



## Lecture 2 - Respiratory Block

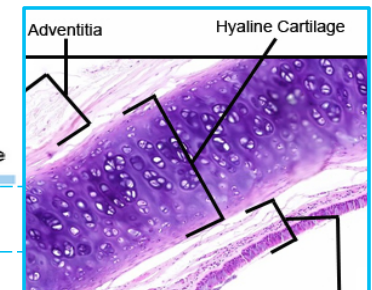
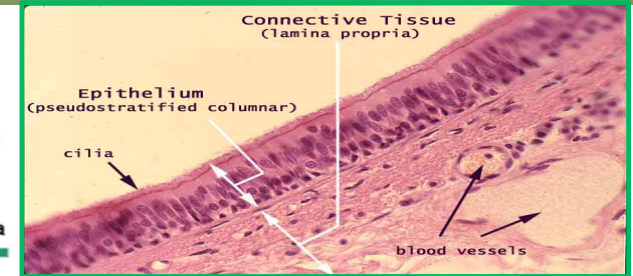
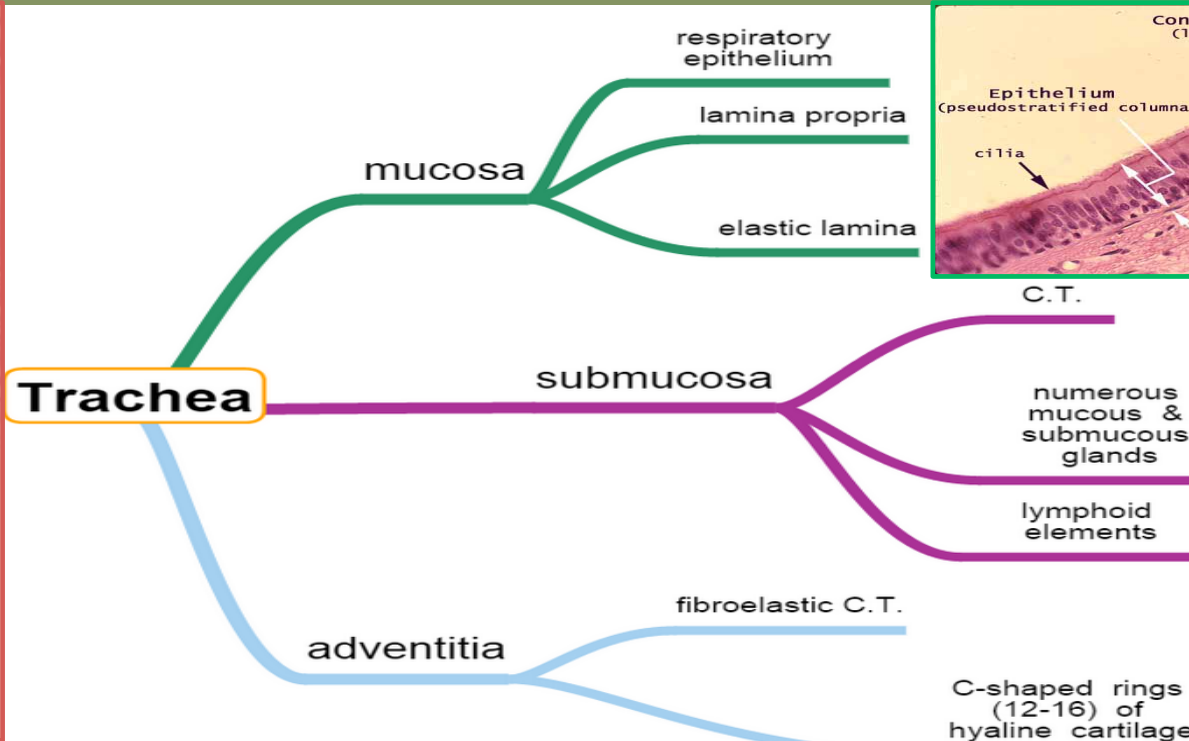
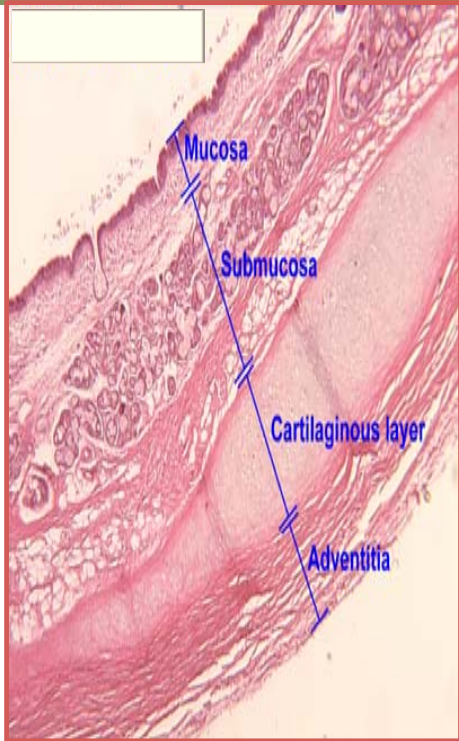
# Histology of the Lower Respiratory Tract (Trachea, Bronchi, Bronchioles) & the Lung

### Objectives

By the end of this lecture the student should be able to describe the microscopic structures of:

- ✓ **1- The microscopic structures of the wall of:**
  - ✓ **Trachea.**
  - ✓ **Primary or extrapulmonary bronchi.**
  - ✓ **Intrapulmonary (secondary and tertiary) bronchi.**
  - ✓ **Bronchioles.**
- ✓ **2- The microscopic structures of :**
  - ✓ **Interalveolar septum.**
  - ✓ **Alveolar phagocytes.**
  - ✓ **Pleura.**

# Trachea



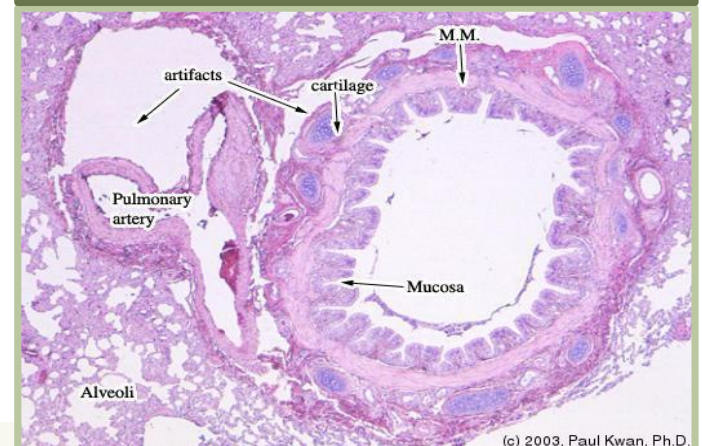
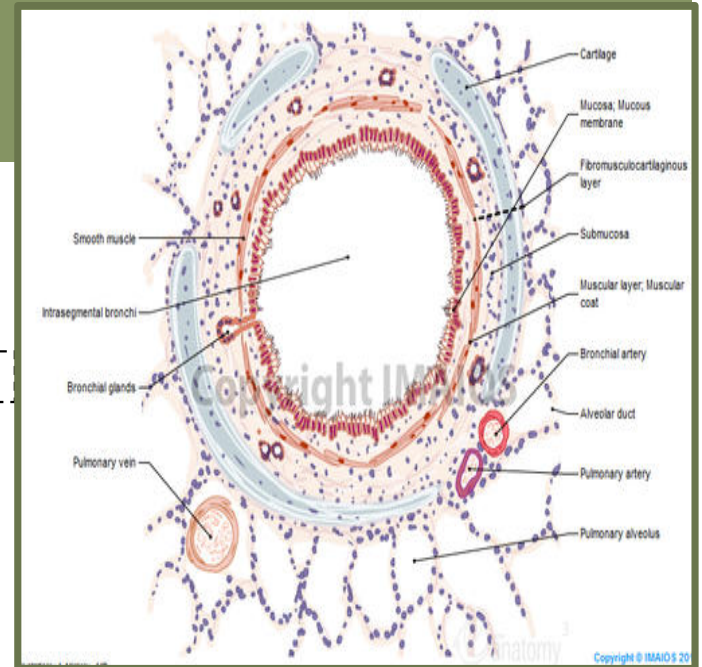
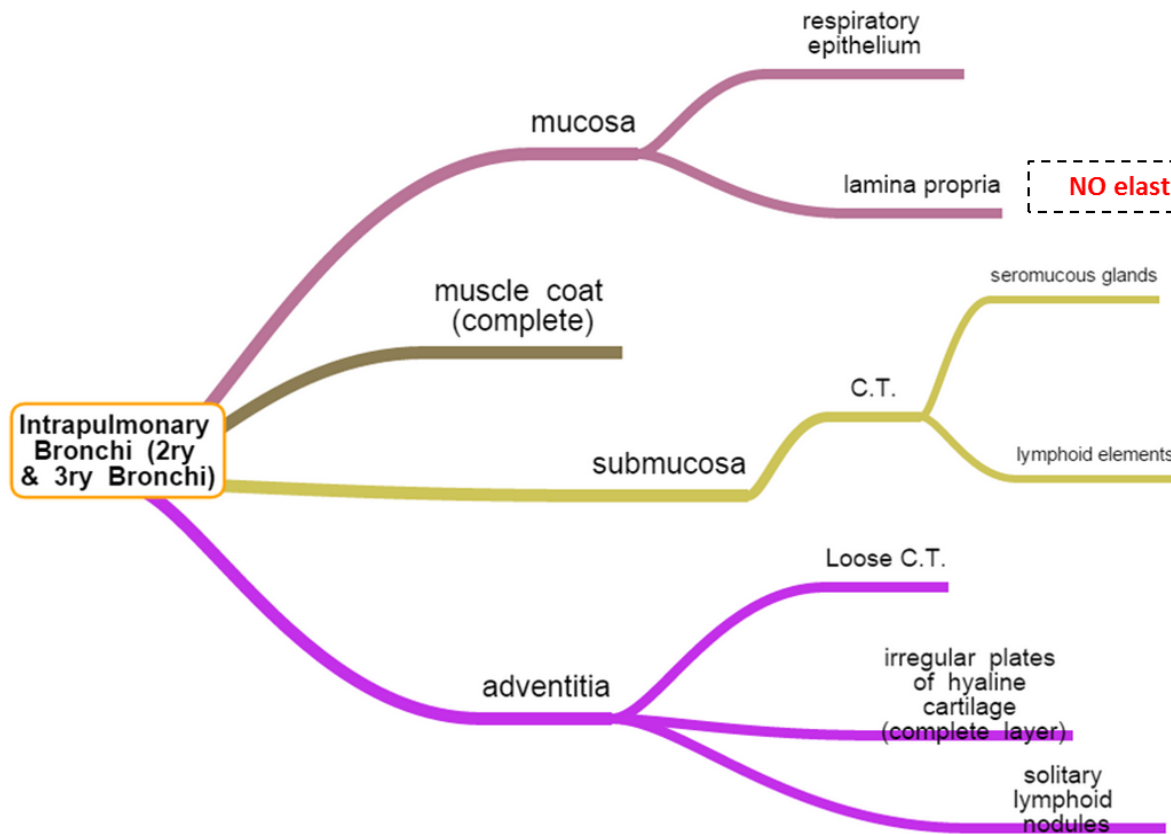
Trachealis muscle (bundle of smooth muscle fibers) connects the 2 ends of each C-shaped (incomplete) rings of cartilage

N.B. **EXTRAPULMONARY BRONCHUS (1ry BRONCHUS)**

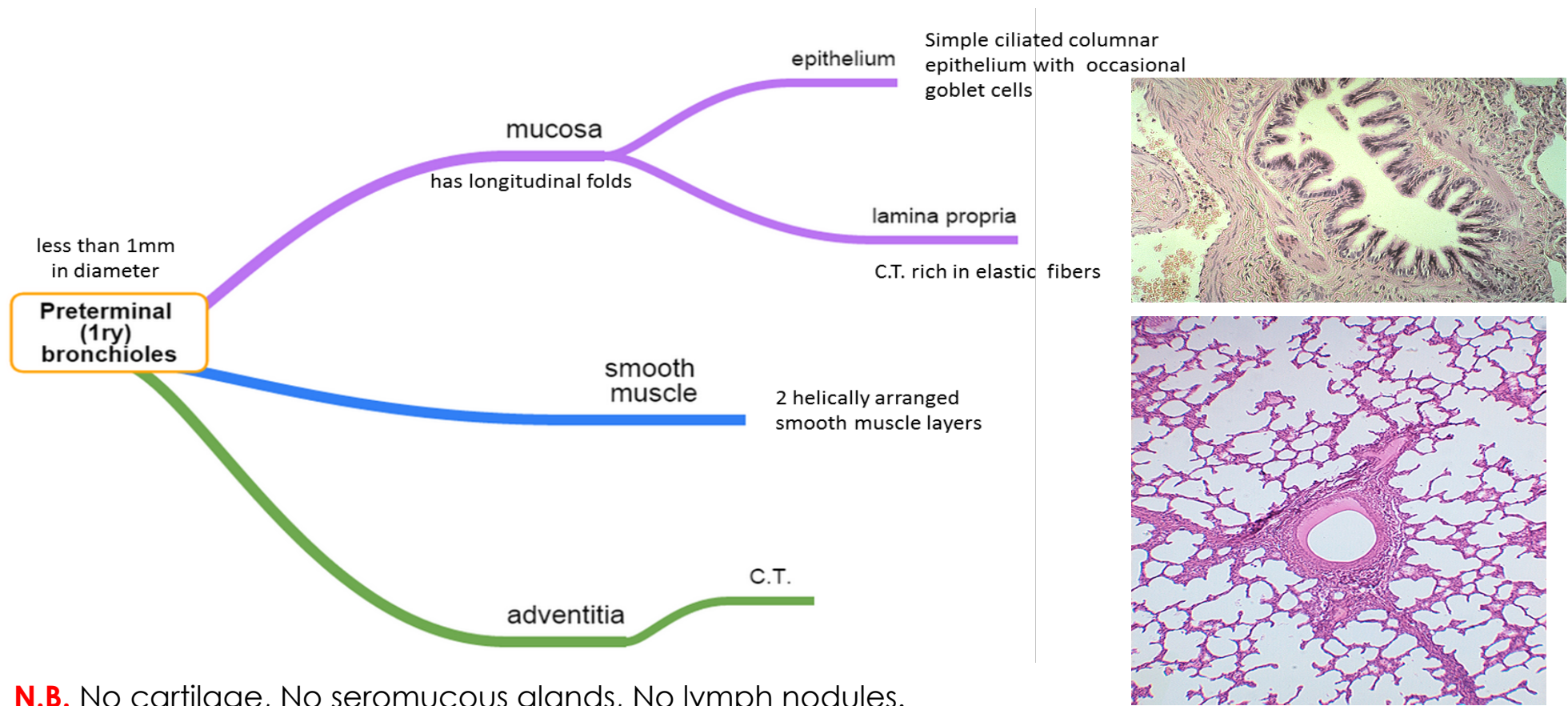
Generally has the same histological appearance as the trachea  
 Trachealis muscle (bundle of smooth muscle fibers) connects the 2 ends of each C-shaped (incomplete) rings of cartilage

<http://www.getbodysmart.com/ap/respiratorysystem/tracheabronchi/trachea/tracheawall/tutorial.html>

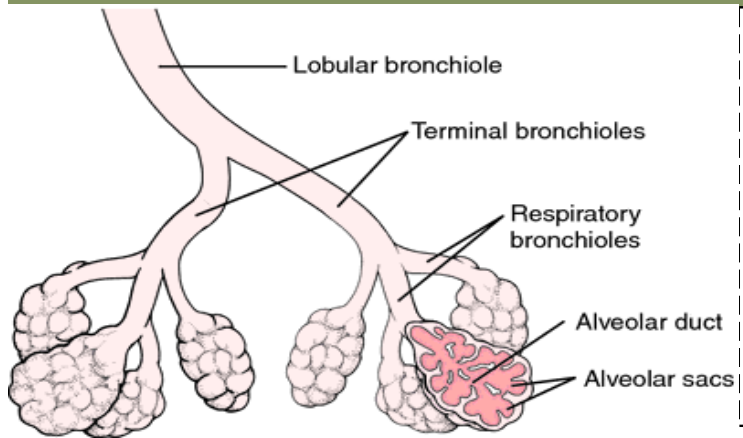
# INTRAPULMONARY BRONCHUS



# Preterminal ( 1ry ) Bronchioles



# Terminal Bronchioles & Respiratory Bronchioles

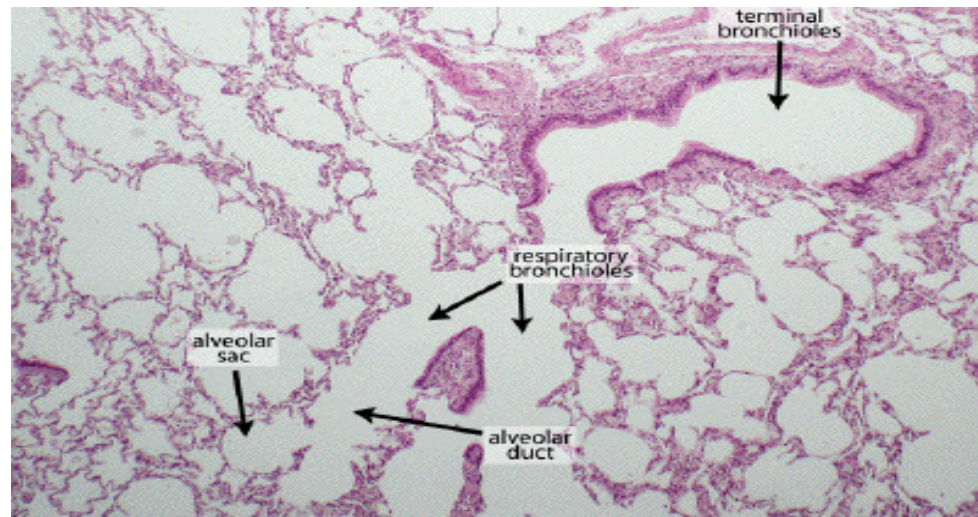


## Terminal Bronchioles

- Similar structure to preterminal bronchioles, **BUT**:
- Epithelium:
- Simple cuboidal partially ciliated epithelium
- With Clara cells ( With **NO goblet cells**).
- N.B. Are less than 0.5mm in diameter.

## Respiratory Bronchioles

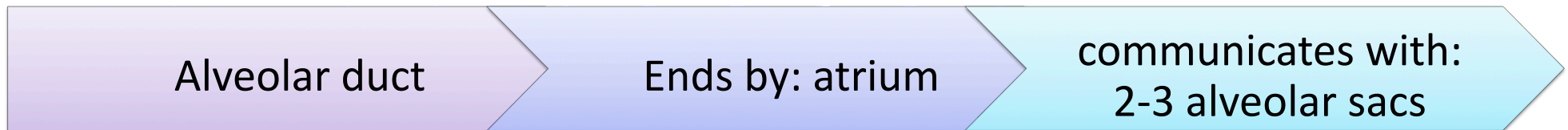
Similar in structure to terminal bronchioles, **BUT**:  
their walls are interrupted by the presence of few pulmonary alveoli



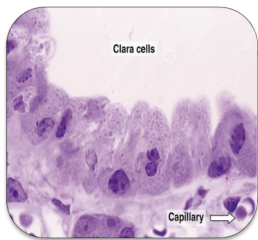
# Alveolar Ducts

## Alveolar Ducts

The wall of alveolar ducts consist almost of pulmonary alveoli.



### Clara cells

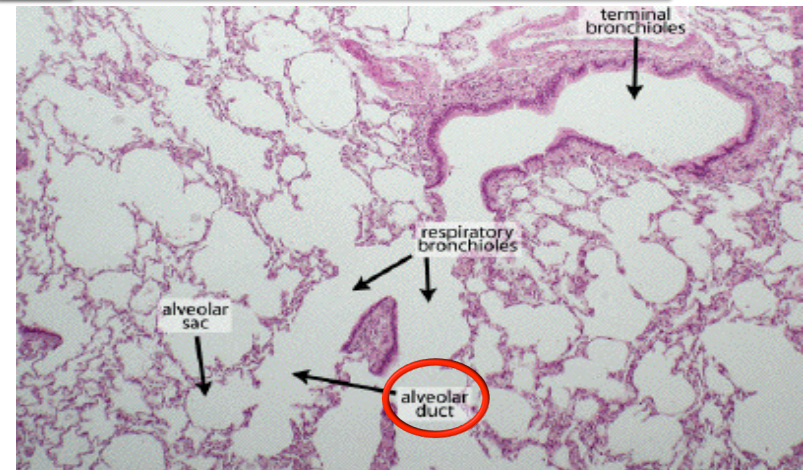


#### Structure

- columnar cells (non ciliated)

#### Functions

- 1- Degrade toxins in inhaled air.
- 2- Divide to regenerate the bronchiolar epith.
- 3- Produce surfactant-like material.



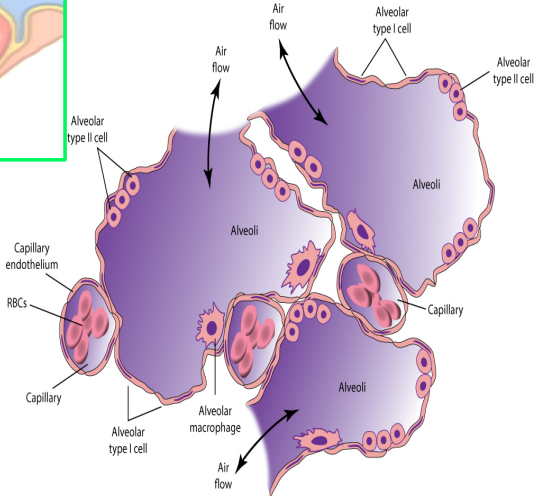
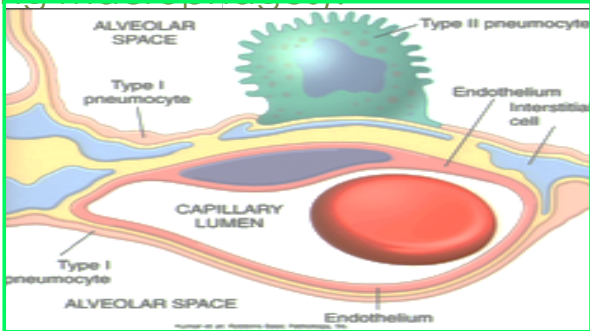
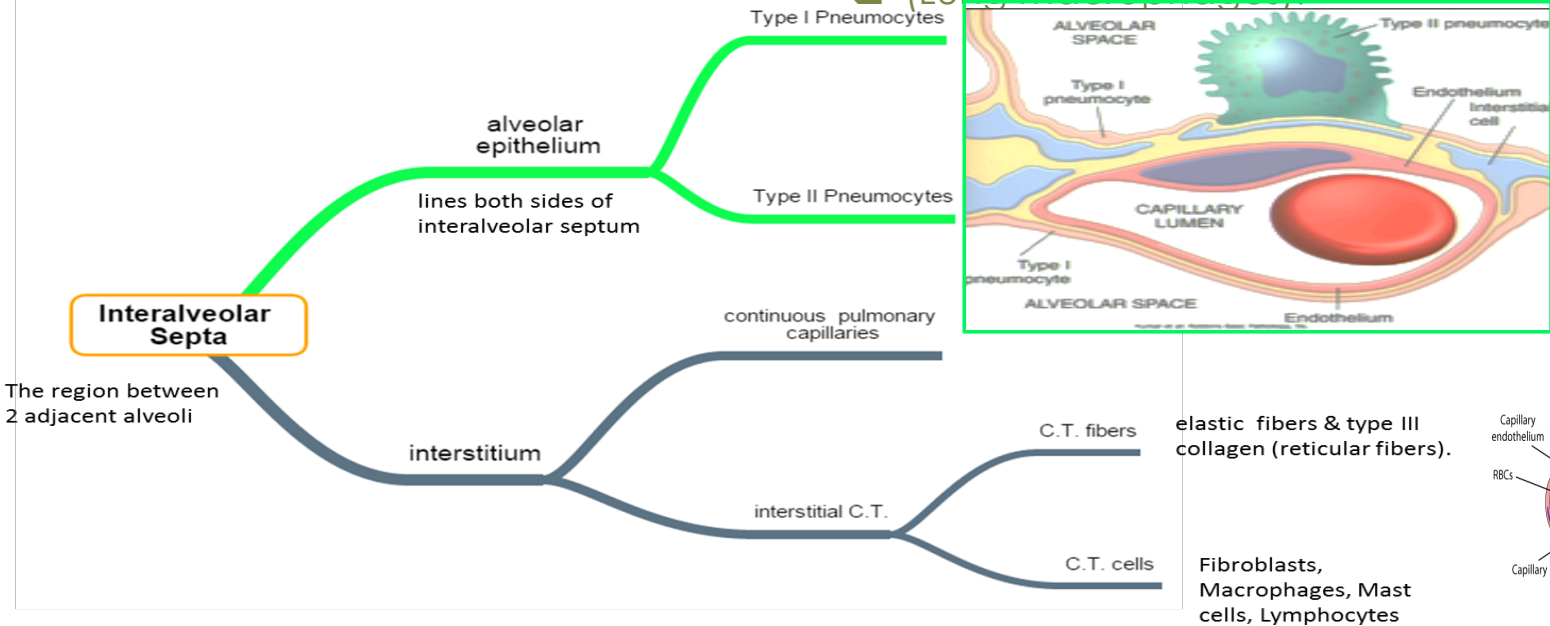
# PULMONARY ALVEOLI

**Definition:**

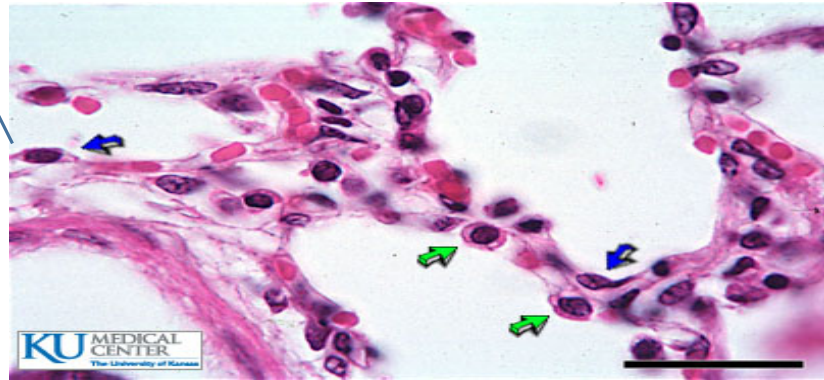
They are small out-pouching of respiratory bronchioles, alveolar ducts & alveolar sacs.

**Topics:**

- ❑ Interalveolar septa.
- ❑ Alveolar epithelium.
- ❑ Alveolar phagocytes
- ❑ (Lung macrophages)



Type I  
Pneumocytes:



Type II  
Pneumocytes:

Type I Pneumocytes	Type II Pneumocytes
Line 95% of the alveolar surfaces	Line 5% of the alveolar surfaces
less numerous than type II pneumocytes	more numerous than type I pneumocytes
simple squamous epithelium	cuboidal or rounded cells With Foamy cytoplasm. Nucleus: central & rounded. The cytoplasm contains membrane-bound Lamellar bodies (contain pulmonary surfactant)

### Functions

Type I Pneumocytes	Type II Pneumocytes
Exchange of gases.	1- Synthesis & secretion of pulmonary surfactant. 2- Renewal of alveolar epithelial cells: Type II cells can divide to regenerate both type I & type II pneumocytes.



# Blood-gas barrier & Alveolar phagocytes

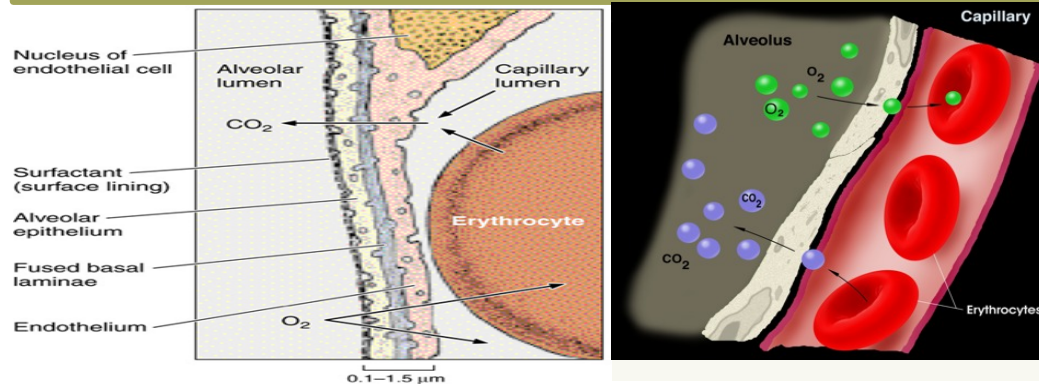
## *Blood-gas barrier* (BLOOD-AIR BARRIER)

### Definition:

It is the region of the interalveolar septum that is traversed by O<sub>2</sub> & CO<sub>2</sub>

### Components:

- 1- Thin layer of surfactant.
- 2- Type I pneumocyte.
- 3- Fused basal laminae of type I pneumocytes & endothelial cells of the pulmonary capillary.
- 4- Endothelial cells of the pulmonary capillary.



## *Alveolar phagocytes* (alveolar macrophages/dust cells)

### Sites:

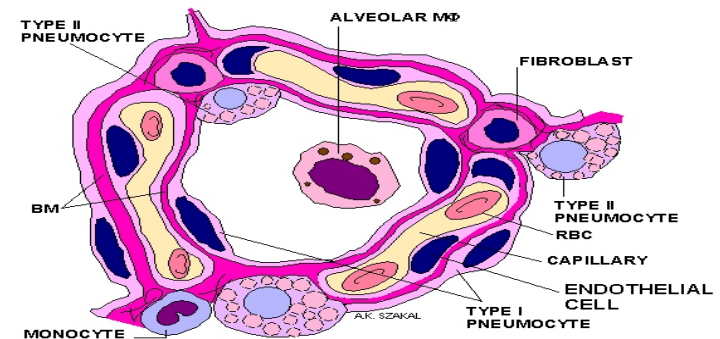
In the lumen of pulmonary alveoli.

In the interstitium of interalveolar septa.

### Function:

Phagocytose particulate matter (e.g. dust) & bacteria in the lumen of pulmonary alveoli and in the interstitium of interalveolar septa.

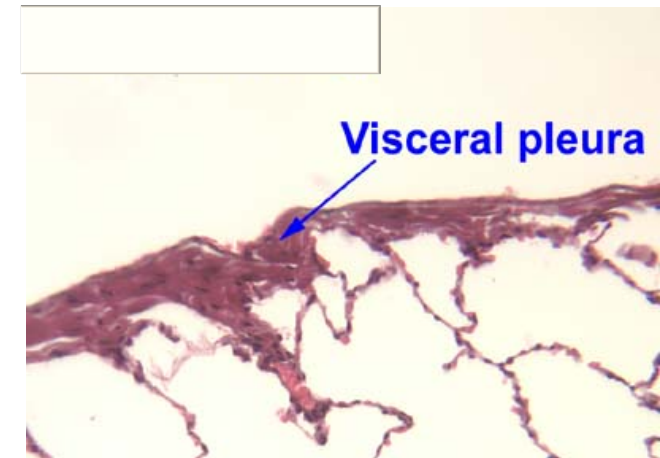
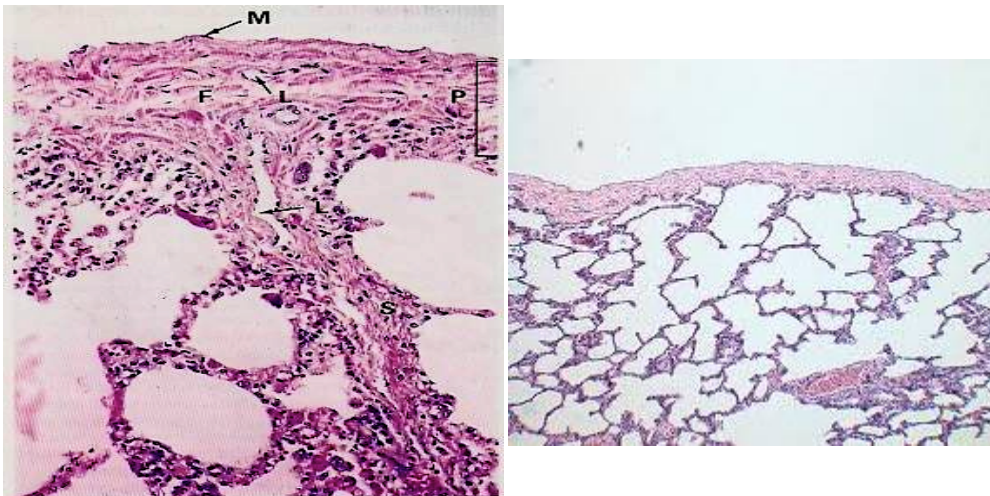
## PULMONARY ALVEOLI



# Lung pleura

Is formed of two layers:  
Parietal and visceral.

It is formed of simple squamous mesothelium. The two layers are separated by serous fluid. The visceral layer has sub-epithelium loose C.T that extends into the lung tissue



# MCQ's

Q1) The wall of the trachea is formed of all the following EXCEPT?

- A-Submucosa.
- B-Connective tissue.
- C-Adventitia.
- D-Mucosa.

Q3)The region between 2 adjacent alveoli?

- A-Alveolar epithelium.
- B-Inter-alveolar septa.
- C-Alveolar phagocytes
- D-Alveolar duct.

Q2)Which type of cell is responsible about exchanging gases?

- A-Clara cell.
- B-Type 1 pneumocyte.
- C-Dust cell.
- D-Type 2 pneumocyte

Q4) What structure in the terminal bronchioles epithelium differentiates it from the pre-terminal bronchioles?

- A-Goblet cells.
- B-Ciliated columnar cells.
- C-Clara cells.

Q5) Which of the following structures has the same histological appearance as the trachea?

- A-Pre-terminal Bronchioles.
- B-Respiratory Bronchioles.
- C-Extra-pulmonary Bronchus.
- D-Intra-pulmonary Bronchus.

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## Motivation Corner

**Done By:**

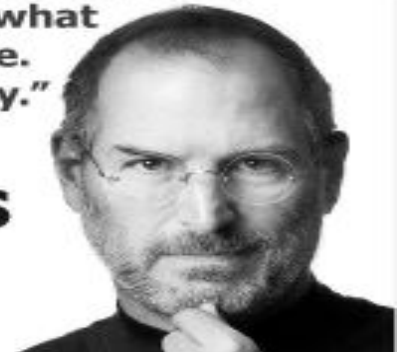
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Amal Afrah

**"Your time is limited, so don't waste it living someone else's life. Don't be trapped by dogma — which is living with the results of other people's thinking. Don't let the noise of others' opinions drown out your own inner voice. And most important, have the courage to follow your heart and intuition. They somehow already know what you truly want to become. Everything else is secondary."**

**Steve Jobs**  
1955-2011



Thank you for Checking our Work

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