

**ISTINYE UNIVERSITY
MEDICAL SCHOOL**

Grade I

**HISTOLOGY AND EMBRYOLOGY
PRACTICE BOOKLET
2024-2025**

“Patience is the road to wisdom”

Kao Kalia Yang

PREFACE

Dear Students,

This laboratory manual has been prepared to help you understand and enhance your knowledge and skills in histology, which is the study of the microscopic structure of tissues and organ systems. Our laboratory studies will enhance your understanding of the theoretical subjects and give you a view of the microscopic structures of all human tissues.

During our laboratory sessions, you will examine the morphological features of tissues and organ systems in detail both from microscopical slides but mostly on digitalized versions of the tissue sections. You will have the opportunity to recognize various tissue types, their cellular details, and organization while refining your microscopic observation skills. This manual is designed to guide you on topics of general and specialized histology.

A disciplined and meticulous approach to your laboratory work is essential. Accurately and systematically recording your microscopic observations will strengthen your scientific perspective. We also recommend drawing of your own figures with annotations, which will emphasize their structures on your long term memory.

We hope this manual serves as a valuable guide in your laboratory work and inspires a deeper interest in histology. May your journey always be illuminated by the light of science...

Wishing you success.

Department of Histology and Embryology

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LEARNING OBJECTIVES AND EVALUATION METHOD

COMMITTEE NAME	COURSE NAME	LEARNING OBJECTIVES	EVALUATION METHOD
Passive Locomotor System	Epithelial Tissue	Be able to classify epithelial tissue.	MCQ, OEQ*
		Be able to define cell morphology.	MCQ, OEQ*
		Be able to distinguish the apical, basal and lateral surfaces of the cell within the epithelial tissue.	MCQ, OEQ*
		Be able to define the types of lining epithelia.	MCQ, OEQ*
		Be able to define the types of glandular epithelia.	MCQ, OEQ*
Passive Locomotor System	Connective Tissue	Be able to list the classification of connective tissue.	MCQ, OEQ*
		Be able to distinguish connective tissue fibers under light microscope.	MCQ, OEQ*
		Be able to distinguish connective tissue cells under light microscope.	MCQ, OEQ*
		Be able to distinguish the nerve and vessels.	MCQ, OEQ*
		Name the connective tissue type and the connective tissue elements it contains.	MCQ, OEQ*
Passive Locomotor System	Cartilage and Bone Tissue	Be able to classify cartilage tissue.	MCQ, OEQ*
		Be able to describe the differences between cartilage tissues.	MCQ, OEQ*
		Be able to list the names of cartilage tissue cells and their morphological differences.	MCQ, OEQ*
		Be able to tell bone tissue classification.	MCQ, OEQ*
		Knows the names of bone tissue cells and their morphological differences.	MCQ, OEQ*
		Be able to show the Haversian system, haversian and interstitial lamellae and haversian and Volkmann canals.	MCQ, OEQ*
		Be able to distinguish compact bone and cancellous bone.	MCQ, OEQ*
		Be able to define periosteum and endosteum.	MCQ, OEQ*
Active Locomotor System	Muscle Tissue	Be able to classify and distinguish muscle tissue.	MCQ, OEQ*
		Be able to show endomysium, perimysium and epimysium in muscle tissue and explain their structure.	MCQ, OEQ*
		Be able to distinguish skeletal muscle and its components.	MCQ, OEQ*
		Be able to distinguish smooth muscle and its components.	MCQ, OEQ*
		Be able to distinguish cardiac muscle and its components.	MCQ, OEQ*
		Be able to explain striation in skeletal and cardiac muscle.	MCQ, OEQ*
		Be able to show intercalated discs in the cardiac muscle.	MCQ, OEQ*
Micro-organisms, Blood, Immune System	Blood	Be able to tell the names of blood cells and recognize cells at the light microscopic level	MCQ, OEQ*
		Be able to show Megakaryocytes in the bone marrow.	MCQ, OEQ*
		Be able to show Erythrocytes, Leukocytes, Monocytes, Eosinophils, Basophils, Neutrophils and Platelets in the blood smear preparation.	MCQ, OEQ*
		Be able to distinguish peripheral nerve and ganglion under the light microscope and can tell the difference with at least 2 items.	MCQ, OEQ*
		Be able to distinguish the structures of the peripheral nerve under the light microscope.	MCQ, OEQ*
		Be able to distinguish ganglion under light microscope.	MCQ, OEQ*

* MCQ: Multiple choice questions

* OEQ: Open-ended questions

EPITHELIAL TISSUE

Learning Objectives

Be able to classify epithelial tissue.

Be able to define cell morphology.

Be able to distinguish the apical, basal and lateral surfaces of the cell within the epithelial tissue.

Be able to define the types of lining epithelia.

Be able to define the types of glandular epithelia.

Identify the Following:

Lining Epithelia

- Simple Squamous Epithelia
- Simple Cuboidal Epithelia
- Simple Columnar Epithelia
- Pseudostratified Ciliated Columnar Epithelia
- Pseudostratified Stereociliated Columnar Epithelia
- Keratinized Stratified Squamous Epithelia
- Nonkeratinized Stratified Squamous Epithelia
- Transitional Epithelia

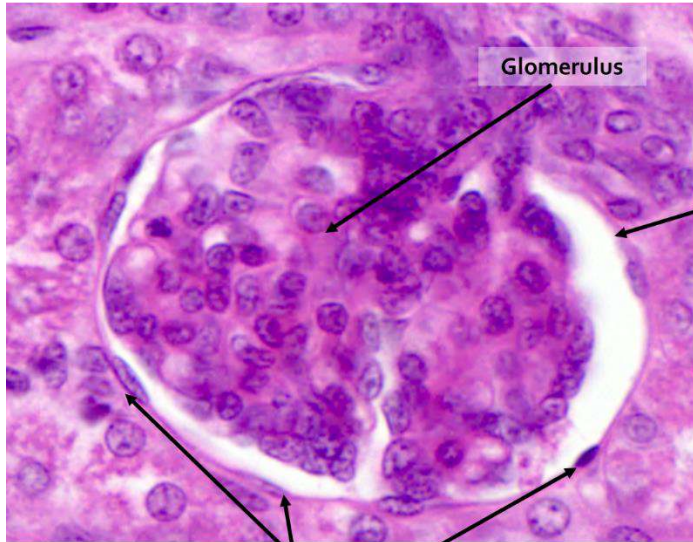
Glandular Epithelia

- Unicellular Gland- Goblet Cells
- Serous Acinus
- Mucous Acinus
- Mix Acinus
- Intralobular Duct
- Interlobular Duct
- Lumen

LINING EPITHELIA

Kidney Prep No.1

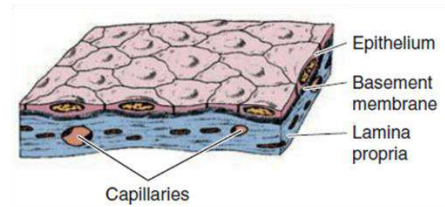
Aim: Examination of simple squamous epithelia



Glomerulus

Parietal layer of Bowman capsule

Simple Squamous epithelium

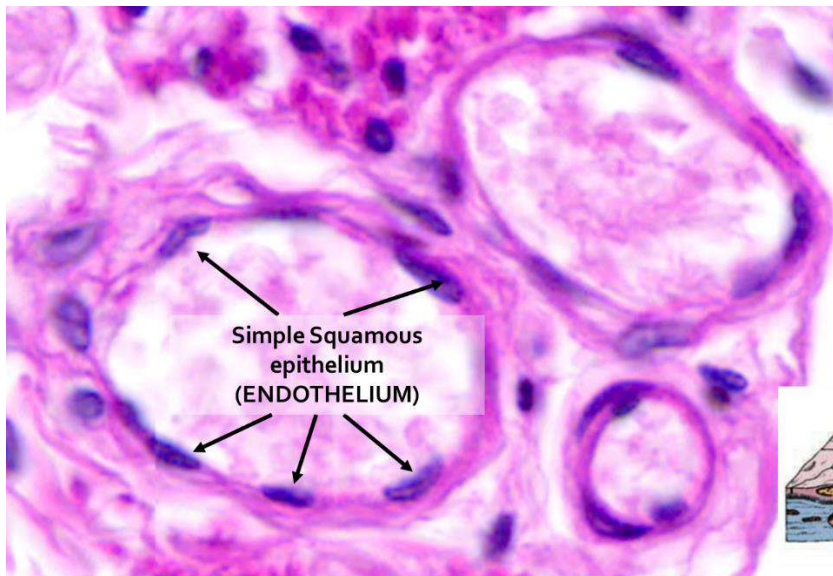


Epithelium
Basement membrane
Lamina propria

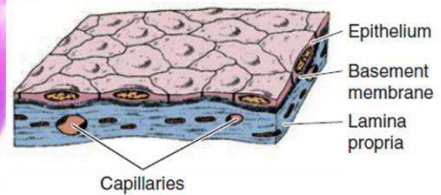
Capillaries

Esophagus- Prep No.9

Aim: Examination of simple squamous epithelia (endothelia)



Simple Squamous
epithelium
(ENDOTHELIUM)

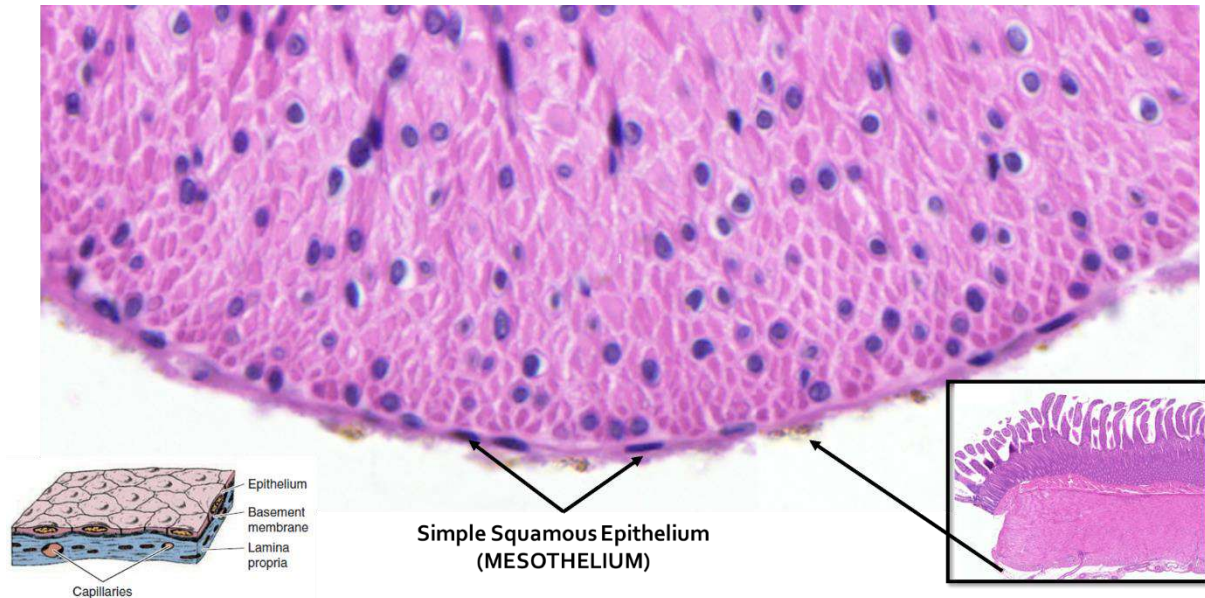


Epithelium
Basement membrane
Lamina propria

Capillaries

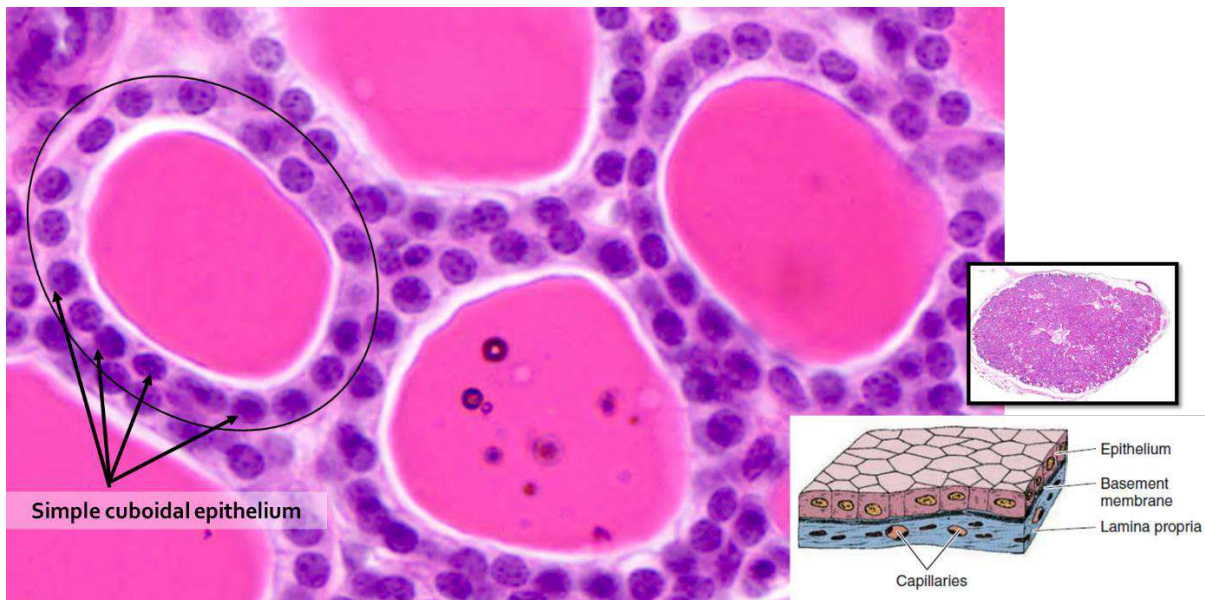
Small Intestine- Prep No.4

Aim: Examination of simple squamous epithelia (mesothelia)



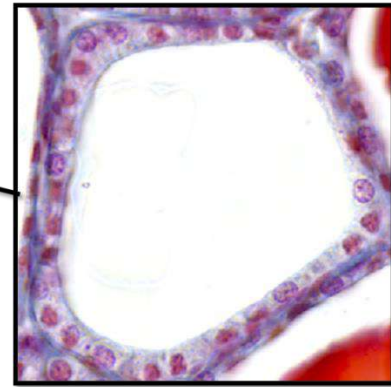
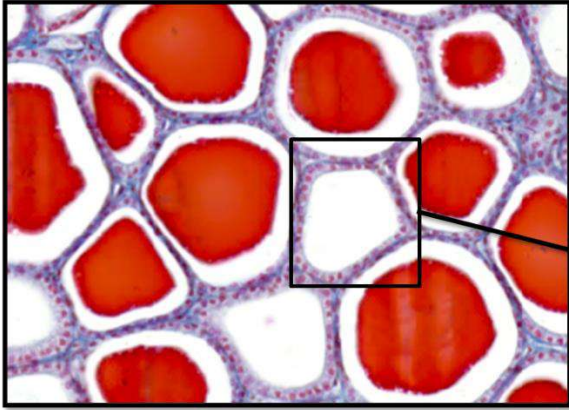
Thyroid- Prep No.2

Aim: Examination of simple cuboidal epithelia

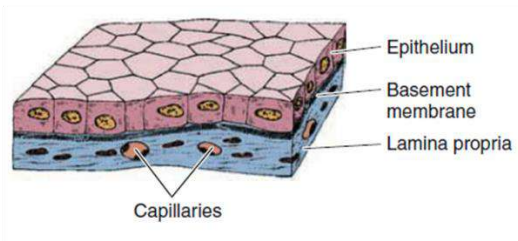


Thyroid-Prep No.3

Aim: Examination of simple cuboidal epithelia

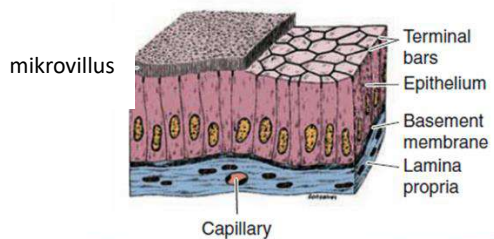
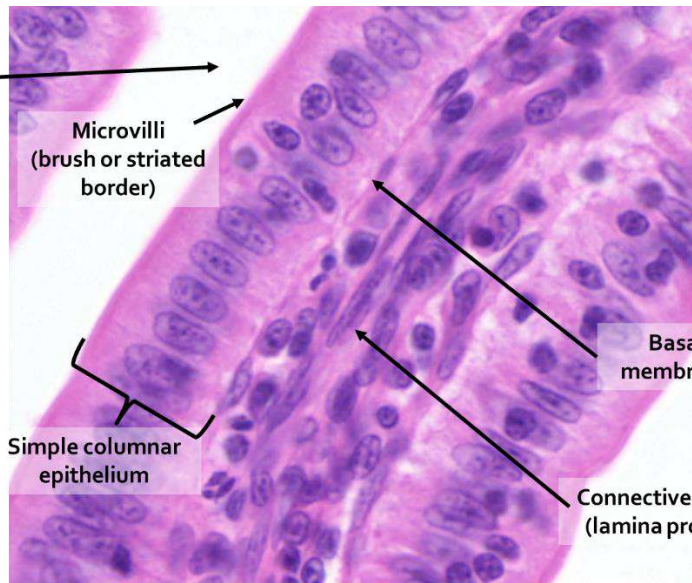


Simple cuboidal epithelium



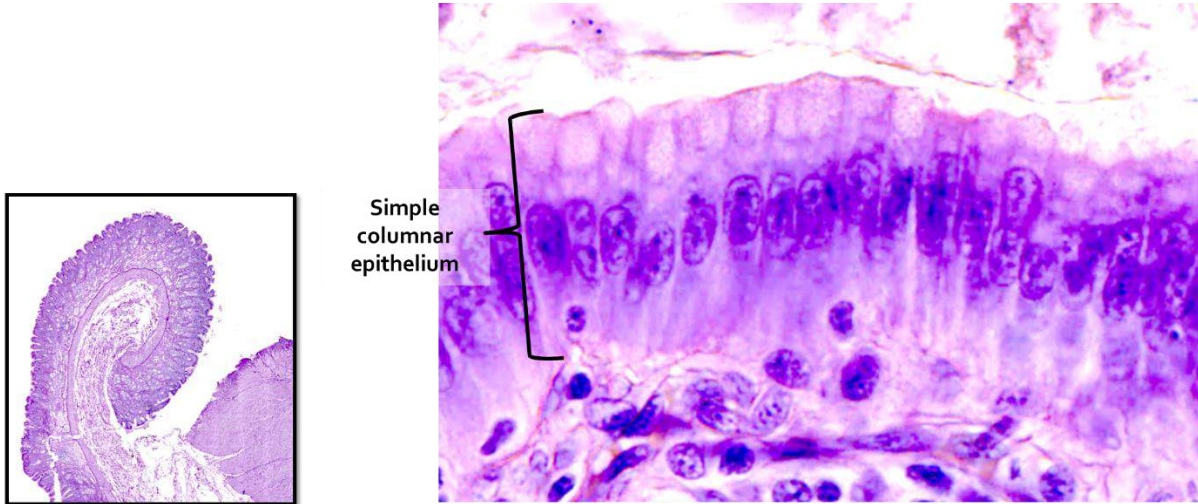
Small Intestine- Prep No.4

Aim: Examination of simple columnar epithelia



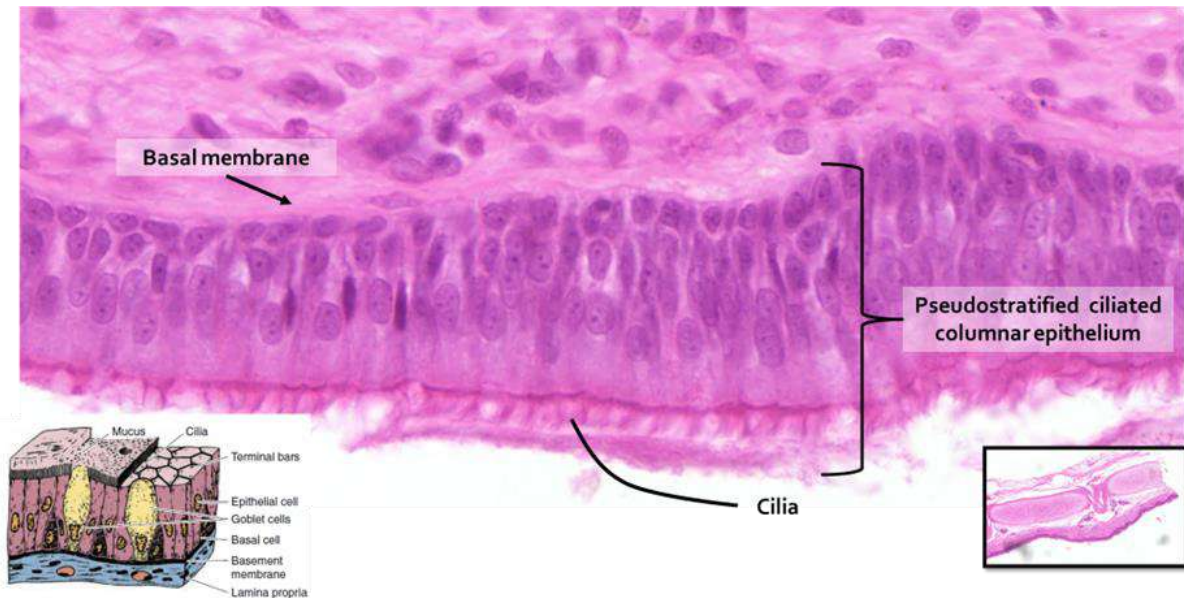
Stomach- Prep No.5

Aim: Examination of simple columnar epithelia



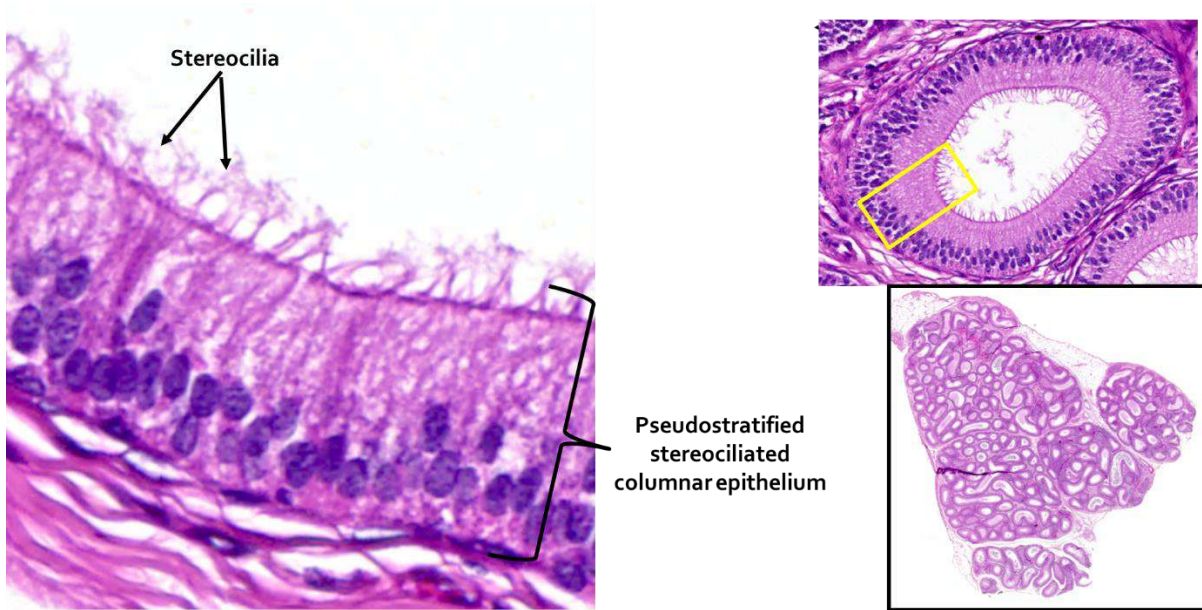
Trachea- Prep No.6

Aim: Examination of pseudostratified ciliated columnar epithelia



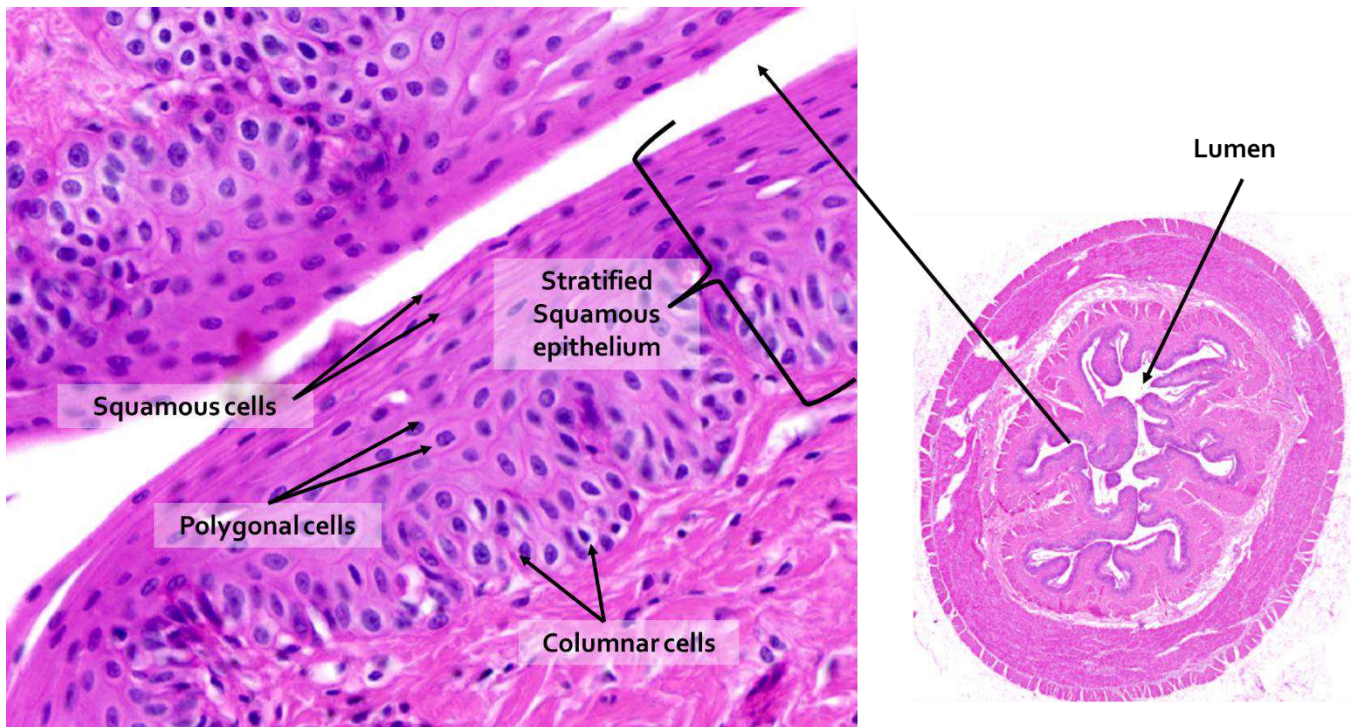
Epididymis- Prep No.8

Aim: Examination of pseudostratified stereociliated columnar epithelia



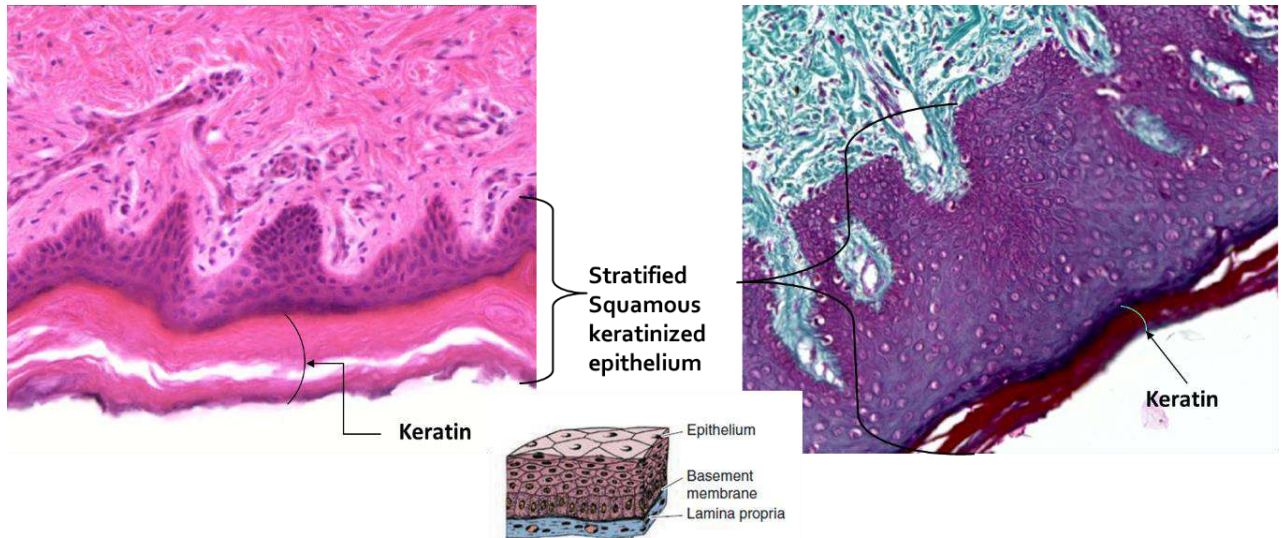
Esophagus- Prep No.9

Aim: Examination of stratified squamous nonkeratinized epithelia



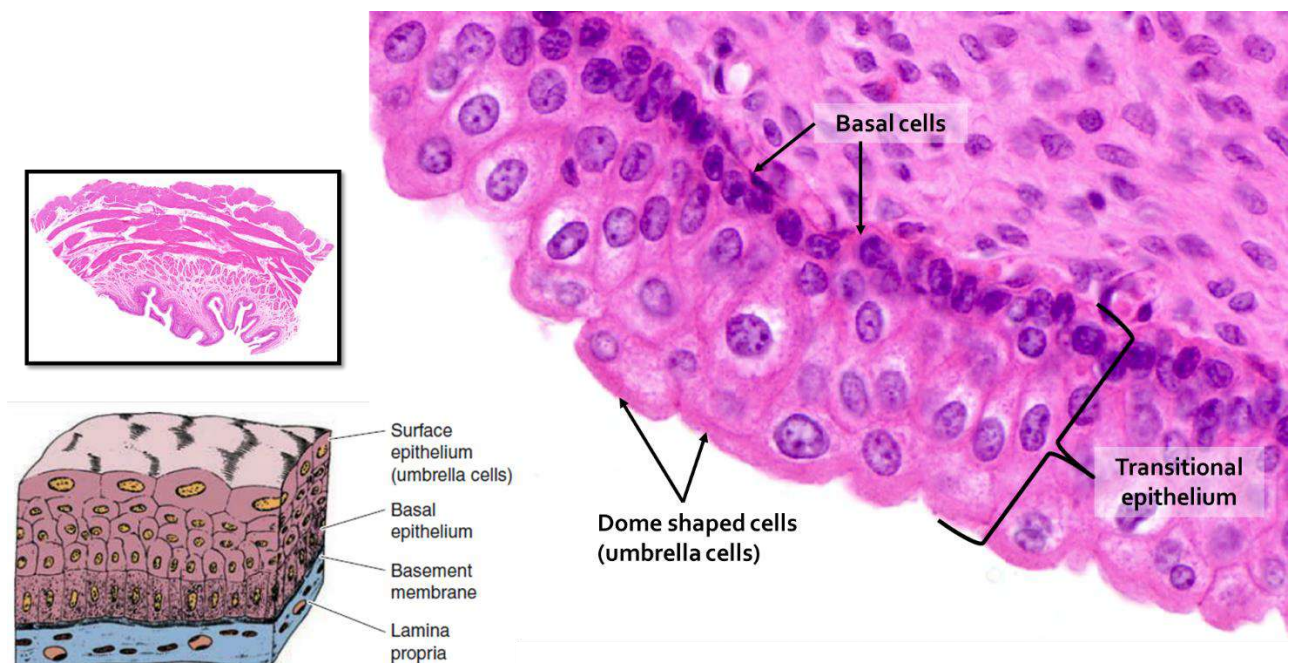
Skin- Prep No.12-13

Aim: Examination of stratified squamous keratinized epithelia



Urinary Bladder-Prep No.15

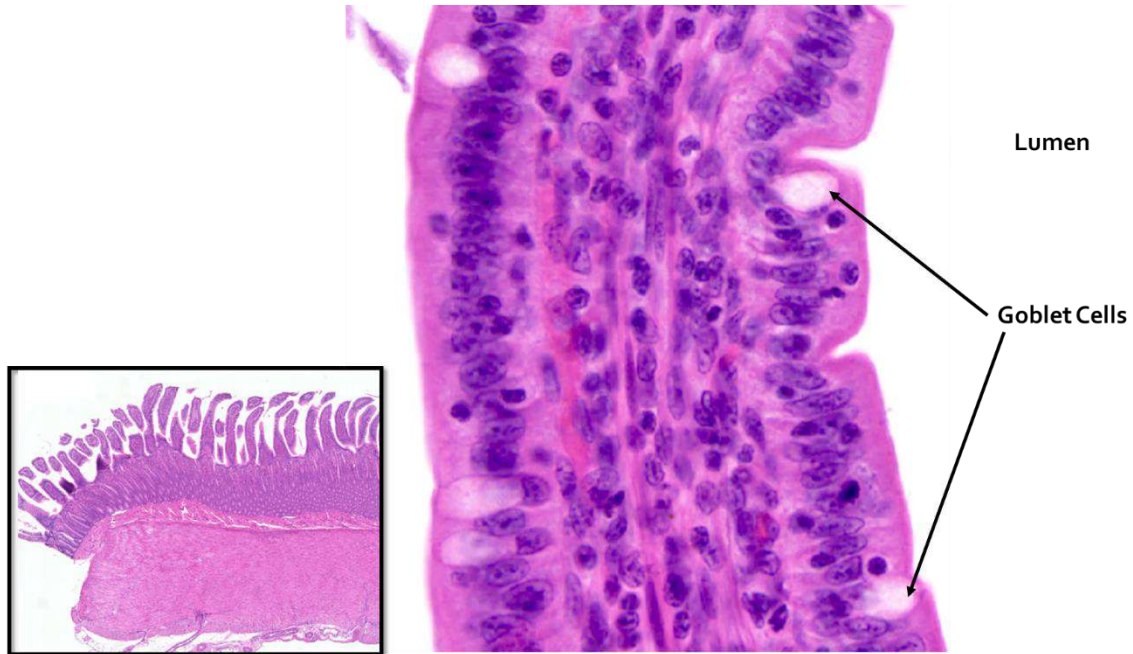
Aim: Examination of transitional epithelia



GLANDULAR EPITHELIA

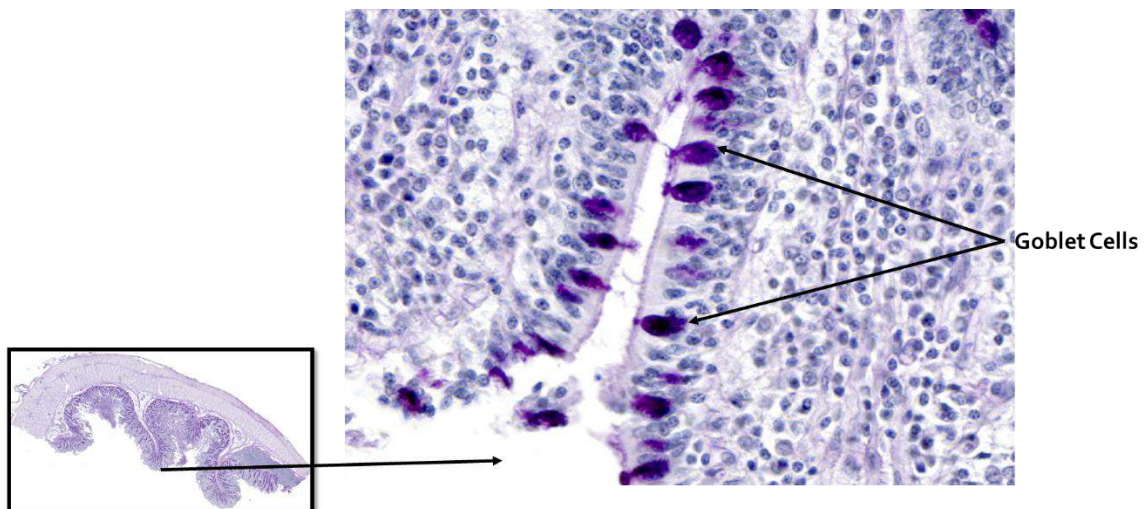
Small Intestine-Prep No.1

Aim: Examination of unicellular gland- goblet cells



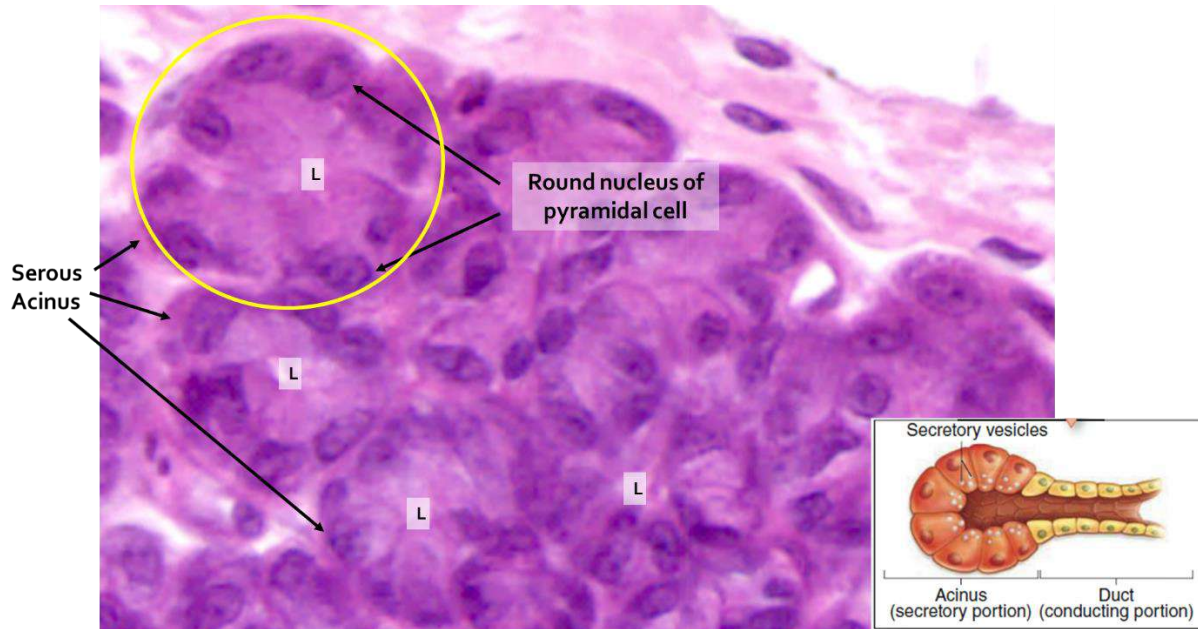
Small Intestine-Prep No.2

Aim: Examination of unicellular gland- goblet cells



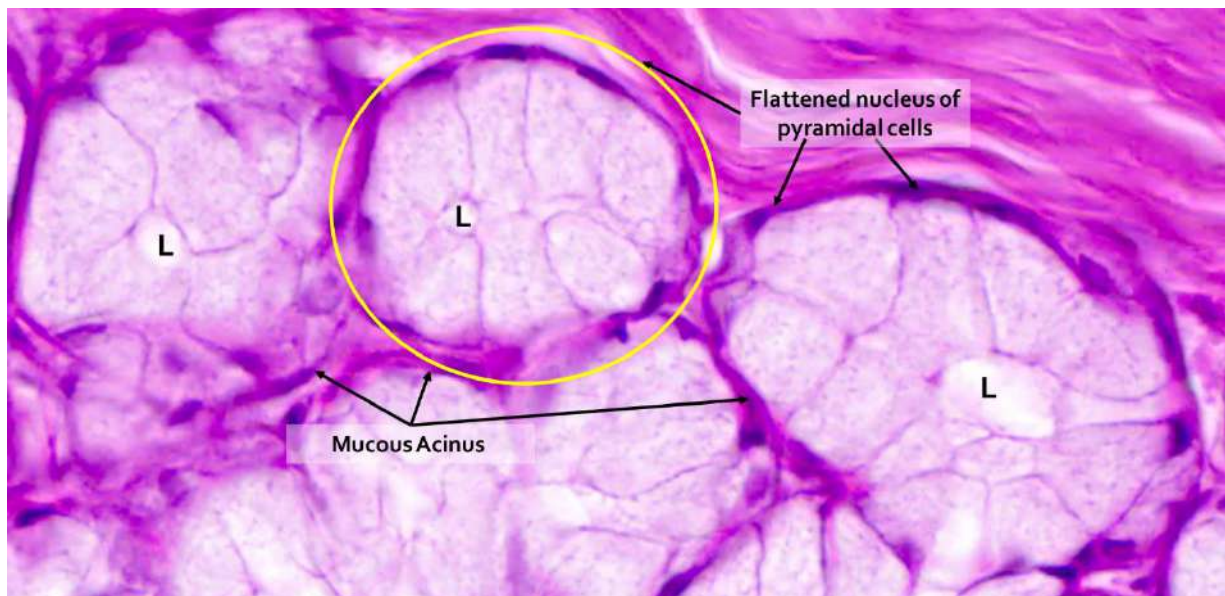
Parotid Gland-Prep No.5

Aim: Examination of serous acinus



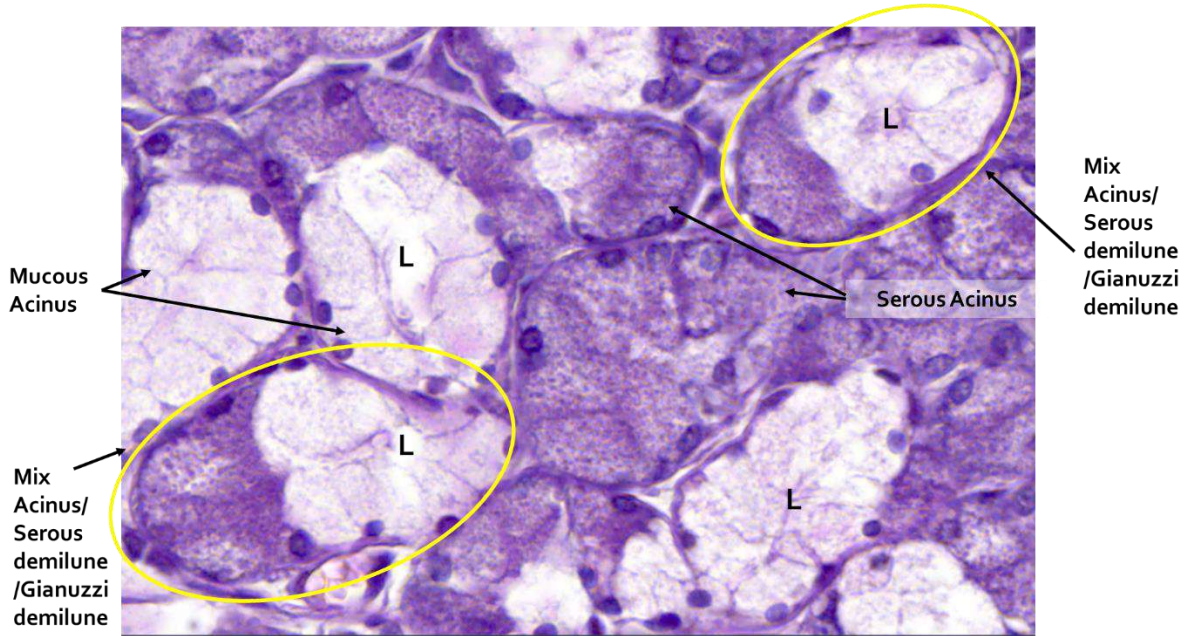
Sublingual Gland-Prep No.10

Aim: Examination of mucous acinus



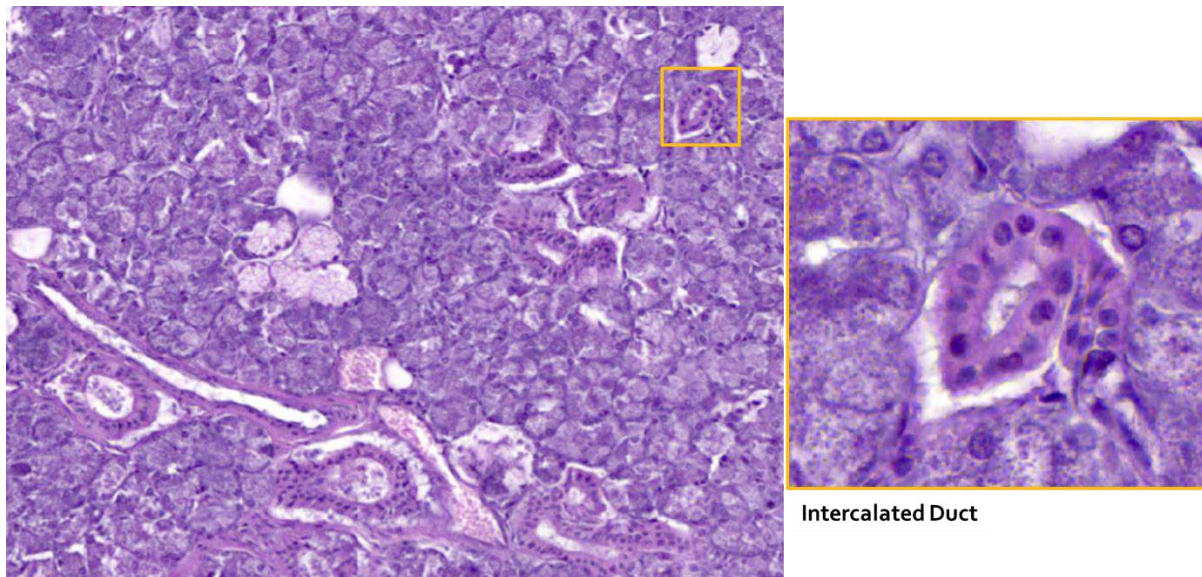
Submandibular Gland-Prep No.8

Aim: Examination of mix acinus



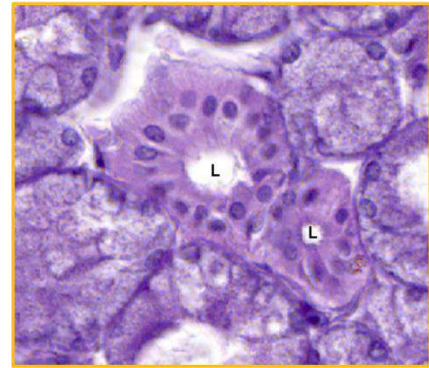
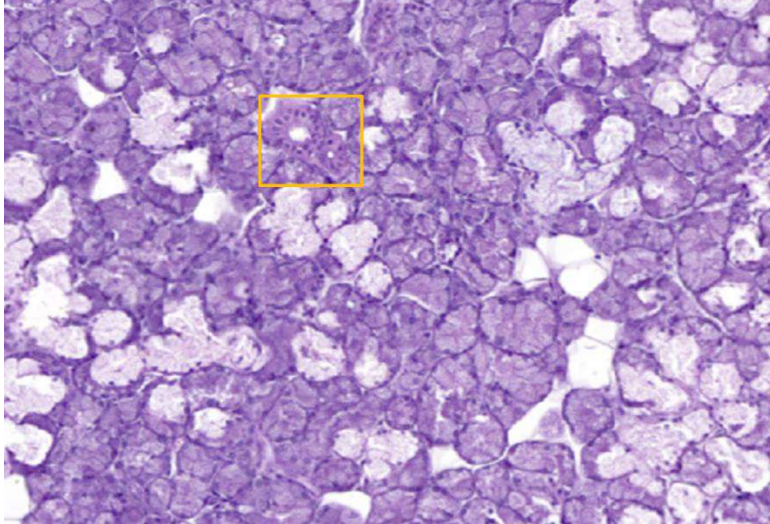
Submandibular Gland-Prep No.8

Aim: Examination of mix acinus (intercalated duct structure)



Submandibular Gland-Prep No.8

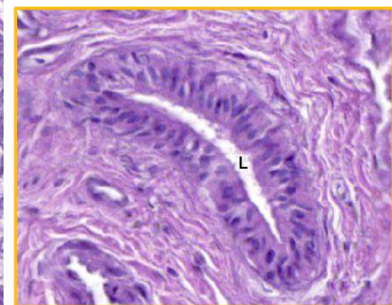
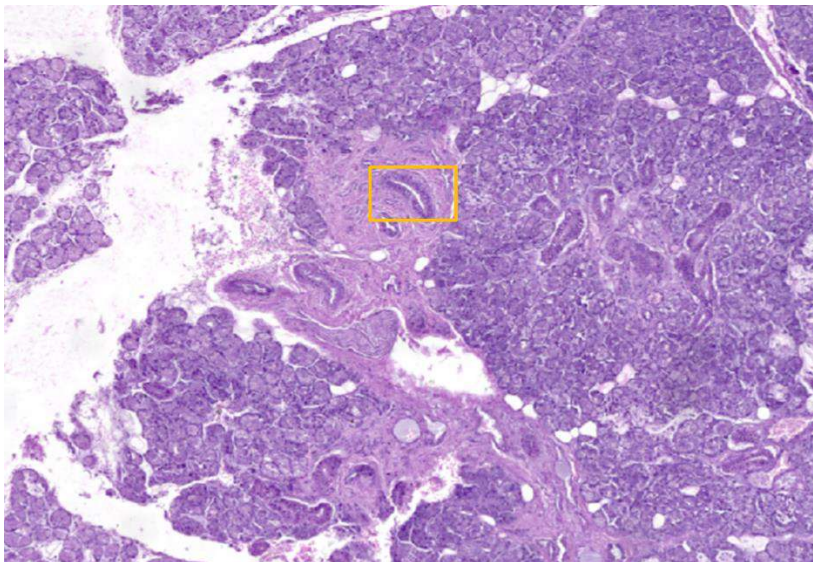
Aim: Examination of mix acinus (striated duct structure)



Striated duct

Submandibular Gland-Prep No.8

Aim: Examination of mix acinus (interlobular duct structure)



Interlobular Duct

CONNECTIVE TISSUE

Learning Objectives

Be able to list the classification of connective tissue.

Be able to distinguish connective tissue fibers under light microscope.

Be able to distinguish connective tissue cells under light microscope.

Be able to distinguish the nerve and vessels.

Name the connective tissue type and the connective tissue elements it contains.

Identify the Followings:

Cells

- Active fibroblast
- Inactive fibroblast
- Plasma cell
- Lymphocyte
- Macrophage
- Adipocyte

Fibers

- Collagen fiber
- Elastic fiber
- Reticular fiber

Types of Connective Tissue

Adult Connective Tissue

- **Loose Connective tissue**
- **Dense Irregular Connective Tissue**
- **Dense Regular Connective Tissue**

Specialised Connective Tissue

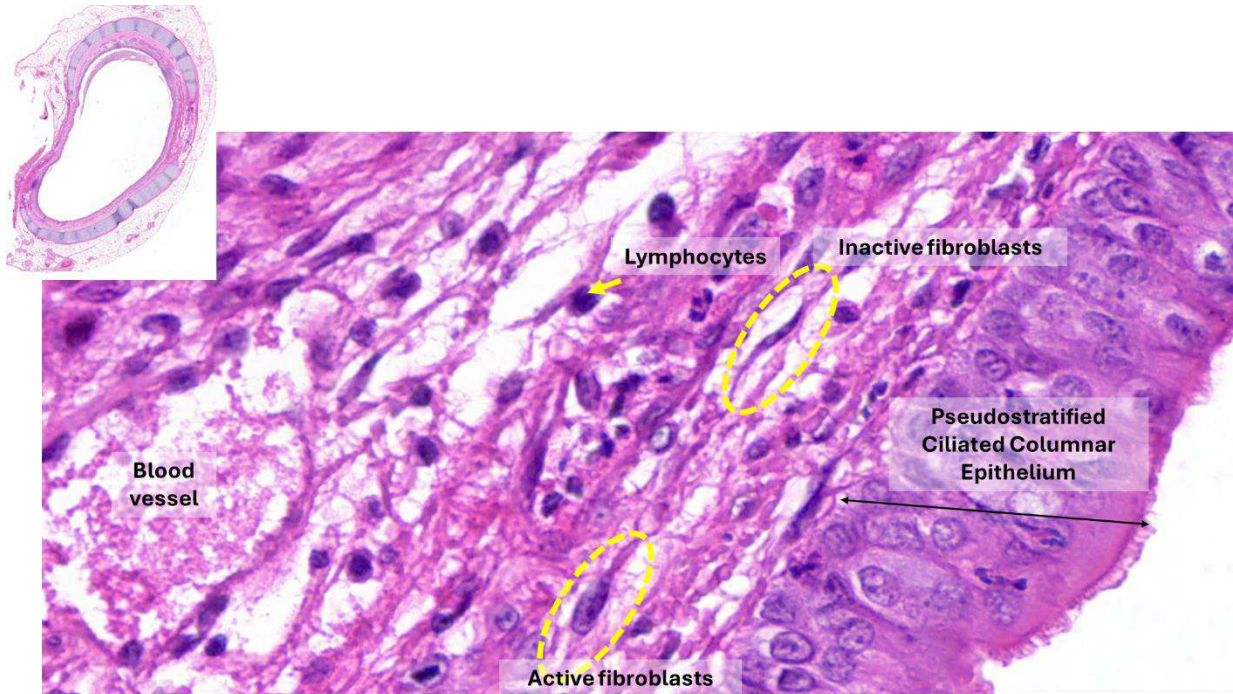
- Adipose Tissue
- Reticular Connective Tissue
- Cartilage and Bone Tissue (page 23)
- Blood (page 48)

Embryonic Connective Tissue

- Mucous Connective Tissue

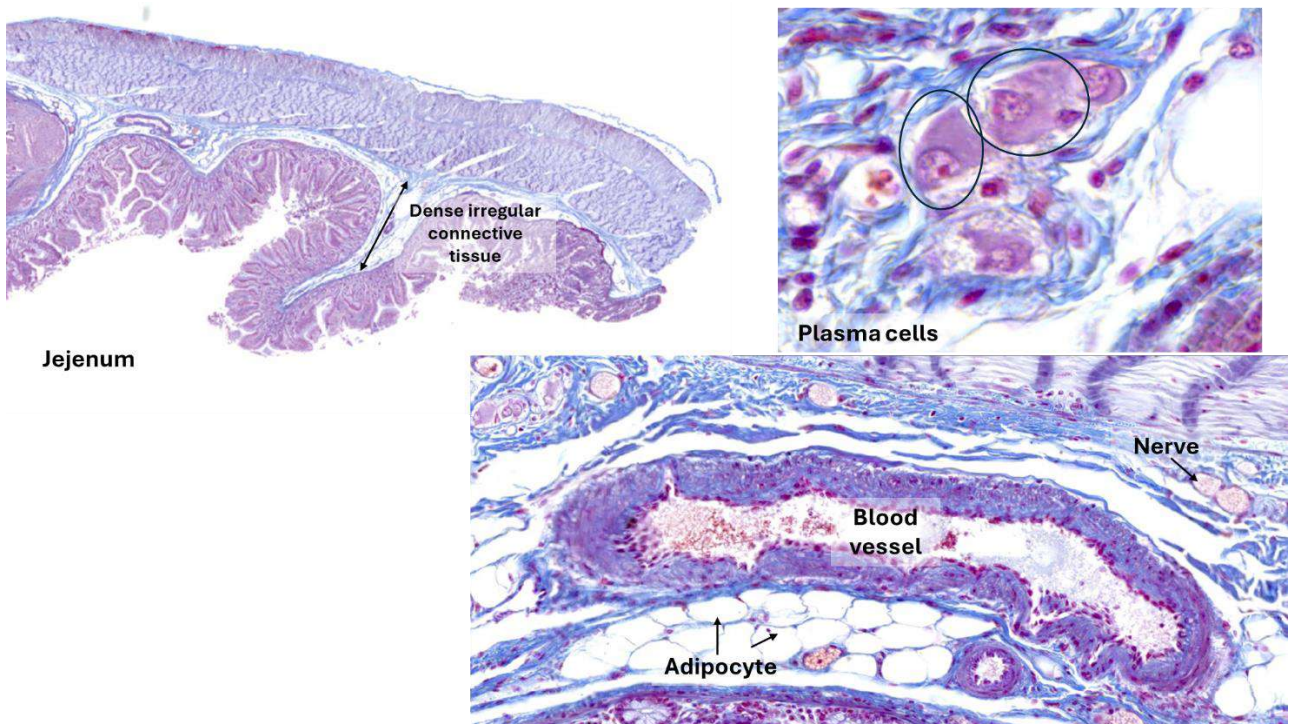
Trachea-Prep No.6

Aim: Examination of connective tissue cells



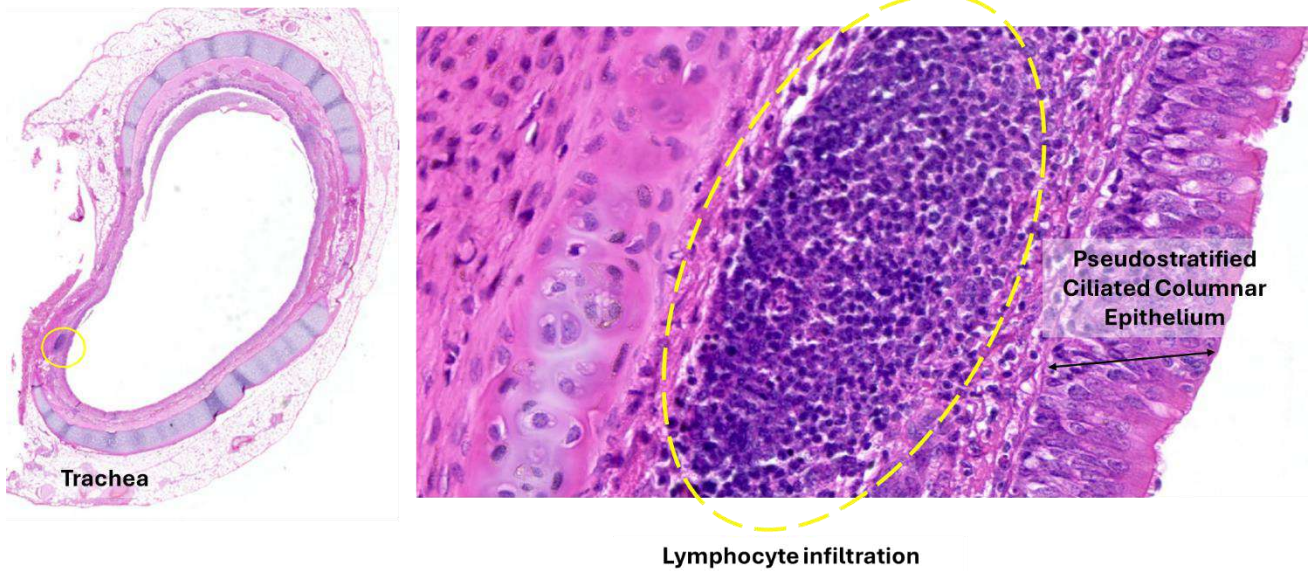
Jejunum-Ileum Junction- Prep. No.9

Aim: Examination of connective tissue cells



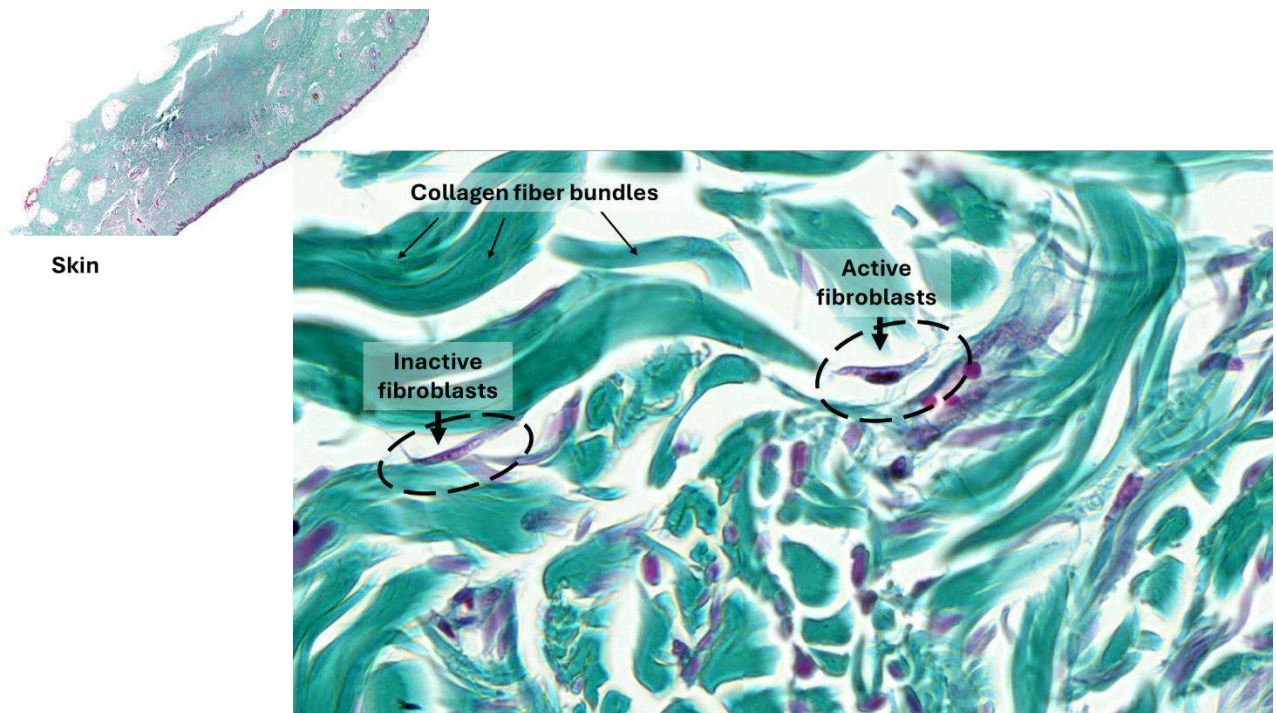
Trachea-Prep No.6

Aim: Examination of connective tissue cells



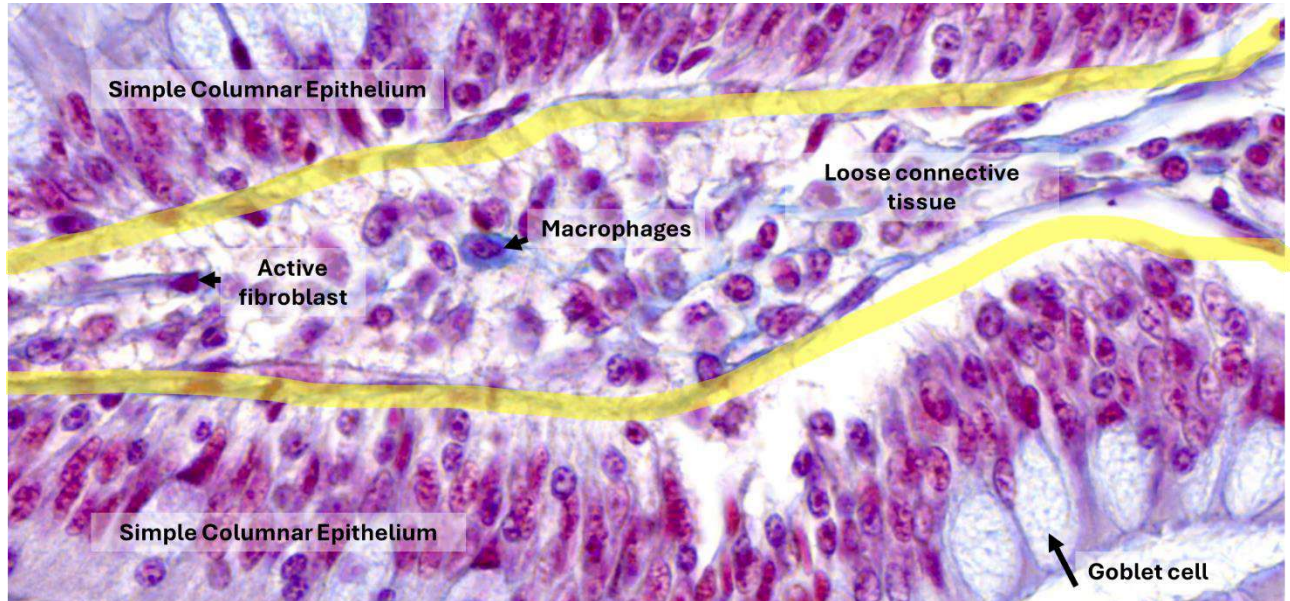
Skin, Hair follicle, Sweat gland- Prep. No.9

Aim: Examination of connective tissue cells



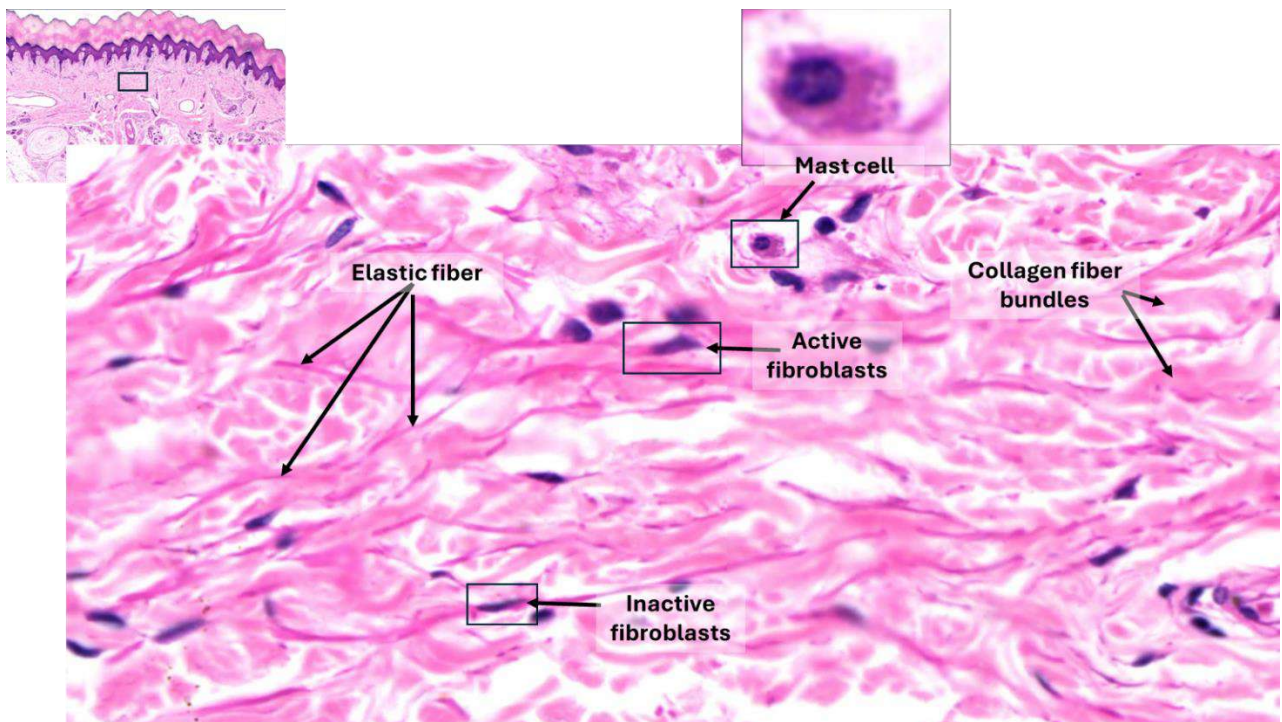
Jejunum - Prep No. 9

Aim: Examination of connective tissue cells

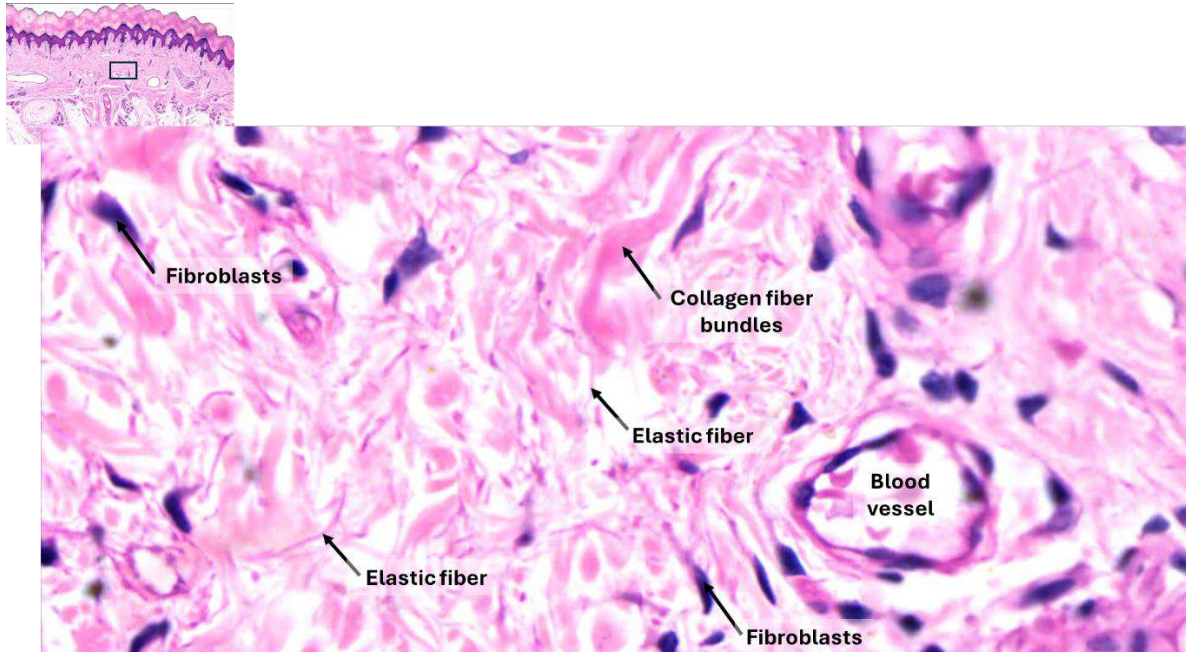


Skin, Hair follicle, Sweat gland- Prep. No.10

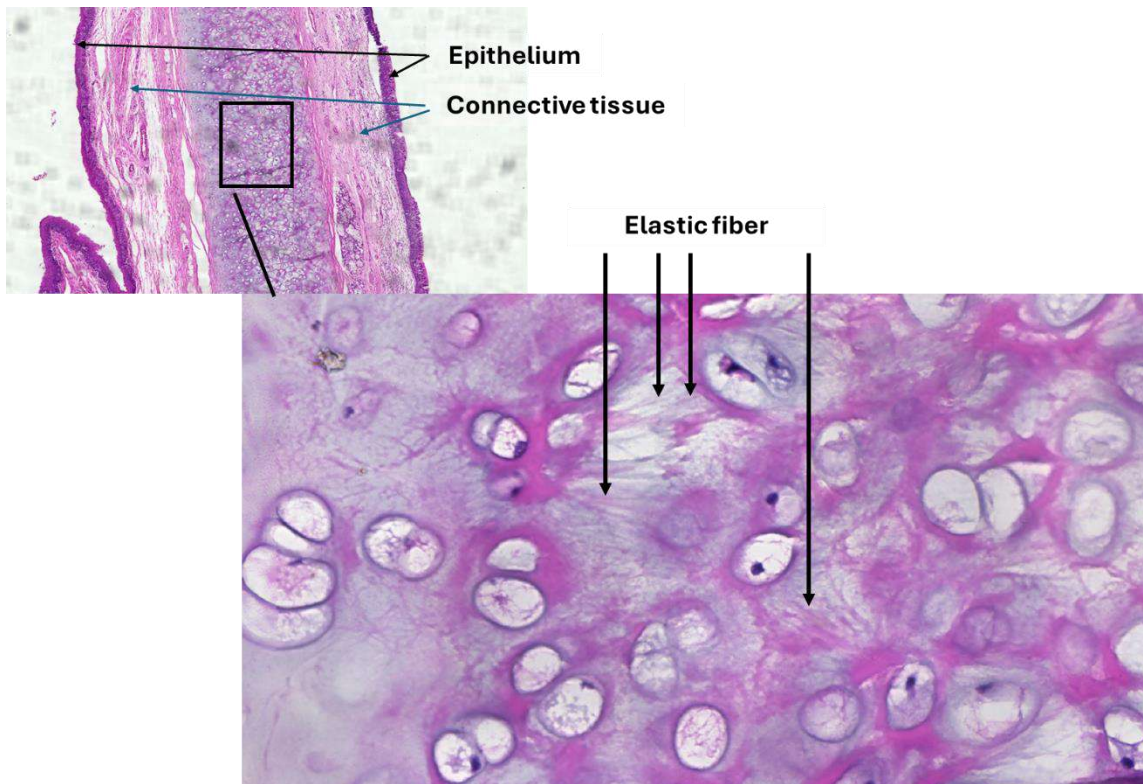
Aim: Examination of connective tissue cells



Skin, Hair follicle, Sweat gland- Prep. No.10
Aim: Examination of connective tissue cells

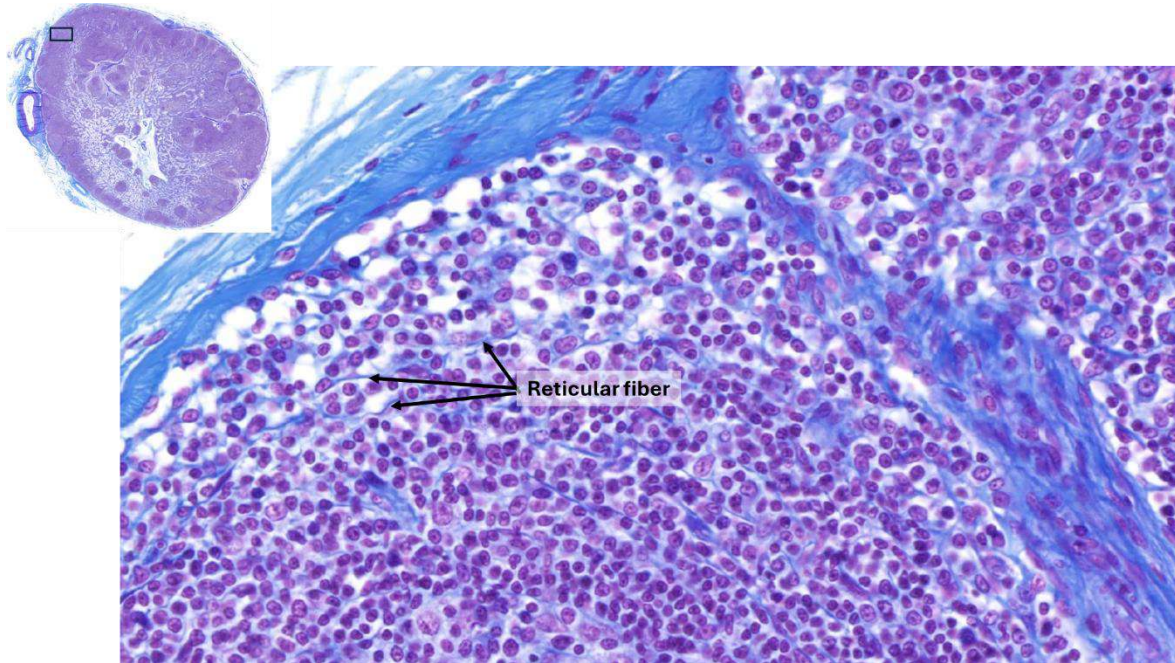


Epiglottis - Prep No. 6
Aim: Examination of connective tissue fibers



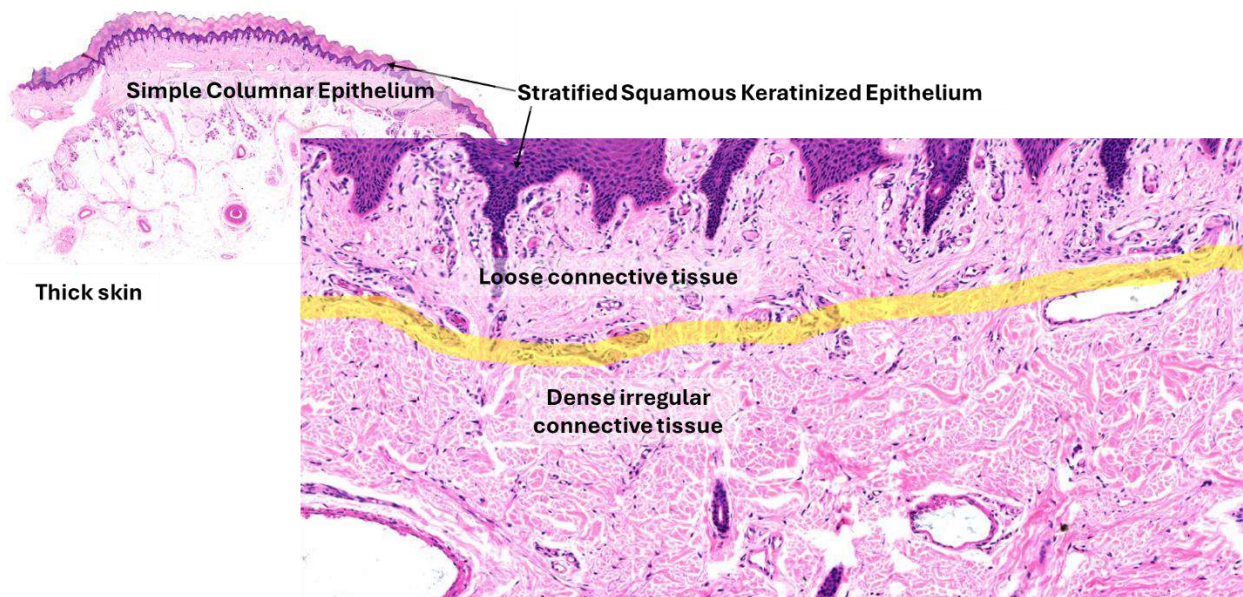
Lymph node- Prep No. 9

Aim: Examination of connective tissue fibers



Thick skin - Prep No. 4

Aim: Examination of loose connective tissue

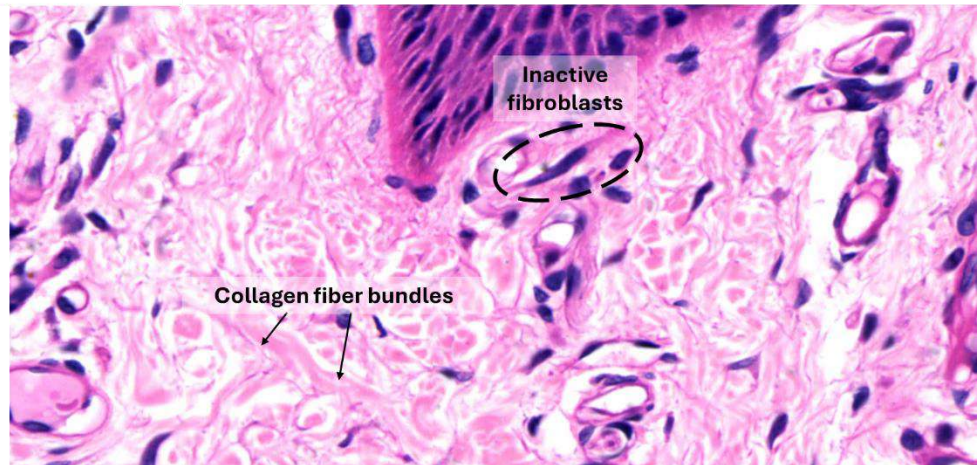


Thick skin - Prep No. 4

Aim: Examination of loose connective tissue

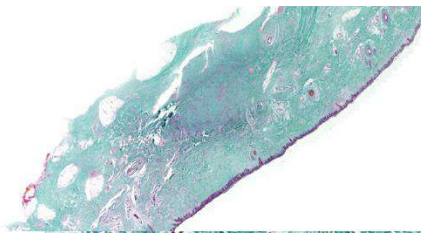


Thick skin

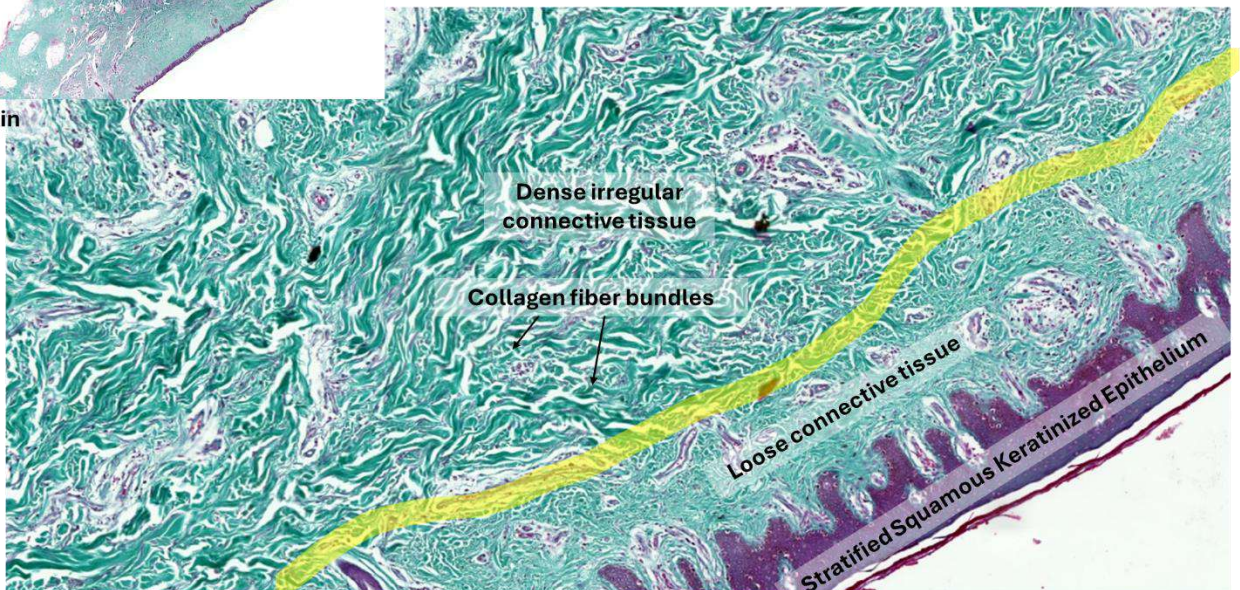


Skin – loose and dense irregular connective tissue- Prep No. 11

Aim: Examination of dense irregular connective tissue

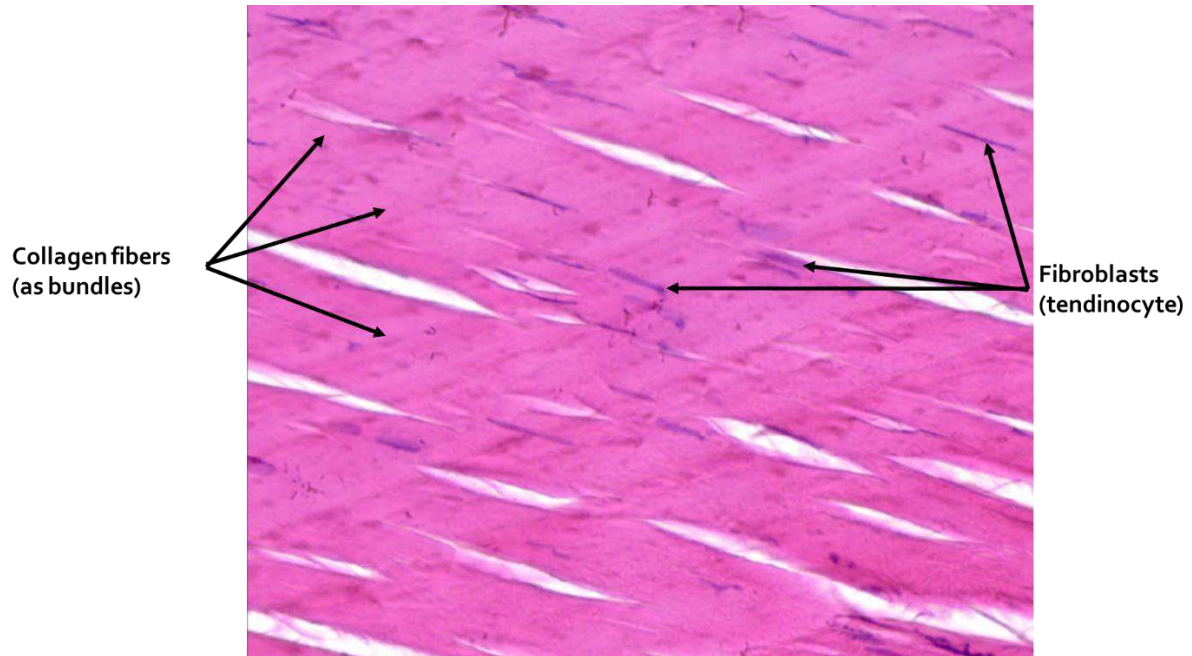


Skin



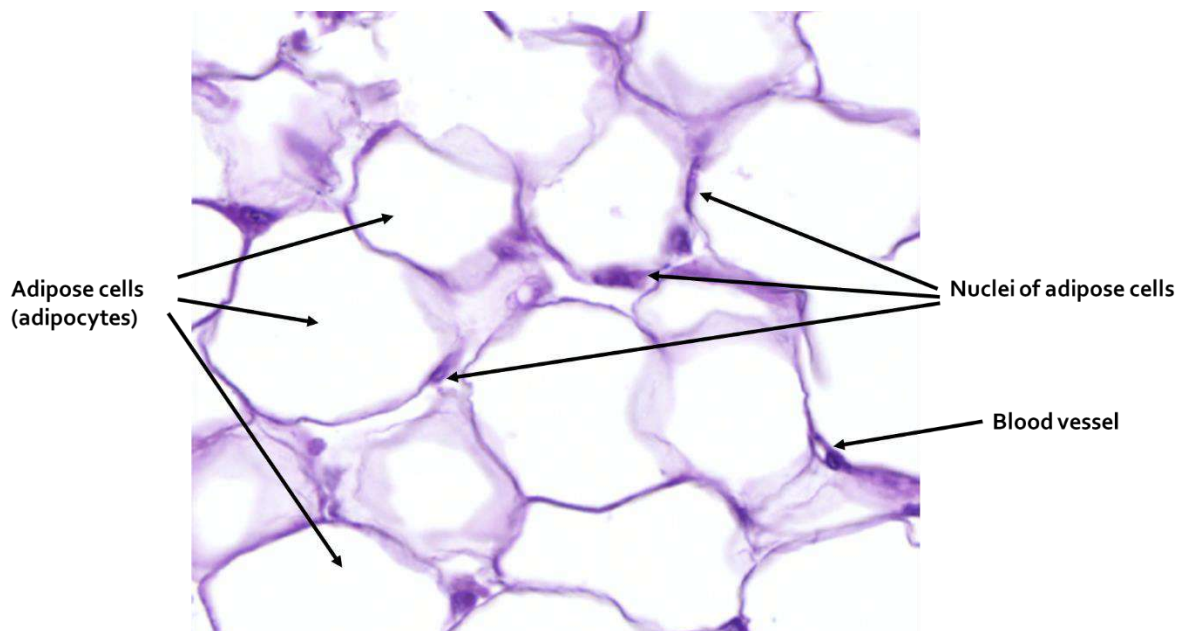
Tendon-Prep No.12

Aim: Examination of dense regular connective tissue



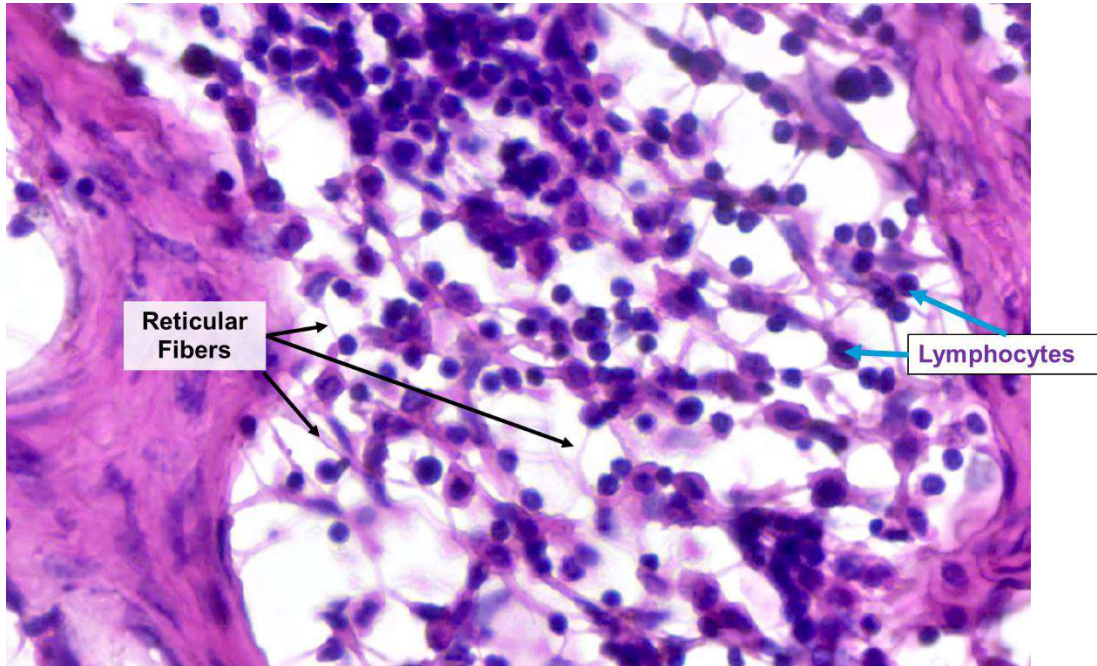
Adipose Tissue -Prep No.18

Aim: Examination of adipose tissue



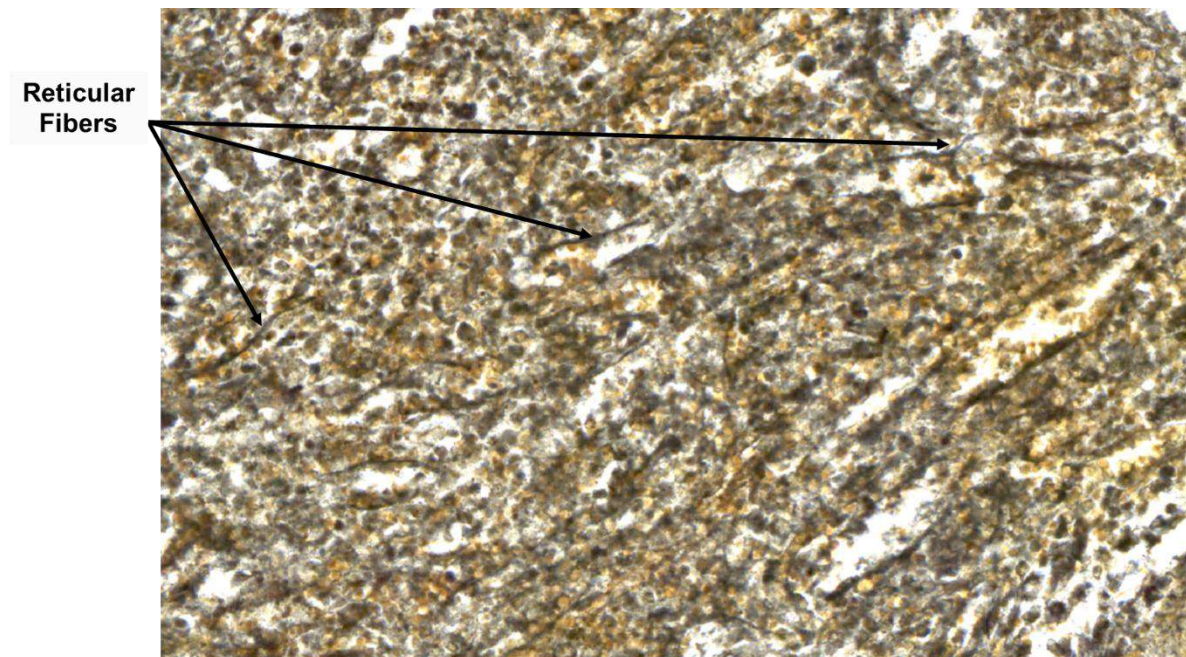
Lymph node- Prep No.21

Aim: Examination of reticular connective tissue



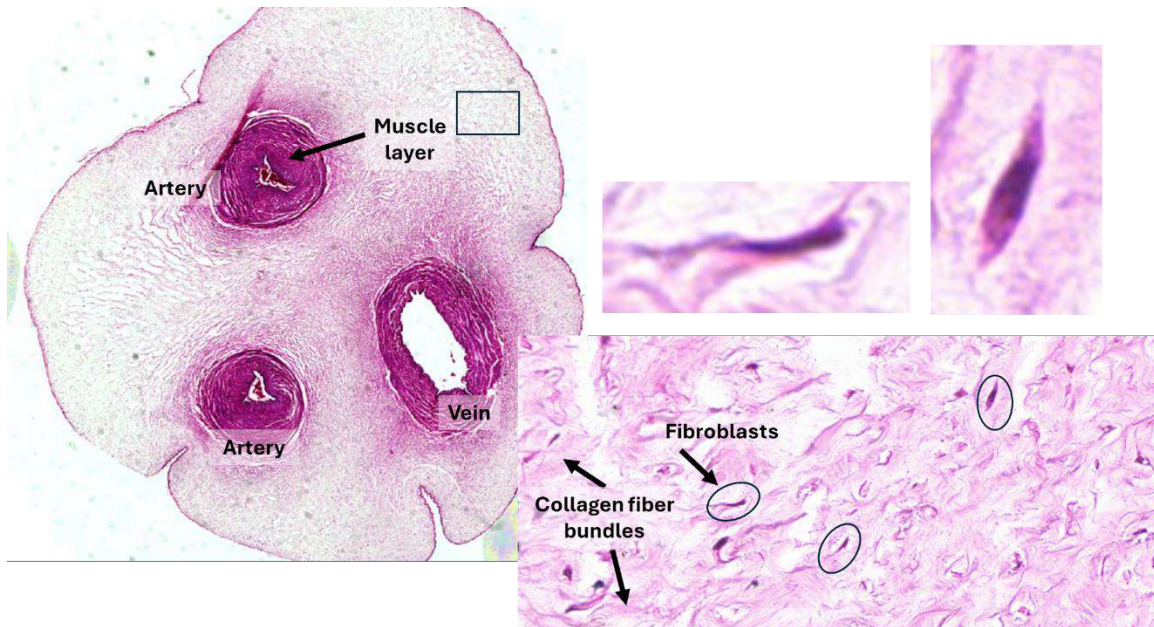
Spleen-Prep No.19

Aim: Examination of reticular connective tissue



Umbilical cord-Prep No.4

Aim: Examination of Mucous Connective Tissue



CARTILAGE and BONE TISSUES

Learning Objectives

Be able to classify cartilage tissue.
Be able to describe the differences between cartilage tissues.
Be able to list the names of cartilage tissue cells and their morphological differences.
Be able to tell bone tissue classification.
Knows the names of bone tissue cells and their morphological differences.
Be able to show the Haversian system, and interstitial lamellae and haversian and Volkmann canals.
Be able to distinguish compact bone and cancellous bone.
Be able to define periosteum and endosteum.

Identify the Following:

CARTILAGE TISSUE

Hyaline Cartilage

- Perichondrium
 - Inner chondrogenic
 - Outer fibrous
- Lacunae
- Chondroblasts
- Chondrocytes
- Isogenous group
- Territorial matrix
- Interterritorial matrix

Elastic Cartilage

- Perichondrium
 - Inner chondrogenic
 - Outer fibrous
- Fibroblasts of perichondrium
- Inner chondrogenic layer (Chondroblasts)
- Lacunae
- Chondroblasts
- Chondrocytes
- Isogenous chondrocytes
- Cartilage matrix with elastic fibers

Fibrous Cartilage

- Cartilage matrix
- Row of chondrocytes
- Lacunae
- Fibroblasts

•

BONE TISSUE

Compact Bone

- Osteon (Haversian system)
- Haversian canal
- Haversian Lamellae
- Interstitial Lamellae
- Lacunae
- Canaliculi
- Osteocyte
- Volkmann's canals
- Periosteum
- Endosteum

Spongy Bone

- Bone trabeculae
- Endosteum
- Bone Marrow
- Osteoblast
- Osteocytes
- Osteoclast

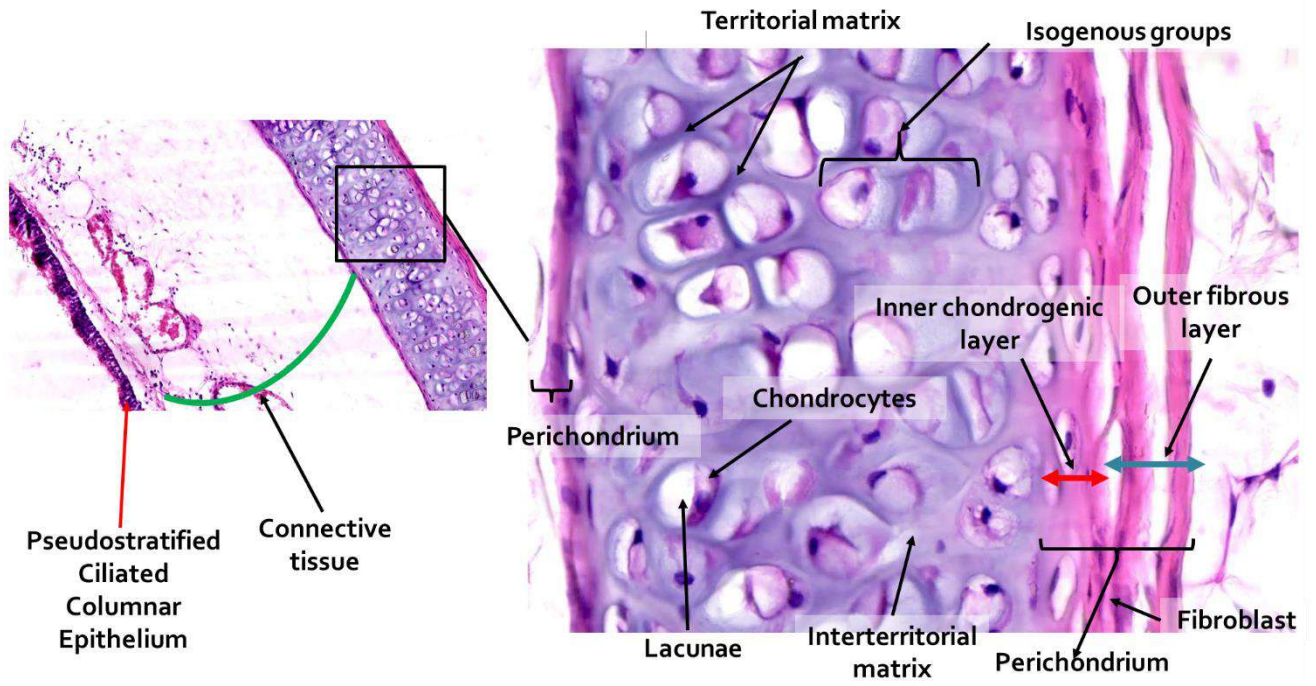
Endochondral ossification

- Chondrocytes
- Resting Zone
- Proliferation Zone
- Hypertrophy Zone
- Calcification Zone
- Ossification Zone
- Hypertrophied chondrocytes
- Spicules of bone
- Osteoblast
- Osteocytes
- Osteoclast

CARTILAGE TISSUE

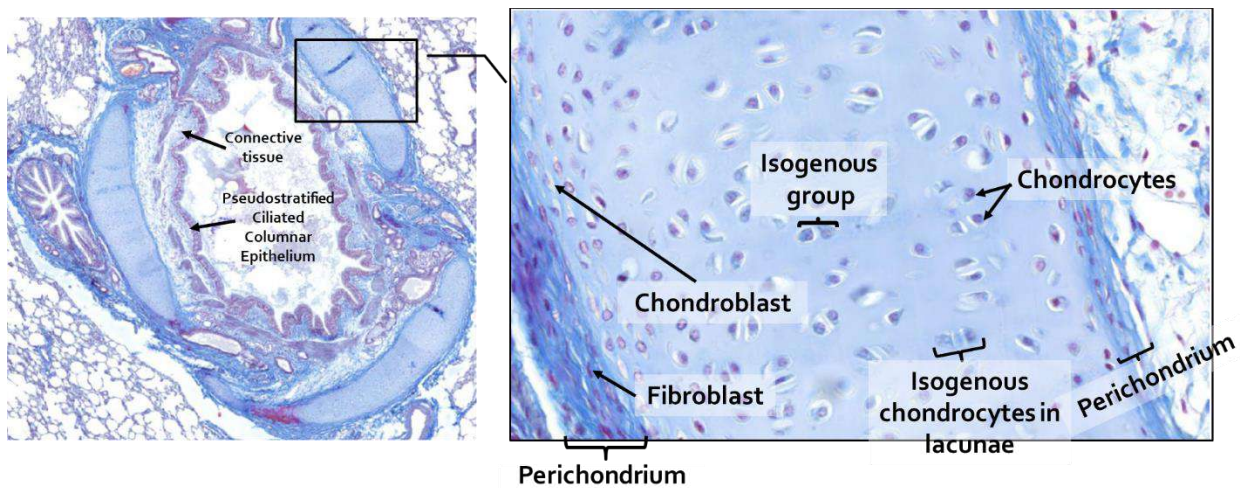
Trachea-Prep No.1

Aim: Examination of hyaline cartilage



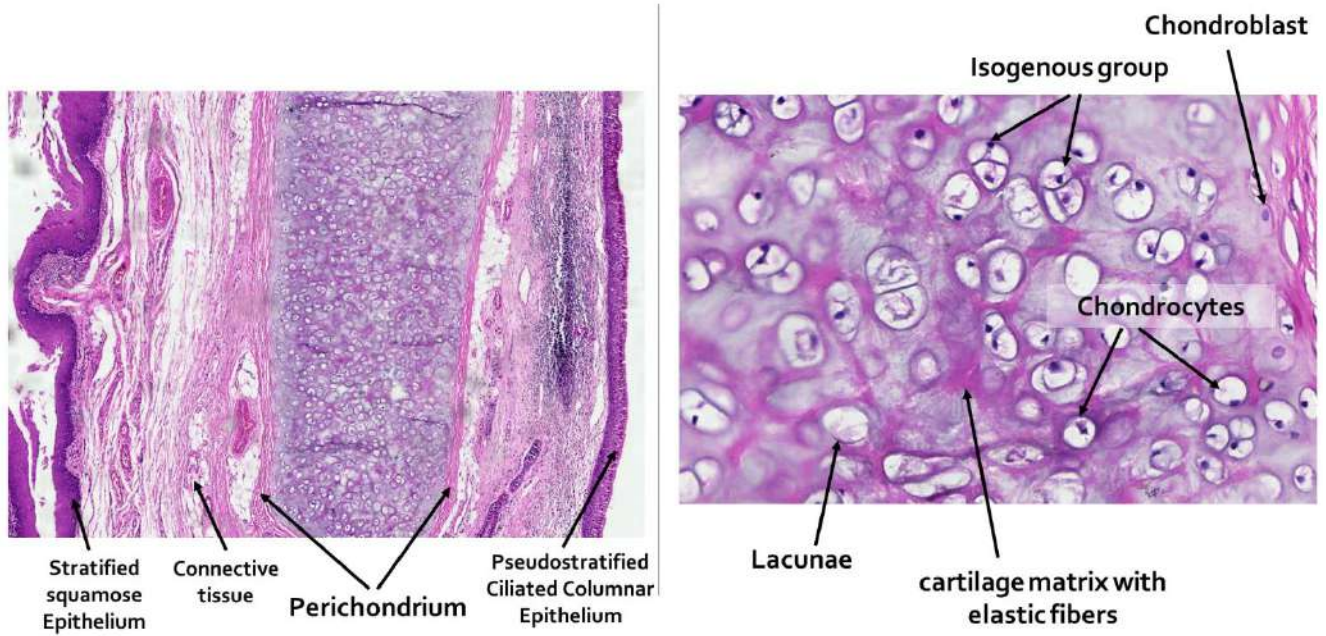
Bronchi (Masson Trichrome)-Prep No.2

Aim: Examination of hyaline cartilage



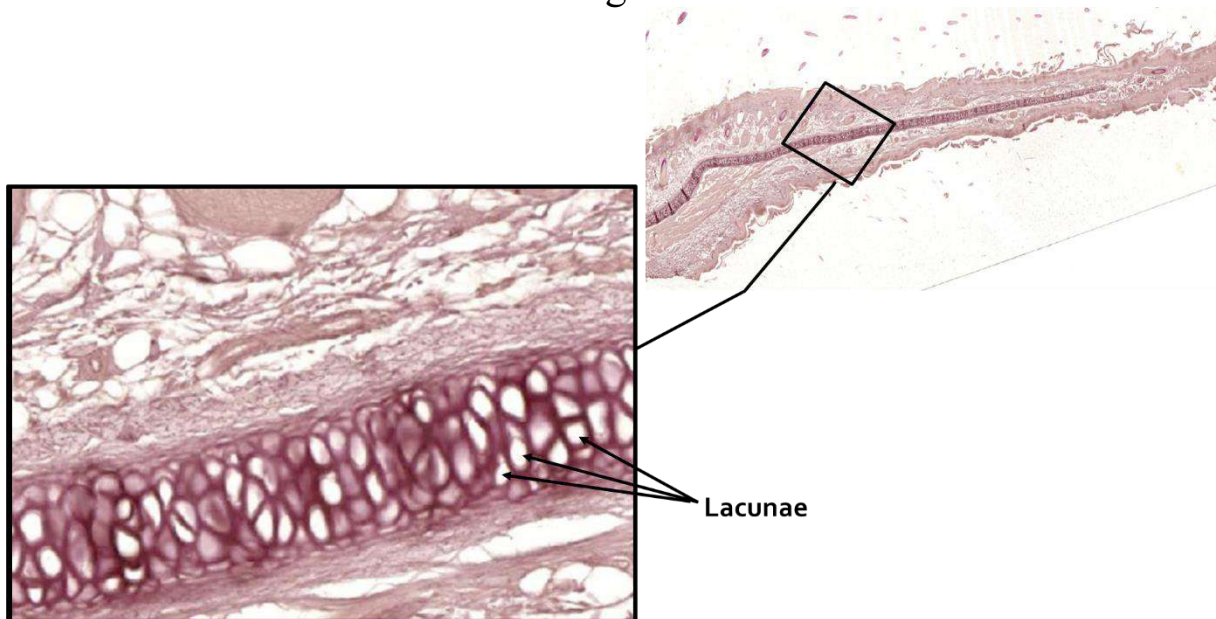
Epiglottis-Prep No. 6

Aim: Examination of elastic cartilage



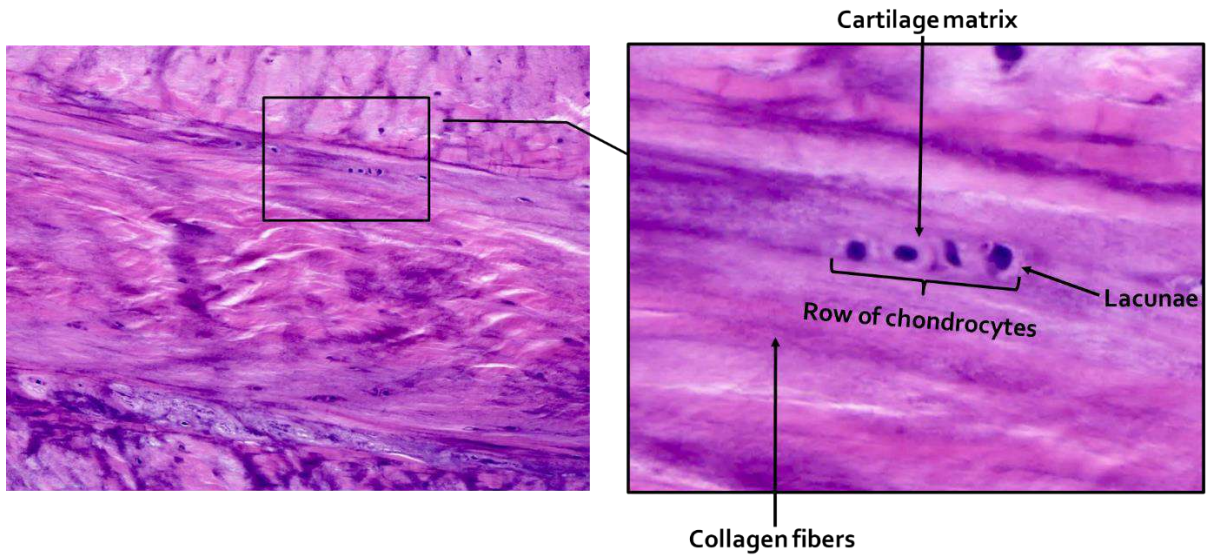
Ear (Verhoeff)-Prep No:8

Aim: Examination of elastic cartilage



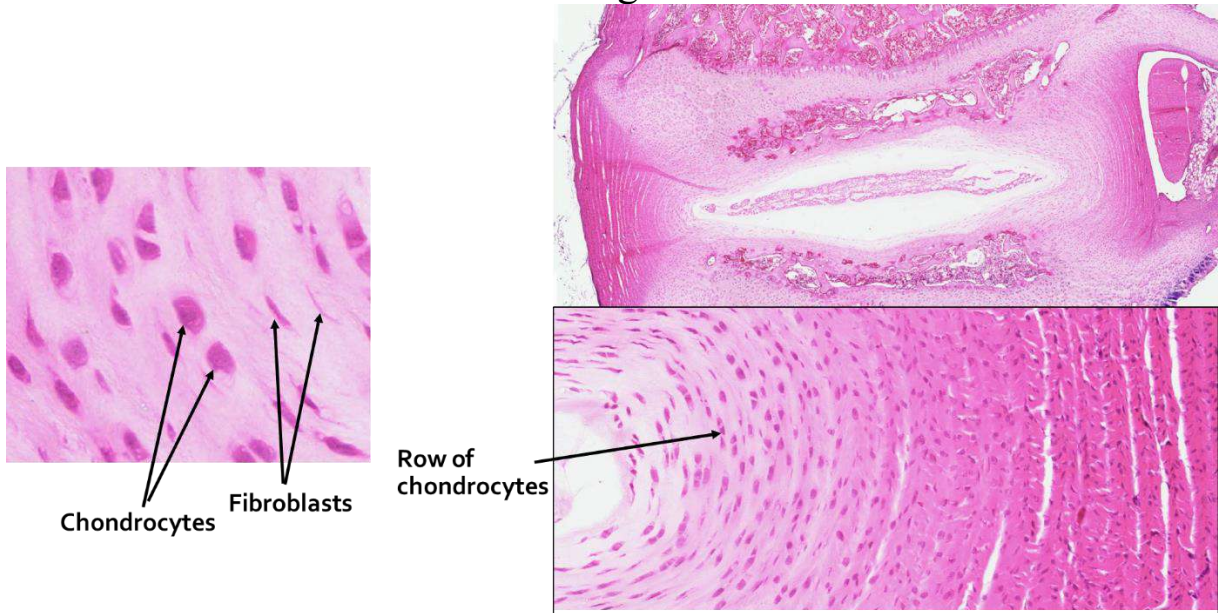
Fibrous Cartilage -Prep No:11

Aim: Examination of fibrous cartilage



Intervertebral Disk -Prep No:10

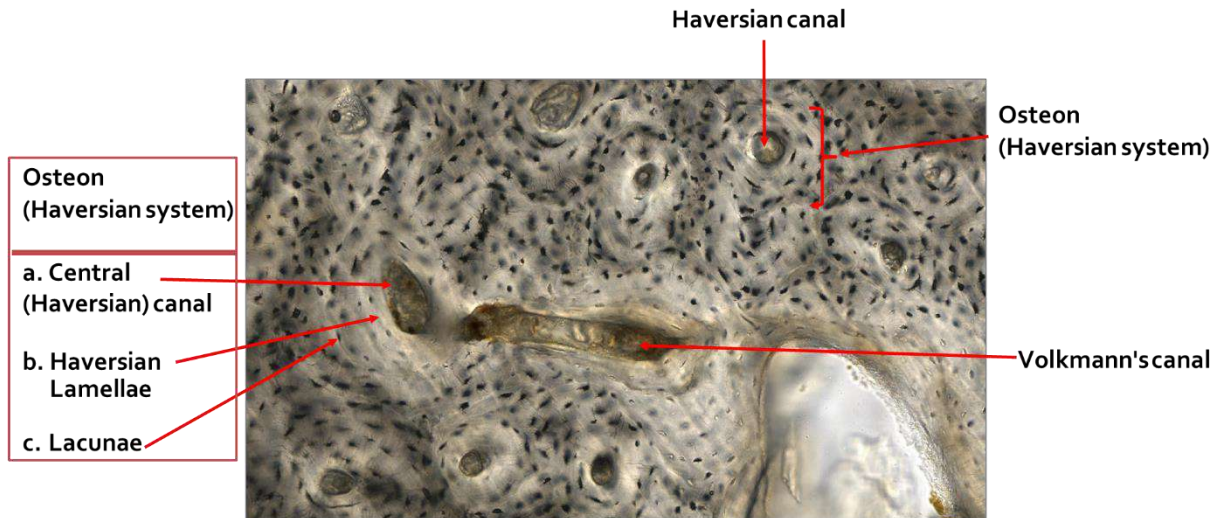
Aim: Examination of fibrous cartilage



BONE TISSUE

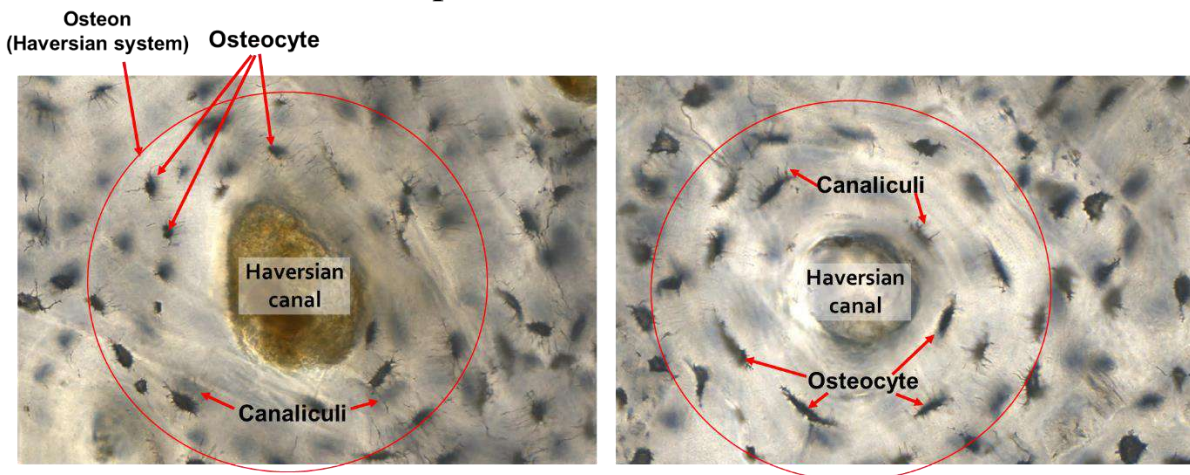
Compact Bone (Grindig method)-Prep No: 5

Aim: Examination of compact bone



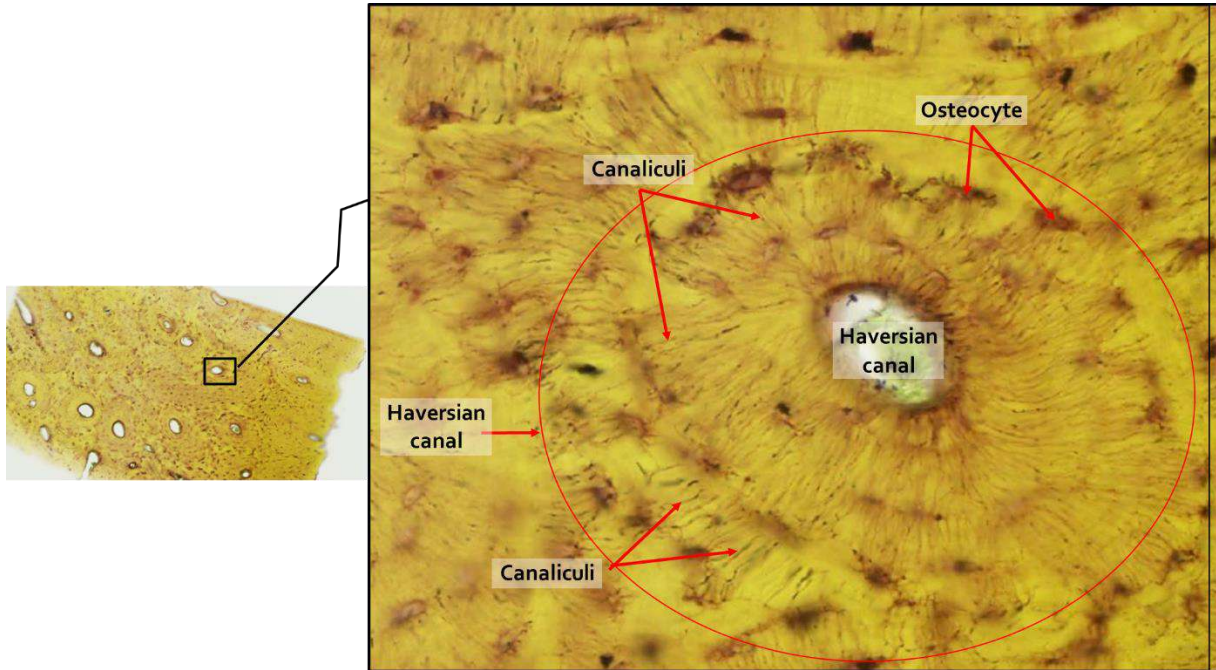
Compact Bone (Grindig method)-Prep No: 6

Aim: Examination of compact bone



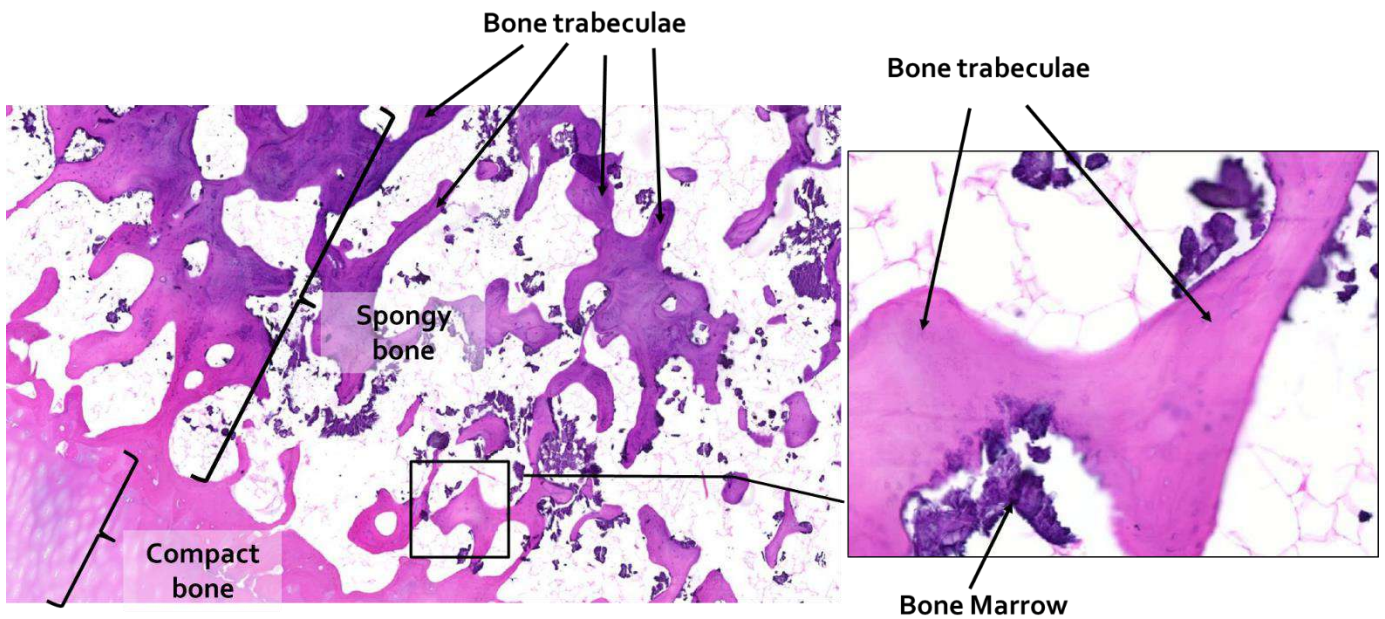
Compact Bone (Picric acid)-Prep No: 7

Aim: Examination of compact bone



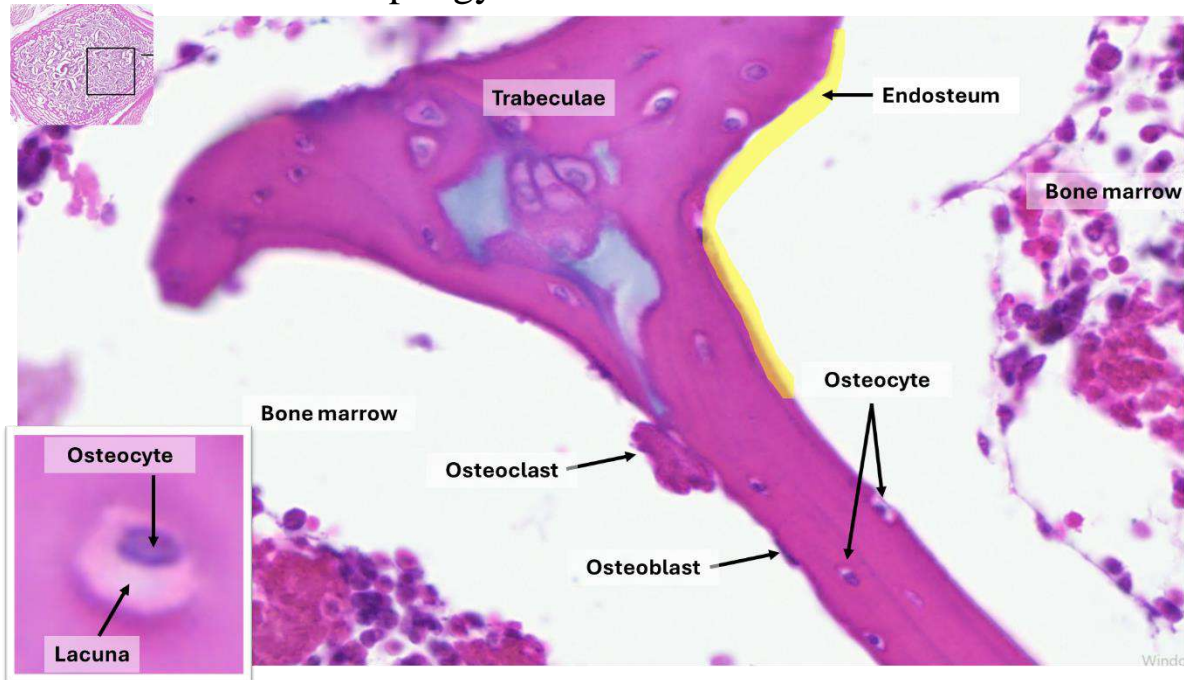
Spongy Bone-Prep No:8

Aim: Examination of spongy bone



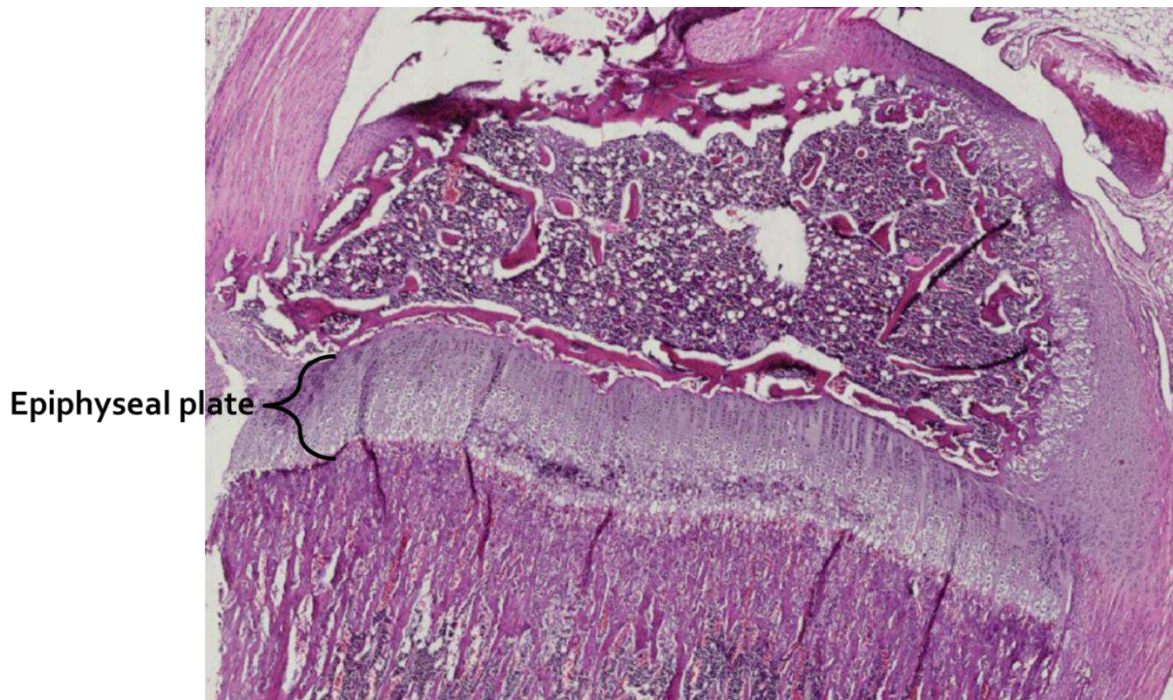
Bone Marrow -Prep No: 10

Aim: Examination of spongy bone



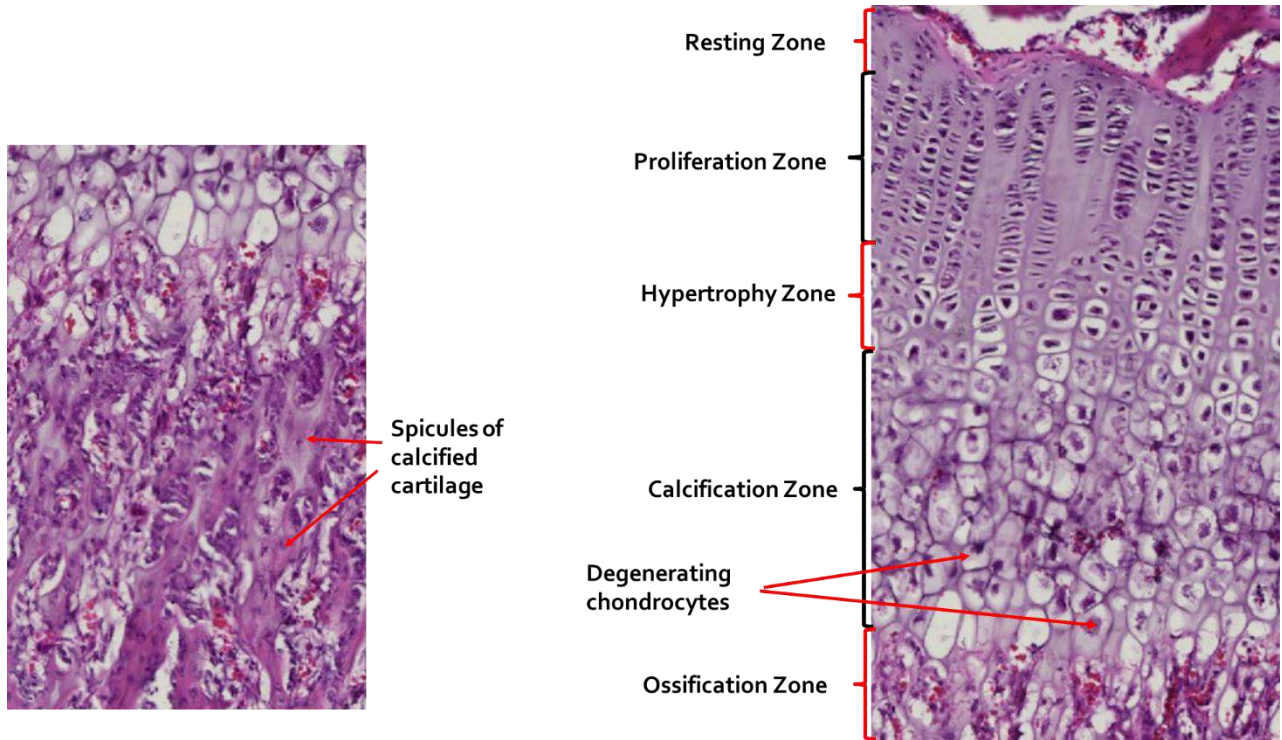
Endochondral Ossification-Prep No:3

Aim: Examination of endochondral ossification



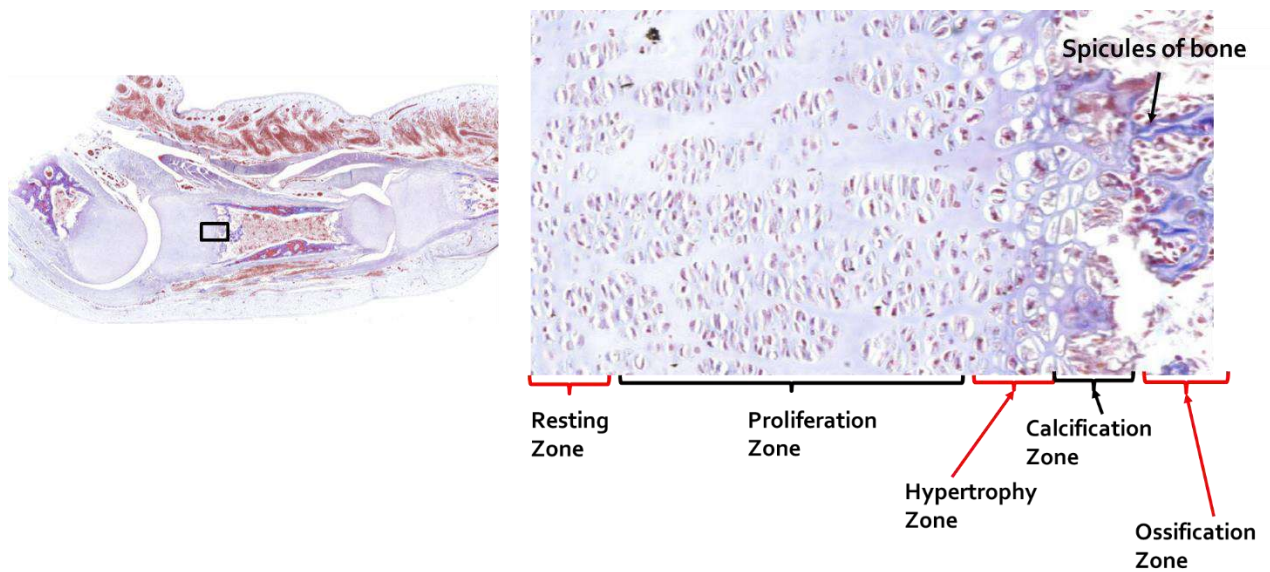
Endochondral Ossification-Prep No:3

Aim: Examination of endochondral ossification



Endochondral Ossification (Masson Trichrome)-Prep No:2

Aim: Examination of endochondral ossification



MUSCLE TISSUE

Learning Objectives

Be able to classify and distinguish muscle tissue.

Be able to show endomysium, perimysium and epimysium in muscle tissue and explain their structure.

Be able to distinguish skeletal muscle and its components.

Be able to distinguish smooth muscle and its components.

Be able to distinguish cardiac muscle and its components.

Be able to explain striation in skeletal and cardiac muscle.

Be able to show intercalated discs in the cardiac muscle.

Identify the Following:

Skeletal Muscle

- Cross-striations
 - A band (dark)
 - I band (light)
- Periferal nucleus
- Myofibrils
- Skeletal muscle fibers
- Fascicles
- Endomysium
- Perimysium
- Epimysium

Cardiac Muscle

- Central nucleus
- Cross-striations
 - A band (dark)
 - I band (light)
- Intercalated discs
- Branching cardiac muscle fibers

Smooth Muscle

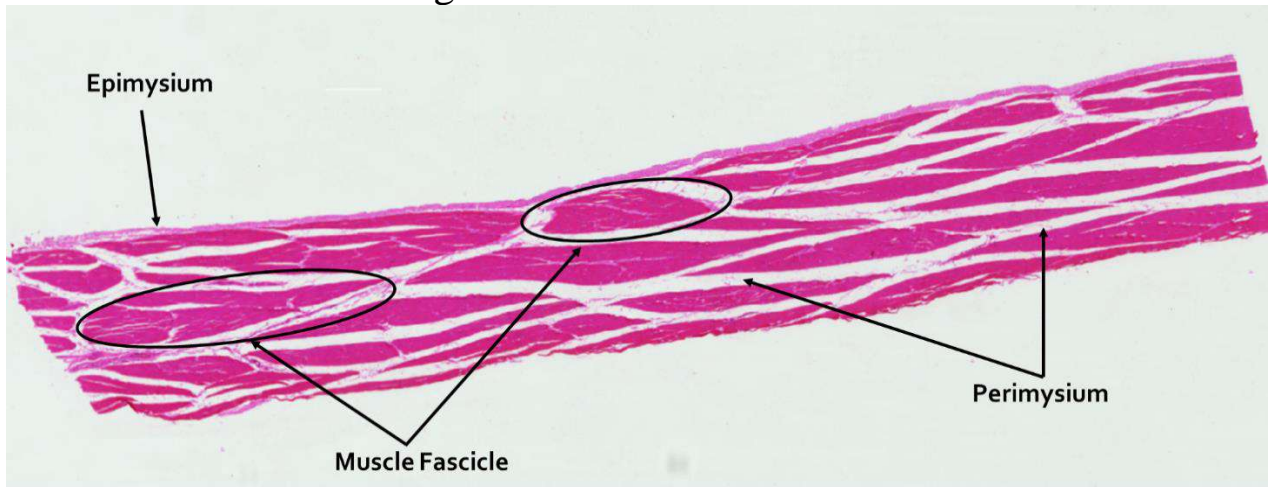
- Longitudinal layer
- Circular layer
- Central nucleus

Myotendinous Junction

- Muscle Fibers
- Tendon
- Tendinocyte

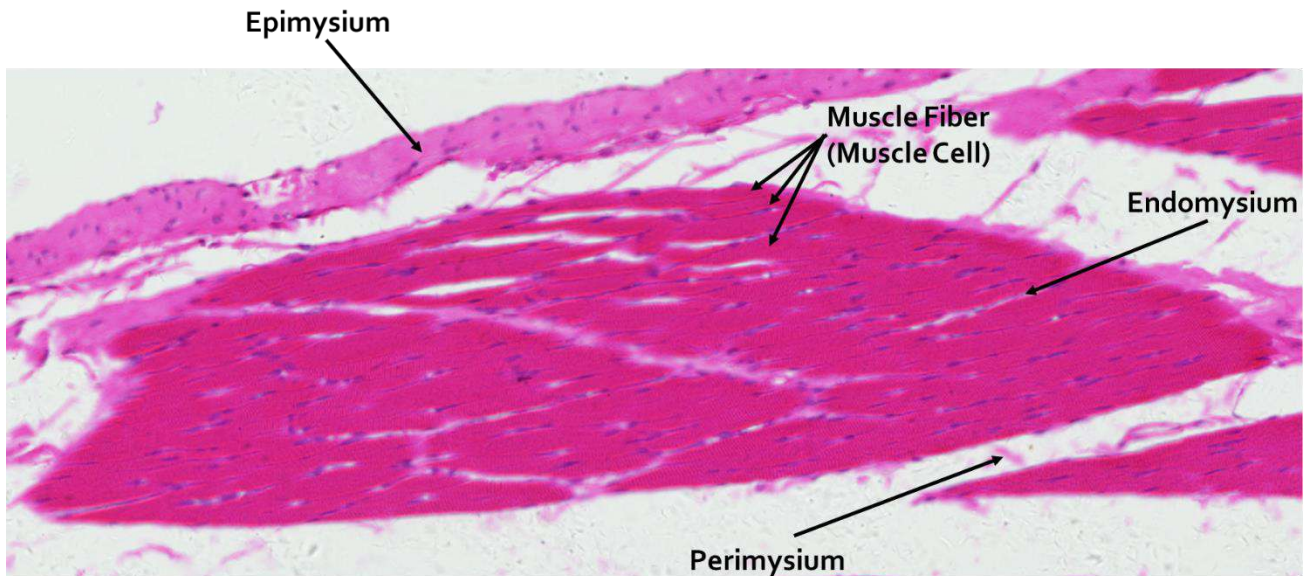
Skeletal Muscle- Prep No.14

Aim: Examination of longitudinal sections of skeletal muscles



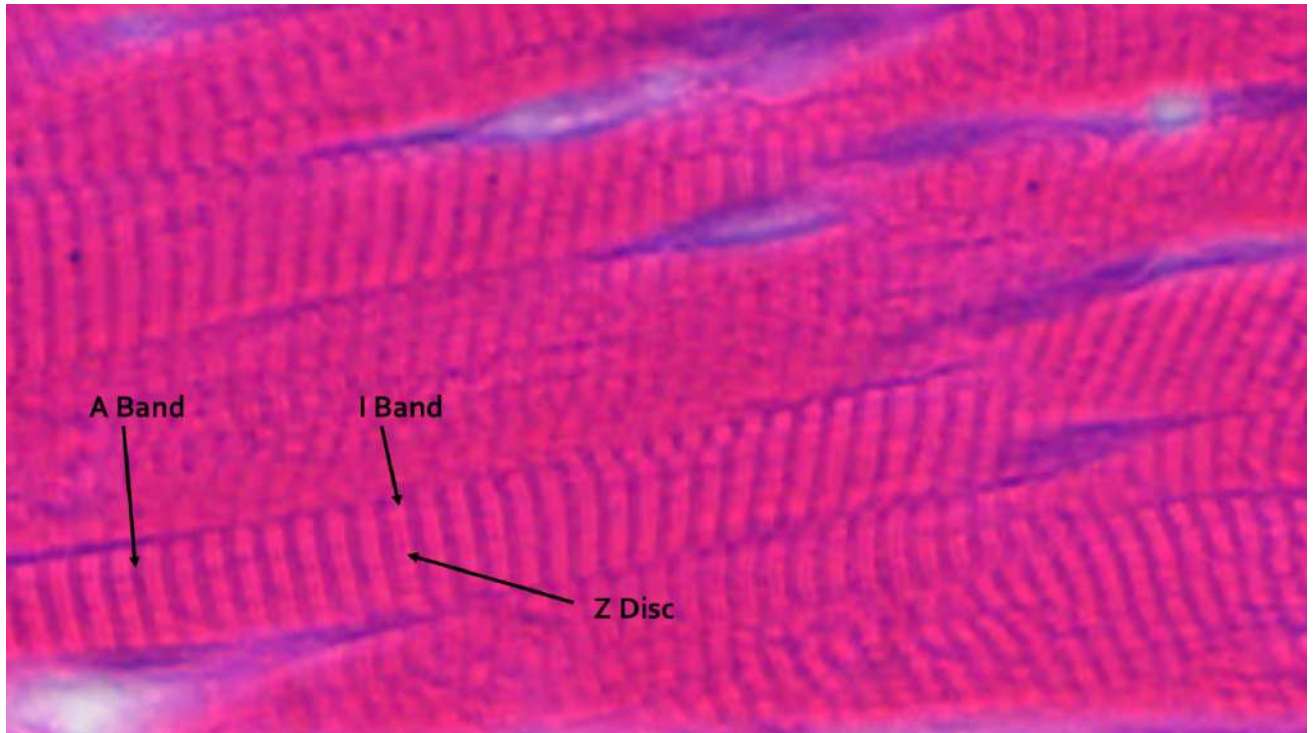
Skeletal Muscle- Prep No.14

Aim: Examination of skeletal muscles



Skeletal Muscle- Prep No.14

Aim: Examination of skeletal muscles



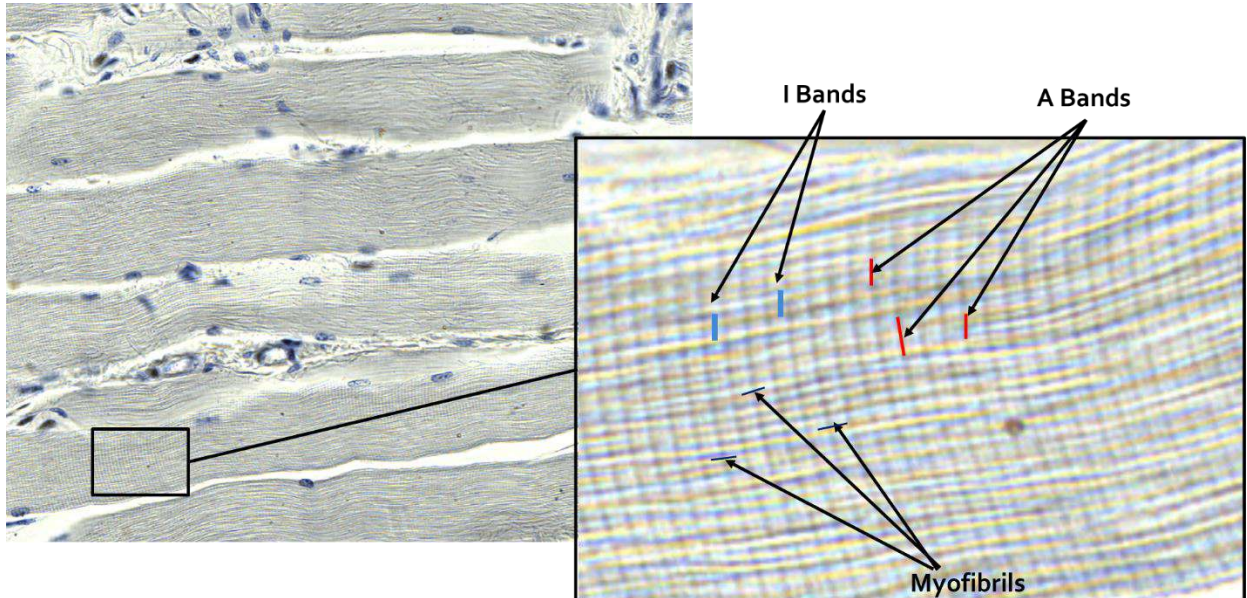
Skeletal Muscle- Prep No.7

Aim: Examination of skeletal muscles



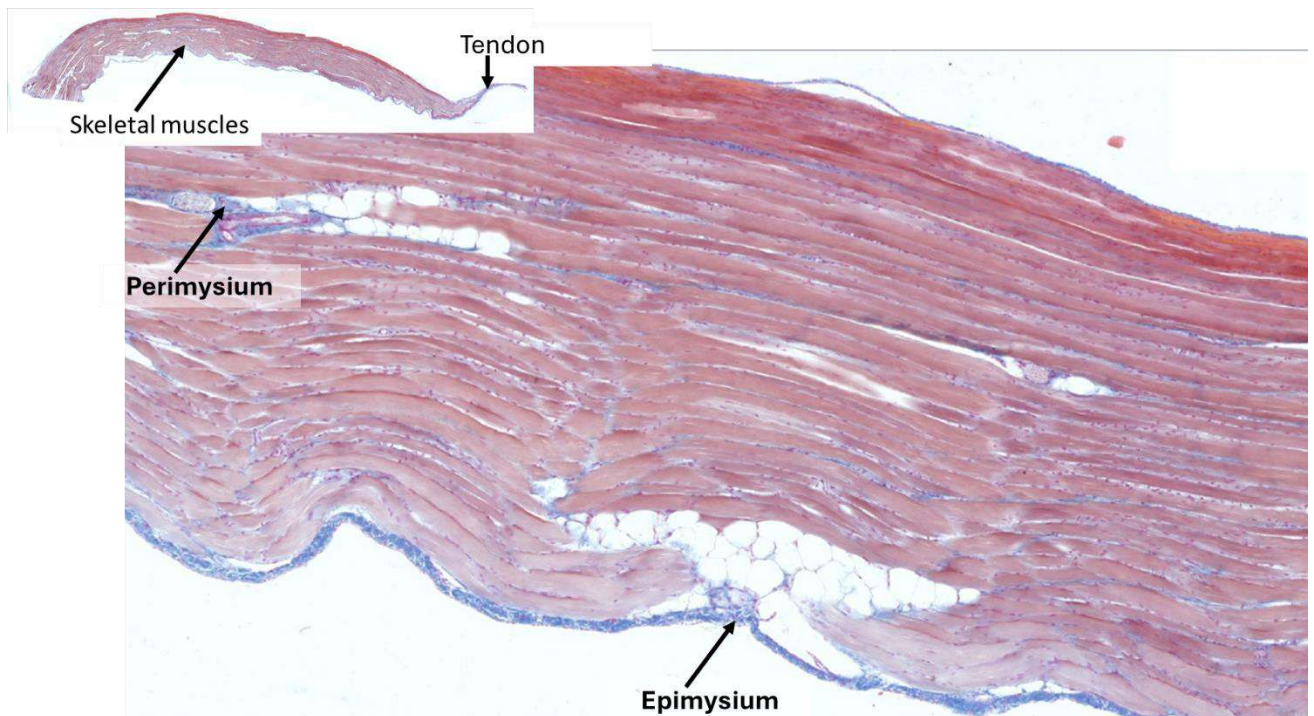
Skeletal Muscle- Prep No.7

Aim: Examination of skeletal muscles



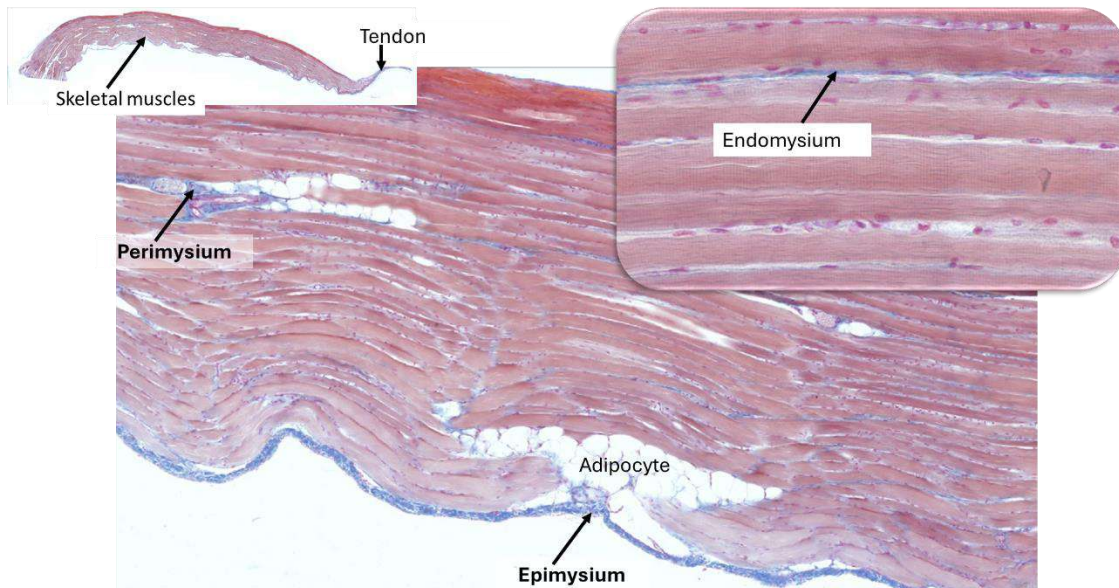
Myotendinous Junction-Prep No.5

Aim: Examination of longitudinal section of skeletal muscle



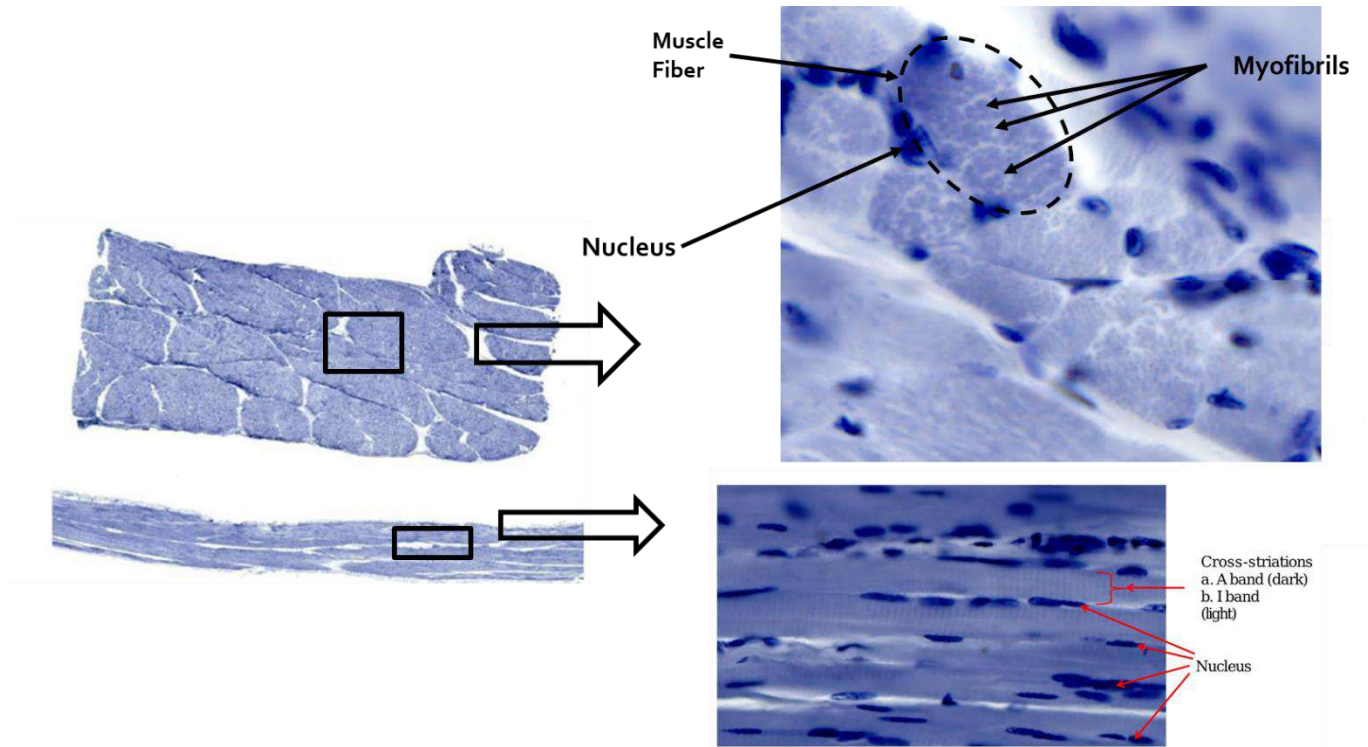
Myotendinous Junction-Prep No.5

Aim: Examination of longitudinal section of skeletal muscle



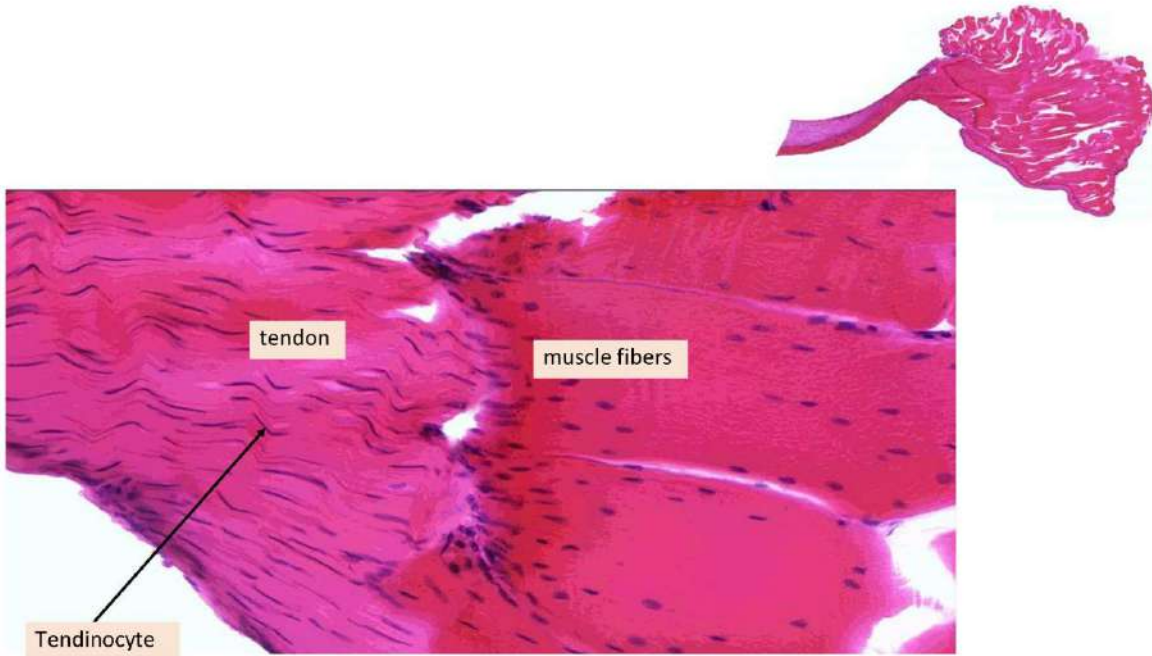
Skeletal Muscle- Prep No.2

Aim: Examination of skeletal muscles



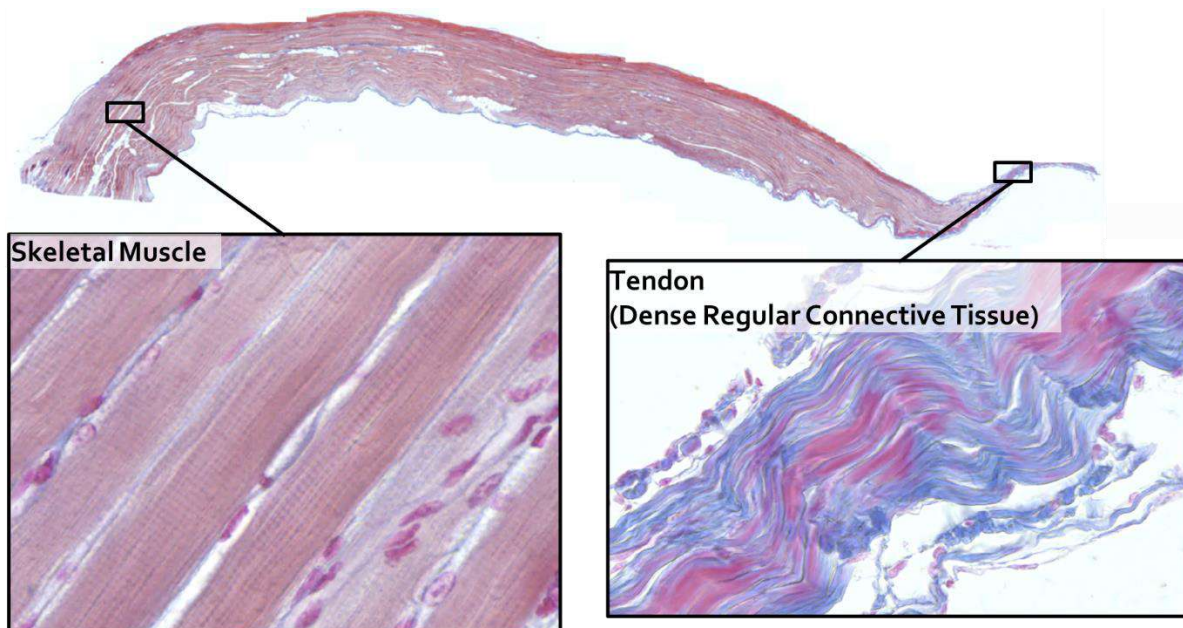
Myotendinous Junction-Prep No.4

Aim: Examination of myotendinous junction



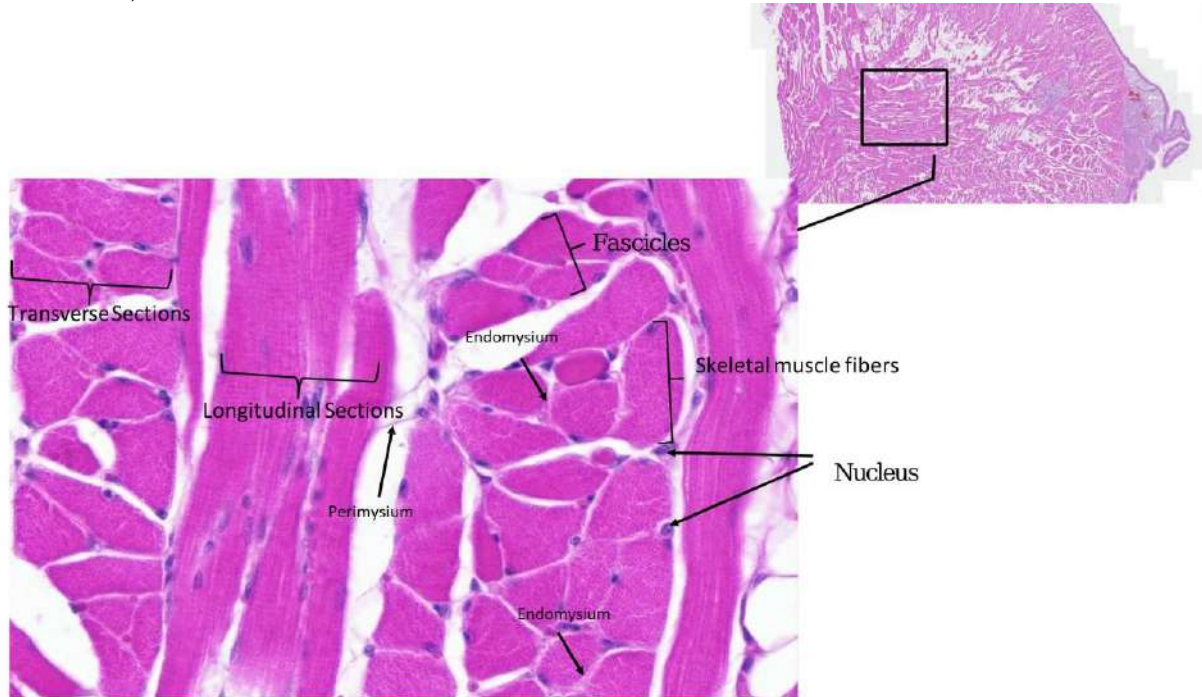
Myotendinous Junction (Masson Thrichrome)-Prep No.5

Aim: Examination of myotendinous junction



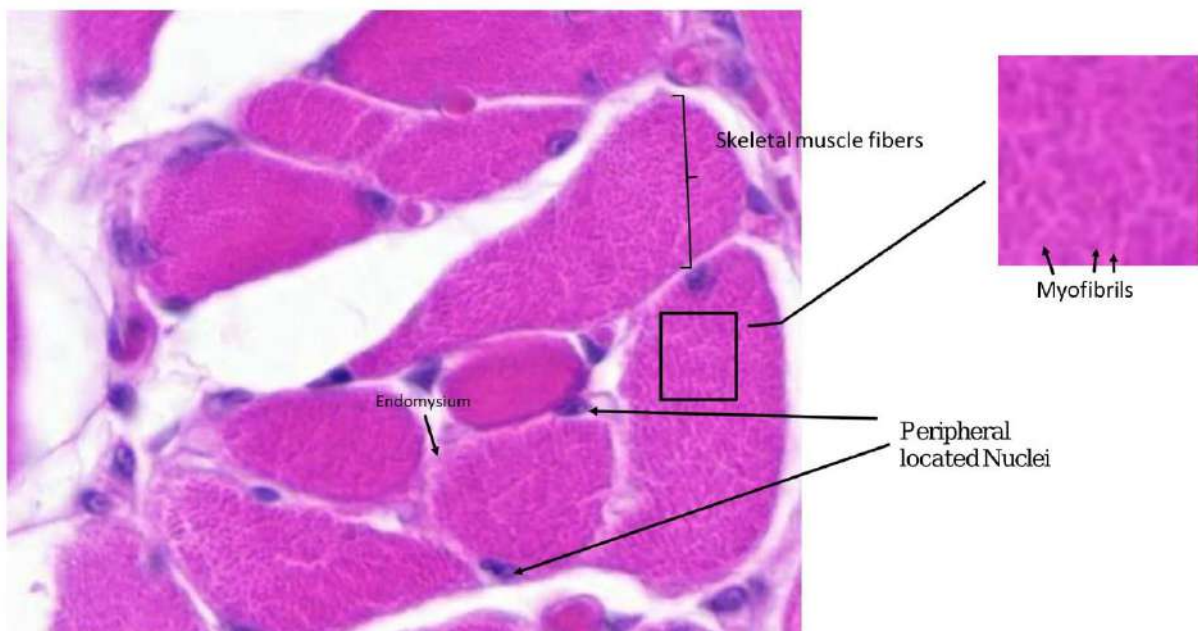
Tongue-Prep No.1

Aim: Examination of longitudinal and transverse sections of skeletal (visseral) muscles



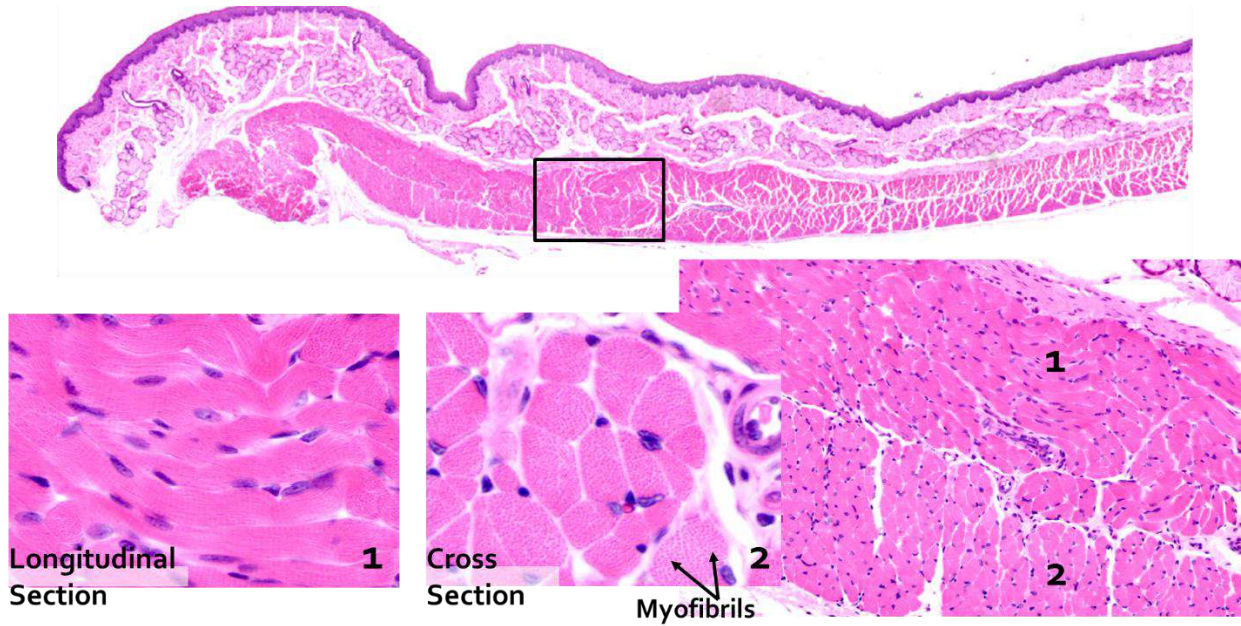
Tongue-Prep No.1

Aim: Examination of transverse sections of skeletal muscles



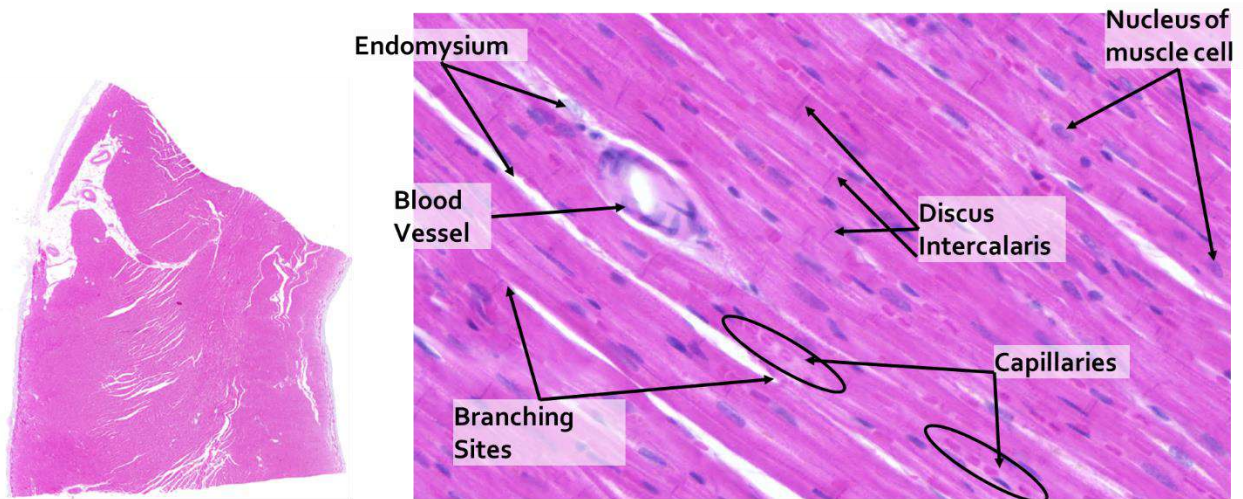
Esophagus- Prep No.17

Aim: Examination visceral striated muscle



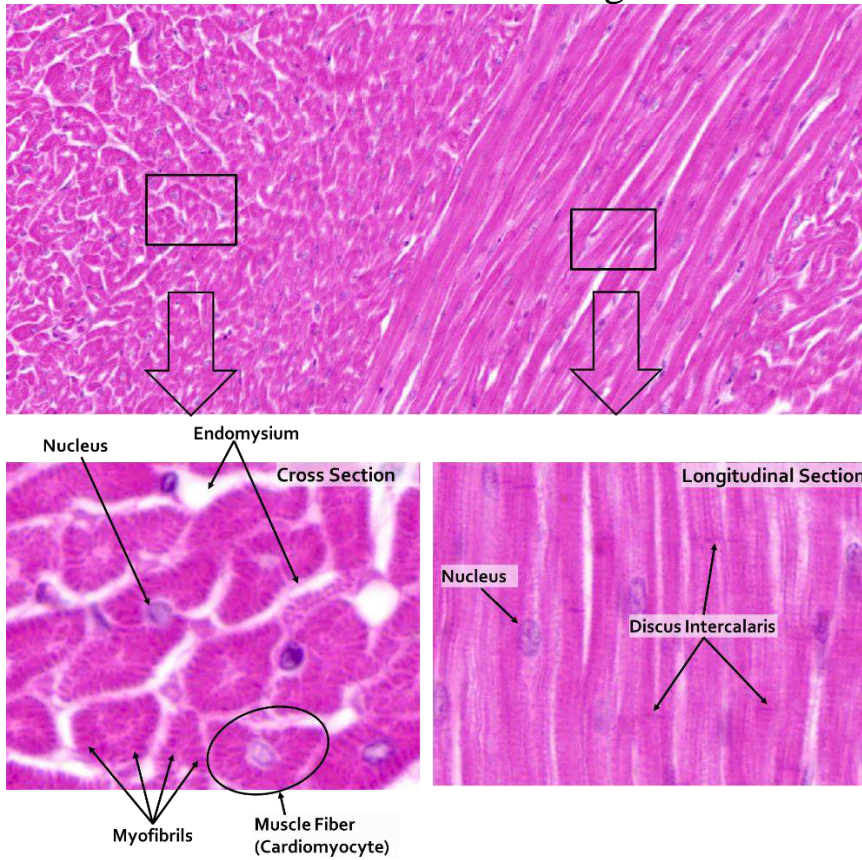
Cardiac Muscle -Prep No.16

Aim: Examination of cardiac muscle



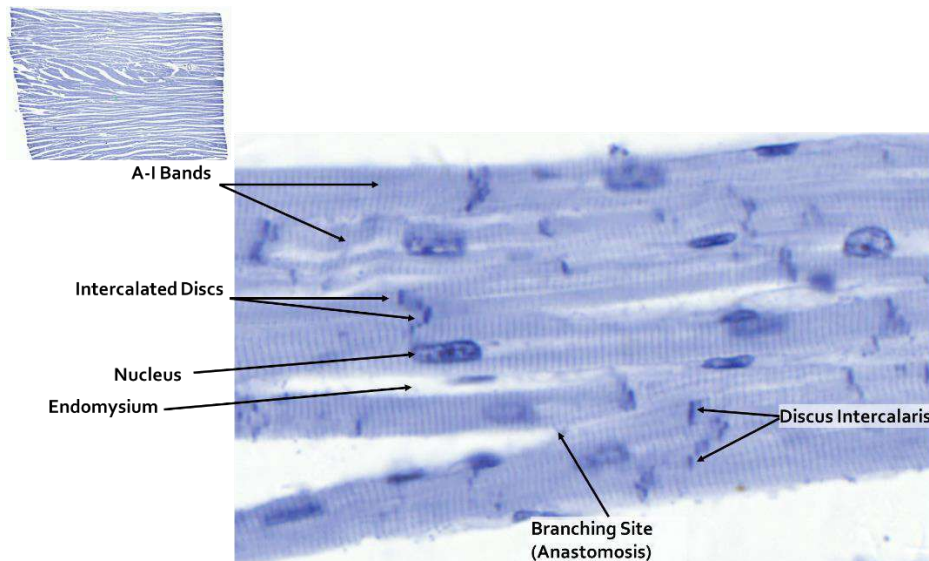
Cardiac Muscle -Prep No.16

Aim: Examination of cross and longitudinal section of cardiac muscle



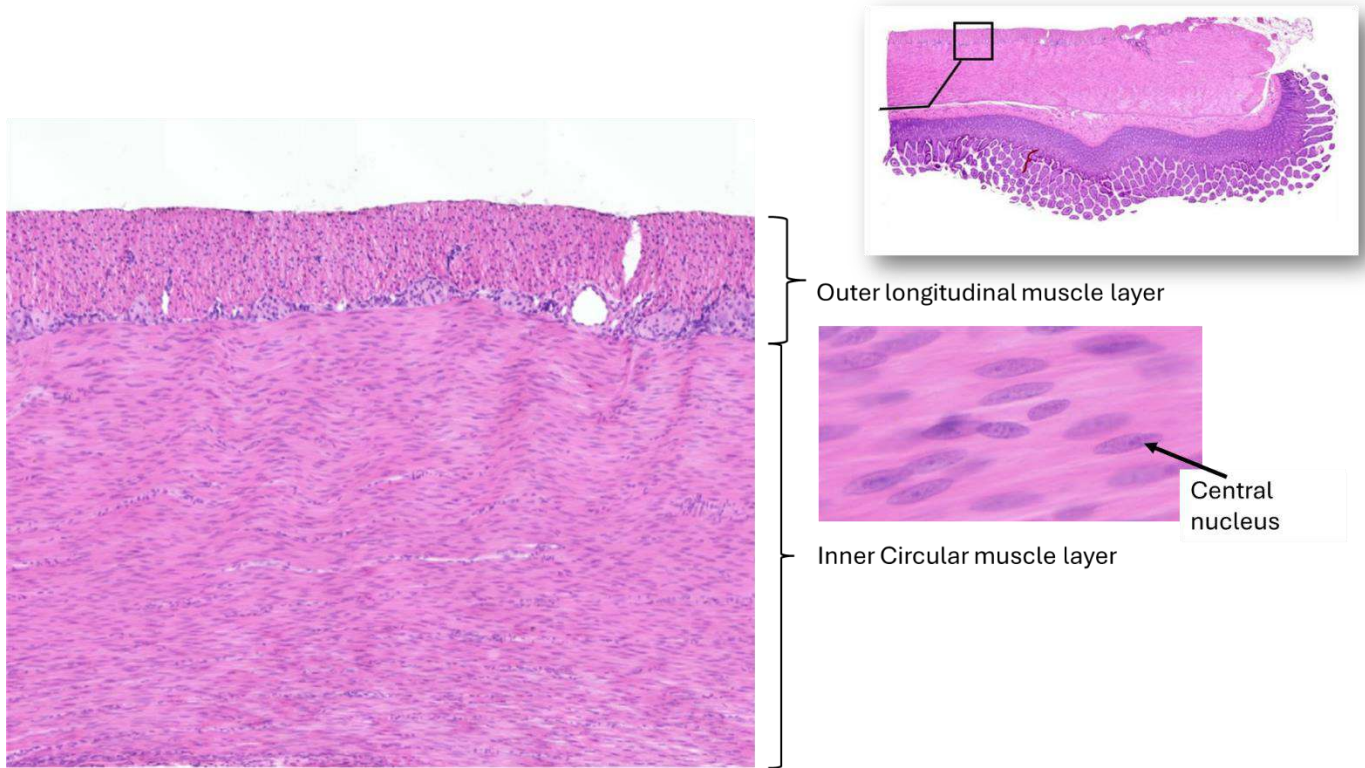
Cardiac Muscle -Prep No.10

Aim: Examination of cardiac muscle



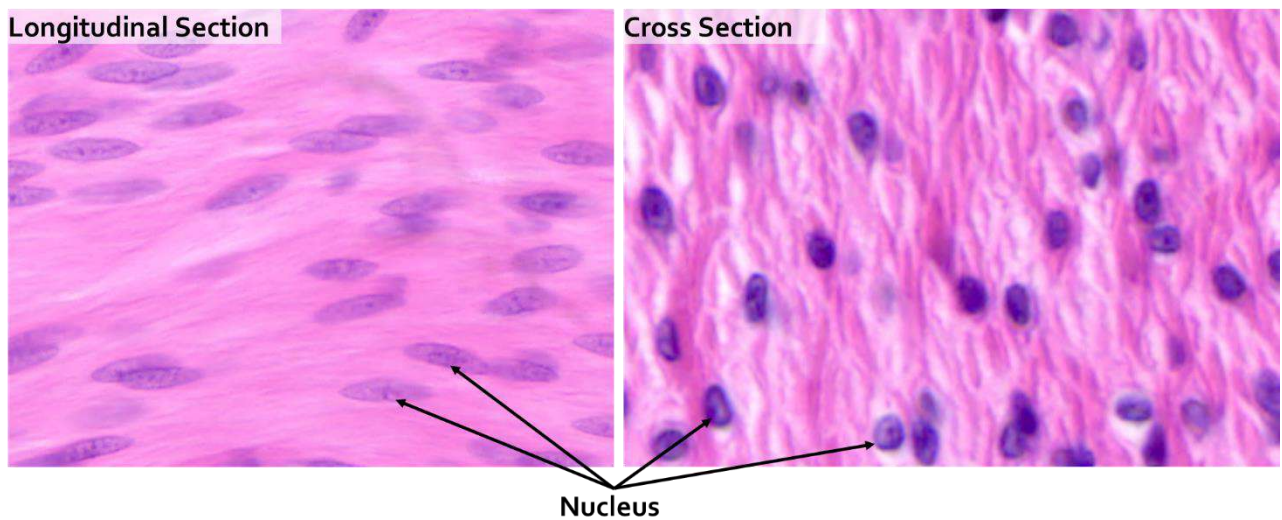
Jejunum-Prep No.13

Aim: Examination of vicceral smooth muscle



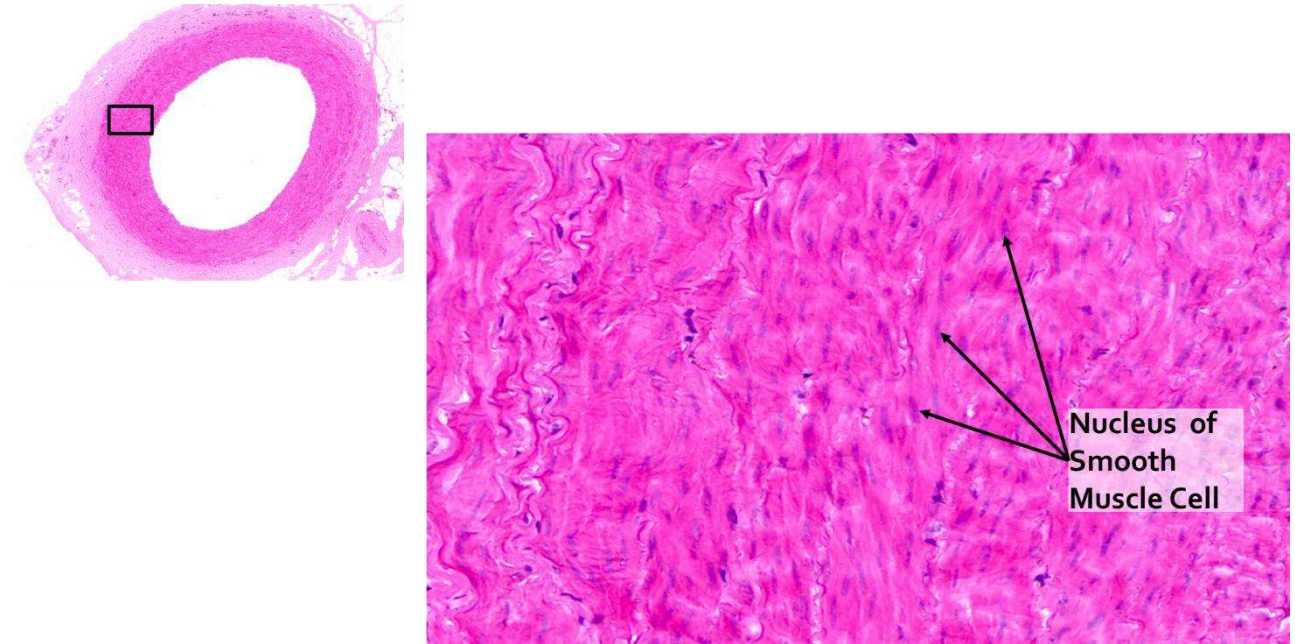
Jejunum-Prep No.13

Aim: Examination of vicceral smooth muscle in different sections



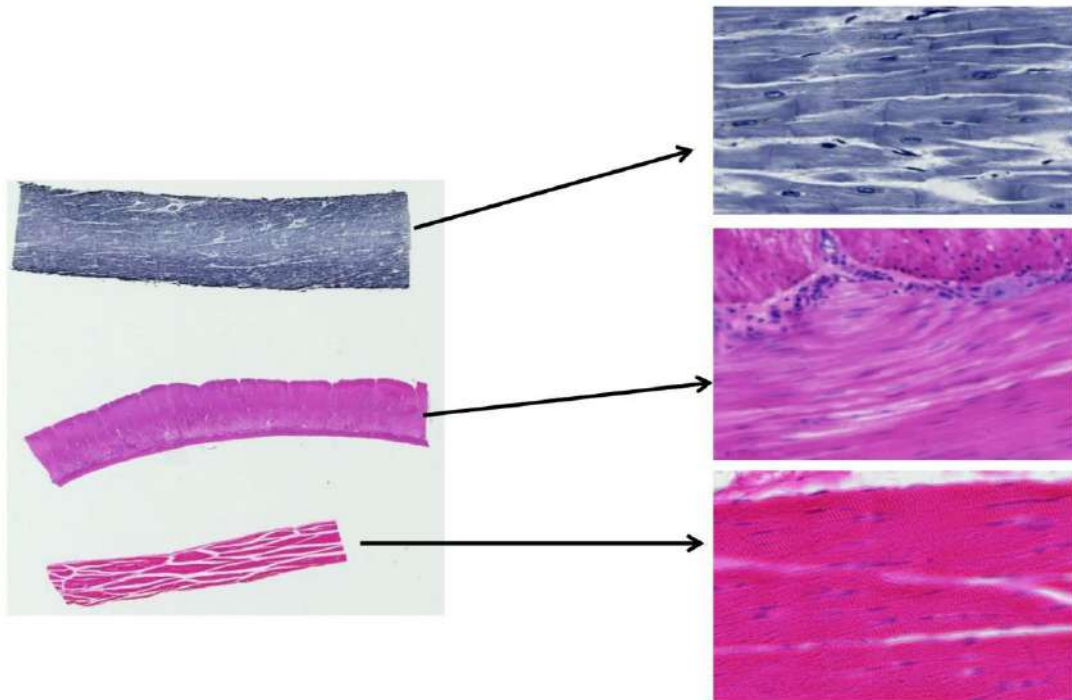
Muscular artery- Prep No. 13

Aim: Examination of vascular smooth muscle



Three Types of Muscles-Prep No.14

Aim: Examination of three types of muscles



BLOOD

Learning Objectives

Be able to tell the names of blood cells and recognize cells at the light microscopic level

Be able to show Megakaryocytes in the bone marrow.

Be able to show Erythrocytes, Leukocytes, Monocytes, Eosinophils, Basophils, Neutrophils and Platelets in the blood smear preparation.

Identify the Following:

Blood Smear

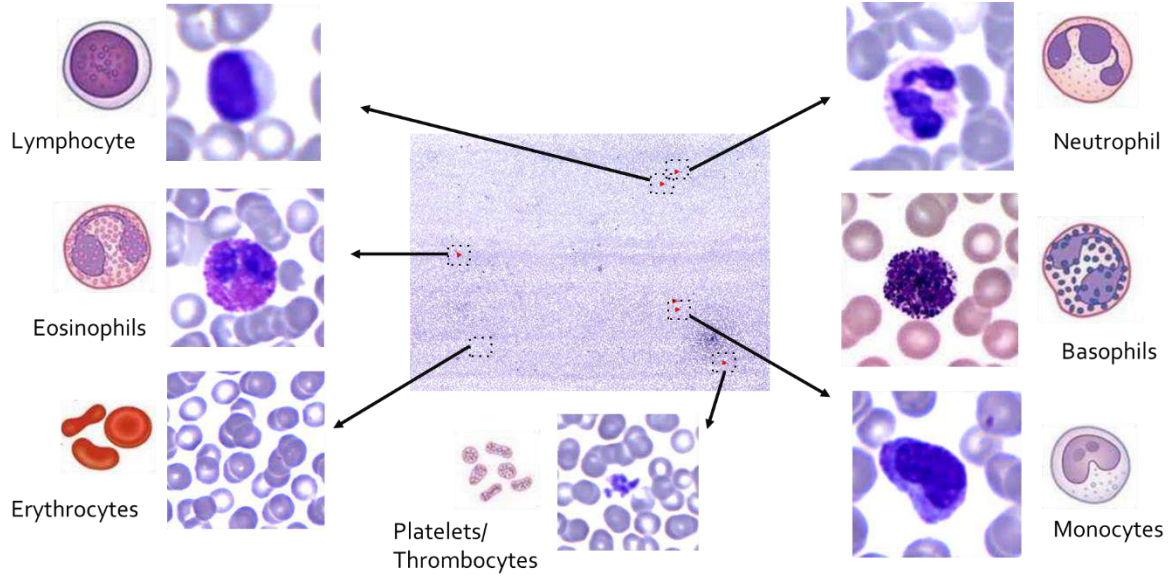
- Erythrocytes
- Leukocyte
 - Granulocytes
 - Neutrophil
 - Eosinophils
 - Bazofil
 - Agranulocytes
 - Lymphocyte
 - Monocytes
- Platelets

Red Bone Marrow

- Bone trabeculae
- Erythrocytes
- Hematopoietic cells
- Adipocytes
- Megakaryocytes
- Sinusoids

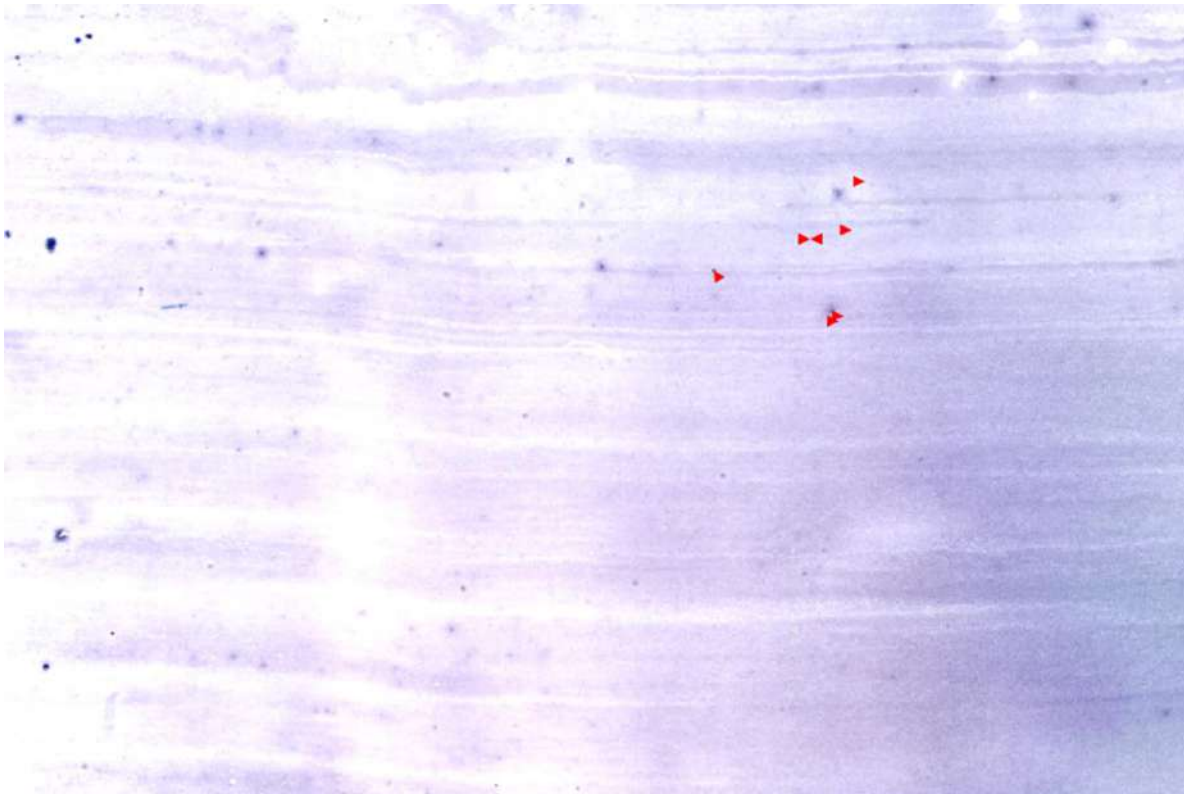
Blood Smear -Prep. No.1

Aim: Examination of blood cells



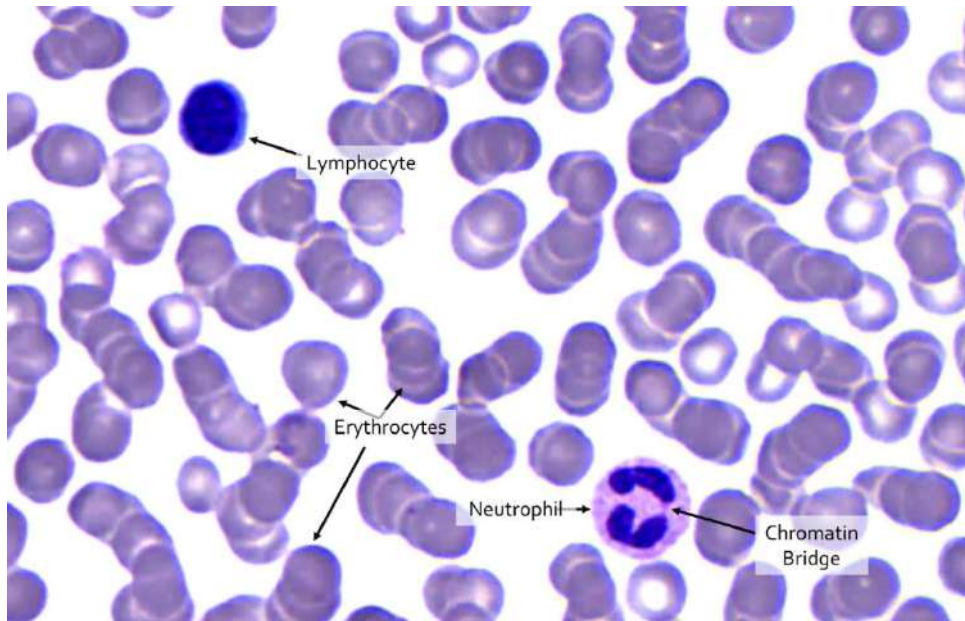
Blood Smear -Prep. No.1

Aim: Examination of blood cells



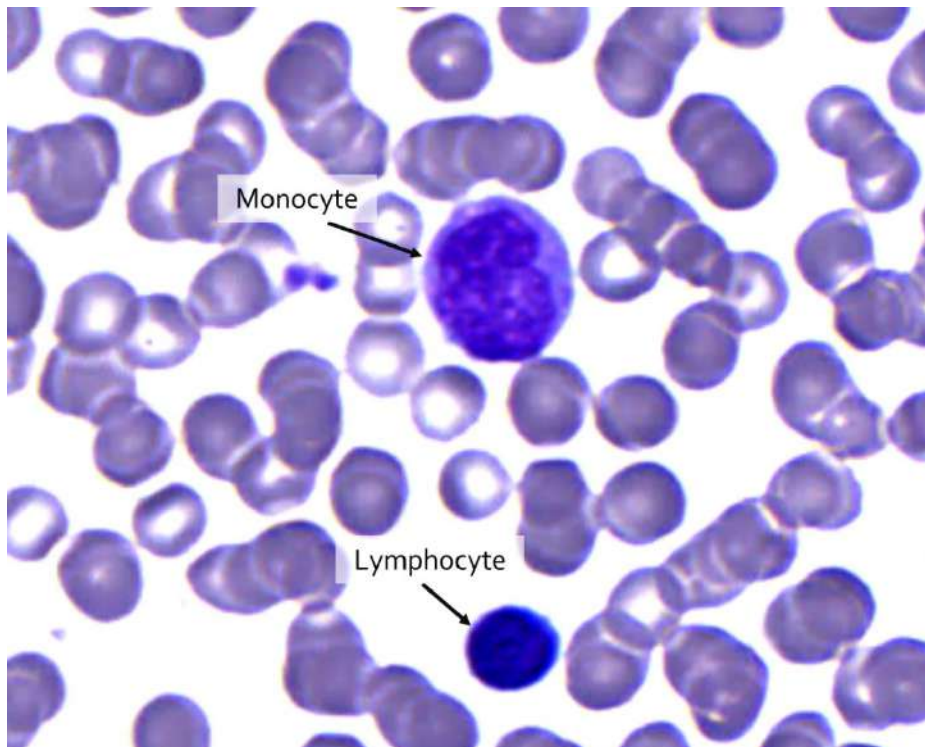
Blood Smear -Prep. No.1

Aim: Examination of blood cells



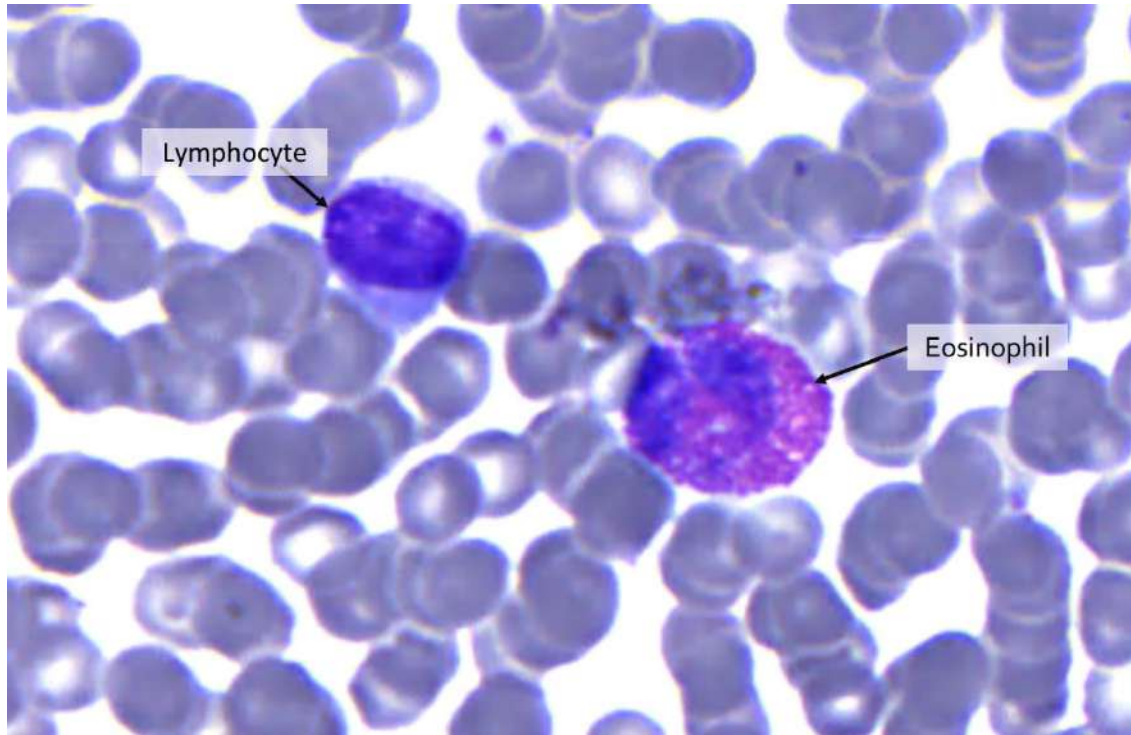
Blood Smear -Prep. No.1

Aim: Examination of blood cells



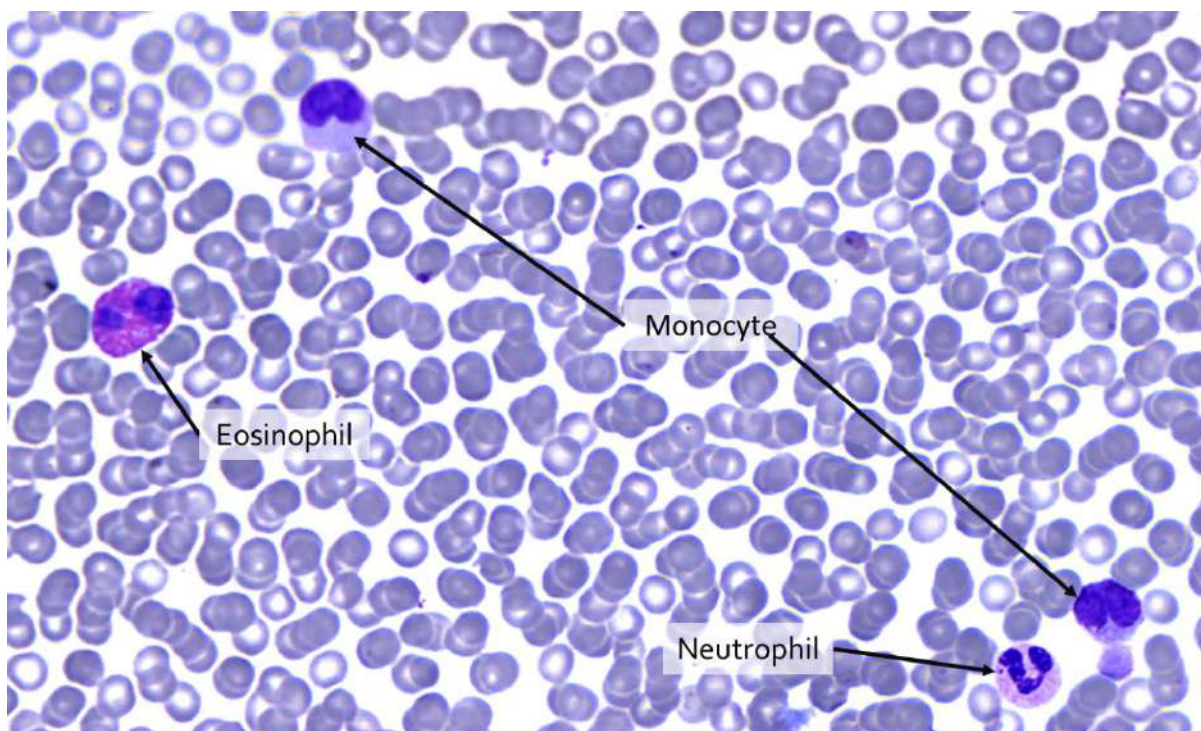
Blood Smear -Prep. No.1

Aim: Examination of blood cells



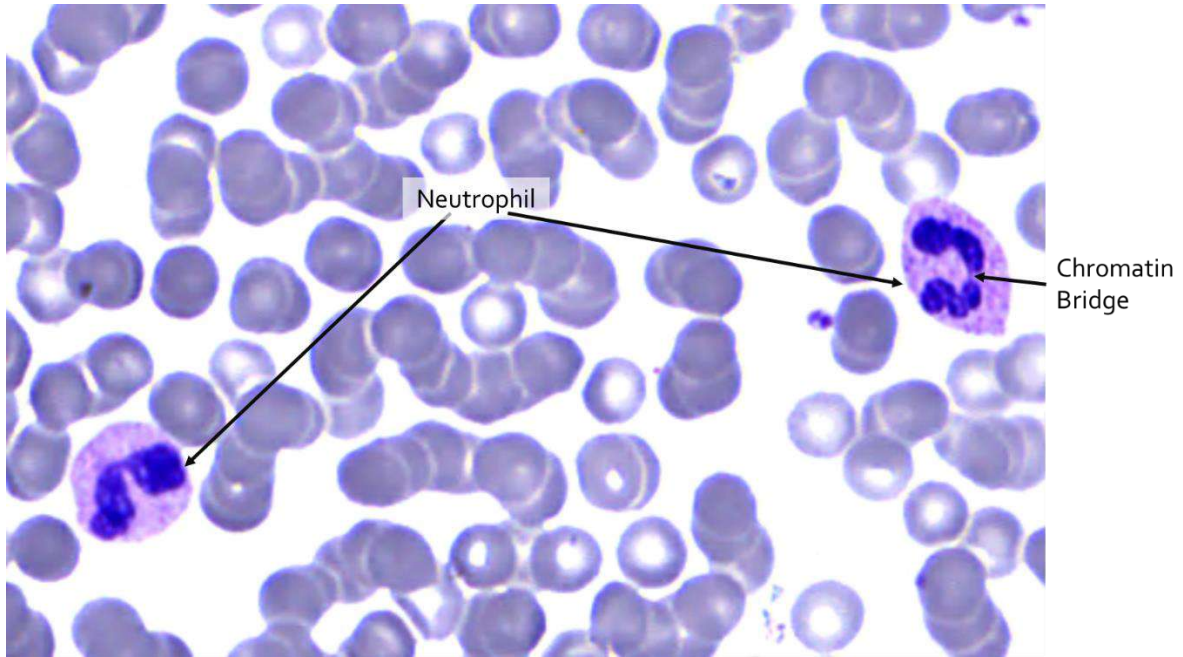
Blood Smear -Prep. No.1

Aim: Examination of blood cells



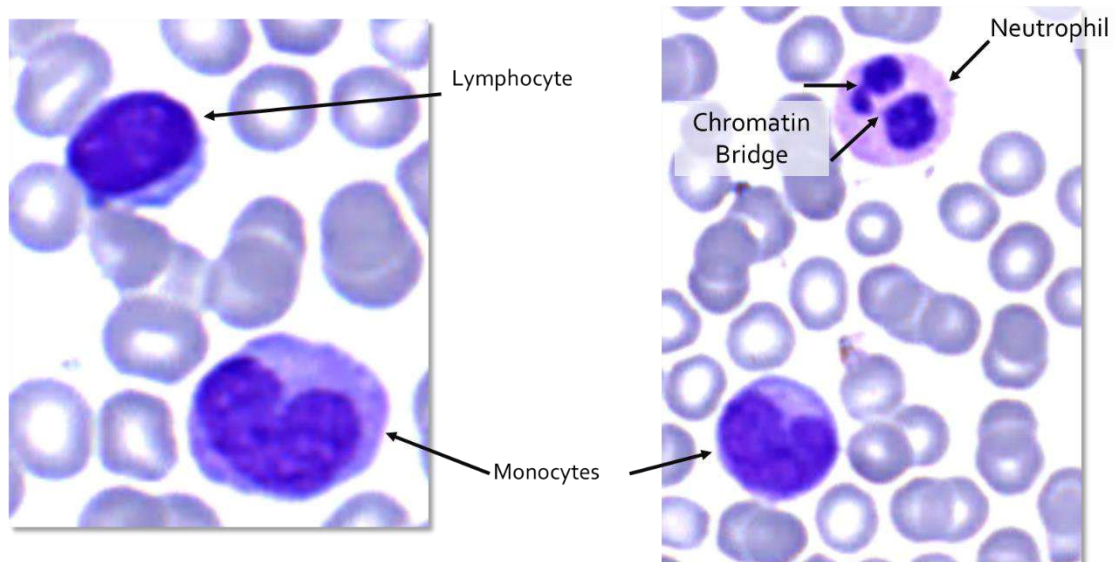
Blood Smear -Prep. No.1

Aim: Examination of blood cells



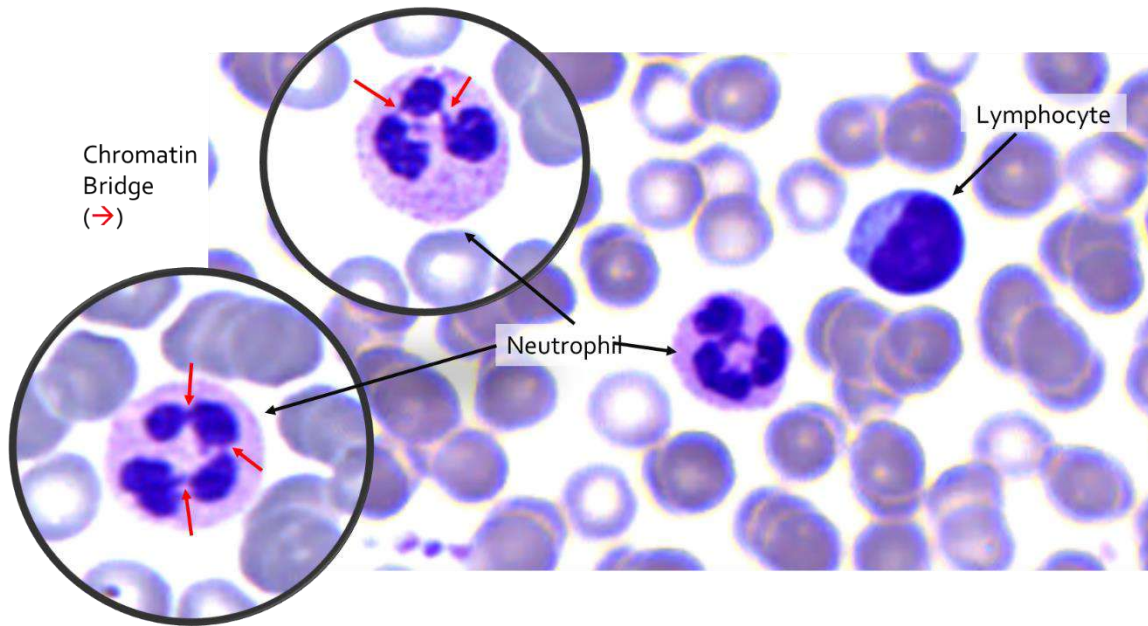
Blood Smear -Prep. No.1

Aim: Examination of blood cells



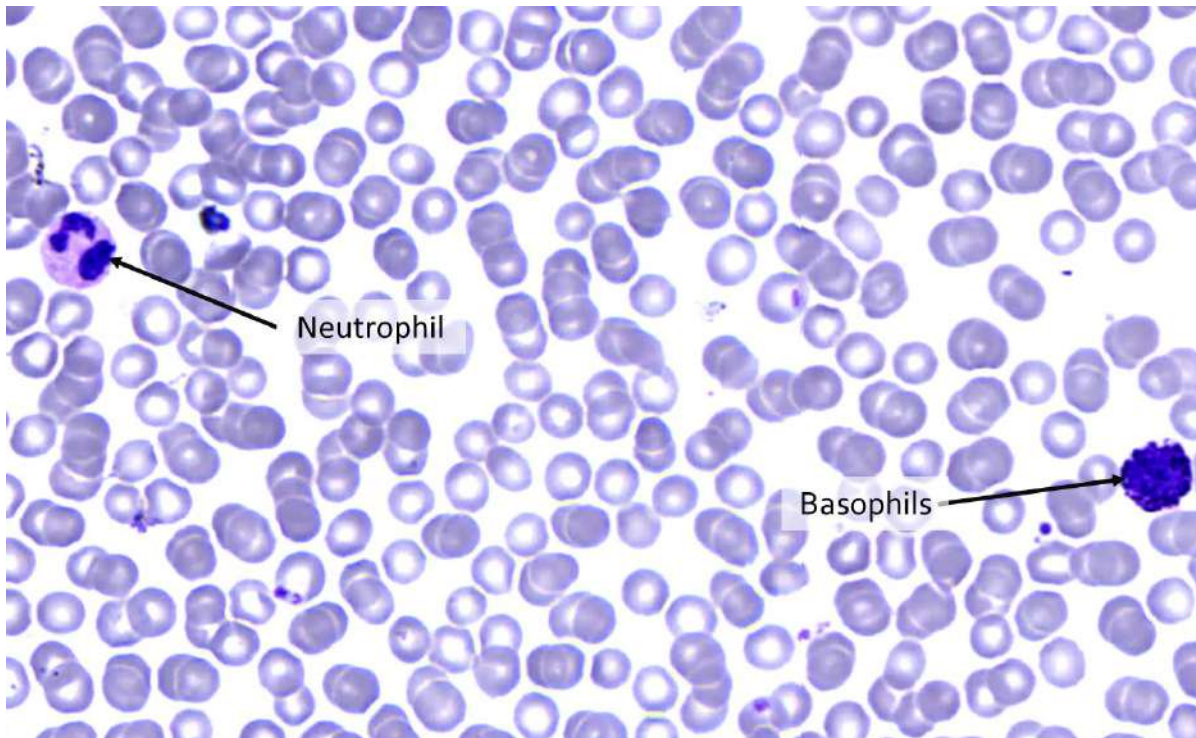
Blood Smear -Prep. No.1

Aim: Examination of blood cells



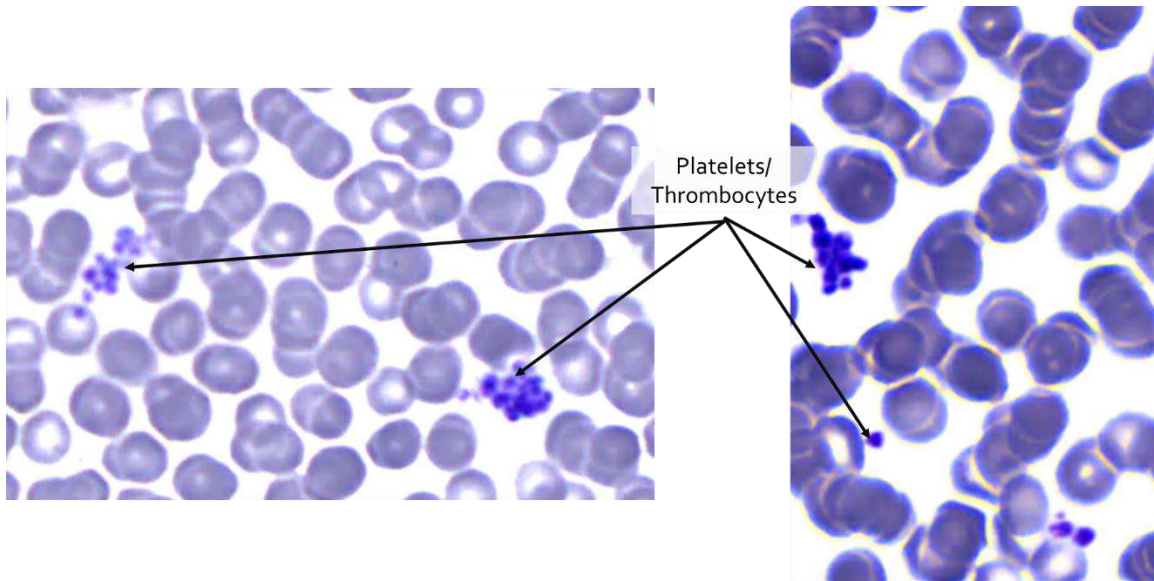
Blood Smear -Prep. No.1

Aim: Examination of blood cells



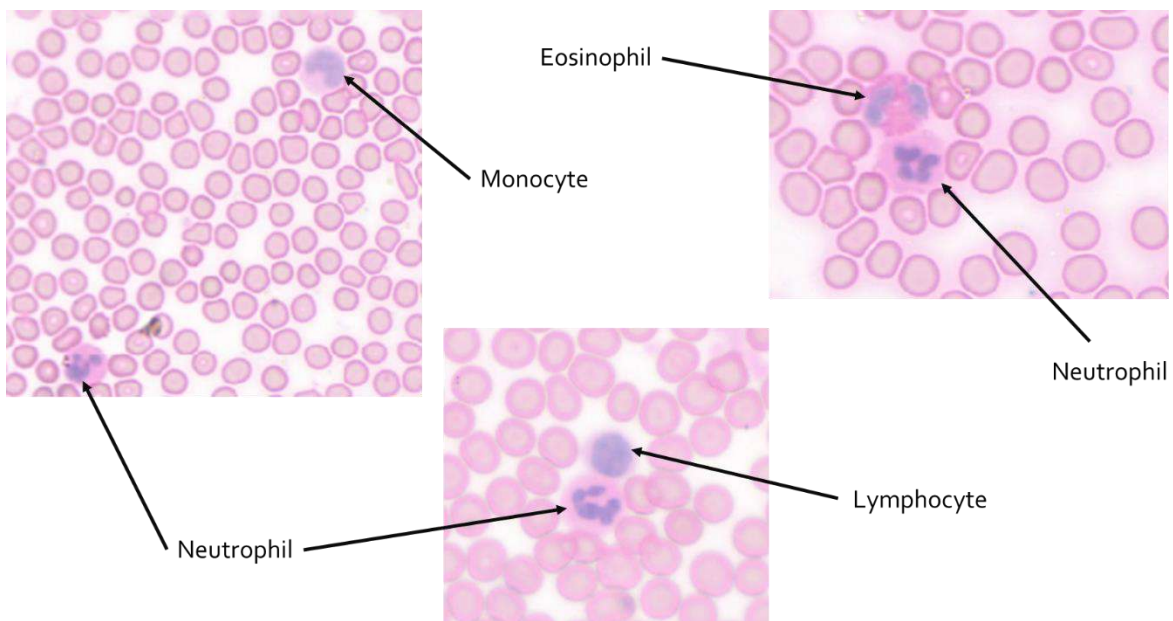
Blood Smear -Prep. No.1

Aim: Examination of blood cells



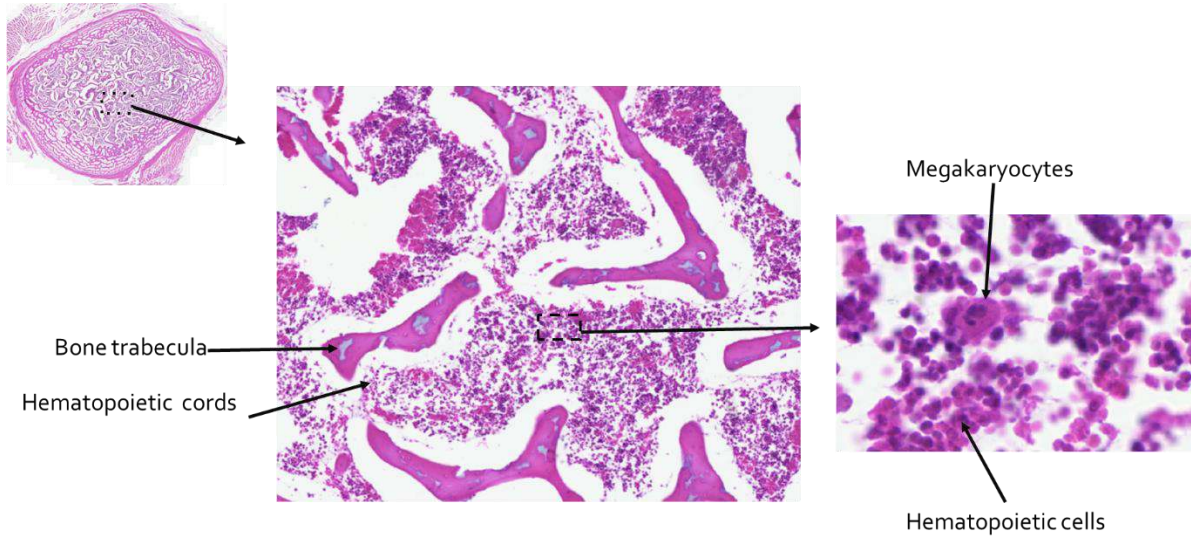
Blood Smear -Prep. No.3

Aim: Examination of blood cells



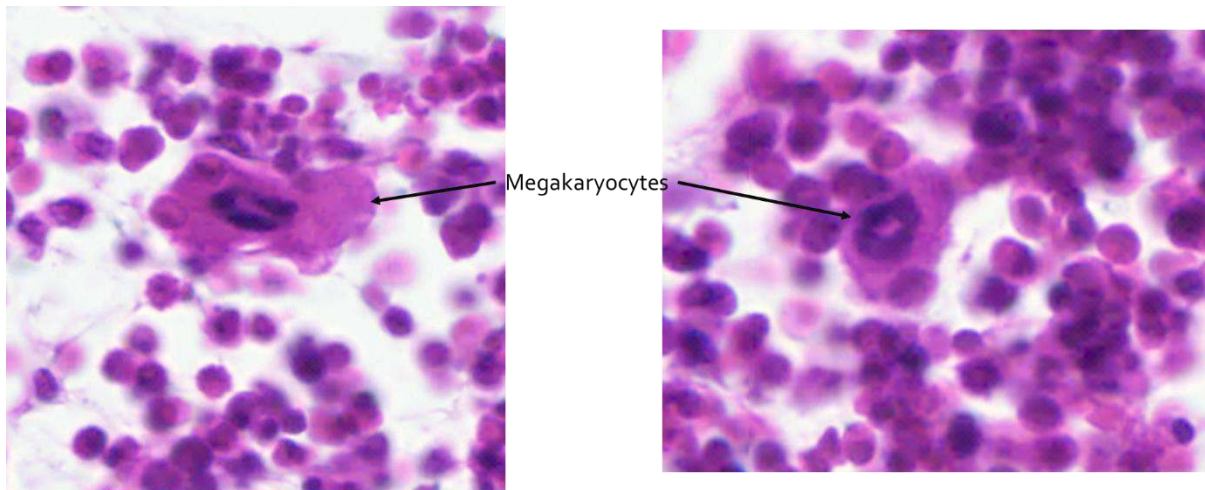
Red Bone Marrow-Prep. No.5

Aim: Examination of bone marrow structure and cells



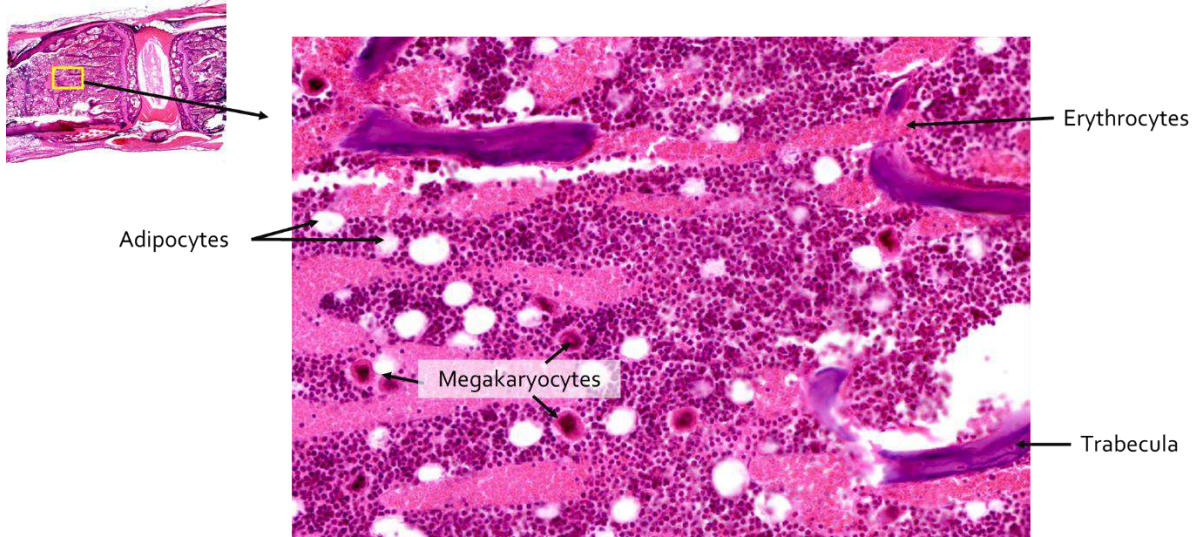
Red Bone Marrow-Prep. No.5

Aim: Examination of bone marrow structure and cells



Intervertebral disc-Prep. No.6

Aim: Examination of red bone marrow structure and cells



Intervertebral disc-Prep. No.6

Aim: Examination of red bone marrow structure and cells

