



# Respiratory System

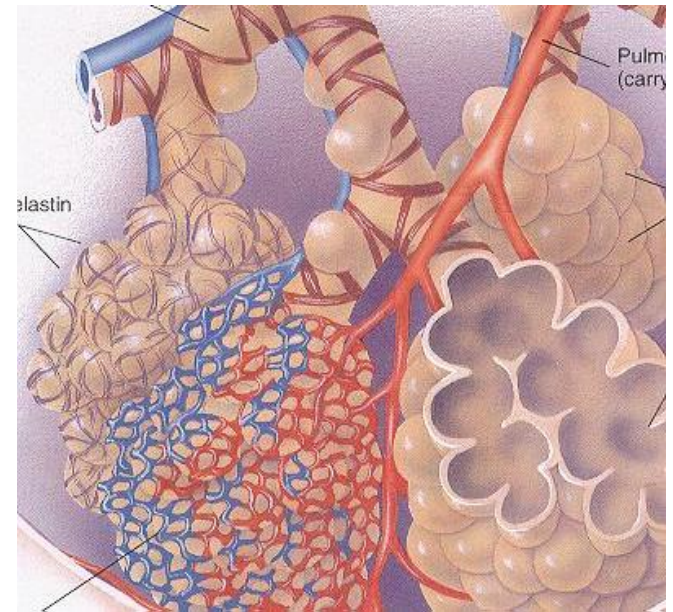
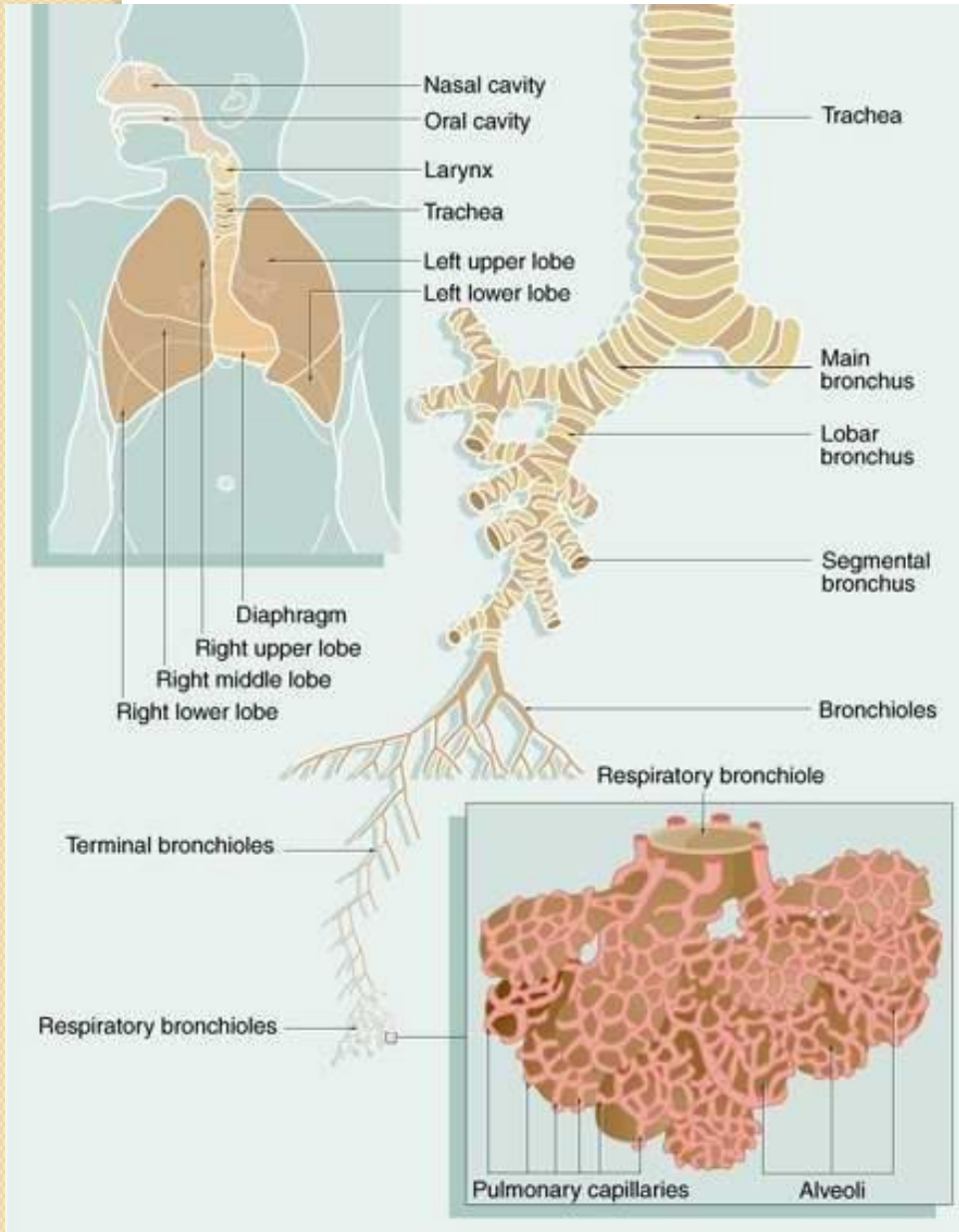
# Respiratory system

comprising the lungs and a sequence of airways leading to the external environment

This system providing Oxygen and eliminating Carbon dioxide

**is subdivided into:**

- conducting portions
- respiratory portions



➤ According to function (listed in order from exterior to interior)

Conducting Portion

(Transports air from exterior)

1. Nasal cavity
2. Pharynx
3. Larynx
4. Trachea
5. Primary bronchi
6. Secondary bronchi
7. Bronchioles
8. Terminal bronchioles

Respiratory Portion

(Involved with gas exchange)

1. Respiratory bronchioles
2. Alveolar ducts
3. Alveoli

> In relationship to lungs (listed in order from exterior to interior, i.e. the path of inspired air)

### Extrapulmonary

1. Nasal cavity
2. Pharynx
3. Larynx
4. Trachea
5. Primary bronchi

### Intrapulmonary

1. Secondary bronchi
2. Bronchioles
3. Terminal bronchioles
4. Respiratory bronchioles
5. Alveolar ducts
6. Alveoli

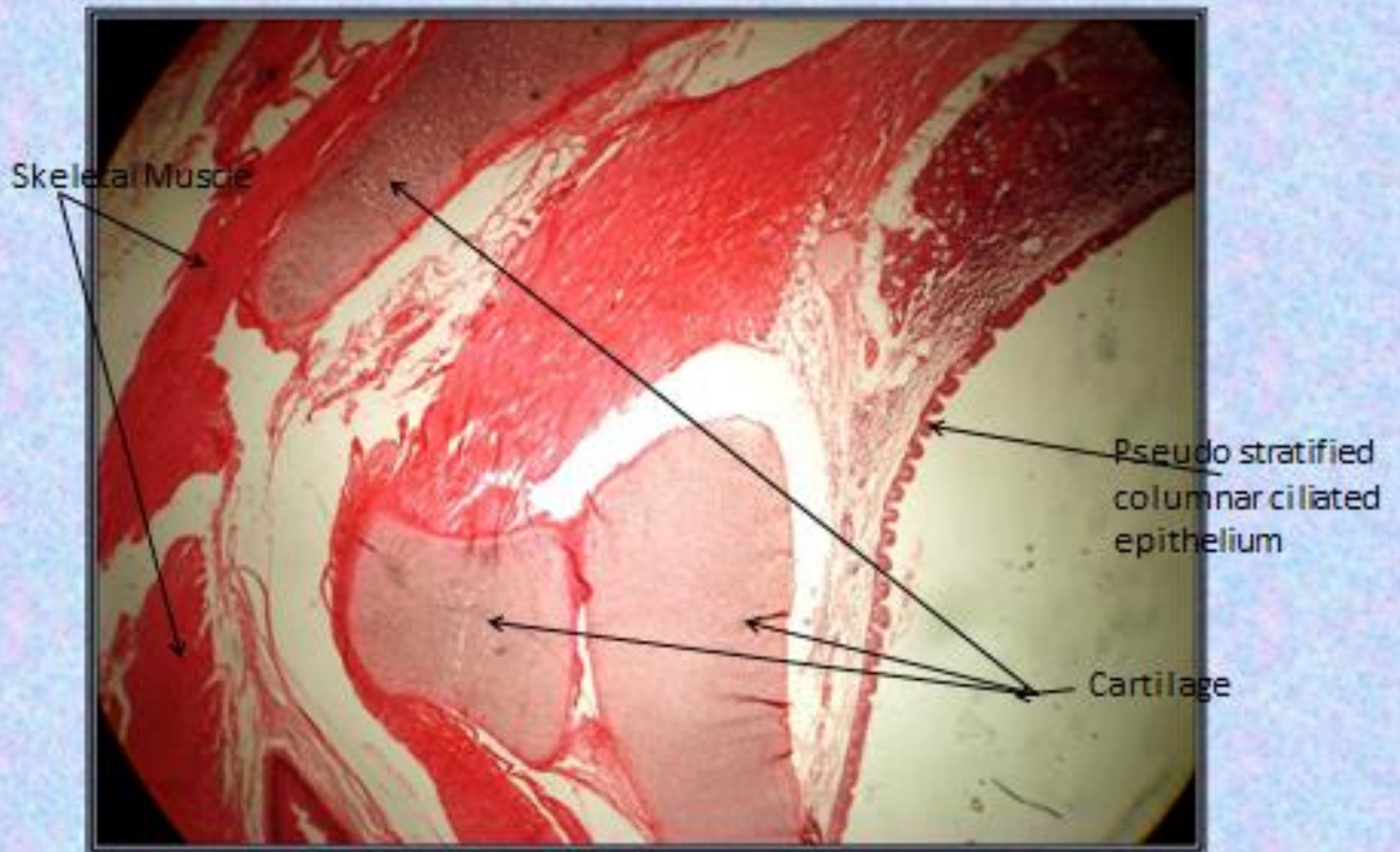
# Parts of Respiratory System

- **Nasal Cavity**
- **Cutaneous Region** thick keratinized stratified squamous epithelium
- **Respiratory Region** ciliated pseudostratified columnar
- **Olfactory Region** Olfactory cells & Sustentacular cells & Basal cells
- **Pharynx**
- **LARYNX**
- **Trachea**
- **Bronchus**
- **LUNG**

# Larynx

- Connects pharynx to trachea
- Is lined by respiratory epithelium
- Laryngeal cartilages(hyaline and elastic) are located in lamina propria
- The cartilages connected to each other by ligaments and move with respect to one another by some striated muscles
- **Larynx has two folds consist of superior and inferior**
- ✓ **Superior vestibular folds** lined by respiratory epithelium
- ✓ **Inferior vocal folds** lined by stratified squamous nonkeratinized epithelium

# Larynx





# Trachea

- **Mucosa**

- Respiratory epithelium composed of 6 cell types located on a thick basement membrane

- **Goblet cells** are about 30% of cells, produce mucinogen

- **Ciliated columnar cells** about 30% of cells, are tall which have cilia and microvilli

- **Basal cells** are also about 30% of cells, they are undifferentiated stem cells

- **Brush cells** are just 3% of cells, they are narrow columnar cells that their function is unknown, but nerve ending associated with them

- **Serous cells** are about 3% of cells, they are columnar and have serous granule

- **DNES cells**, constitute about 3-4% of cells, have numerous granule in basal cytoplasm which is contain various pharmacological agents

## **Lamina propria**

composed of loose fibroelastic CT, contain **seromucous** glands and lymphoid elements, elastic lamina separate this layer from submucosa

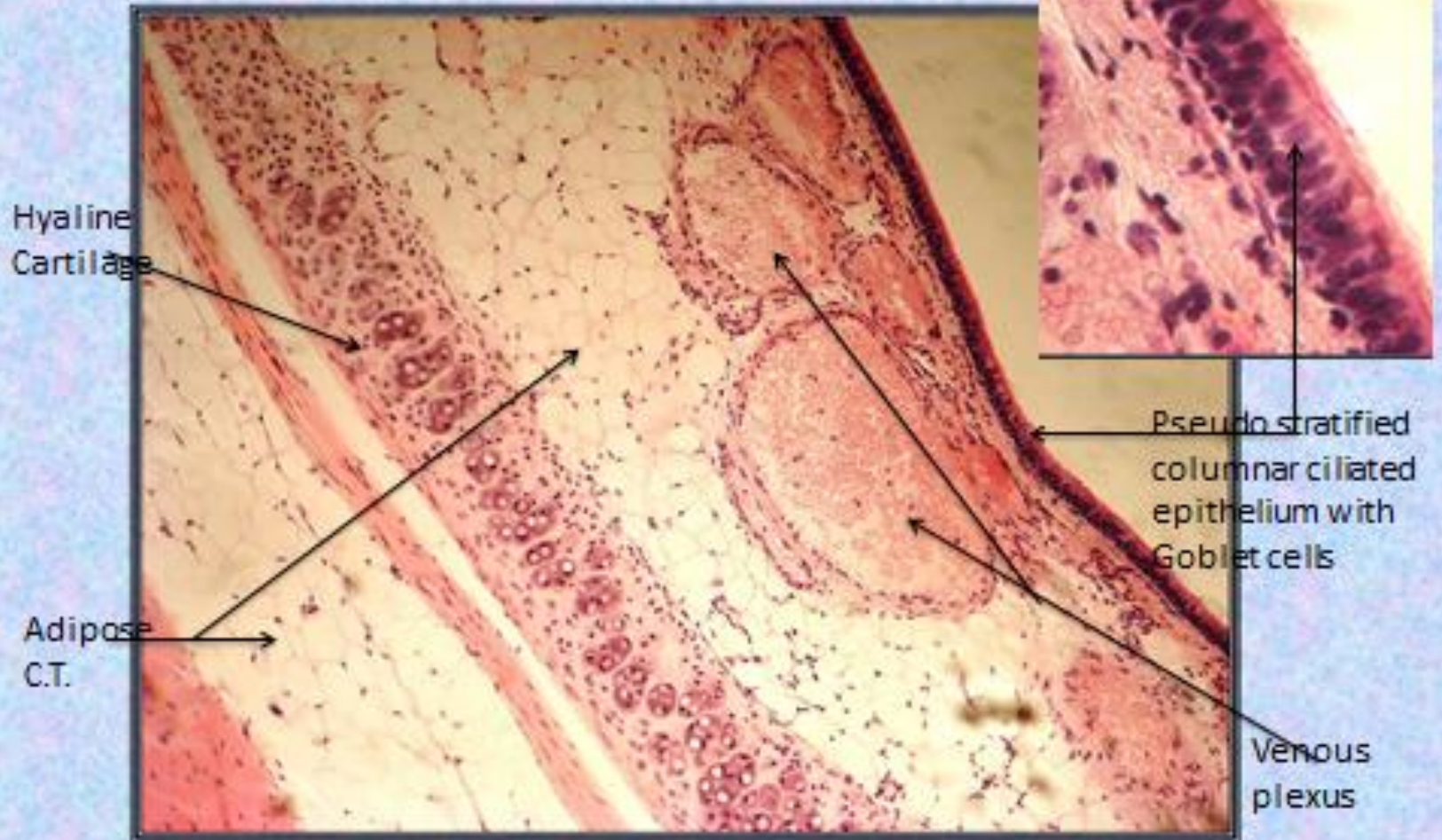
## **Submucosa**

Submucosa is composed of dense irregular fibroelastic CT that houses **mucous and seromucous glands**, rich in blood and lymph supply

## **Adventitia**

Adventitia is a fibroelastic CT that houses C-shaped hyaline cartilage, at posterior aspect of cartilage, there is a dense band of smooth muscle cells known as trachealis muscle

# Trachea



# Bronchial Tree

**Is composed of:**

- **2 primary bronchus** that enter lungs
- **3 lobar ( secondary) bronchus** on right and 2 on the left
- **Segmental (tertiary) bronchus**
- **bronchioles**

Terminal bronchioles

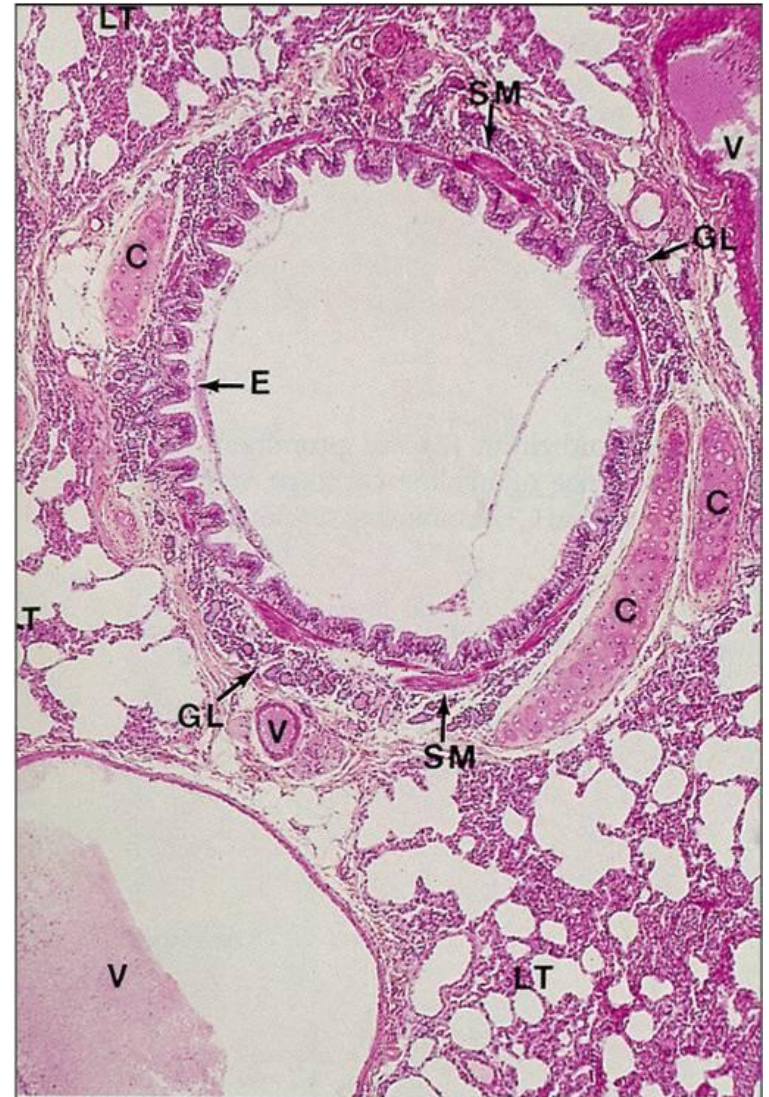
Respiratory bronchioles

Progressively airways decreased in size and cartilage, glands, goblet cells, and the height of epithelial cells

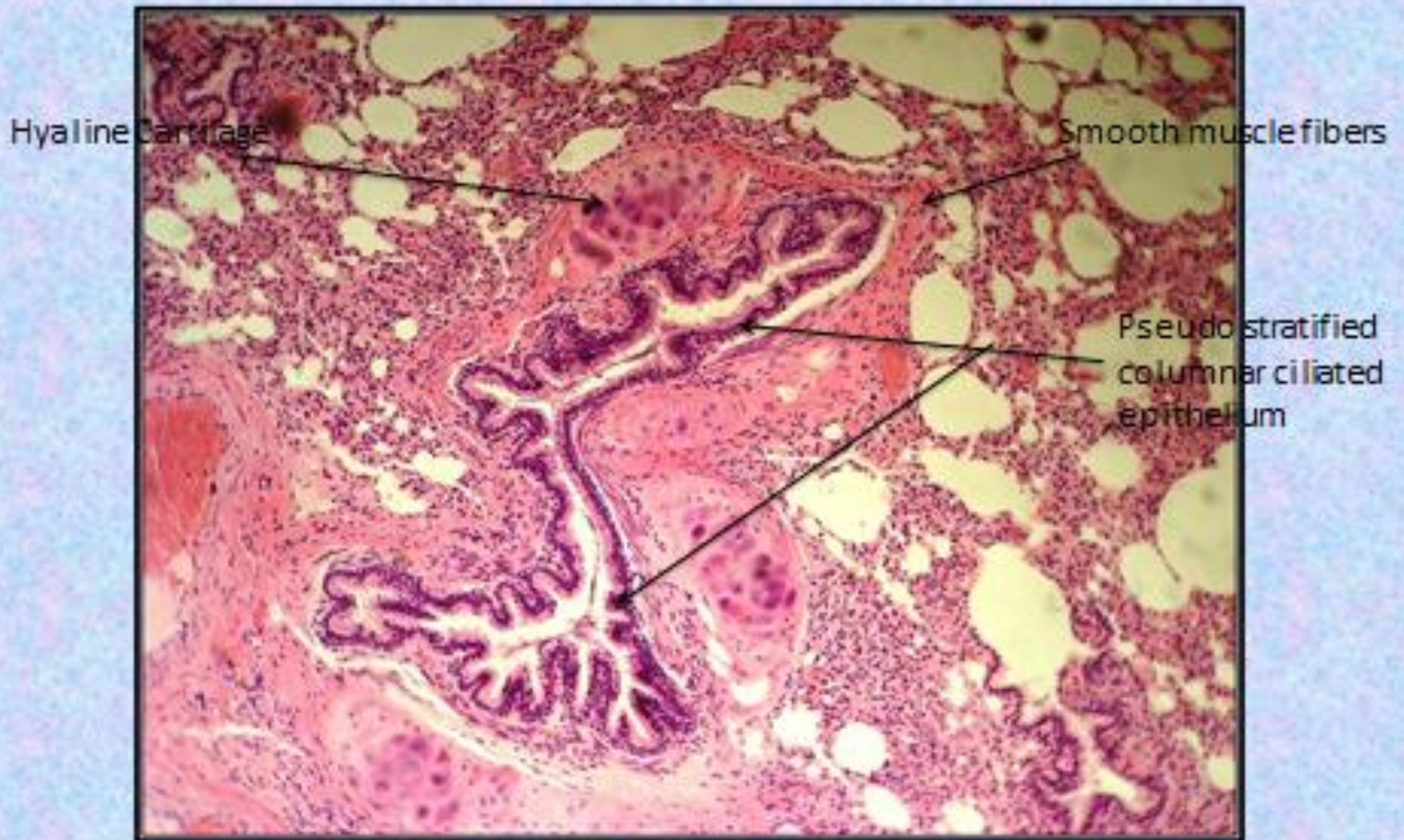
But increase smooth muscle cells and elastic tissue

# Primary Bronchi (**bronchus**) extrapulmonary)

- Primary bronchi is identical to trachea, but have smaller diameter and thinner wall
- Cartilage is in form of irregular plates
- Smooth muscle located between lamina propria and submucosa as 2 distinct layers



## Lung of horse - Bronchus



# Bronchioles

- ❑ Have not any cartilage or glands
- ❑ But have few goblet cells
- ❑ In larger bronchioles epithelium is simple columnar ciliated, with occasional goblet cells
- ❑ In smaller bronchioles epithelium change to simple cuboidal, with no goblet cells
- ❑ Bronchioles have a smooth muscle coats surrounded by fibroelastic connective tissue

## Lung of horse - Bronchiol



Simple columnar  
epithelium



# Bronchioles

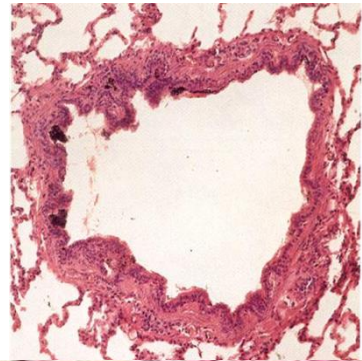
Terminal bronchioles are terminus of conducting portion they are lined by cuboidal cells (some with cilia) and Clara cells which have domed apical surface

## Lamina propria

is a fibroelastic CT, 1-2 layer of smooth muscle cells separate it from adventitia

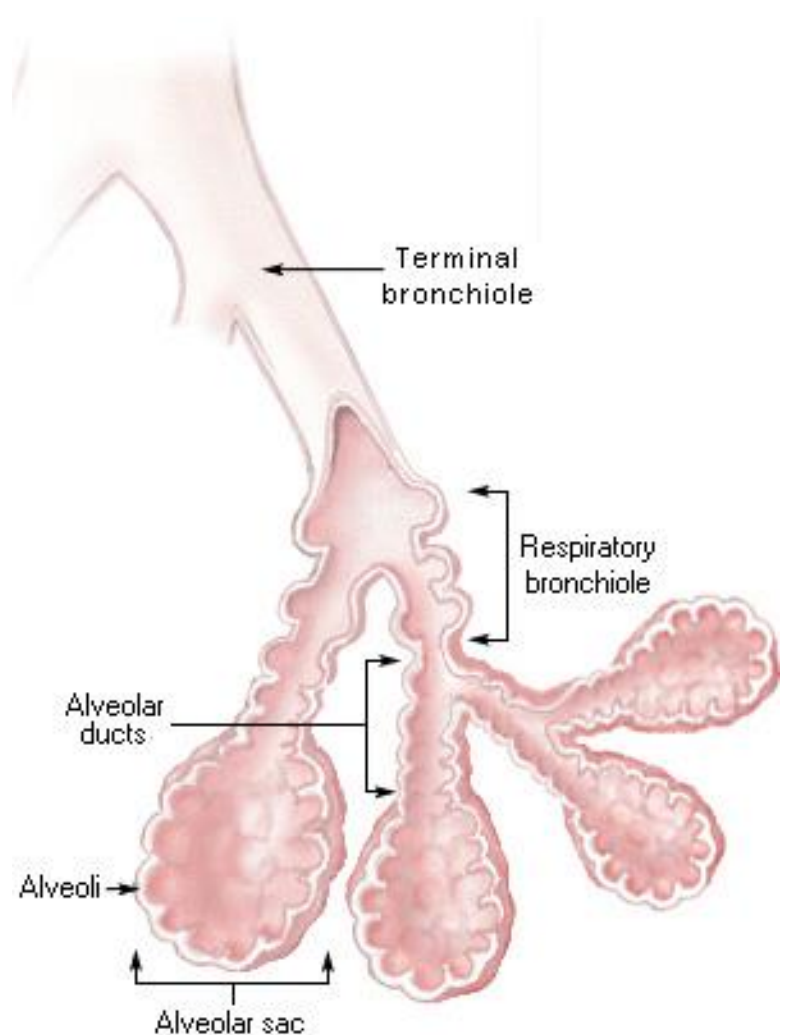
## Clara cells ( exocrine bronchiolar cells)

- Clara cells are columnar with dome-shaped apex secretory granules
- RER, which secret glycoproteins and surfactant-like materials
- Degrade toxins (SER)
- Divide to replace other cells
- Antimicrobial peptide



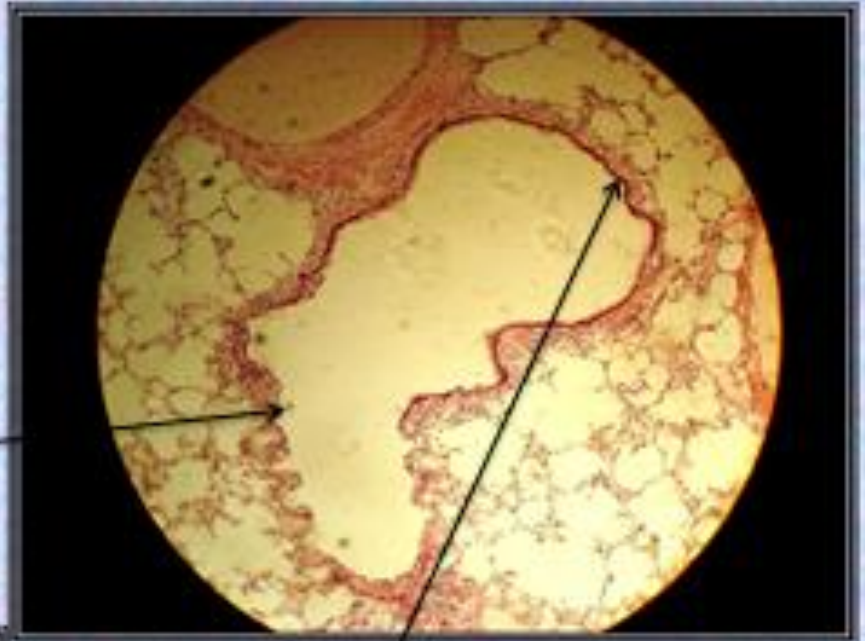
# Respiratory Bronchioles

- Are a transitional zone between conducting and respiratory tissues
- Alveoli branching from their walls
- Are lined by ciliated **cuboidal epithelium** with Clara cells that change to type I alveolar cells
- Smooth muscle cells and elastic fibers underlie epithelium

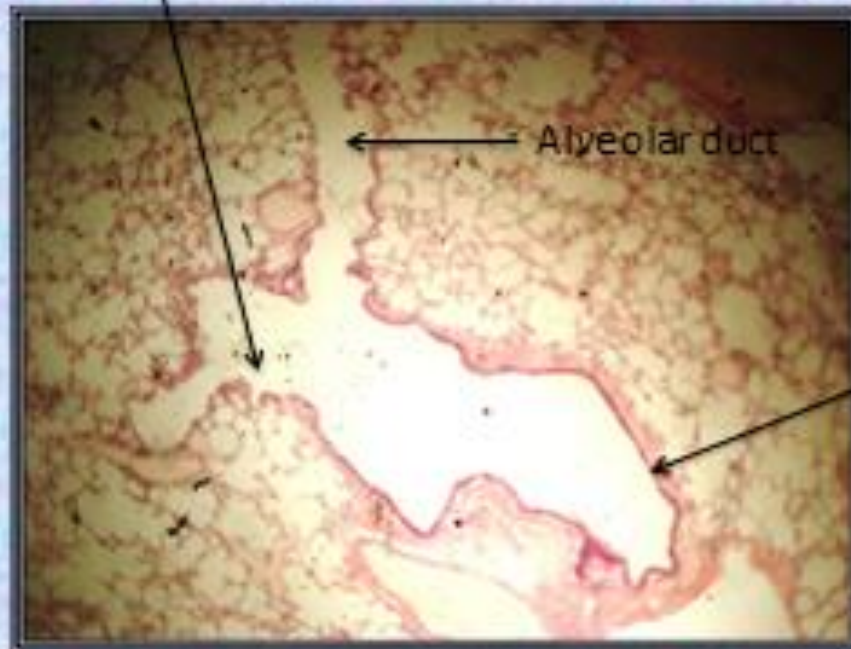


## Lung of human

Respiratory bronchiole lined with Simple cuboidal epithelium



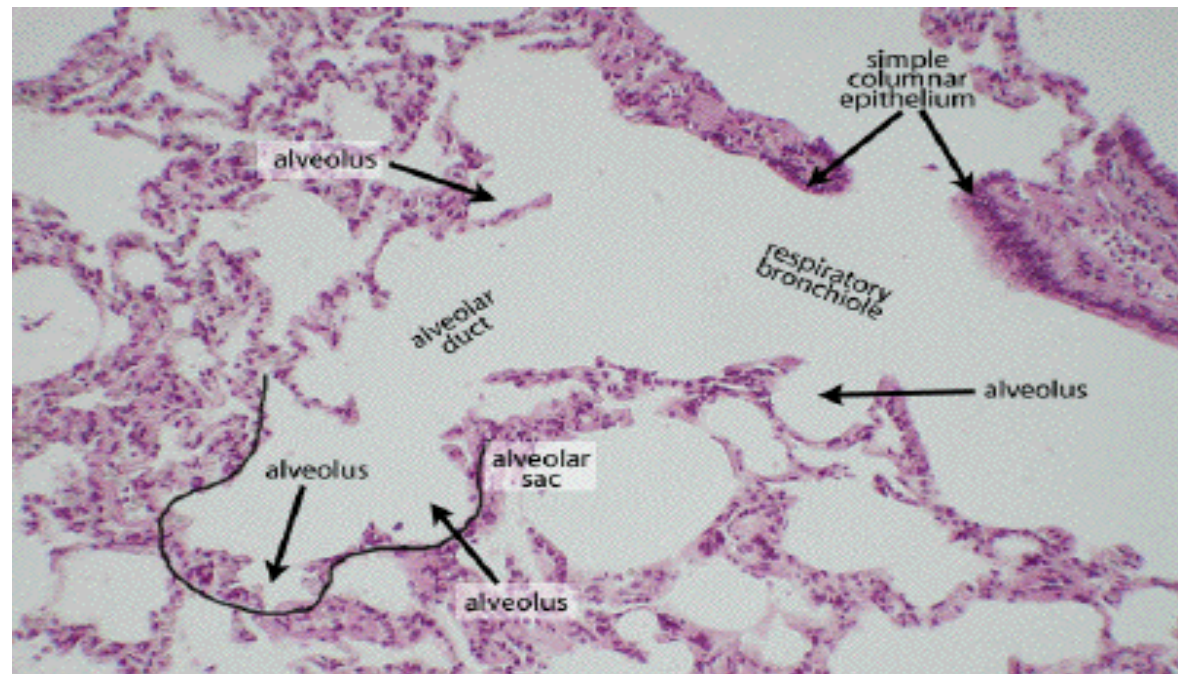
Terminal bronchiole lined with Simple columnar epithelium



Alveolar duct

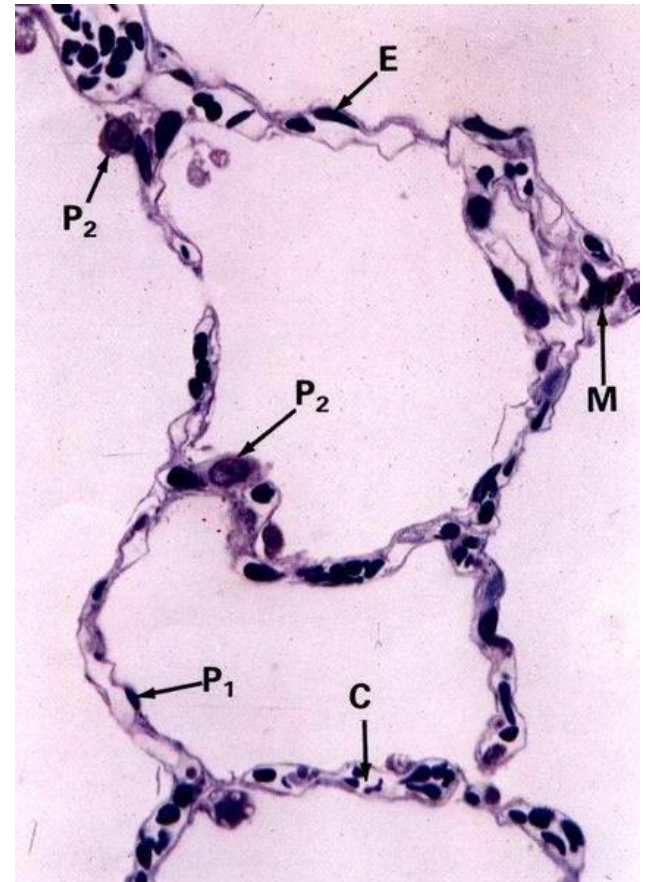
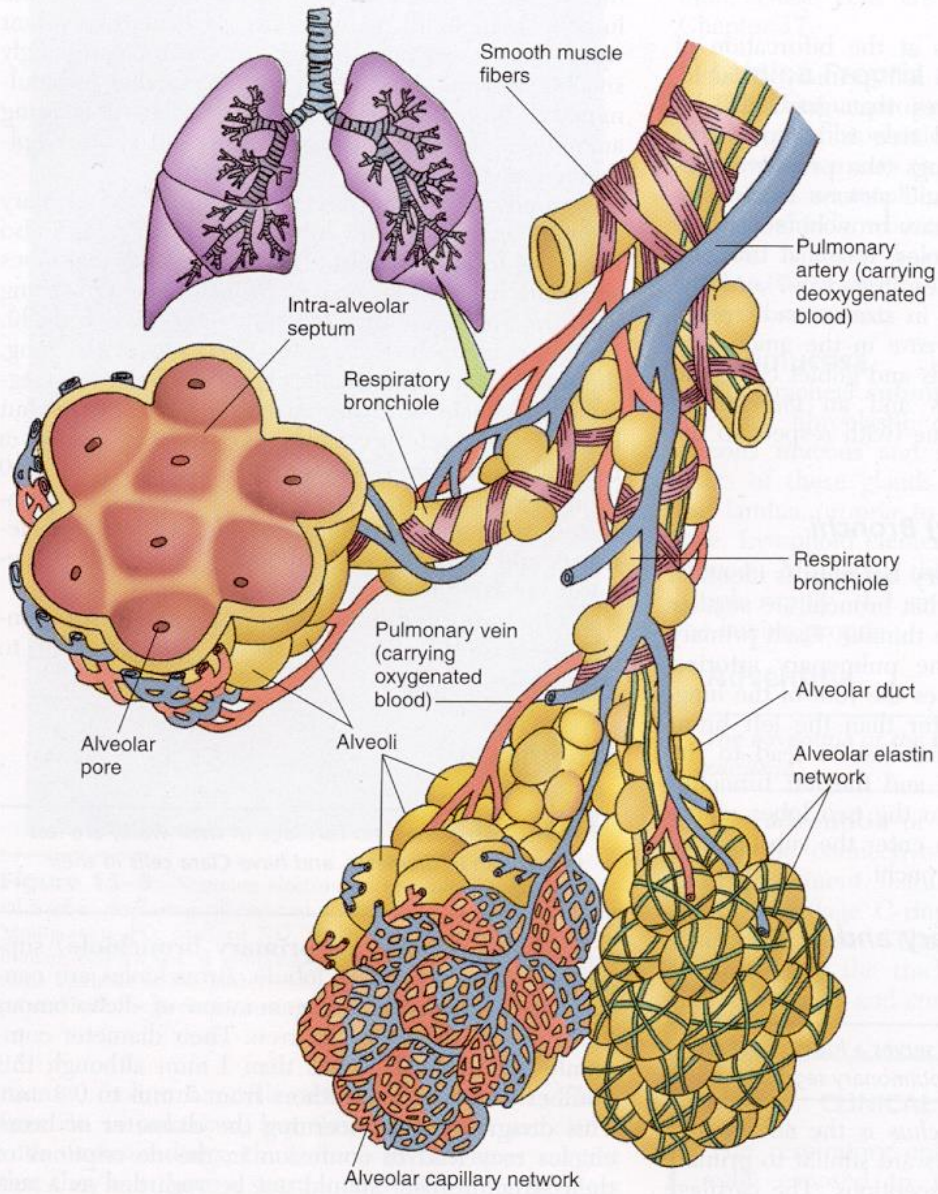
# Alveolar Ducts

- Do not have wall of their own
- They are only a linear arrangements of alveoli
- They end as a blind out pouching known as alveolar sac
- Opening of alveolus to AD controlled by a single smooth muscle cell embedded



# Alveolus

- Alveolus has 200 micrometer in diameter and is the functional unit of respiratory system
- Open as out pouching from RB, AD
- Composed of attenuated type I and type II pneumocytes
- Connective tissue between them are very scant
- Air space of two adjacent alveoli communicate through an alveolar pore
- Interalveolar septum is between alveoli have an extensive capillary bed





**Thank you**