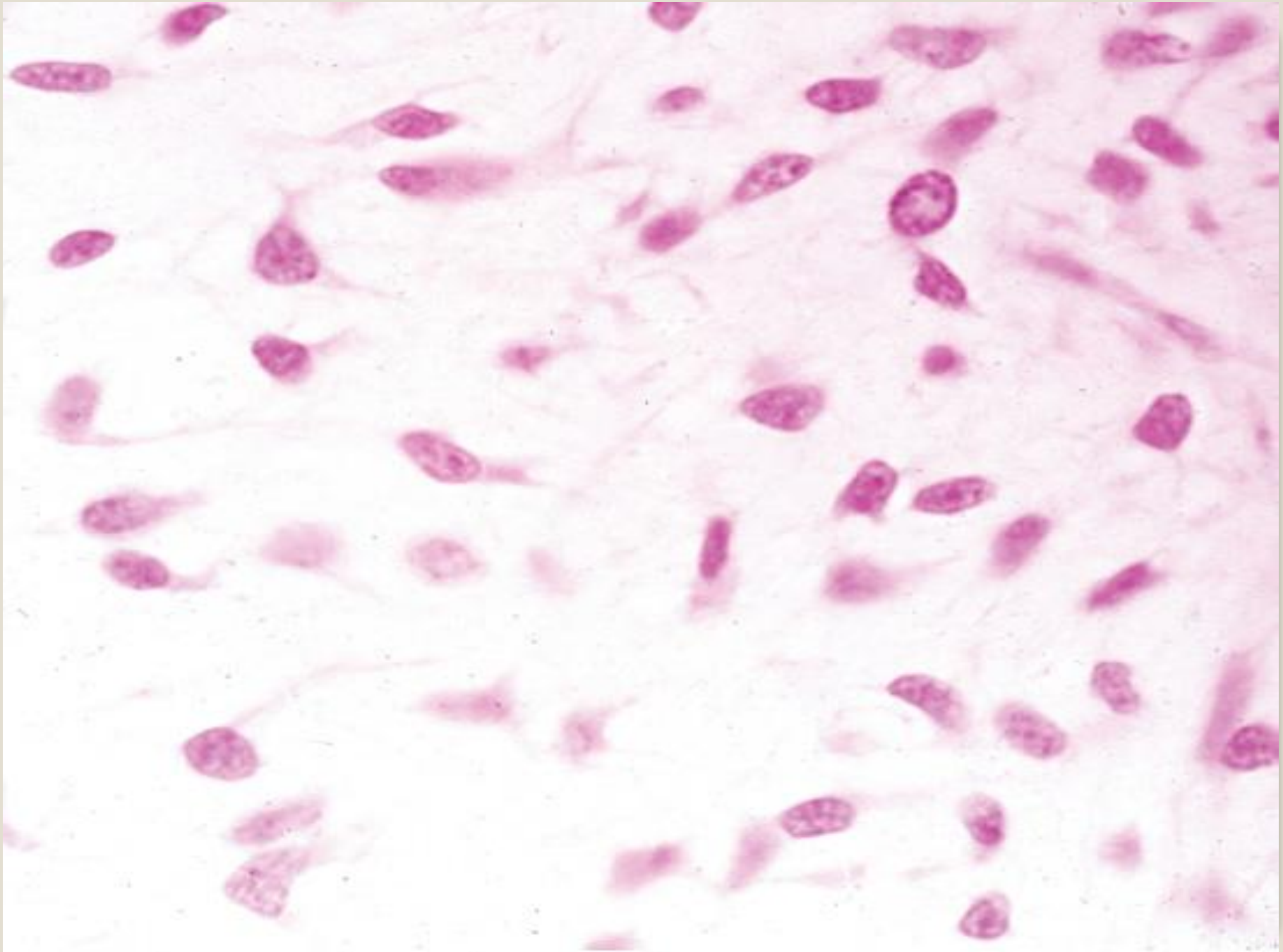
- Cells,
- Fibers,
- Ground substance

Extracellular matrix (ECM) is the major constituent of connective tissue.

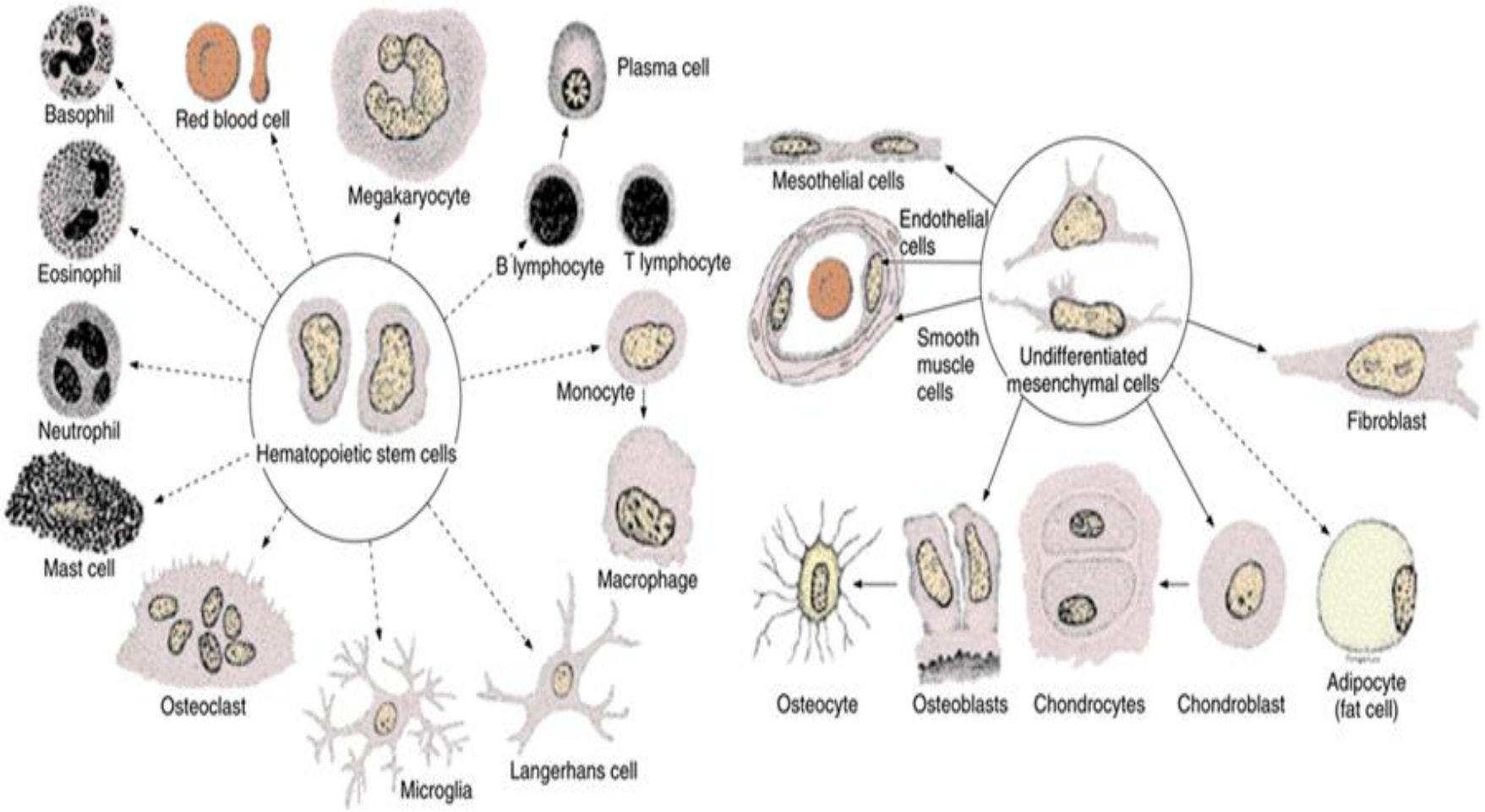
ECM consist of different combinations of **protein fibers** (collagen, reticular, and elastic fibers) and **ground substance.**

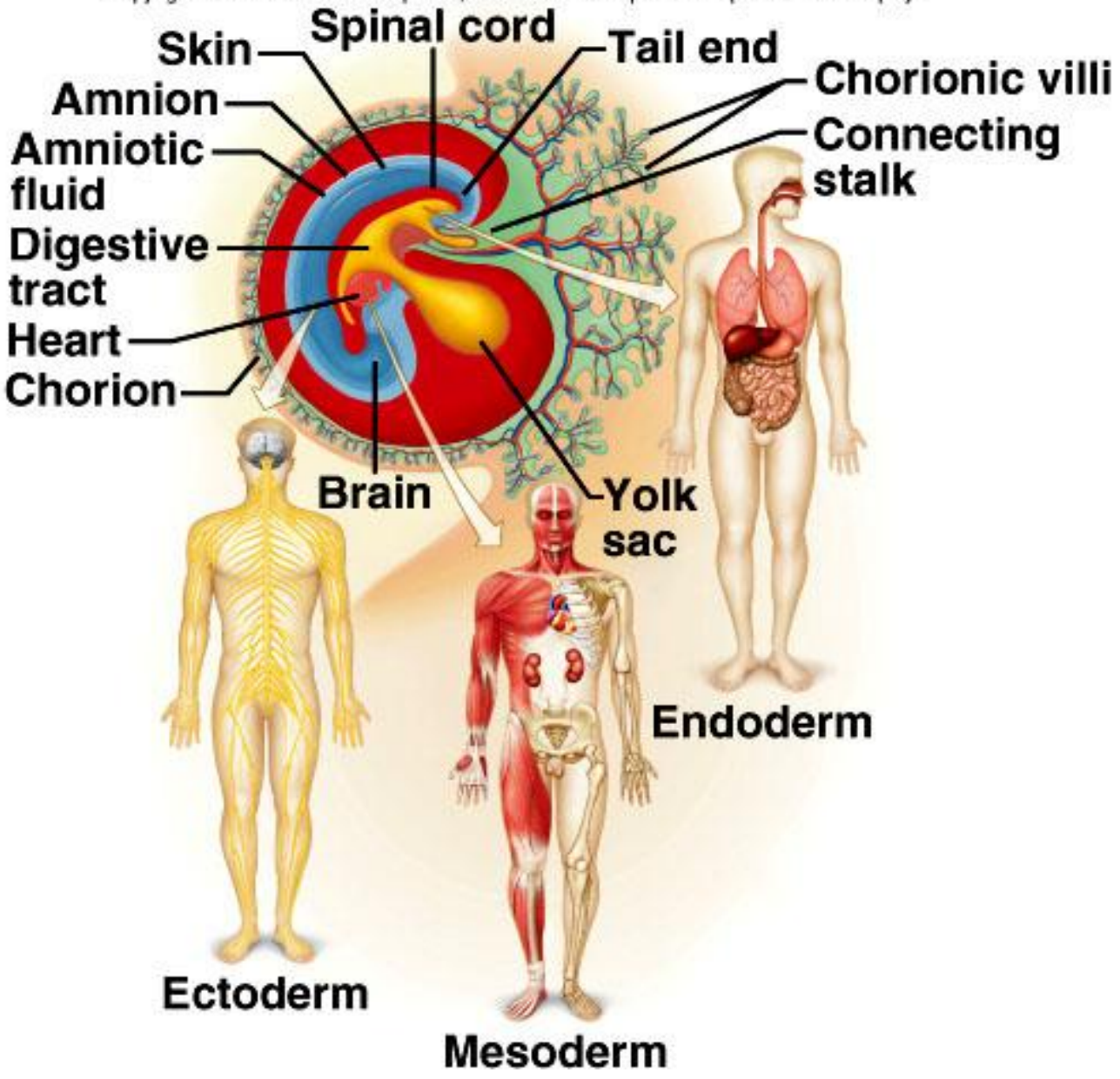
Ground substance is a highly hydrophilic, viscous complex of anionic macromolecules (glycosaminoglycans and proteoglycans) and multiadhesive glycoproteins (laminin, fibronectin, and others)

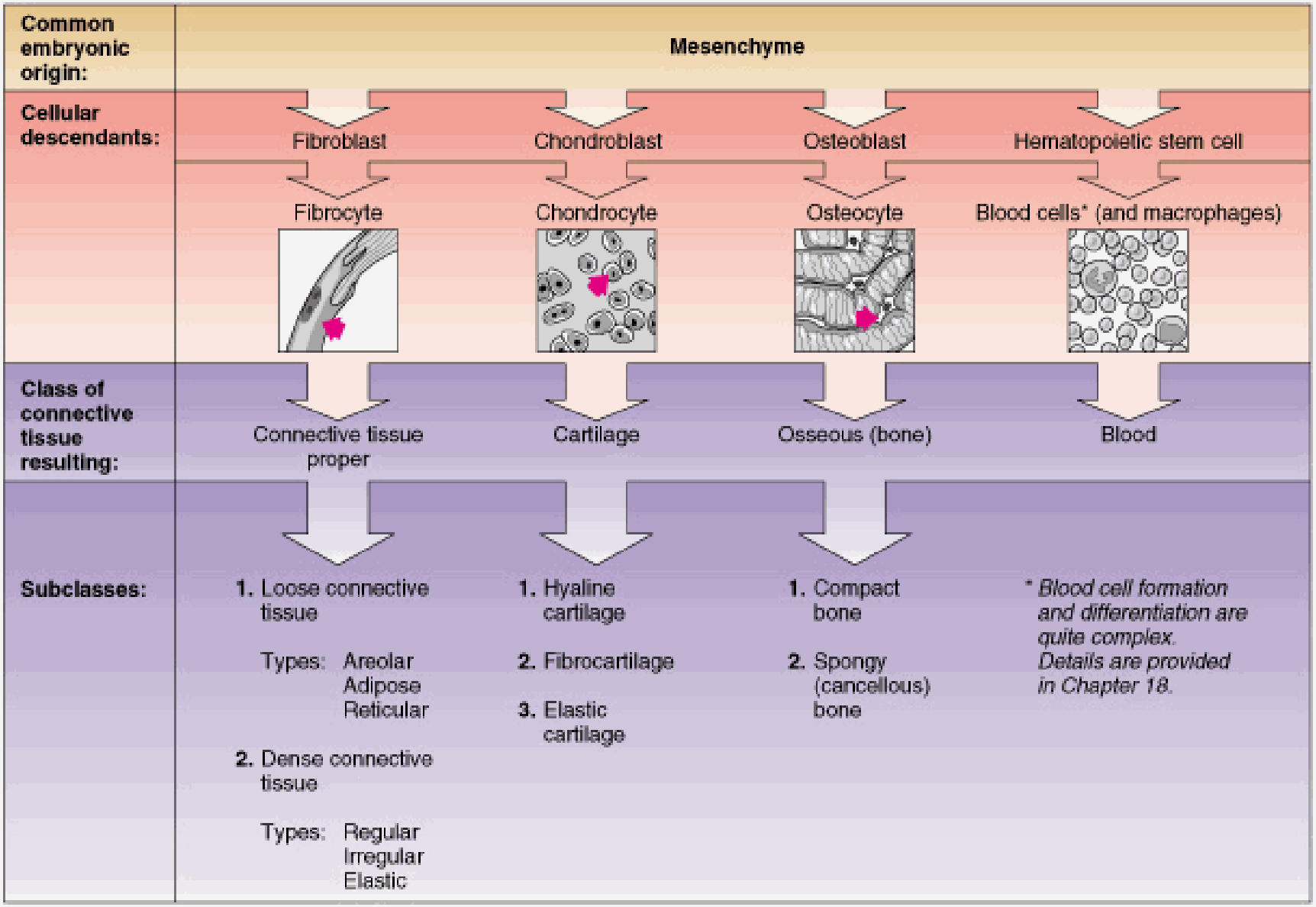
It stabilizes the ECM by binding to receptor proteins (**integrins**) on the surface of cells and to the other matrix components

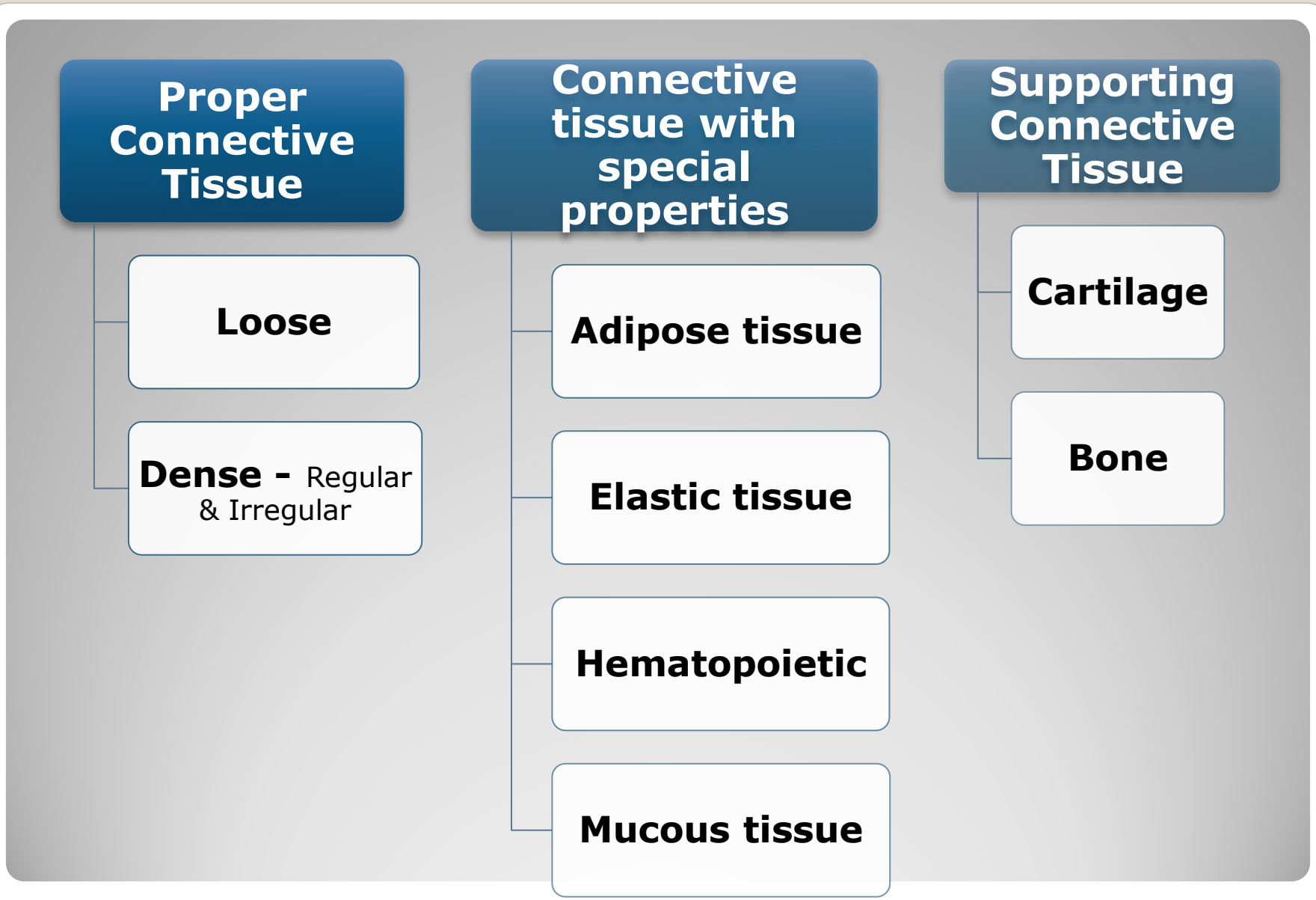


Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas,*


Basophil
Red blood cell
Megakaryocyte
Plasma cell
Eosinophil
B lymphocyte
T lymphocyte
Neutrophil
Hematopoietic stem cells
Monocyte
Mast cell
Macrophage
Osteoclast
Microglia
Langerhans cell
Mesothelial cells
Endothelial cells
Smooth muscle cells
Undifferentiated mesenchymal cells
Fibroblast
Osteocyte
Osteoblasts
Chondrocytes
Chondroblast
Adipocyte (fat cell)







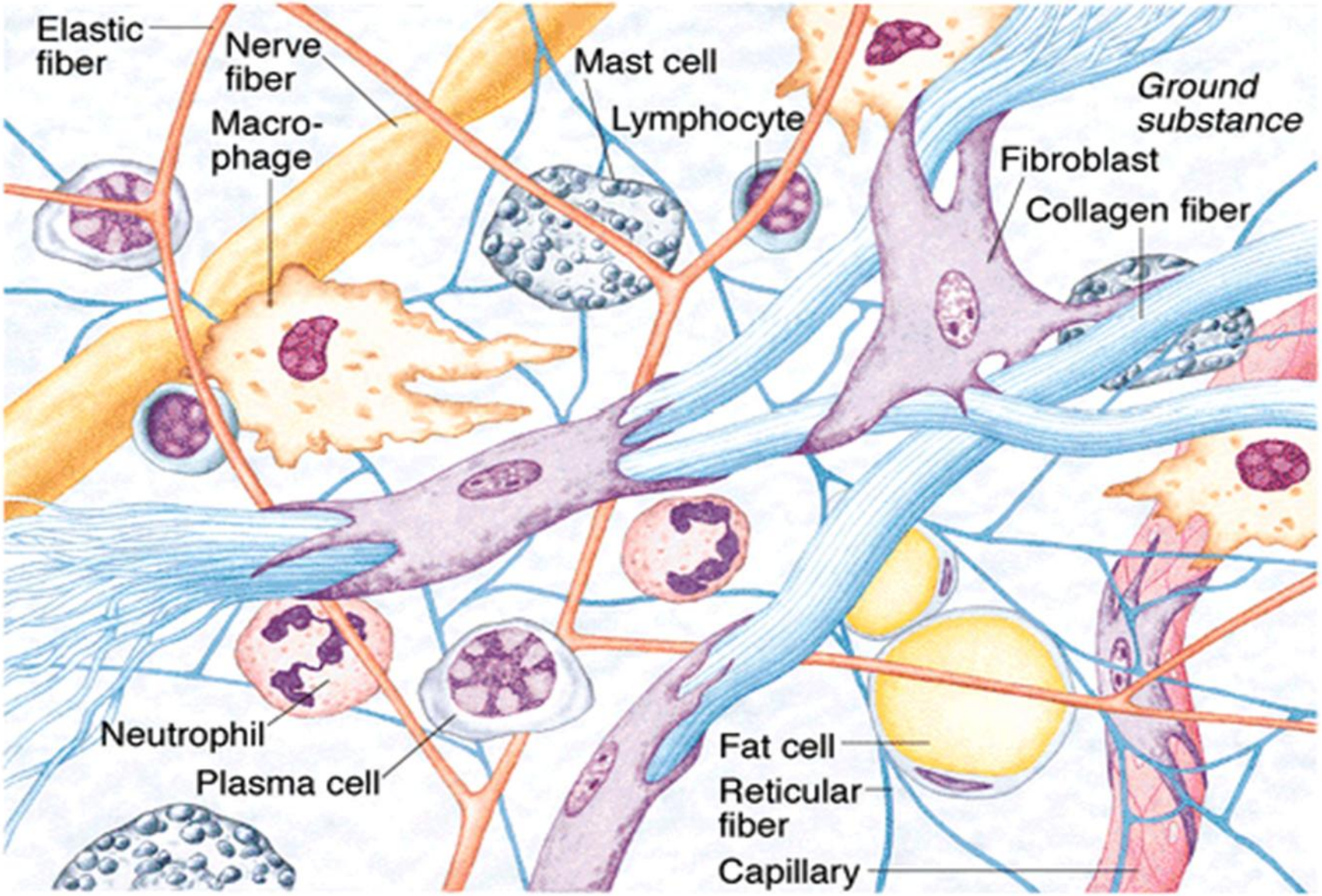
Type of connective tissue

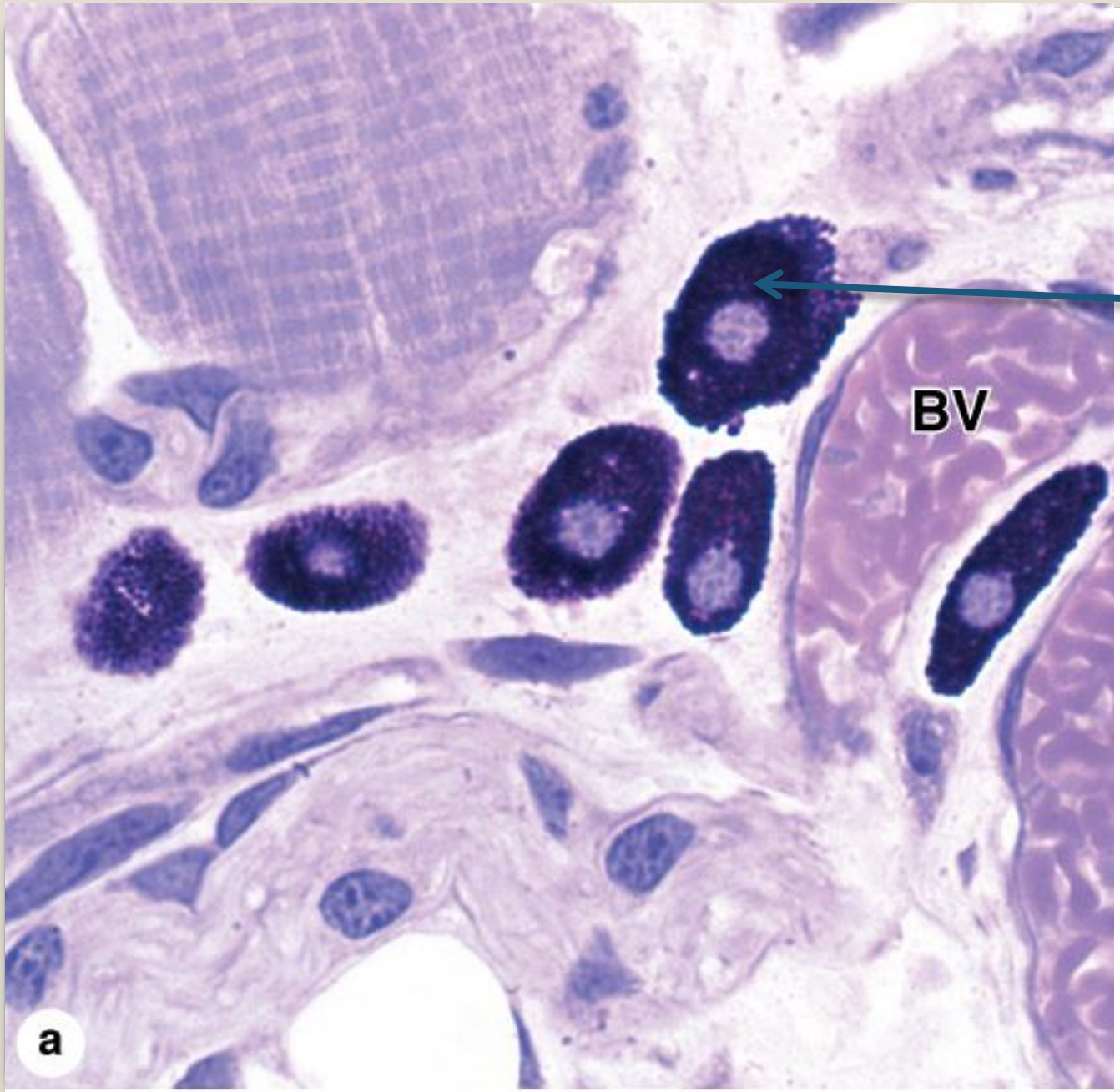
Loose Connective tissue consists of:

1. Fibers
   - Collagen
   - Elastin
   - Reticular

2. Cells
   - Fibroblasts (The most common cells in connective tissue)
   - Plasma Cells
   - Adipocytes
   - Mast Cells, and
   - Macrophages.

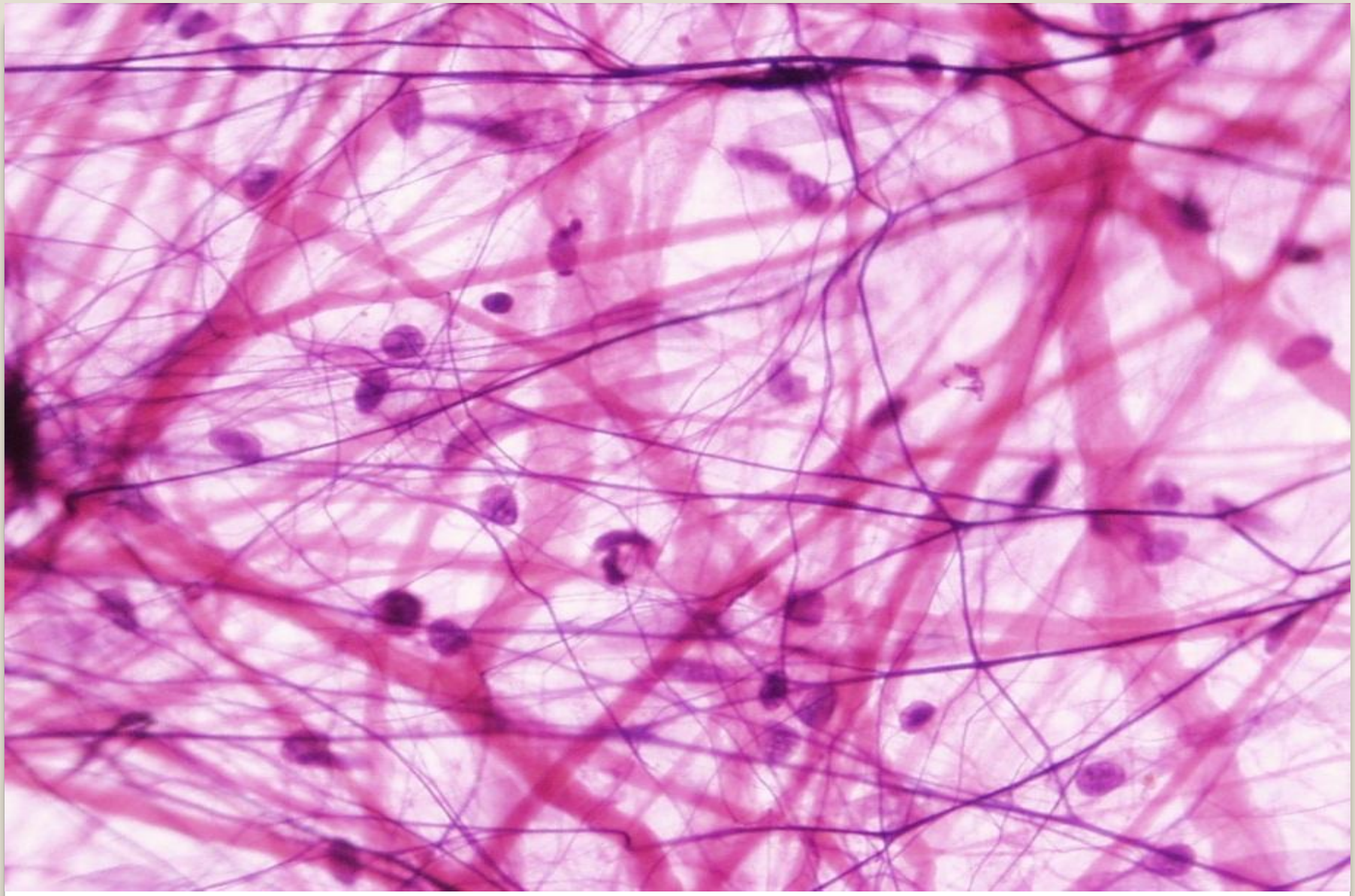
Loose Connective Tissue


Elastic fiber
Nerve fiber
Macro-phage
Mast cell
Lymphocyte
Ground substance
Fibroblast
Collagen fiber
Neutrophil
Plasma cell
Fat cell
Reticular fiber
Capillary
© BENJAMIN/CUMMINGS

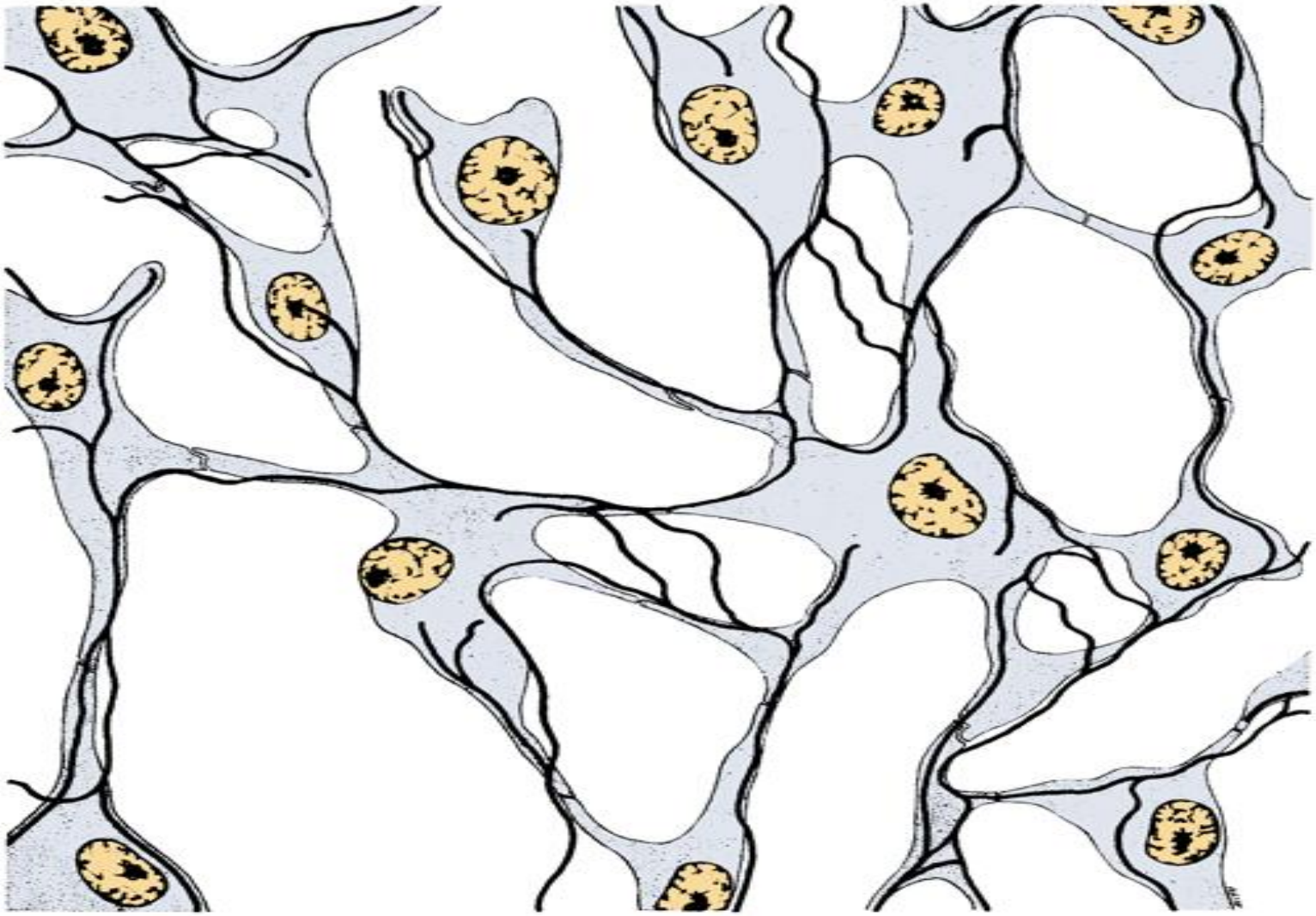


Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas, 12th Edition:* http://www.accessmedicine.com

- **Heparin**, a sulfated glycosaminoglycan that acts locally as an anticoagulant
- **Histamine**, which promotes increased vascular permeability and smooth muscle contraction
- **Serine proteases**, which activate various mediators of inflammation
- **Eosinophil** and **neutrophil chemotactic factors** which attract those leukocytes
- **Leukotrienes C_4, D_4, and E_4** (or the slow-reacting substance of anaphylaxis, SRS-A) which also trigger smooth muscle contraction.



Loose Connective Tissue



Reticular connective tissue

Dense Connective Tissue

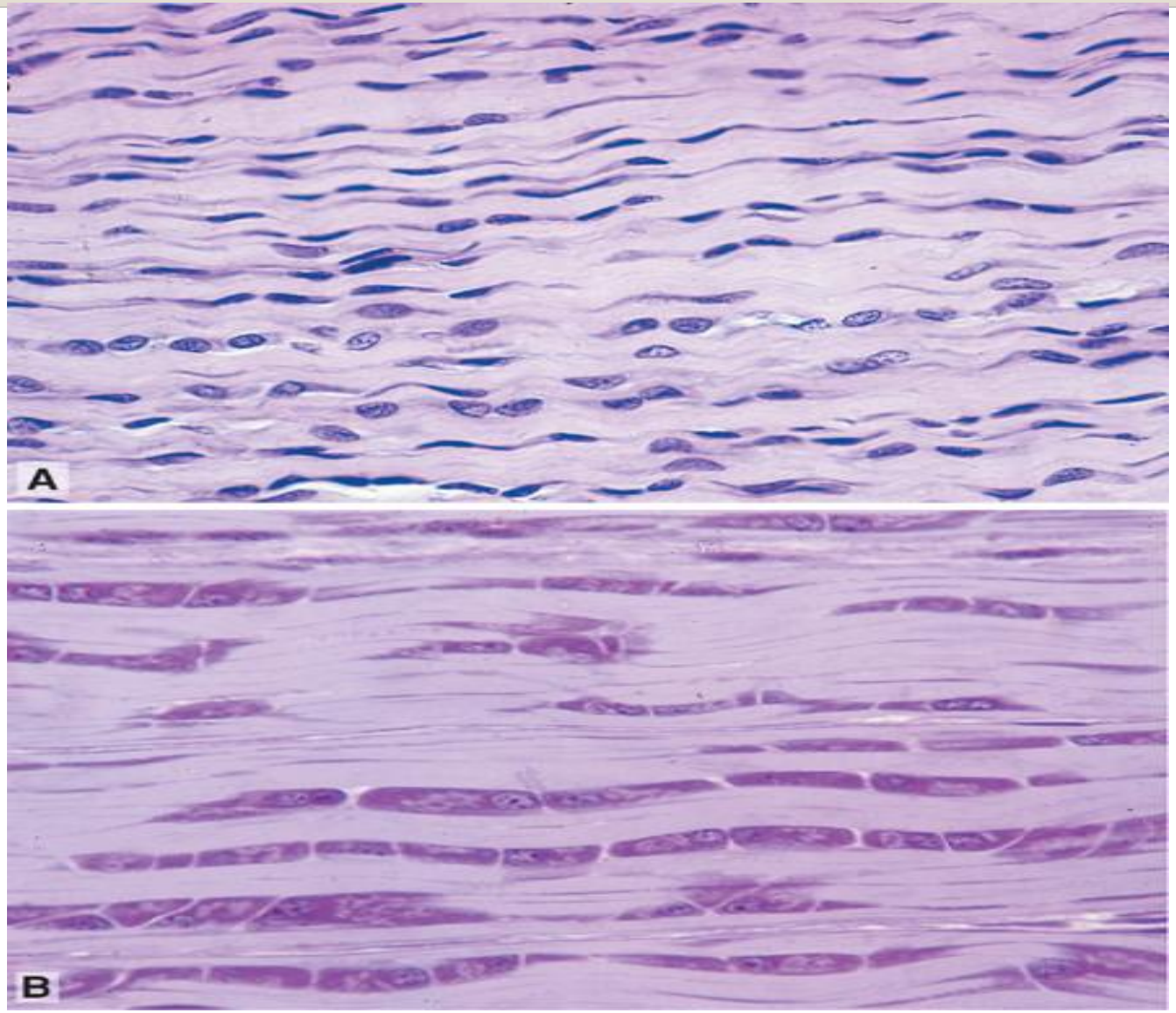
Dense Connective Tissue:

A. Dense regular connective tissue

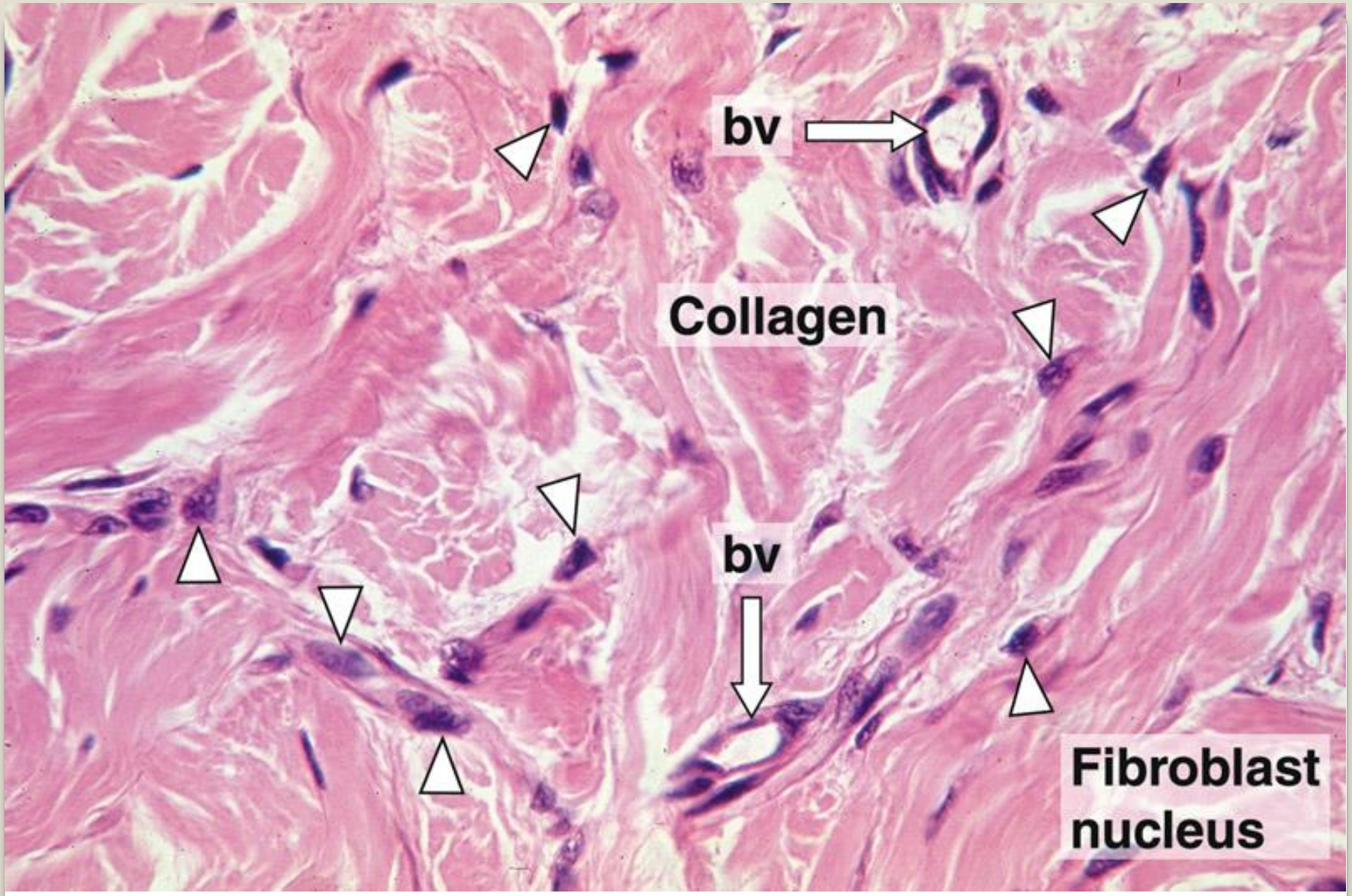
Tendons and ligaments

B. Dense irregular connective tissue

Dermis of skin, submucosa of digestive tract



Dense regular Connective Tissue



Dense Irregular Connective Tissue

Adipose Tissue is a loose fibrous connective tissue that is packed with many fat cells (called "**adipocytes**").

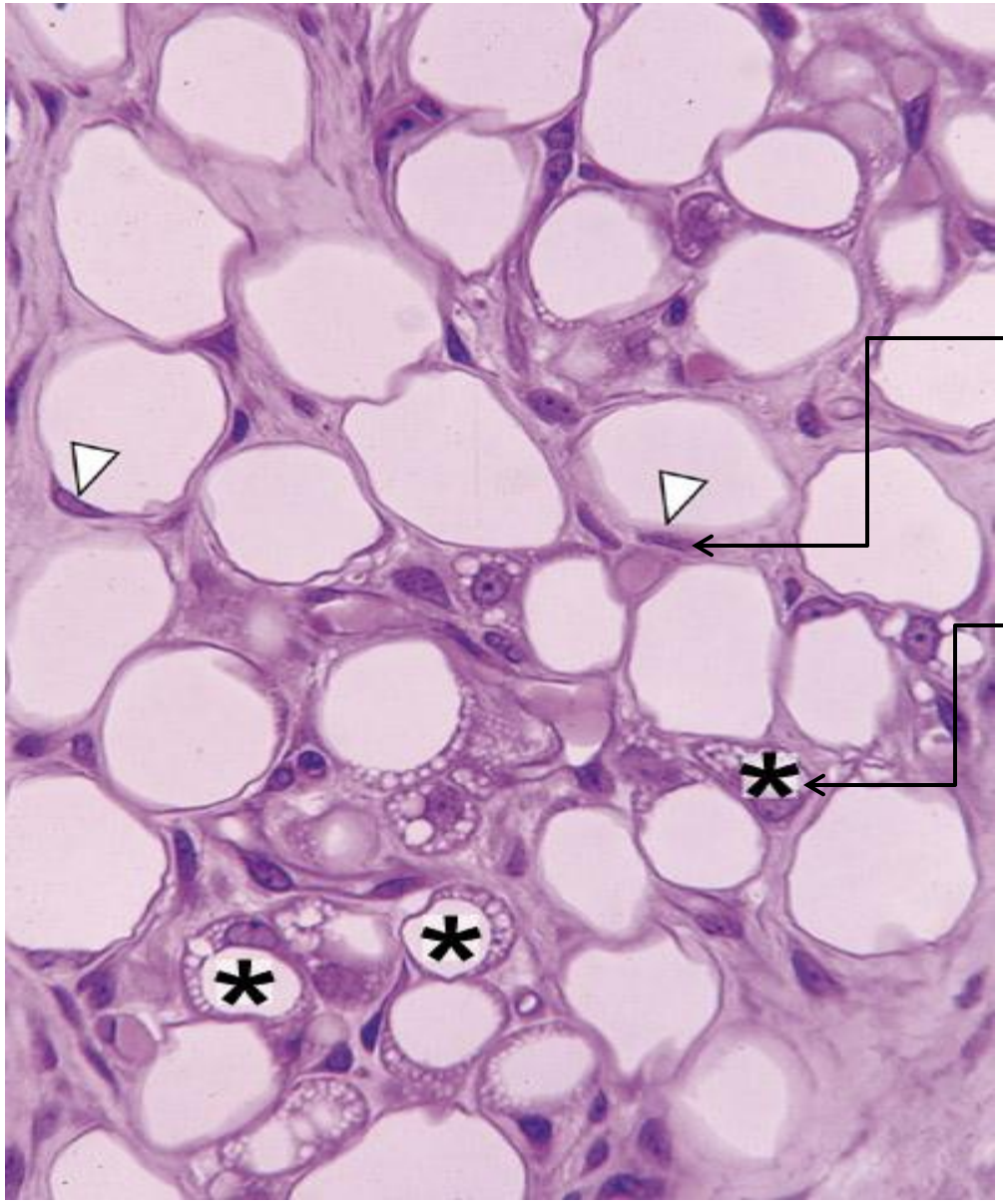
Locations of adipose tissue include:

- Subcutaneous layer deep to skin;
- Around the heart;
- Around the kidneys;
- Yellow marrow of the long bones
- Padding around the joints
- Inside the eye-socket, posterior to the eyeball.

The Functions of adipose tissue

- Adipose tissue acts as an **insulating layer**, helping to reduce heat loss through the skin.
- It also has a **protective** function, providing mechanical protection ("padding") and **support** around some of the major organs, e.g. kidneys.
- Adipose tissue is also a means of **energy storage**.
  Food that is excess to requirements is converted into fat and stored within adipose tissue in the body.

Adipose Tissue


nuclei of adipocytes
Adipocytes in growing stage

Most connective tissue is serving several vital functions simultaneously, including --

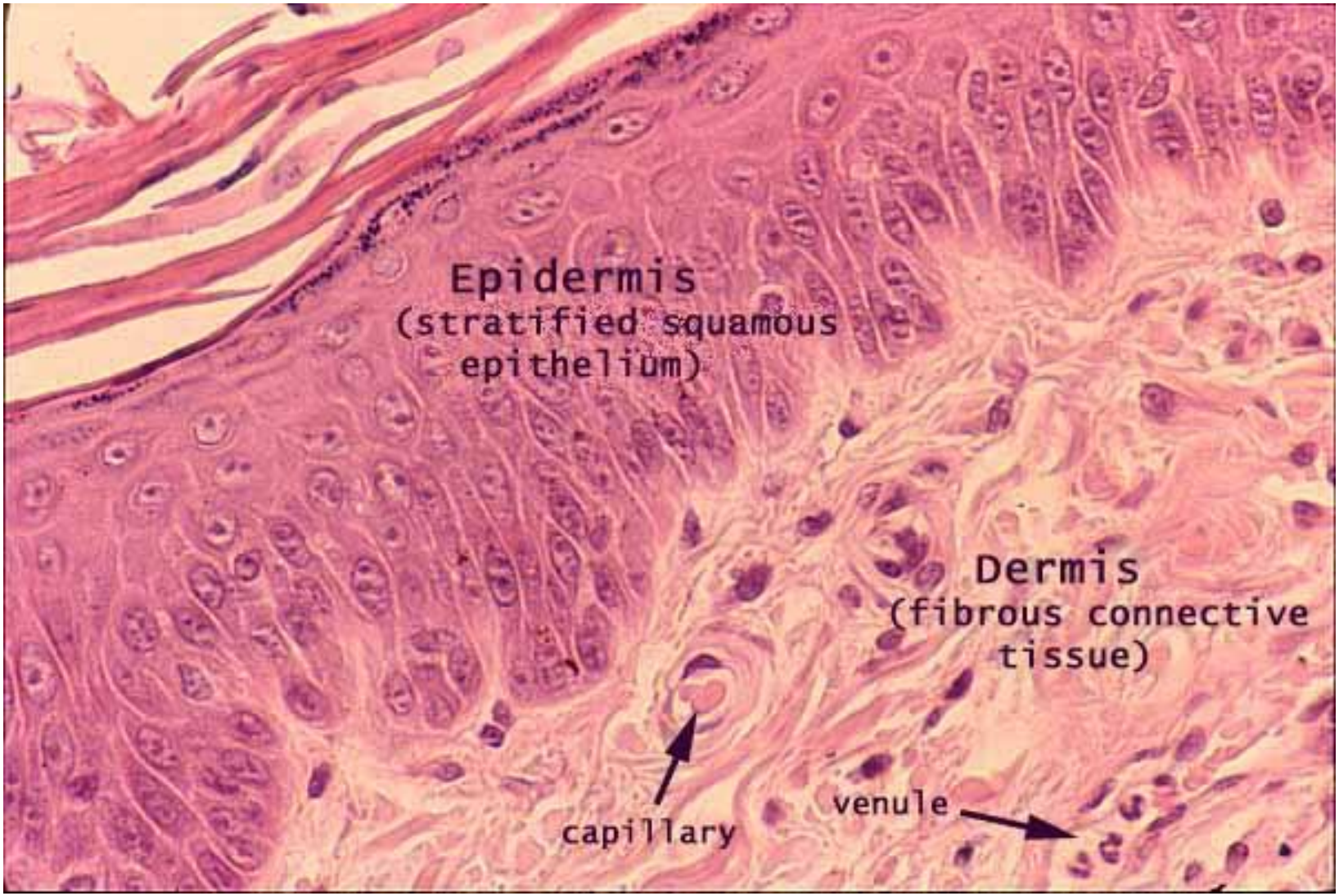
- transport of nutrients and metabolites,
- immunological defense,
- mechanical support.

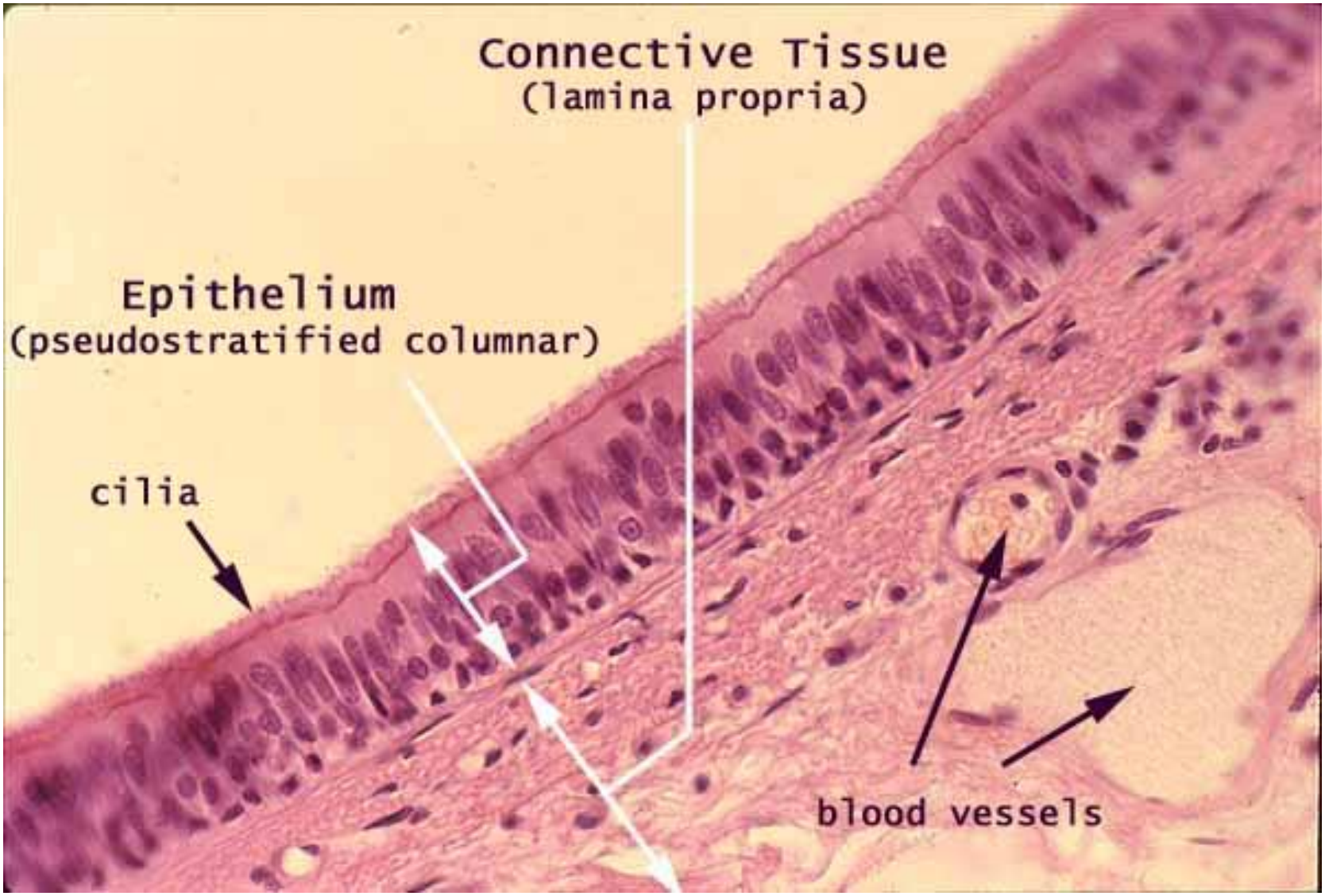
After injury, connective tissue is instrumental in tissue repair, specifically in scar formation.

- Additional functions found in specialized sites include --

- reserve energy storage (as fat),
- heat generation (brown fat),
- hemopoiesis (blood cell formation).

FUNCTIONS of Connective Tissue


Epidermis
(stratified squamous epithelium)
Dermis
(fibrous connective tissue)
capillary
venule


Connective Tissue
(lamina propria)
Epithelium
(pseudostratified columnar)
cilia
blood vessels

http://www.accessmedicine.com/content.aspx?aid=6180656