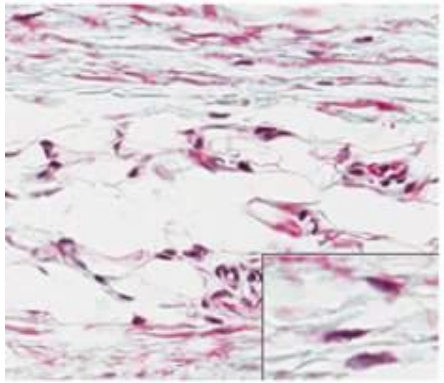
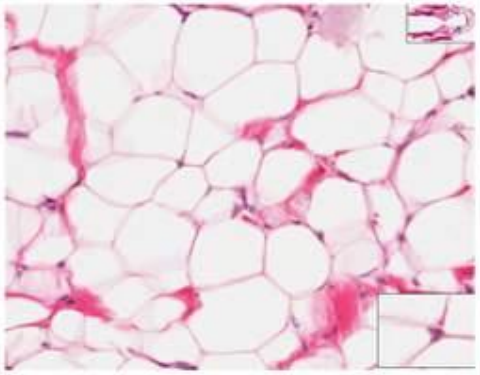
CONNECTIVE TISSUE PROPER

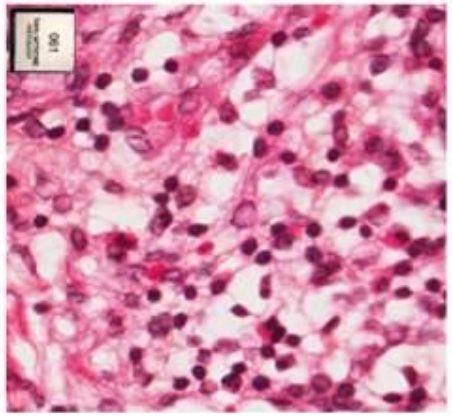
Dr. Larry Johnson



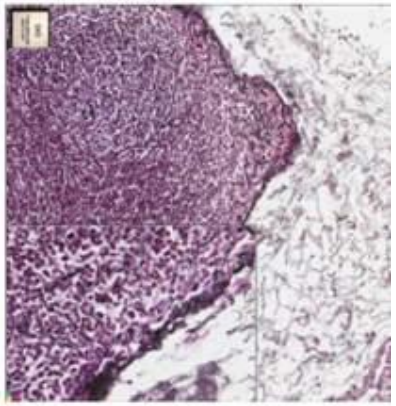
Mesenchyme connective tissue
Slide 39



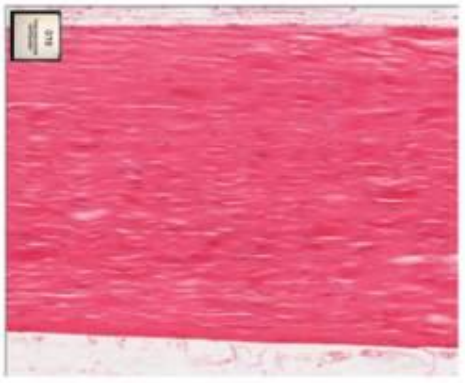
Adipose connective tissue
Slide 38b



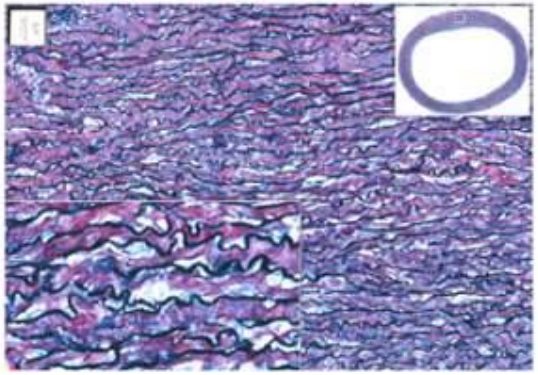
Loose connective tissue
Slide 61 Alternative slide 250



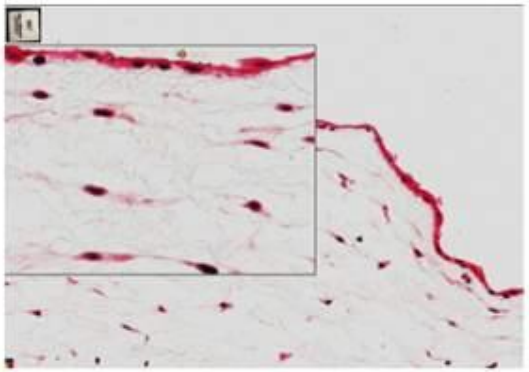
Reticular connective tissue
Slide 45



Dense connective tissue
Slide 15



Elastic connective tissue
Slide 28



Mucus connective tissue
Slide 87

Objectives

- Describe each type of connective tissue (CT) and explain where they are found.
- List the types of cells, fibers, and other extracellular matrix components found in connective tissues.
- Relate the functions of each connective tissue to their structural organization.

From: Douglas P. Dohrman and TAMHSC Faculty 2012 Structure and Function of Human Organ Systems, Histology Laboratory Manual

FUNCTION OF CT

MECHANICAL SUPPORT – STROMA BELOW EPITHELIUM

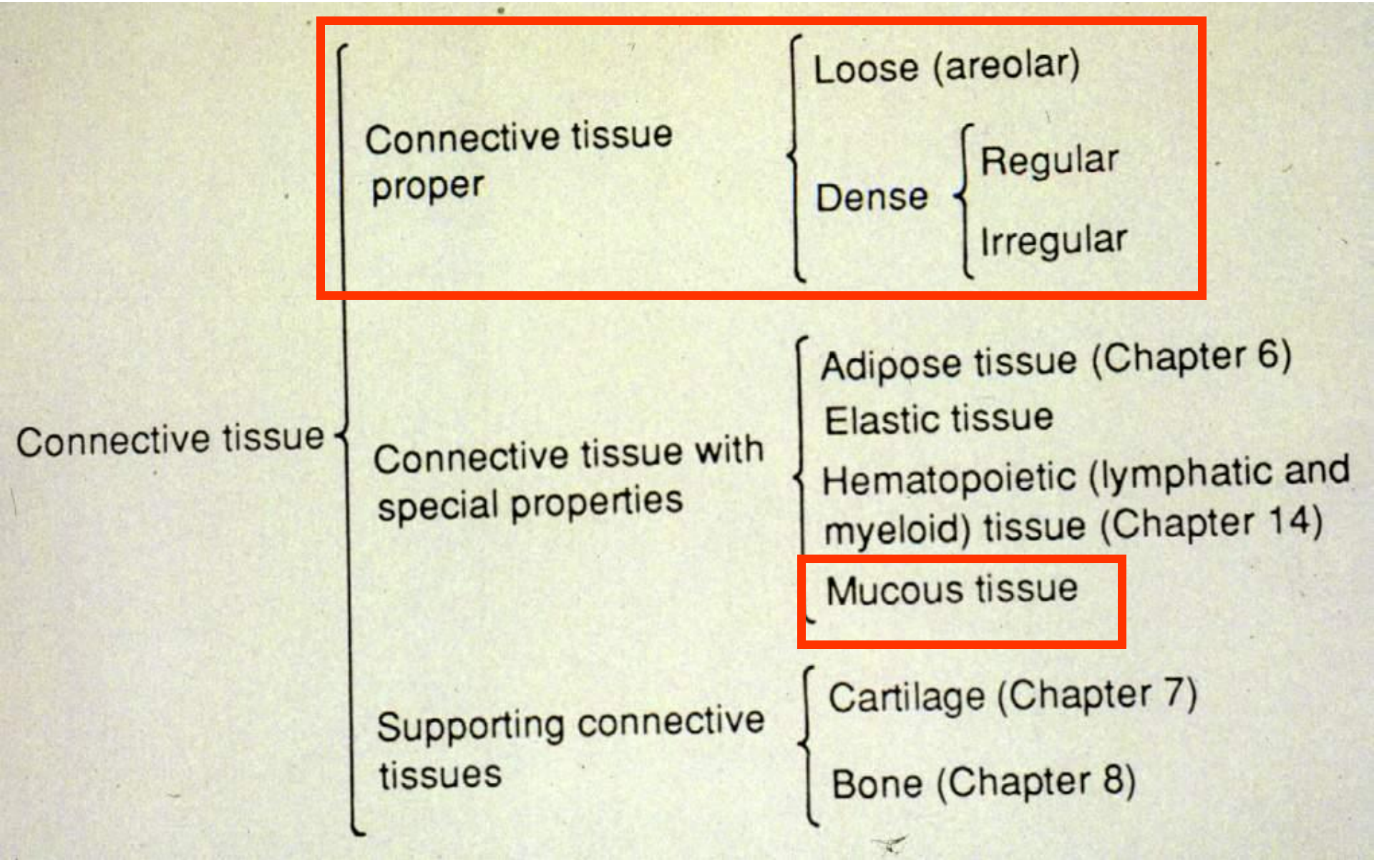
METABOLITE EXCHANGE - VASCULAR BEDS

ENERGY STORAGE - ADIPOSE TISSUE

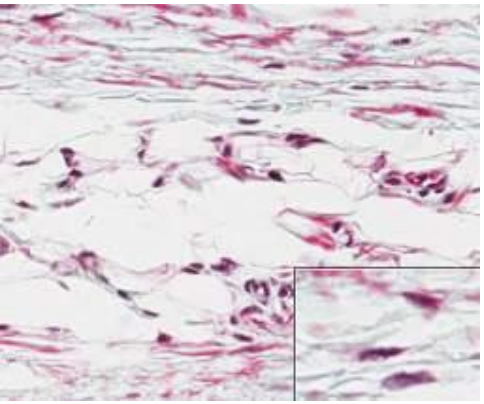
INFLAMMATION - SITE OF ACTION FOR BLOOD BORNE IMMUNE CELLS

FIBROSIS - WOUND HEALING - OVER-PRODUCTION OF COLLAGEN

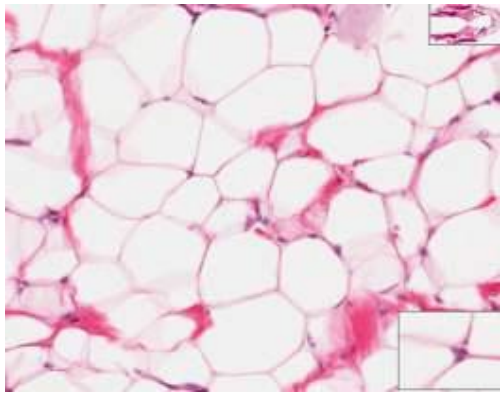
CONNECTIVE TISSUE



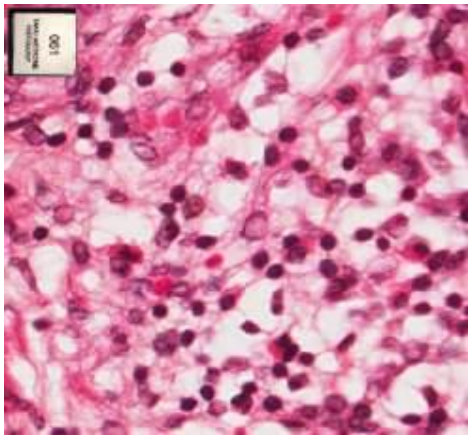
Types of connective tissue



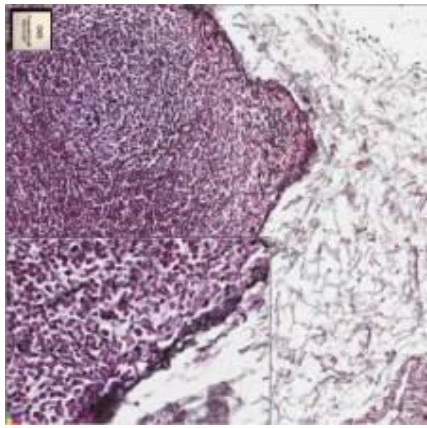
Mesenchyme connective tissue
Slide 39



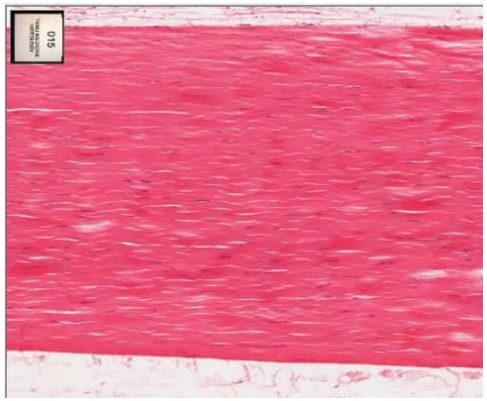
Adipose connective tissue
Slide 38b



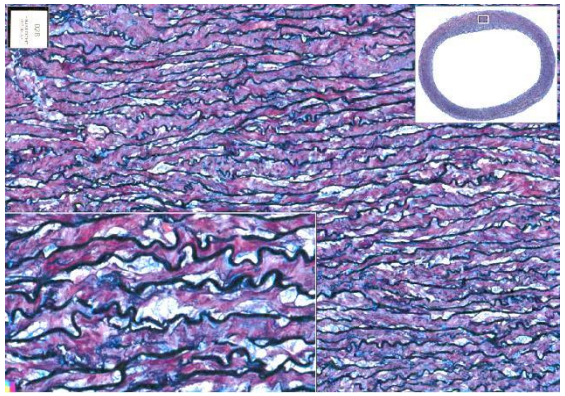
Loose connective tissue
Slide 61 Alternative slide 250



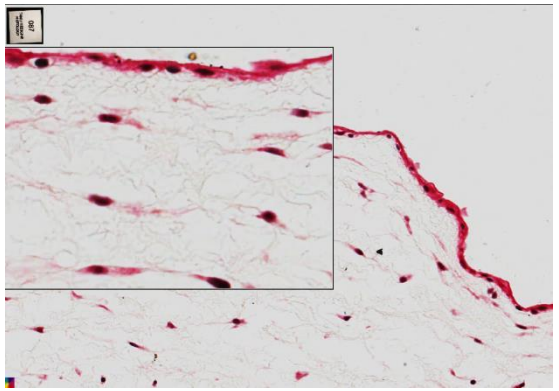
Reticular connective tissue
Slide 45



Dense connective tissue
Slide 15

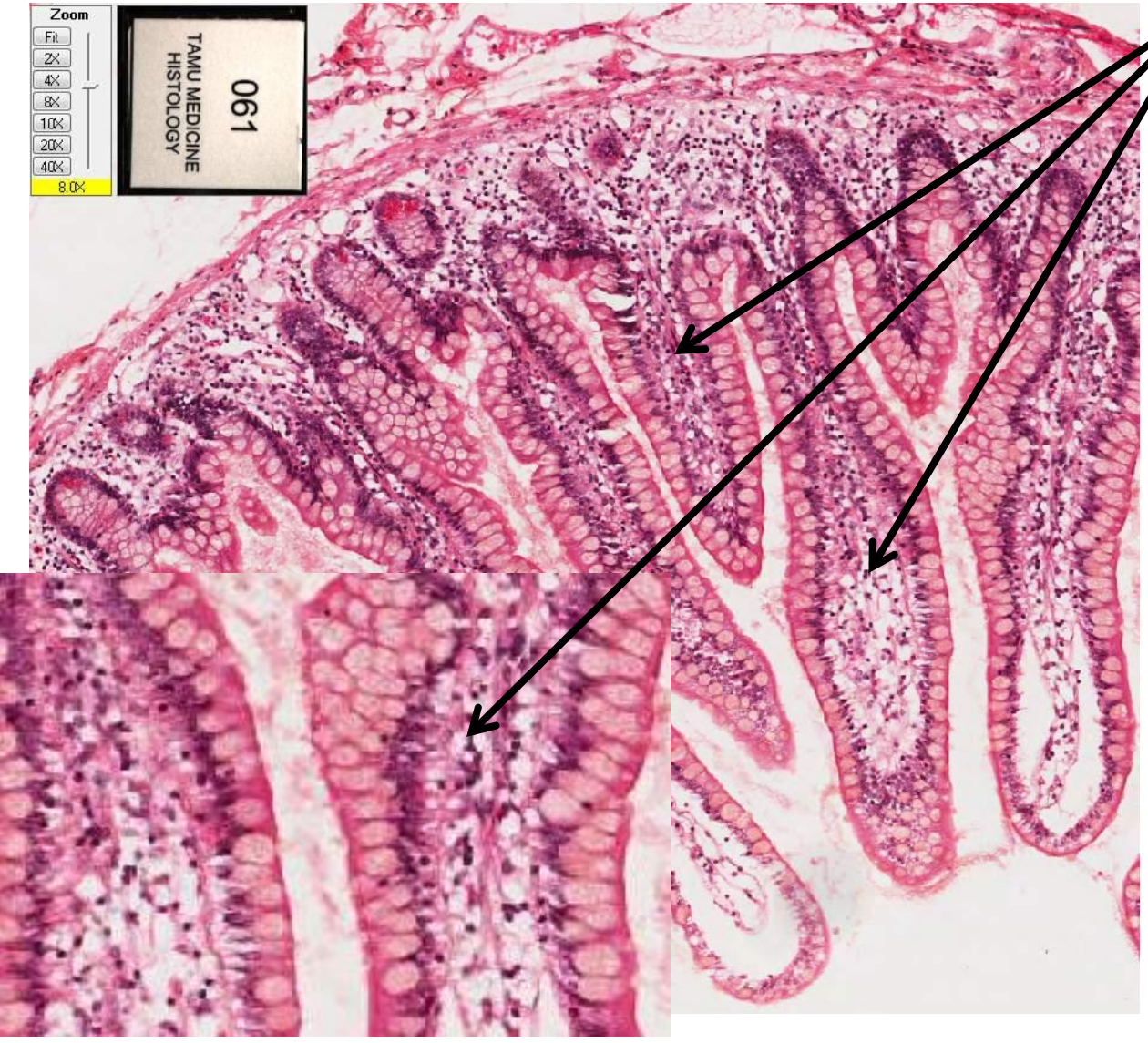


Elastic connective tissue
Slide 28



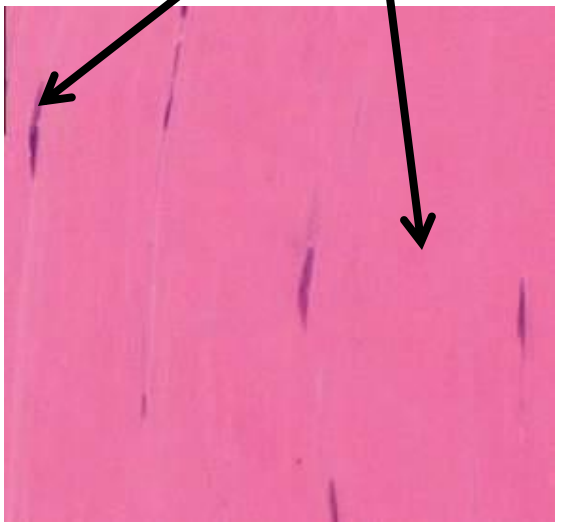
Mucus connective tissue
Slide 87

Slide 61: Terminal Ileum



Lamina propria consisting of loose connective tissue (more cells and less fibers)

Note the abundance of cells and low density of fibers in the lamina propria compared to this tendon (dense regular CT) which is mostly fibers and few cells.



CELLS OF CT (all from mesoderm)

FIBROBLASTS

MESENCHYMAL CELLS

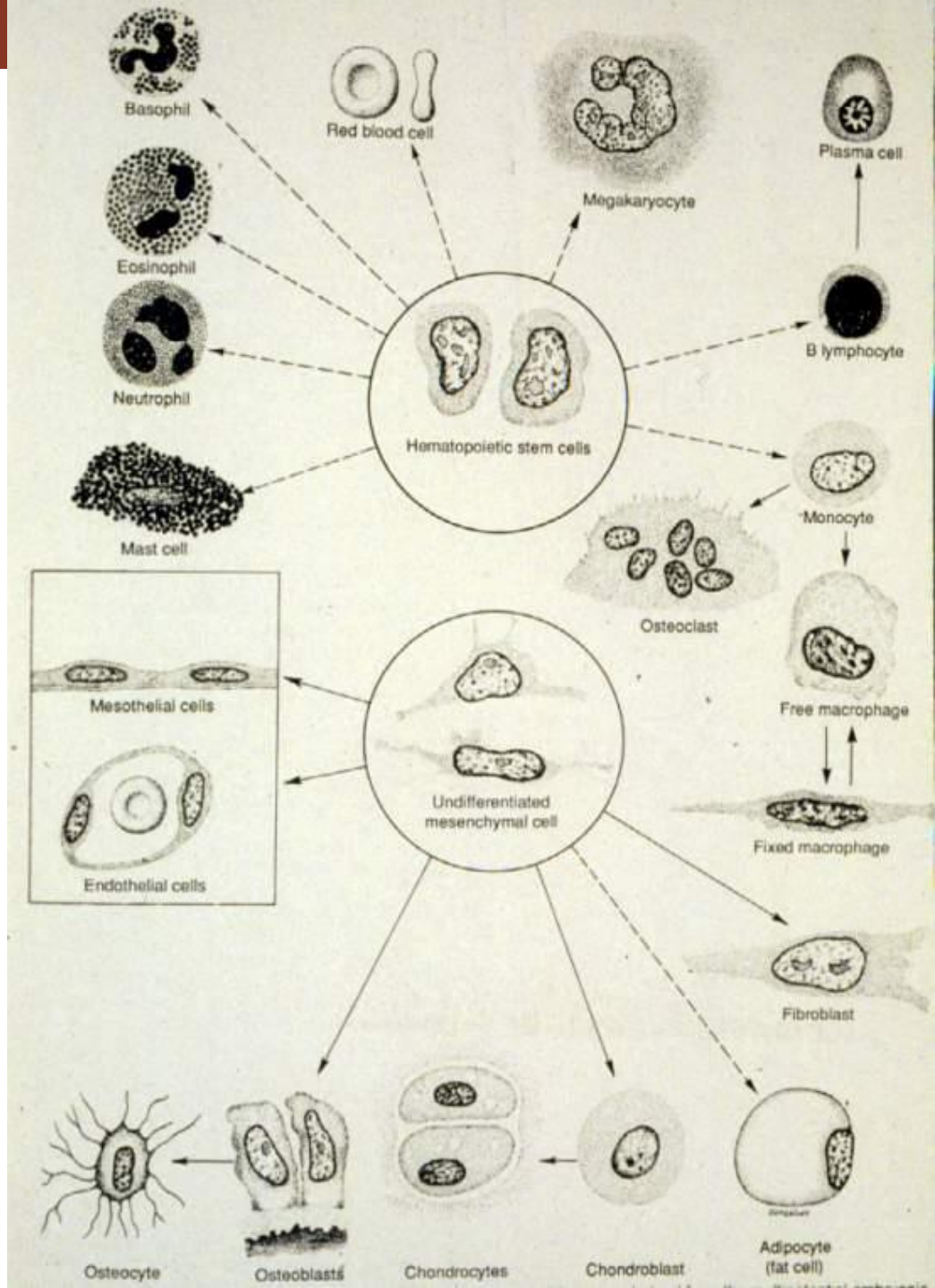
ADIPOSE CELLS

MACROPHAGE

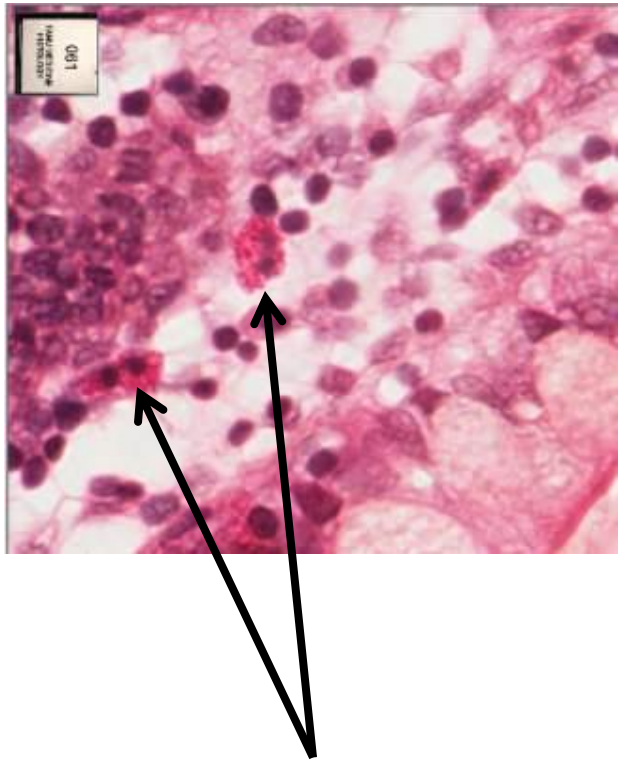
PLASMA CELLS

MAST CELLS

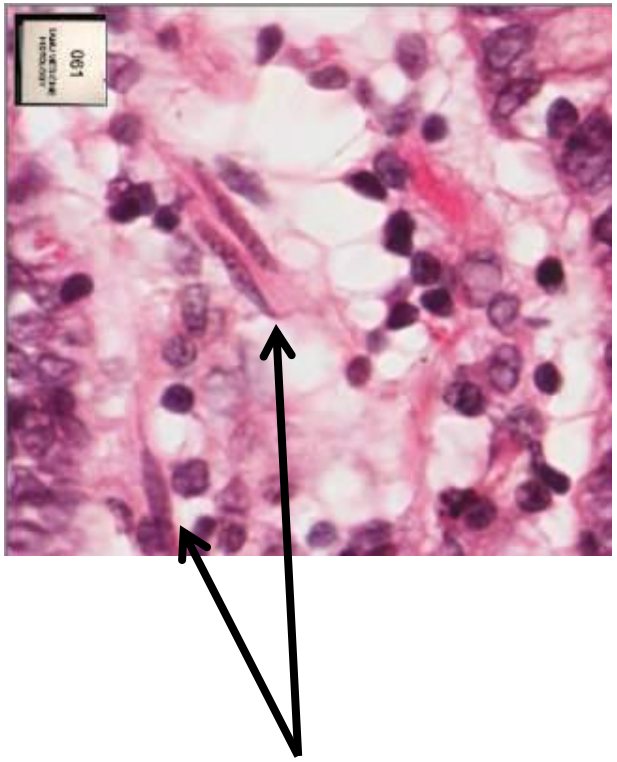
OTHERS



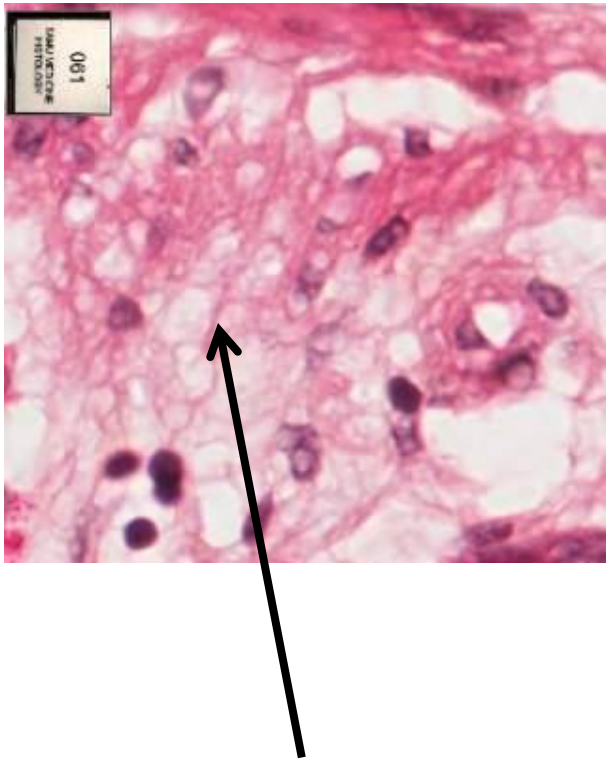
Slide 61: Terminal Ileum



Eosinophils

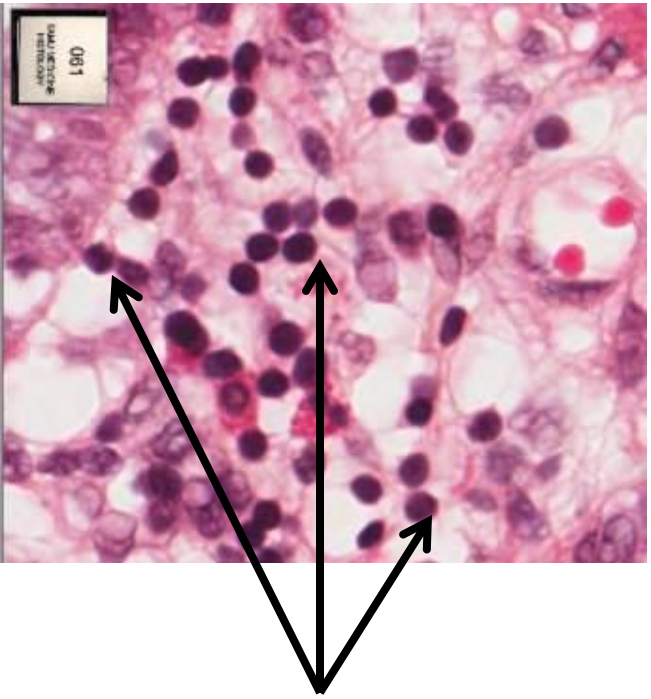


Fibroblasts

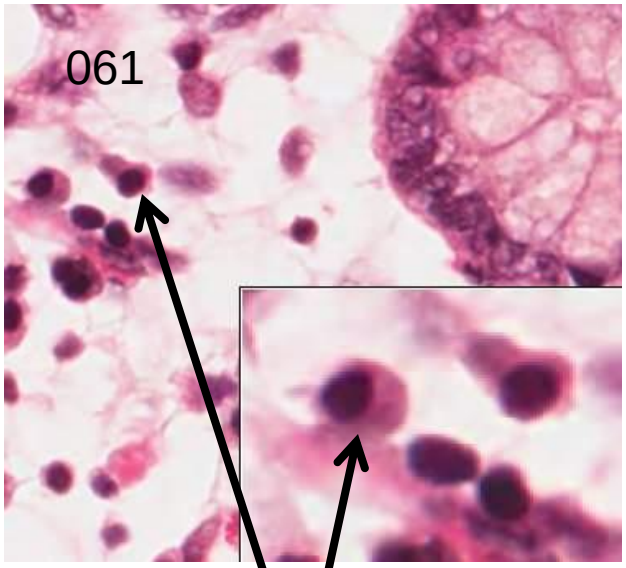


Collagen Type I bunbles

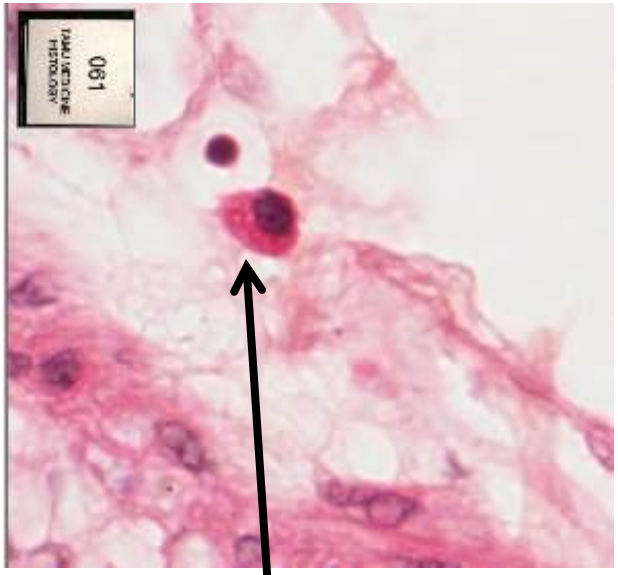
Slide 61: Terminal Ileum



Lymphocytes

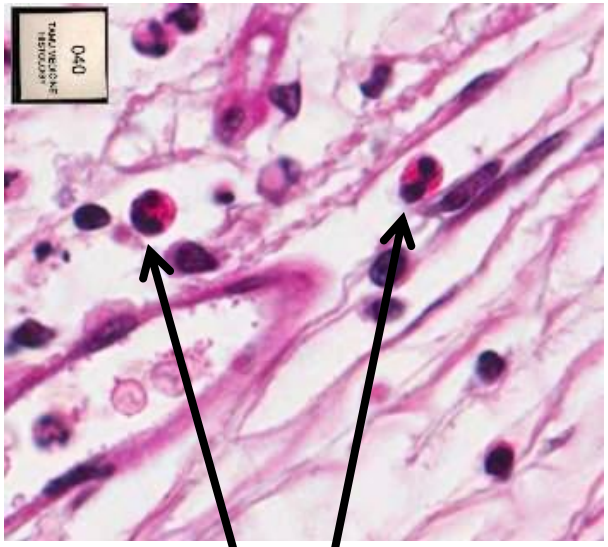


Plasma cells

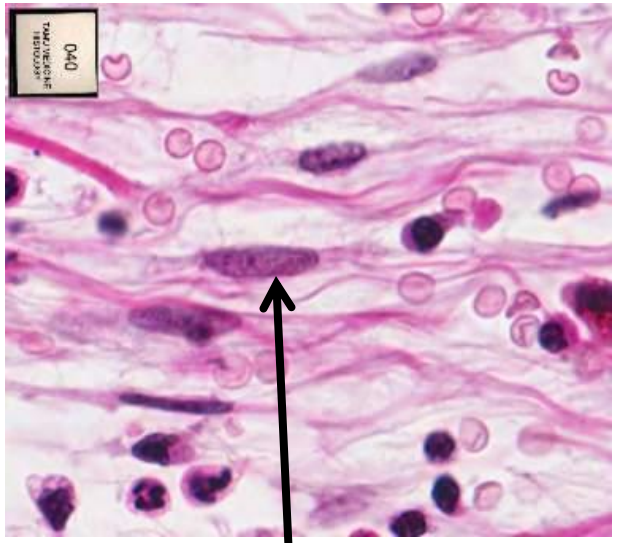


Mast cell

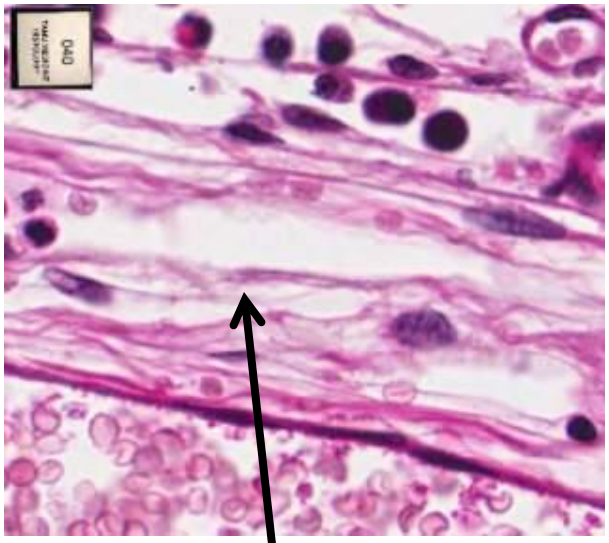
Slide 40: Trachea



Eosinophils

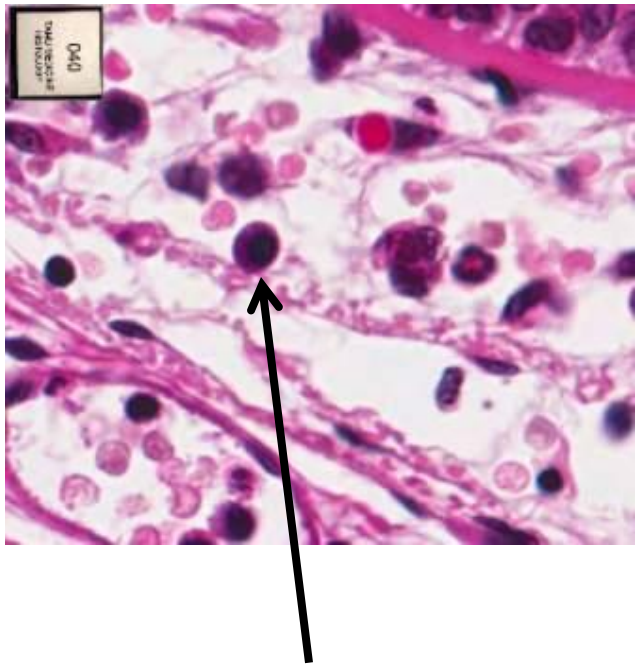


Fibroblast

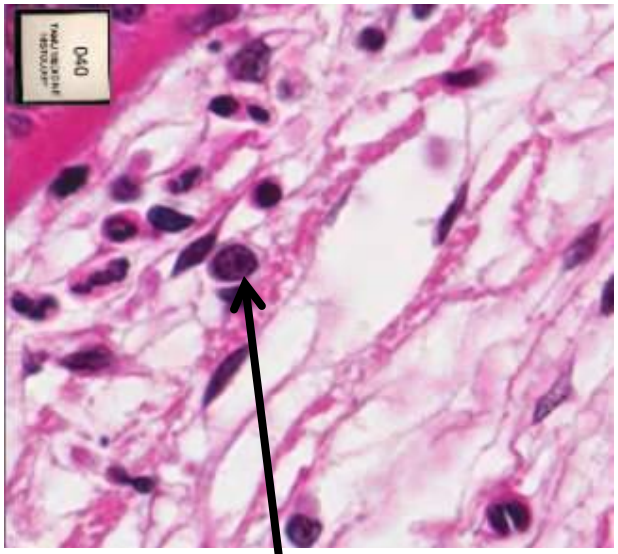


Collagen Type I bundles

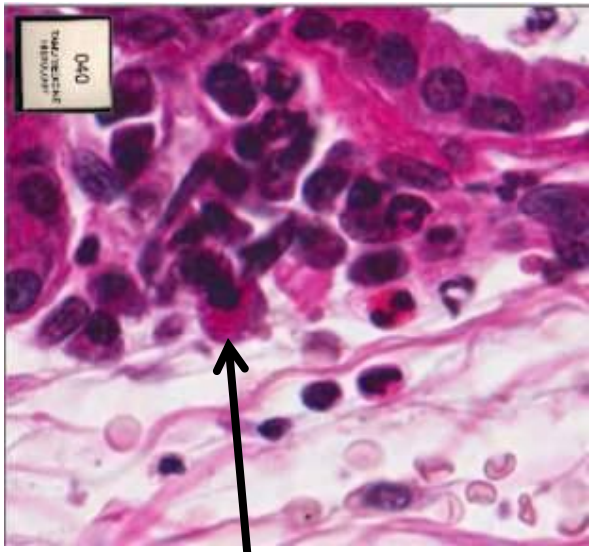
Slide 40: Trachea



Lymphocyte

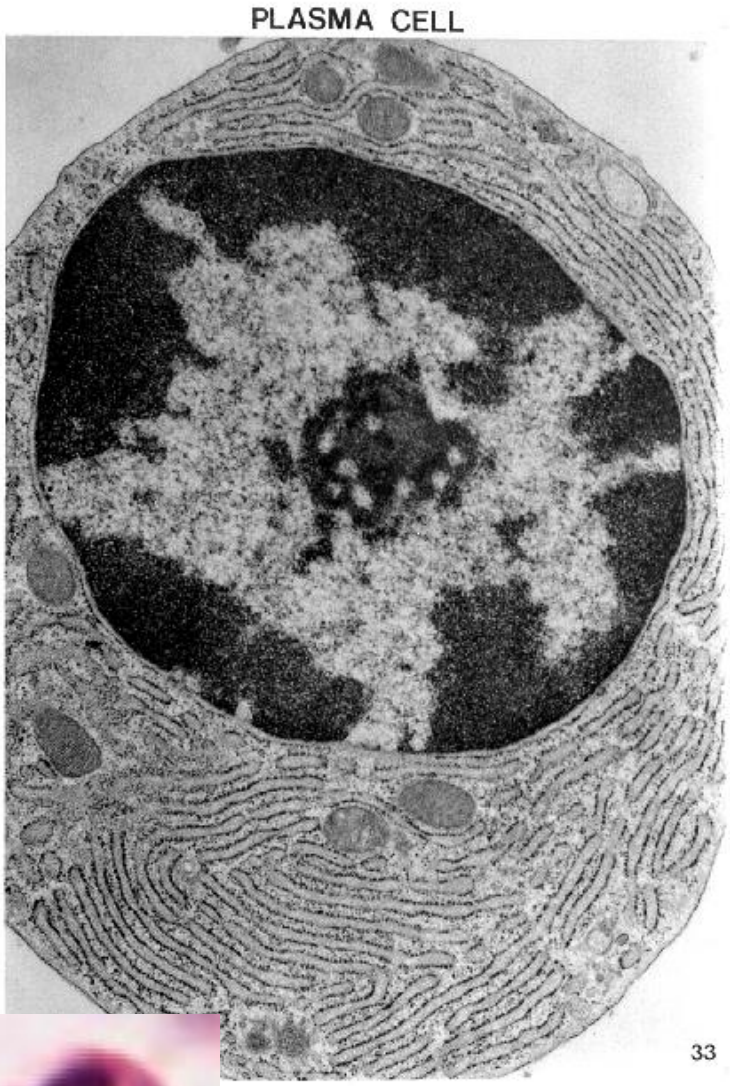


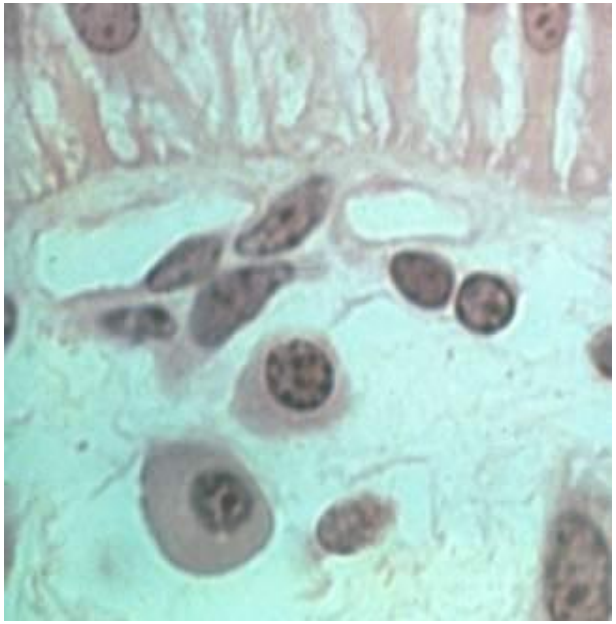
Plasma cell

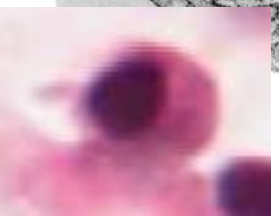


Mast cell

EM 33

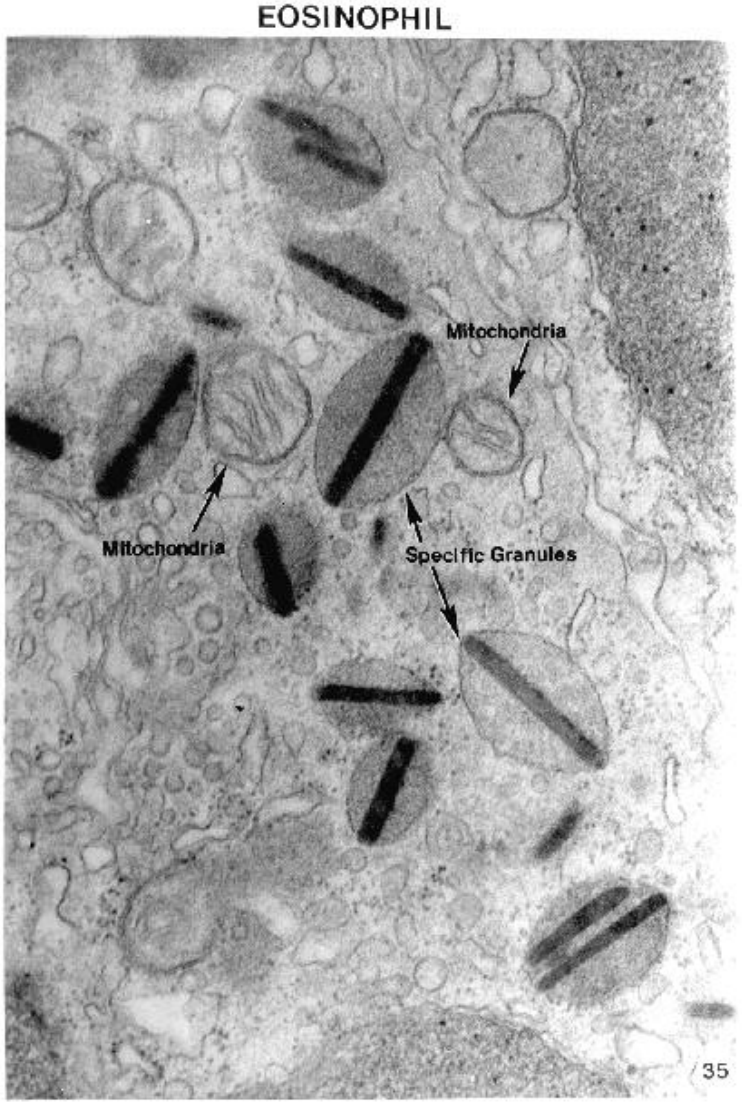


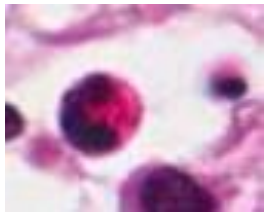




Plasma cells are identified by their small, eccentrically placed nucleus with condensed, coarse chromatin clumps distributed peripherally in a characteristic radial pattern and one central mass. A prominent, clear area in the cytoplasm is adjacent to the nucleus.

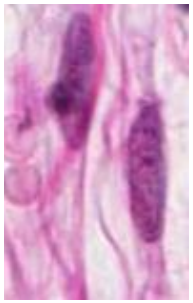
EM 35 & 56



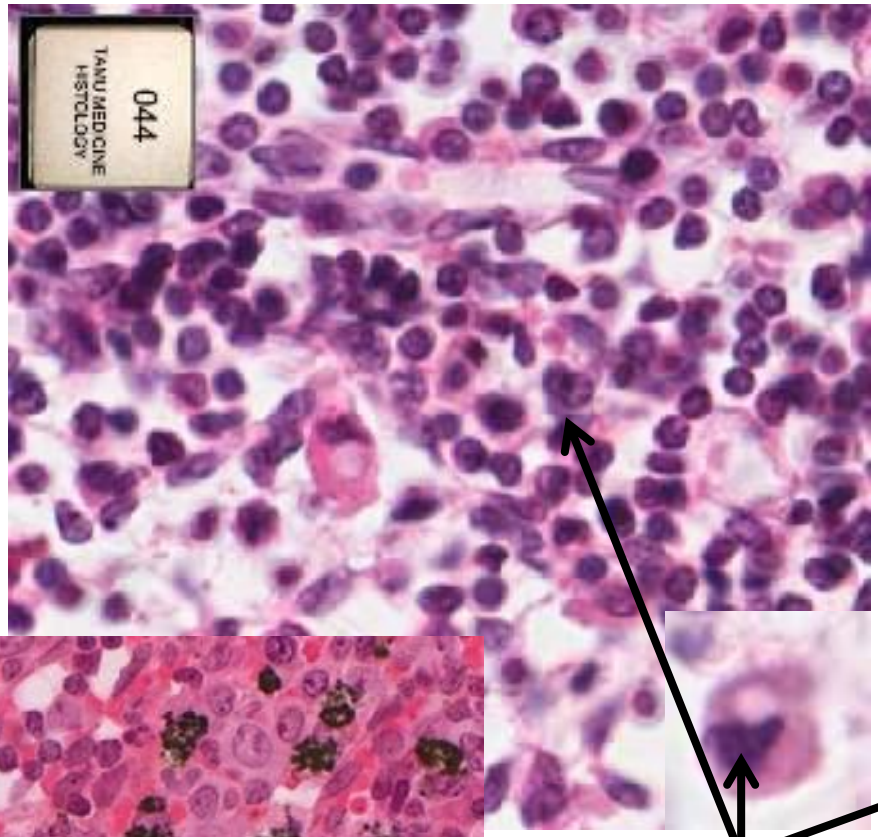


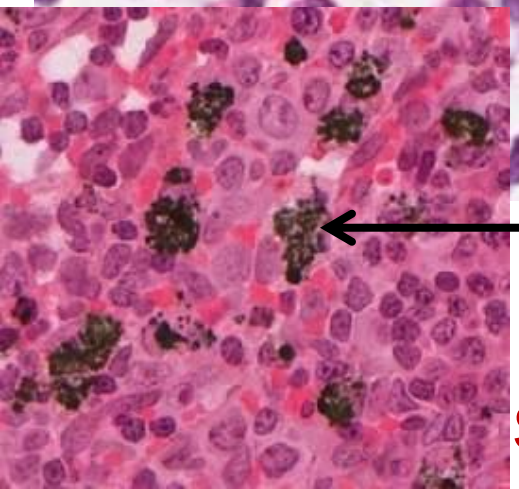
040

040



Slide 44: Lymph node



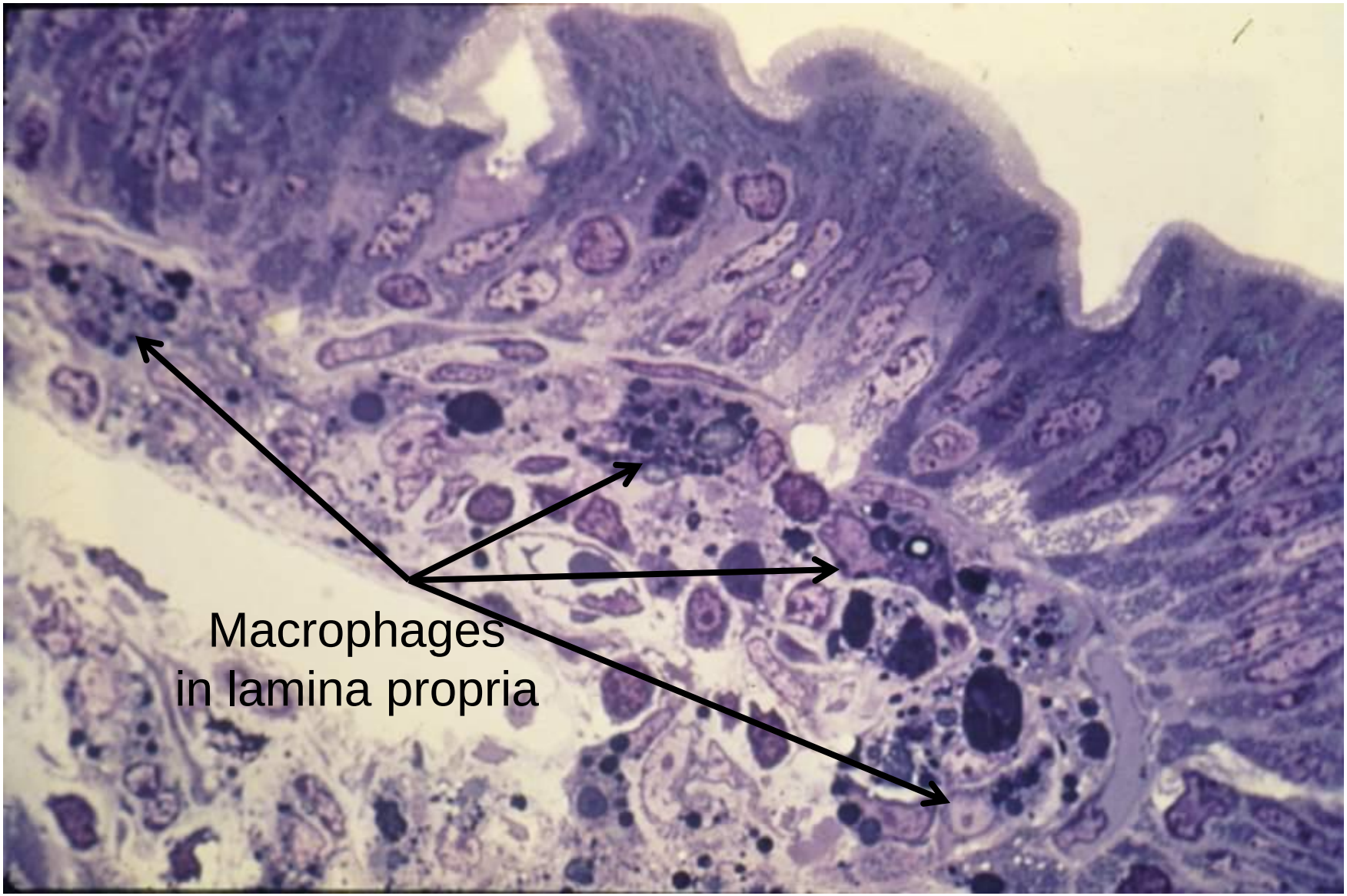


Macrophage

Spleen

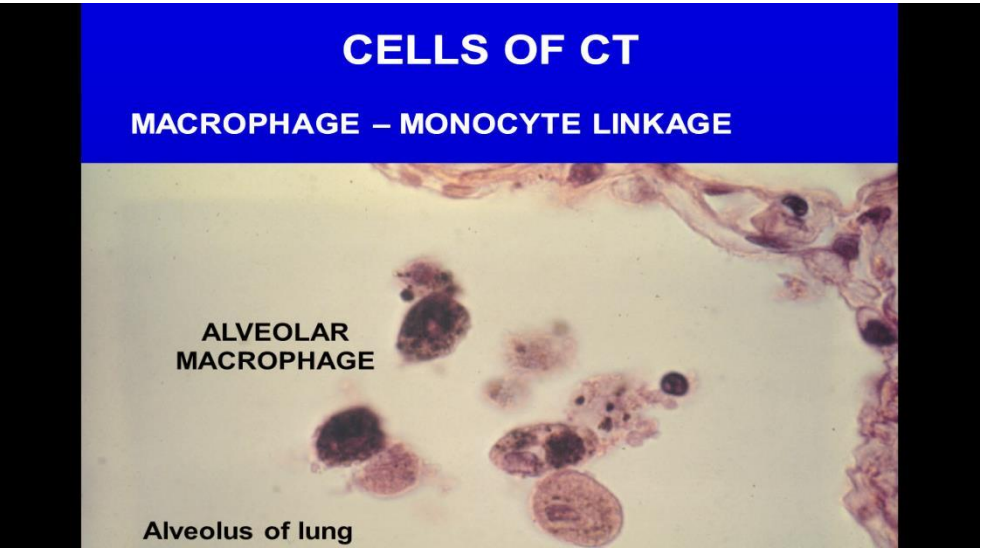
Lamina propria

Small intestinal villus

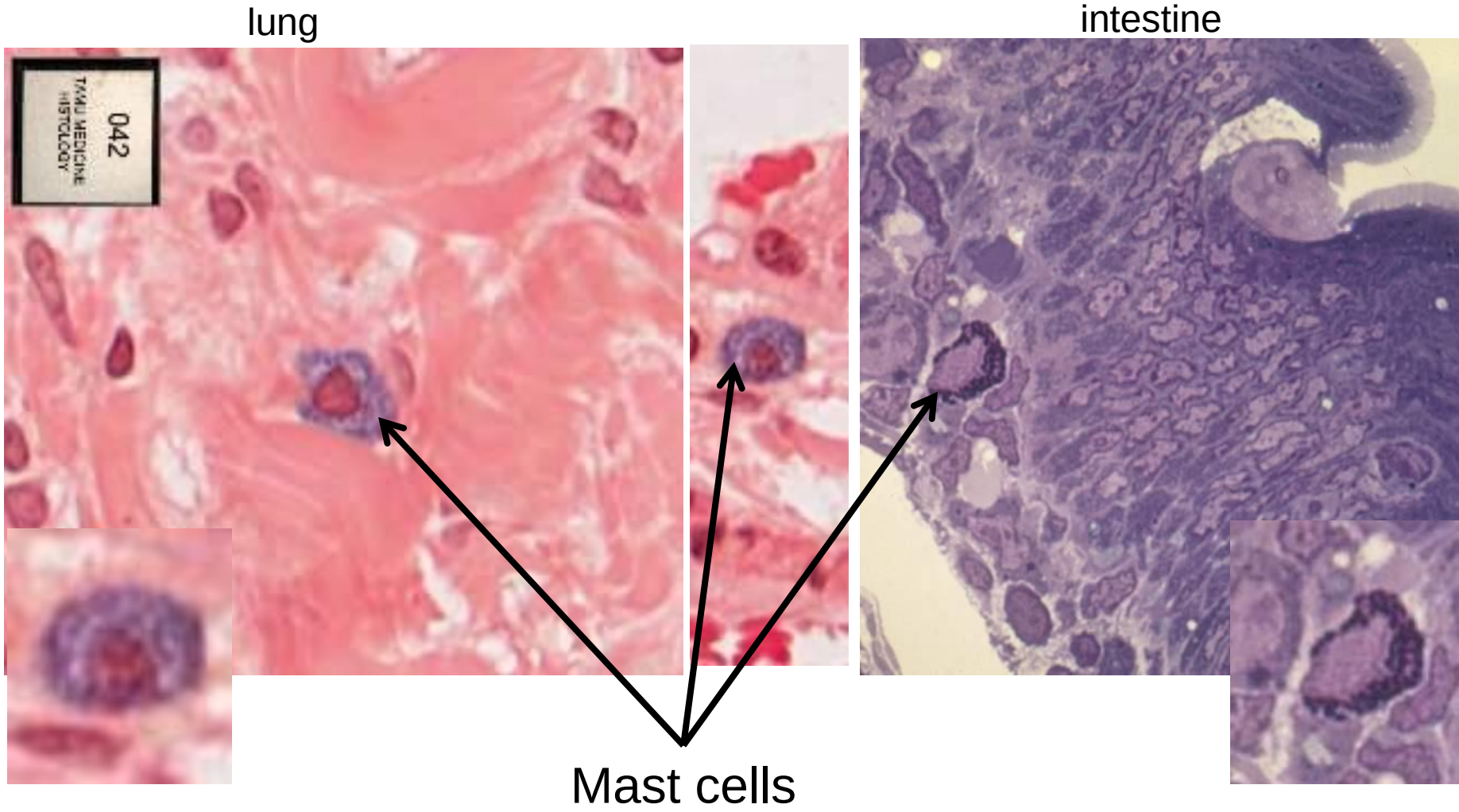


Function of macrophages

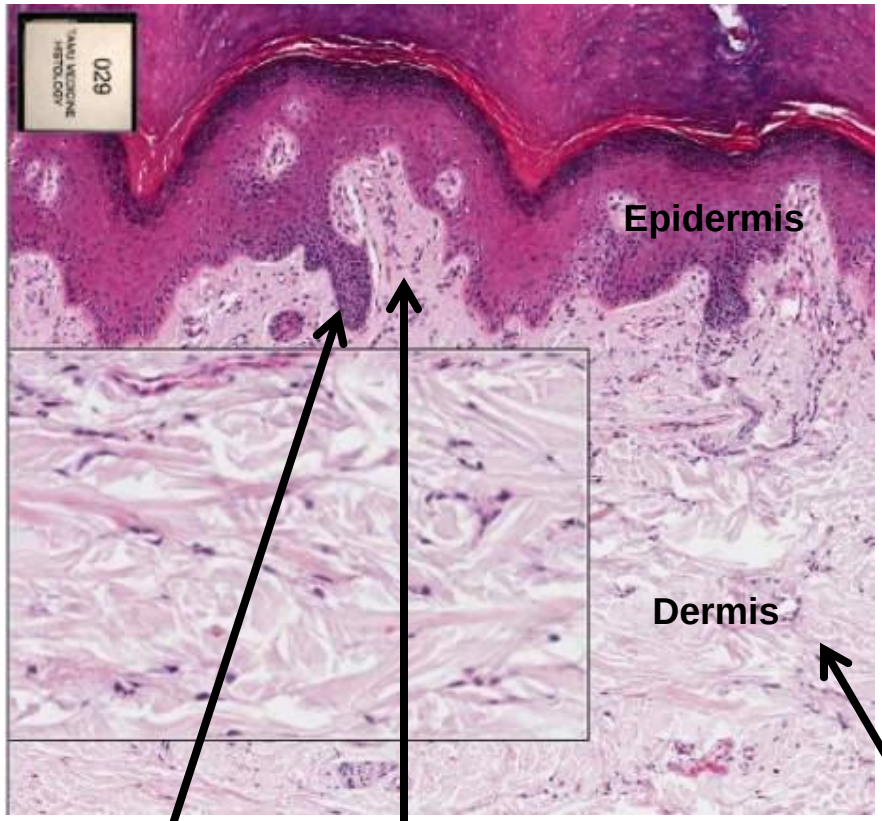
Macrophages are attracted to inflammation sites. They function to ingest bacteria, dead cells, cell debris, and other foreign matter. Macrophages also enhance the immunologic activities of lymphocytes by acting as antigen-presenting cells.

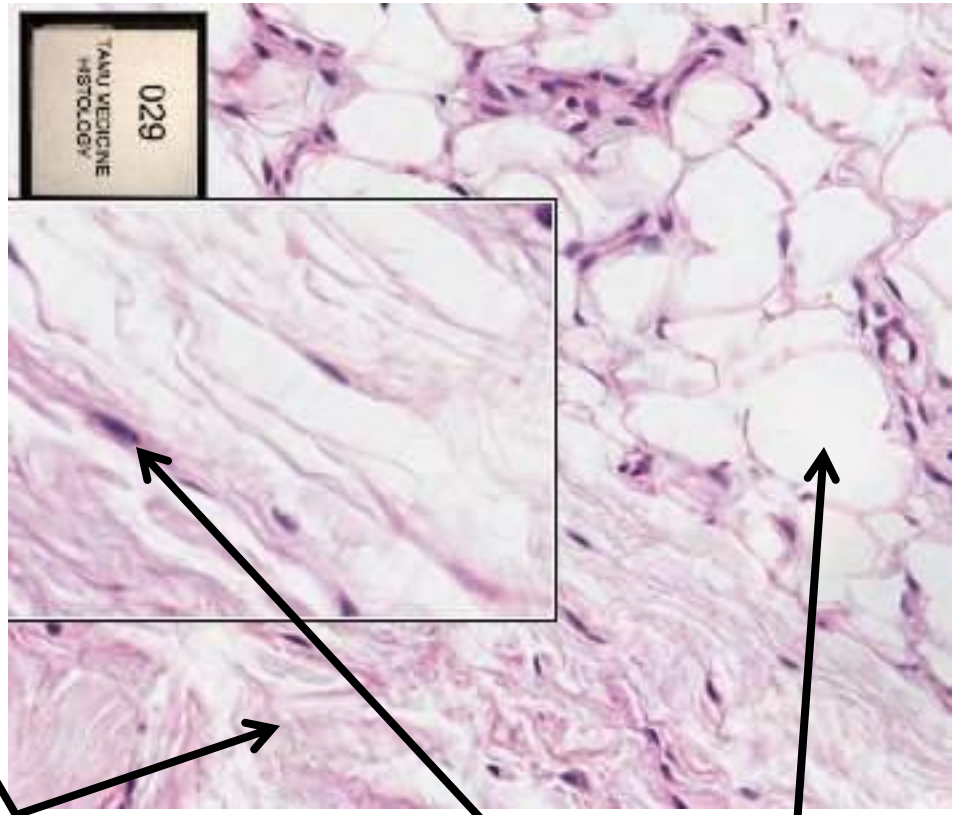


Slide 42: Lung (Cannon-Sampson stain for mast cells)



Slide 29: Skin





Rete pegs

Dermal papilla

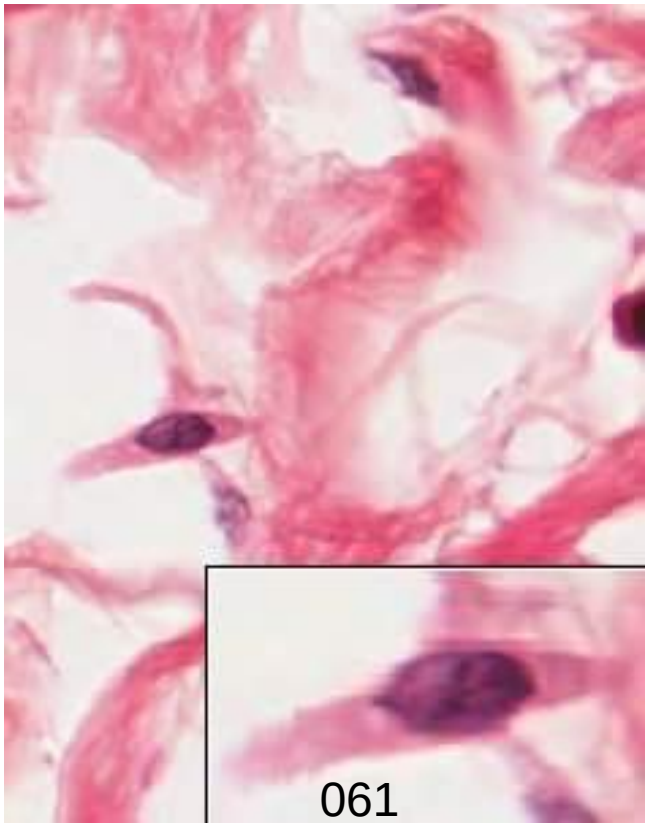
Type I collagen fiber bundles composing dense irregular connective tissue

Fibroblasts & Adipocytes

Epithelium is avascular and must get its nourishment (oxygen, nutrients, and metabolites) from that diffused through the blood capillaries located in the underlying connective tissue.

EXTRACELLULAR MATRIX - COLLAGEN

SYNTHESIS BY FIBROBLASTS



EXTRACELLULAR MATRIX - TYPES OF COLLAGEN

FIBROUS

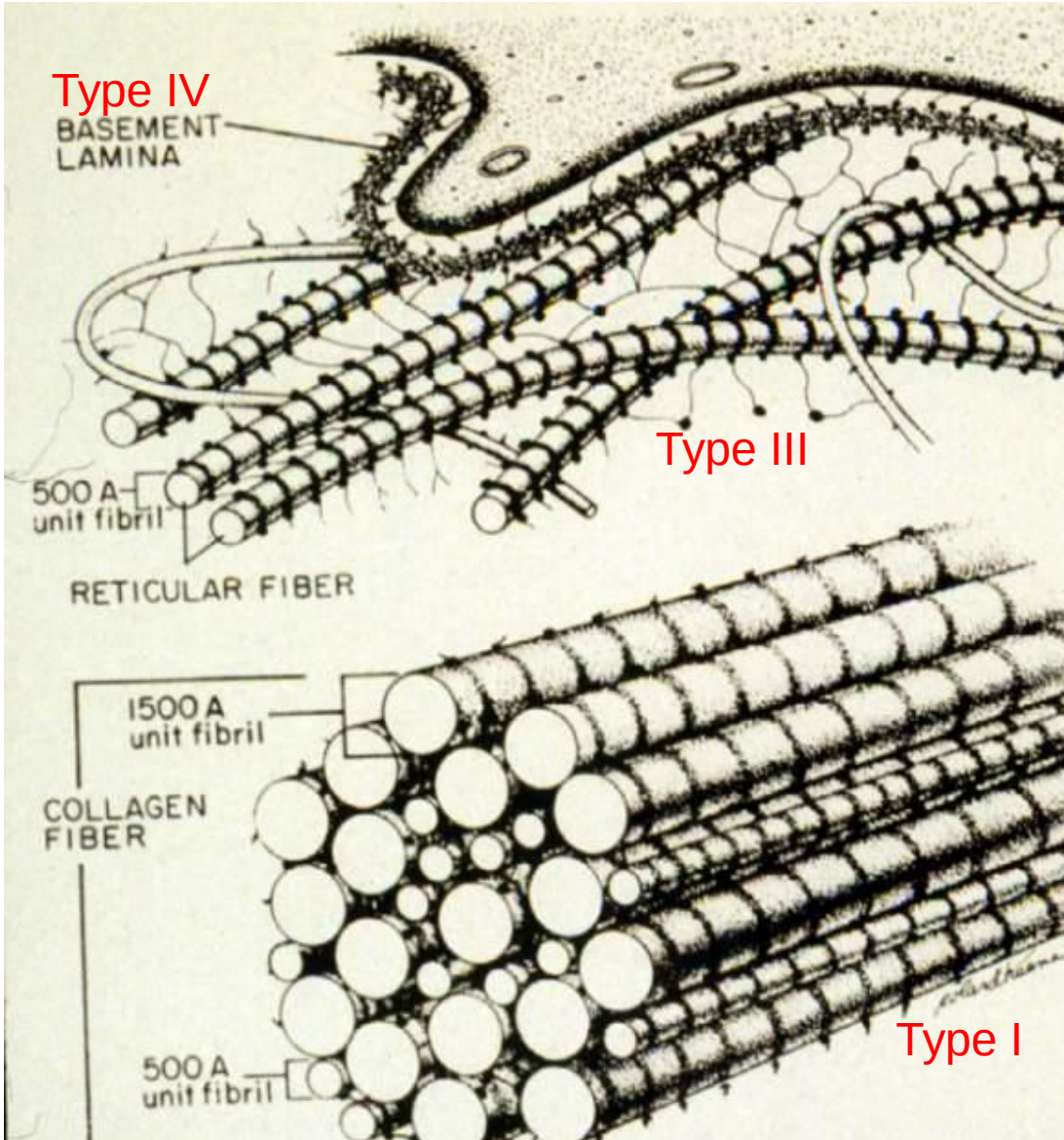
TYPE I - FIBER FORMING – MOST CT

TYPE II - FIBRIL FORMING

HYALINE CARTILAGE AND VITREOUS BODY OF EYE

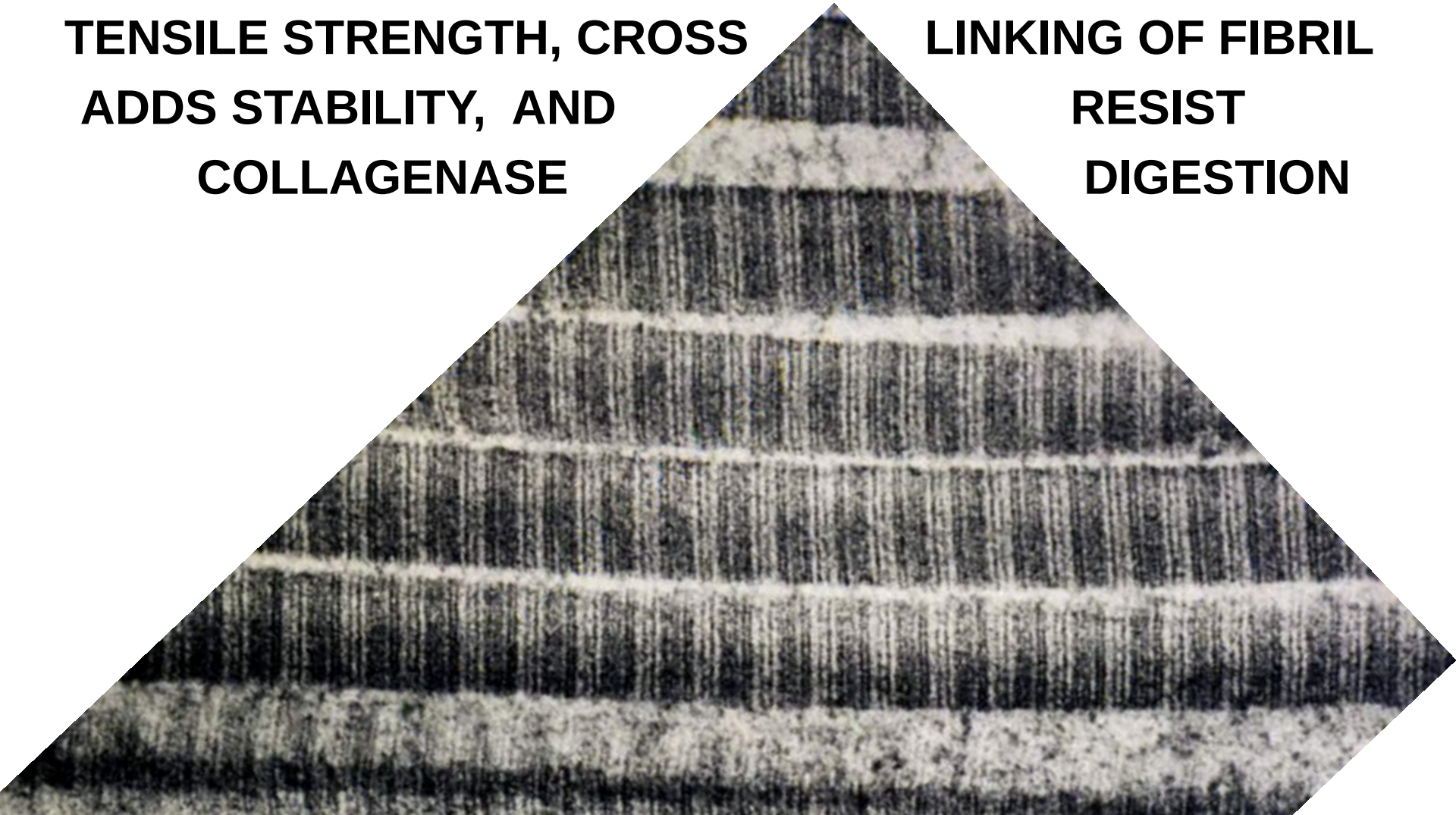
TYPE III - RETICULAR NETWORK

BRANCHING



EXTRACELLULAR MATRIX – COLLAGEN (Type I)

GENERAL CHARACTERISTICS – FLEXIBLE WITH HIGH TENSILE STRENGTH, CROSS LINKING OF FIBRIL ADDS STABILITY, AND RESIST COLLAGENASE DIGESTION

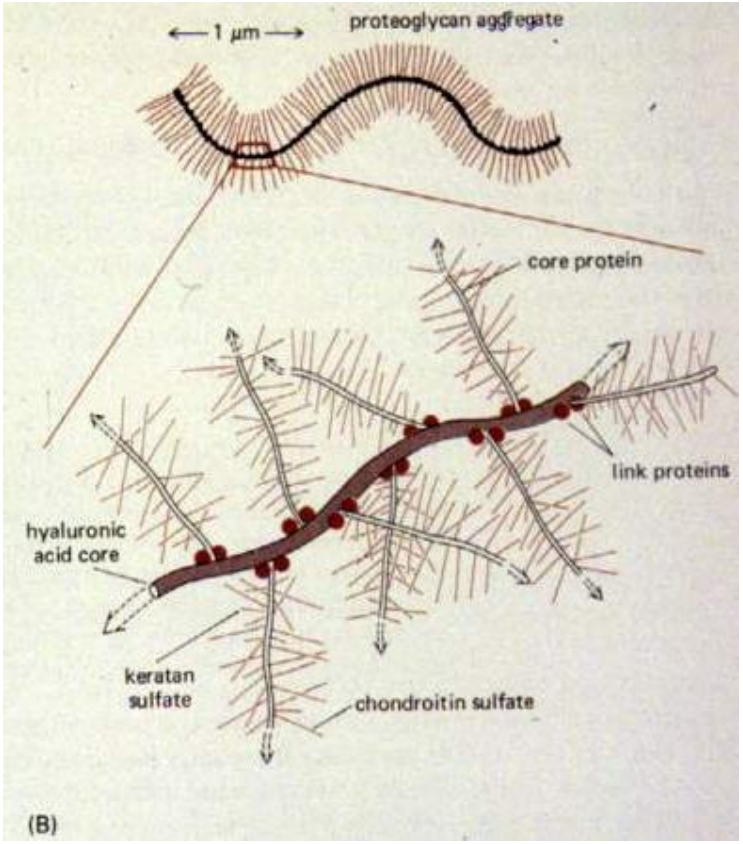


EXTRACELLULAR MATRIX - GROUND SUBSTANCE

PROTEOGLYCANS - GROUND SUBSTANCES

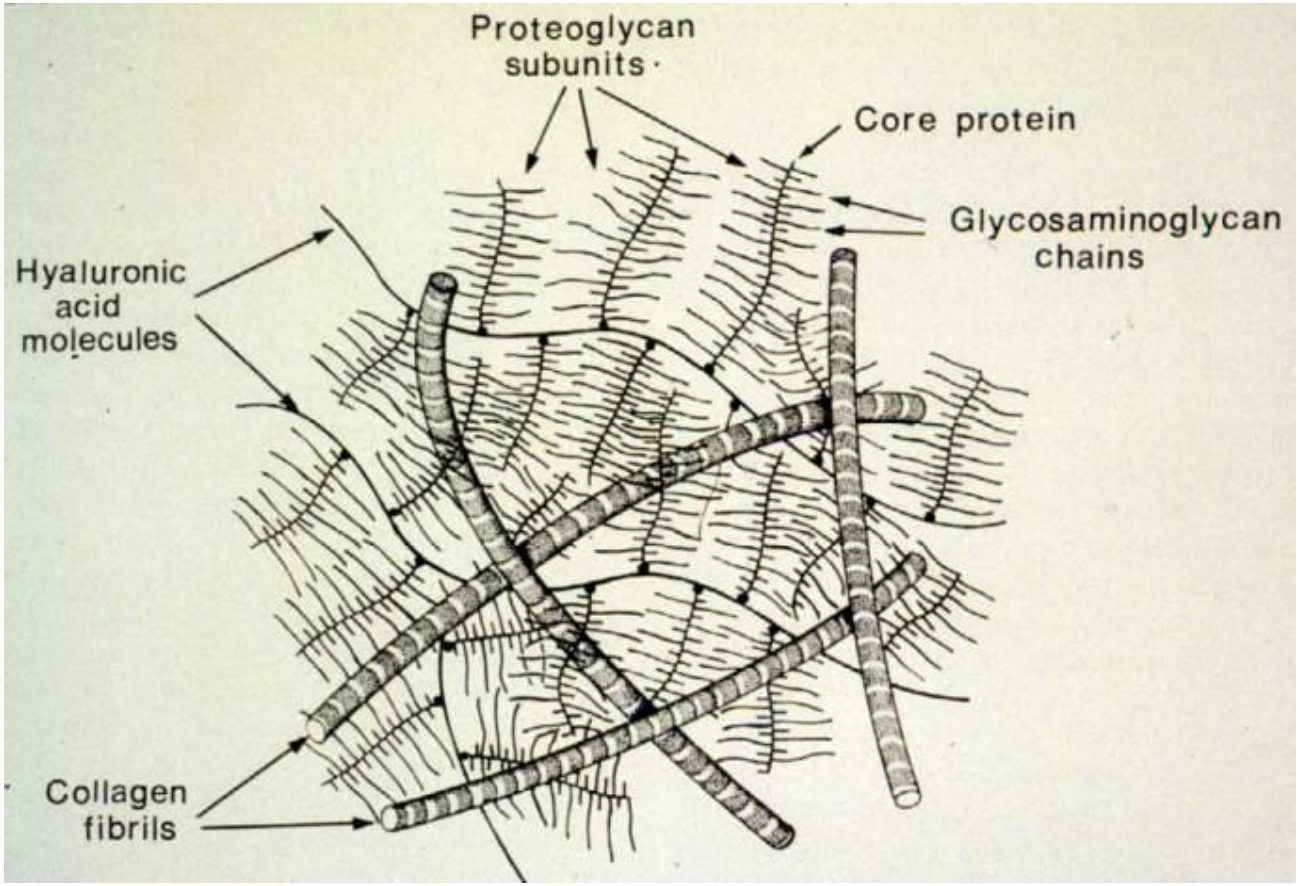
HYALURONIC ACID

GLYCOSAMINOGLYCANS



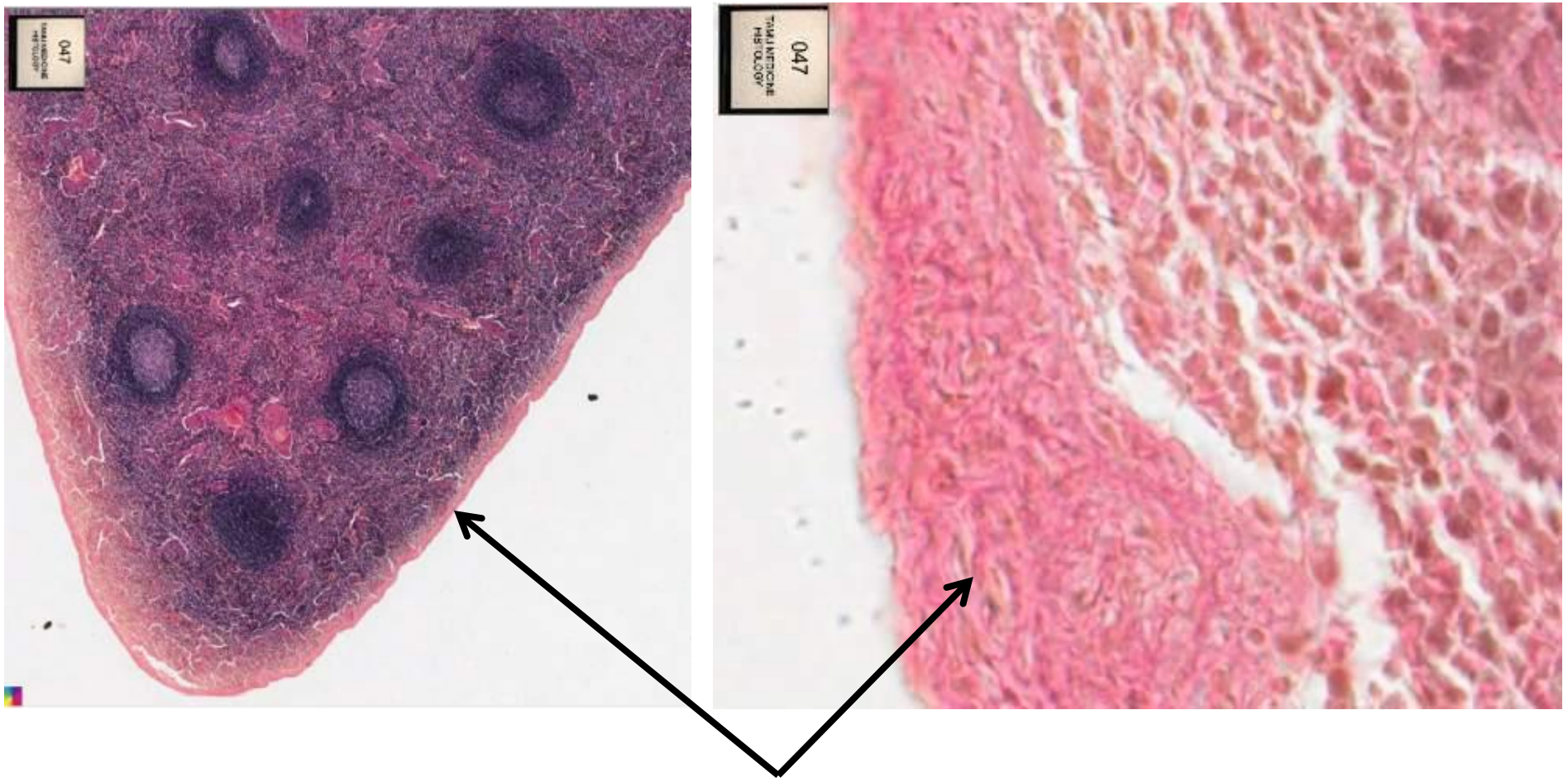
Ground substance is rich in Hyaluronic acid, sulfated glycosaminoglycans, proteoglycans, glycoproteins, water, ions, metabolites, and regularity molecules.

EXTRACELLULAR MATRIX - GROUND SUBSTANCE



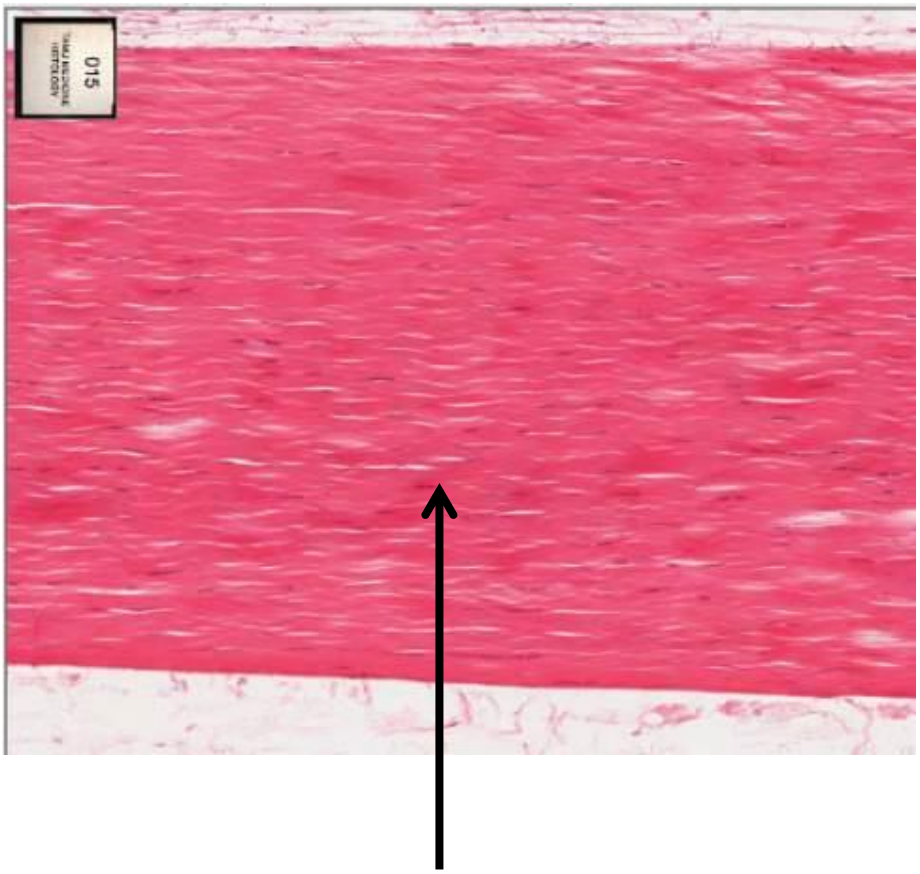
The ground substance supports, surrounds, and binds all connective tissue cells and fibers. It facilitates the diffusion of oxygen, electrolytes, nutrients, fluids, metabolites, waste, and other water soluble molecules between connective tissue cells and blood vessels. The ground substance also acts as a barrier from pathogen invasion of the connective tissue.

Slide 47: Spleen

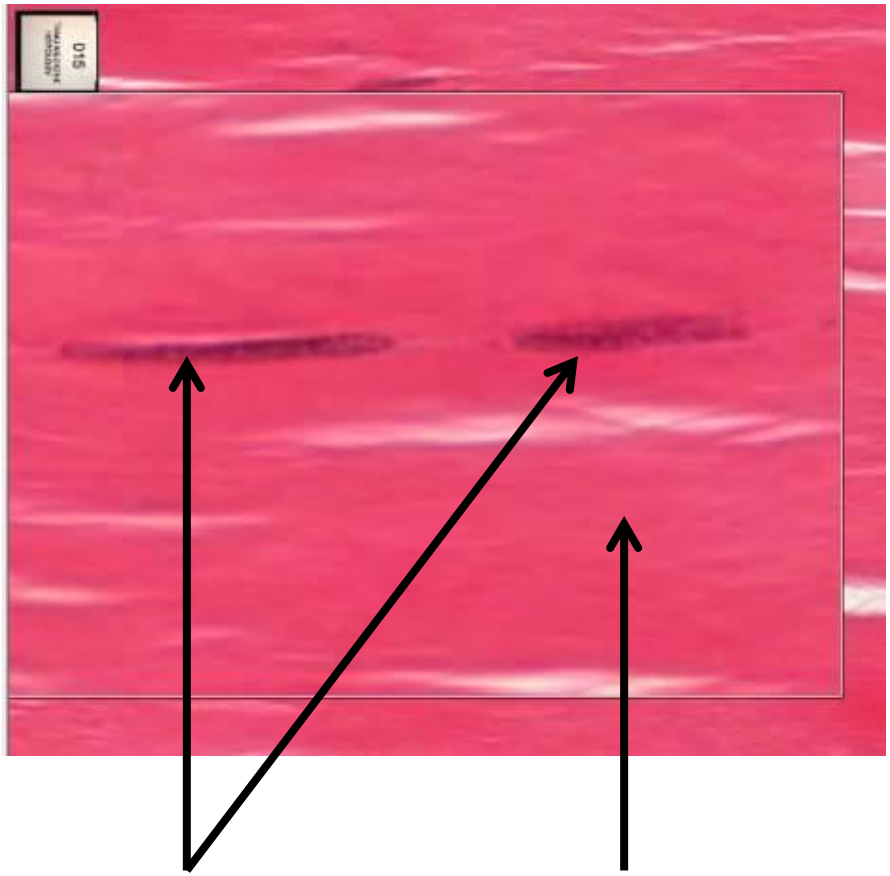


Dense irregular connective tissue capsule

Slide 15: Tendon



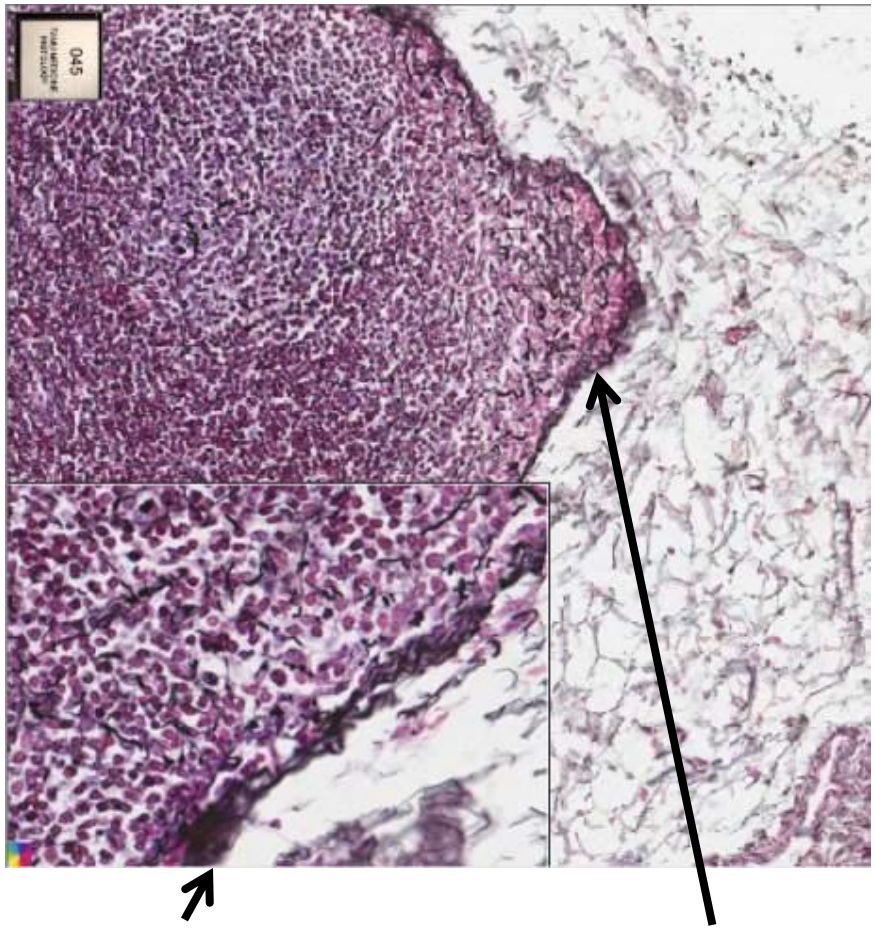
Dense regular connective tissue



Fibroblasts

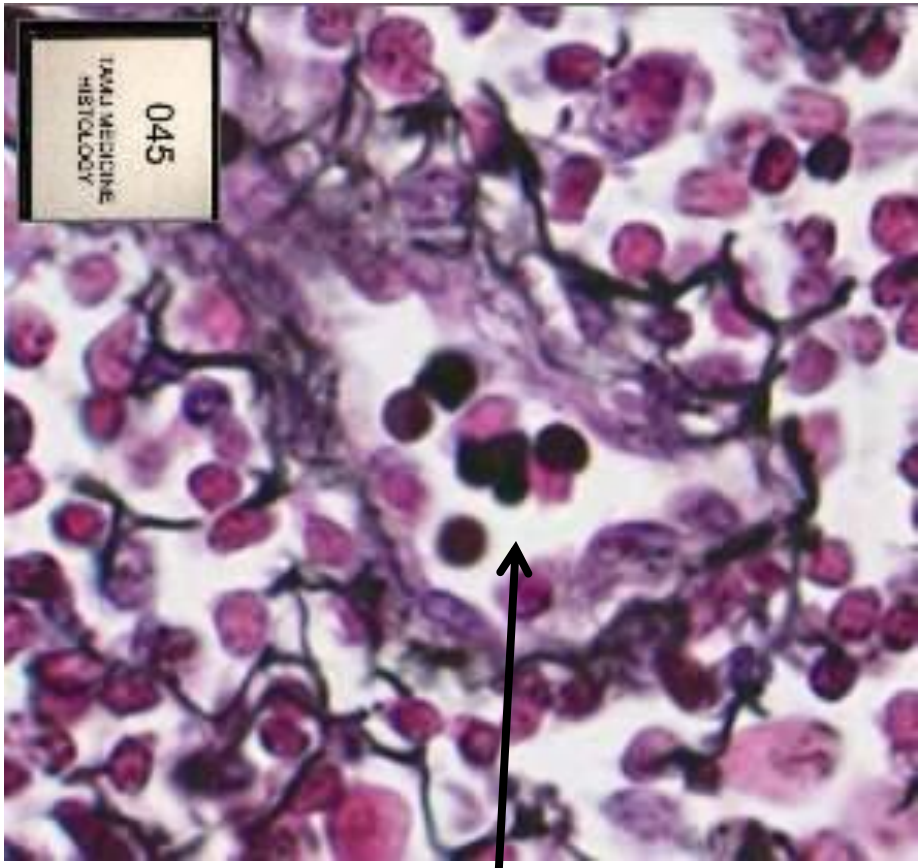
Collagen

Slide 45: Lymph node (reticular fiber stain)



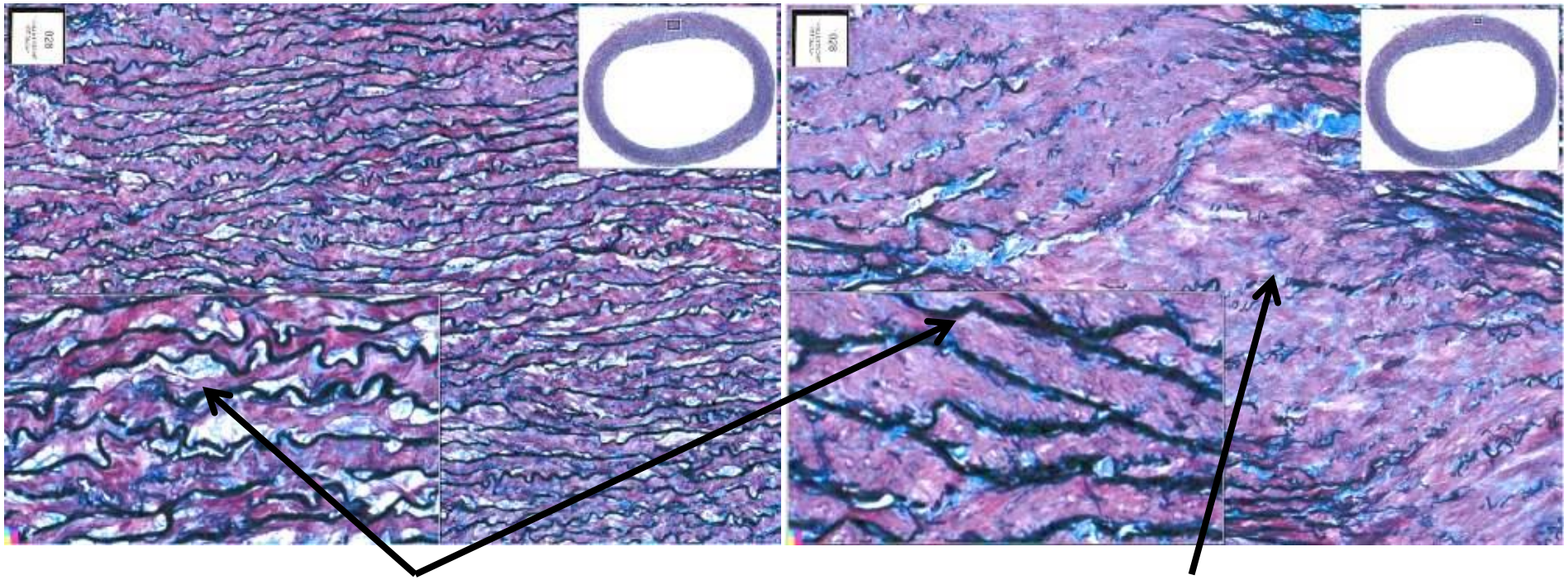
Reticular fibers

Connective tissue capsule



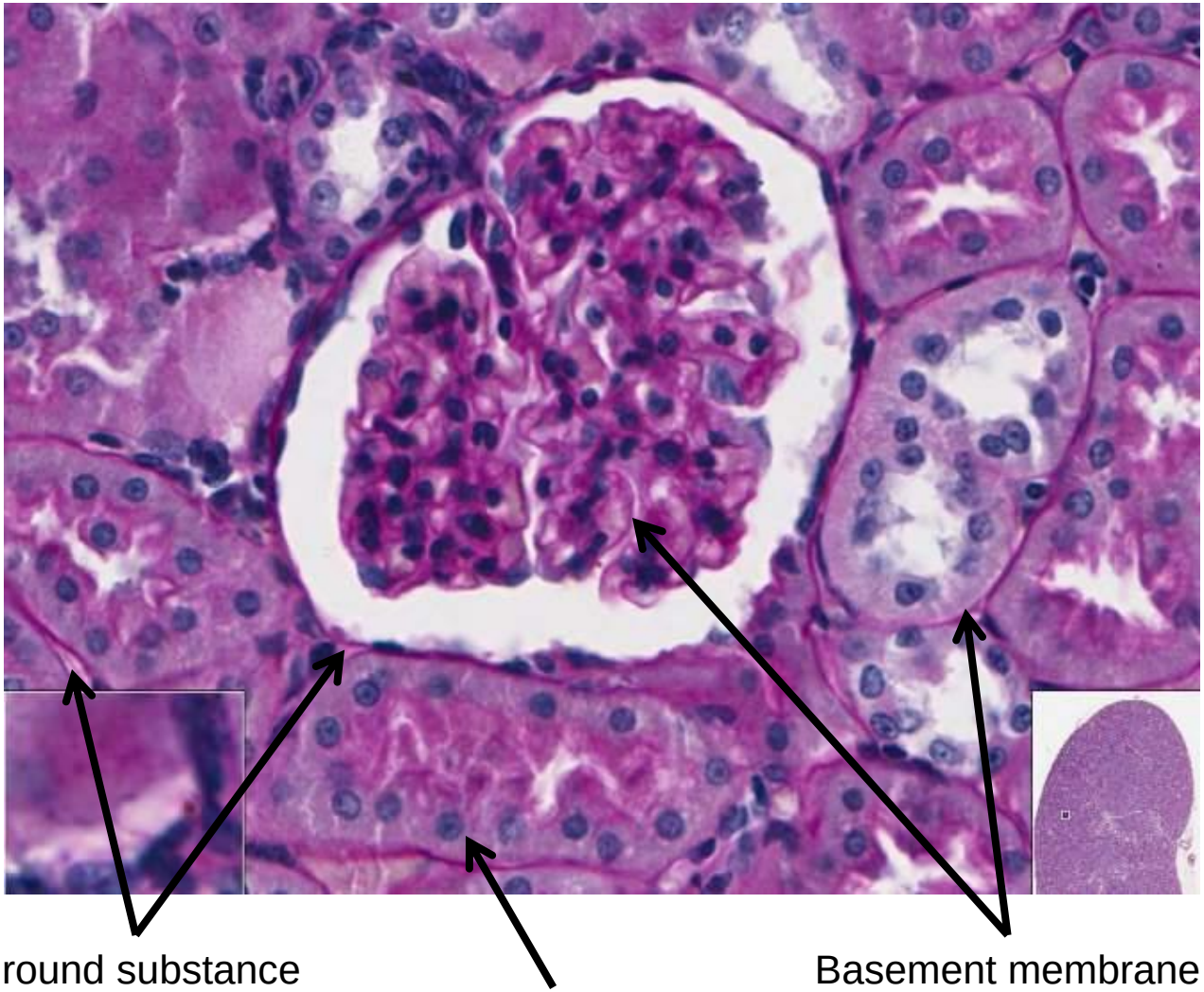
Lymphocyte cluster

Slide 28: Aorta (Verhoff's / Gomori trichrome stain)

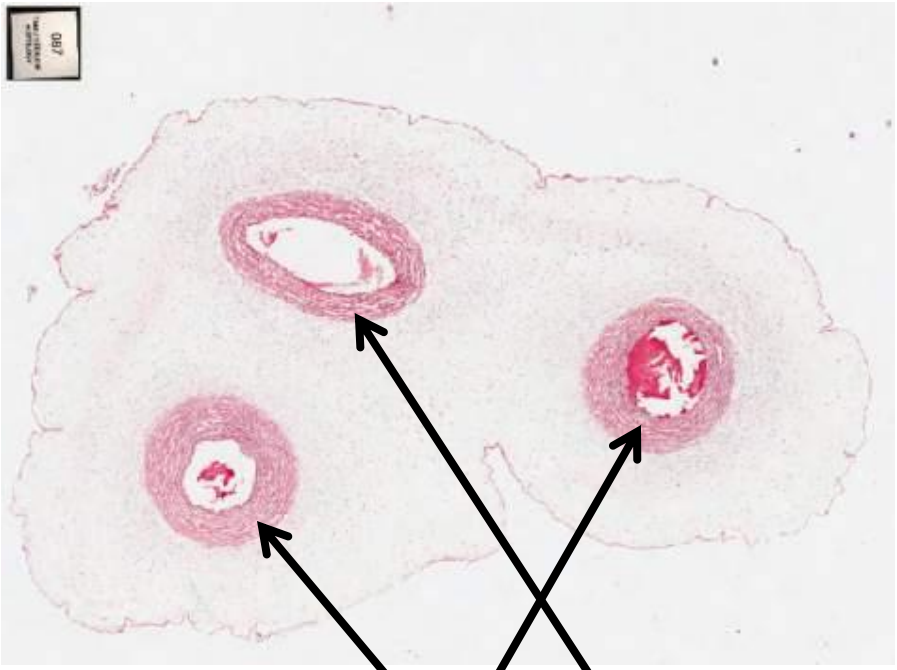


The presence of elastic fibers in the aorta (and other large arteries) allows for stretching and recoiling of these vessels during powerful blood ejections from the heart ventricles.

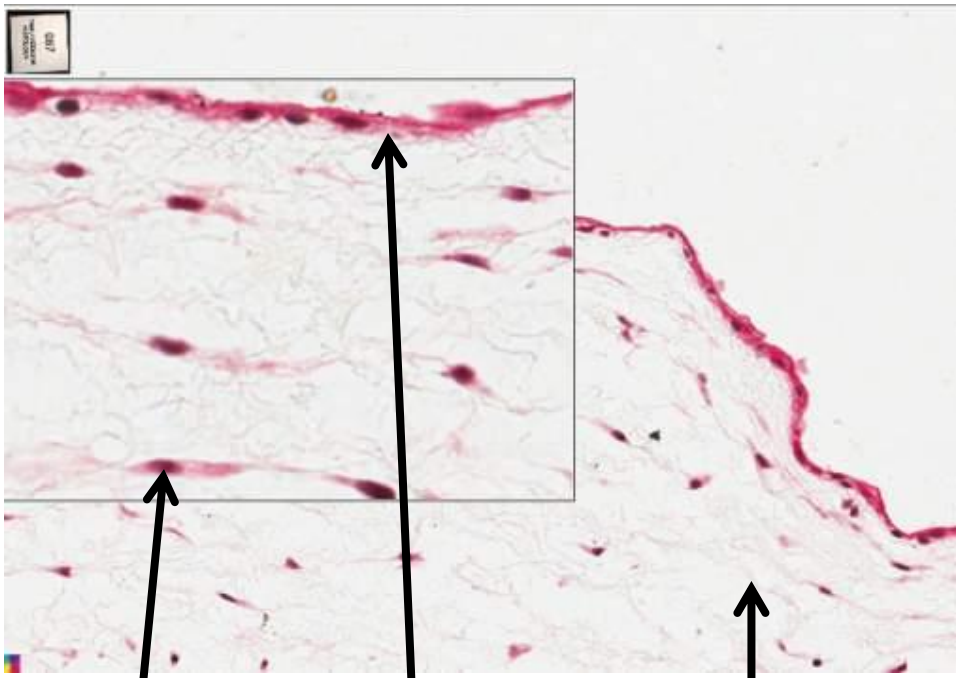
Slide 33: Kidney (PAS stain)



Slide 87: Umbilical cord (Gomori Trichrome)



Umbilical arteries and vein



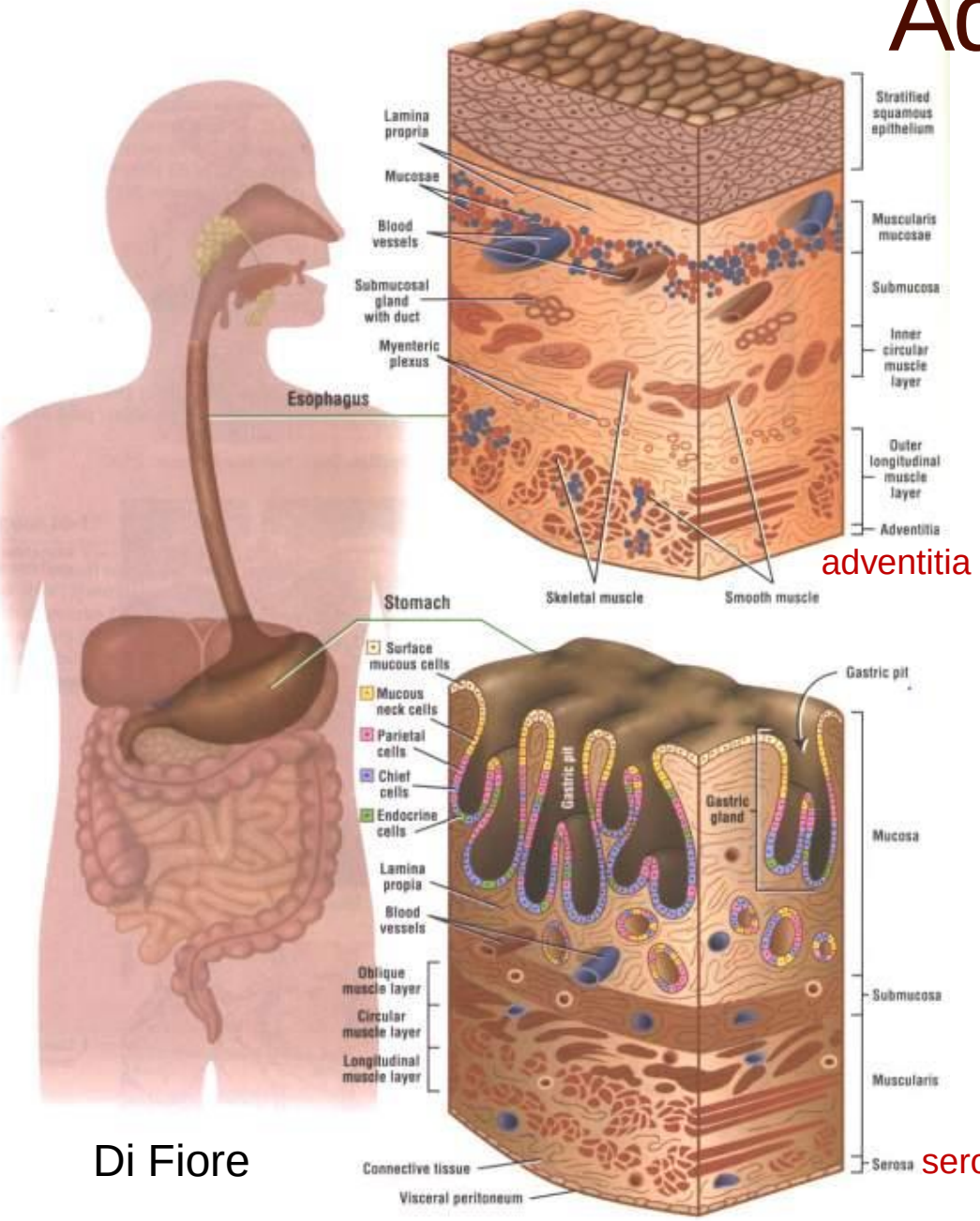
Fibroblasts

Serosa lining

Mucus tissue with fine collagen fibers

Umbilical arteries and vein are more similar in wall structure than is typical because the pressure is low compared to an adult. In this absence of high pressure, arteries lack the thick walls seen in adults and resemble veins.

Adventitia or Serosa



Di Fiore

Digestive organs (oral cavity or upper esophagus) that lie outside the peritoneal cavity are covered by adventitia. The serosa covers organs that are located within the peritoneal cavity.

The adventitia is provides direct, firm attachment to the body surrounding tissues/structures. The serosa is a serous membrane that consists of slick simple squamous epithelium called mesothelium and thin layers of underlying loose connective tissue.

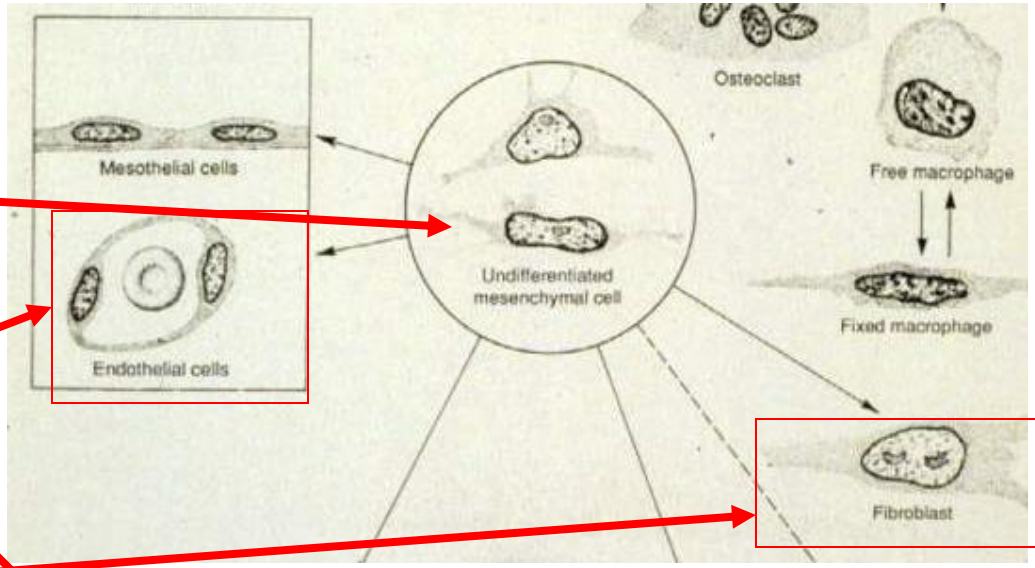
The adventitia facilitates a firmer attachment while the serosa allows more movement of the organs it covers by providing a slippery surface coating.

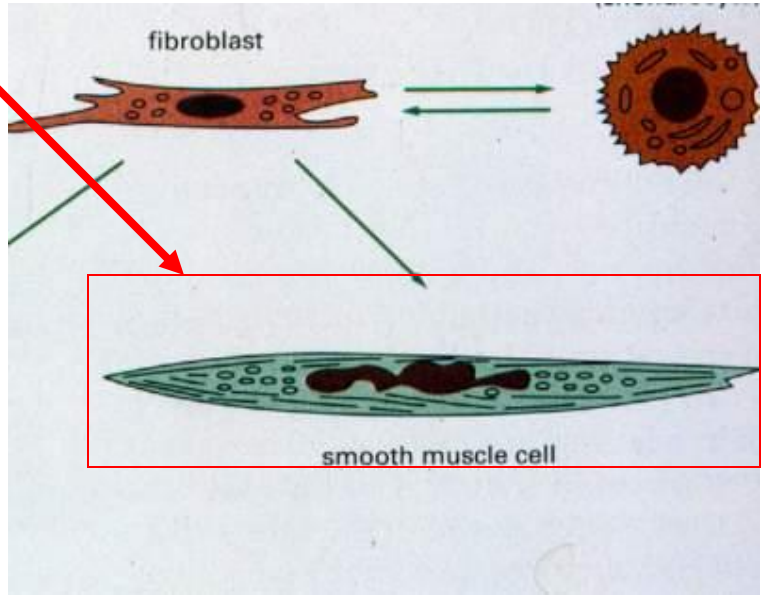
MESENCHYMAL CELLS

Endothelial cells

Smooth muscle cells

Fibroblasts



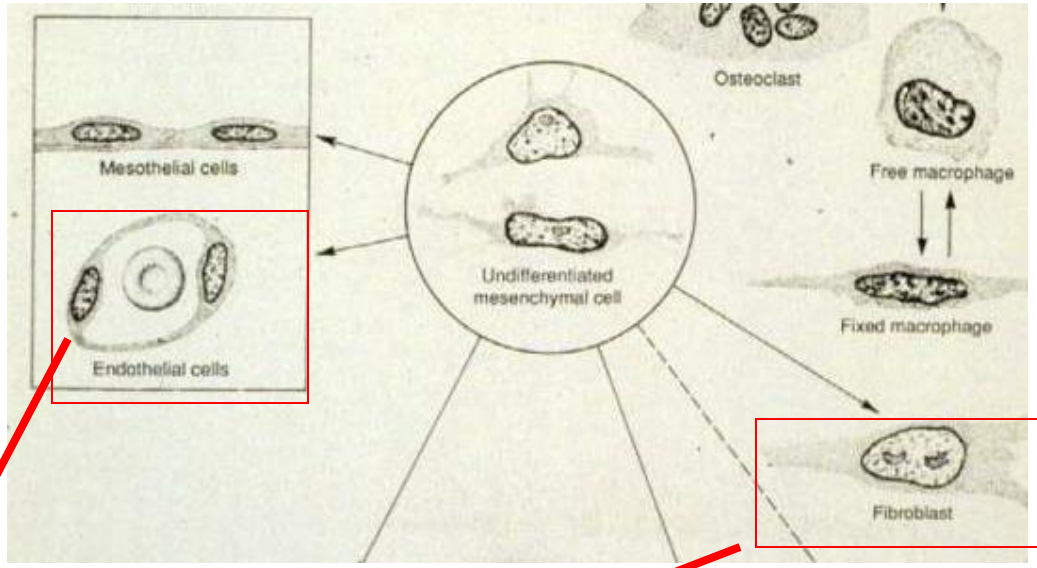


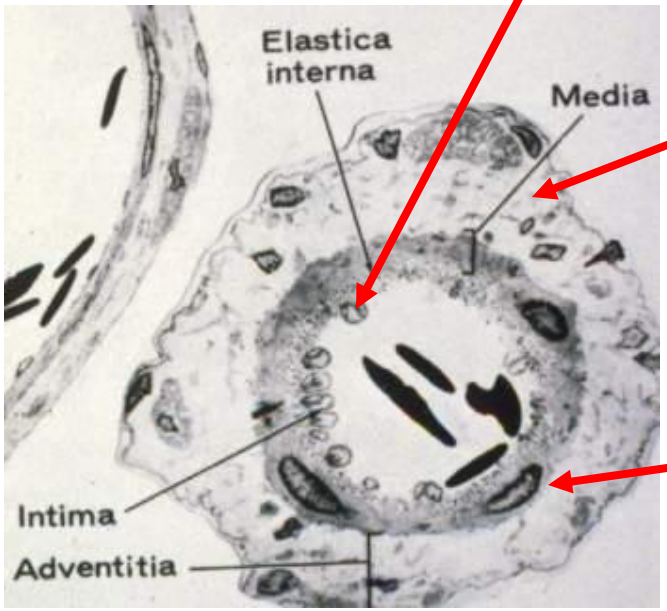
MESENCHYMAL CELLS

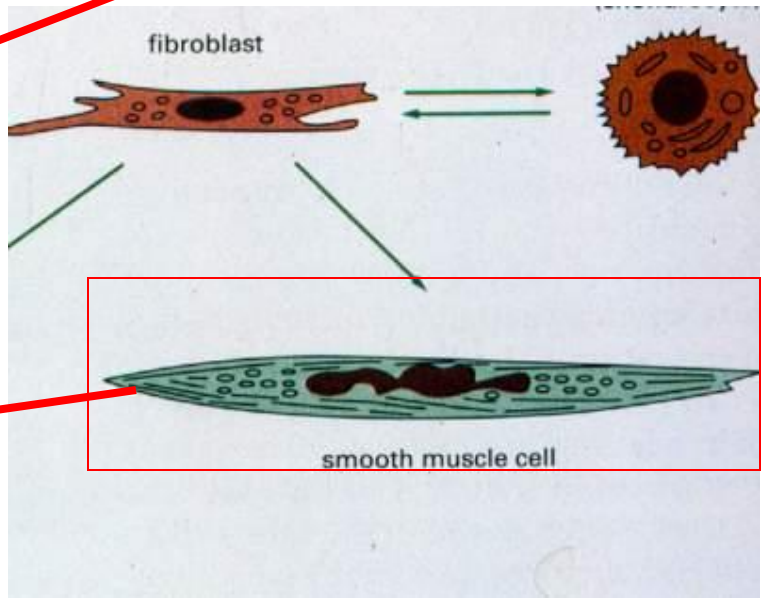
Endothelial cells

Smooth muscle cells

Fibroblasts

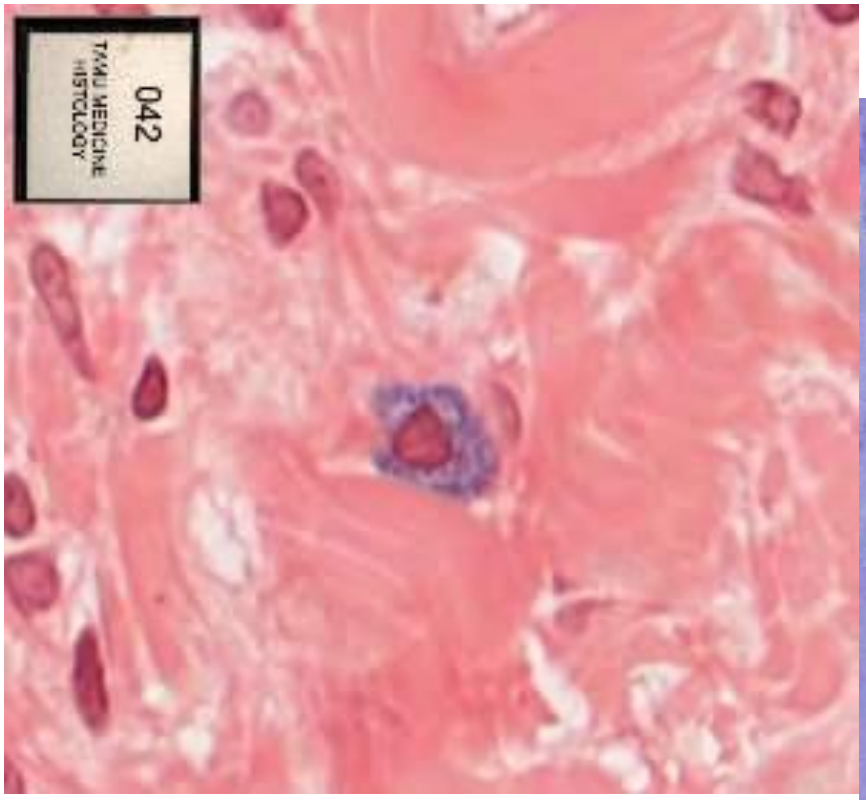


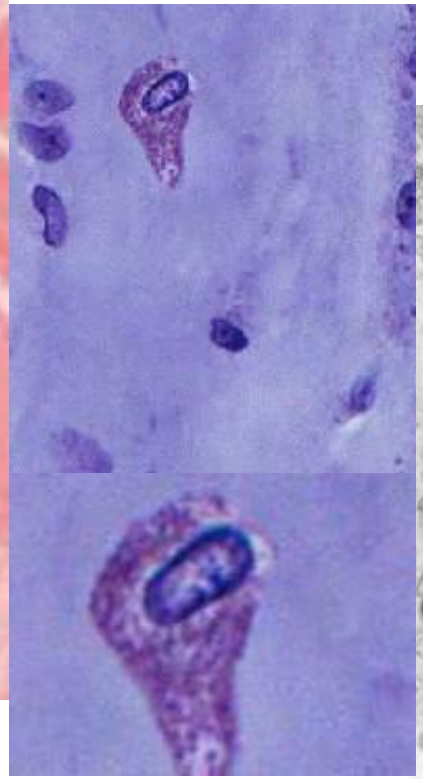


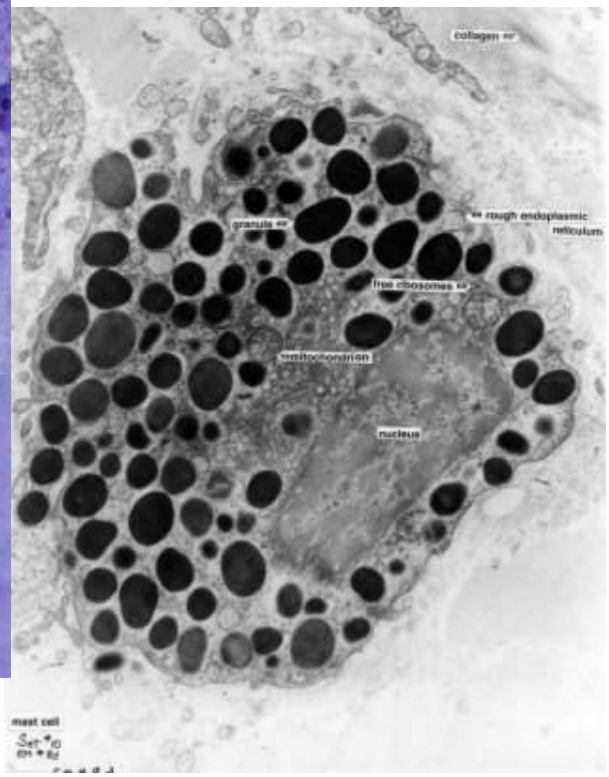


Clinical Correlation

Mast cells are connective tissue cells that release granules that contain chemicals like histamine and heparin which act in immediate hypersensitivity reactions.





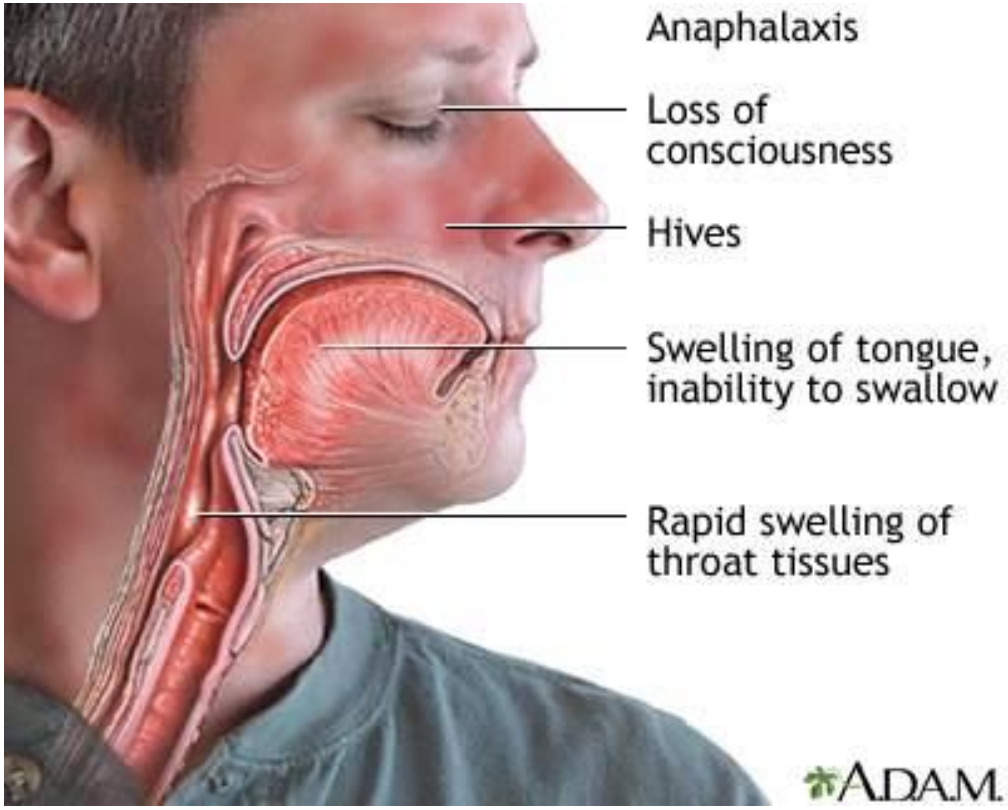


Mast cells and anaphylactic shock

Clinical Correlation

Mast cells and anaphylactic shock

In a highly sensitized individual, a potentially fatal, dramatic immediate hypersensitivity reaction (anaphylactic shock) may occur. The reaction may be fatal because the chemicals released during anaphylactic shock may swell airways shut and cardiac effects may also occur.



Many illustrations in these VIBS Histology YouTube videos were modified from the following books and sources: Many thanks to original sources!

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- Douglas P. Dohrman and TAMHSC Faculty 2012 Structure and Function of Human Organ Systems, Histology Laboratory Manual - Slide selections were largely based on this manual for first year medical students at TAMHSC

The End!