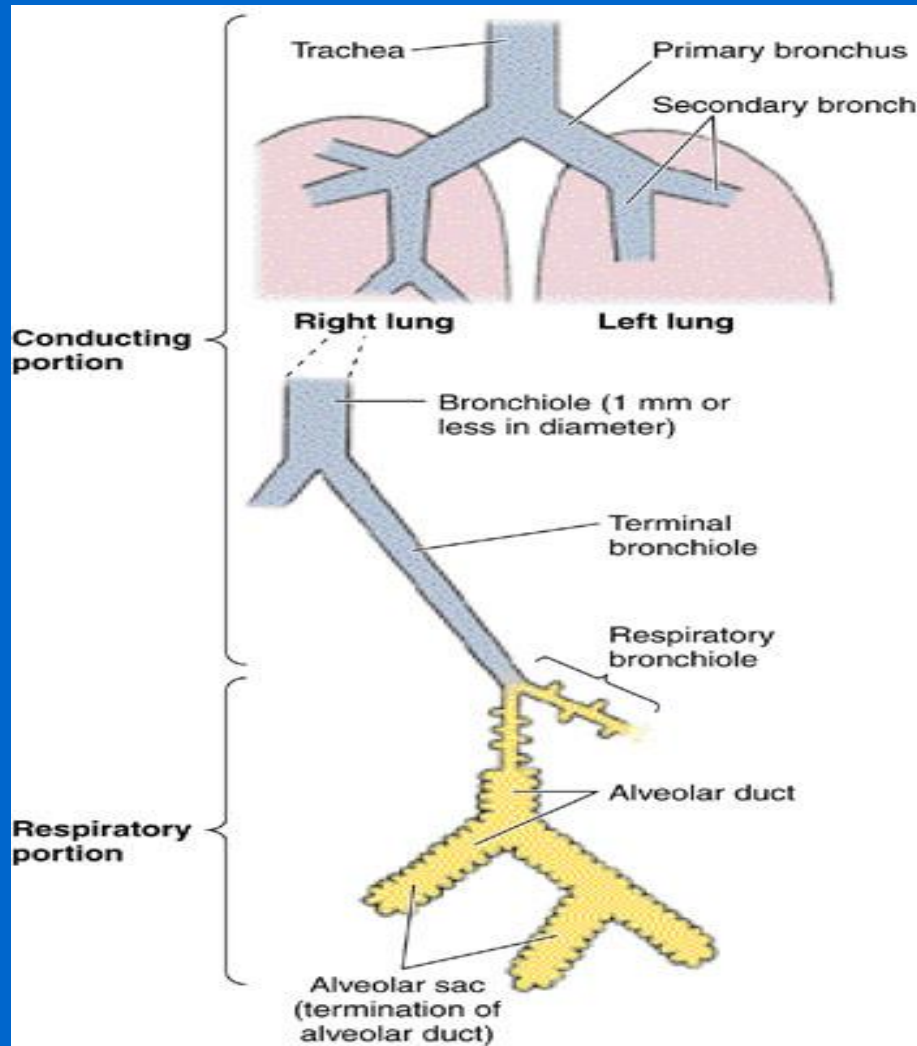


# RESPIRATORY SYSTEM (II)

## 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:

## **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.

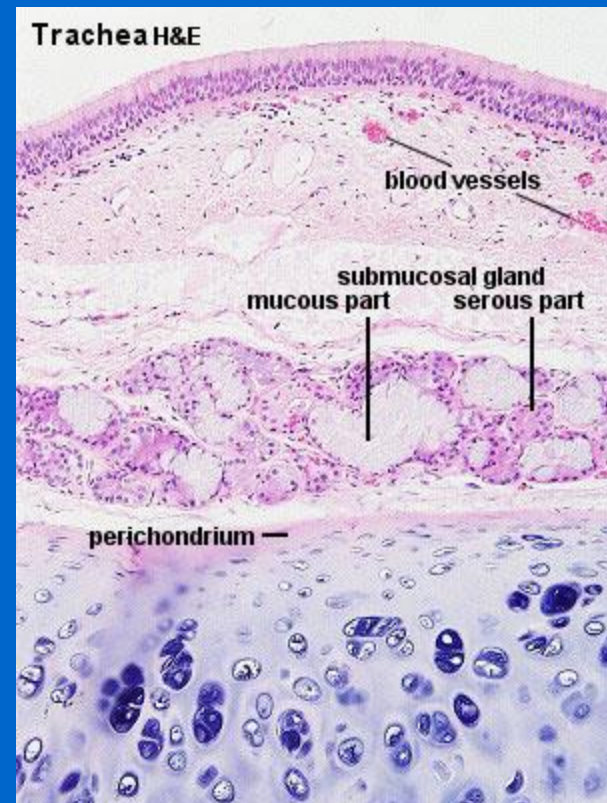
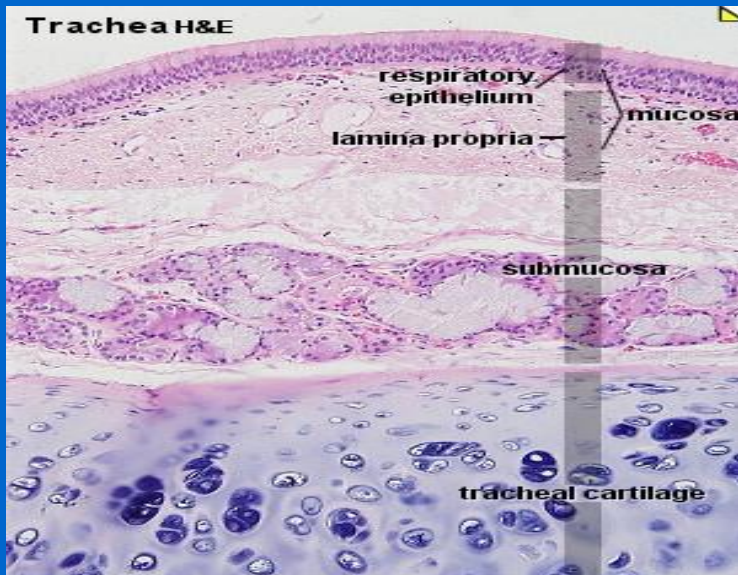
Alveolar phagocytes.

Pleura.

# TRACHEA

The wall of trachea is formed of:

- (1) Mucosa.
- (2) Submucosa.
- (3) Adventitia.





# MUCOSA OF TRACHEA

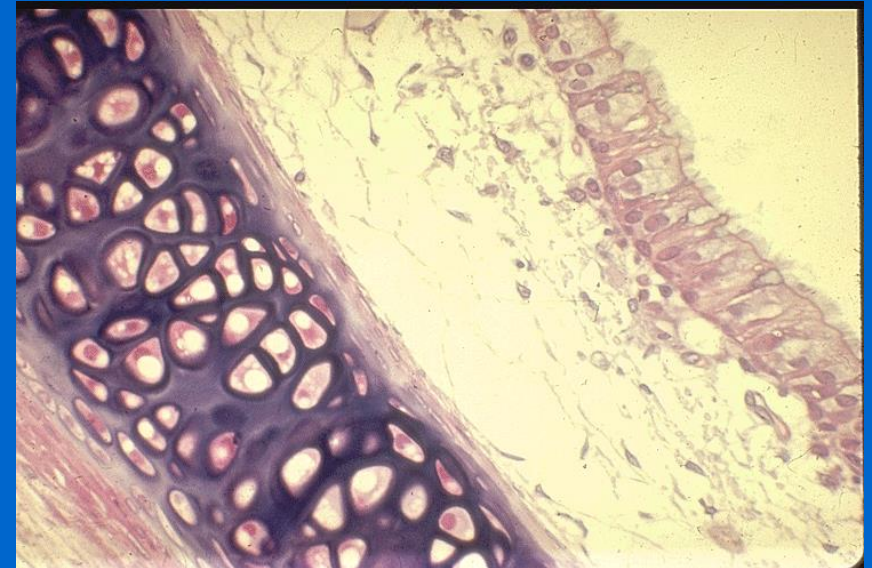
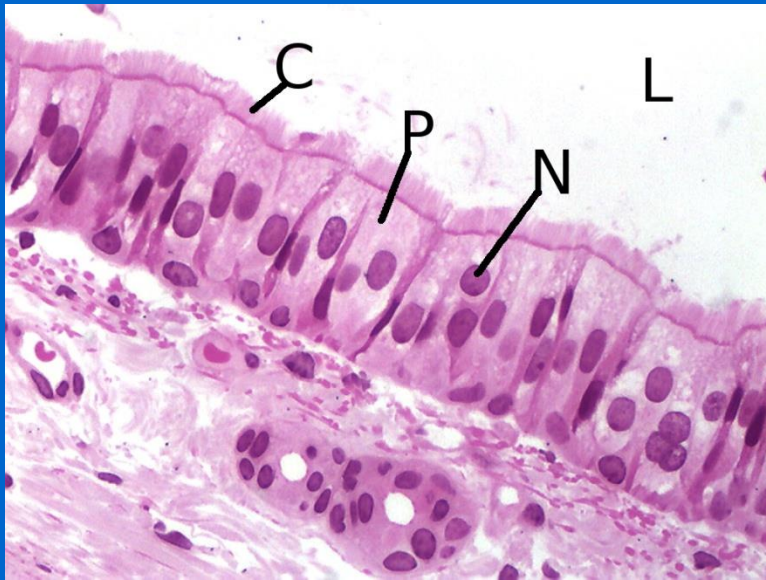
(1) **Epithelium:** Respiratory epithelium

(2) **Lamina propria.**

(3) **Elastic lamina:**

It is formed of elastic fibers.

It separates lamina propria from submucosa.



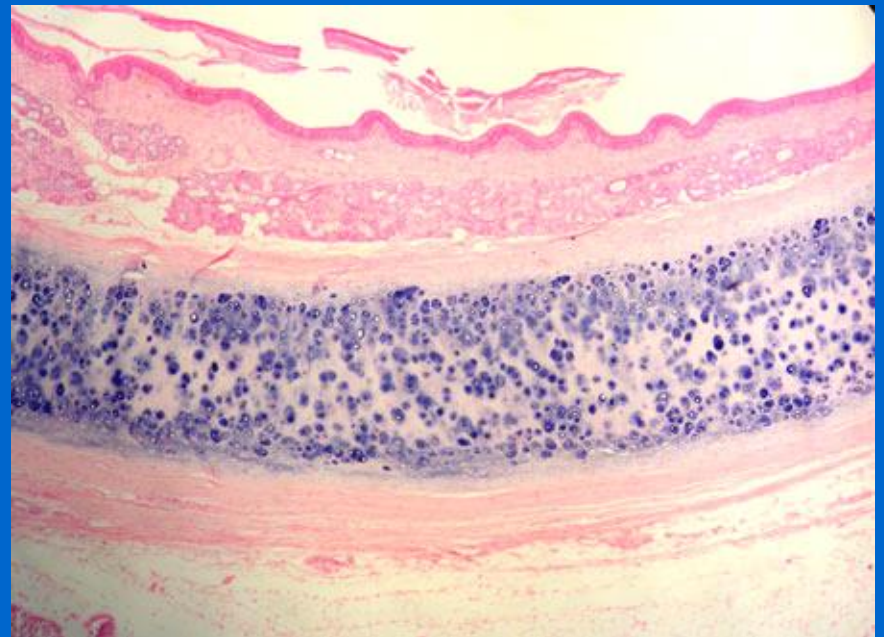
# SUBMUCOSA OF TRACHEA

Contents:

1- C.T.

2- Numerous mucous & seromucous glands.

3- Lymphoid elements.

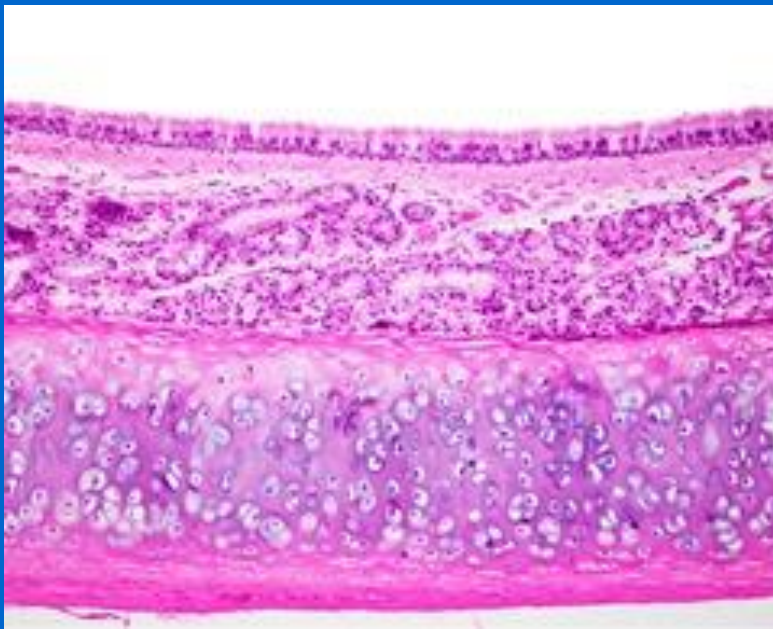


# ADVENTITIA OF TRACHEA

## Contents:

- 1- Fibroelastic C.T.
- 2- C-shaped rings (12-16) of hyaline cartilage.

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





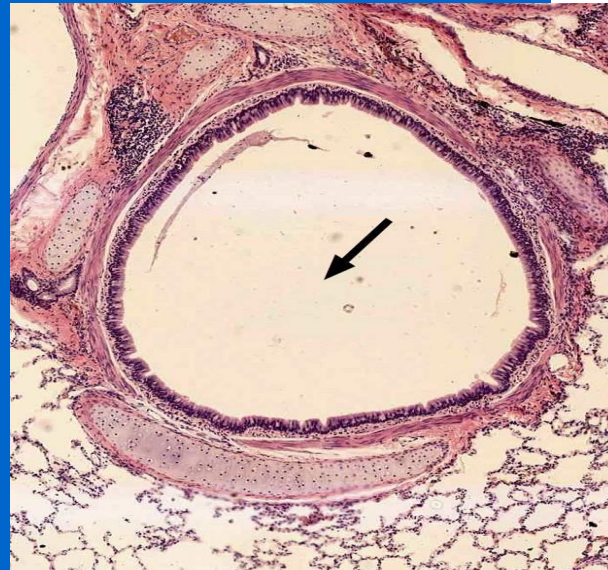
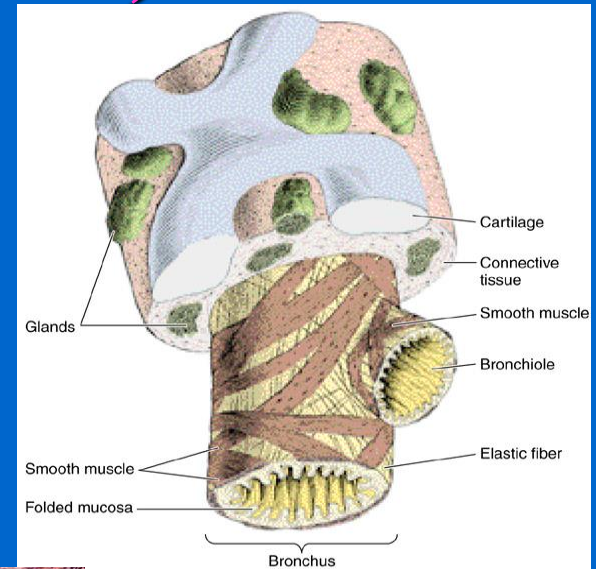
# *EXTRAPULMONARY BRONCHUS* *(Iry BRONCHUS)*

Generally have the same histological appearance as the trachea.

# *INTRAPULMONARY BRONCHI*

## *(2ry & 3ry BRONCHI)*

- 1- Mucosa.
- 2- Muscle coat.
- 3- Submucosa.
- 4- Adventitia.





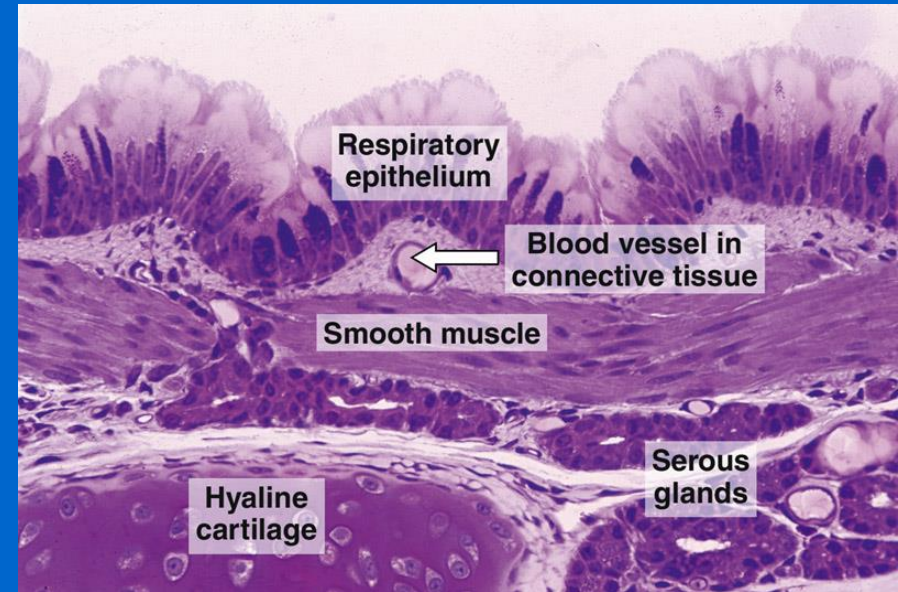
# ***INTRAPULMONARY BRONCHUS***

## **(1) Mucosa:**

a- Epithelium: Respiratory epith.

b- Lamina propria.

N.B. No elastic lamina.



## **(2) Muscle coat (complete):**

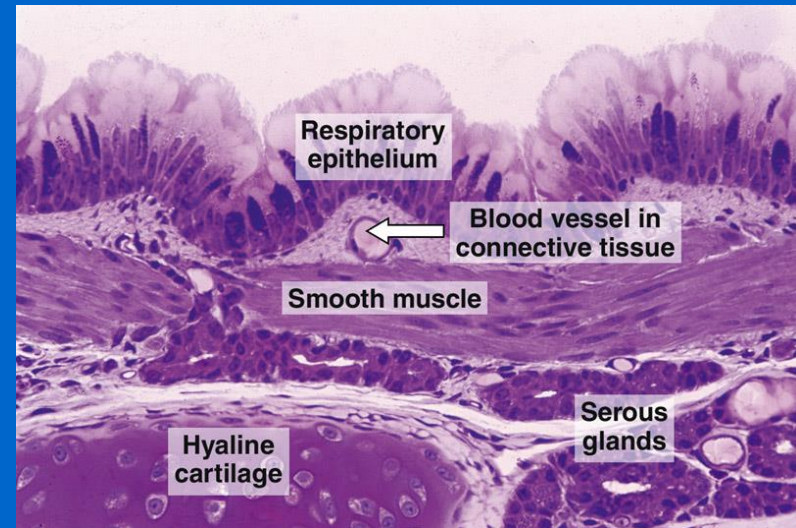
Two distinct layers of smooth muscle fibers spirally arranged in opposite direction.

# INTRAPULMONARY BRONCHUS

## (3) Submucosa:

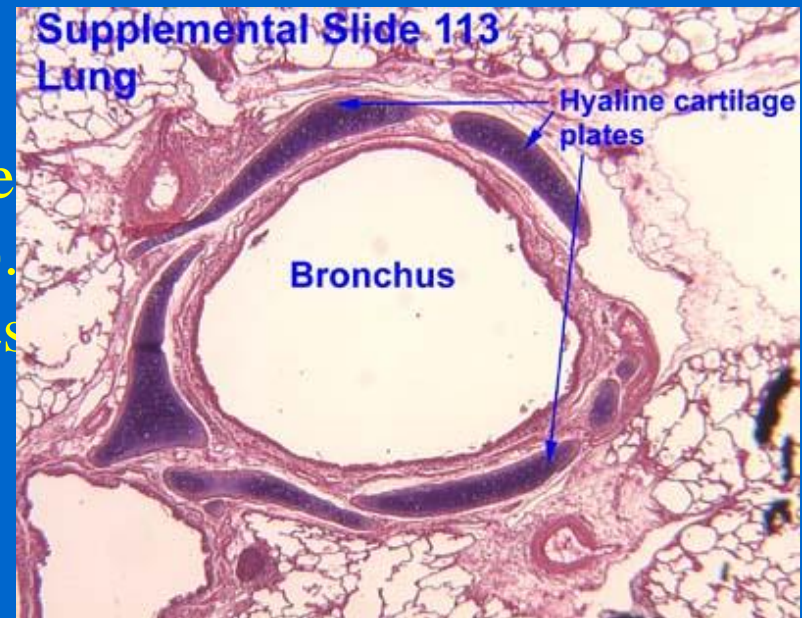
C.T. contains:

- a- Seromucous glands.
- b- Lymphoid elements.



## (4) Adventitia:

- Contents:
- a- Loose C.T.
  - b- Irregular plates of hyaline cartilage (complete layer).
  - c- Solitary lymphoid nodules





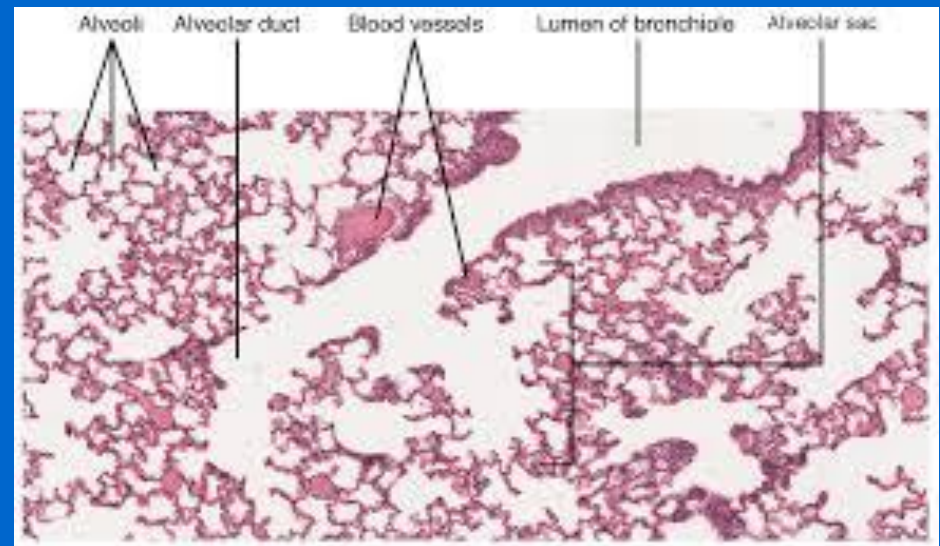
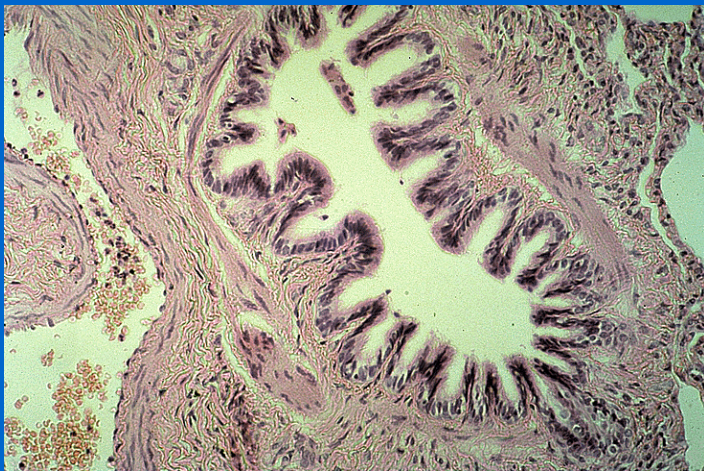
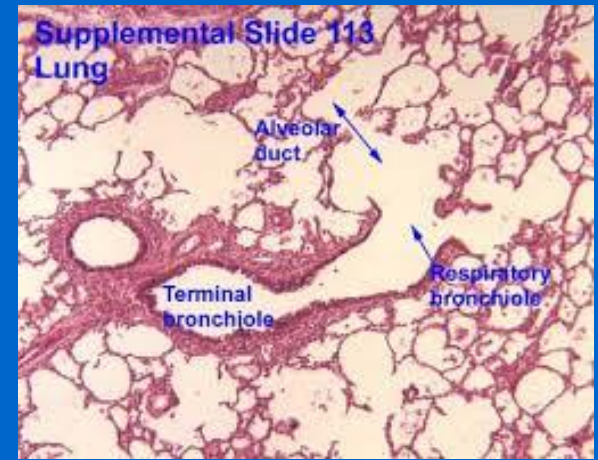
# ***BRONCHIOLES***

1- Preterminal ( 1ry ) Bronchioles (Bronchioles):

Are less than 1mm in diameter.

2- Terminal ( 2ry ) Bronchioles.

3- Respiratory ( 3ry ) Bronchioles.



# *Preterminal Bronchioles*

(1) **Mucosa:** has longitudinal folds:

**A- Epithelium:**

Simple ciliated columnar epith.  
with occasional goblet cells.



**B- Lamina propria:** C.T. rich in elastic fibers.

(2) **Smooth muscle:** 2 helically arranged smooth muscle layers.

(3) **Adventitia:** C.T.

N.B. No cartilage, No seromucous glands, No lymph nodules.



# *Terminal Bronchioles*

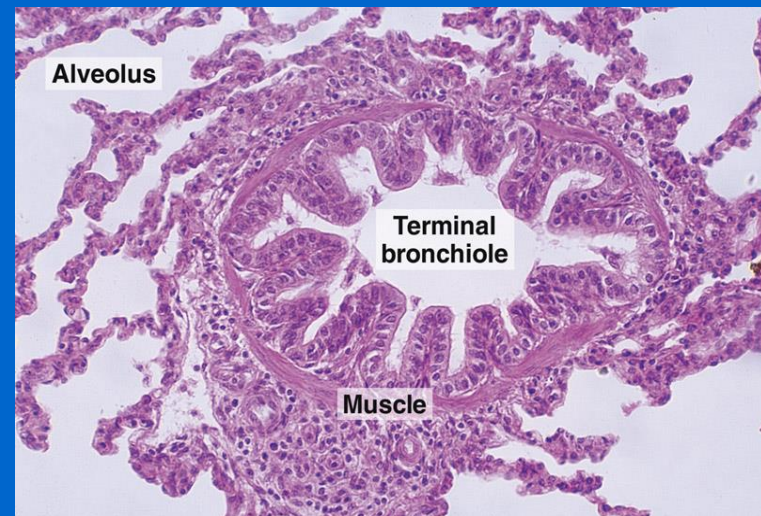
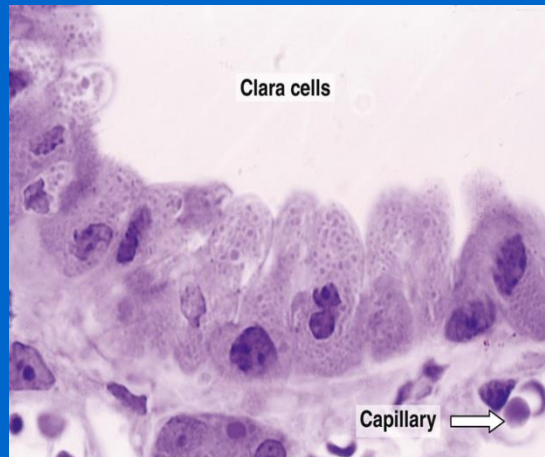
Similar structure to preterminal bronchioles, but:

## **Epithelium:**

Simple cuboidal partially ciliated epithelium

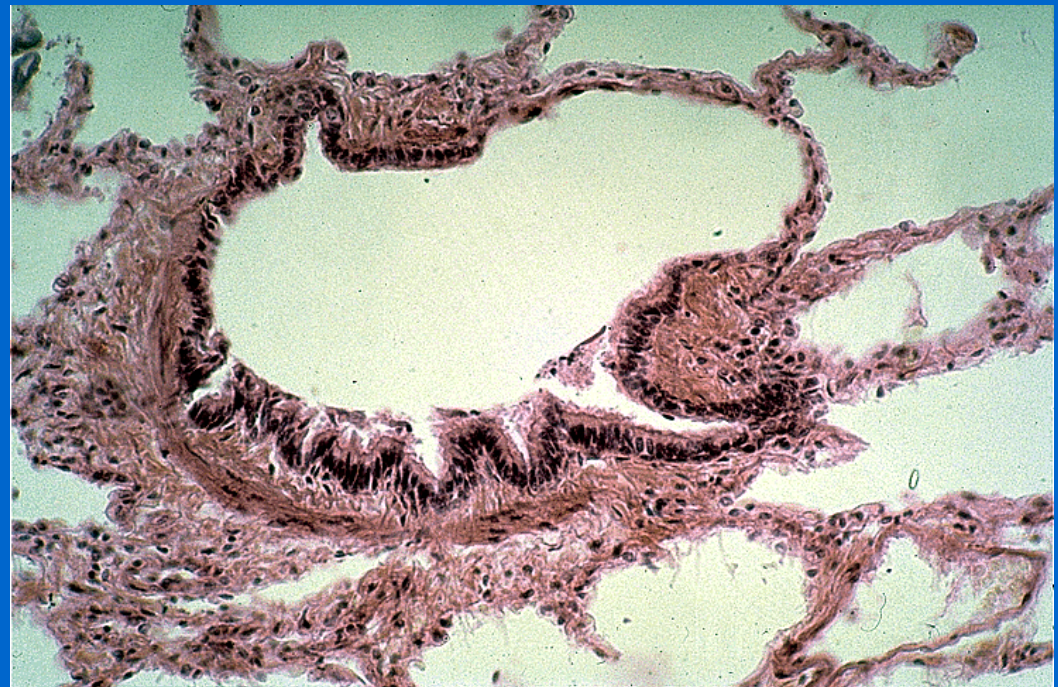
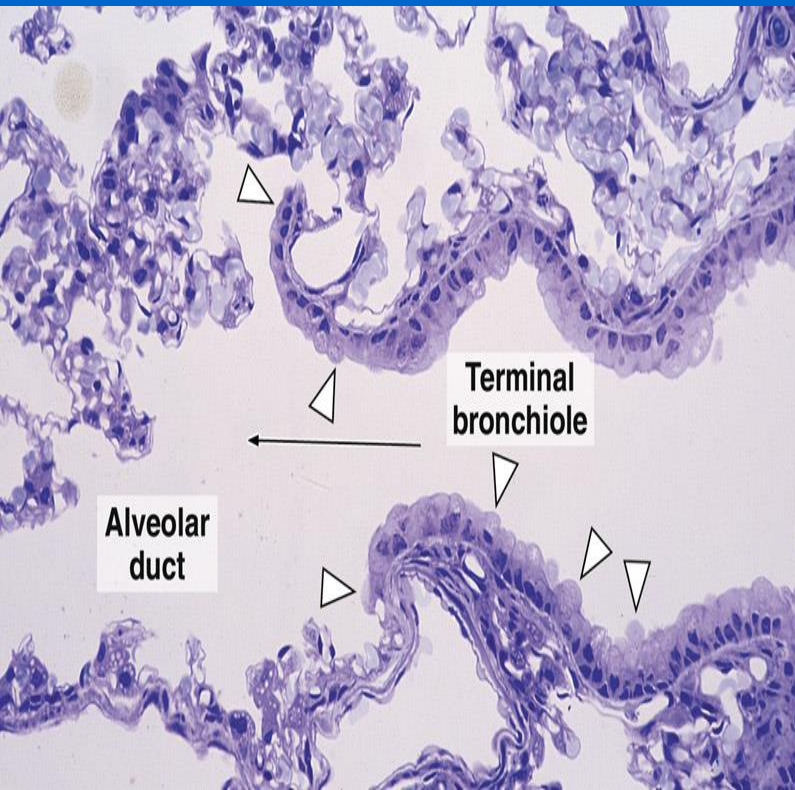
With **Clara cells** ( **With NO goblet cells**).

N.B. Are less than 0.5mm in diameter.



# *Respiratory Bronchioles*

Are similar in structure to terminal bronchioles **But:**  
their walls are interrupted by the presence of  
few pulmonary alveoli.





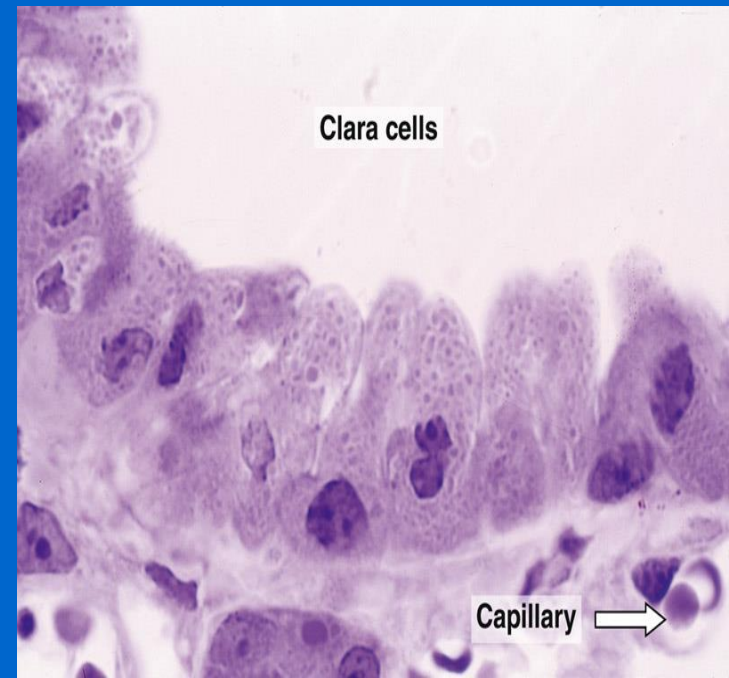
# CLARA CELLS

## Structure:

columnar cells (non ciliated).

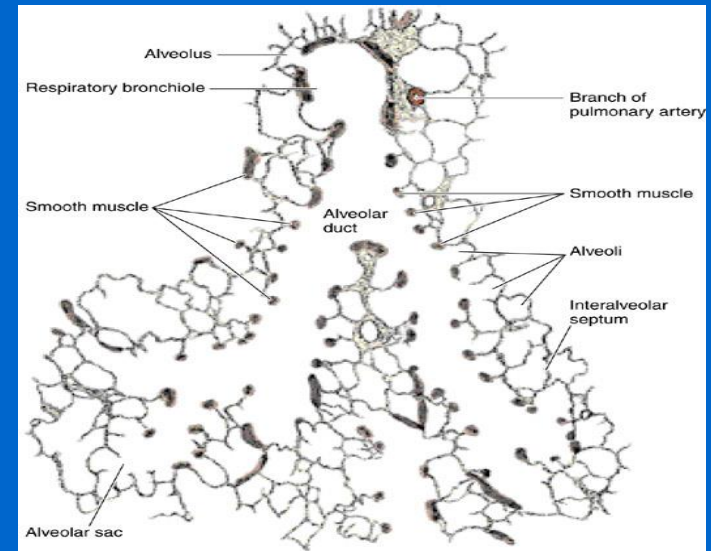
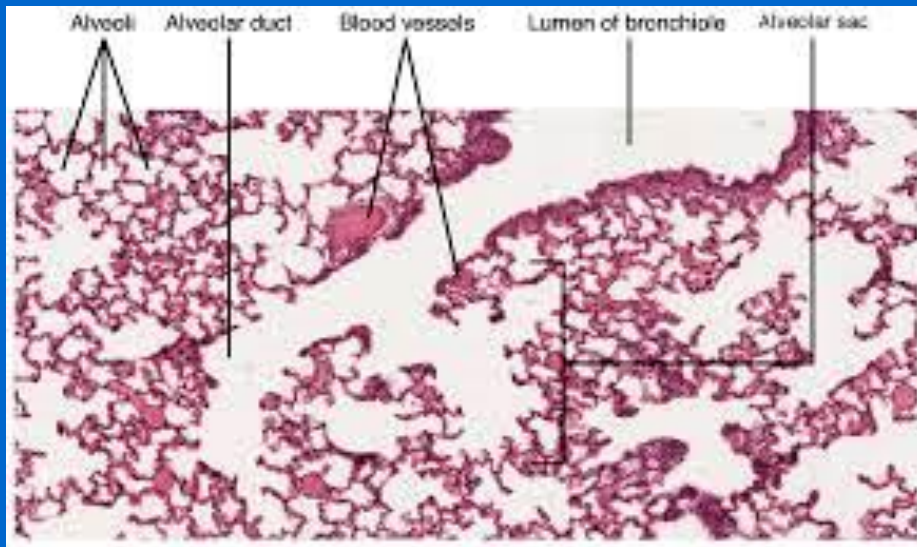
## Function:

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



# ALVEOLAR DUCTS

The wall of alveolar ducts consist almost of pulmonary alveoli.



N.B. Alveolar duct → ends by: atrium →  
communicates with: 2-3 alveolar sacs



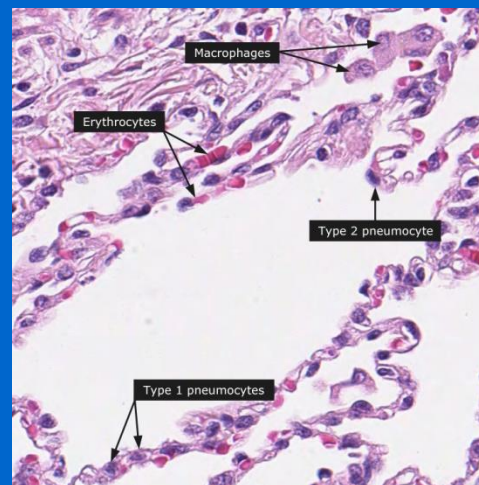
# ***PULMONARY ALVEOLI***

## **Definition:**

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

## **Topics:**

- \* Inter-alveolar septa.
- \* Alveolar epithelium.
- \* Alveolar phagocytes (Lung macrophages).



# ***INTERALVEOLAR SEPTA***

## **Definition:**

The region between 2 adjacent alveoli.



## **Components:**

### **(A) Alveolar Epithelium:**

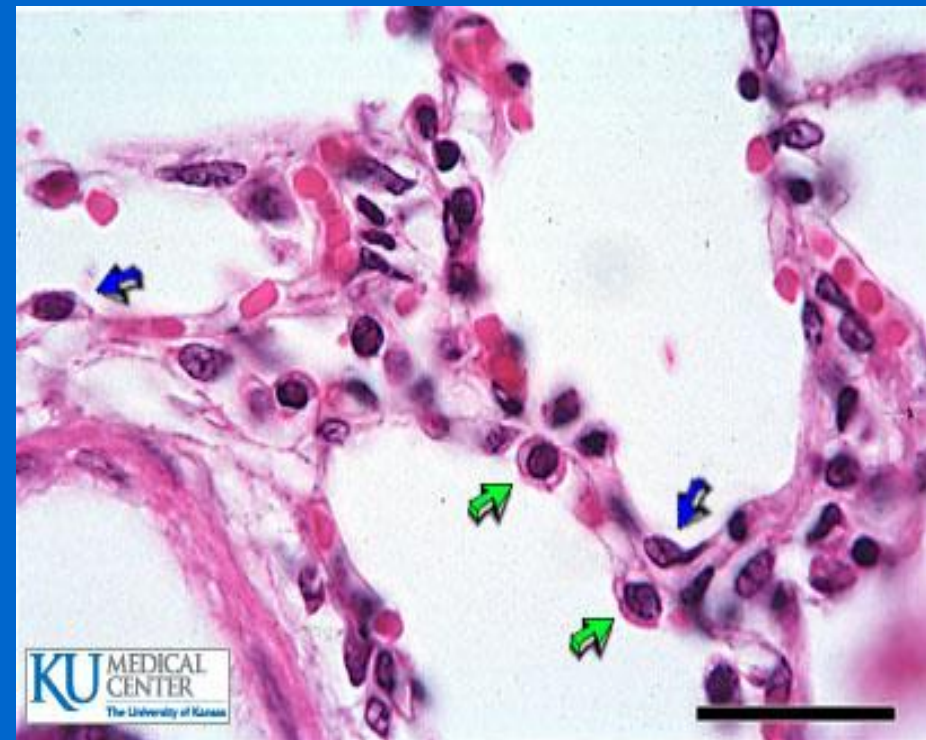
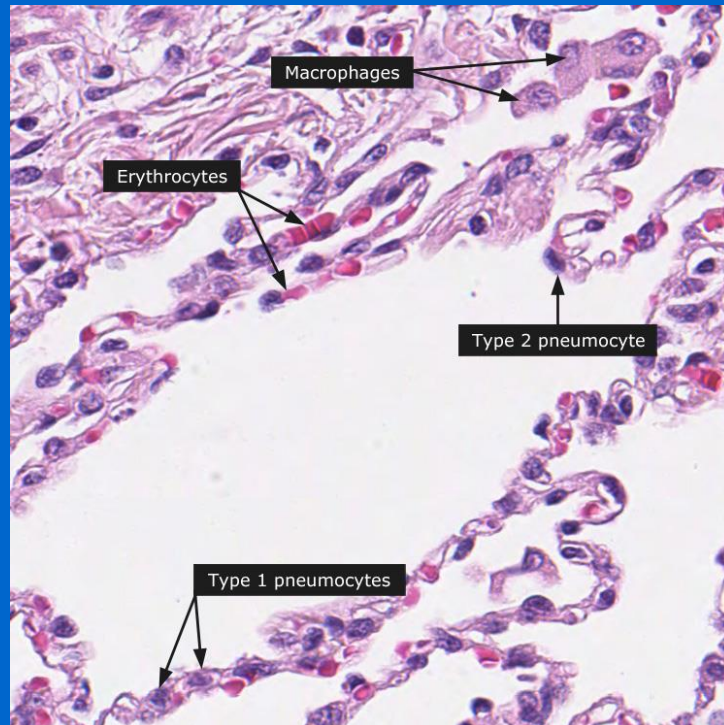
lines both sides of interalveolar septum.

### **(B) Interstitium.**

# ALVEOLAR EPITHELIUM

## (1) Type I Pneumocytes

## (2) Type II Pneumocytes



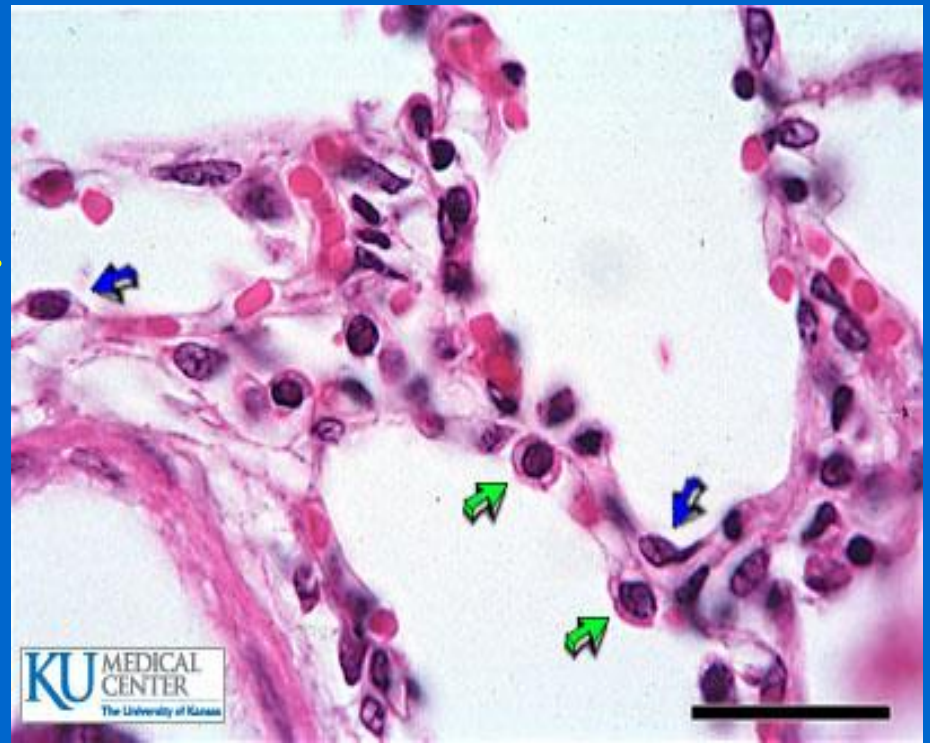
# ALVEOLAR EPITHELIUM

## (1) Type I Pneumocytes:

- line **95%** of the alveolar surface.
- **Count:** less numerous than type II pneumocytes.
- **L/M:** simple squamous epith.

## -Function:

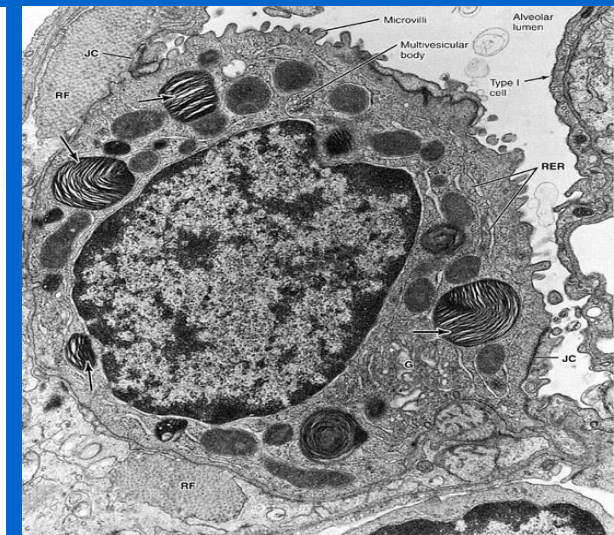
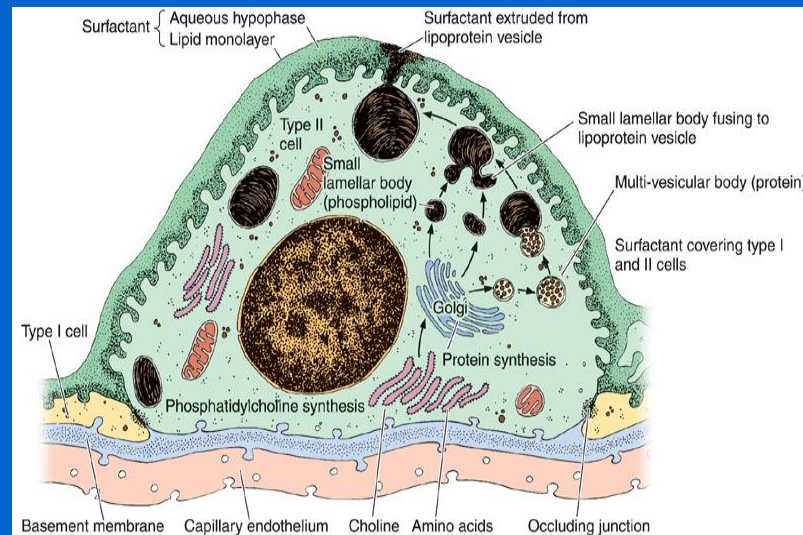
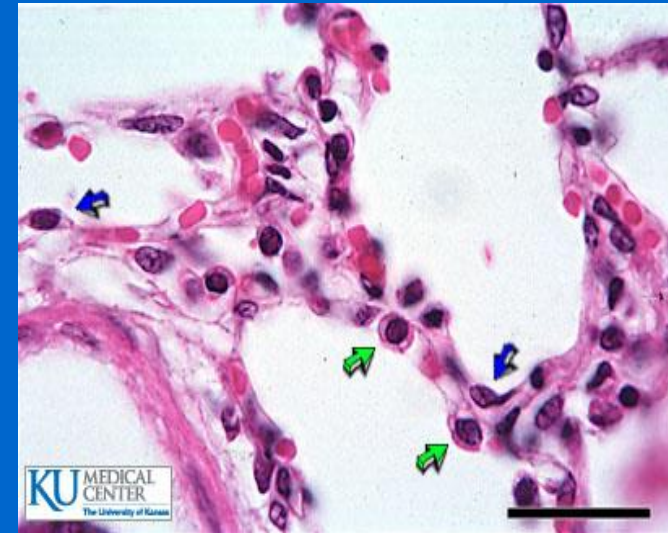
Exchange of gases.





## (2) Type II Pneumocytes:

- Line 5% of the alveolar surfaces.
- Are more numerous than type I pneumocytes.
- Are cuboidal or rounded cells, With Foamy cytoplasm.
- Nucleus: central & rounded.
- The cytoplasm contains membrane-bound Lamellar bodies (contain pulmonary surfactant).



# Type II Pneumocytes:

## **Function:**

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.

# Interstitium of interalveolar septa

(1) Continuous Pulmonary Capillaries.

(2) Interstitial C.T.:

a- C.T. Fibers: elastic fibers &  
type III collagen (reticular fibers).

b- C.T. Cells: Fibroblasts, Macrophages,  
Mast cells, Lymphocytes.

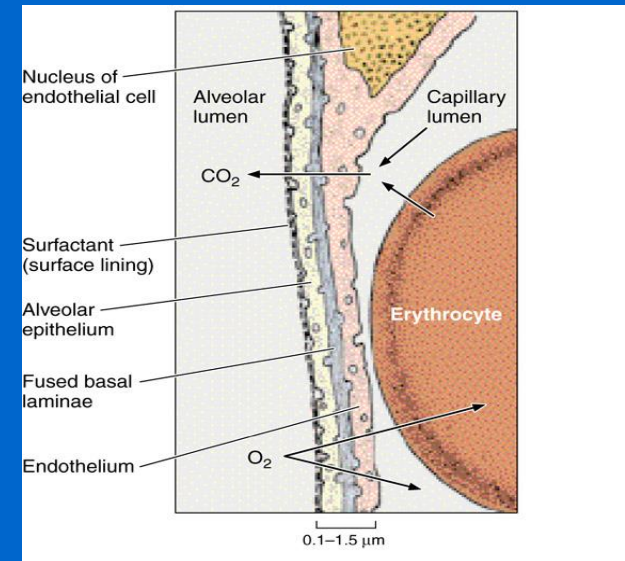
# ***BLOOD-GAS BARRIER*** ***(BLOOD-AIR BARRIER)***

## **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)**

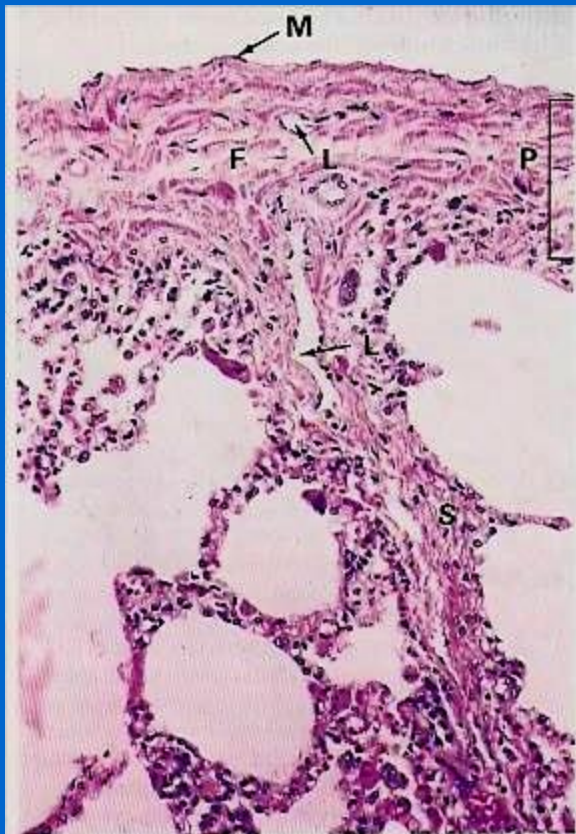
## *Sites:*

- (1) In the lumen of pulmonary alveoli.
- (2) 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.

# 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**

**THANK YOU**

