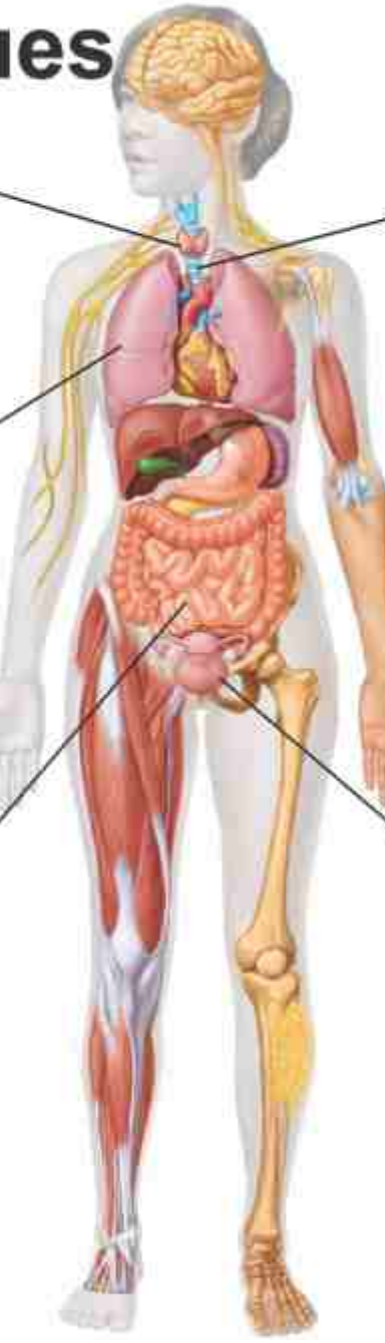
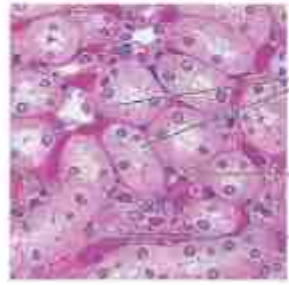


# Epithelial Tissues



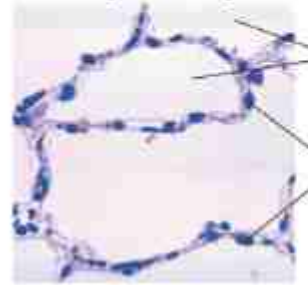
## Simple Cuboidal



Simple cuboidal epithelial cells  
Basement membrane  
Connective tissue

Photomicrograph: Simple cuboidal epithelium in kidney tubules (250x).

## Simple squamous



Air sacs of lungs  
Nuclei of squamous epithelial cells

Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (185x).

## Simple columnar



Simple columnar epithelial cell  
Goblet cell  
Basement membrane  
Connective tissue

Photomicrograph: Simple columnar epithelium of the small intestine (438x).

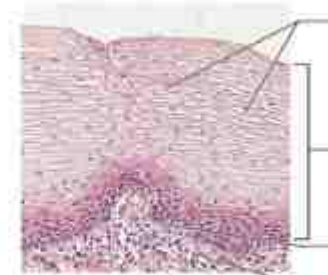
## Pseudostratified columnar



Cilia  
Pseudostratified epithelial layer  
Basement membrane  
Connective tissue

Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (430x).

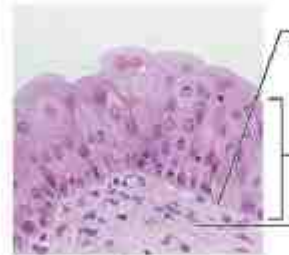
## Stratified squamous



Nuclei  
Stratified squamous epithelium  
Basement membrane  
Connective tissue

Photomicrograph: Stratified squamous epithelium lining of the esophagus (140x).

## Transitional



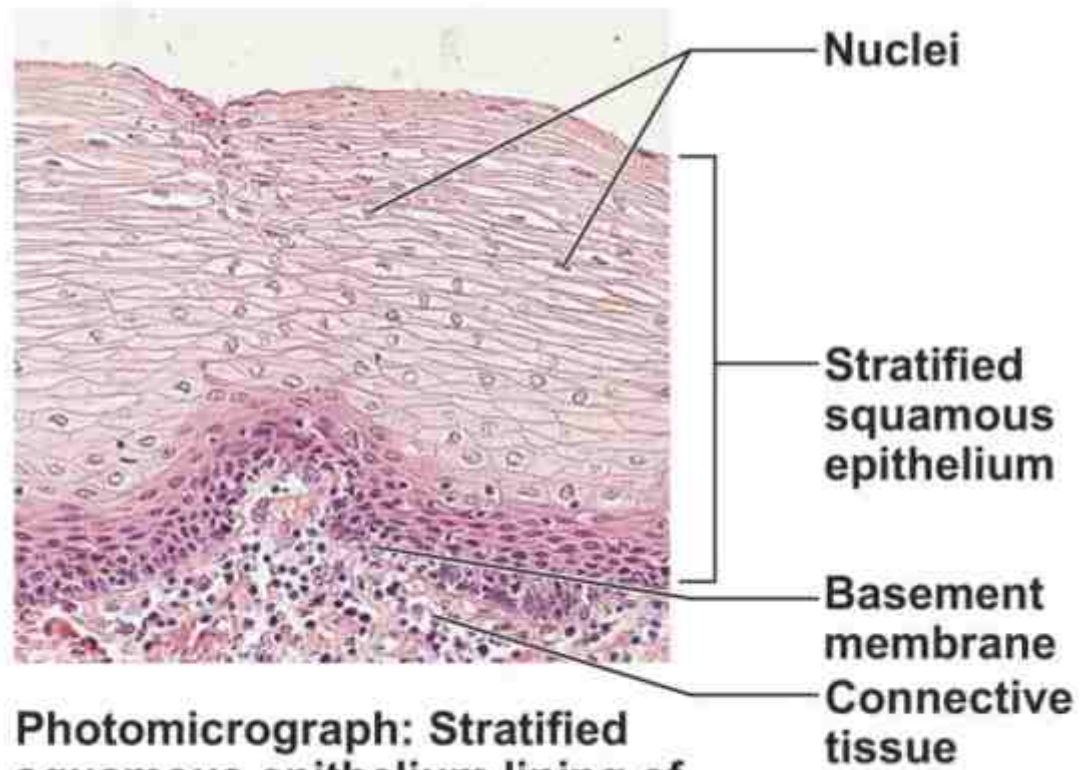
Basement membrane  
Transitional epithelium  
Connective tissue

Photomicrograph: Transitional epithelium lining of the bladder, relaxed state (270x); surface rounded cells flatten and elongate when the bladder fills with urine.

# Types of Simple Epithelium

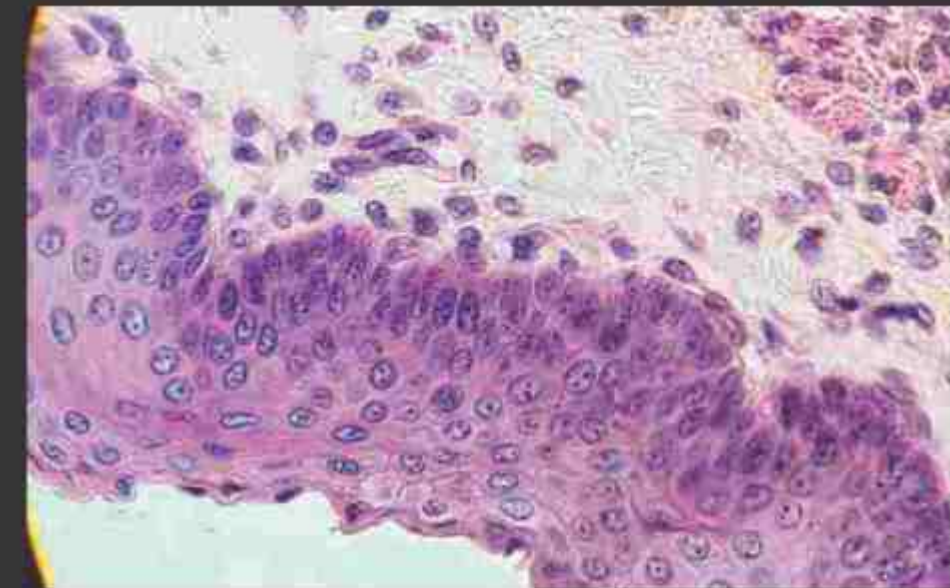
	Squamous	Cuboidal	Columnar
Function(s)	Diffusion, osmosis, secretion, filtration	Secretions and absorption	Secretion and absorption
Location(s)	Serous membranes Lungs Blood vessels & heart linings	Kidney tubules Small Glands Ovary surface	Digestive tract lining Lines respiratory tract Lines uterine tubes
Image	<p>Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (185x).</p>	<p>Photomicrograph: Simple cuboidal epithelium in kidney tubules (250x).</p>	<p>Photomicrograph: Simple columnar epithelium of the small intestine (430x).</p>

# Stratified Epithelia

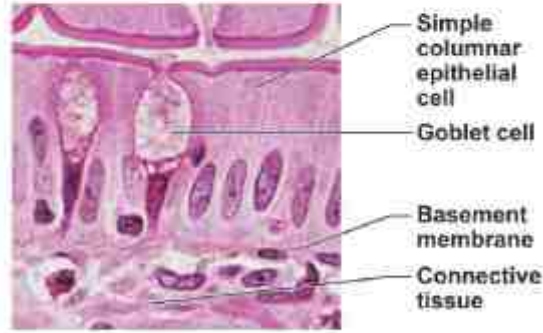


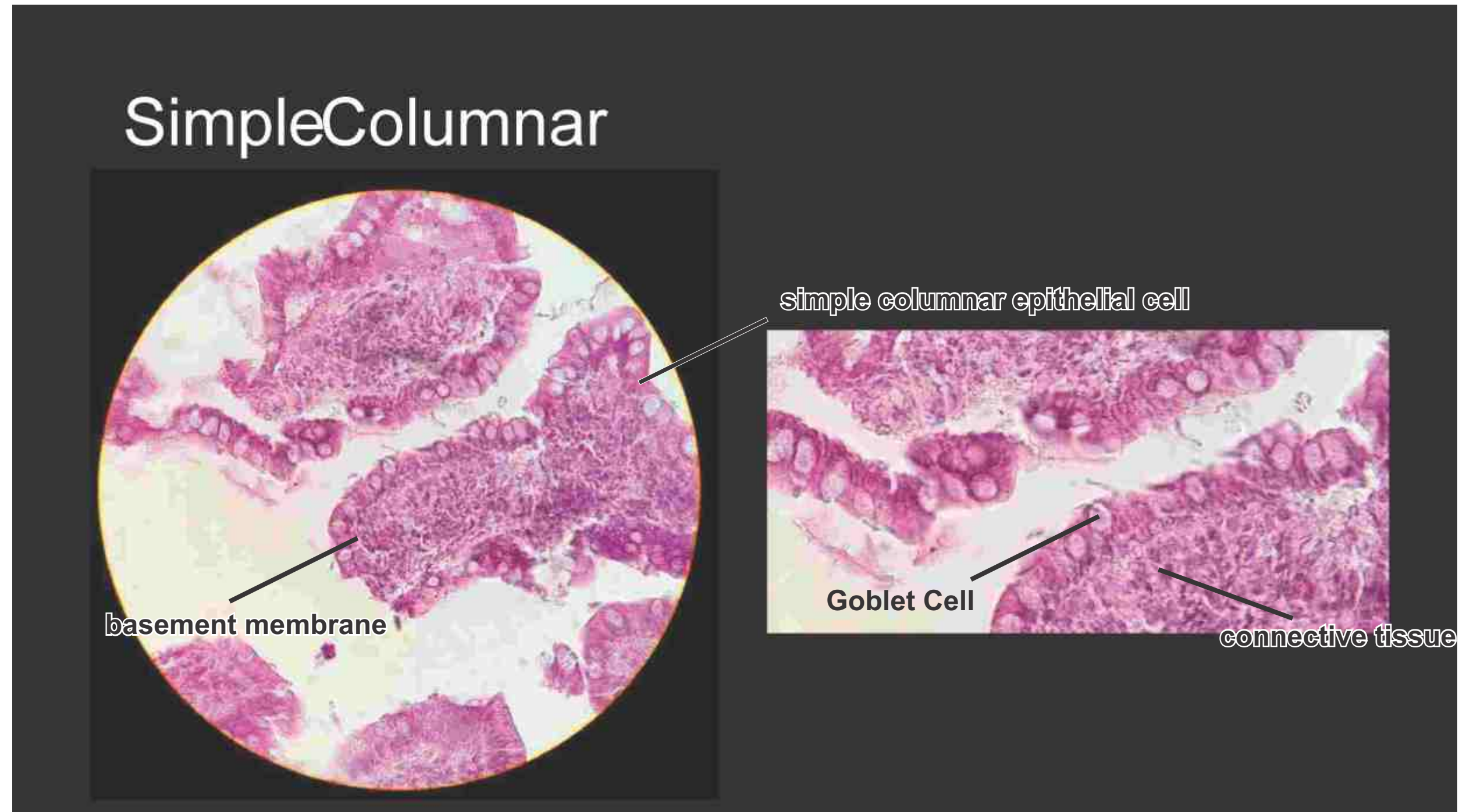
Photomicrograph: Stratified squamous epithelium lining of the esophagus (140x).

## Stratified Squamous Epithelium

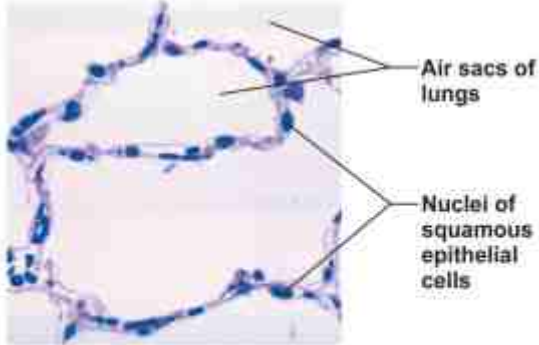


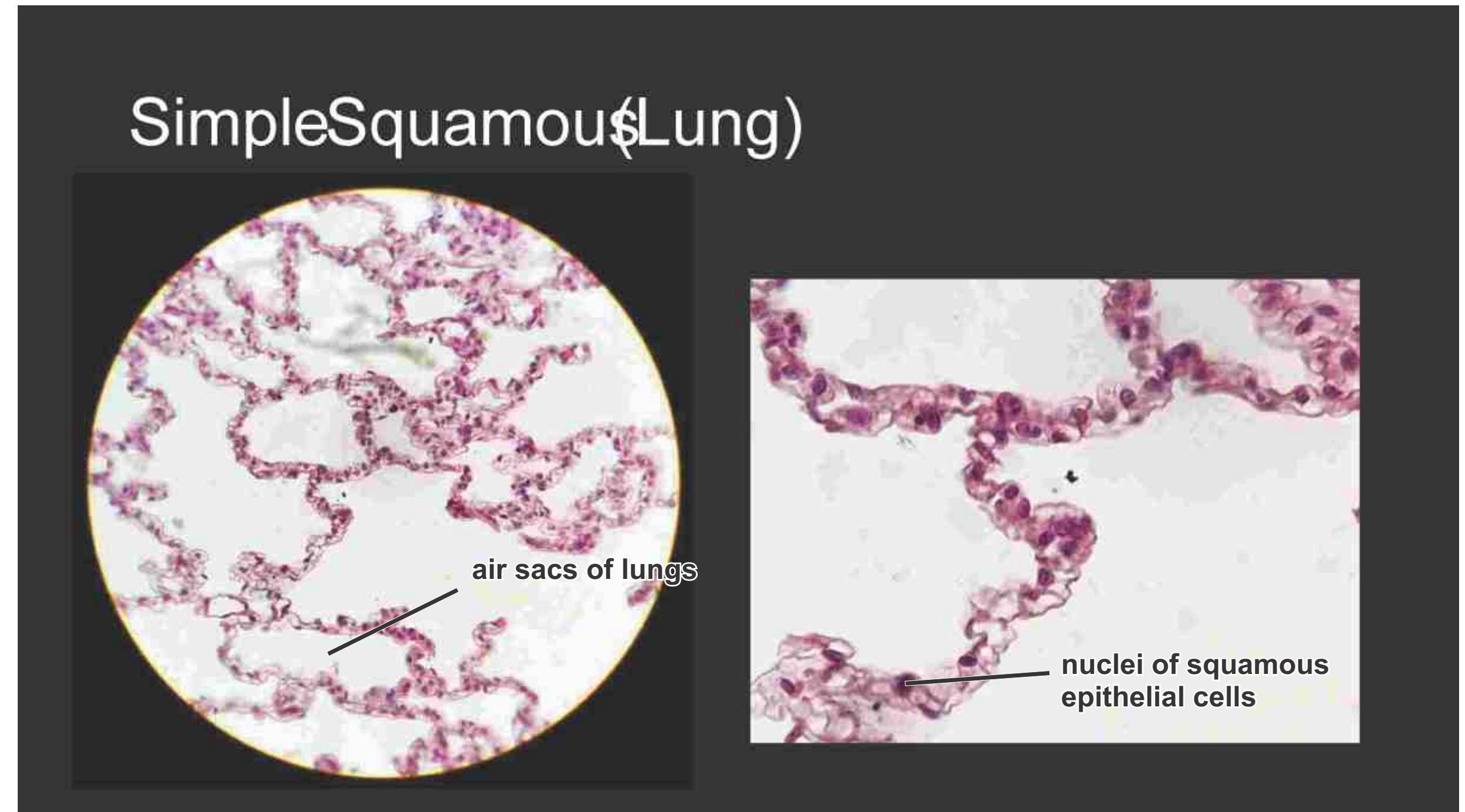
# Simple Epithelium

	<u>Columnar</u>
Function(s)	Secretion and absorption
Location(s)	Digestive tract lining Lines respiratory tract Lines uterine tubes
Image	 <p>Photomicrograph: Simple columnar epithelium of the small intestine (430x).</p>

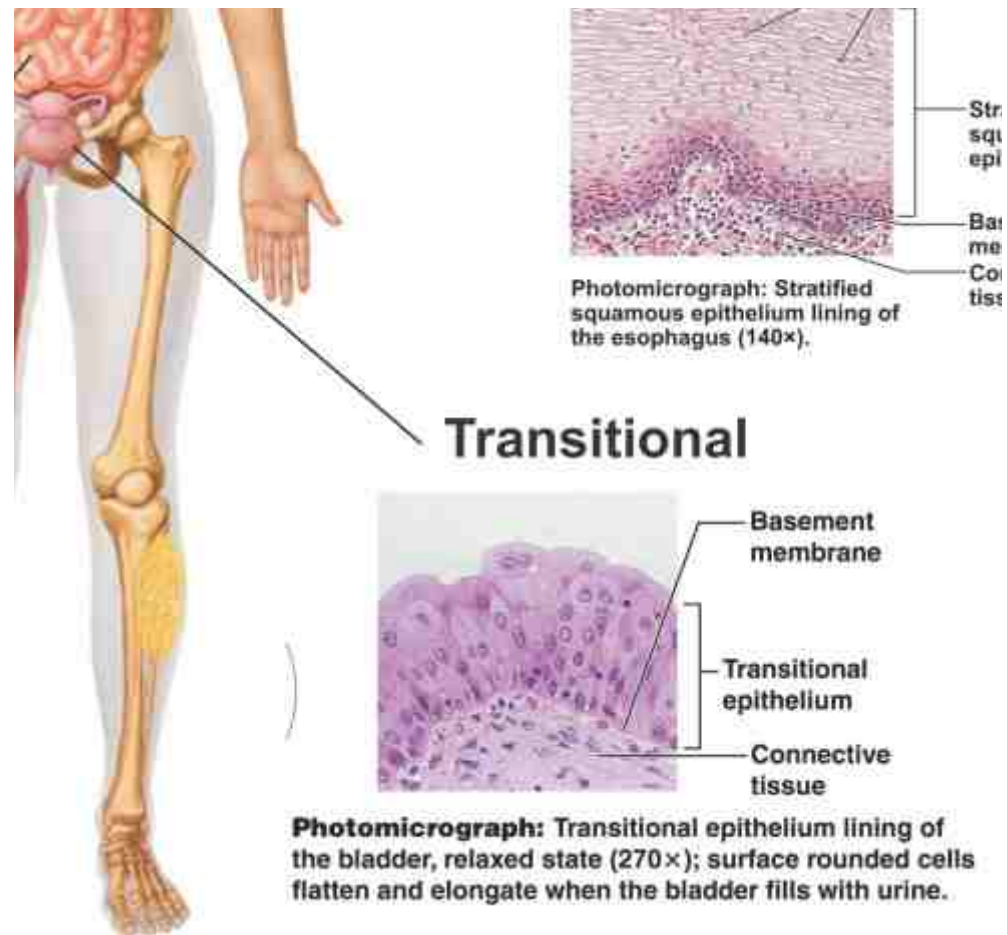


# Simple Epithelium

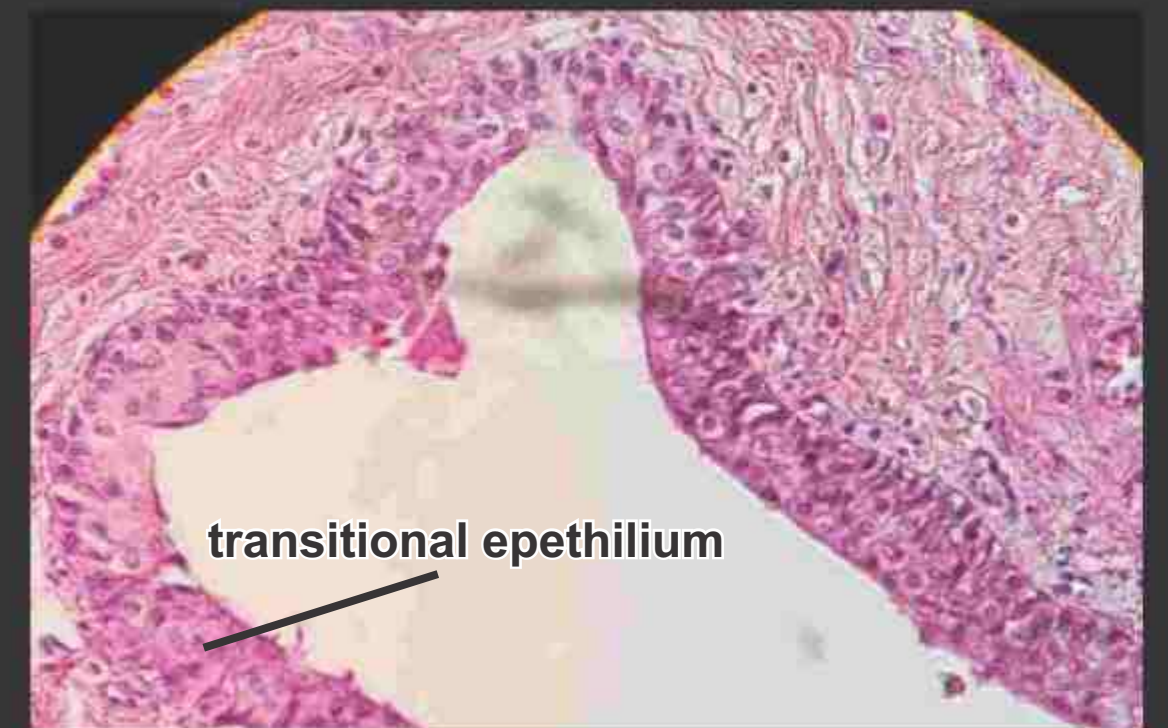
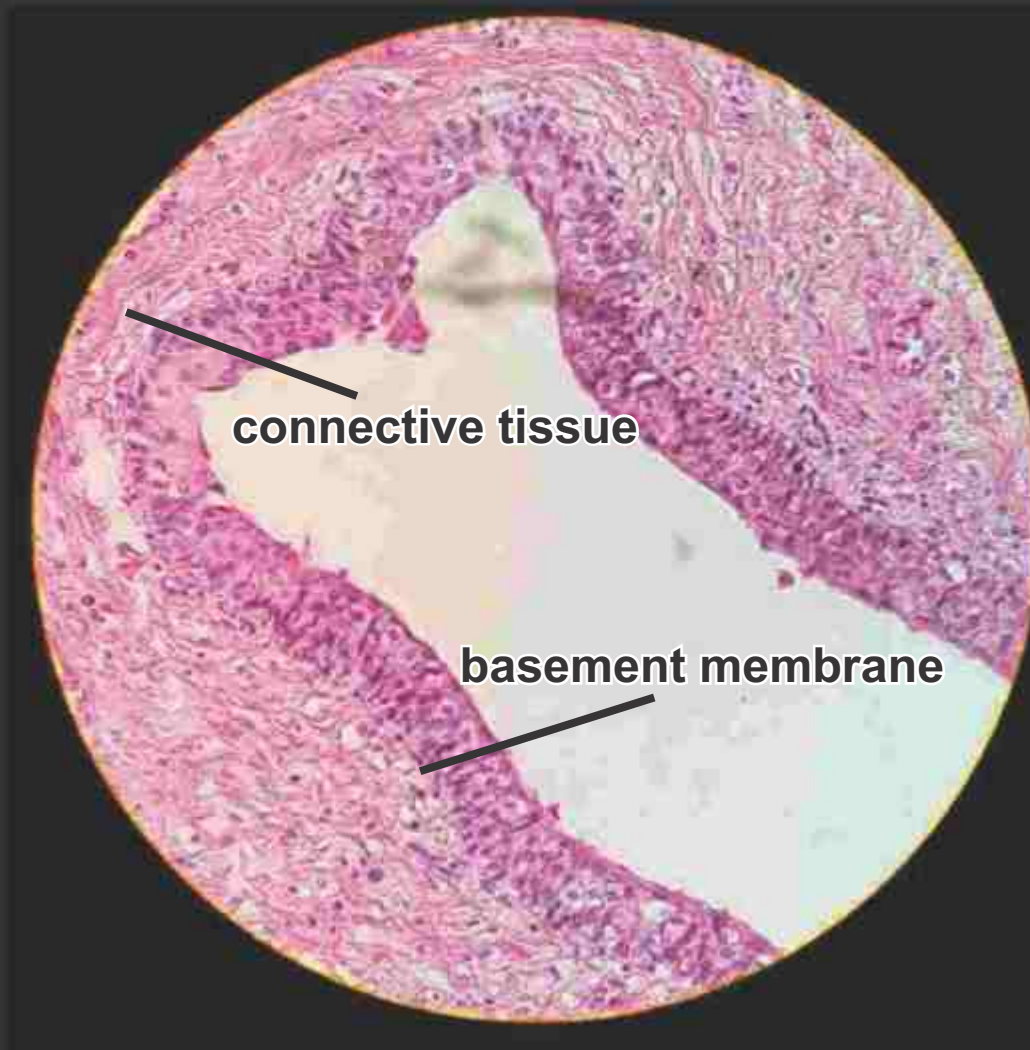
	<u>Squamous</u>
Function(s)	Diffusion, osmosis, secretion, filtration
Location(s)	Serous membranes Lungs Blood vessels & heart linings
Image	 <p>Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (185x).</p>



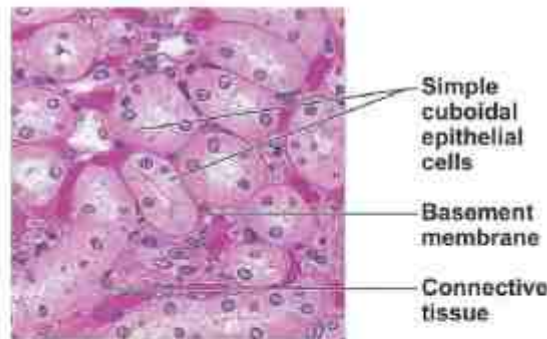
# Transitional Epithelia



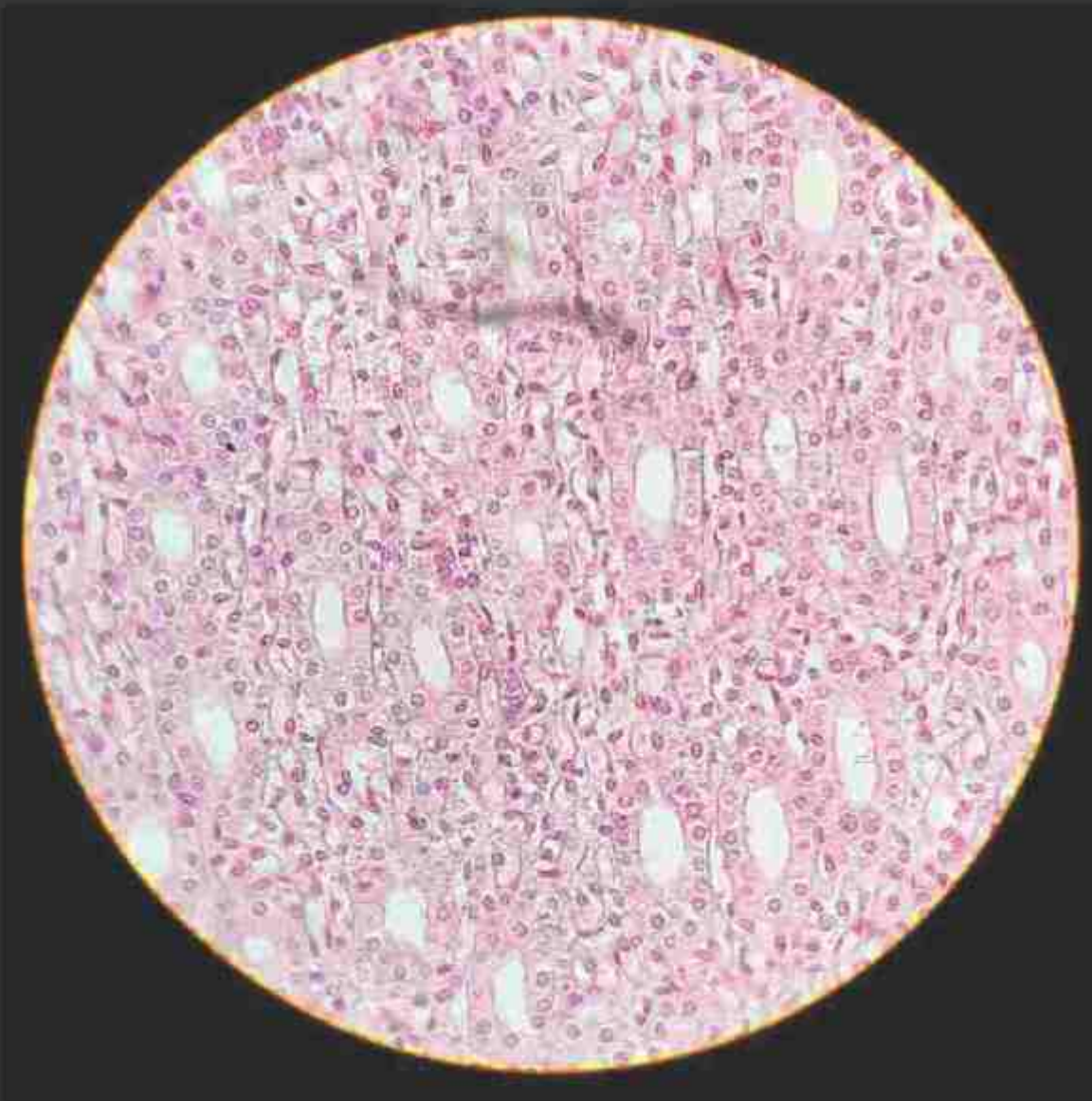
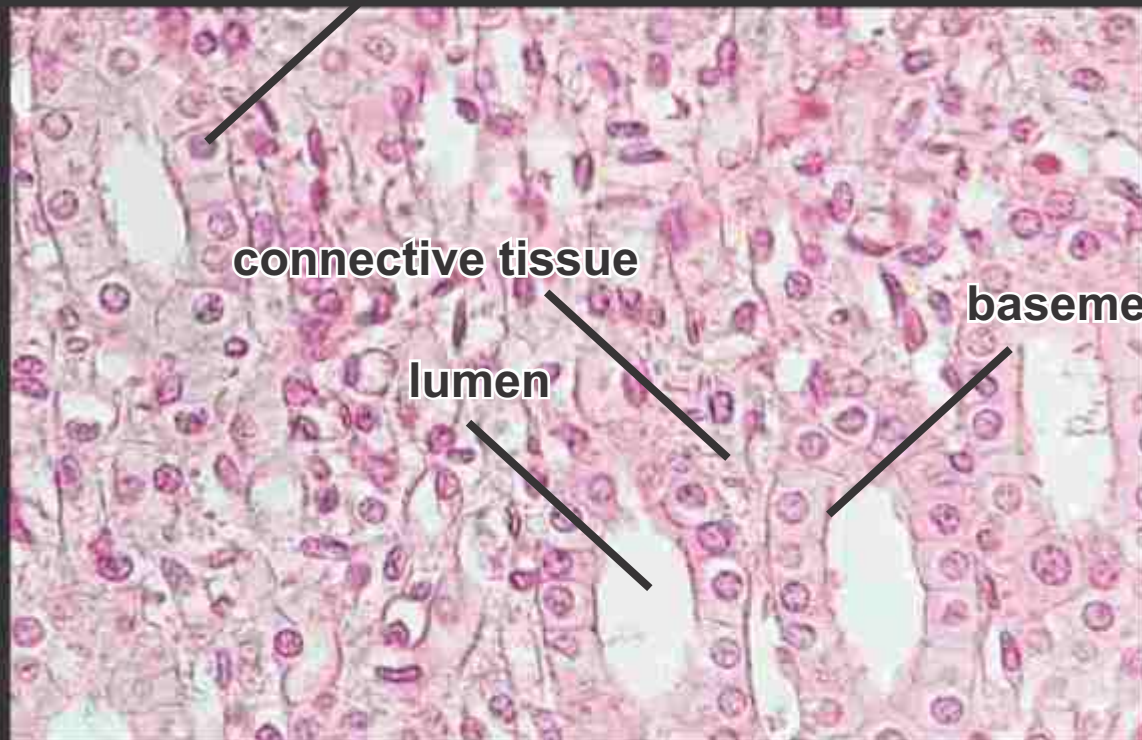
## Transitional Epithelium



# Simple Epethilium

	<u>Cuboidal</u>
Function(s)	Secretions and absorption
Location(s)	Kidney tubules Small Glands Ovary surface
Image	 <p>Simple cuboidal epithelial cells</p> <p>Basement membrane</p> <p>Connective tissue</p> <p>Photomicrograph: Simple cuboidal epithelium in kidney tubules (250x).</p>

## SimpleCuboidal

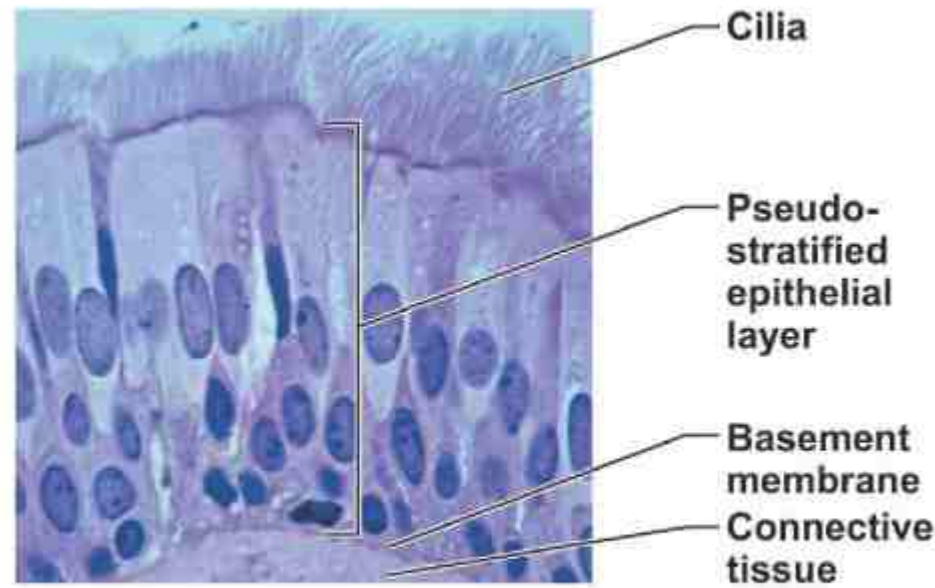
nucleus of cuboidal cell

connective tissue

lumen

basement membrane

# Stratified Columnar Epithelium



Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (430×).

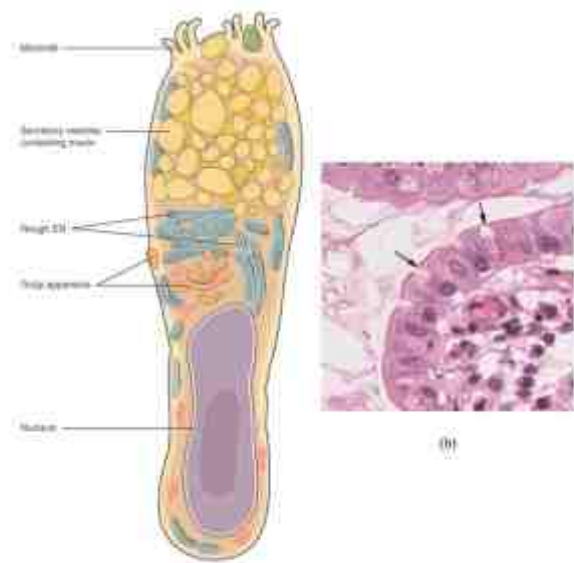
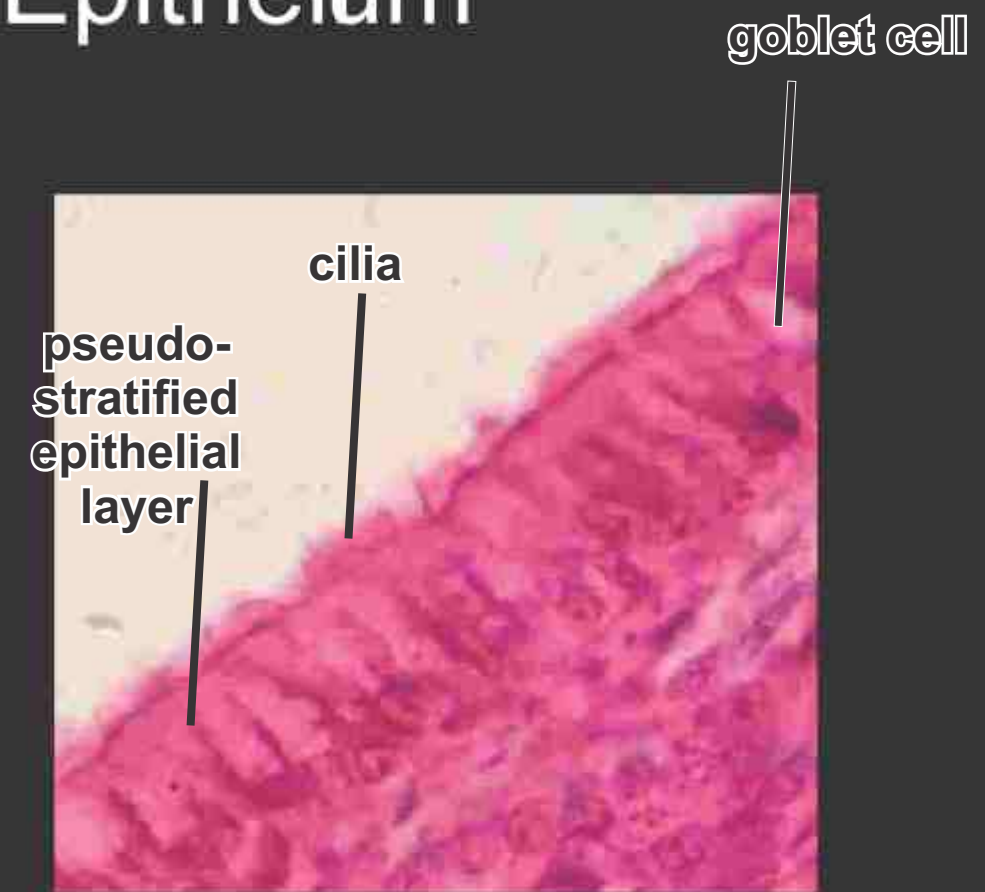
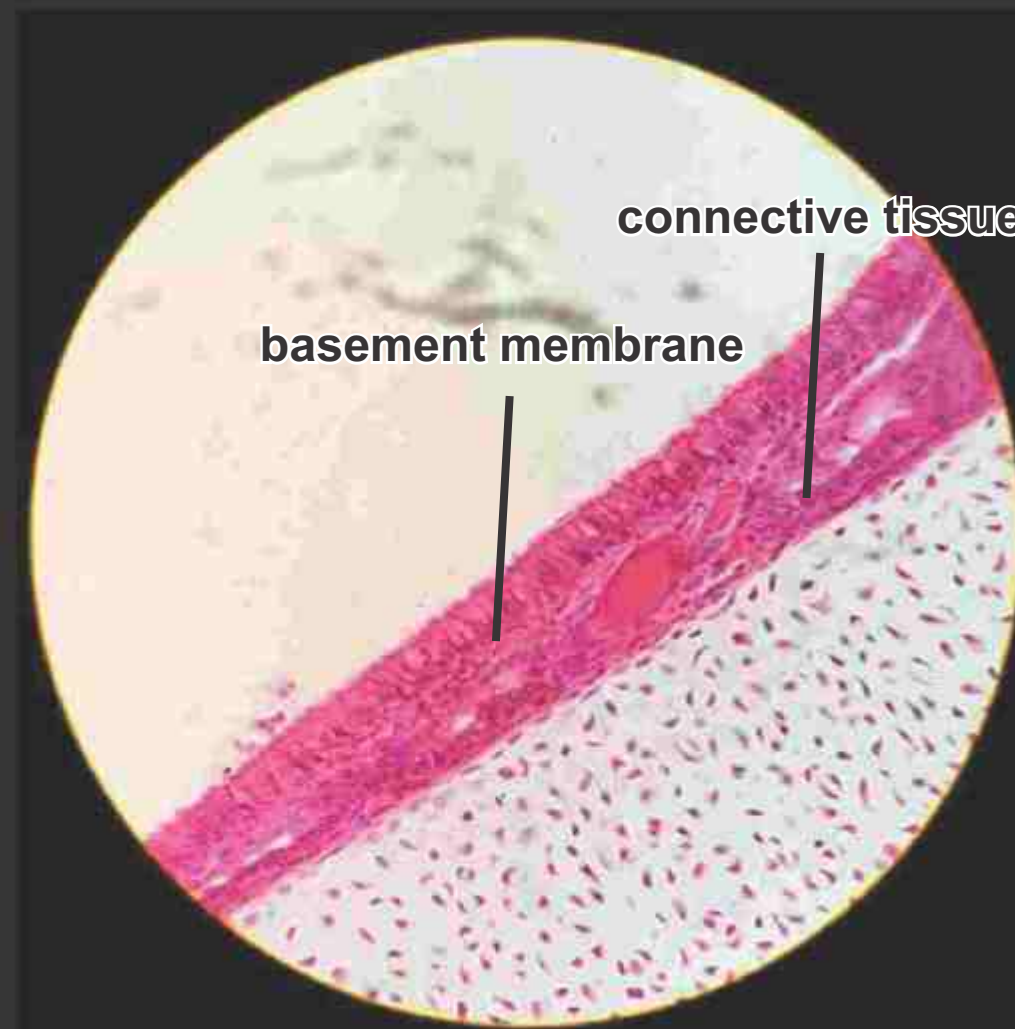
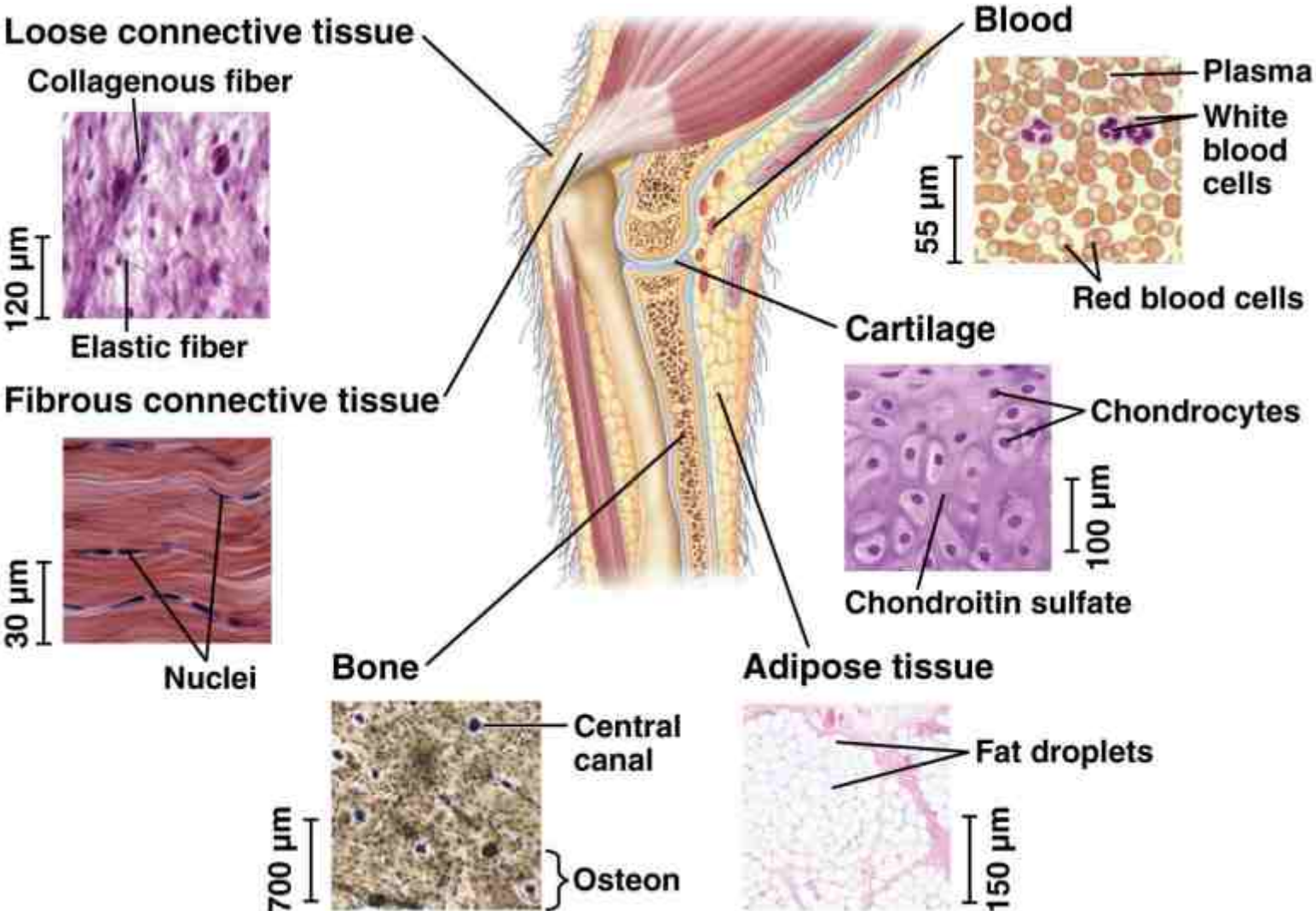


Figure 4.7 Goblet Cell (a) In the lining of the small intestine, columnar epithelium cells are interspersed with goblet cells. (b) The arrows in this micrograph point to the mucous-secreting goblet cells. LM = 1,600. (Micrograph provided by the Regents of University of Michigan Medical School © 2012)

## Pseudostratified Ciliated Epithelium

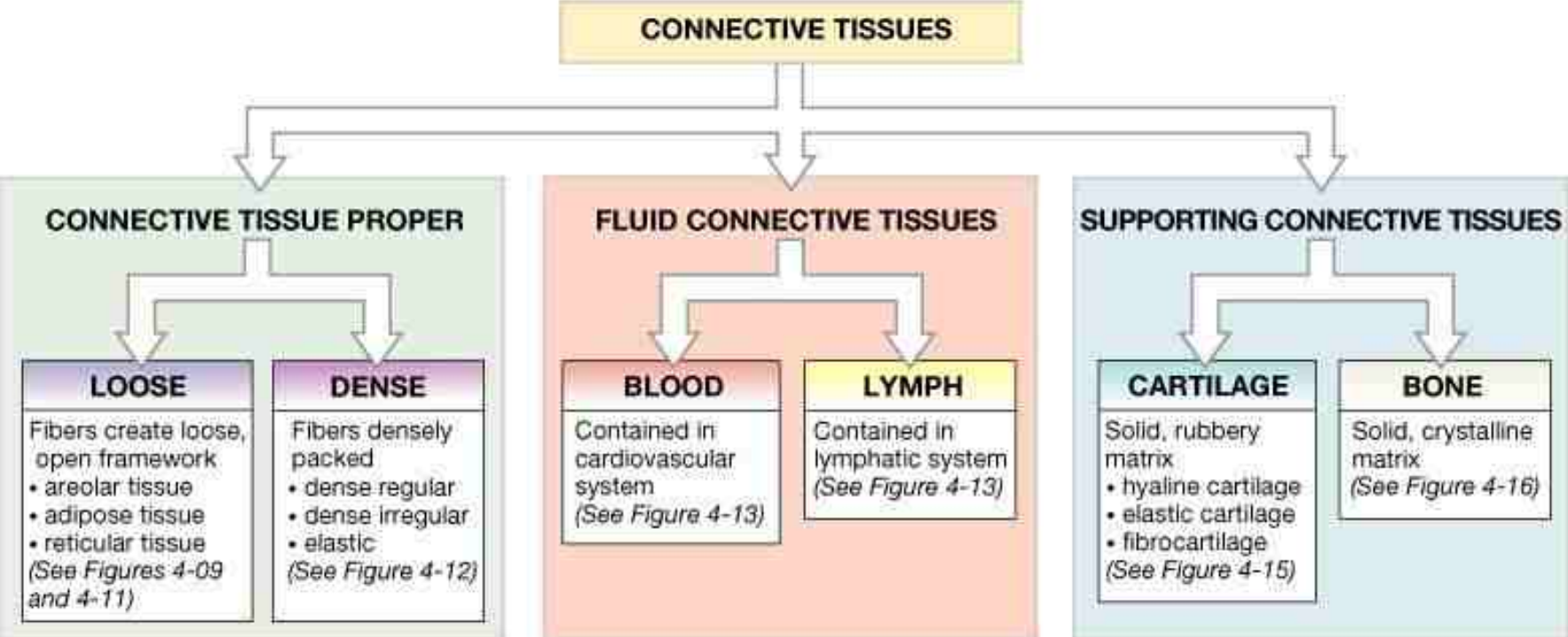


# Connective Tissues



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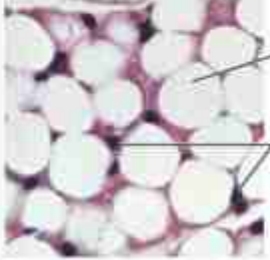
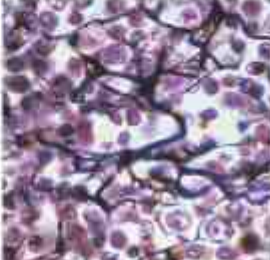
# Classification of Connective Tissues



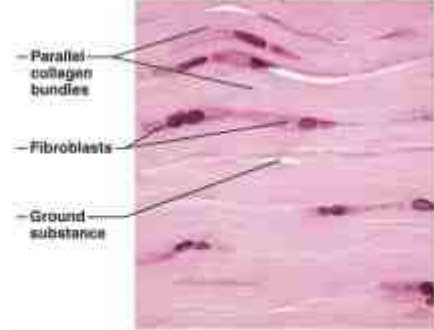
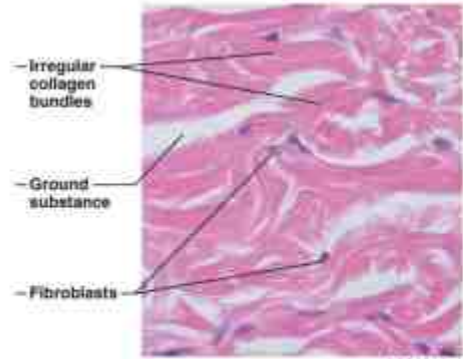
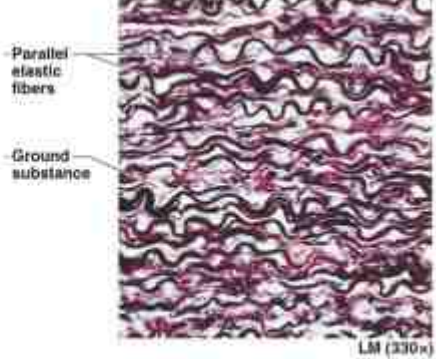
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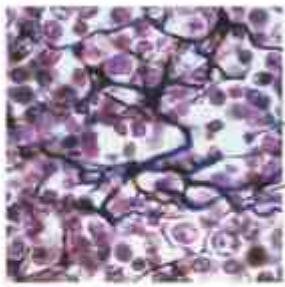
# Types of CT Proper

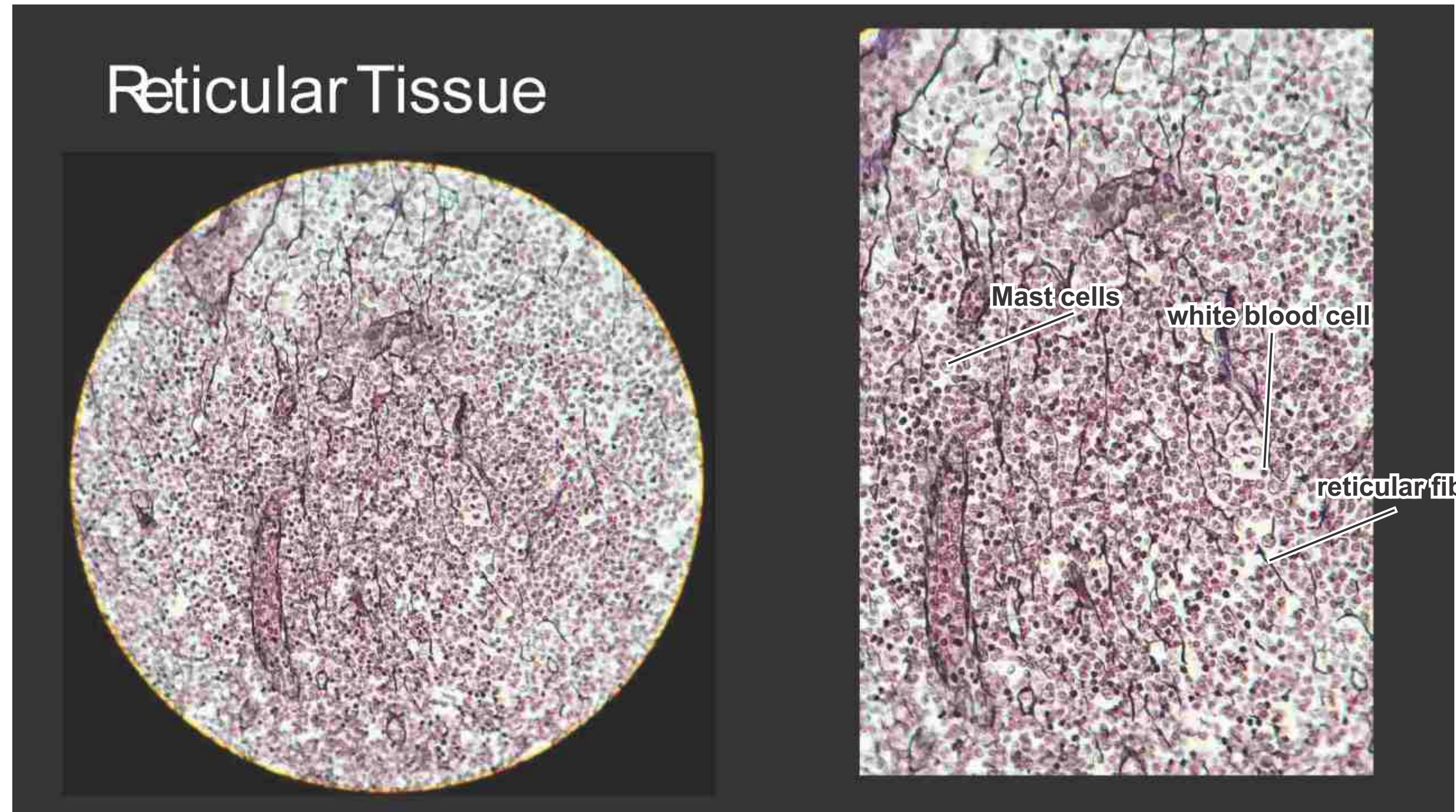
	<u>LOOSE</u> open ECM		
	Areolar	Adipose	Reticular
Cells	Fibroblasts	Adipocytes	Reticular
Fibers	Collagen Elastic Reticular	Collagen	Reticular
Function(s)	Strength, elasticity & support	Insulation, support & protection	Filtration of blood Binds smooth muscle
Location(s)	Papillary layer of the dermis Around organs	Under skin Around organs	Liver Spleen Lymph nodes
Image	 <p><b>Photomicrograph:</b> Areolar connective tissue, a soft packaging tissue of the body (270x).</p>	 <p><b>Photomicrograph:</b> Adipose tissue from the subcutaneous layer beneath the skin (570x).</p>	 <p><b>Photomicrograph:</b> Dark-staining network of reticular connective tissue (400x).</p>

# Types of CT Proper

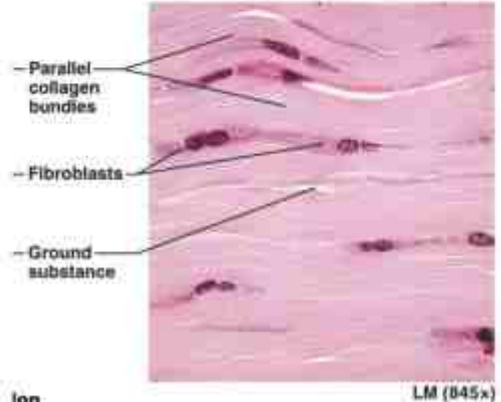
	<u>DENSE</u> ECM packed with fibers		
	Regular	Irregular	Elastic
Cells	Fibroblasts		
Fibers	Regularly arranged collagen fibers	Irregularly arranged collagen fibers	Regularly arranged elastic fibers
Function(s)	Helps with attachment & resists pulling	Helps with attachment & resists pulling	Allows for expansion and contraction of some organs
Location(s)	Tendons Ligaments	Dermis Around muscles Heart valves	Walls of large arteries Vertebrae ligaments
Image	 <p><b>Photomicrograph:</b> Regular dense connective tissue (LM 845x).</p>	 <p><b>Photomicrograph:</b> Irregular dense connective tissue (LM 316x).</p>	 <p><b>Photomicrograph:</b> Elastic dense connective tissue (LM 330x).</p>

# CT Proper

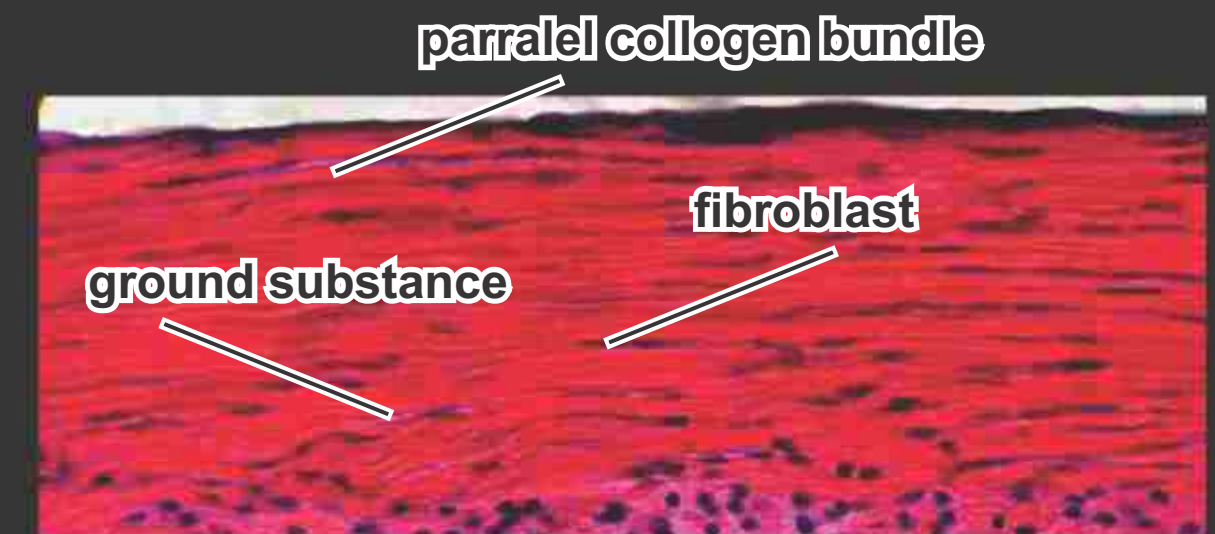
	Reticular
Cells	Reticular
Fibers	Reticular
Function(s)	Filtration of blood Binds smooth muscle
Location(s)	Liver Spleen Lymph nodes
Image	 <p>White blood cell (lymphocyte) Reticular fibers</p> <p><b>Photomicrograph:</b> Dark-staining network of reticular connective tissue (400x).</p>



# CT Proper

	Regular
Cells	
Fibers	Regularly arranged collagen fibers
Function(s)	Helps with attachment & resists pulling
Location(s)	Tendons Ligaments
Image	 <p>Parallel collagen bundles Fibroblasts Ground substance LM (845x)</p>

## Dense Regular Connective Tissue



LOOSE = open ECM

**Adipose**

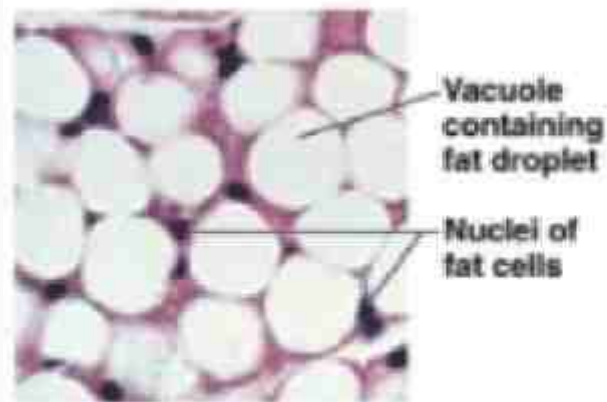
Cells Adipocytes

Fibers Collagen

Function(s) Insulation, support & protection

Location(s) Under skin  
Around organs

Image

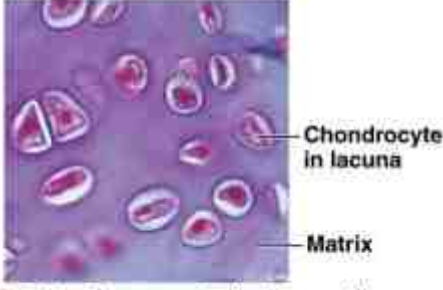


**Photomicrograph:** Adipose tissue from the subcutaneous layer beneath the skin (570×).

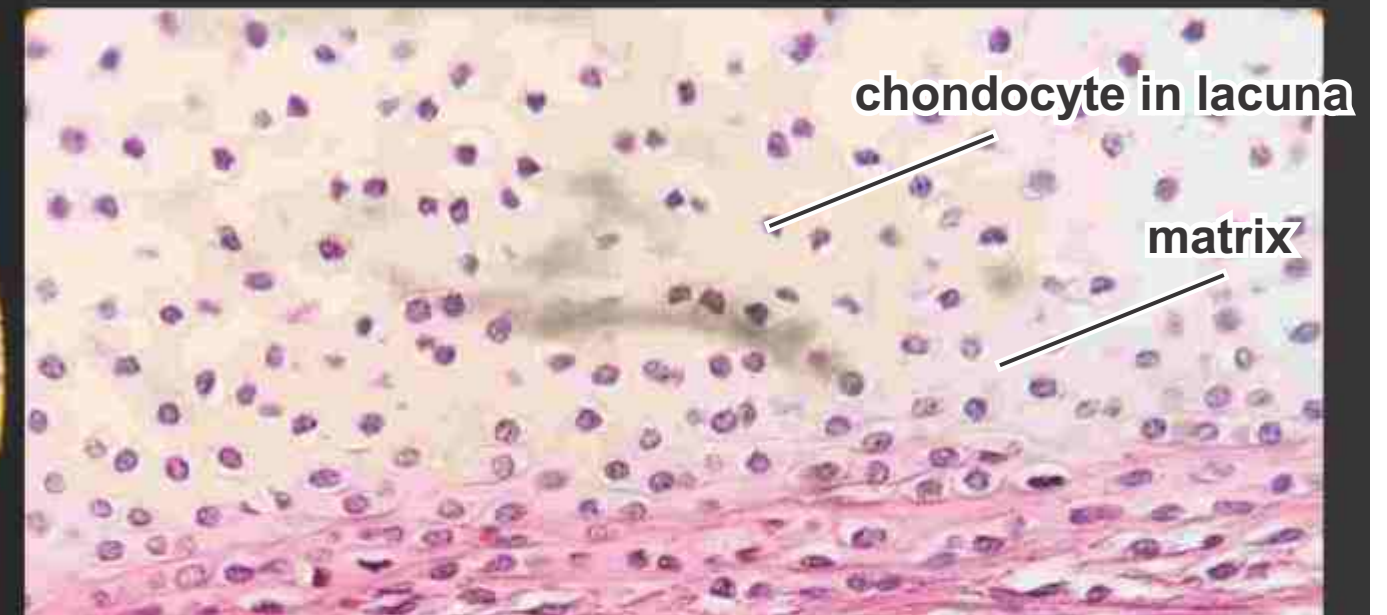
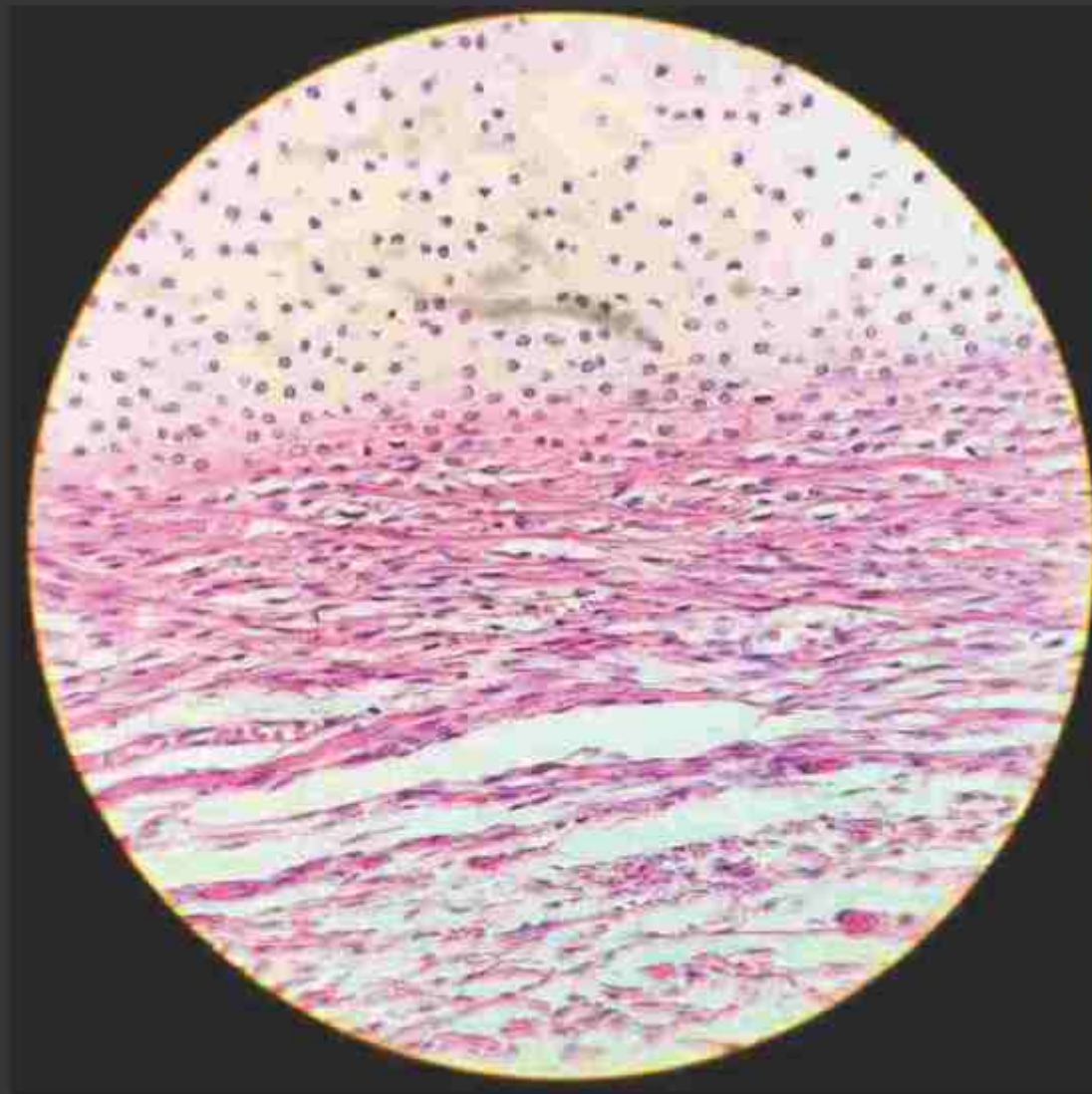
# CT Proper



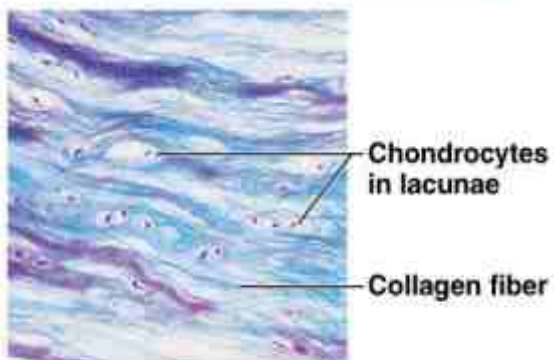
# Support CT

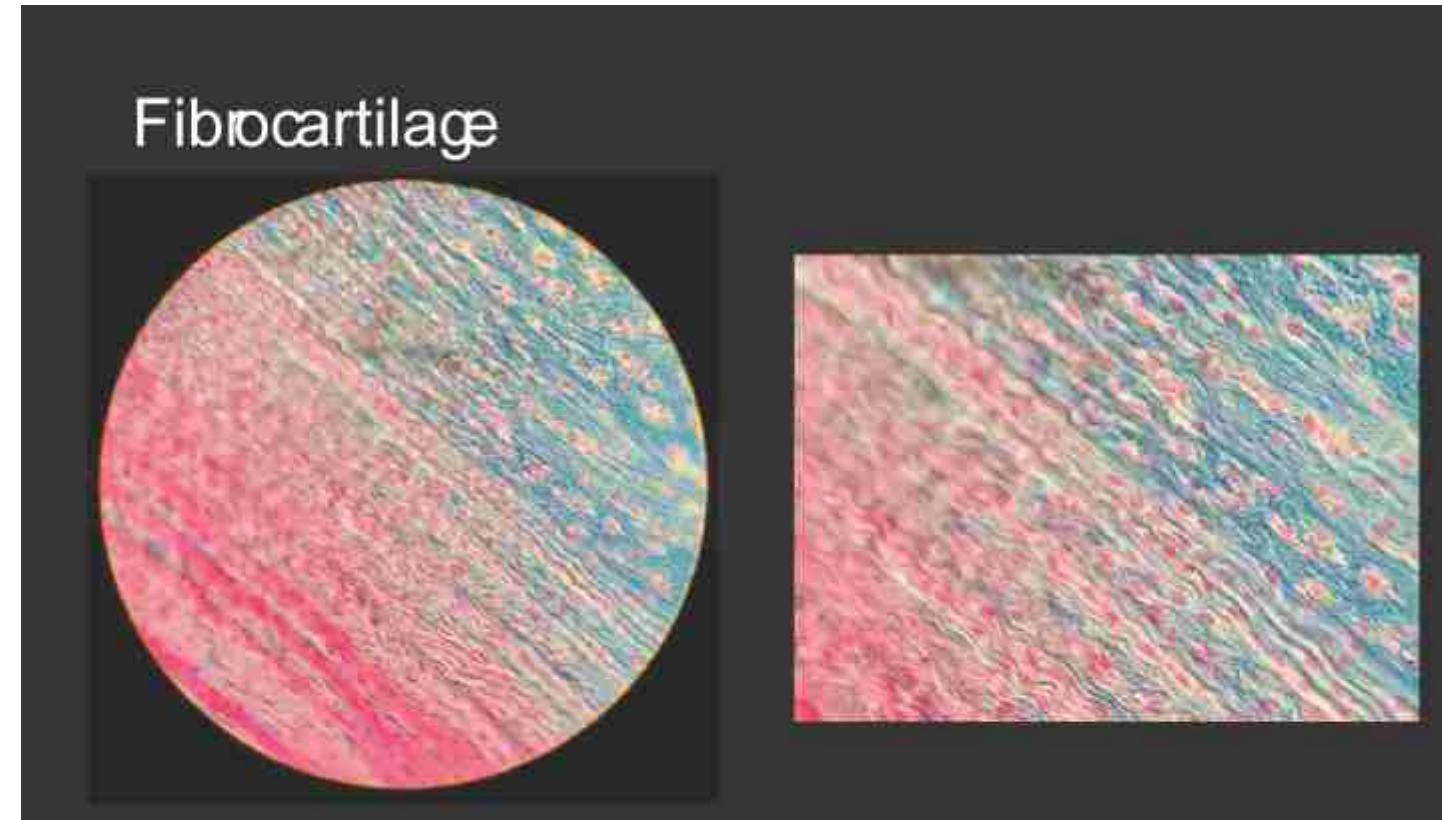
	CAI
	Hyaline
Cells	Ch
Fibers	Thin collagen
Function(s)	Flexibility and support Smooth surface for joint movements
Location(s)	Nose Fetal skeleton Ends of long bones Rib cartilage
Images	 <p><b>Photomicrograph:</b> Hyaline cartilage from the trachea (400×).</p>

## Hyaline Cartilage

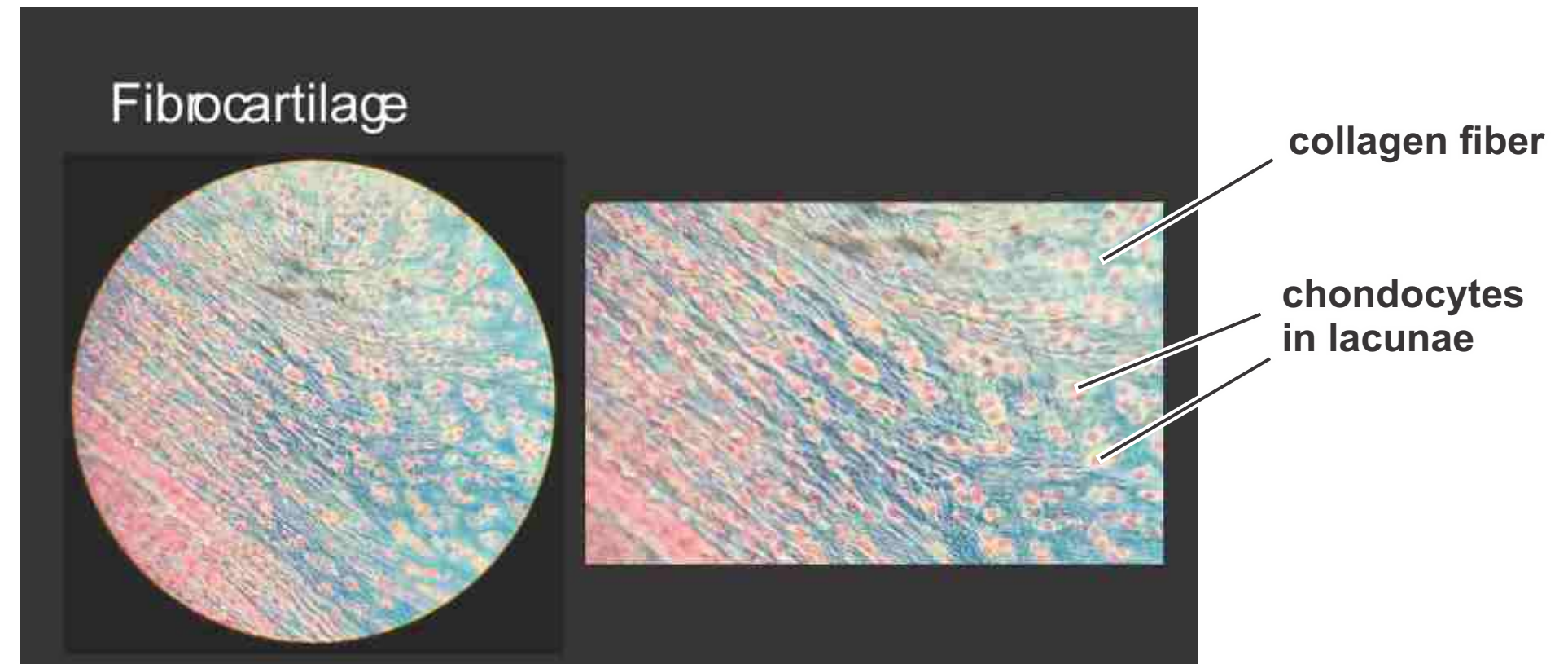


# Support CT

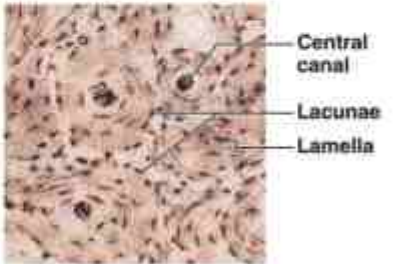
	CM
	<b>Fibrocartilage</b>
Cells	na
Fibers	Thick collagen
Function(s)	Support and joining structures Strength and rigidity
Location(s)	Pubic symphysis Intervertebral discs
Images	 <p>Chondrocytes in lacunae</p> <p>Collagen fiber</p> <p><b>Photomicrograph:</b> Fibrocartilage of an intervertebral disc (150×).</p>

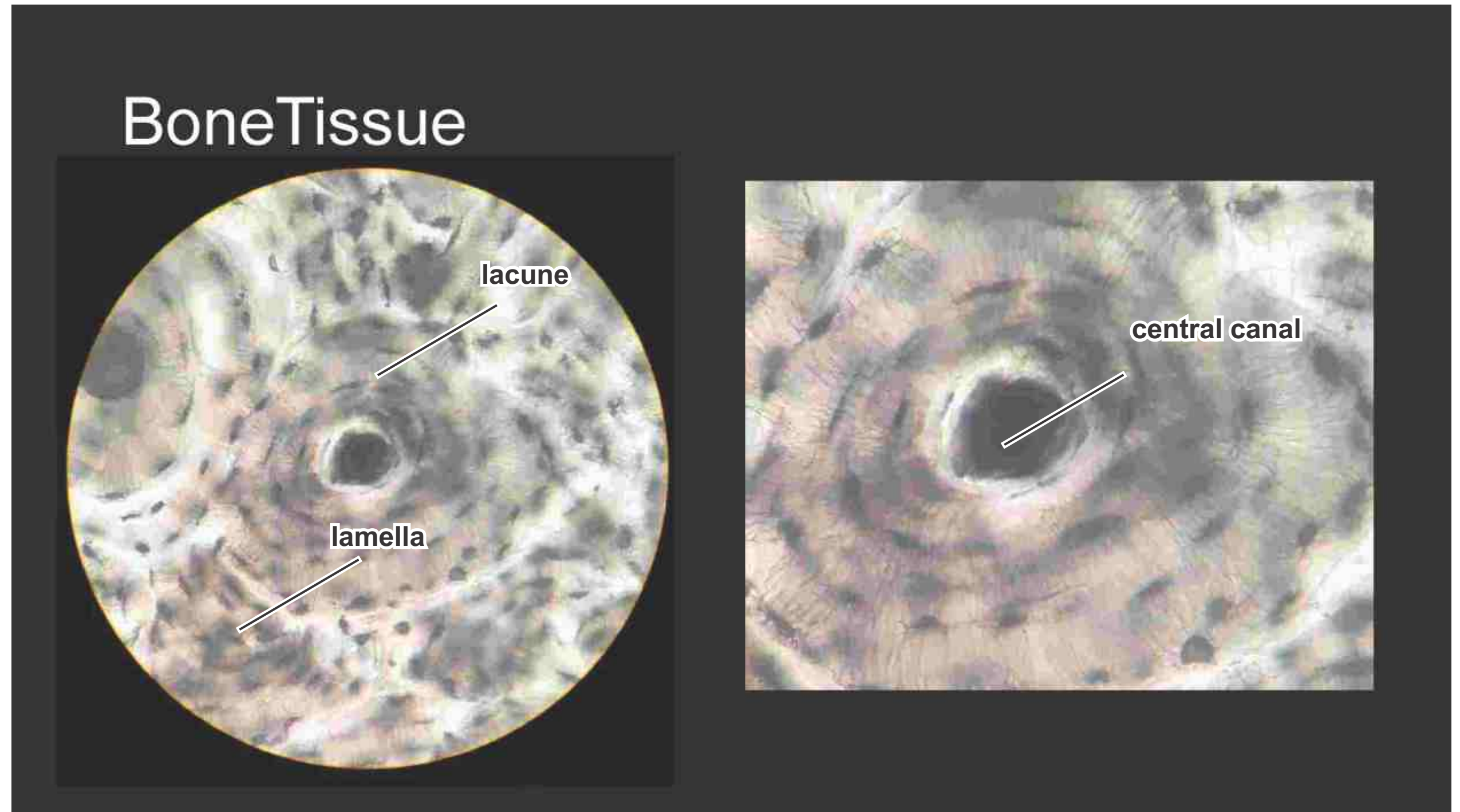


# Support CT



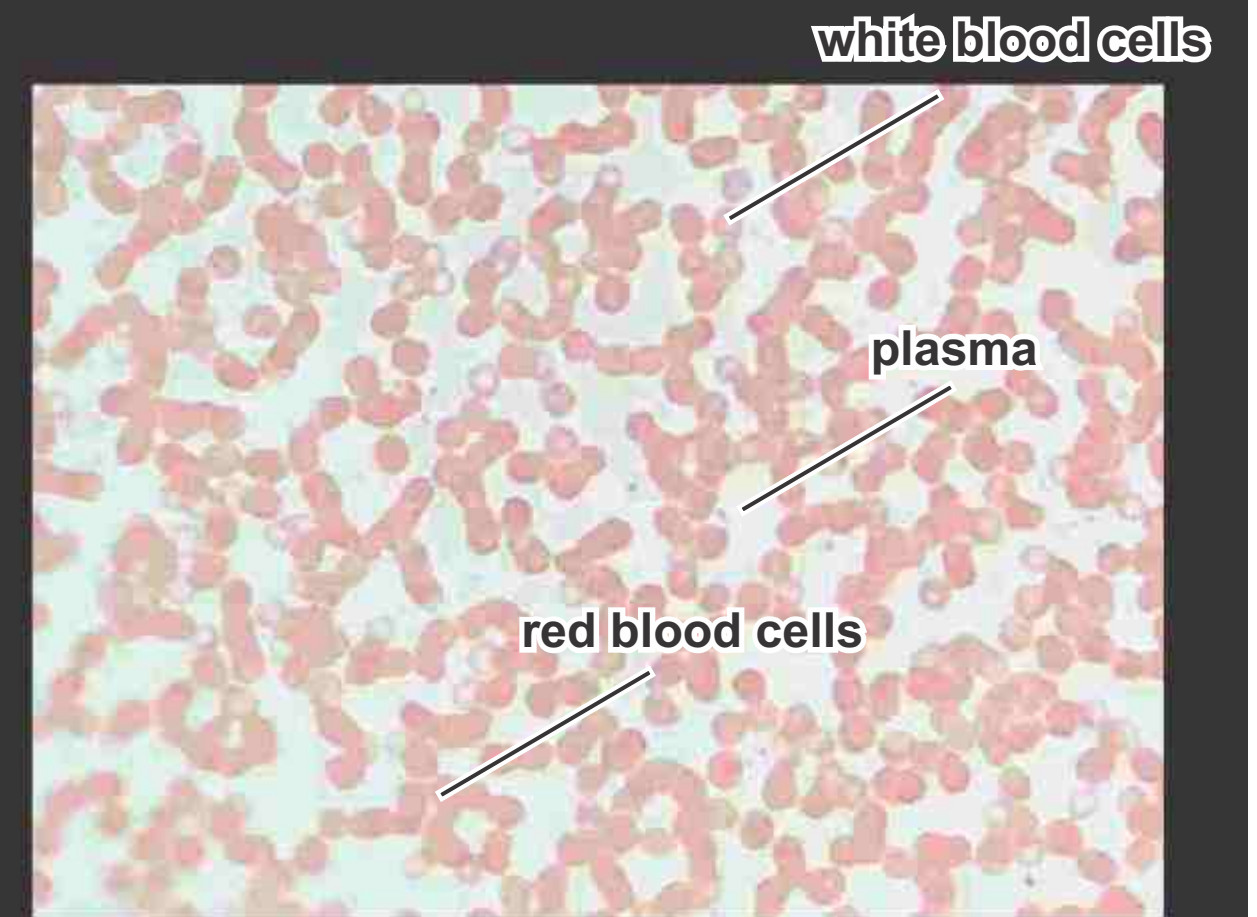
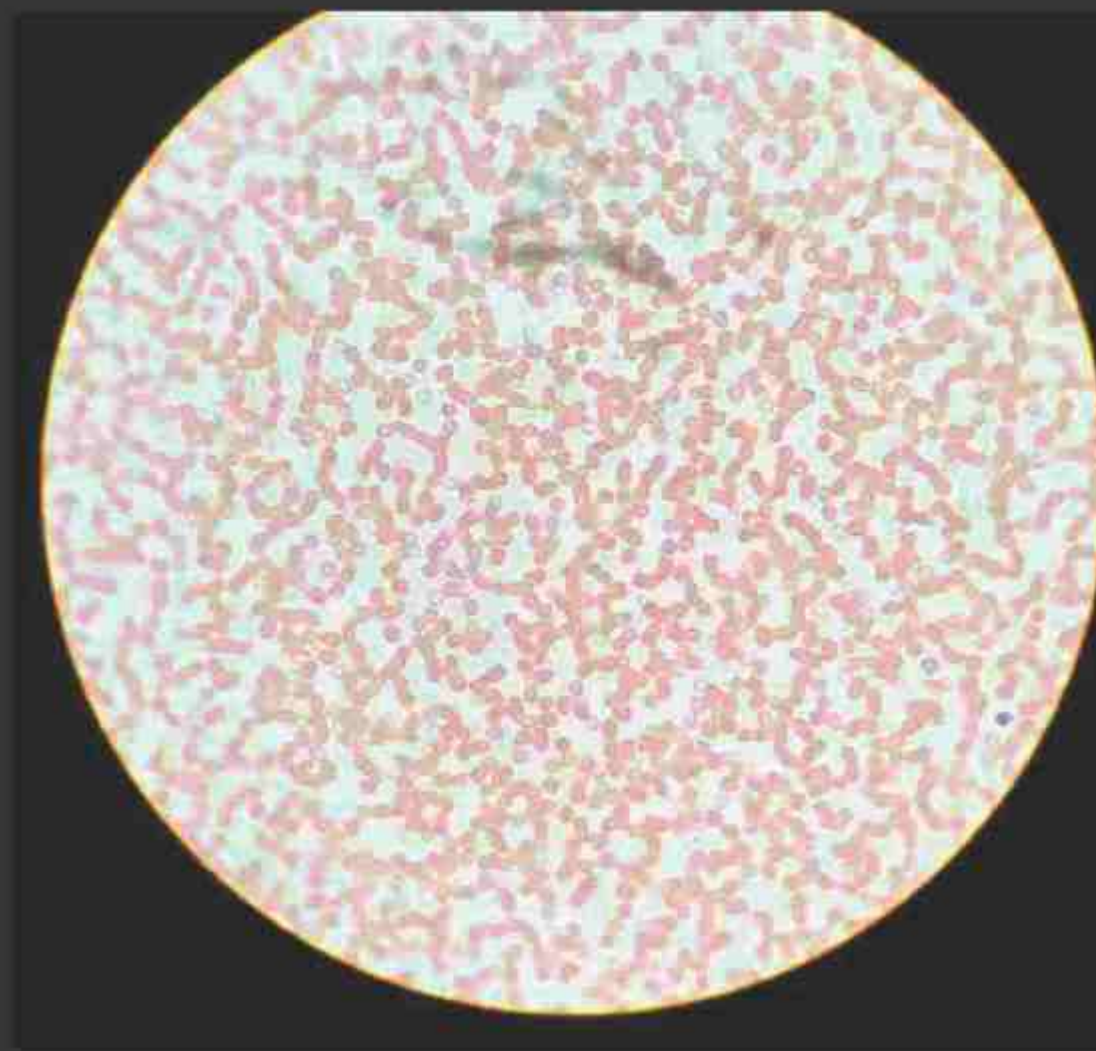
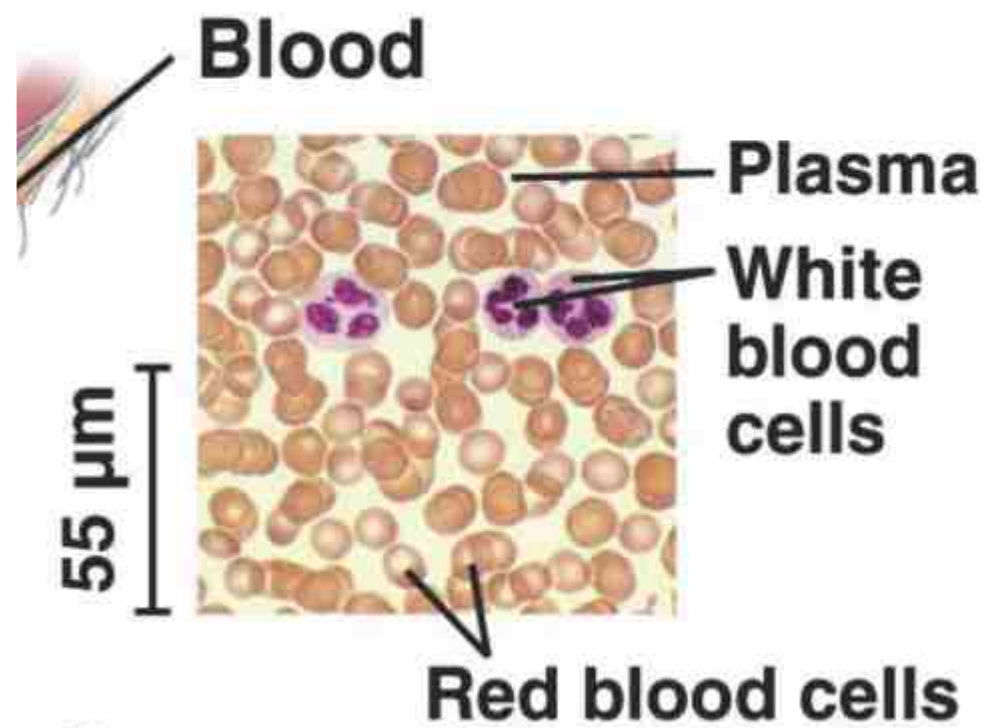
# CT Proper

	<b>BONE</b> = Hard calcium ECM
Cells	Osteocytes in a lacuna
Fibers	Collagen
Function(s)	Protects organs Provides support for the body Assist with movement
Location(s)	Skeleton
Images	 <p><b>Photomicrograph:</b> Cross-sectional view of ground bone (165x).</p>



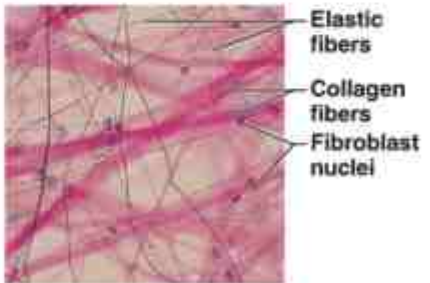
# CT Fluid

## Blood (Connective Tissue)

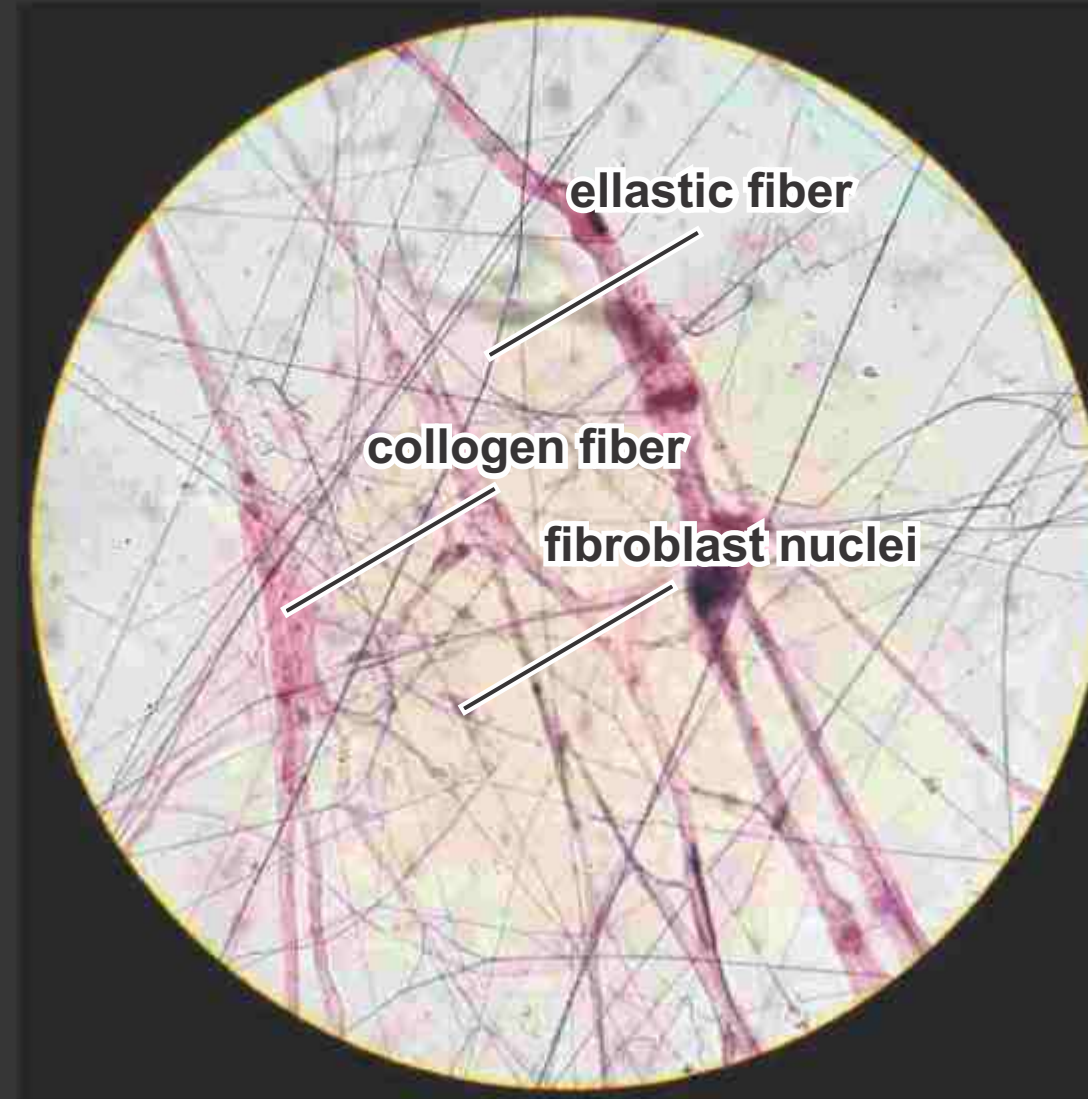





# CT Proper

	Areolar
Cells	Fibroblasts
Fibers	Collagen Elastic Reticular
Function(s)	Strength, elasticity & support
Location(s)	Papillary layer of the dermis Around organs
Image	 <p><b>Photomicrograph:</b> Areolar connective tissue, a soft packaging tissue of the body (270×).</p>

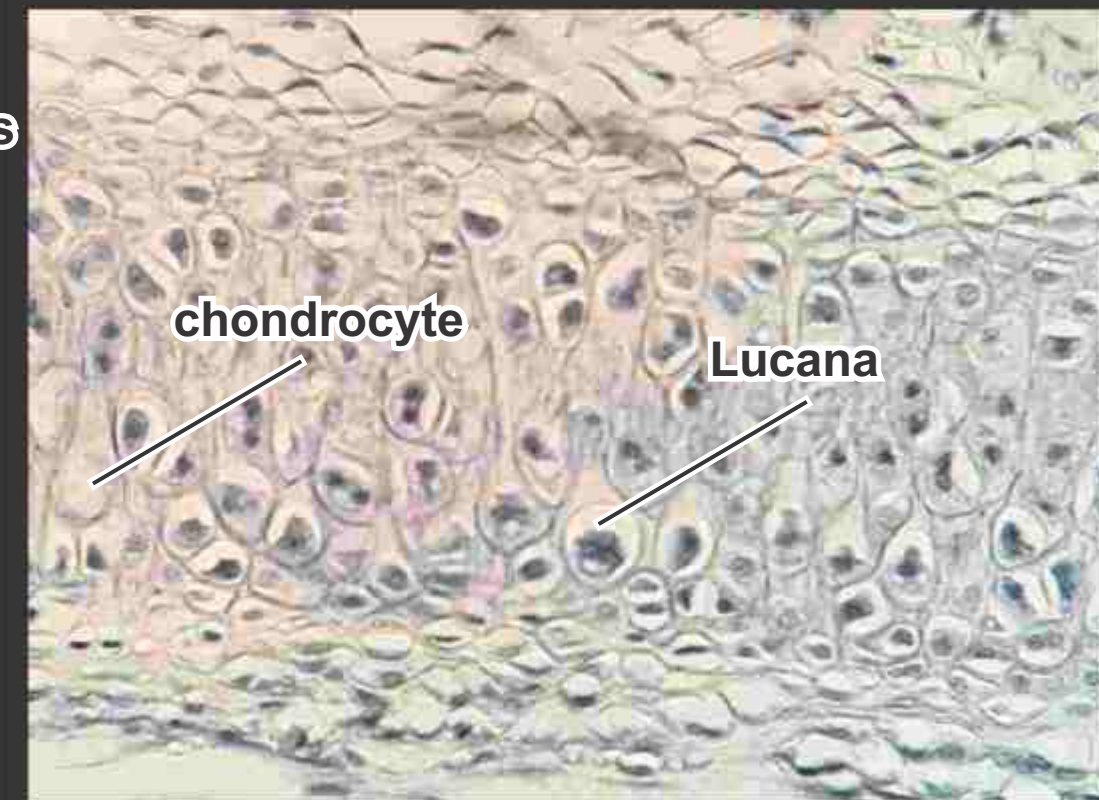
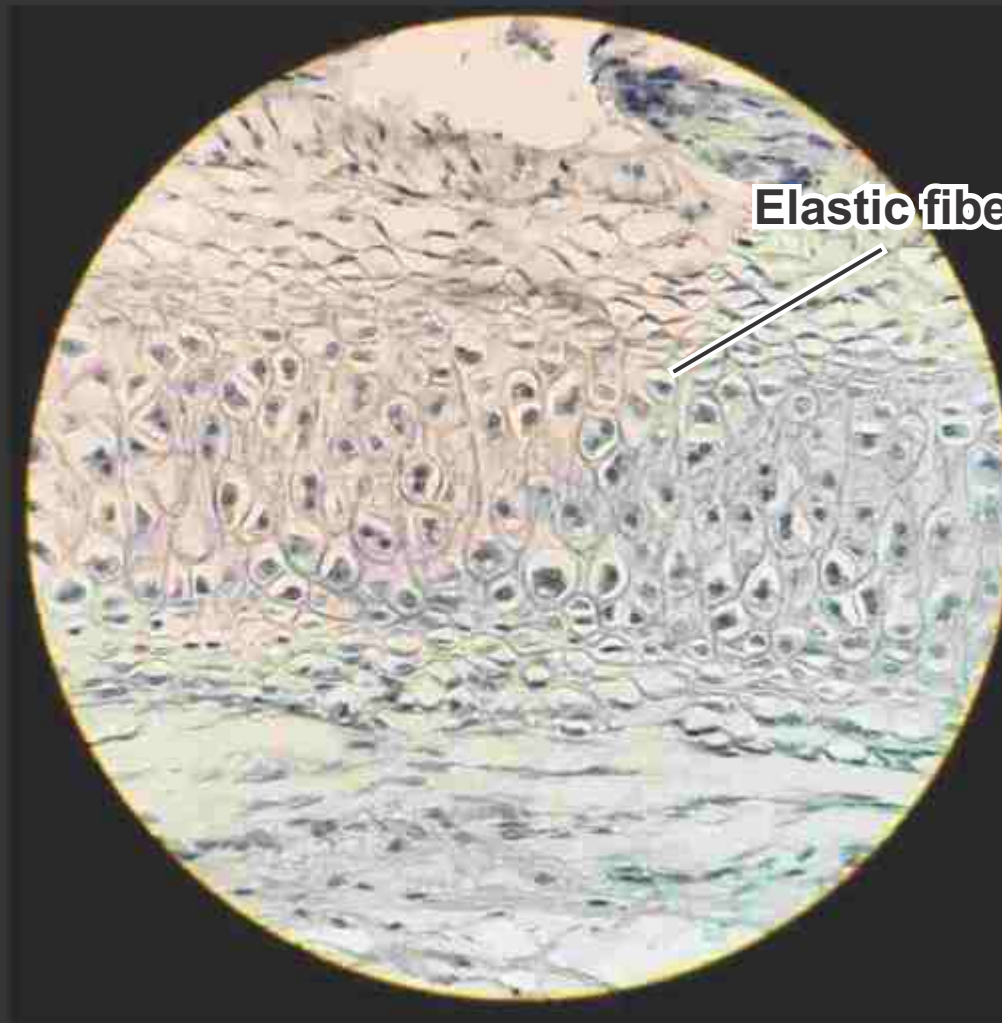
## Areolar Tissue



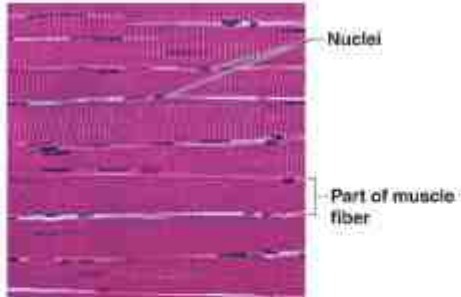
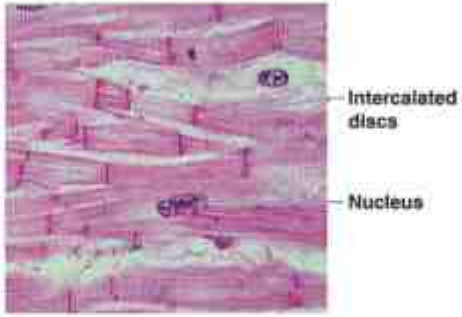
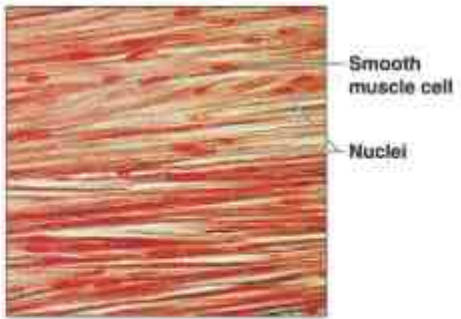
# CT Proper

	Elastic
Cells	
Fibers	Regularly arranged elastic fibers
Function(s)	Allows for expansion and contraction of some organs
Location(s)	Walls of large arteries Vertebrae ligaments
Image	 <p>Parallel elastic fibers</p> <p>Ground substance</p> <p>LM (330x)</p>

## Elastic Cartilage

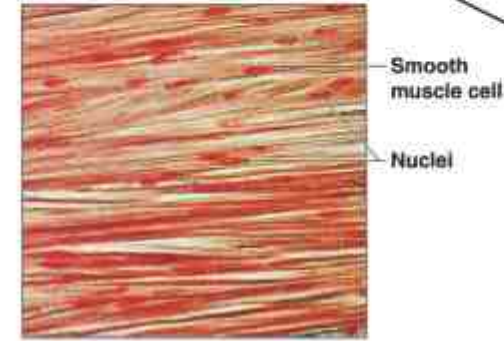


# Types of Muscle Tissue

	<u>Skeletal</u>	<u>Cardiac</u>	<u>Smooth</u>
Cell Shape	Long, cylindrical	Short, branched	Medium, spindle shaped
Cell structures	Many nuclei Obvious striations	One nucleus Obvious striations Intercalated discs	One nucleus No striations
Function	Movement of bones or skin	Movement of blood thru the heart	Movement of substances thru a hollow organ
Location	Attached to bones	Walls of the heart	Walls of hollow organs
Image	 <p><b>Photomicrograph:</b> Skeletal muscle (approx. 250x).</p>	 <p><b>Photomicrograph:</b> Cardiac muscle (800x).</p>	 <p><b>Photomicrograph:</b> Sheet of smooth muscle (approx. 250x).</p>

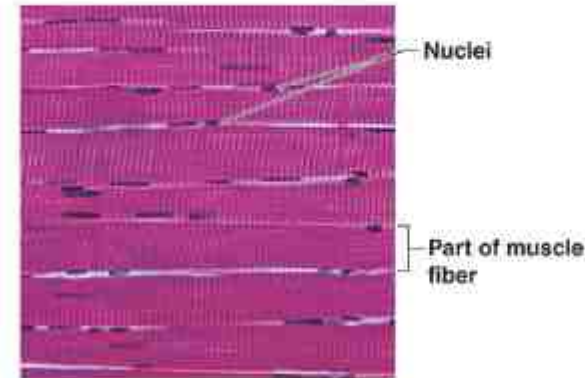
# Muscle Tissues

## Smooth muscle



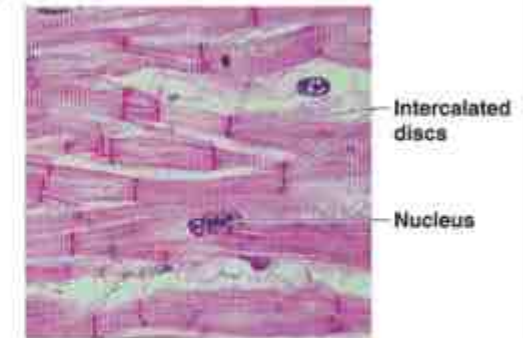
**Photomicrograph:** Sheet of smooth muscle (approx. 250x).

## Skeletal muscle

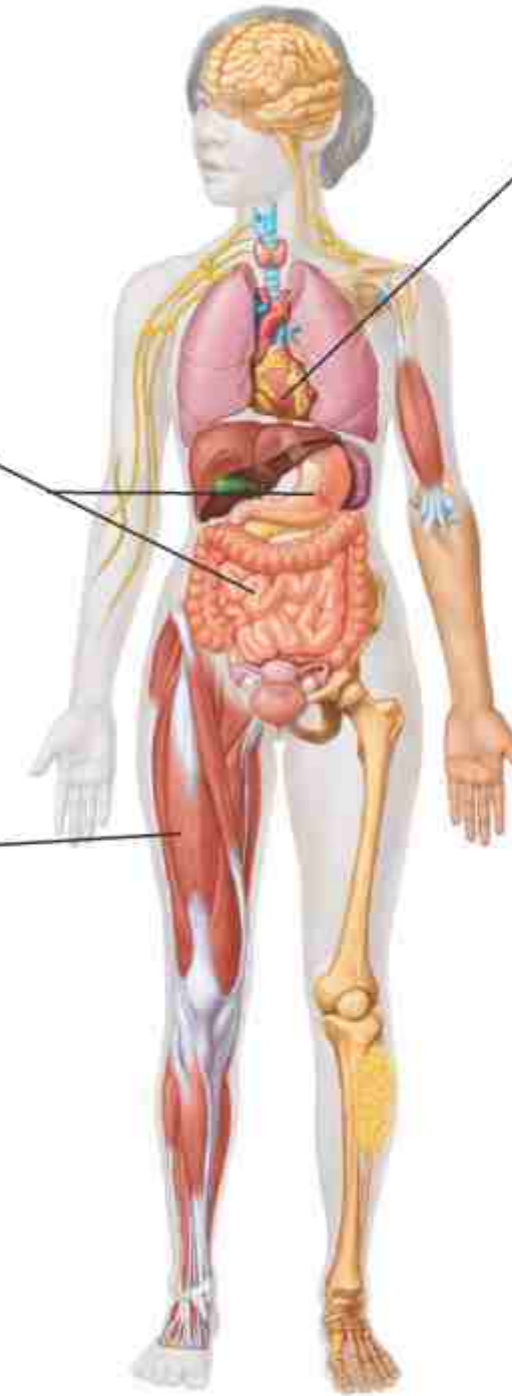


**Photomicrograph:** Skeletal muscle (approx. 250x).

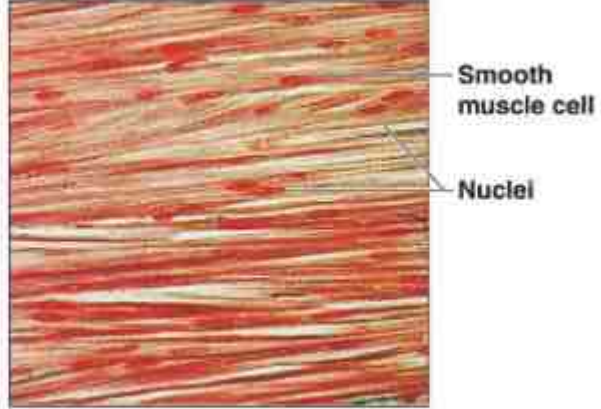
## Cardiac muscle

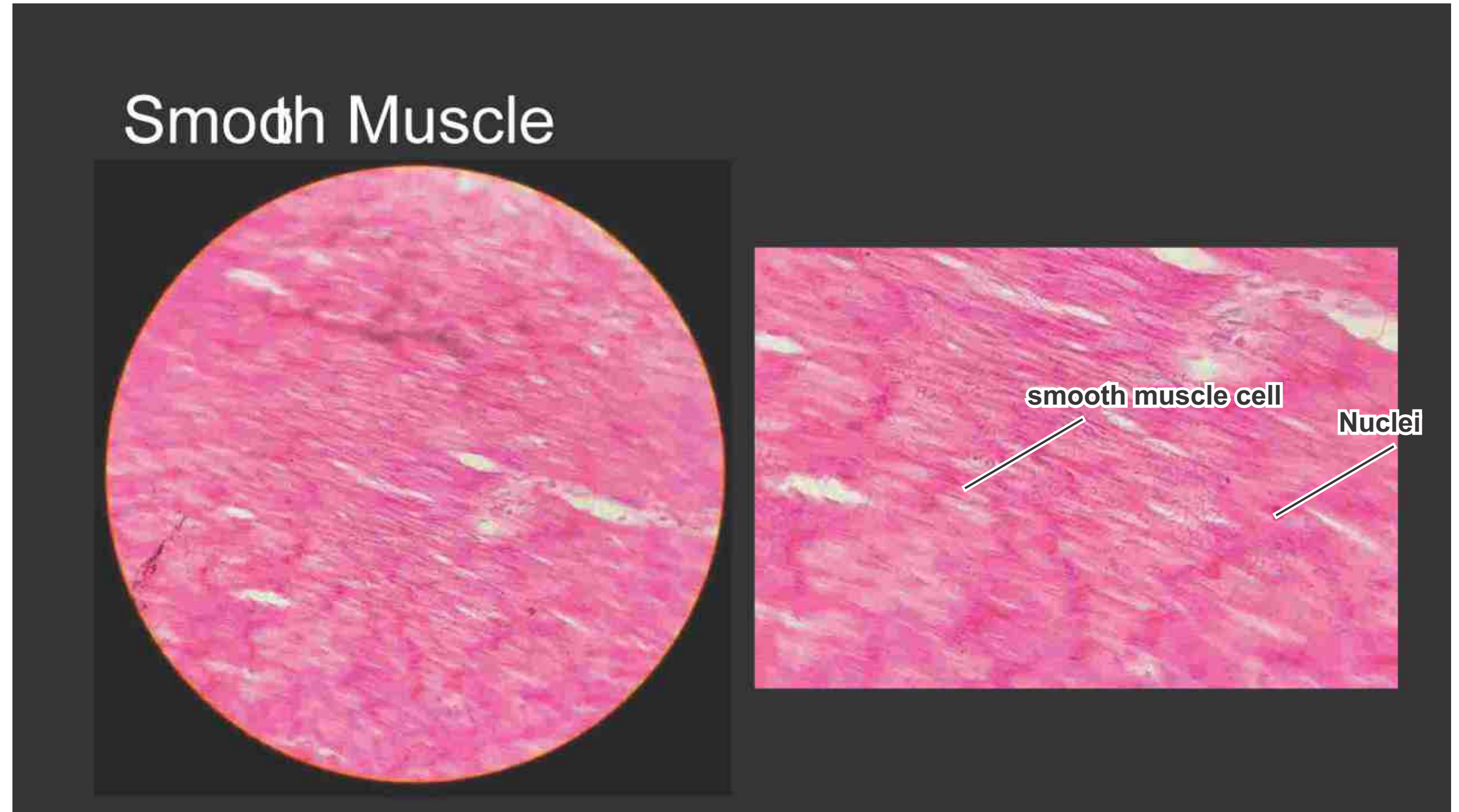


**Photomicrograph:** Cardiac muscle (800x).




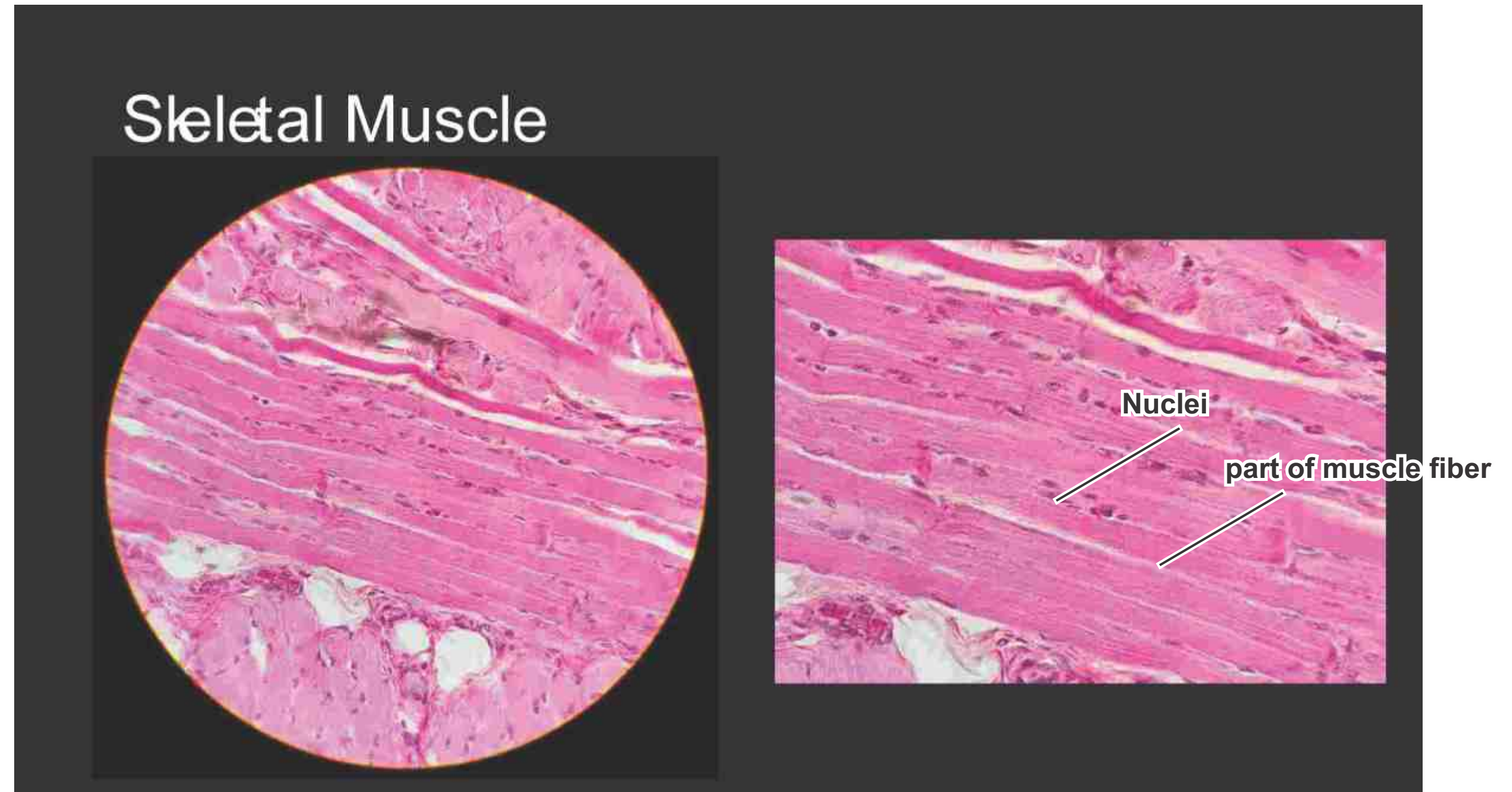
# Muscle Tissues

	<u>Smooth</u>
Cell Shape	Medium, spindle shaped
Cell structures	One nucleus No striations
Function	Movement of substances thru a hollow organ
Location	Walls of hollow organs
Image	 <p>Smooth muscle cell Nuclei</p> <p><b>Photomicrograph:</b> Sheet of smooth muscle (approx. 250x).</p>

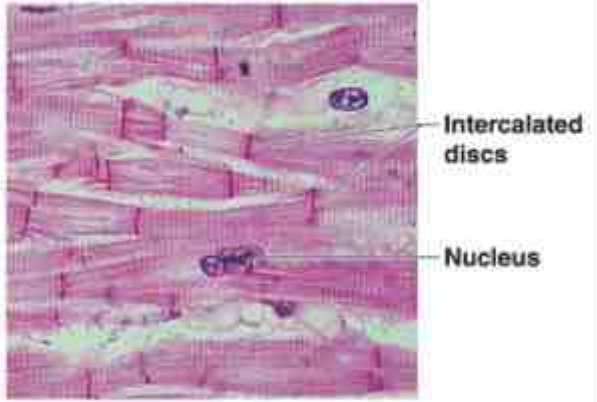


# Muscle Tissues

	<u>Skeletal</u>
Cell Shape	Long, cylindrical
Cell structures	Many nuclei Obvious striations
Function	Movement of bones or skin
Location	Attached to bones
Image:	 <p>Nuclei</p> <p>Part of muscle fiber</p> <p><b>Photomicrograph:</b> Skeletal muscle (approx. 250x).</p>



# Muscle Tissues

	<u>Cardiac</u>
Cell Shape	Short, branched
Cell structures	One nucleus Obvious striations Intercalated discs
Function	Movement of blood thru the heart
Location	Walls of the heart
Image	 <p><b>Photomicrograph:</b> Cardiac muscle (800x).</p>



Sebaceous/Sweat glandson hair (40x)



Scalp/HairFollicle(40x)

