

# Respiratory System histology lab

Hind Shaker Suhwail

# Checklist

Nose: lining epithelium, submucosa with blood vessels, cartilage

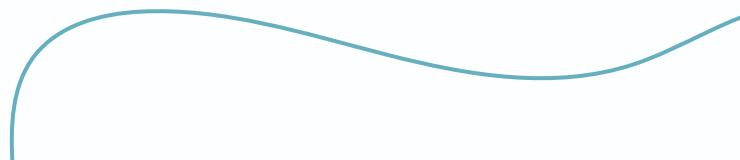
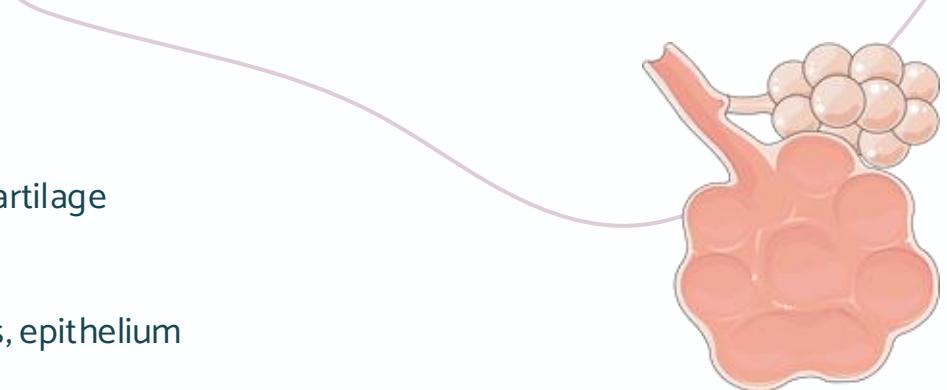
Larynx: ventricle, false vocal folds, glands, true vocal folds, epithelium

Trachea: lining epithelium, cartilage, glands

Primary bronchi (extrapulmonary): lining epithelium, cartilage plates

Secondary bronchi (lobar / intrapulmonary): lining epithelium, cartilage plates, lung tissue, glands, smooth muscle

Tertiary bronchi (bronchopulmonary segments): lining epithelium, ↓ cartilage (1-2 plates), glands, smooth muscle



# Checklist

Large conducting bronchioles: diameter decreases, no cartilage, lining epithelium changes, glands present, smooth muscle

Small / terminal bronchioles: no cartilage, simple epithelium (ciliated + Clara cells), no glands, increased smooth muscle

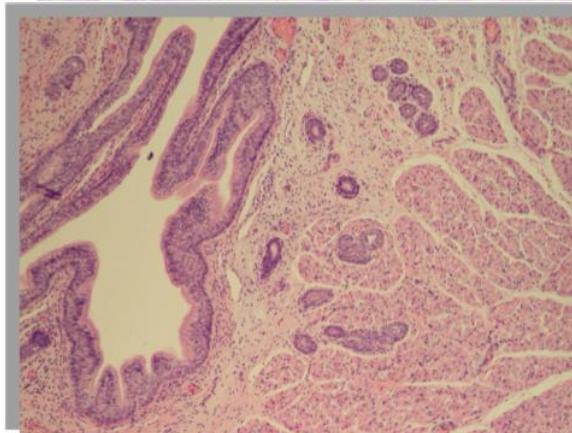
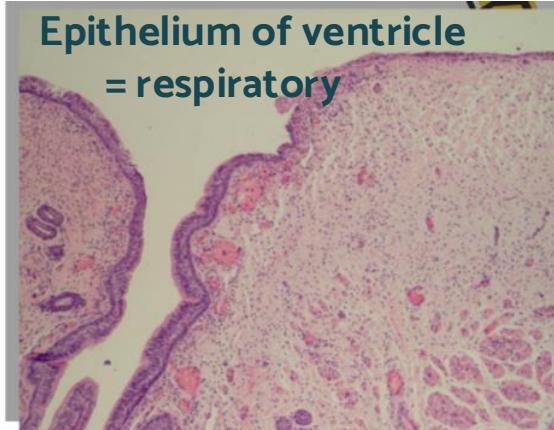
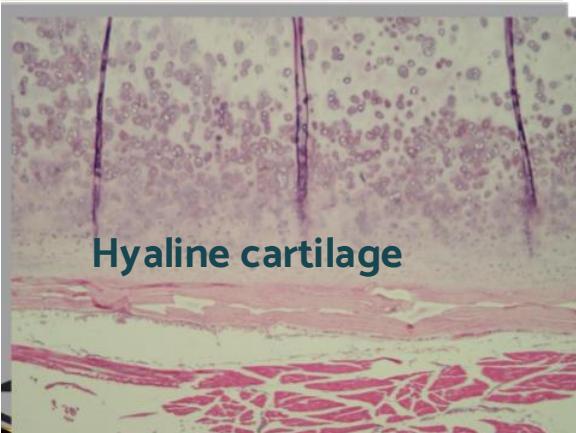
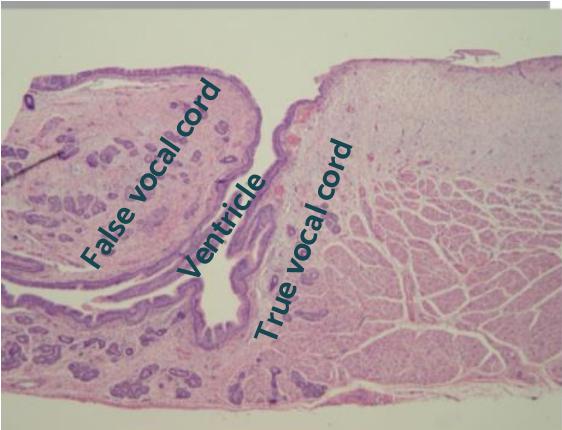
Respiratory bronchioles: epithelium transitions to simple squamous, open into alveolar ducts

Lung tissue (alveolar region): alveolar duct, alveolar sac, alveoli, smooth muscle

Lung tissue (alveolar wall): septum and alveolar wall, type I alveolar cells, type II alveolar cells, endothelial cells, respiratory membrane with RBCs

Pleura: lining epithelium, dust cells (alveolar macrophages)

# Larynx

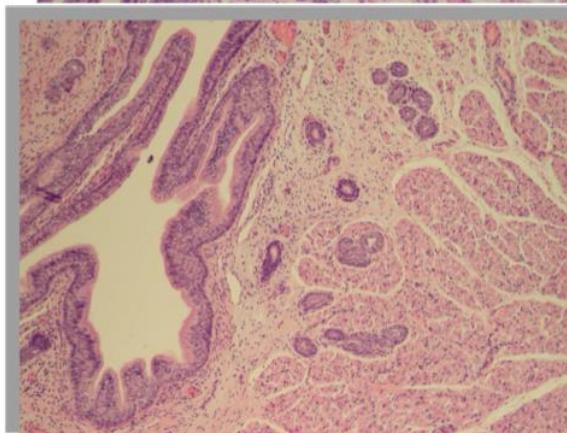
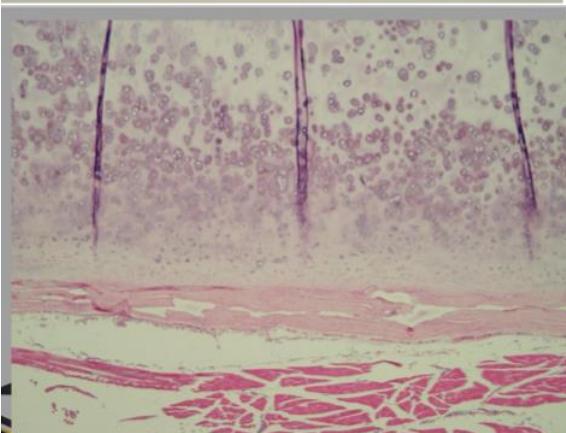
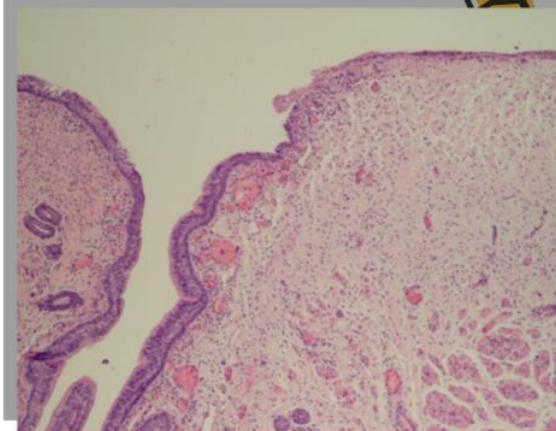
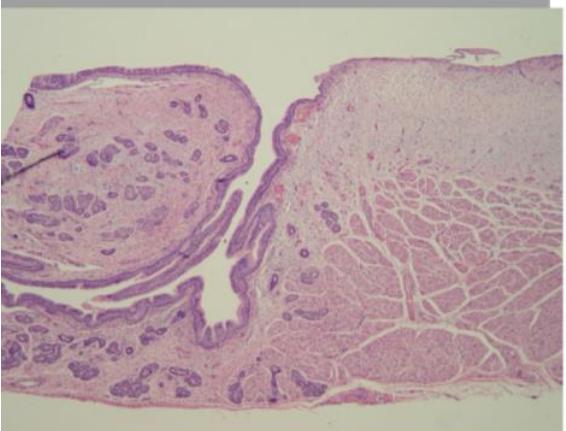


The larynx is composed histologically of the following layers:

1. Mucosa
2. Cartilage
3. Ligaments (fibroelastic tissue)
4. Muscles
5. External connective tissue

Longitudinal section that passes through ventricle

# Larynx



## General Lining Epithelium

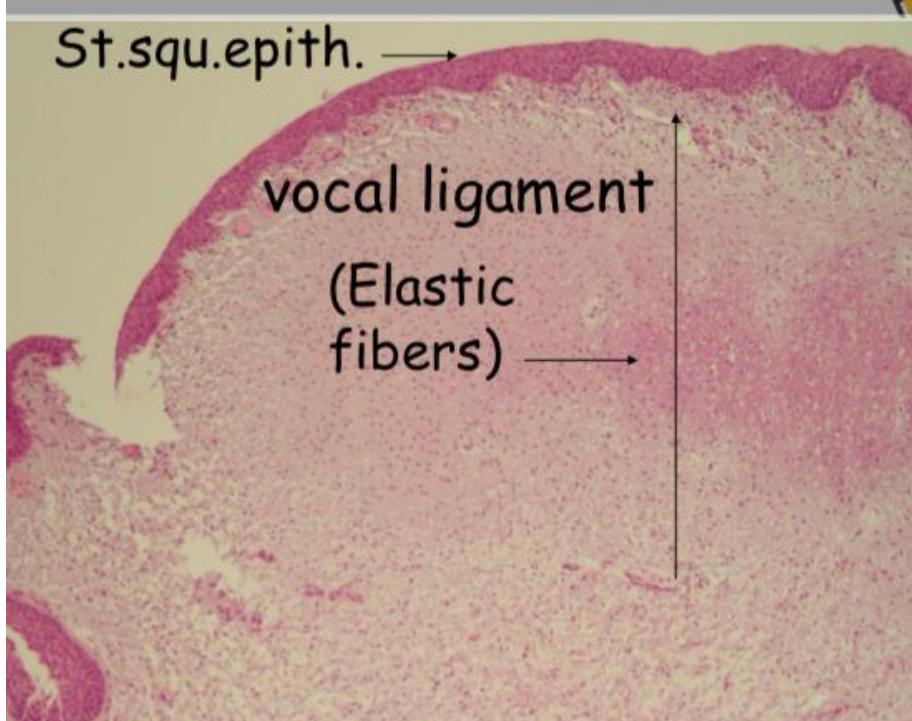
The larynx is lined predominantly by respiratory mucosa:

## Pseudostratified ciliated columnar epithelium

Contains goblet cells

This lining is present in most regions of the larynx

# Larynx – true vocal cords



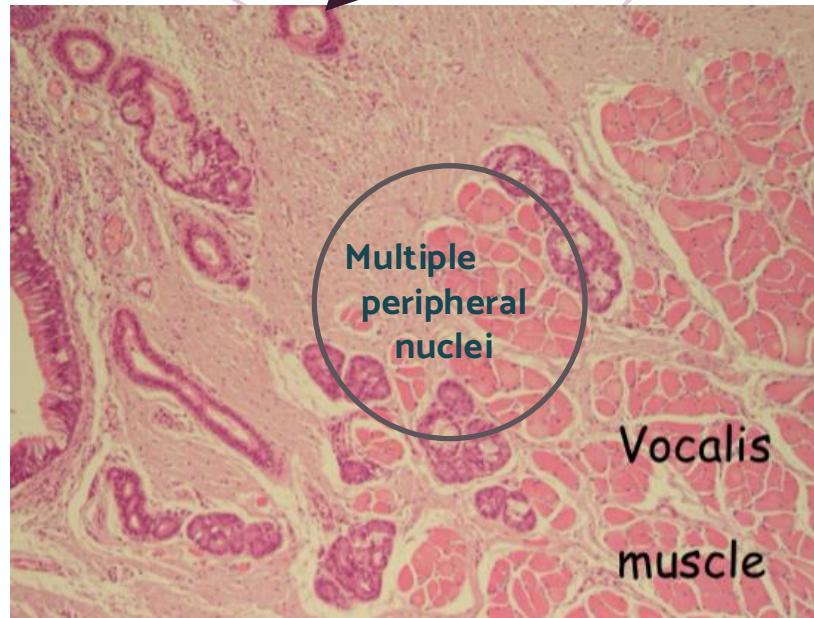
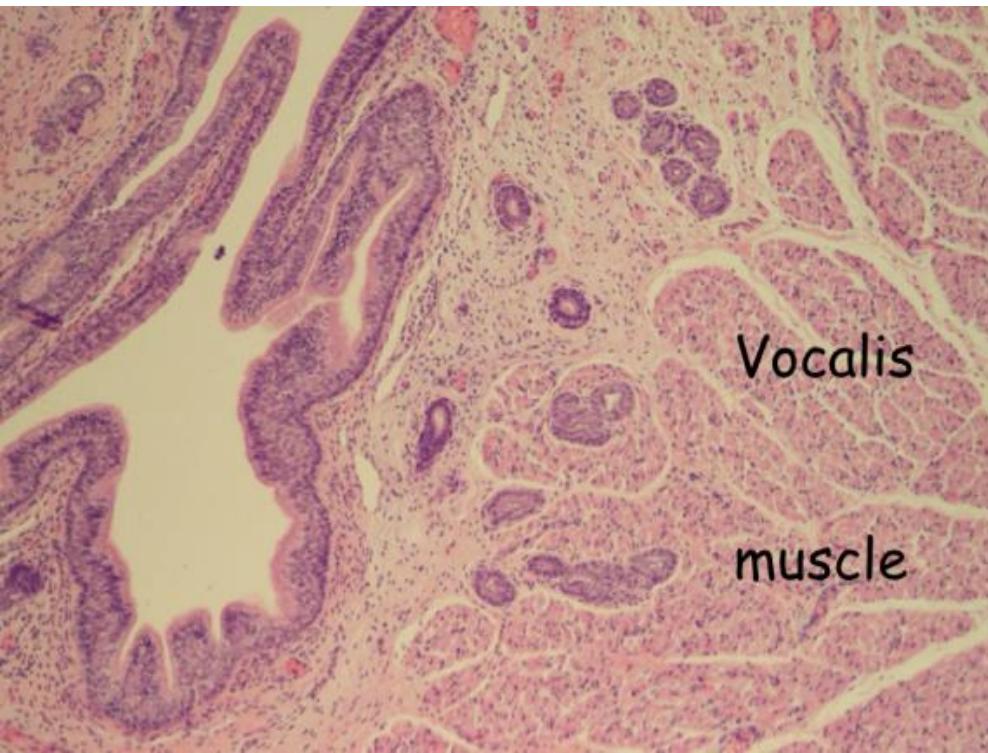
epithelium:

**Stratified squamous non-keratinized epithelium**  
to protect against mechanical stress, friction, and  
vibration, while remaining moist and functional  
(regeneration)

**Vocal ligament Derived from the  
upper free border of cricothyroid  
(conus elasticus) membrane**

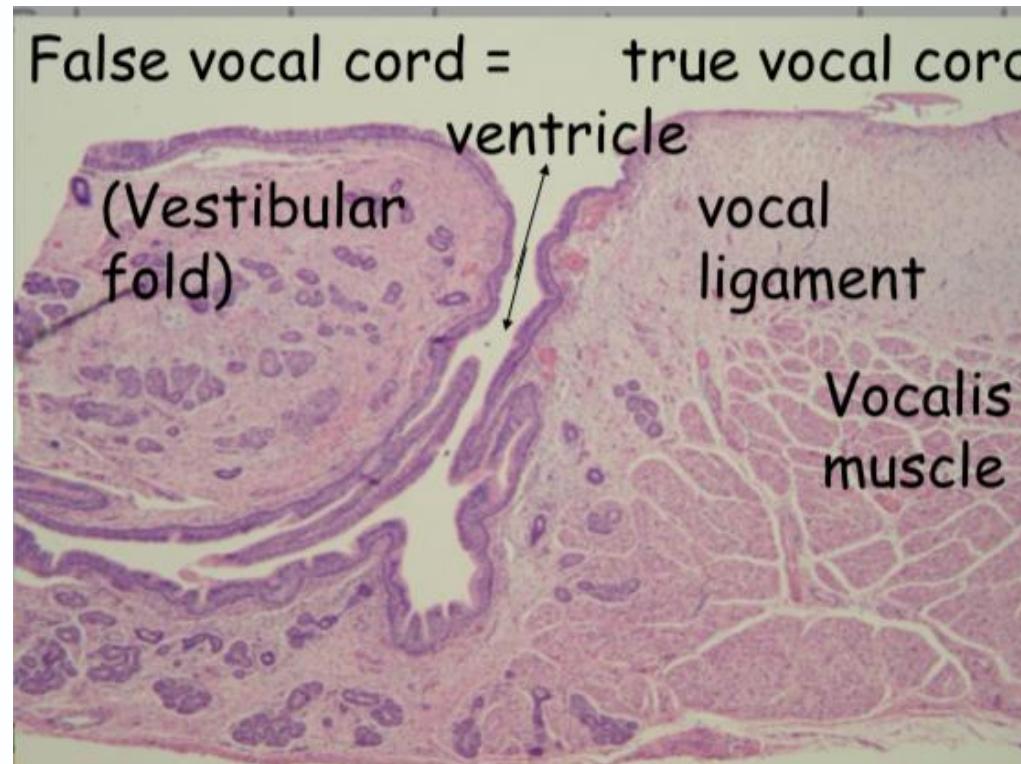
**Contains the vocalis muscle**

# Larynx – true vocal cords



The vocalis muscle is the medial part of the thyroarytenoid muscle  
It lies within the true vocal cord (vocal fold)  
Runs parallel to the vocal ligament  
**Striated muscle =multiple peripheral nuclei**

# Larynx

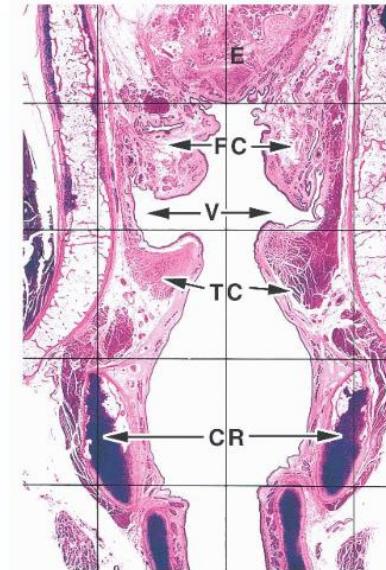
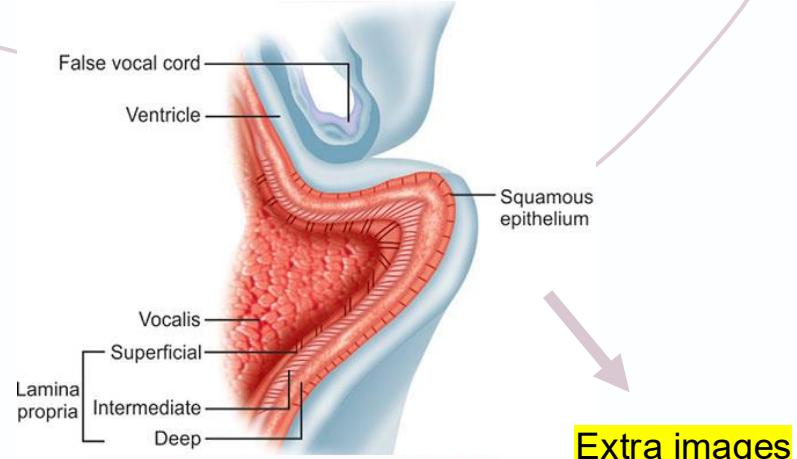
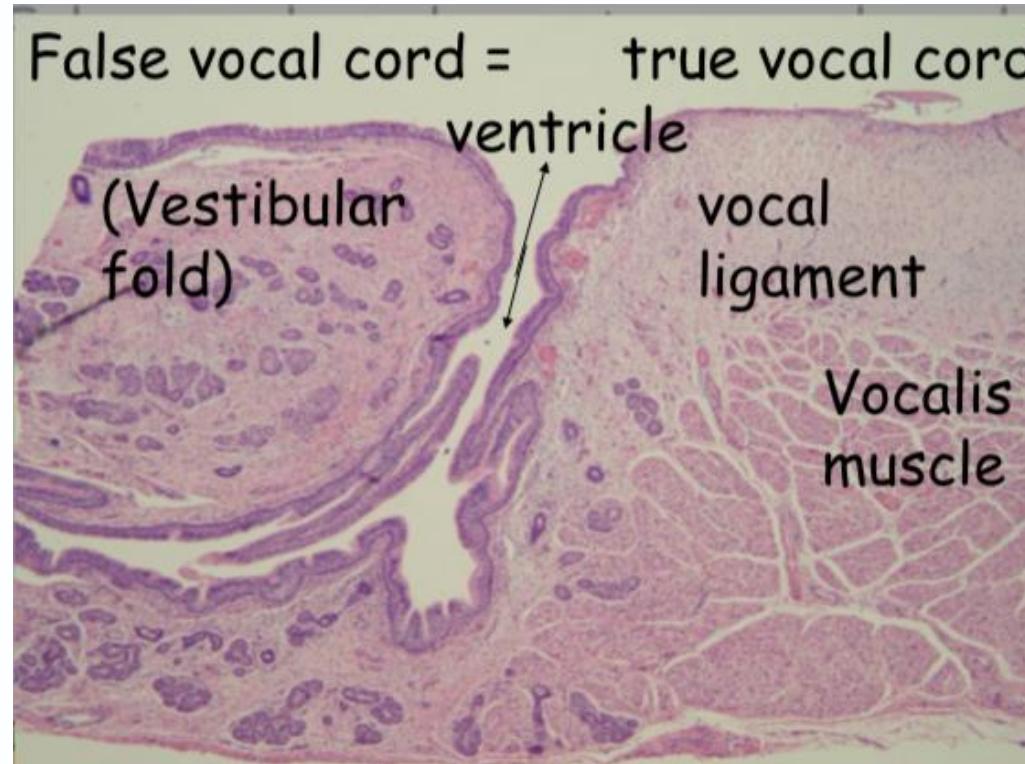


1- False vocal cord = respiratory epithelium ; psuedostratified ciliated & goblet cells continues throughout the ventricle

2- True vocal cord : stratified squamous non keratinized

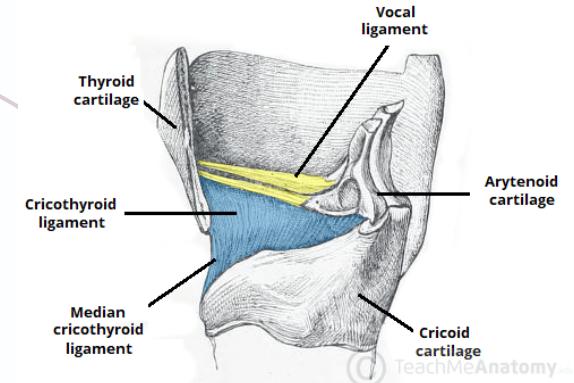
Components : lining epithelium , ligament , vocalis muscle , NO submucosa

# Larynx



Extra images

# Larynx – true vocal cords

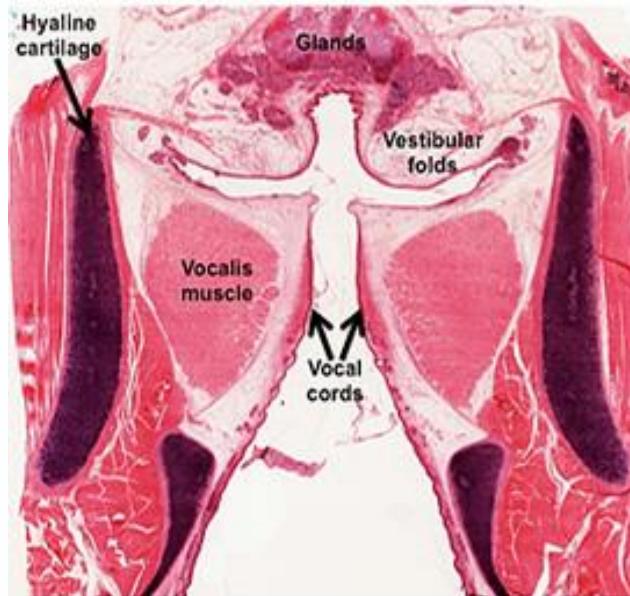


Origin (posterior):

Vocal process of the arytenoid cartilage

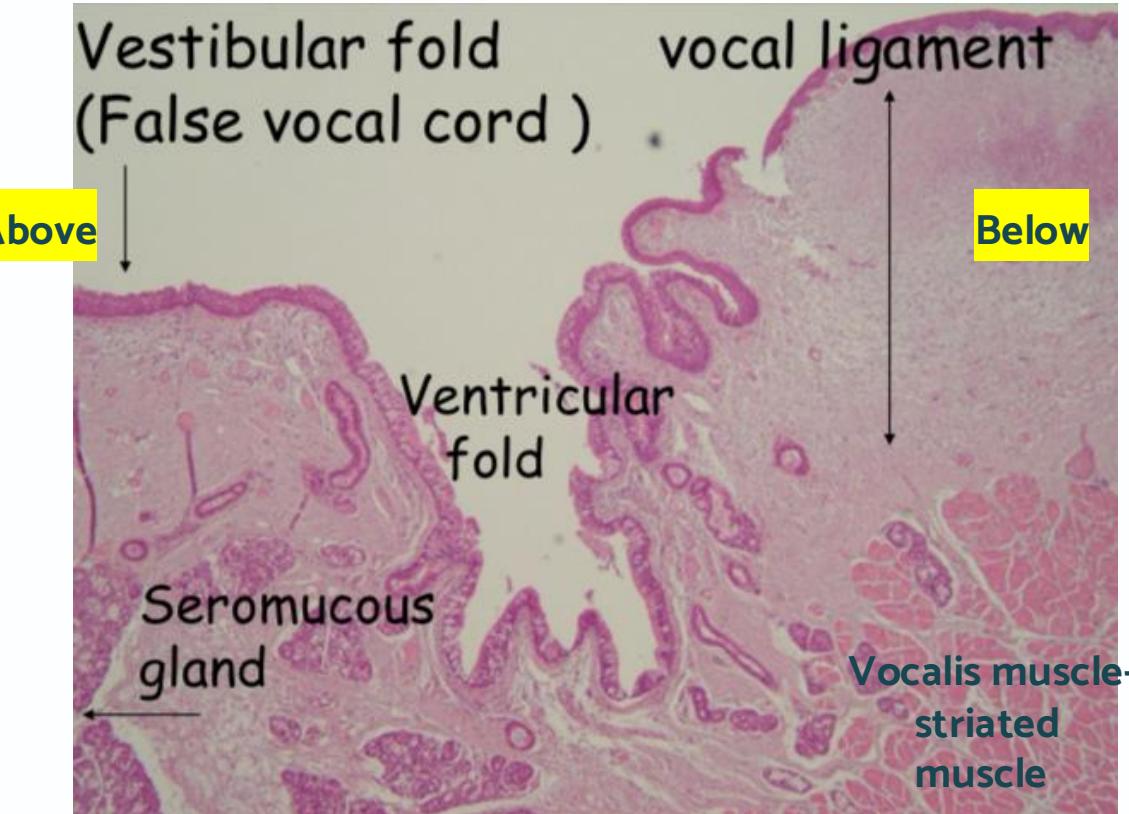
Insertion (anterior):

Inner surface of the thyroid cartilage  
(near the thyroid angle)



Extra images

# Larynx



## Serous Glands in the FALSE VOCAL CORD

Serous (and seromucous) glands are present in the larynx

They are located in the submucosa

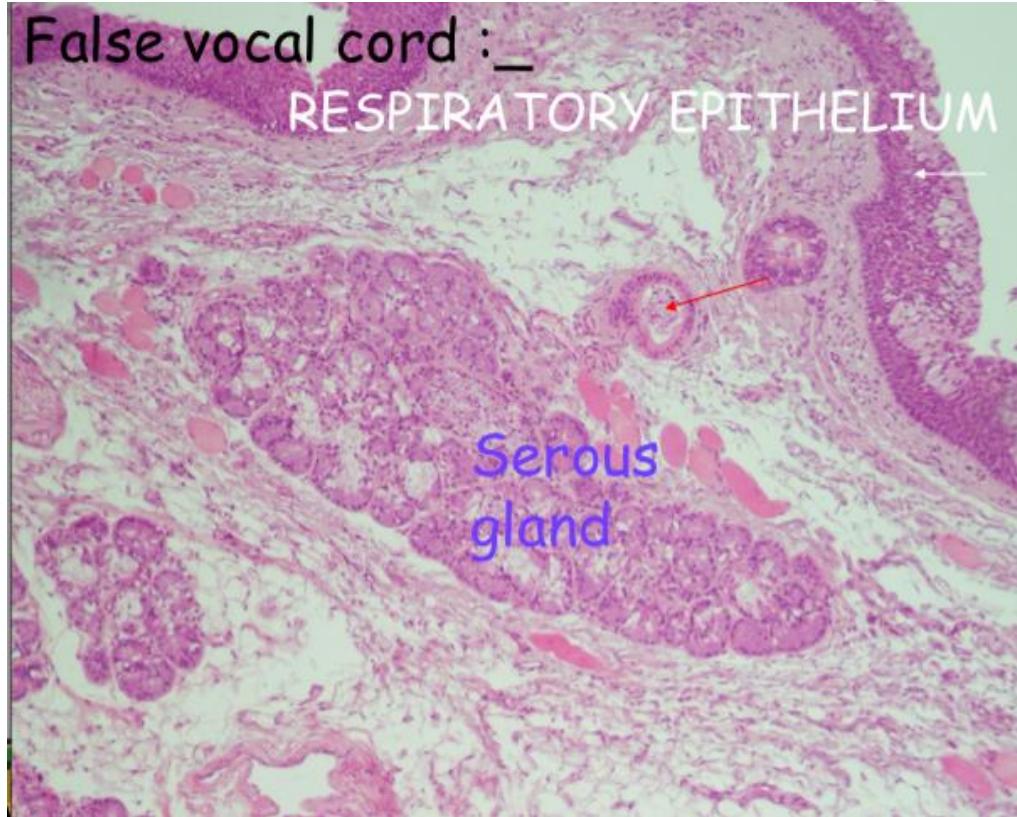
Main Location: Laryngeal Saccule  
deep to false vocal cord

False vocal cord :\_

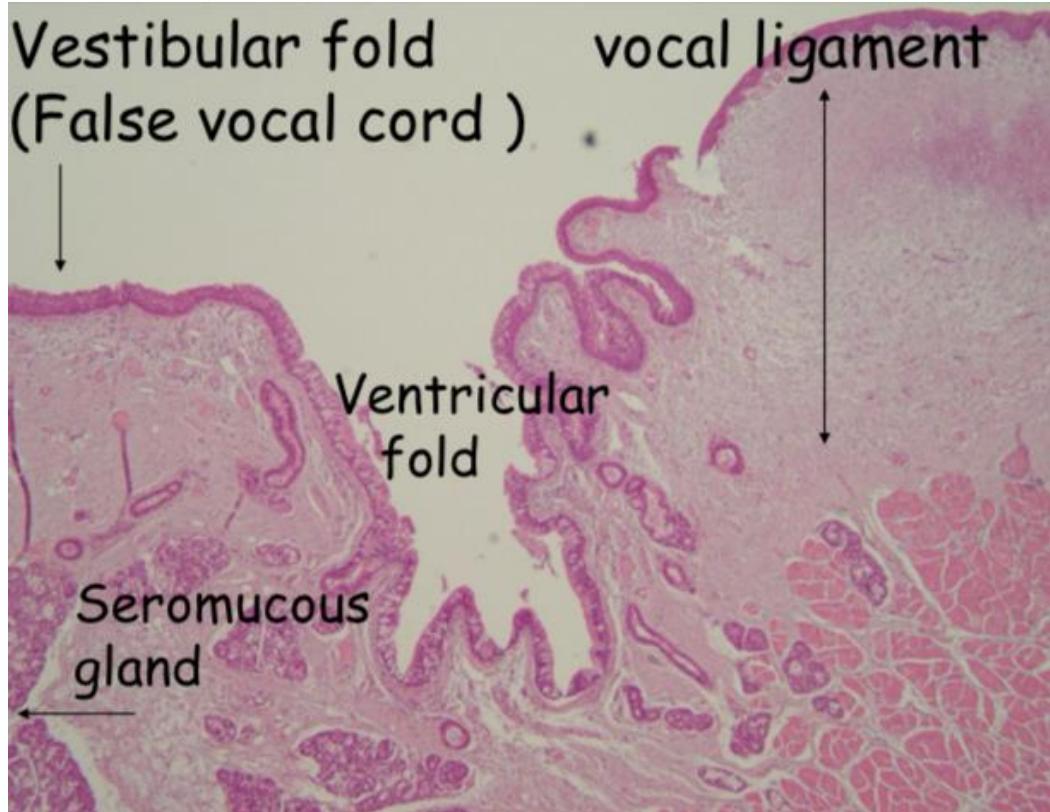
RESPIRATORY EPITHELIUM

Serous  
gland

Seromucous  
gland



# Larynx



## Cough Reflex

Incomplete closure → particles enter inlet → coughing

## Mechanism:

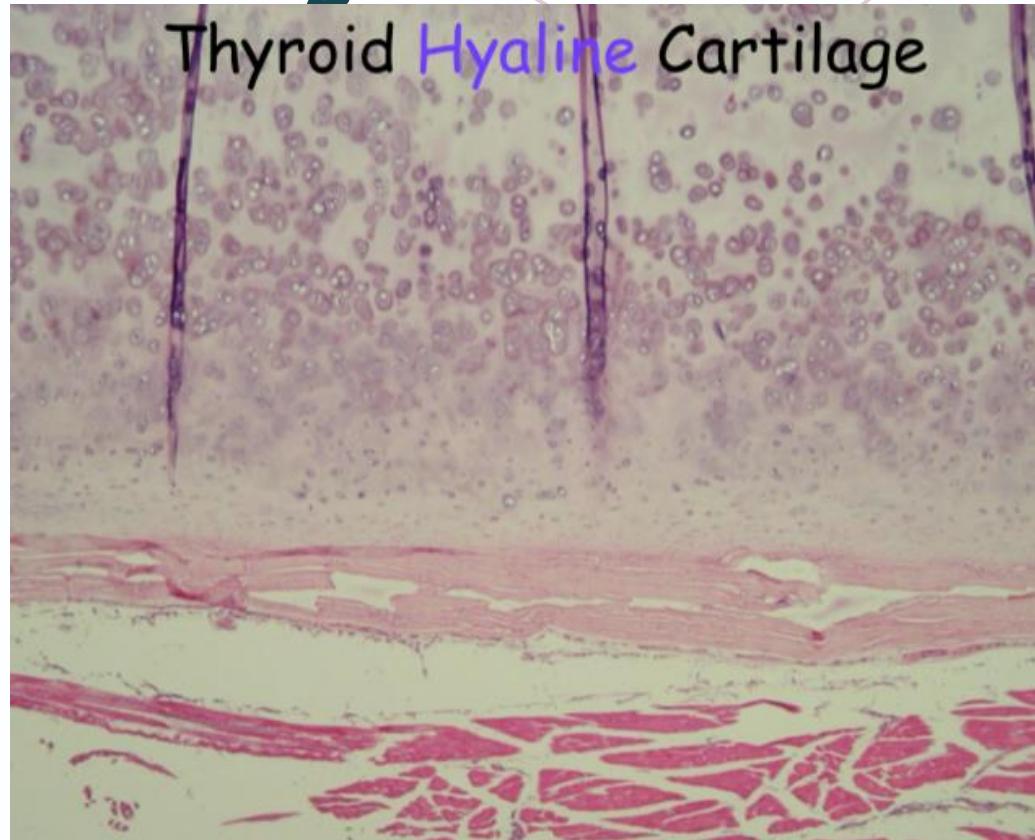
Adduction of true vocal cords  
Compression of air below cords  
Sudden opening → **forceful air expulsion**

## Voice Production (Phonation)

True vocal cords adduct  
Expired air causes vibration → sound

# Larynx – thyroid cartilage

Hyaline cartilage contains chondrocyte which is found inside lacunae



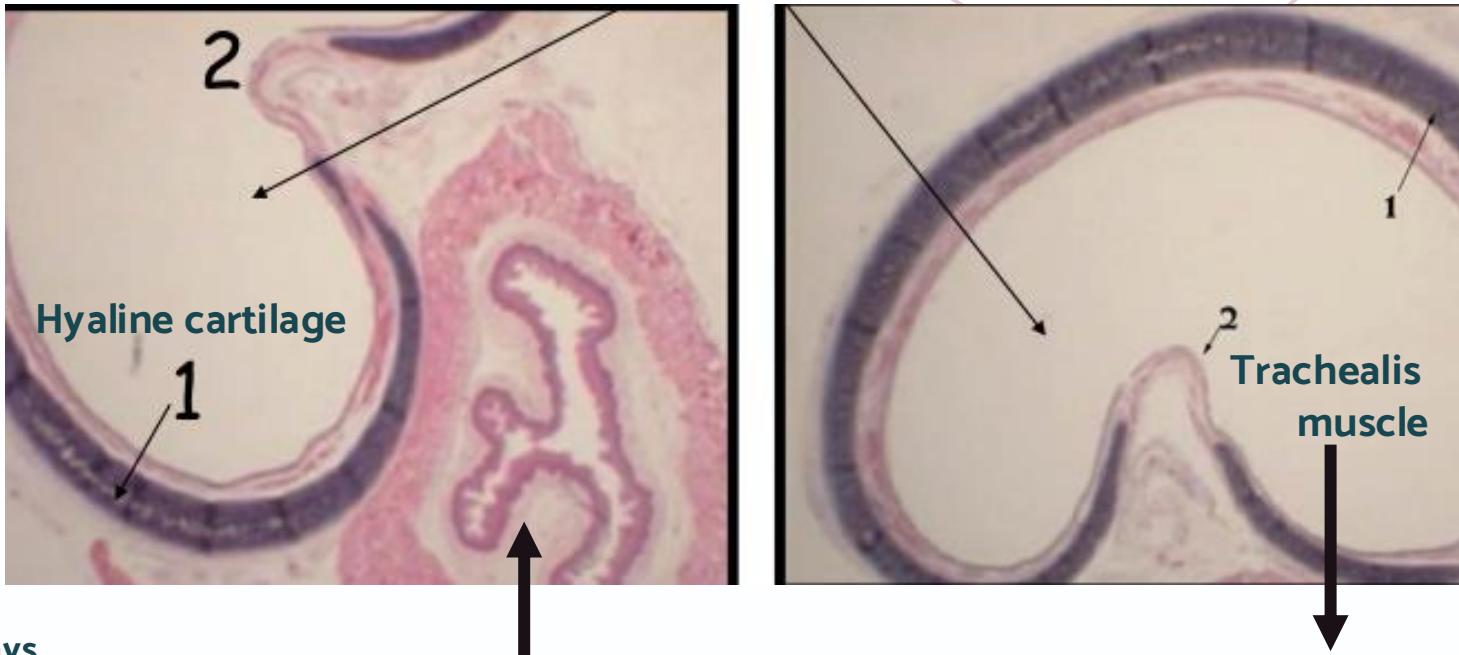


## RESPIRATORY EPITHELIUM

**pseudostratified ciliated  
columnar epithelium with  
goblet cells**

**Found throughout the  
ventricle and false vocal  
cord**

# C- shape trachea – transverse section



Trachea's lumen is always open for passage of air , because of the C- shaped cartilage

Esophagus posteriorly  
Collapsed lumen ; opens during deglutition

Smooth muscle , innervated by autonomic nervous system

# C- shape trachea – transverse section



Lamina propria : found  
in both trachea &  
esophagus  
Contains glands

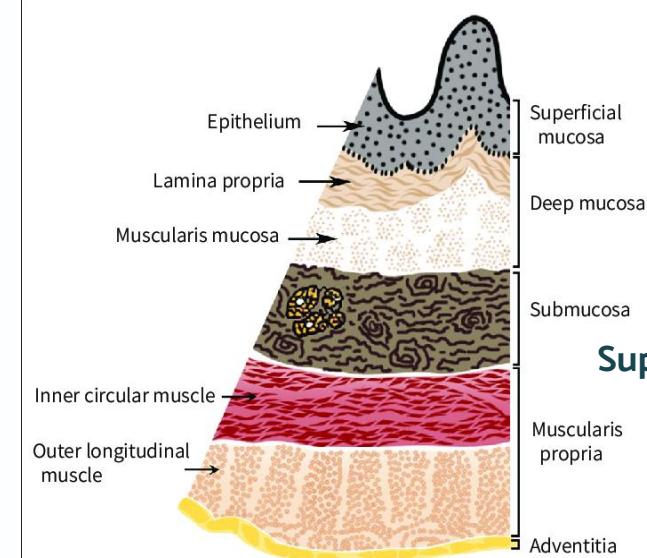
Esophagus : stratified squamous  
non keratinized

Trachea : pseudosratified  
ciliated with goblet cells

Muscularis mucosa : Also found in both esophagus & trachea ; thin ribbon of smooth muscle

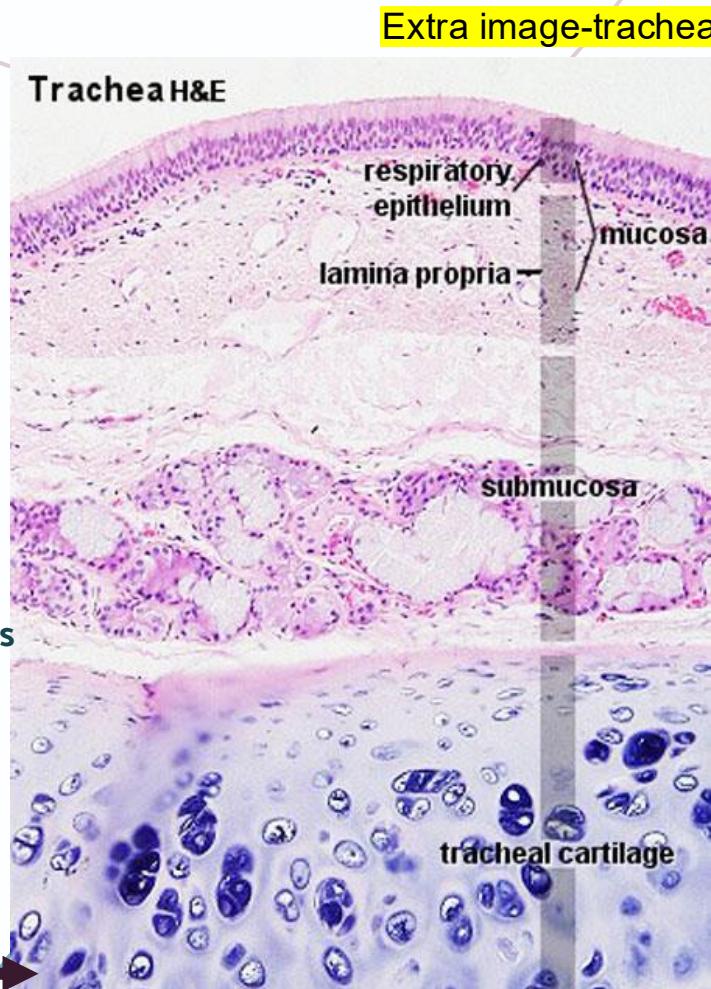
Submucosa : found in both esophagus & trachea ; BVs , lymphatics & CT , you may find glands as well especially in esophagus

Extra image-esophagus

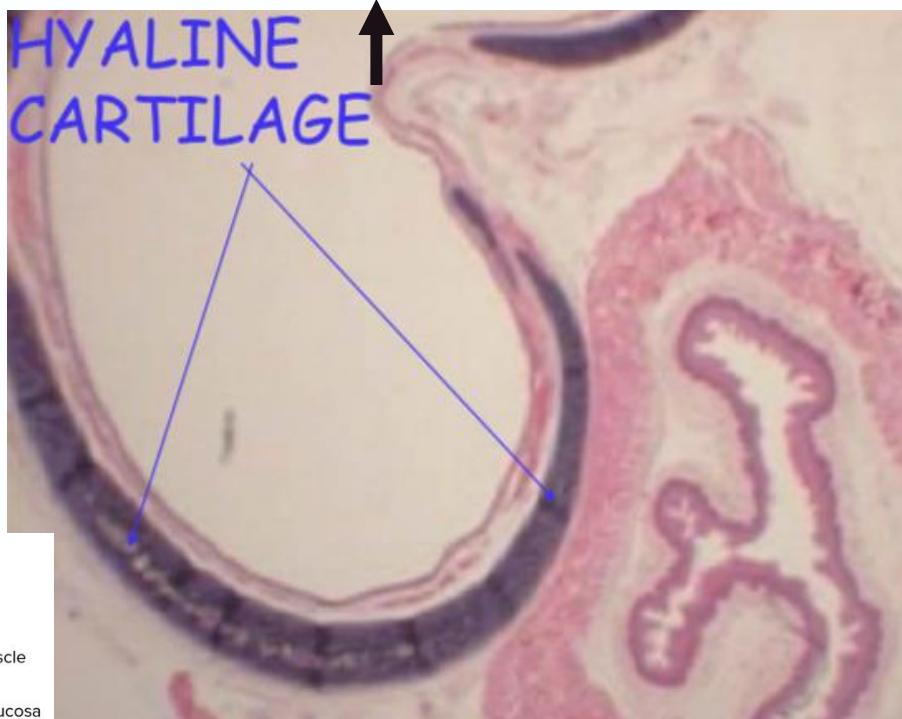


**Supportive layer :**  
**inner circular & outer longitudinal**

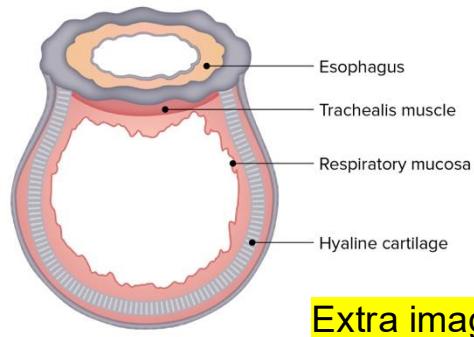
**Supportive layer : has smooth muscle**



# Trachealis ( smooth ) muscle



The trachealis muscle is a band of smooth muscle located on the posterior wall of the trachea, connecting the free ends of the C-shaped tracheal cartilages



Extra image

## TRACHEALIS (SMOOTH) MUSCLE





Layers

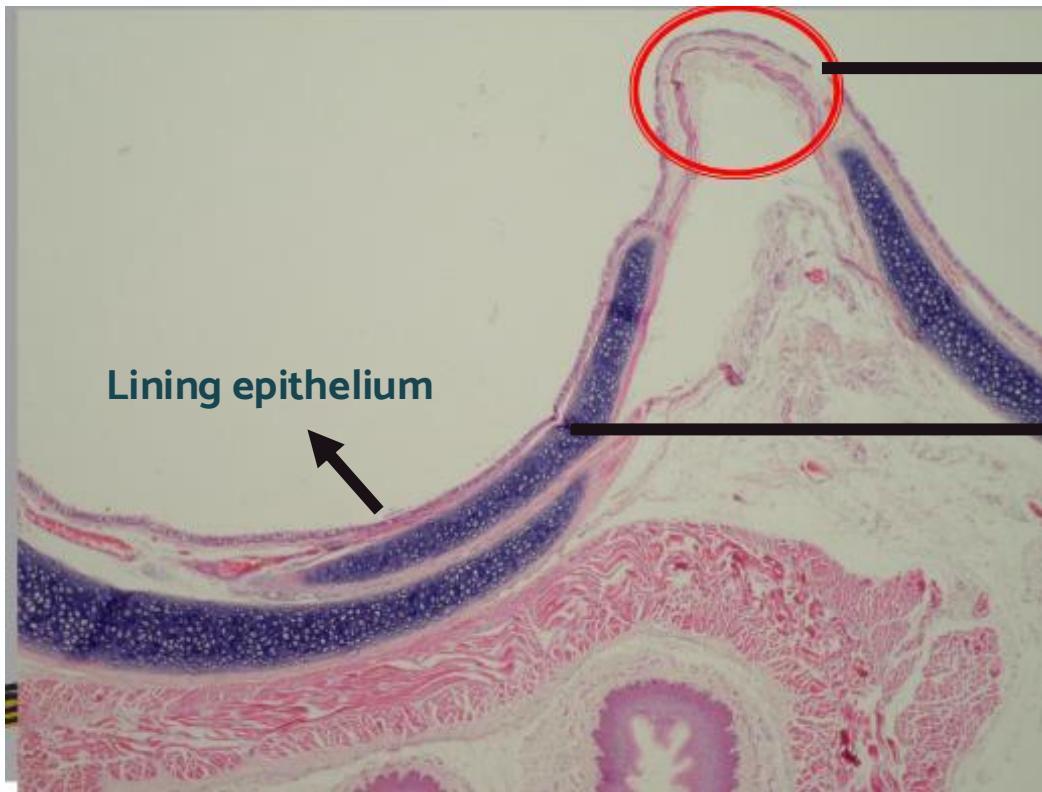
psuedostratified with goblet cells

Lamina propria

Muscularis mucosa

Supportive layer : hyaline & smooth muscle

Connective tissue – adventia

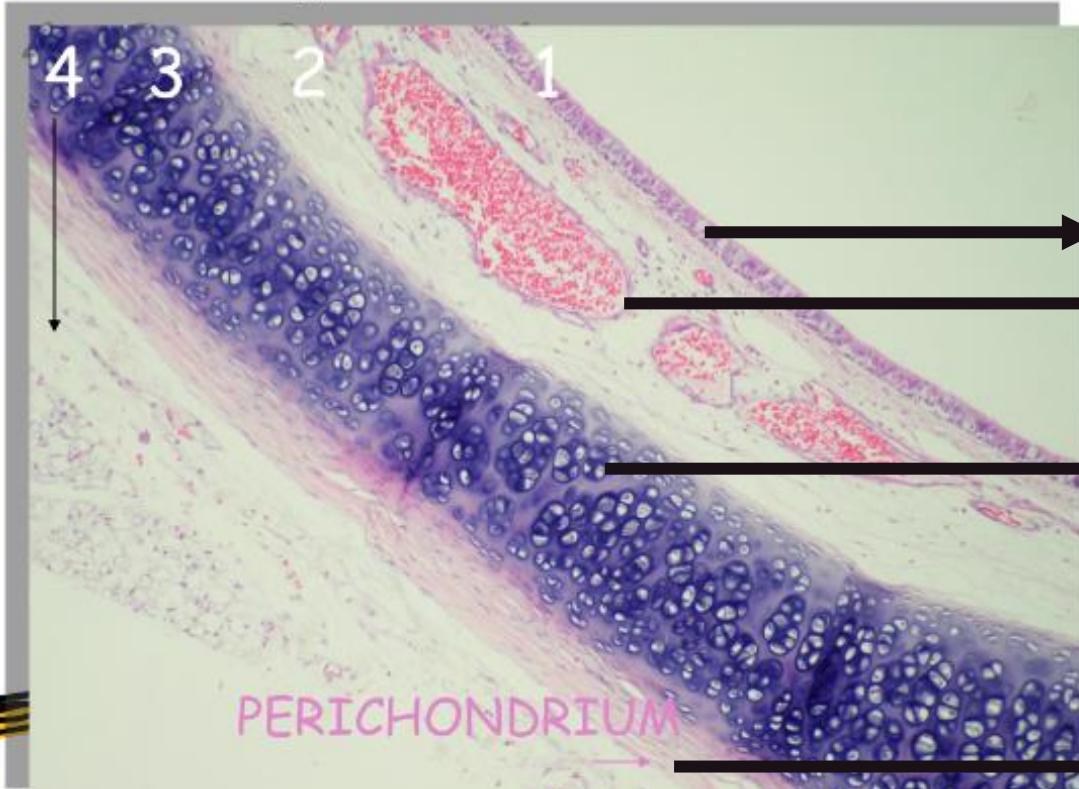


Lining epithelium

Trachealis smooth muscle

Hyaline cartilage

# MUCOSA, SUBMUCOSA,CARTILAGE,ADVENTITIA

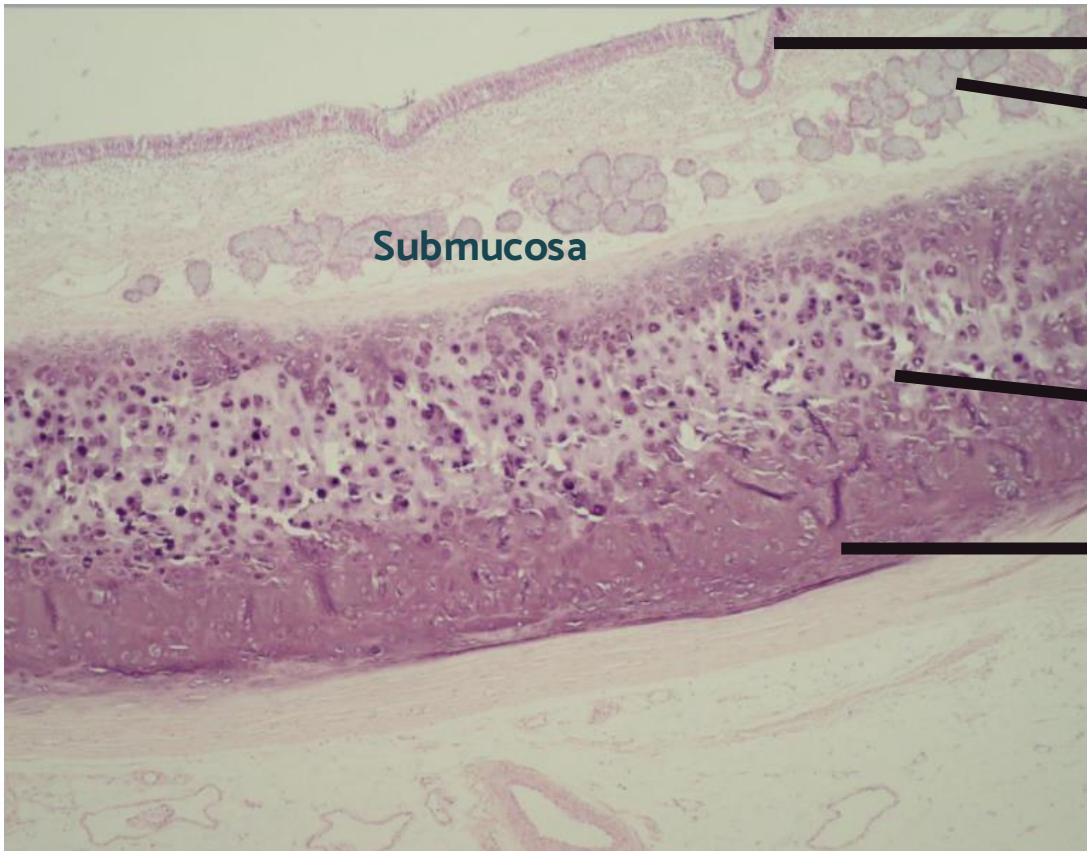


Lining epithelium

Submucosa

Supportive layer

Connective tissue;  
Adventitia



Submucosa

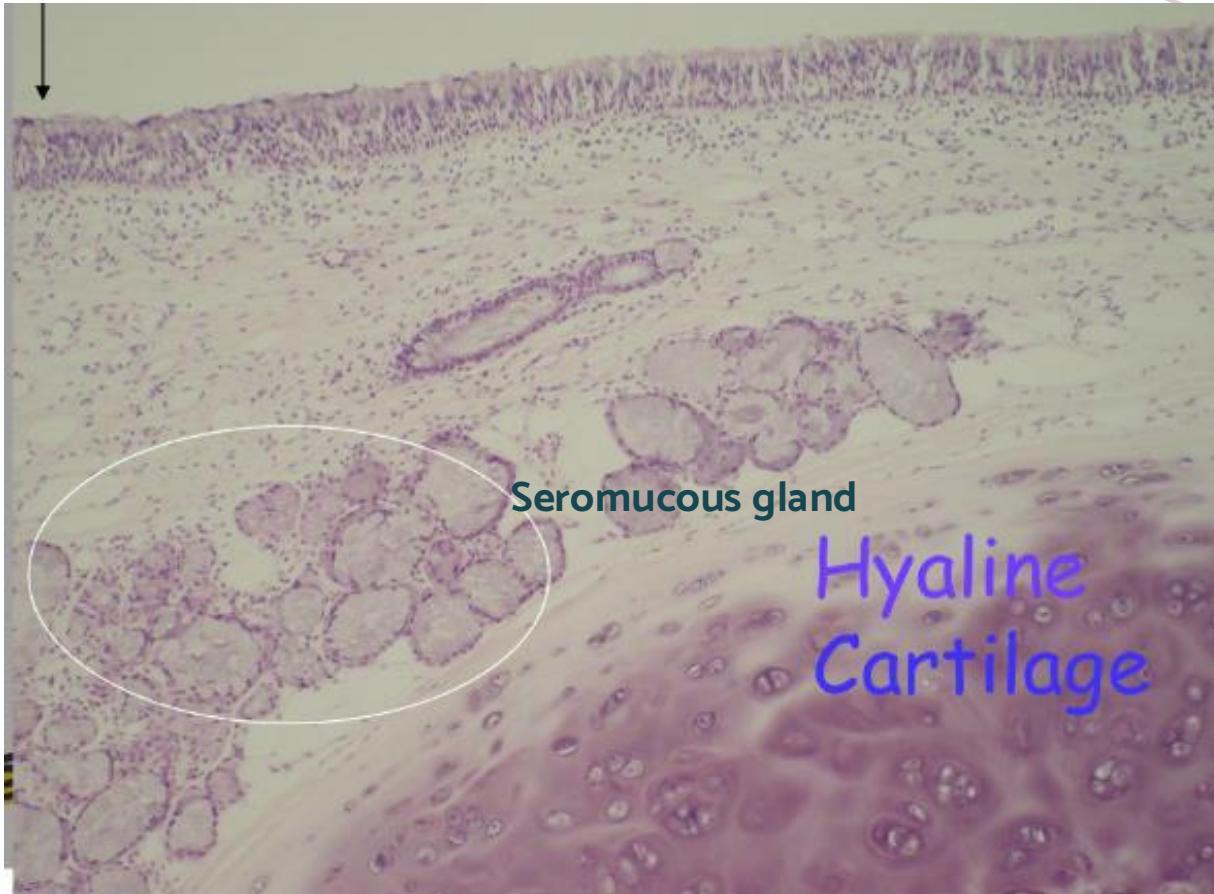
Lining epithelium

Gland found in  
Lamina propria  
can extend to  
submucosa

Hyaline cartilage

Connective tissue ;  
Adventitia

## RESPIRATORY EPITHELIUM TRACHEAL GLAND IN SUBMUCOSA



Lining epithelium

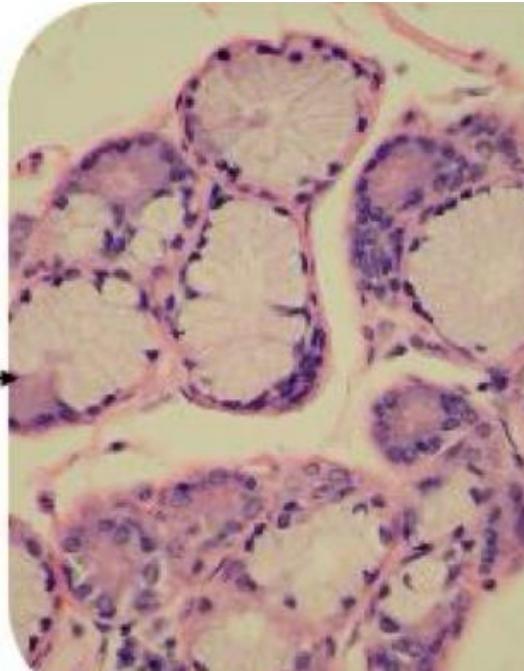
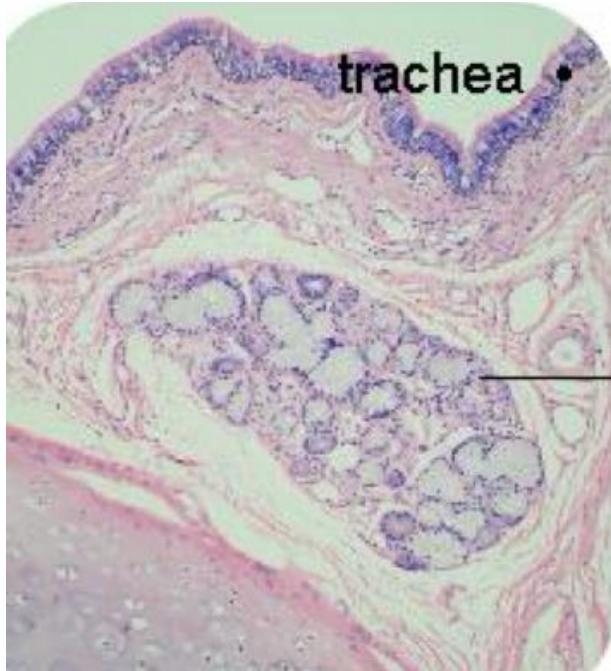
Seromucous gland

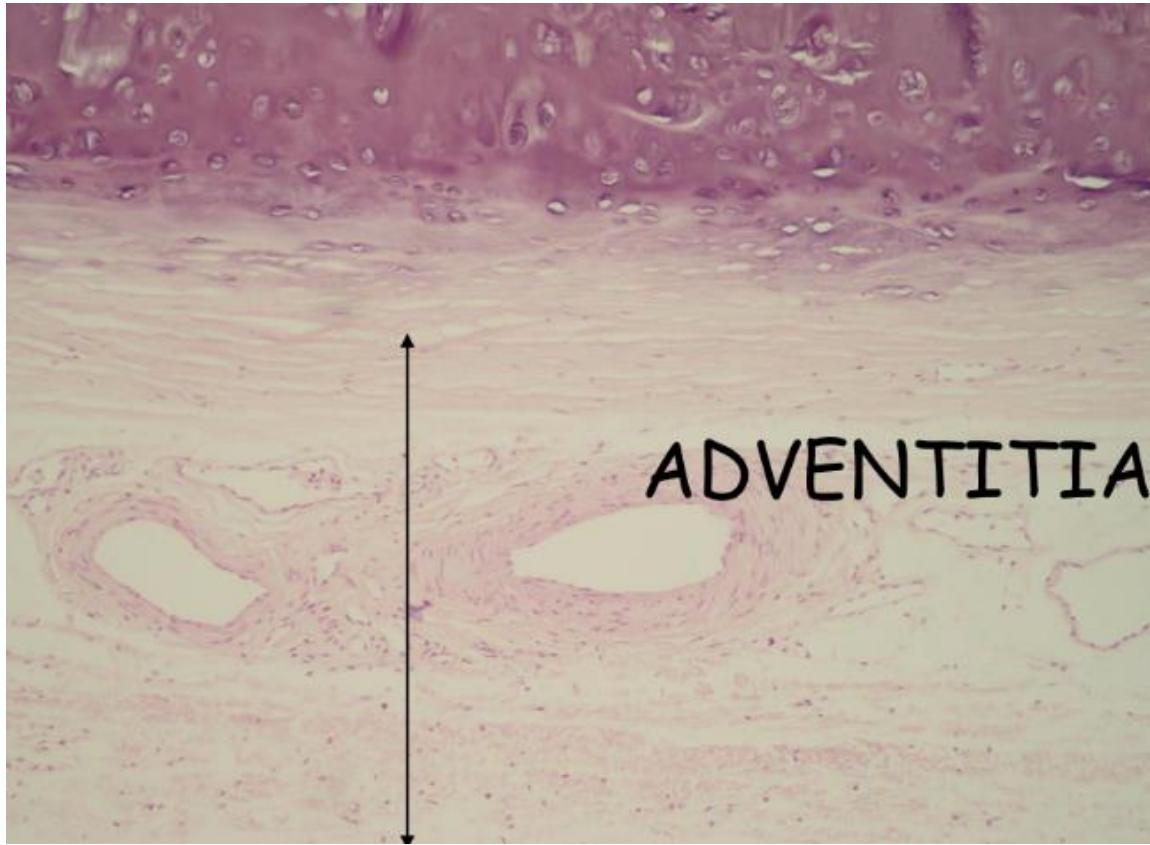
Hyaline  
Cartilage

Branched seromucous gland

Found in Lamina propria & submucosa

Has a duct that connects to lumen





Connective tissue

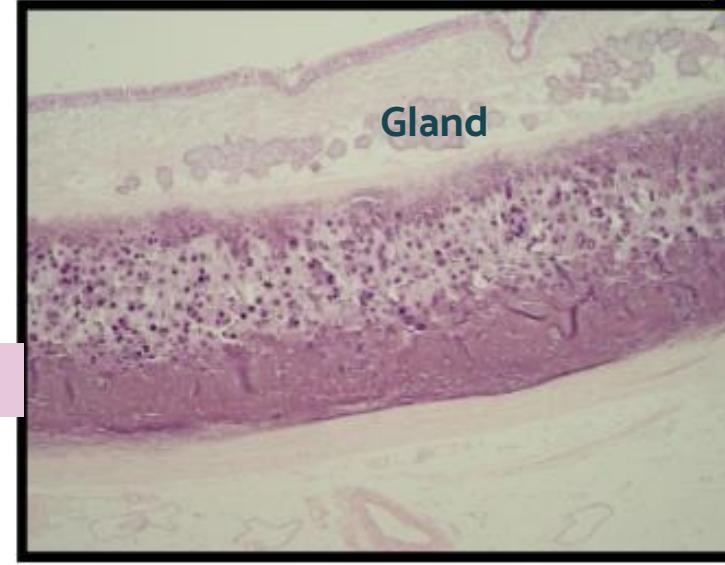
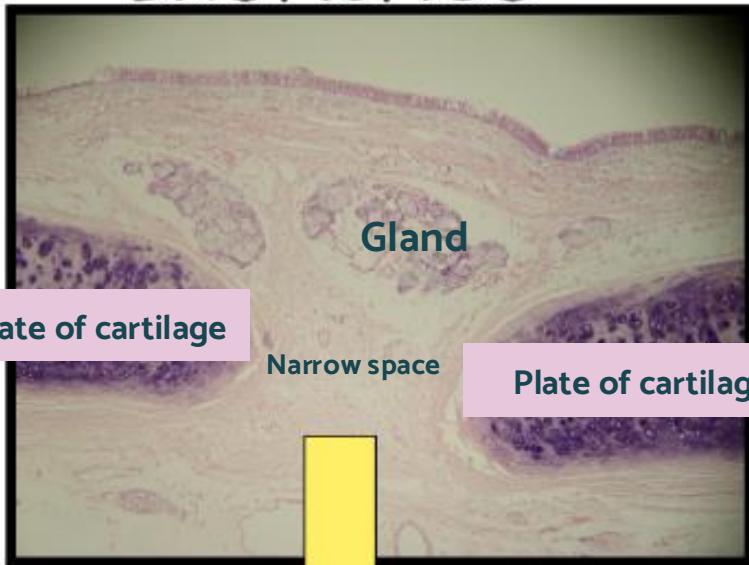
Has blood vessels & nerve vessels

# EXTRAPULMONARY

## BRONCHUS

No lung tissue  
surrounding it

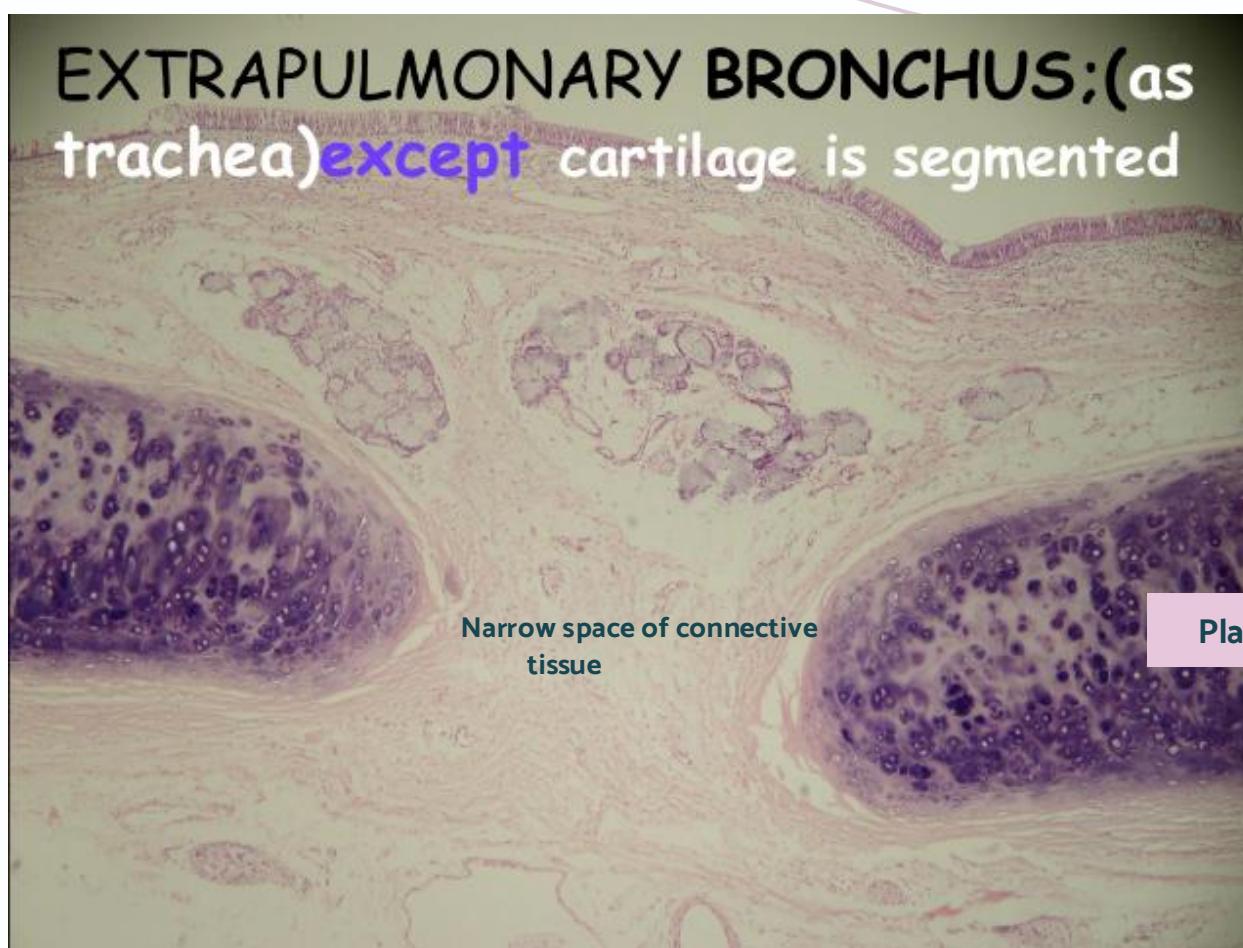
# TRACHEA



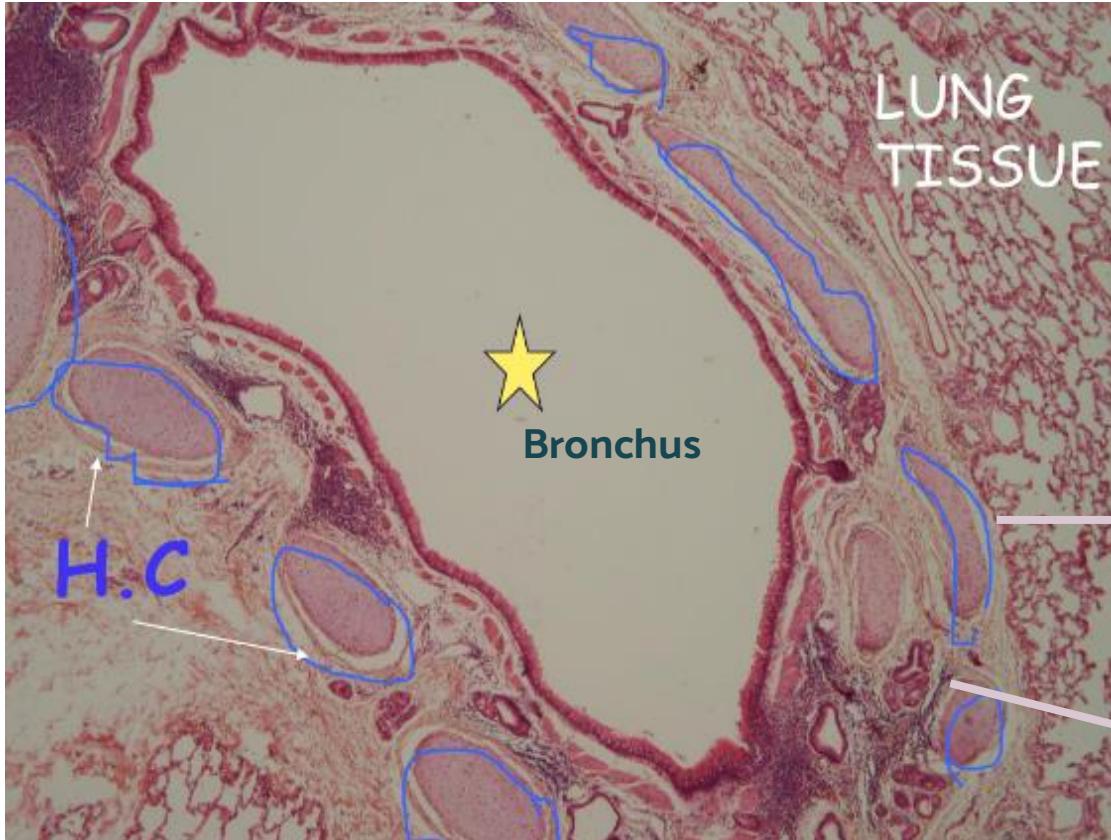
Rest of layers  
are the same

Trachea ends as right & left main bronchi ( extra  
pulmonary bronchus ) ; instead of C-Shape cartilage it  
becomes plate of hyaline cartilage surrounding lumen

# EXTRAPULMONARY BRONCHUS;(as trachea) except cartilage is segmented



## INTRAPULMONARY lobar BRONCHUS (LARGE) = secondary



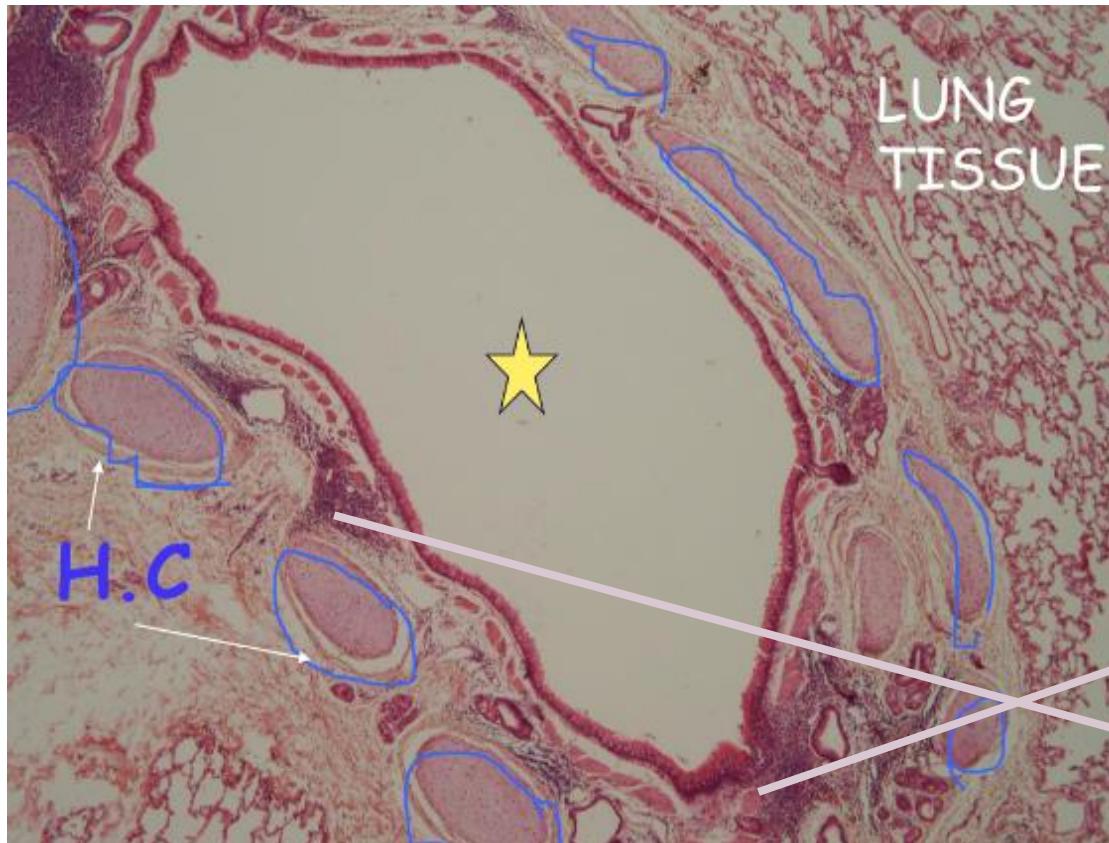
Same lining epithelium as extra pulmonary

Surrounded by lung tissue since it's secondary

Plates surrounds cartilage all around the lumen

Narrow spaces ( CT ) between plates

## INTRAPULMONARY lobar BRONCHUS (LARGE) = secondary



Less goblet cells ( compared to extra pulmonary )

Smooth muscle starts appearing as patches ( increases distally )

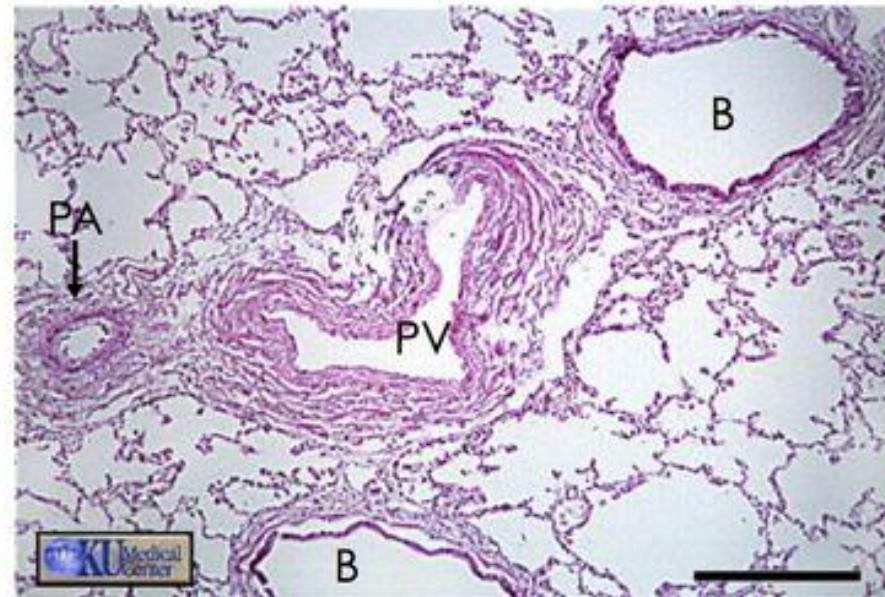
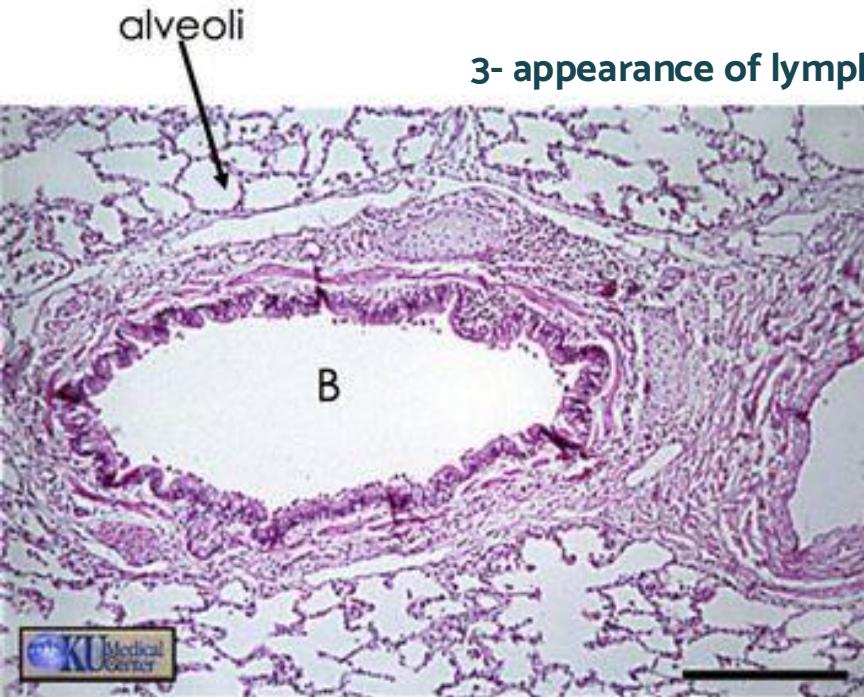
Lymphatic nodule = starts appearing when bronchus enters lung

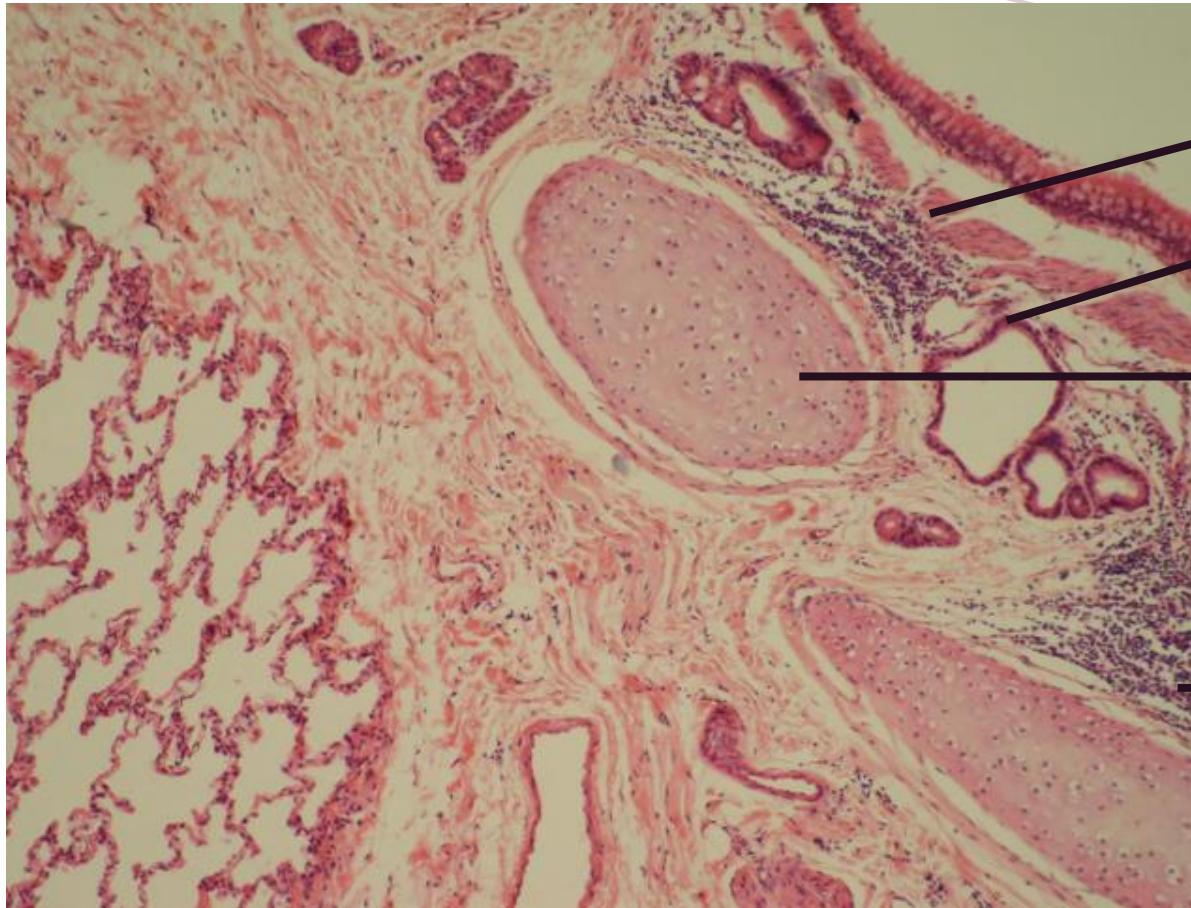
# Intrapulmonary Bronchi

1- surrounded by lung tissue

2- same lining epithelium but has less goblet cells

3- appearance of lymphatic nodules





Smooth muscle in Lamina propria ( could be found in submucosa )

Glands

Hyaline cartilage

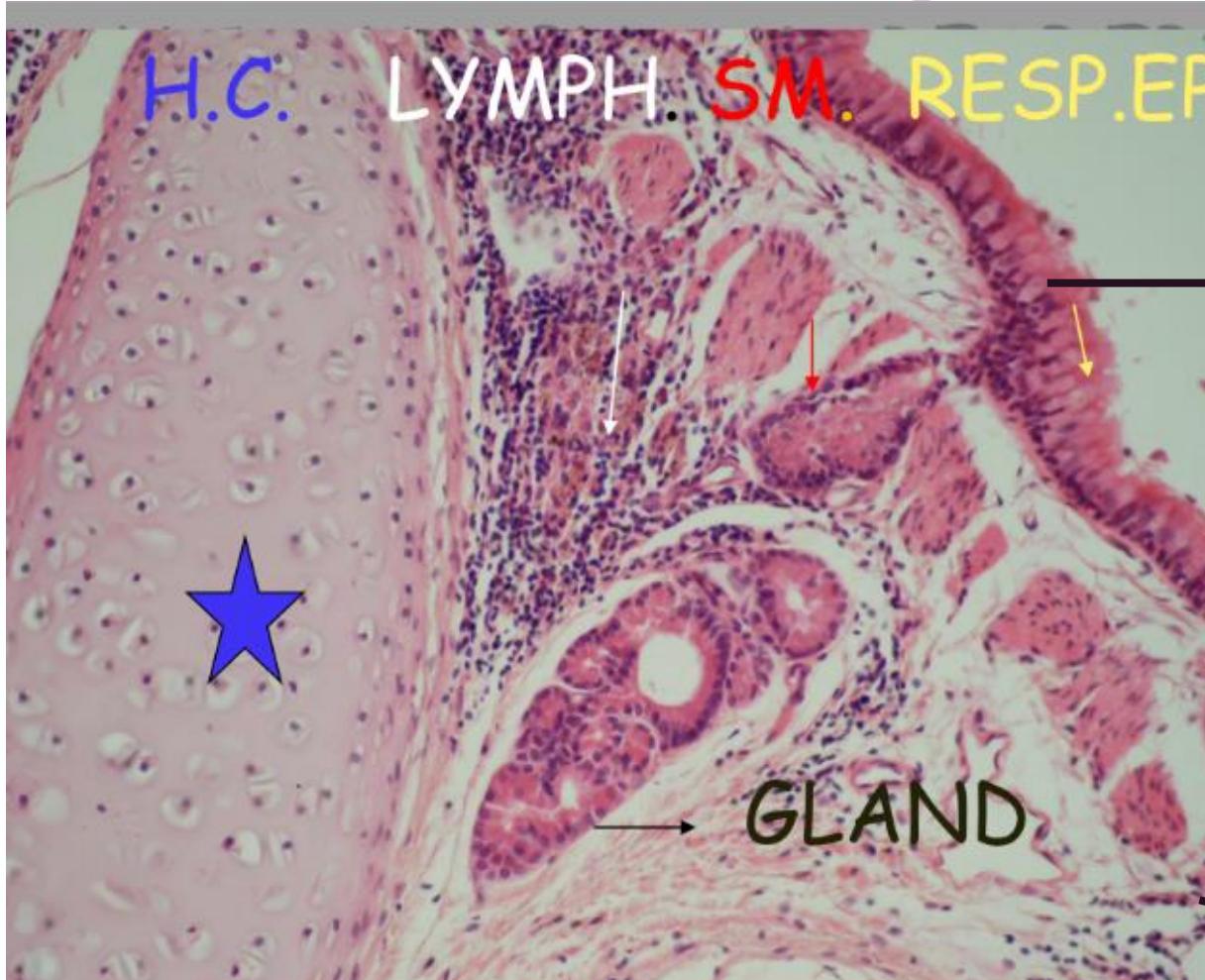
Lymphatic nodule

H.C. LYMPH. SM. RESP. EP

Goblet cells

→ GLAND

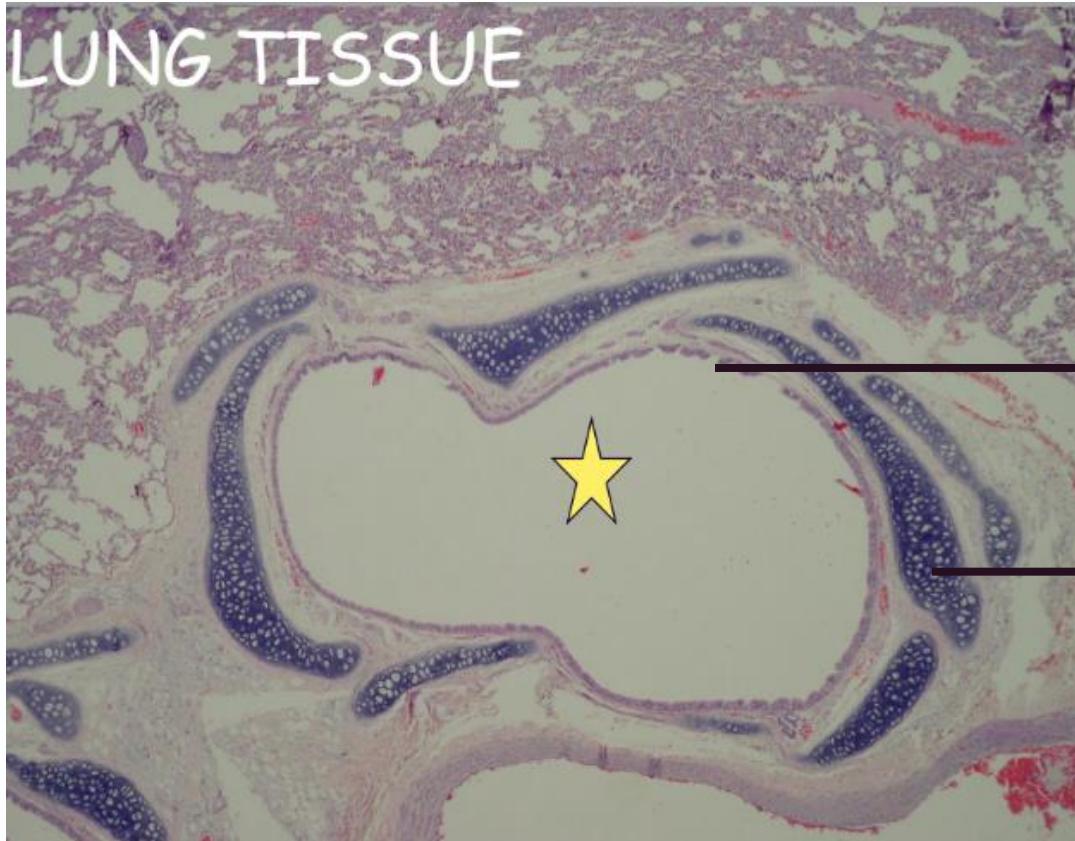
Lung tissue



## PSEUDOSTRATIFIED COLUMNAR CILIATED + GOBLET CELL



## INTRAPULMONARY BRONCHUS-LARGE



Patches of smooth muscles

Hyaline cartilage

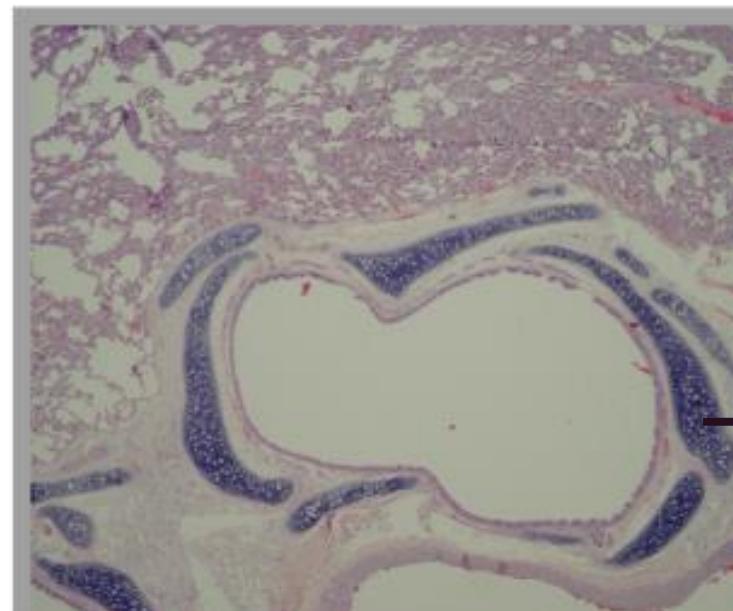
## INTRAPULMONARY BRONCHUS:

**SMALL**

: SEGMENTED , less  
goblet & glands



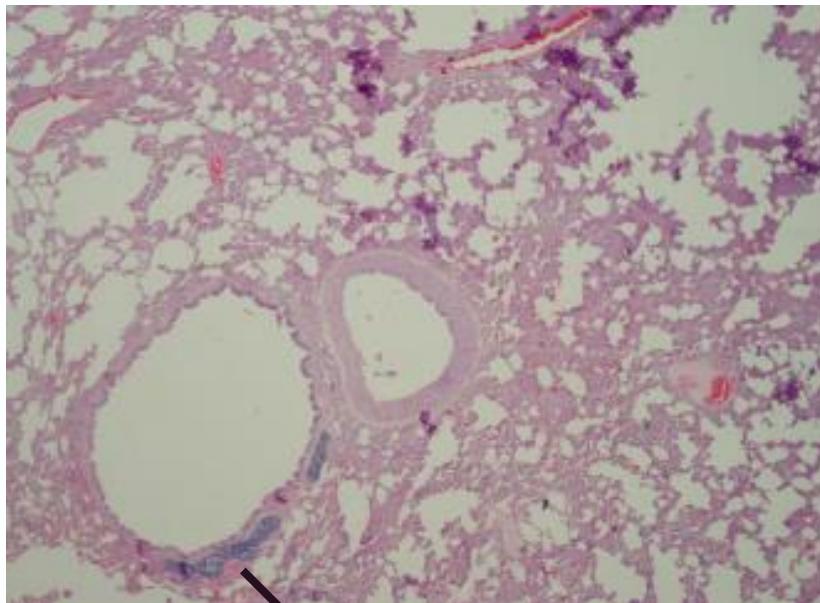
**LARGE** : LOBAR



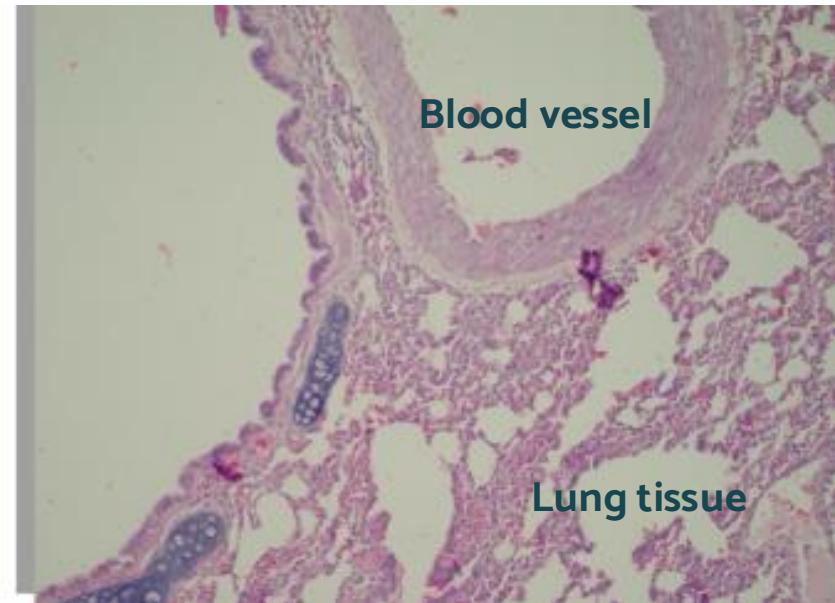
Less hyaline cartilage ( 2-3) not surrounding whole lumen

SMALL

Prominent folding  
Note the BVs



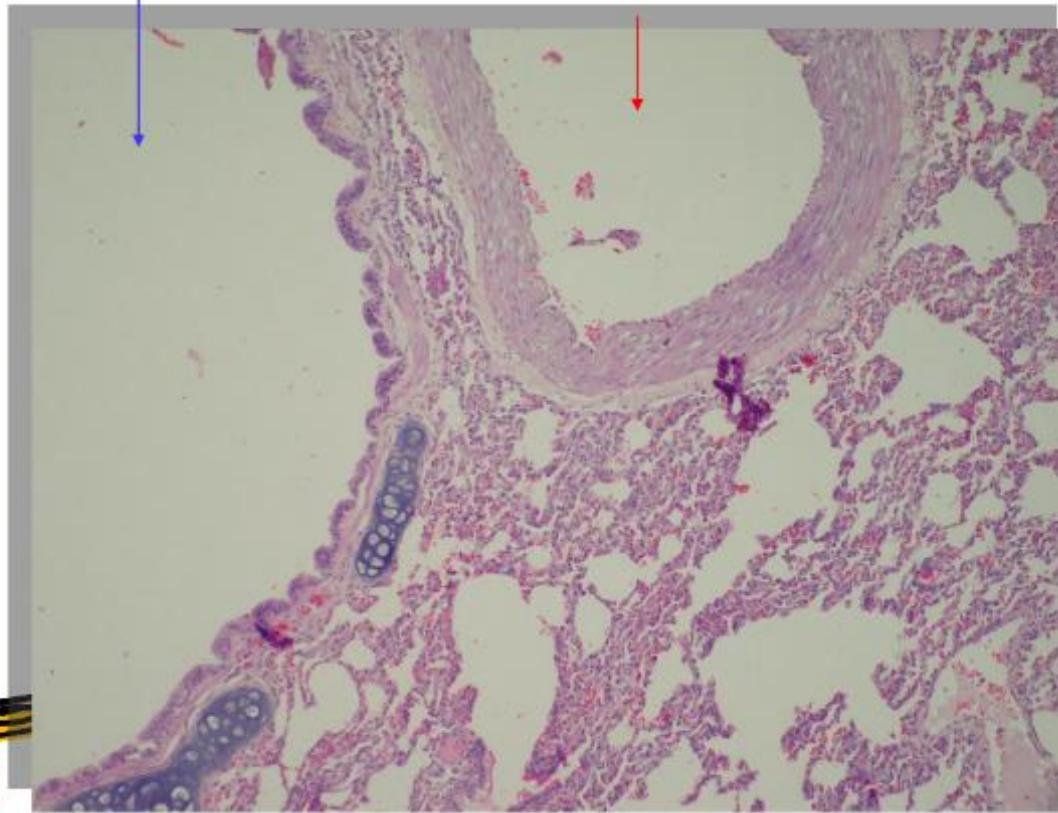
3 plates of cartilage



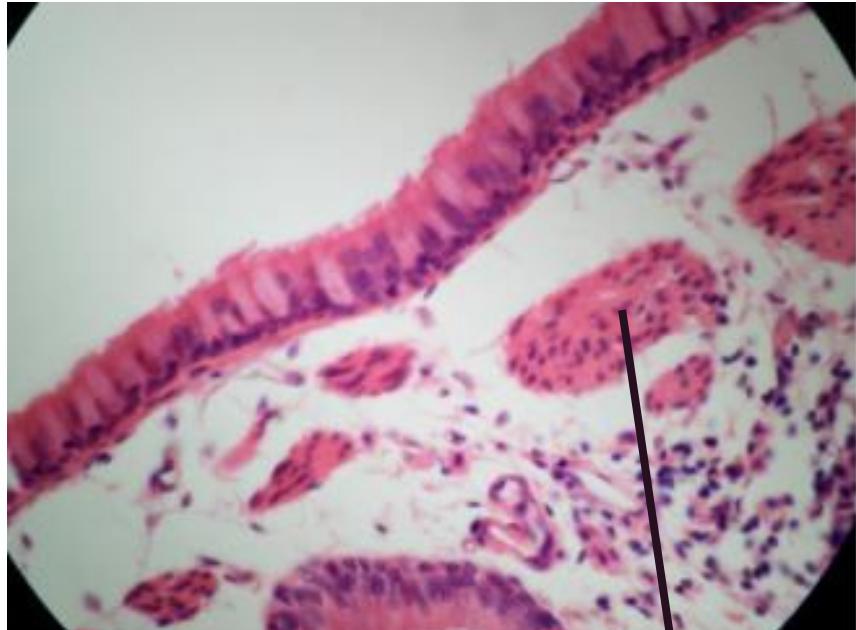
Blood vessel

Lung tissue

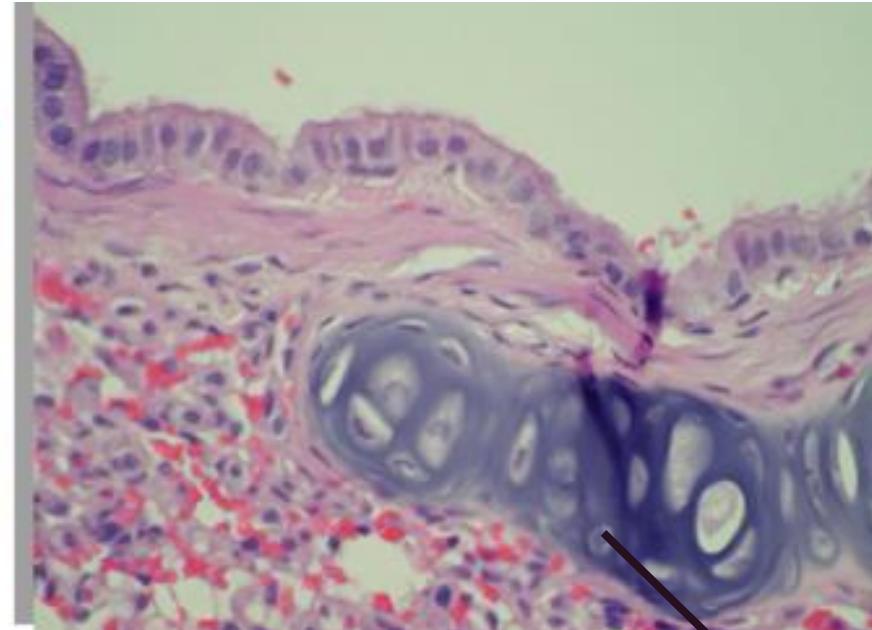
# INTRAPULMONARY BRONCHUS PULMONARY VESSEL



Psuedostratified columnar but with LESS goblet cells

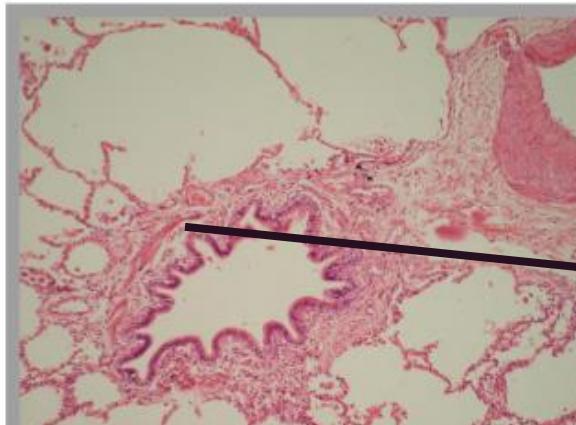
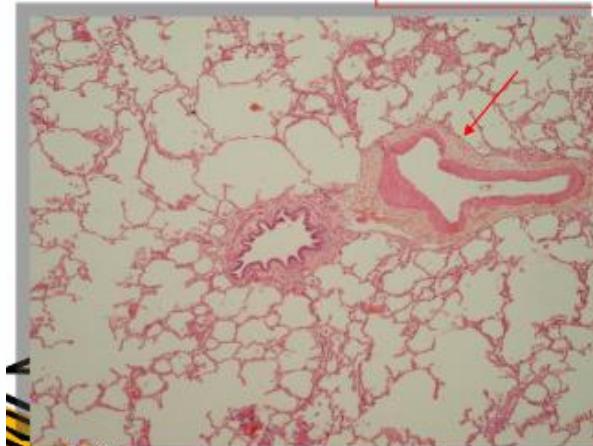
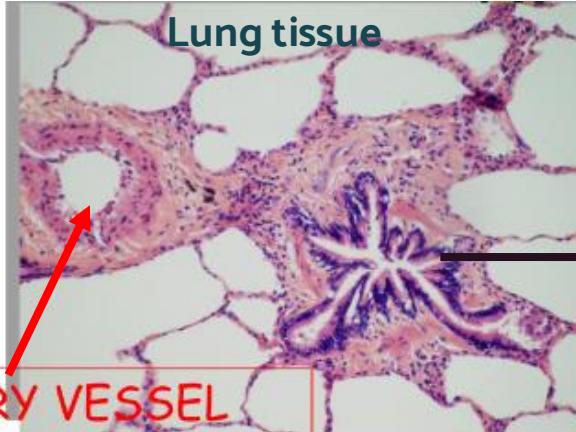
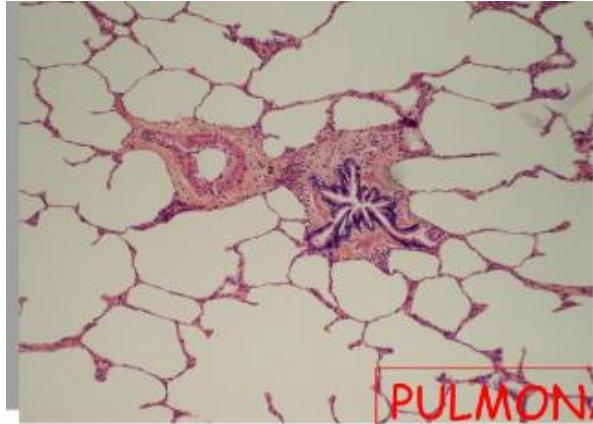


Smooth muscle



Hyaline cartilage

TERMINAL BRONCHIOLES = smaller diameter , distally into lung , NO CARTILAGE

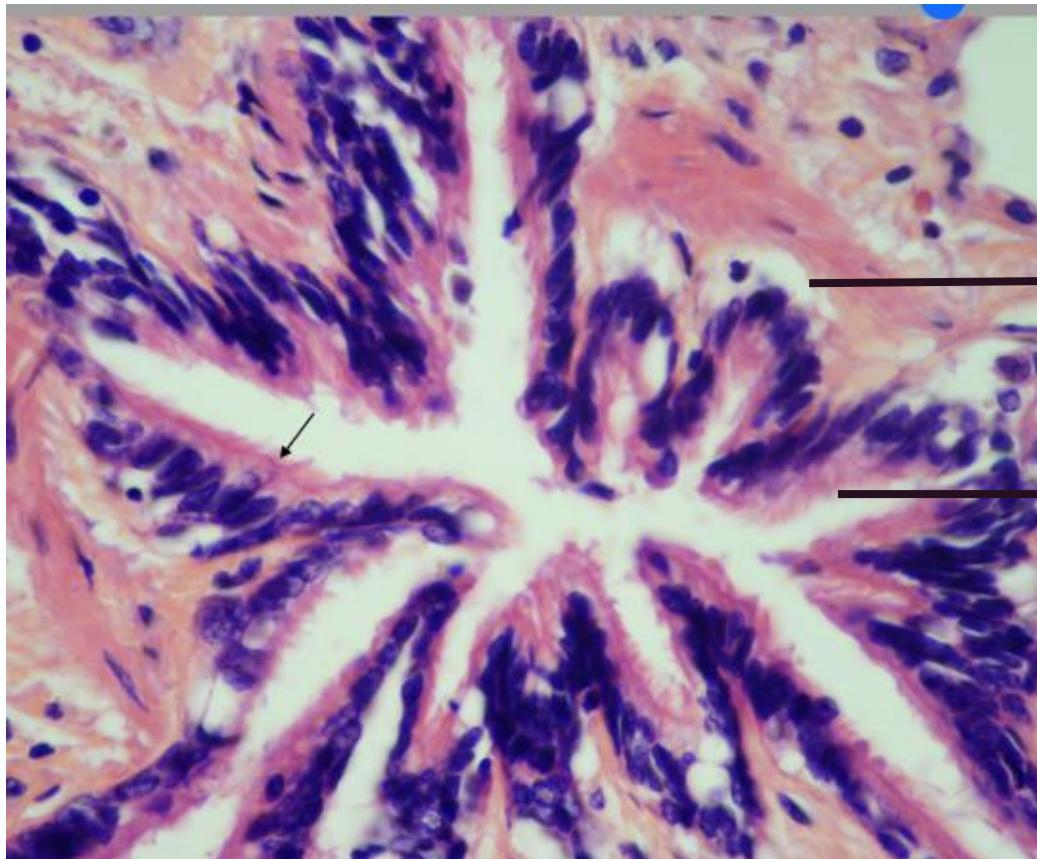


Prominent folding of lumen ; no Cartilage & more smooth muscles

Smooth muscle

Bronchiole = simple columnar & cuboidal ciliated  
Few goblet cells & glands

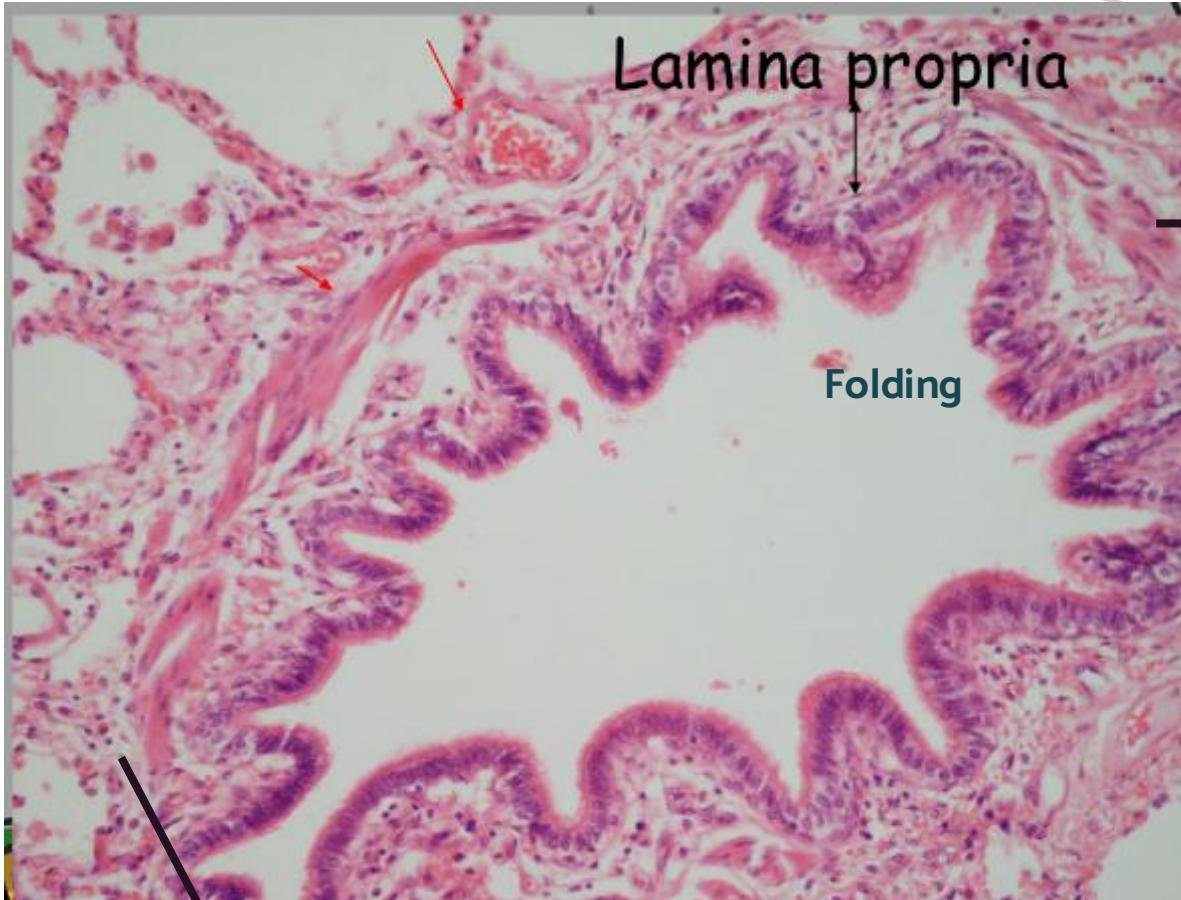
## SIMPLE COLUMNAR CILIATED EP.



Smooth muscle

Simple columnar ciliated

Bronchiole = scattered lymphocytes



Lamina propria

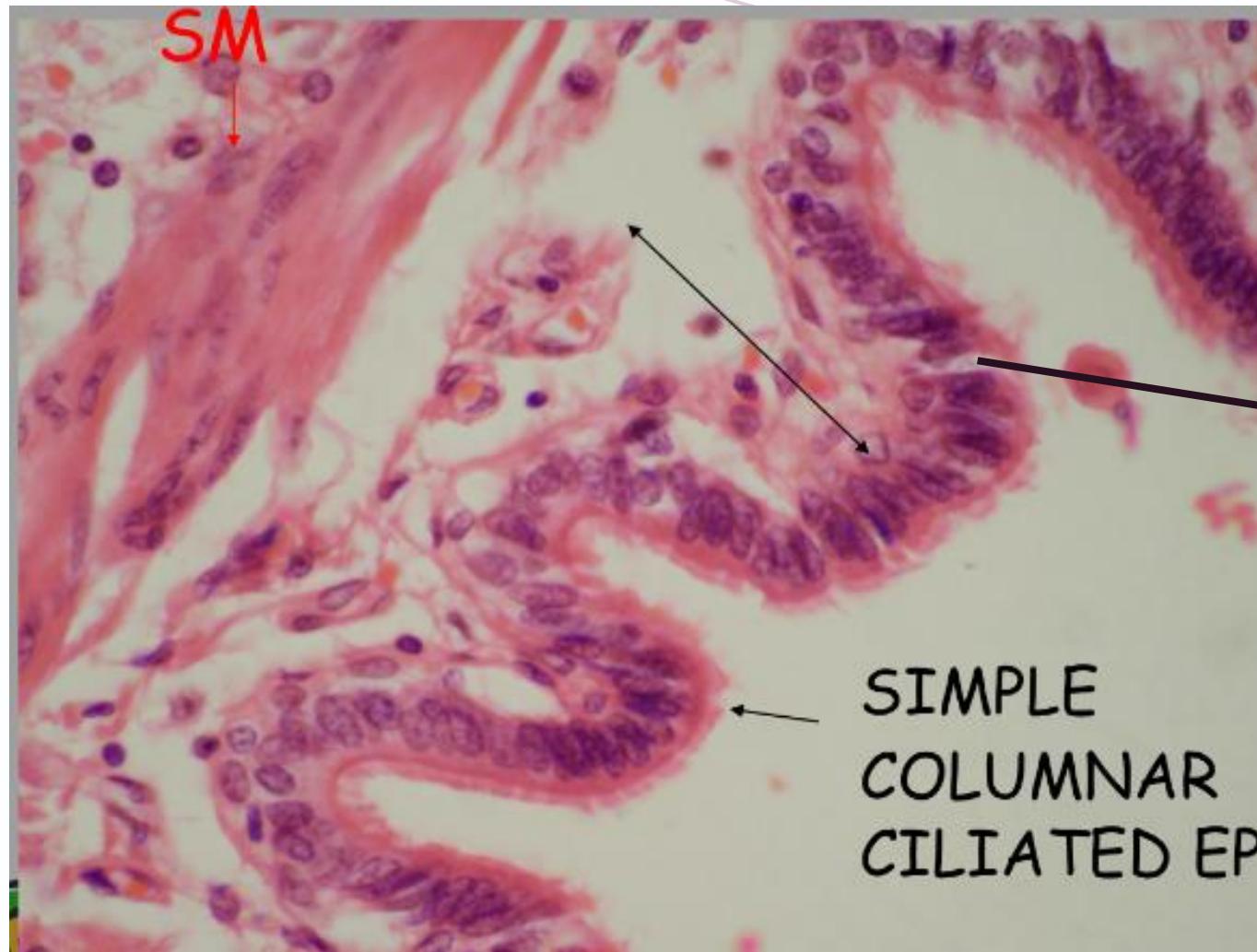
Folding

scattered lymphocytes

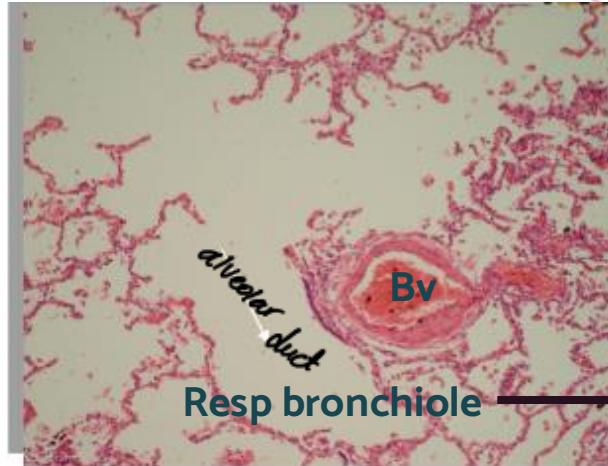
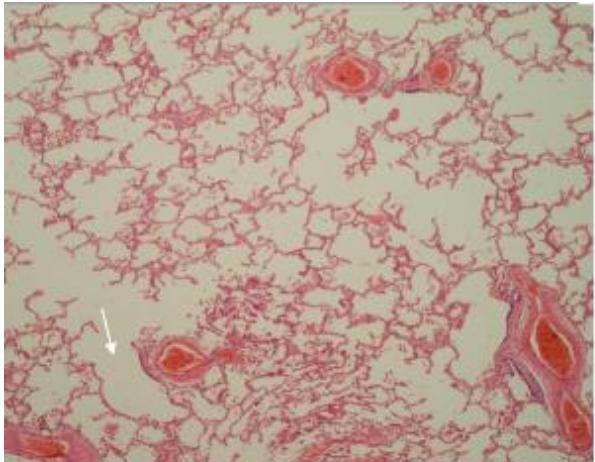
Smooth muscle

Simple columnar ciliated

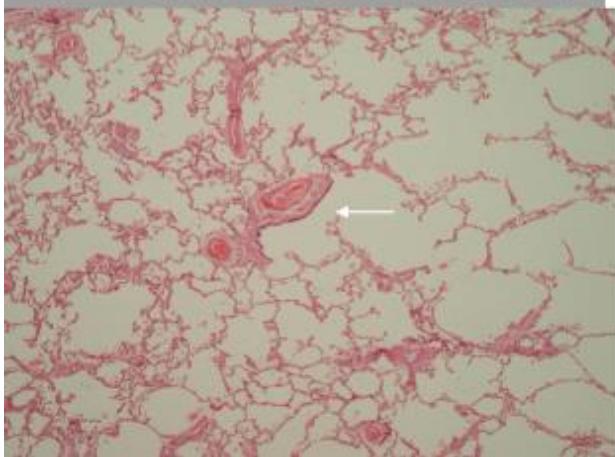
NO CARTILAGE



## Respiratory bronchioles in lung tissue

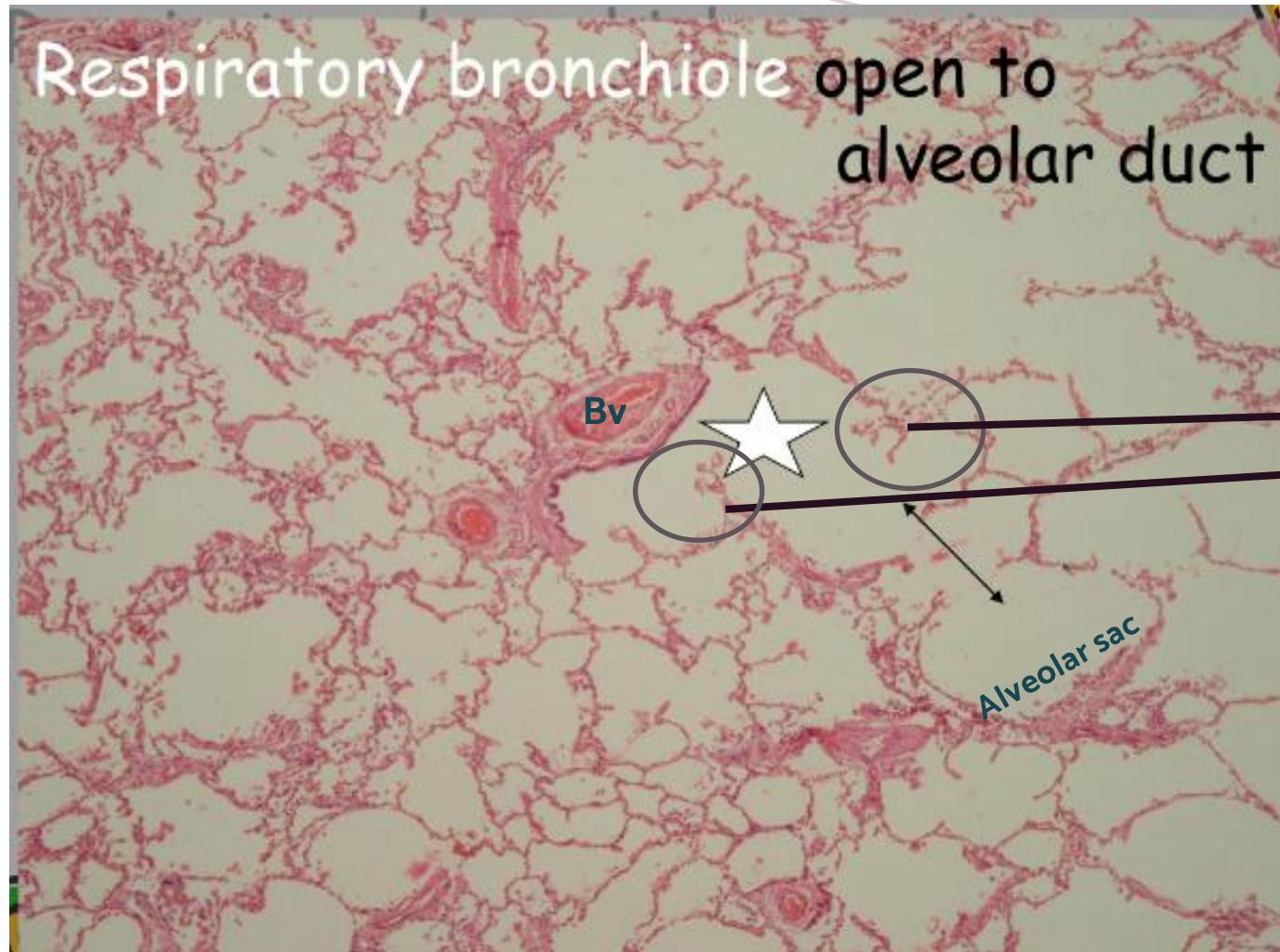


Open on alveolar duct



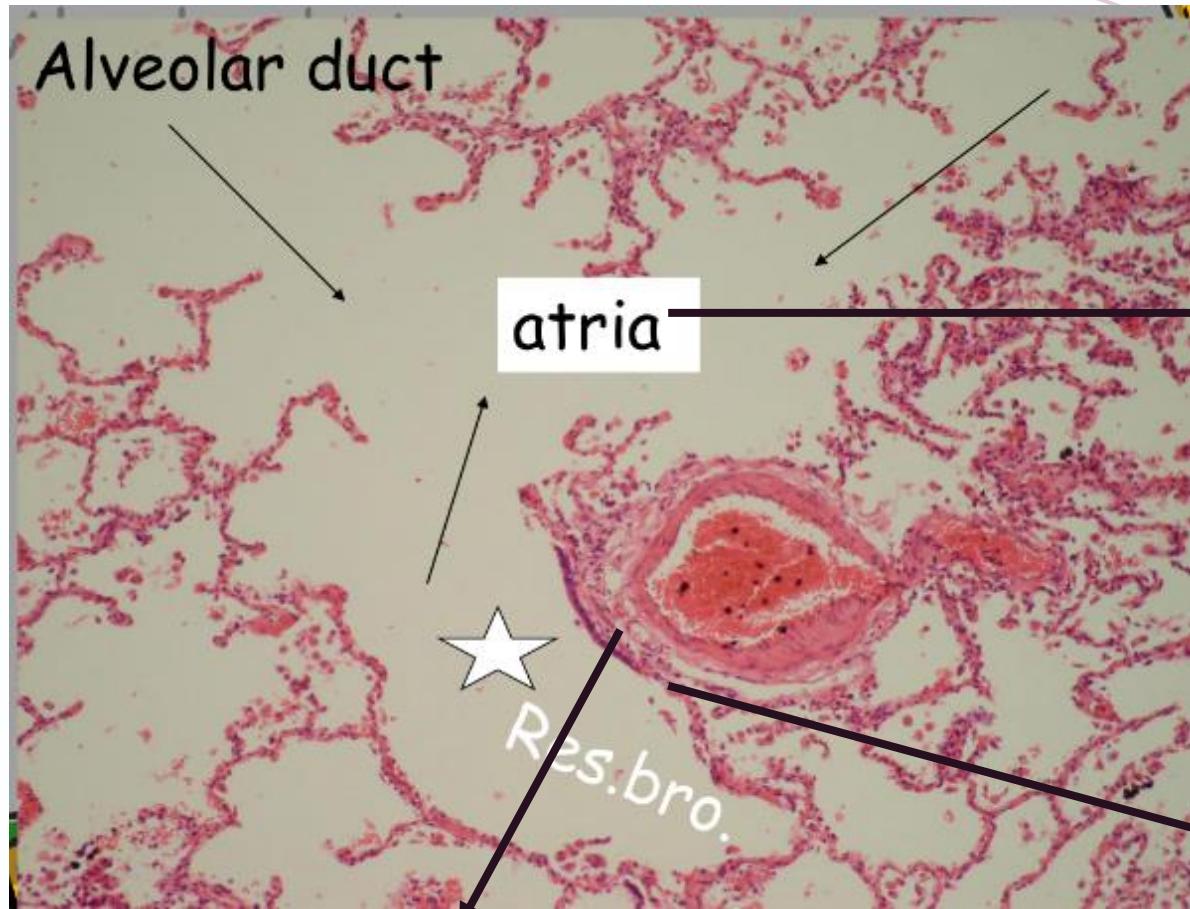
Visceral pleura

# Respiratory bronchiole open to alveolar duct



Knobs of smooth muscles

Alveolar sac

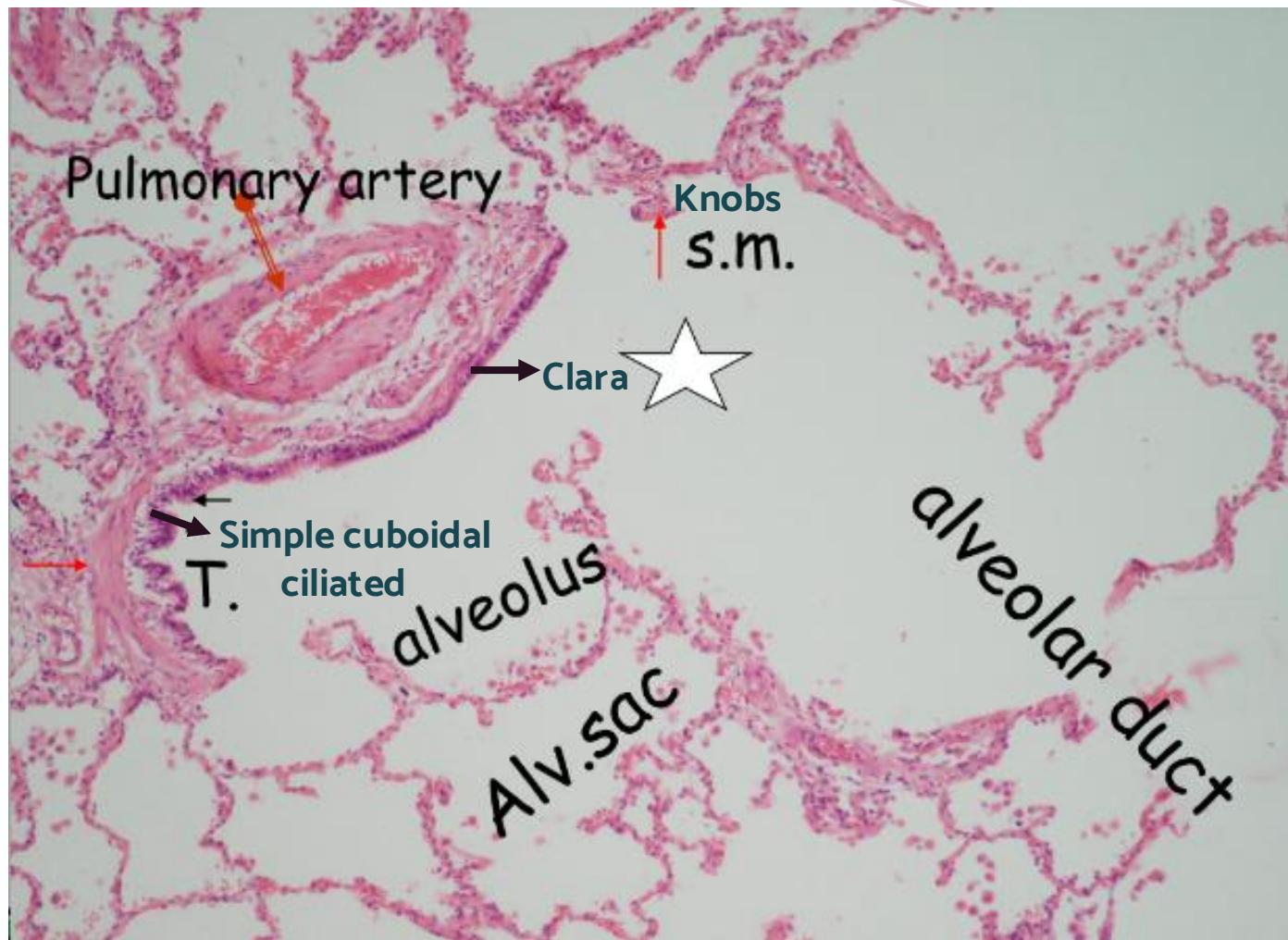


Smooth muscles are less than terminal bronchioles → knobs

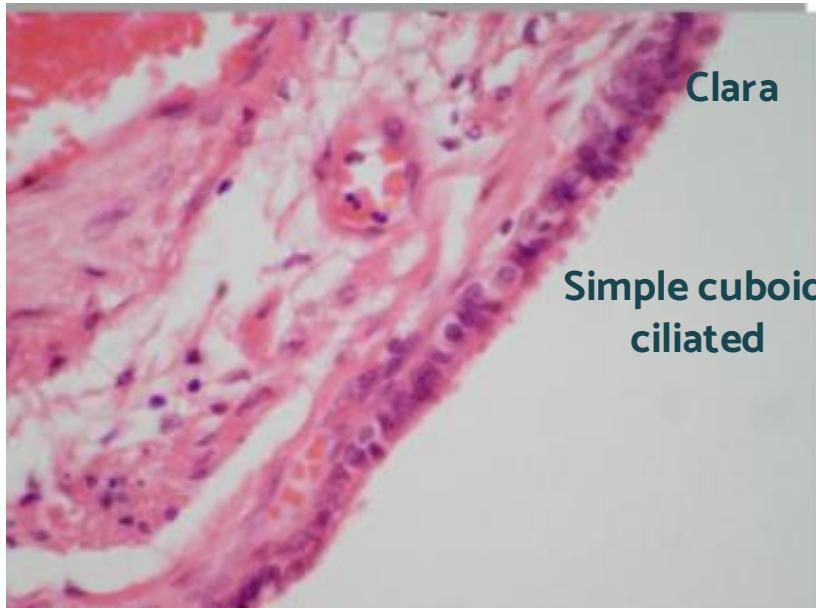
When there is two passage to alveolar duct

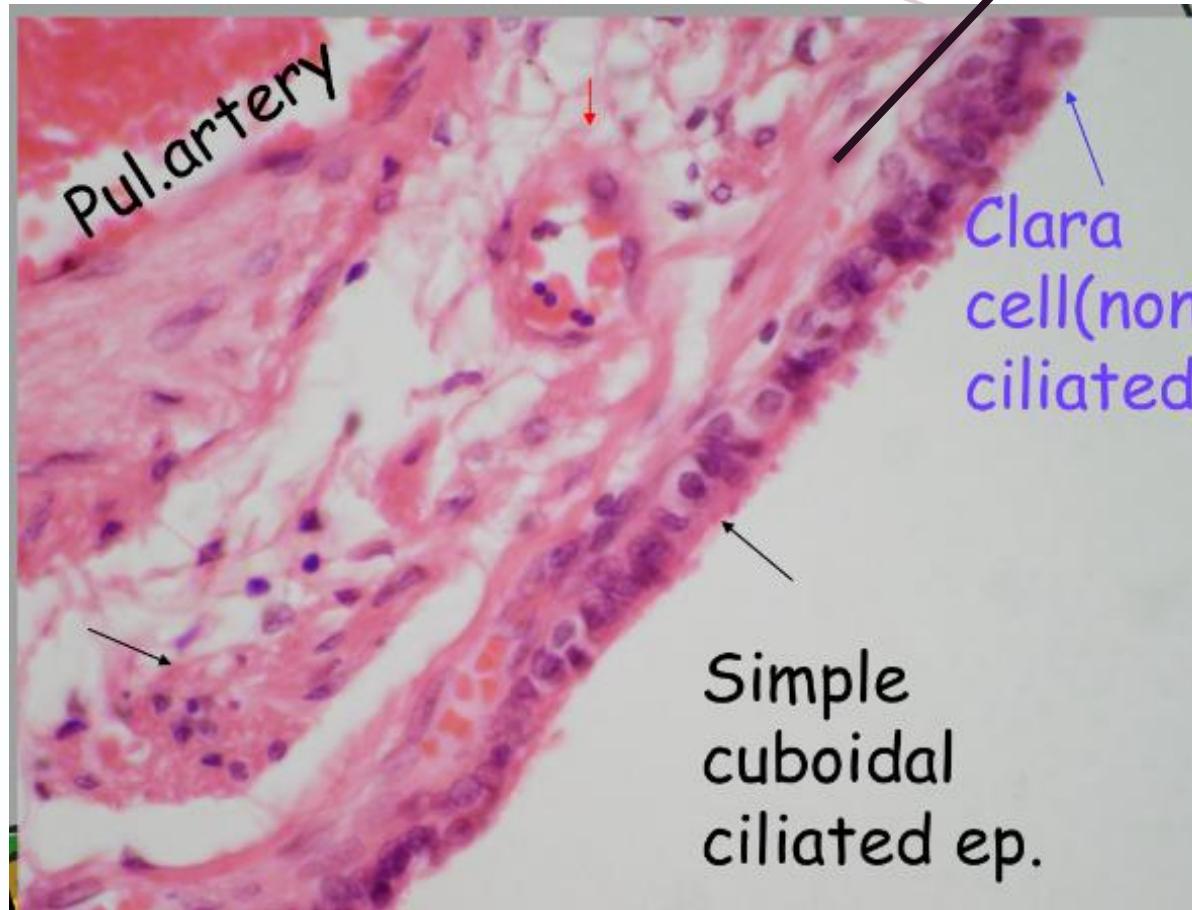
Lining epithelium:  
gradual change  
Simple cuboidal ciliated & non ciliated ( Clara )

At the end simple squamous epithelium



## Bronchial wall:



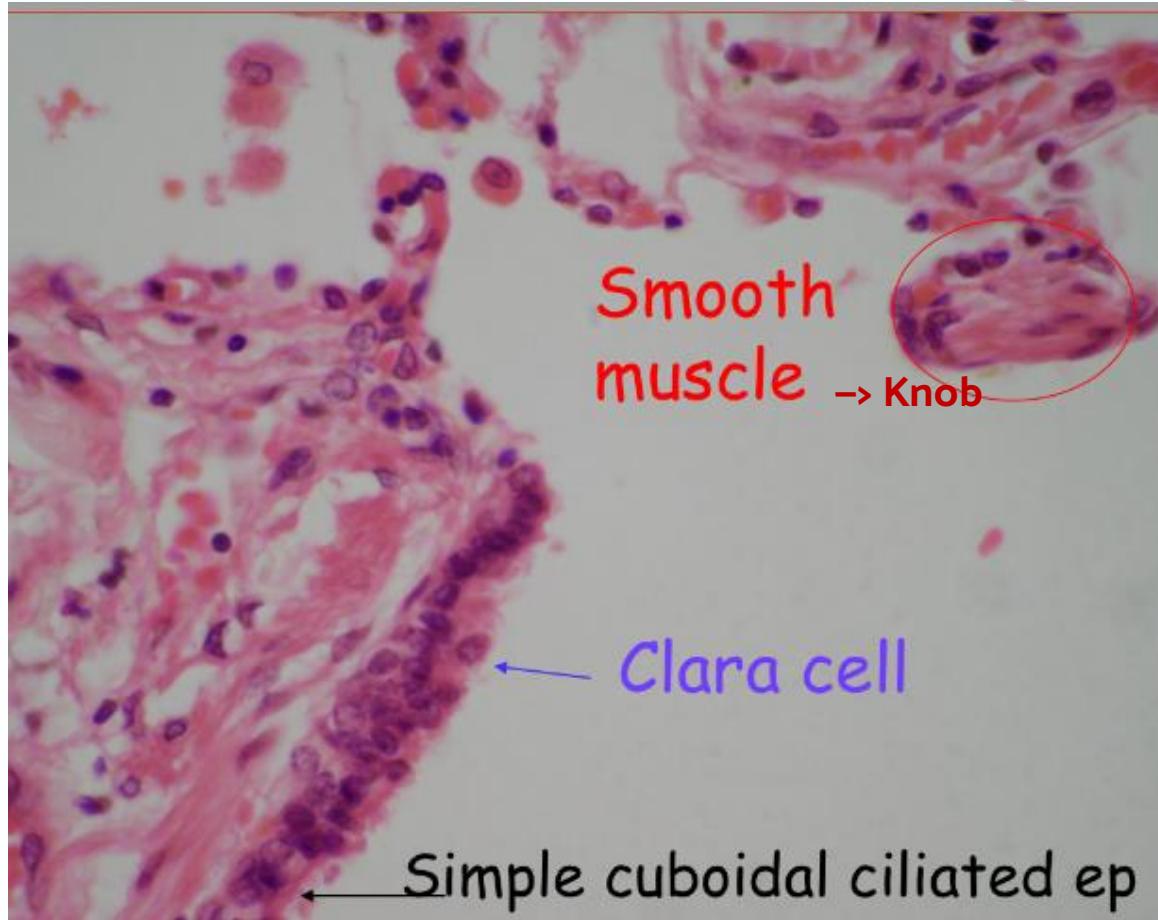


Simple  
cuboidal  
ciliated ep.

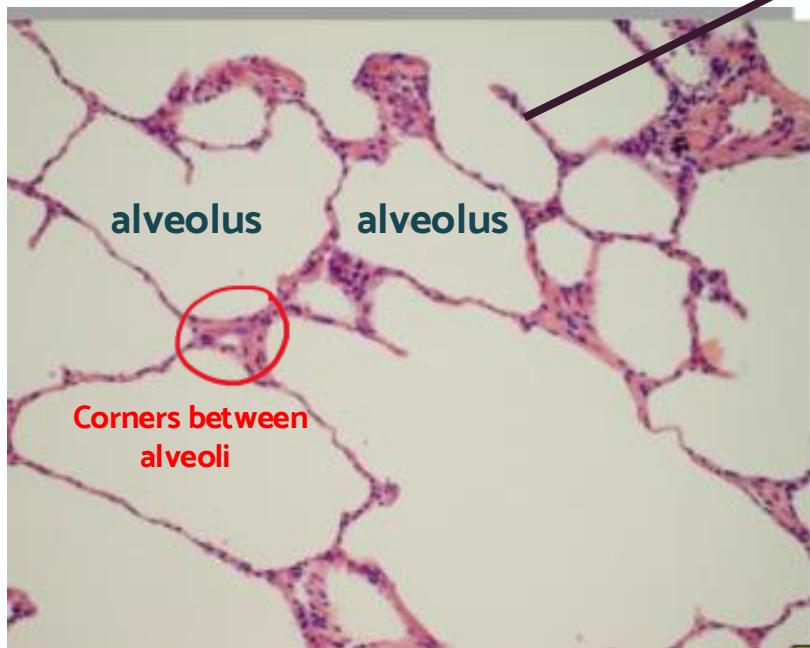
Few Smooth muscles

Clara  
cell(non-  
ciliated)

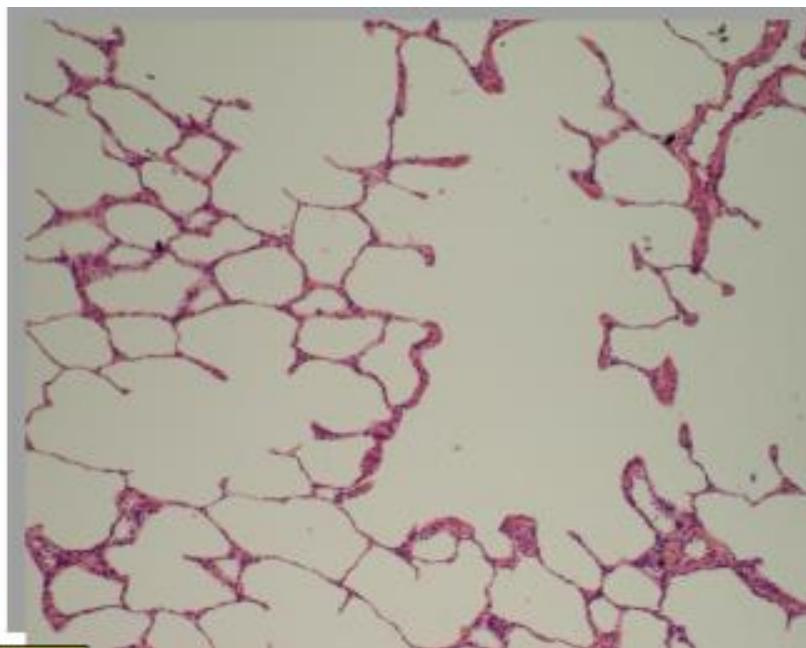
Pul.artery

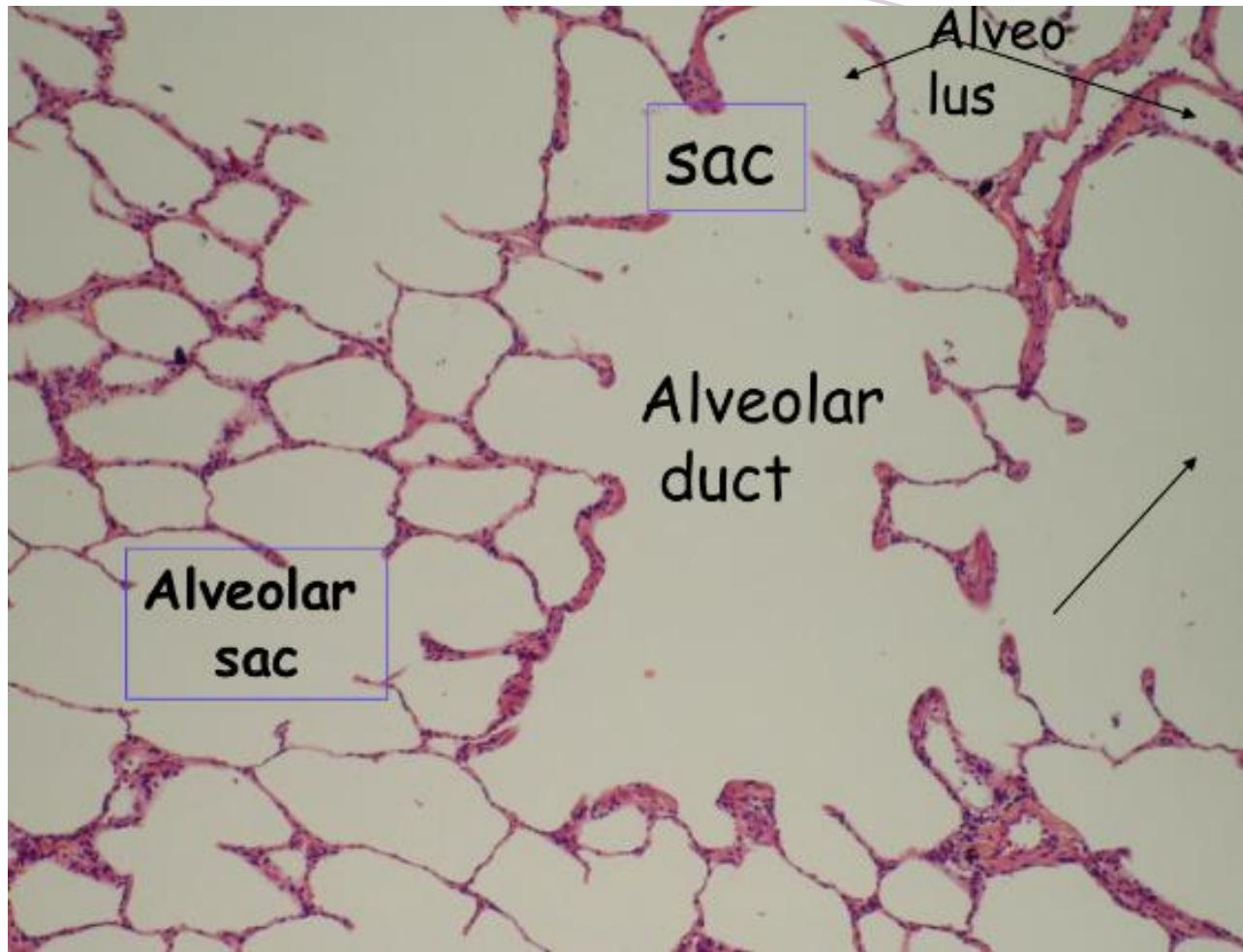


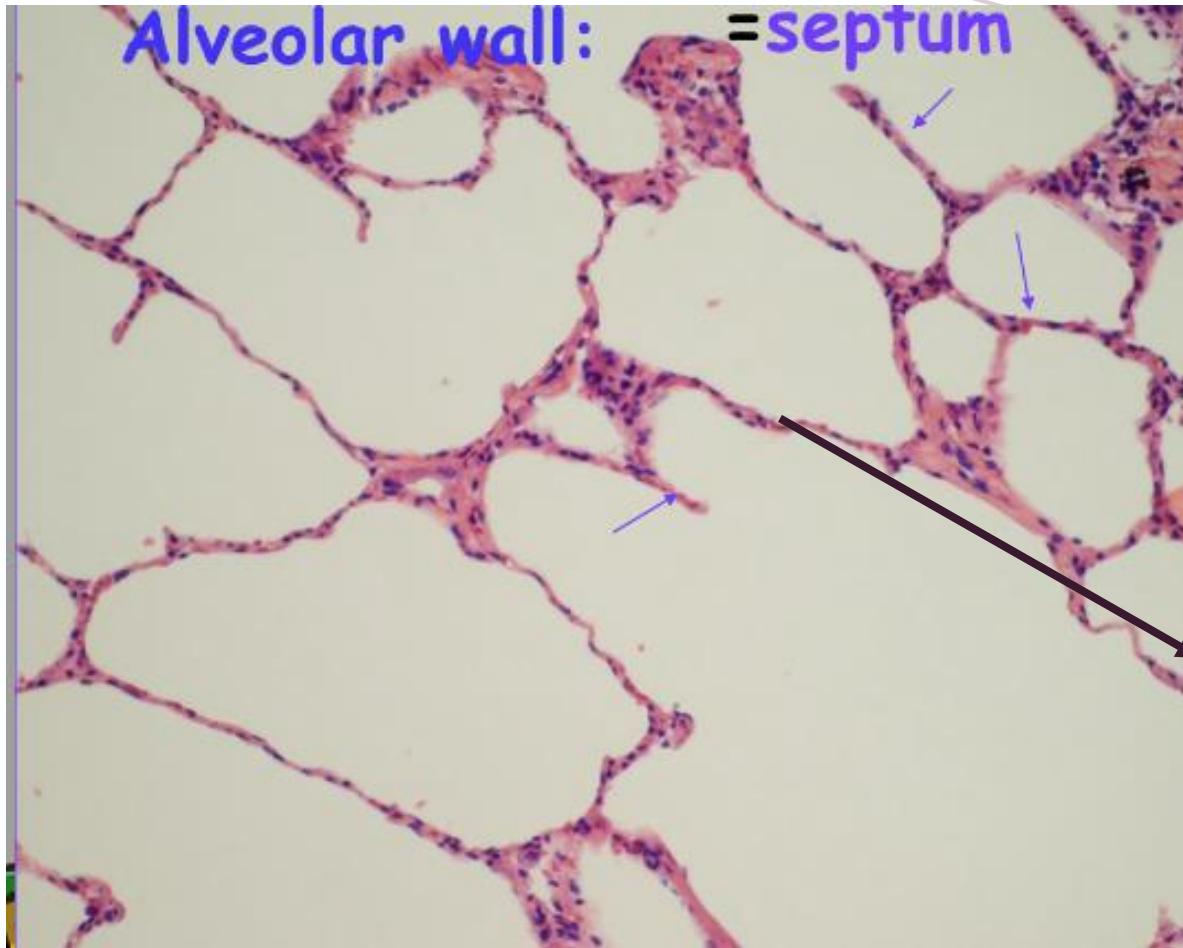
Lung tissue = alveoli



Inter-alveolar septum/wall





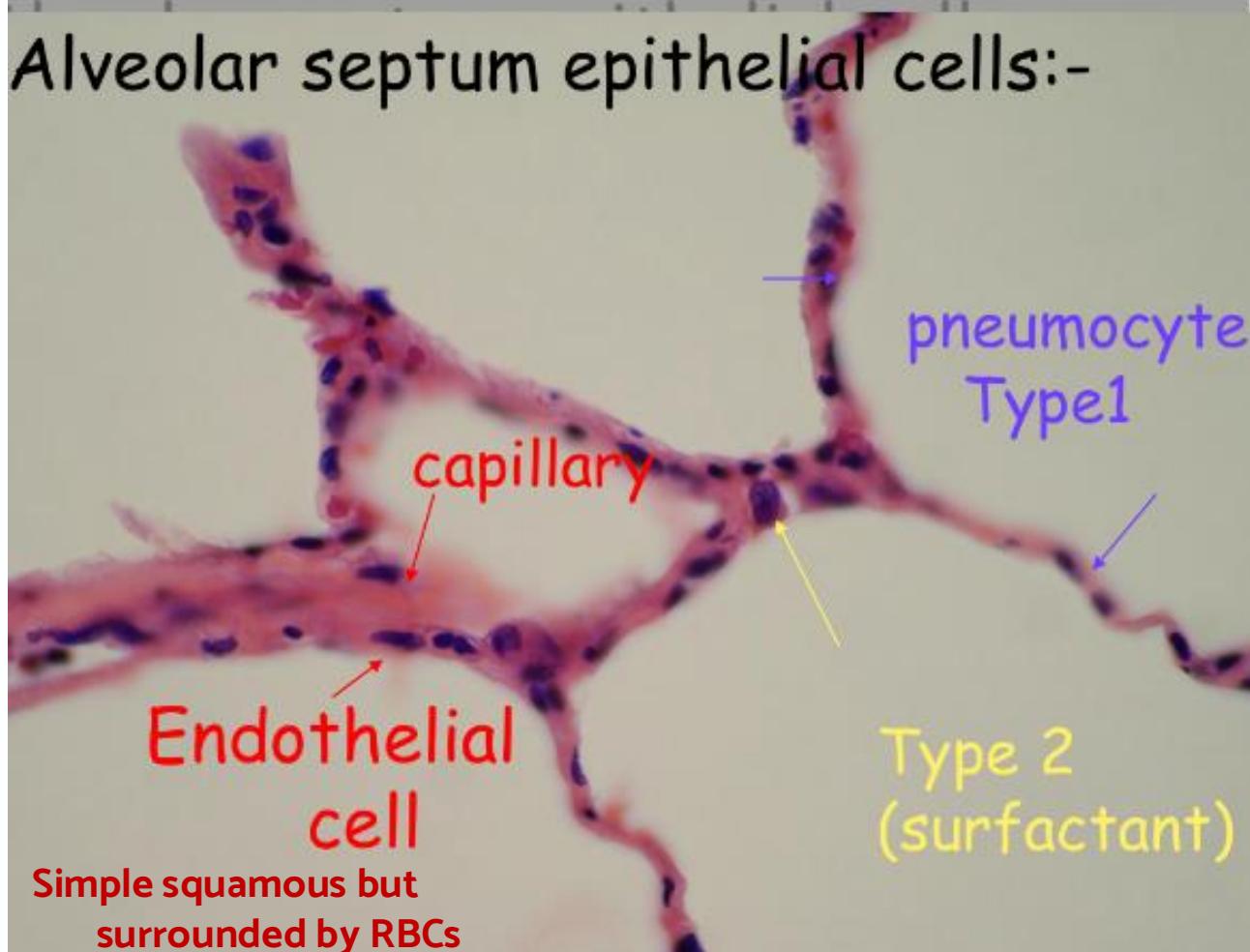


Alveolar wall: =septum

Interalveolar septum :  
Interstitium ; capillaries &  
CTs

Within the wall  
Respiratory membrane:  
very thin

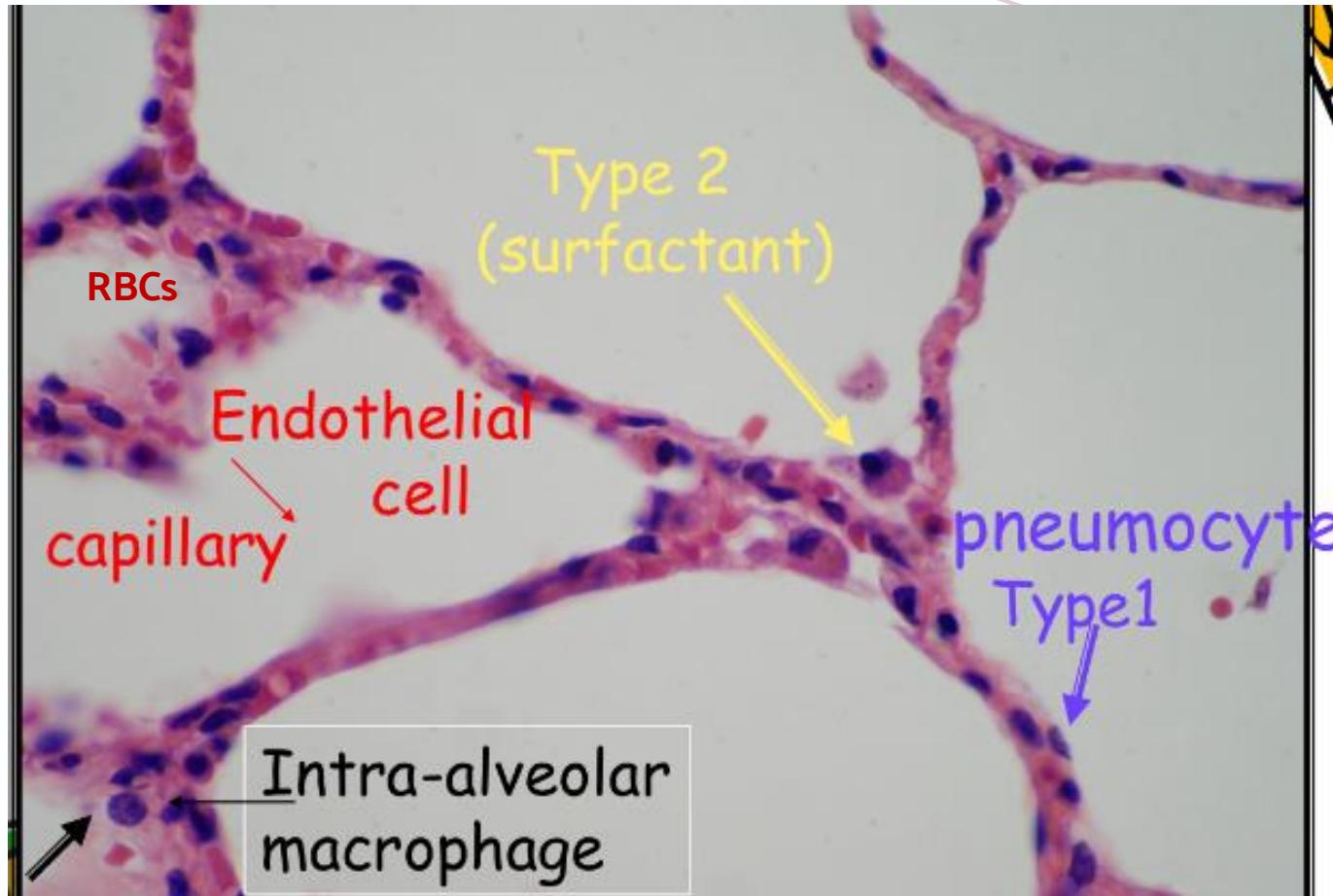
## Alveolar septum epithelial cells:-

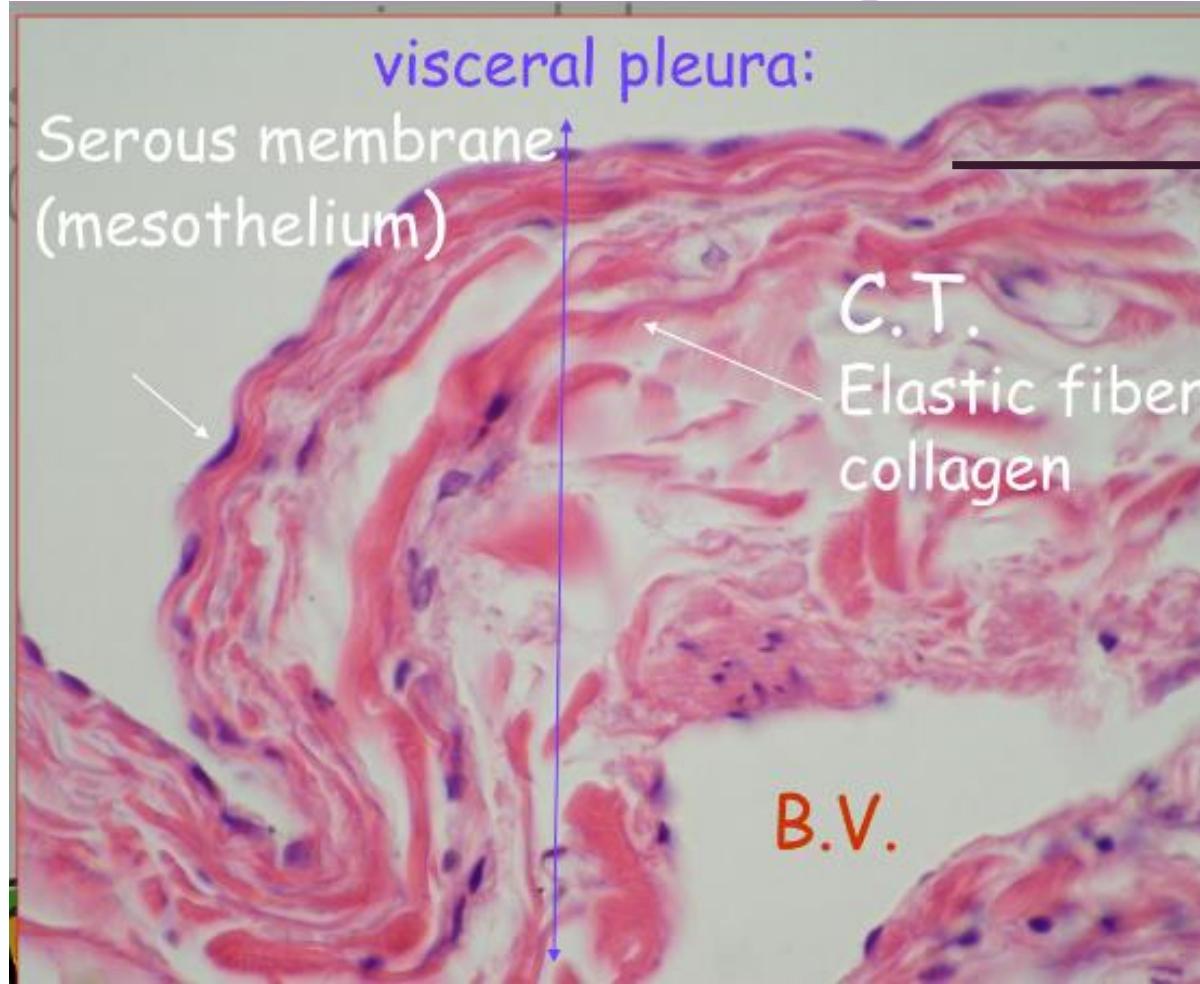


Flattened simple squamous epithelium

NOT SURROUNDED BY RBCs

Large cells , cuboidal nucleus , common on the corner



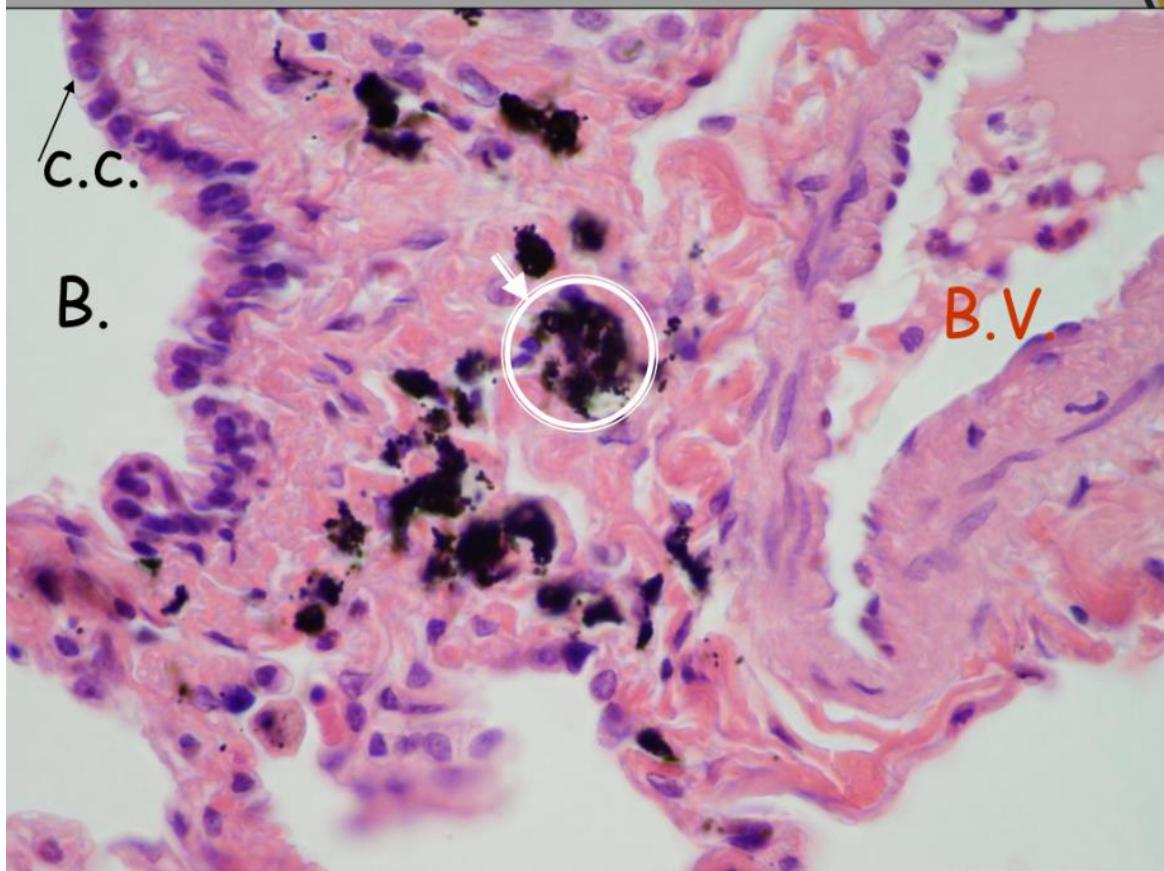


Elastic & reticular fibres (inflation & deflation)

Parietal & visceral pleura : Mesothelial cells ; simple squamous epithelium

Parietal : lines thoracic cavity

Alveolar macrophage= dust cells; originally from monocyte  
In lung tissue , pleura & mediastinum



Dust cells > type 1 pneumocytes

Most numerous