

Respiratory System histology lab

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Checklist

Nose: lining epithelium, submucosa with blood vessels, cartilage

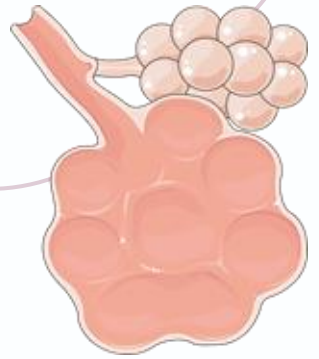
Larynx: ventricle, false vocal folds, glands, true vocal folds, epithelium

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

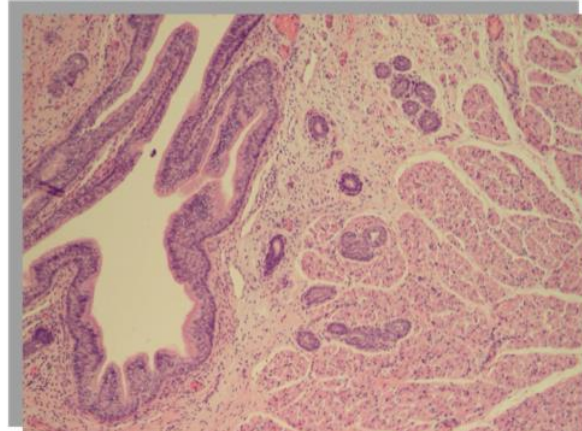
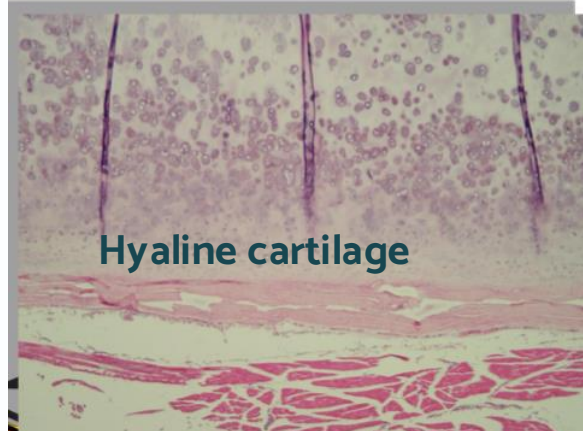
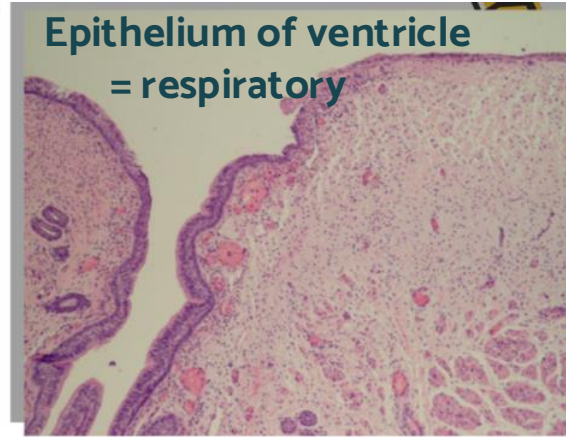
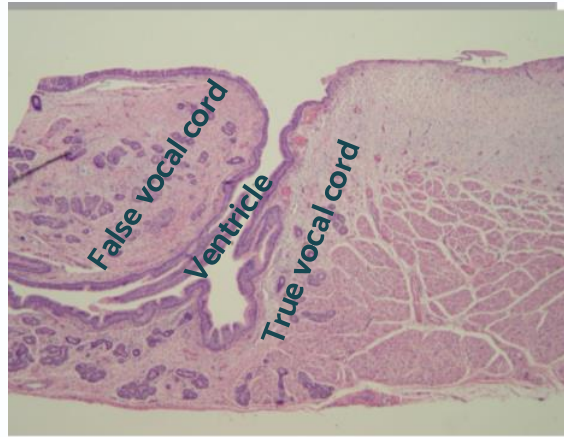
Respiratory bronchioles: epithelium transitions to simple squamous, open into alveolar ducts

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

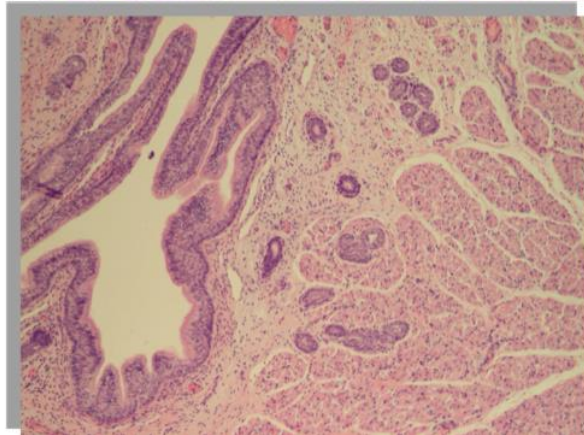
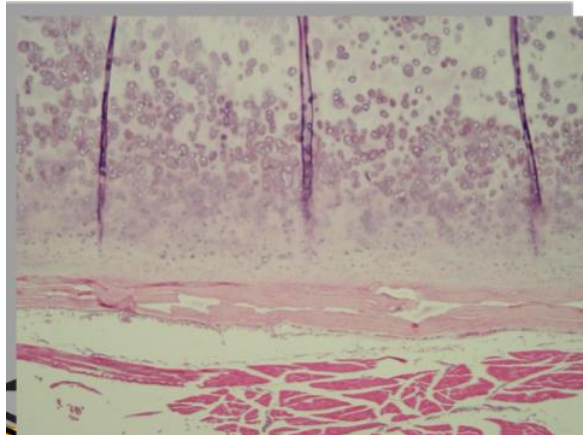
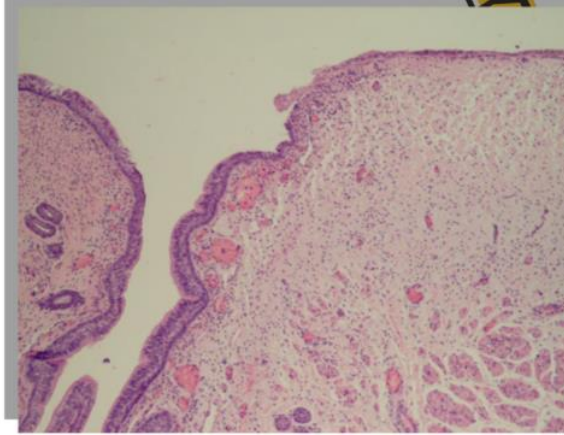
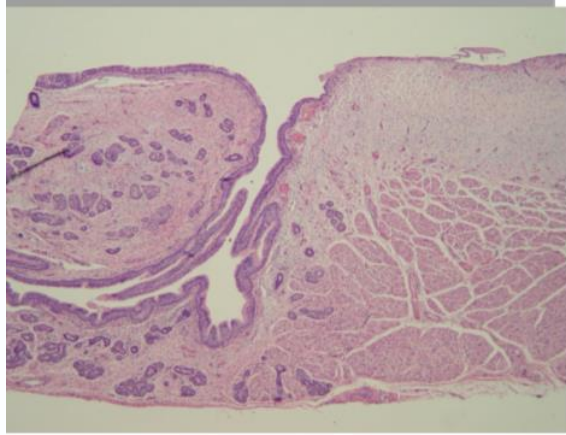


The larynx is composed histologically of the following layers:

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

Longitudinal section that passes through ventricle

Larynx



General Lining Epithelium

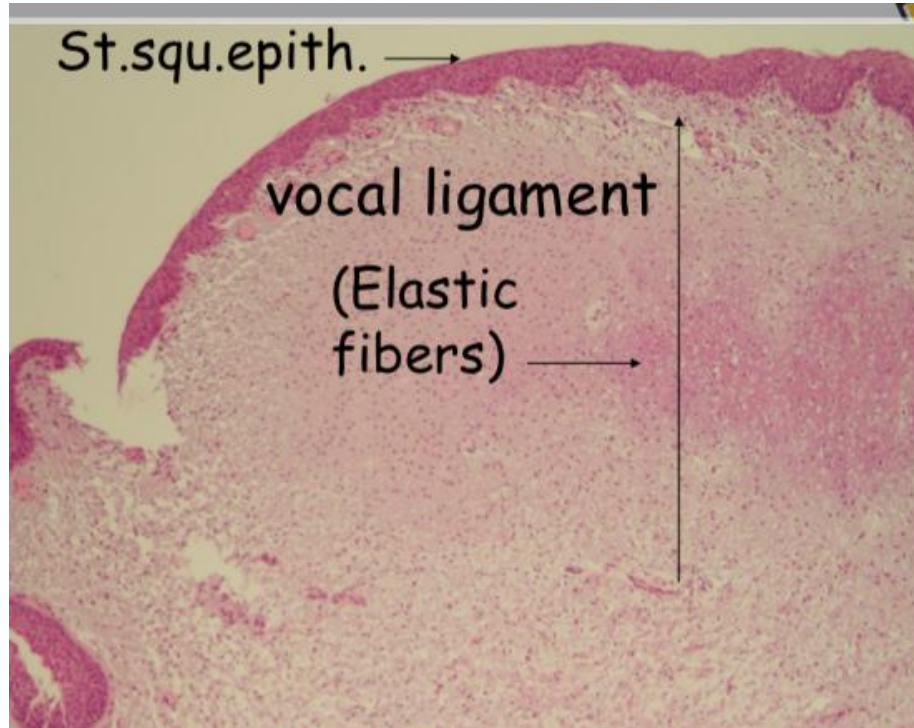
The larynx is lined predominantly by respiratory mucosa:

Pseudostratified ciliated columnar epithelium

Contains goblet cells

This lining is present in most regions of the larynx

Larynx – true vocal cords



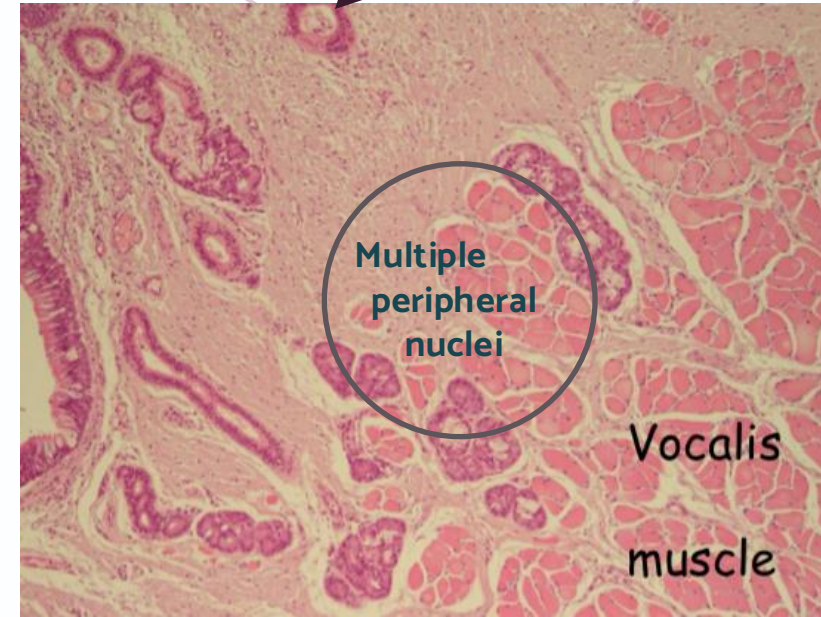
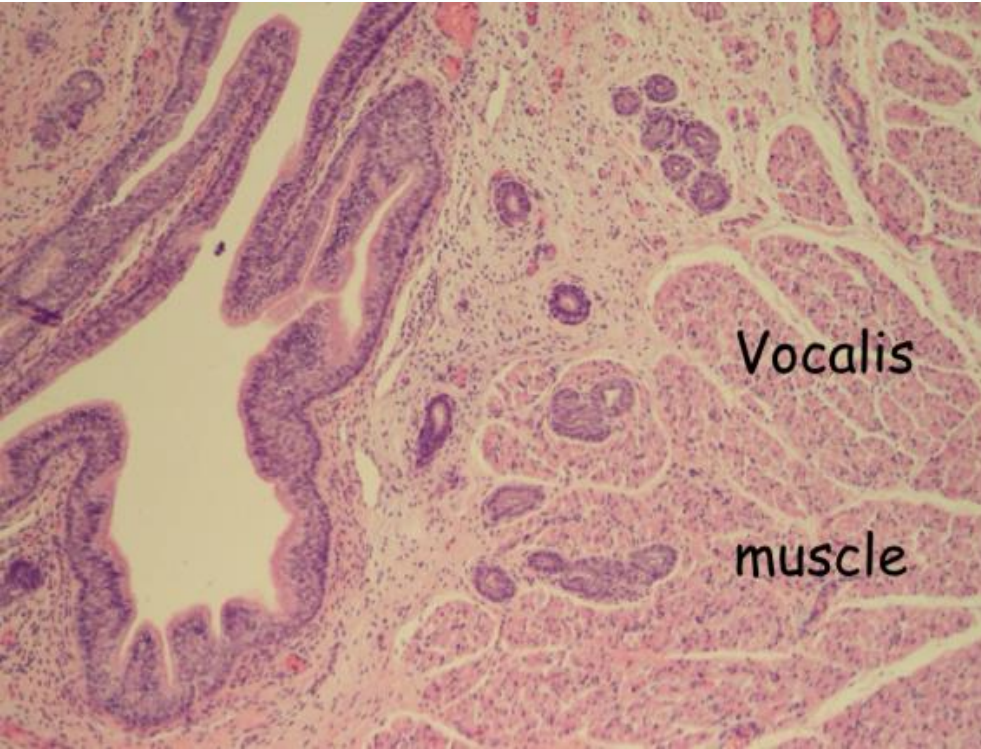
epithelium:

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



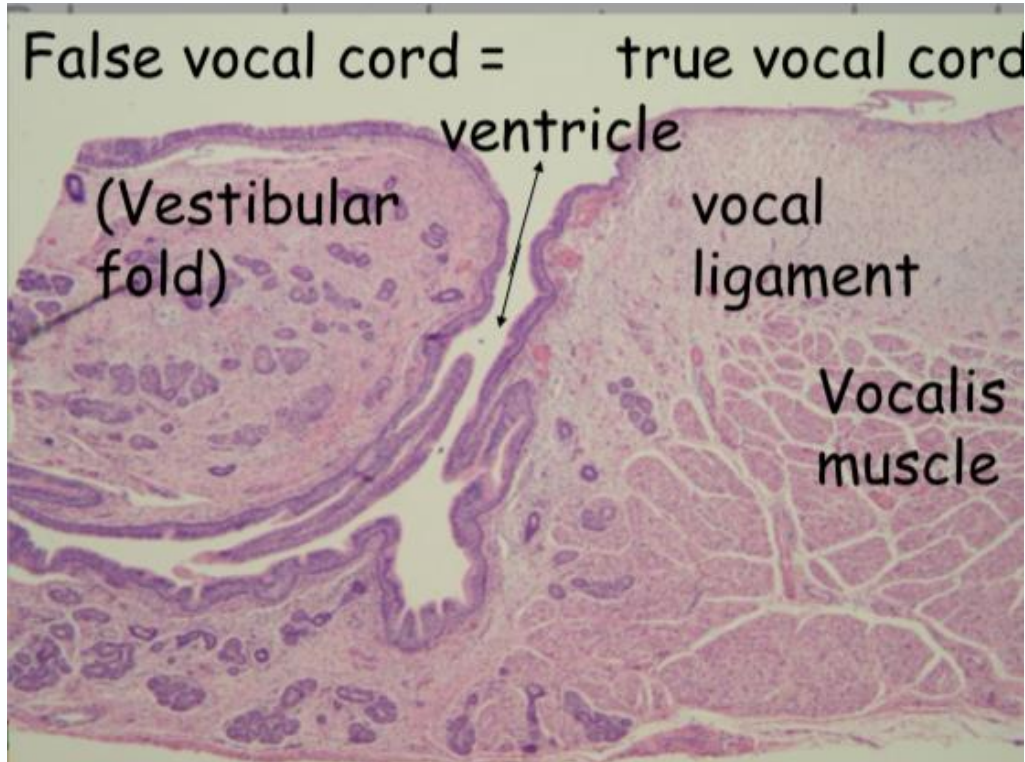
The vocalis muscle is the medial part of the thyroarytenoid muscle

It lies within the true vocal cord (vocal fold)

Runs parallel to the vocal ligament

Striated muscle = multiple peripheral nuclei

Larynx

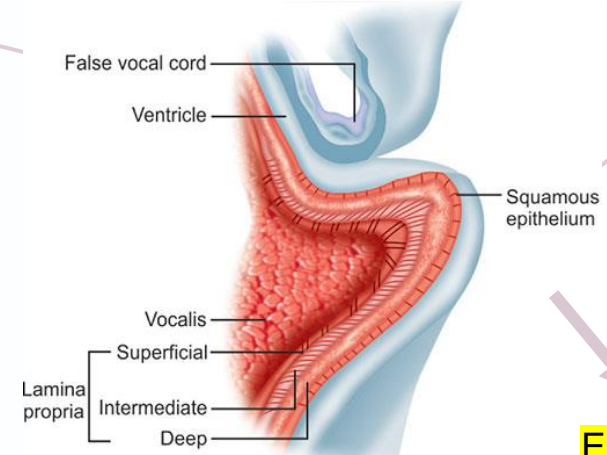
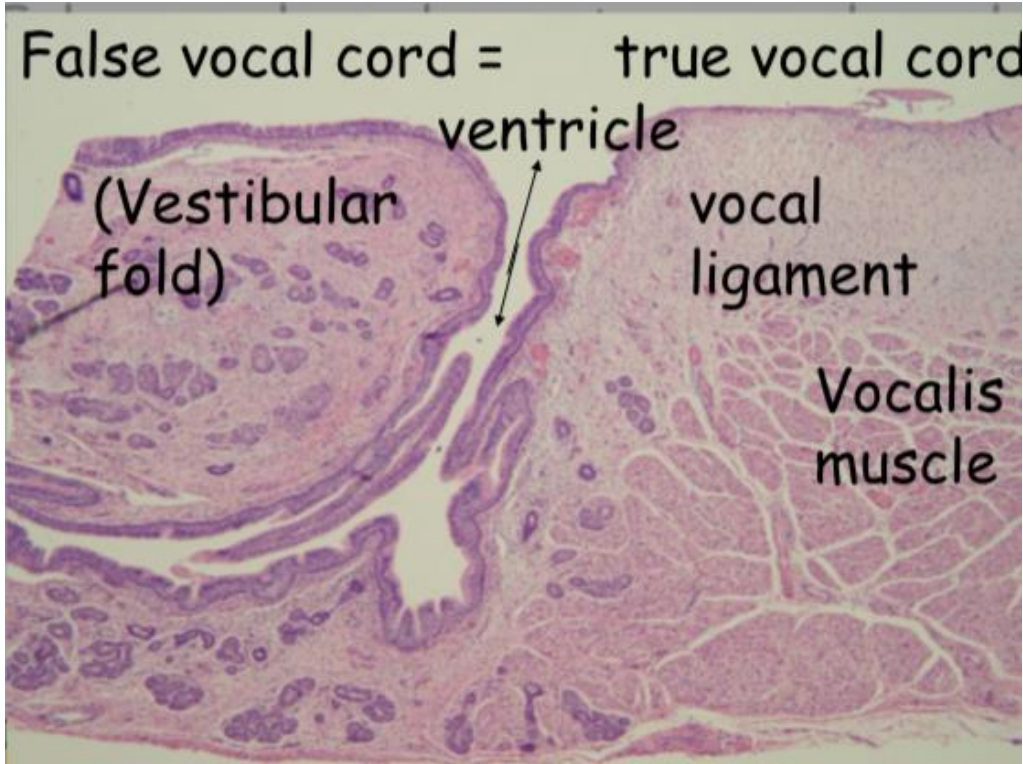


1- False vocal cord = respiratory epithelium ; psuedostratified ciliated & goblet cells continues throughout the ventricle

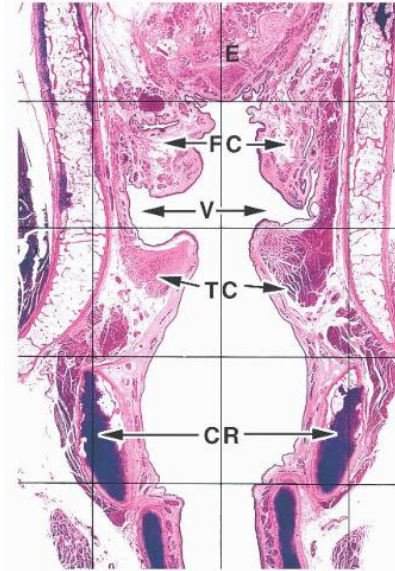
2- True vocal cord : stratified squamous non keratinized

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

Larynx



Extra images



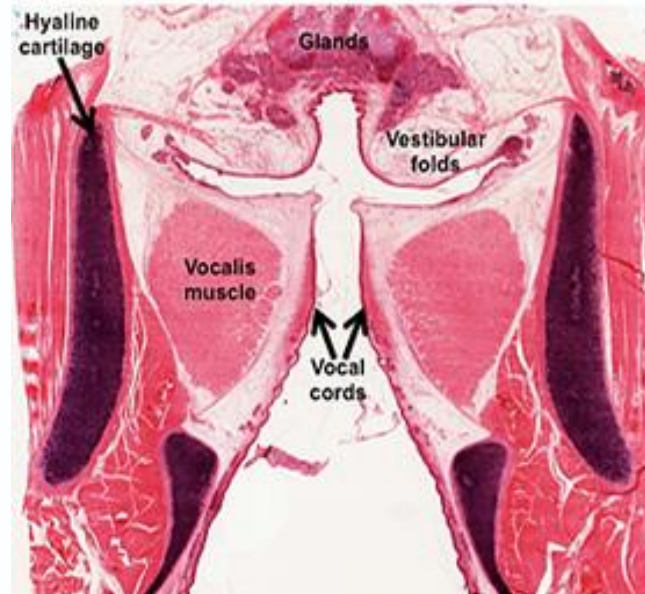
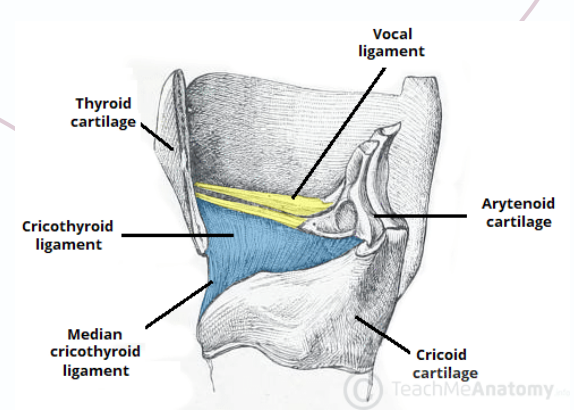
Larynx – true vocal cords

Origin (posterior):

Vocal process of the arytenoid cartilage

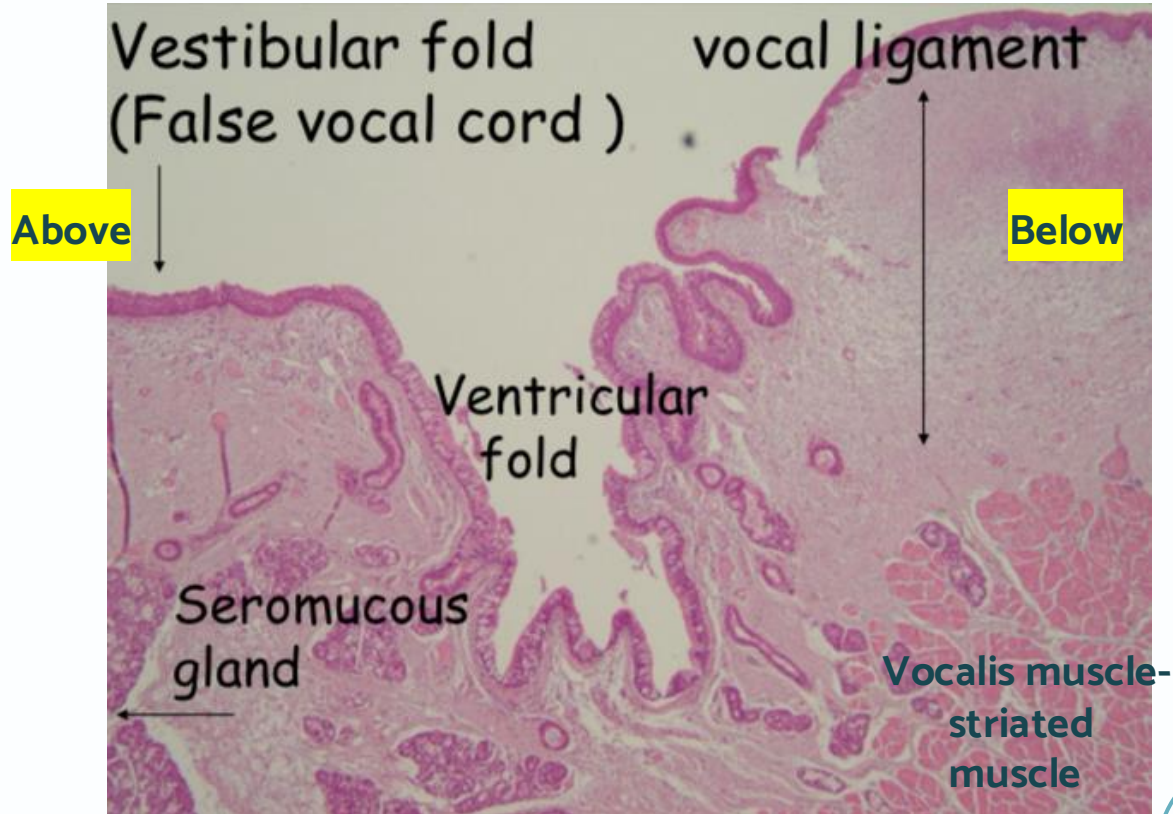
Insertion (anterior):

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



Extra images

Larynx

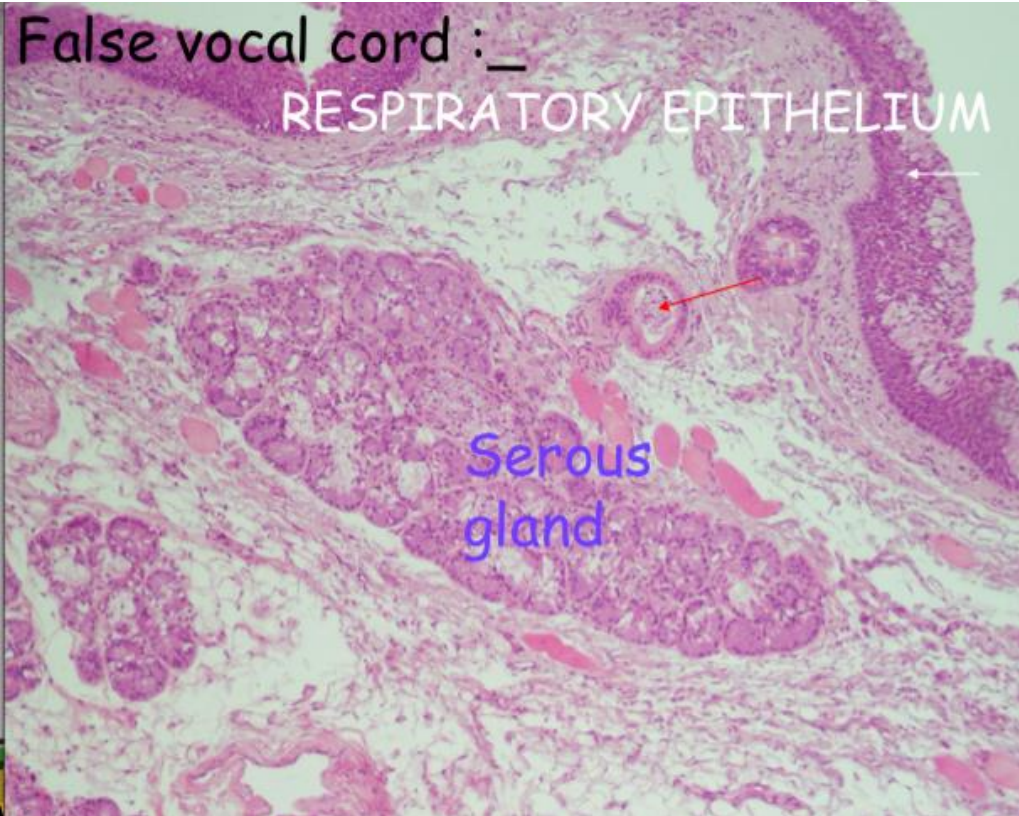


Serous Glands in the FALSE VOCAL CORD

Serous (and seromucous) glands are present in the larynx

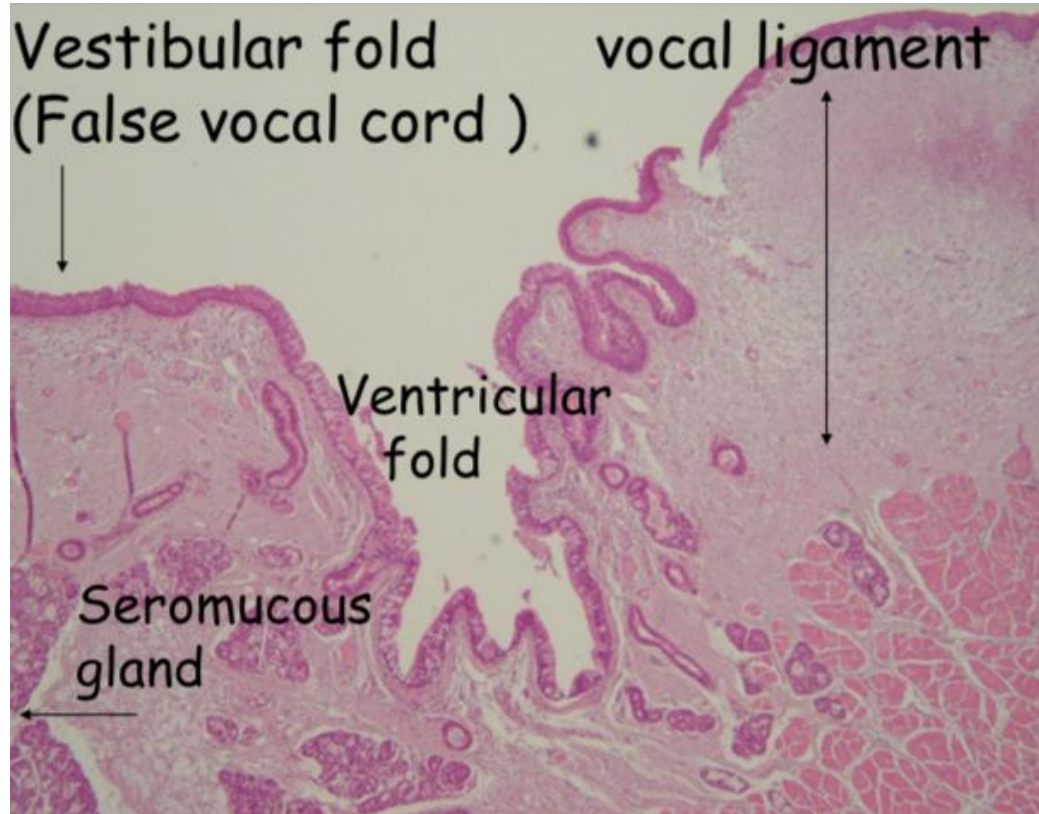
They are located in the submucosa

Main Location: Laryngeal Saccule deep to false vocal cord



Seromucous
gland

Larynx



Cough Reflex

Incomplete closure → particles enter inlet → coughing

Mechanism:

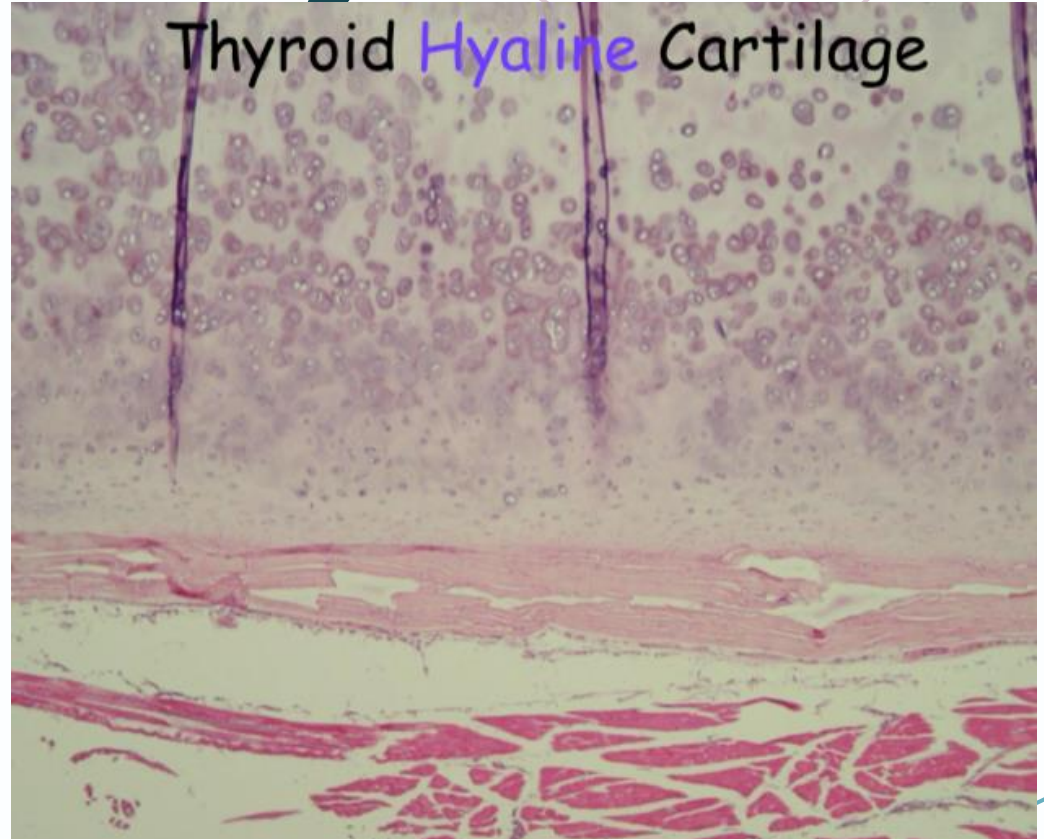
Adduction of true vocal cords
Compression of air below cords
Sudden opening → forceful air expulsion

Voice Production (Phonation)

True vocal cords adduct
Expired air causes vibration → sound

Larynx – thyroid cartilage

Hyaline cartilage contains
chondrocyte which is found
inside lacunae

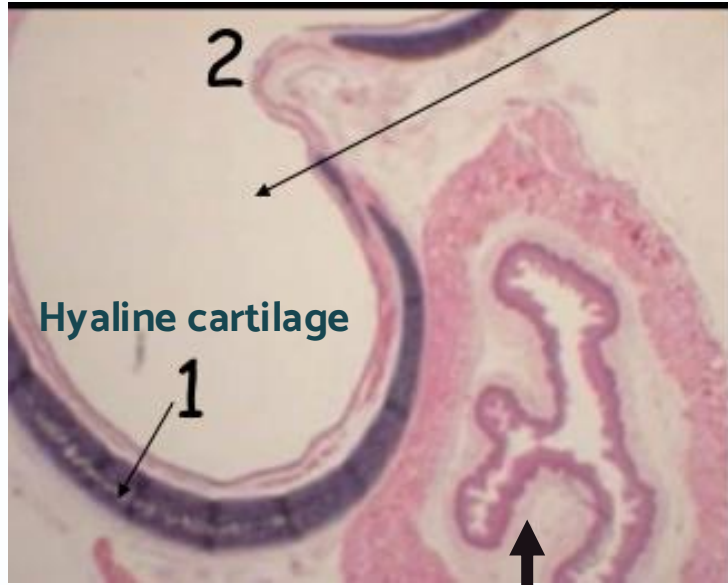




**pseudostratified ciliated
columnar epithelium with
goblet cells**

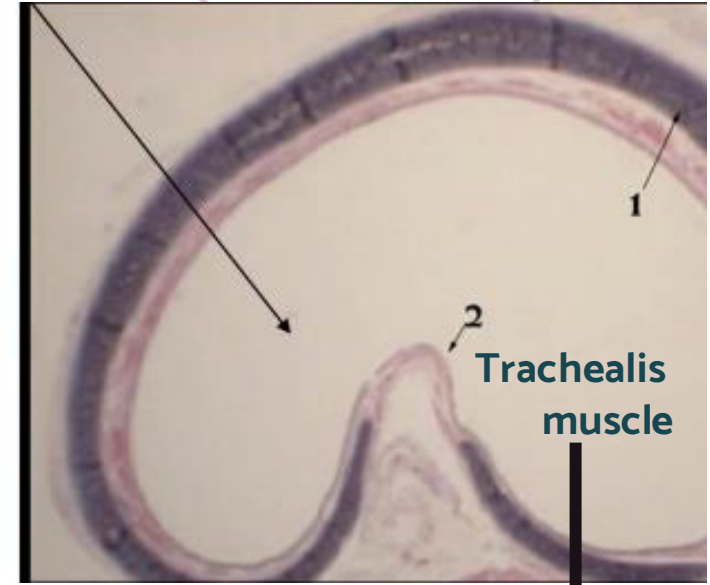
**Found throughout the
ventricle and false vocal
cord**

C- shape trachea – transverse section



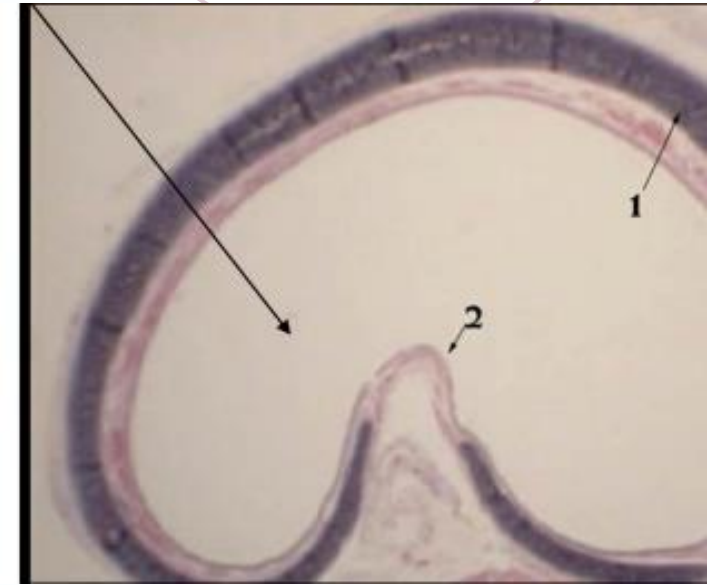
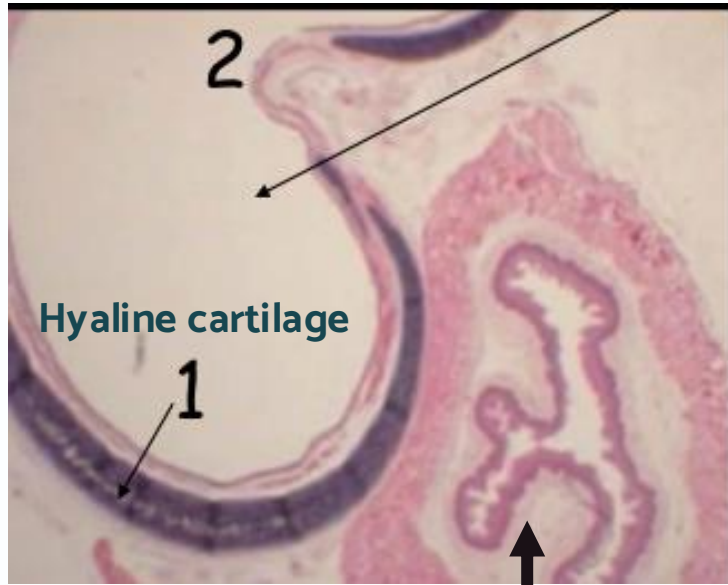
Trachea's lumen is always open for passage of air , because of the C- shaped cartilage

Esophagus posteriorly
Collapsed lumen ; opens during deglutition



Smooth muscle , innervated by autonomic nervous system

C- shape trachea – transverse section



Hyaline cartilage

Lamina propria : found
in both trachea &
esophagus
Contains glands

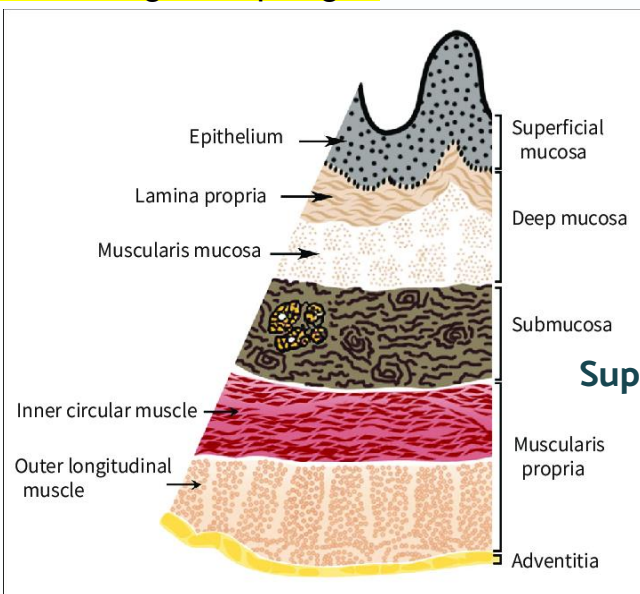
Esophagus : stratified squamous
non keratinized

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

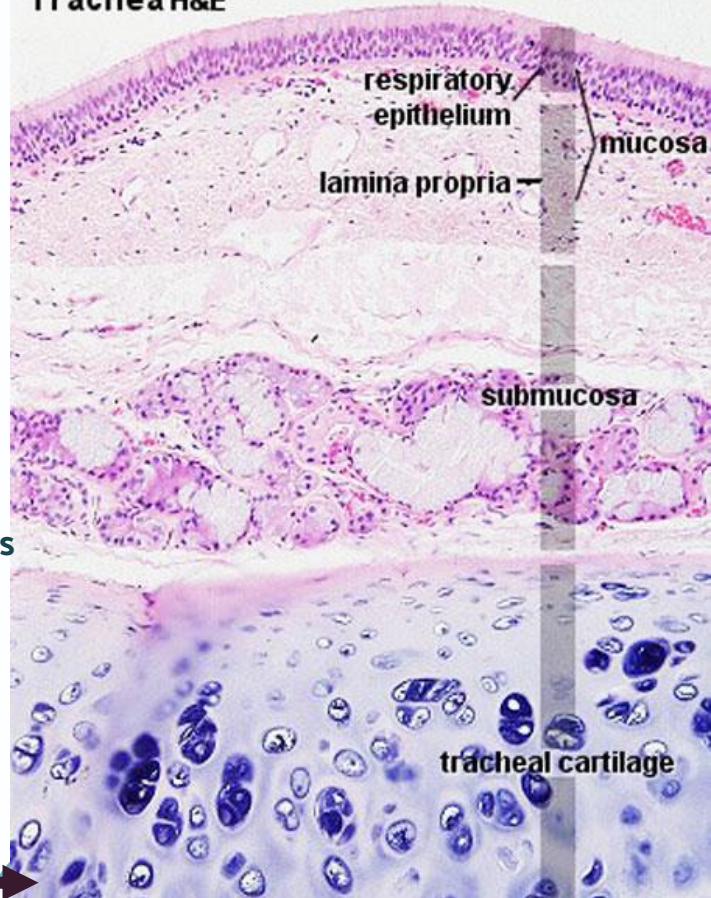
Extra image-esophagus



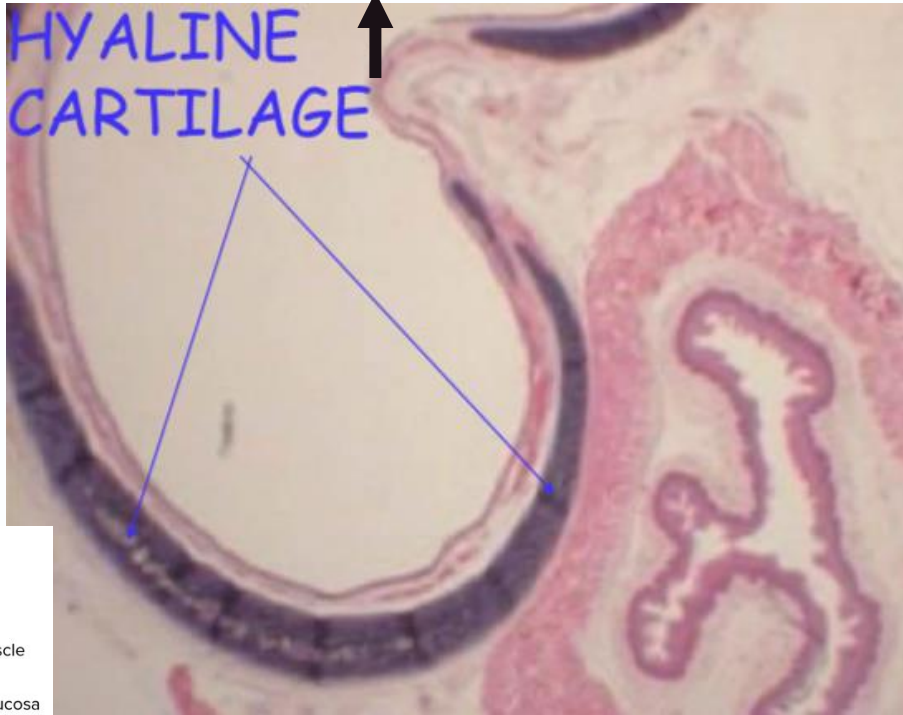
Supportive layer : has smooth muscle

Supportive layer : inner circular & outer longitudinal

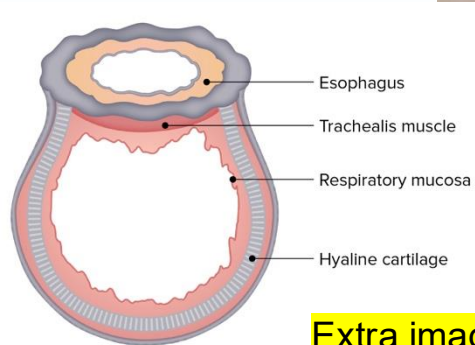
Trachea H&E



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

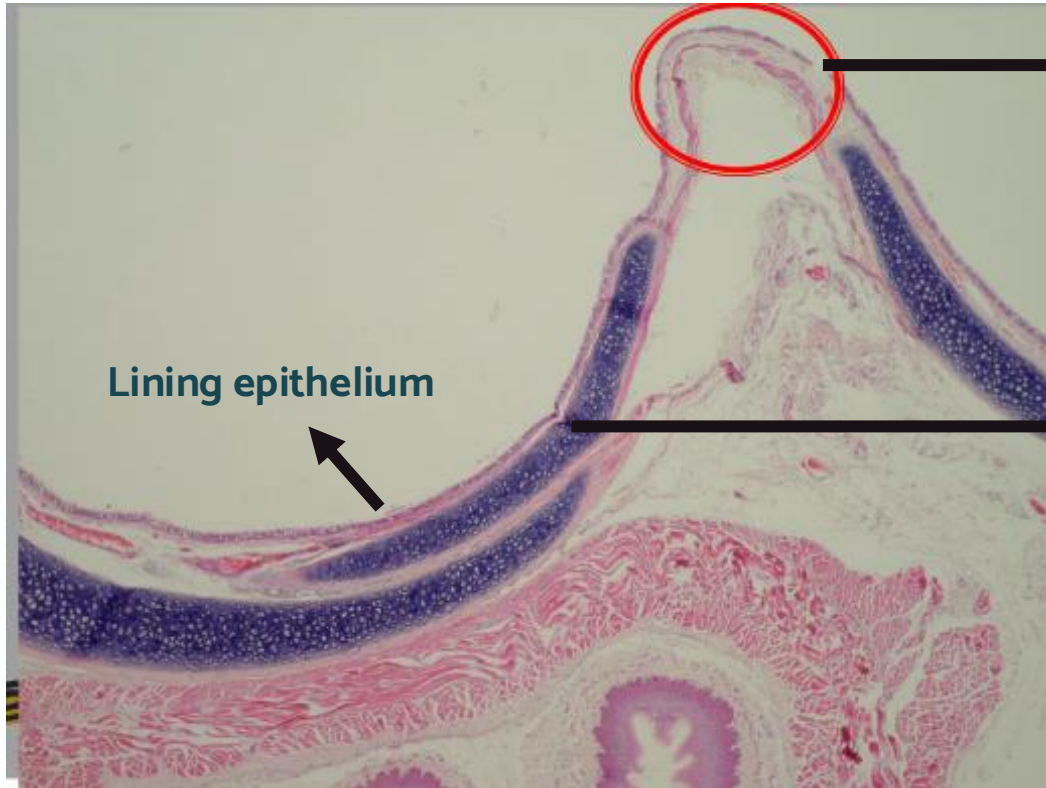
psuedostratified with goblet cells

Lamina propria

Muscularis mucosa

Supportive layer : hyaline & smooth muscle

Connective tissue - adventitia

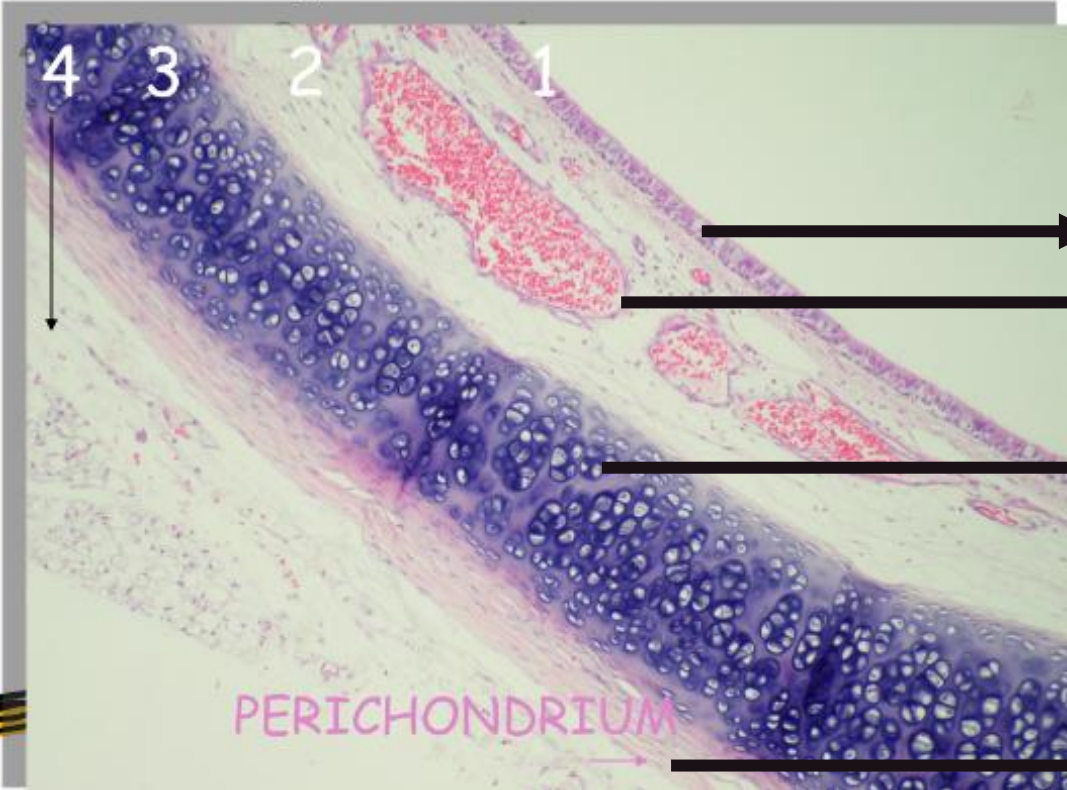


Lining epithelium

Trachealis smooth muscle

Hyaline cartilage

MUCOSA ,SUBMUCOSA,CARTILAGE.ADVENTITIA

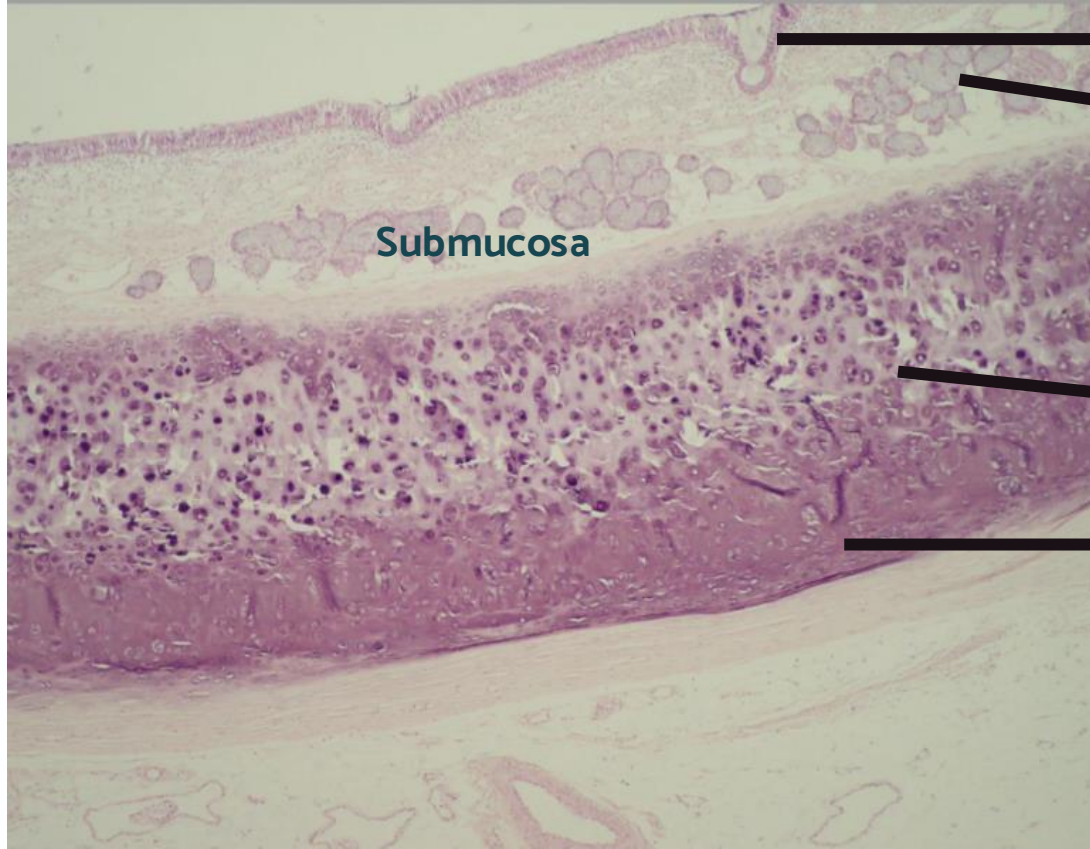


Lining epithelium

Submucosa

Supportive layer

Connective tissue;
Adventitia



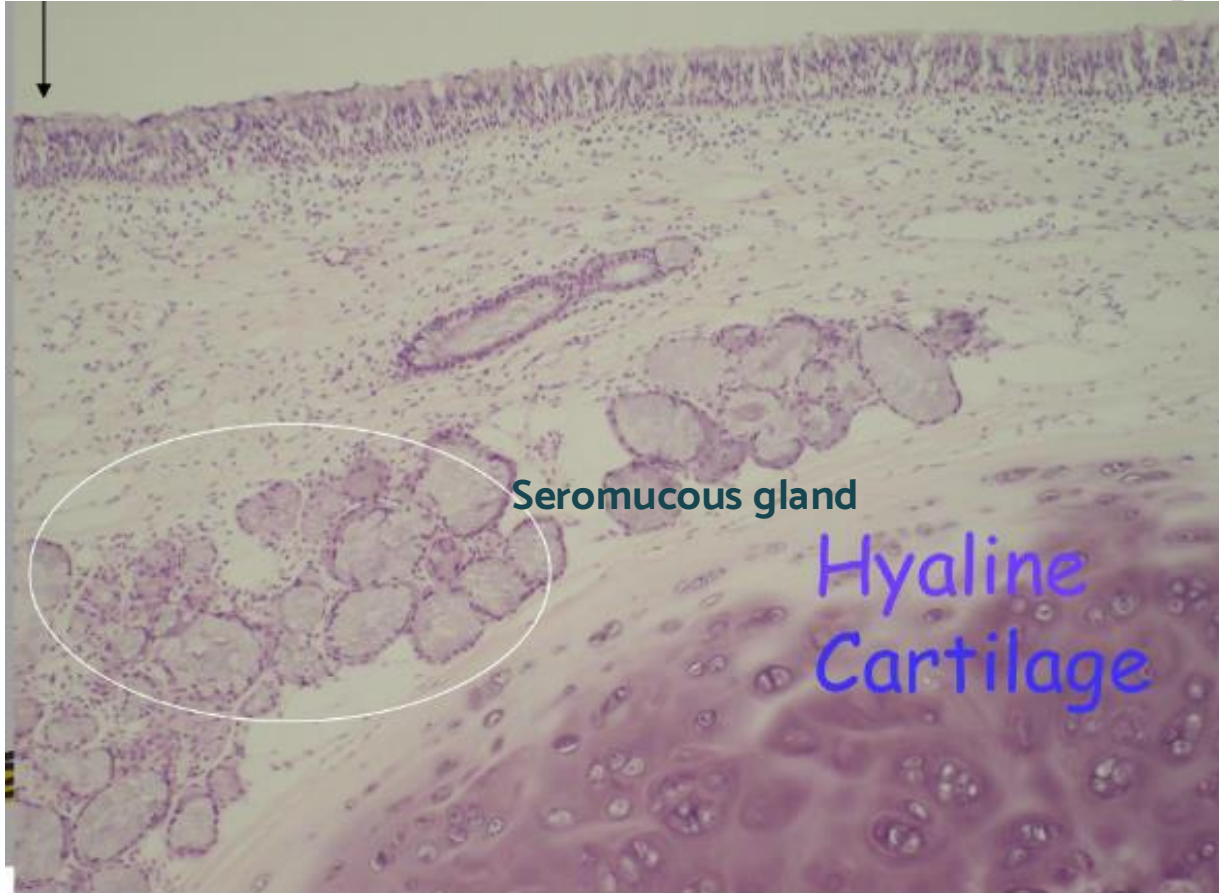
Lining epithelium

**Gland found in
Lamina propria
can extend to
submucosa**

Hyaline cartilage

**Connective tissue ;
Adventitia**

RESPIRATORY EPITHELIUM TRACHEAL GLAND IN SUBMUCOSA

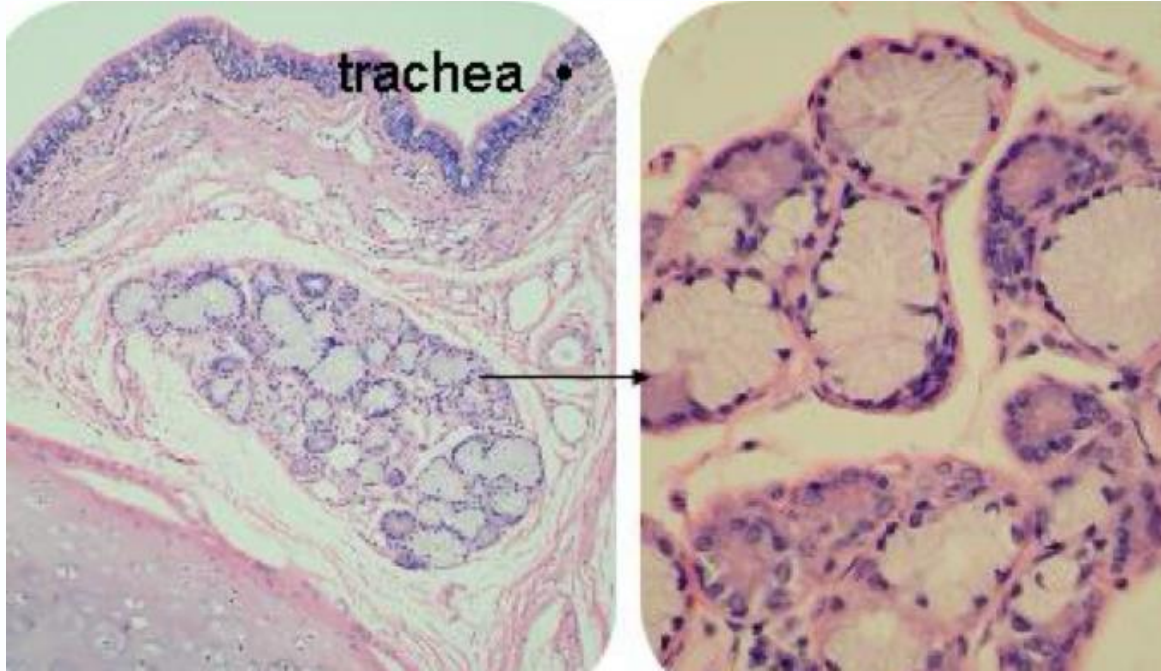


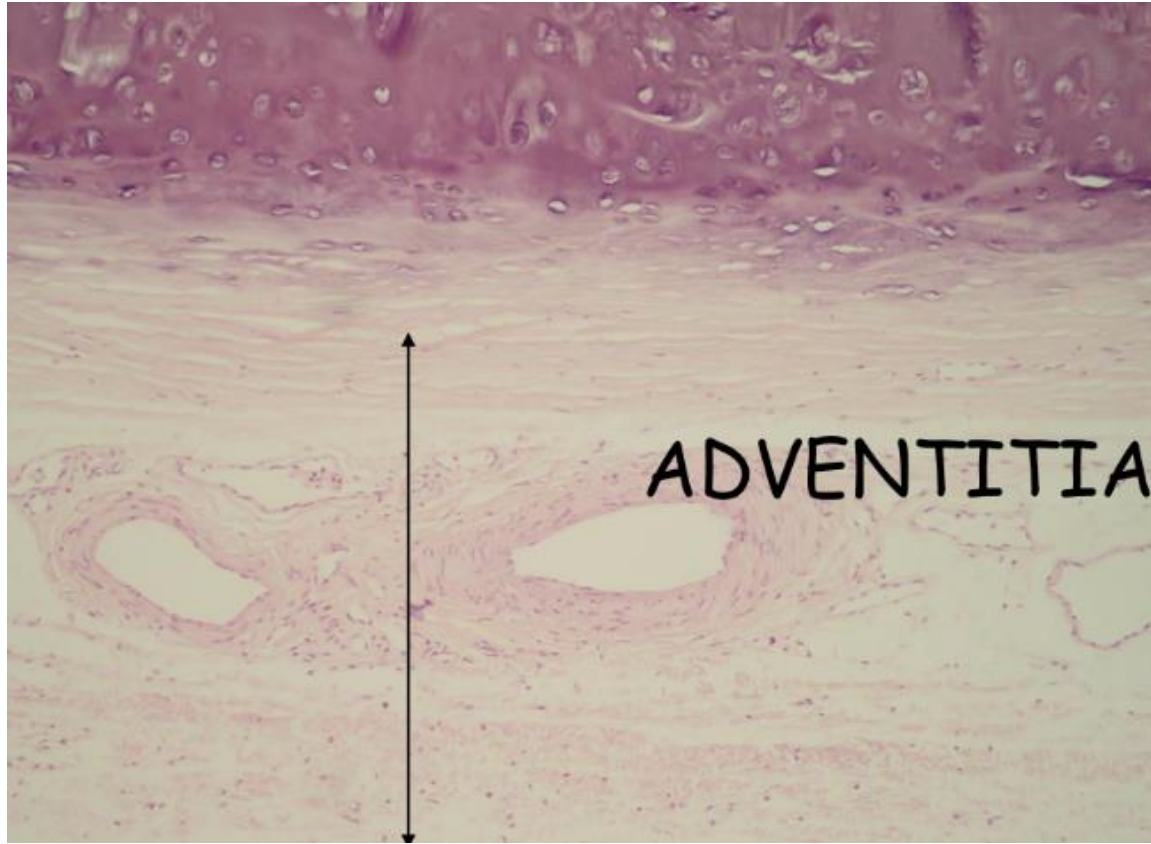
Lining epithelium

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

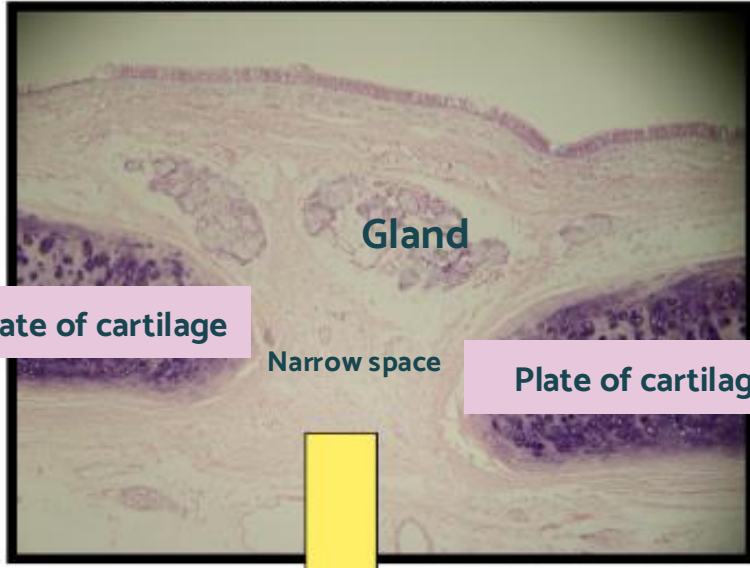
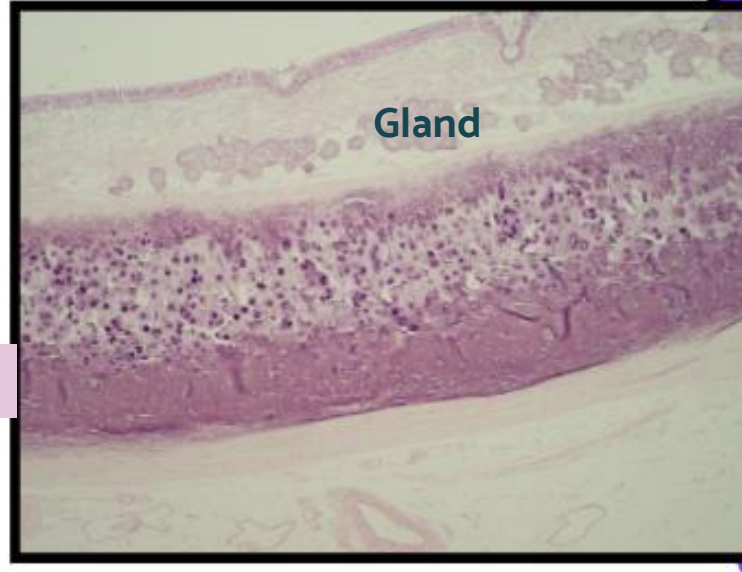


Plate of cartilage

Narrow space

Plate of cartilage

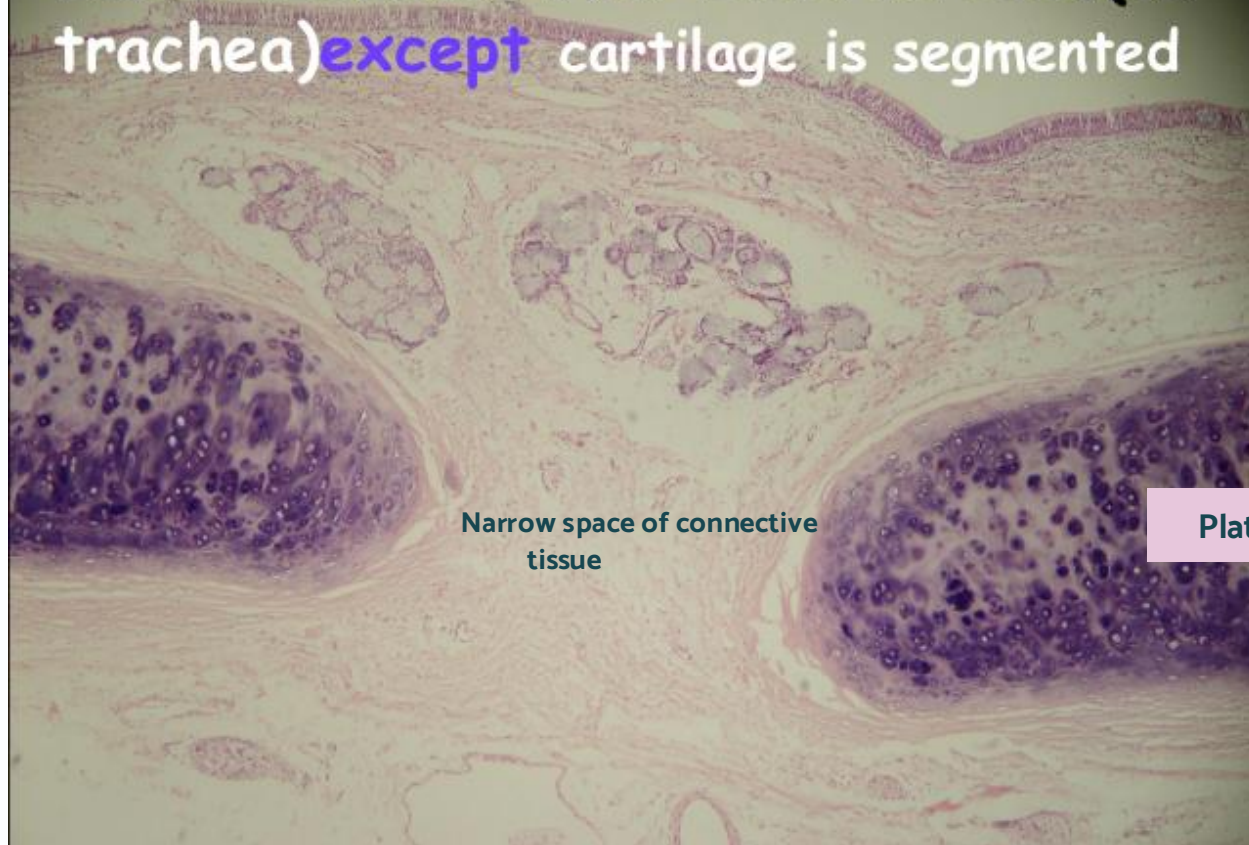


Gland

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

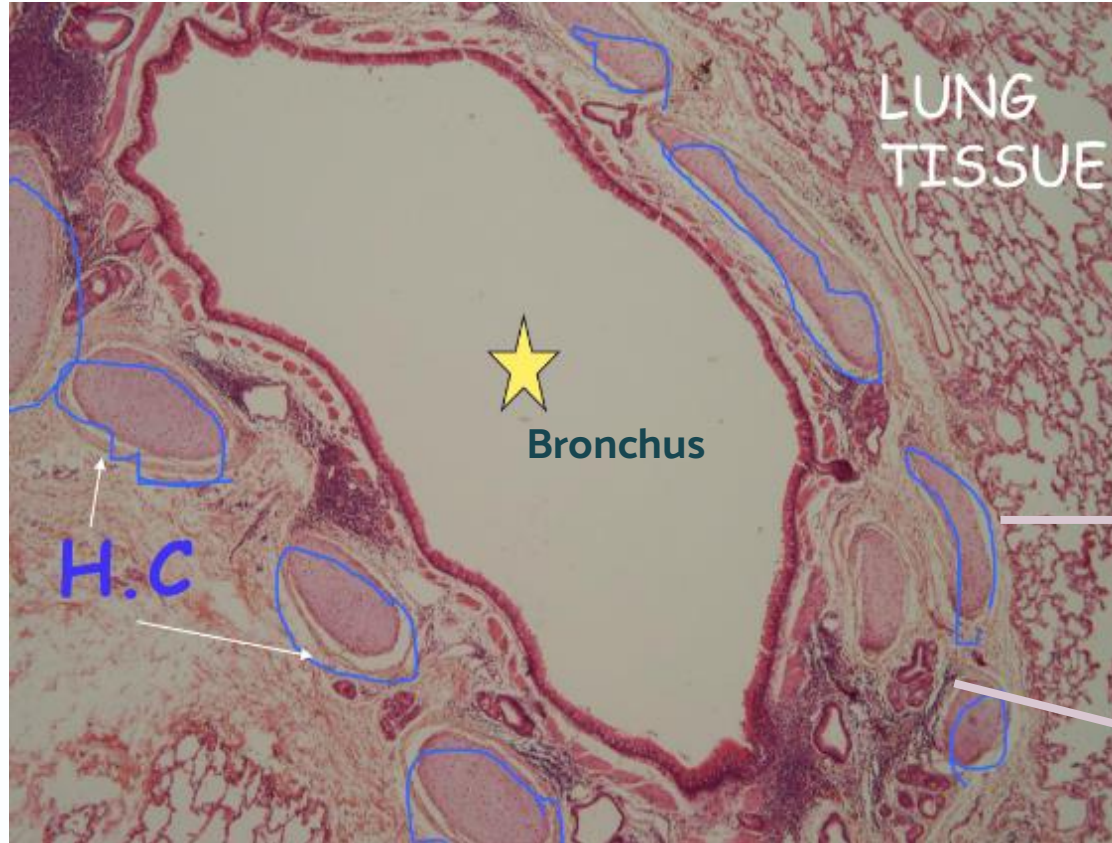
EXTRAPULMONARY BRONCHUS;(as trachea) **except** cartilage is segmented



Narrow space of connective tissue

Plate of cartilage

INTRAPULMONARY lobar BRONCHUS (LARGE) = secondary



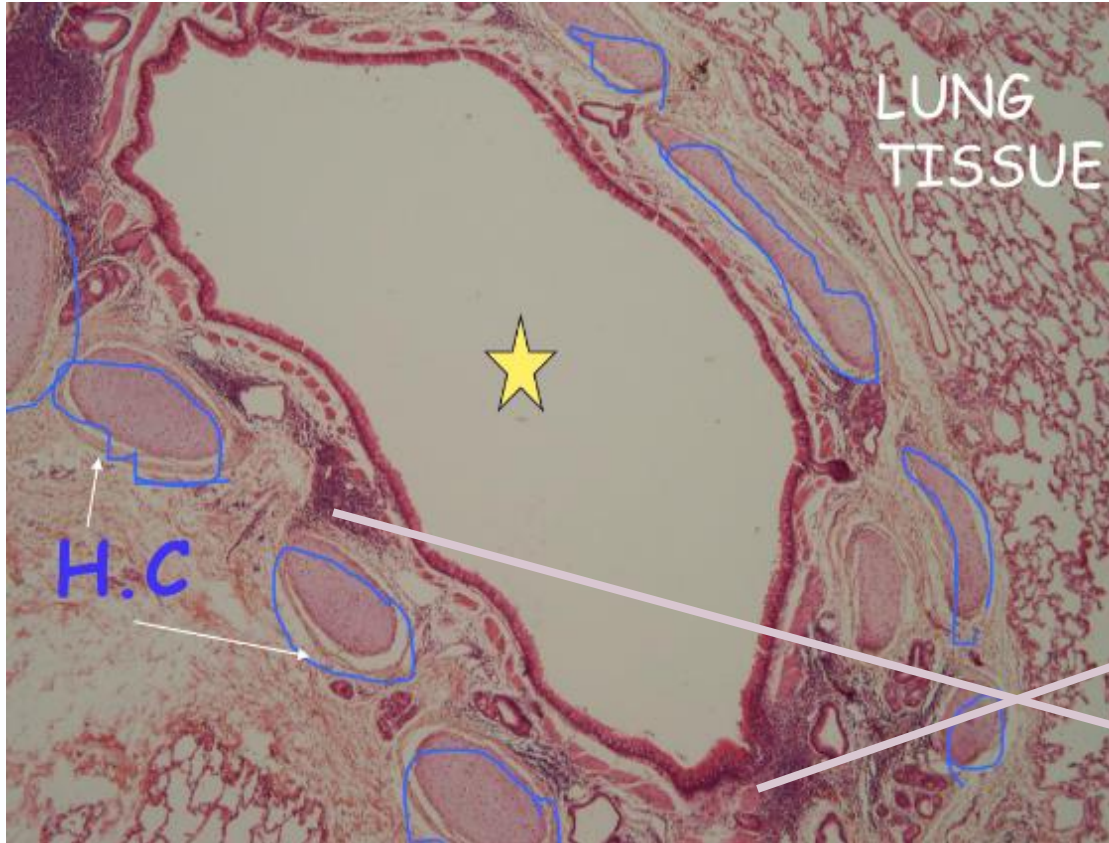
Same lining epithelium as extra pulmonary

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)

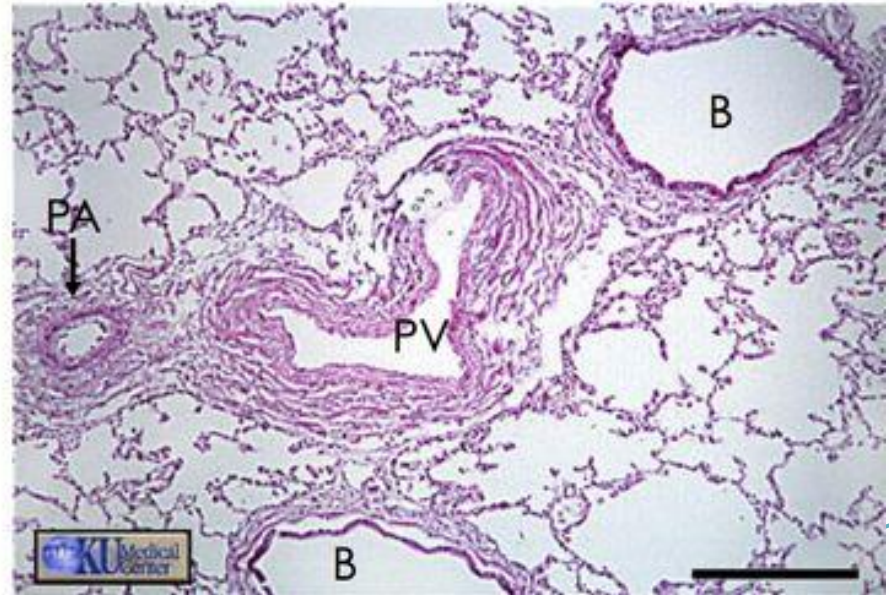
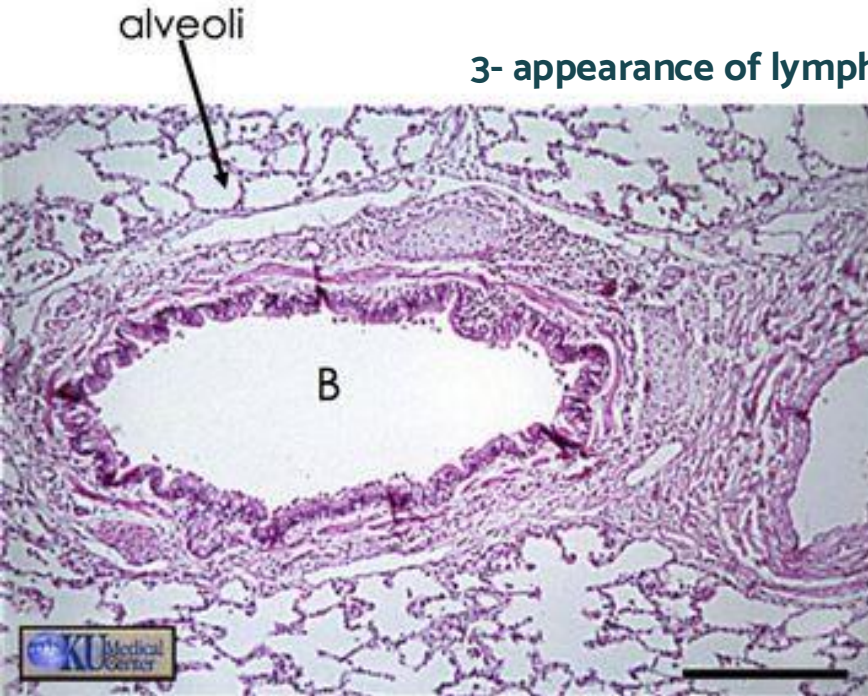
Lymphatic nodule = starts appearing when bronchus enters lung

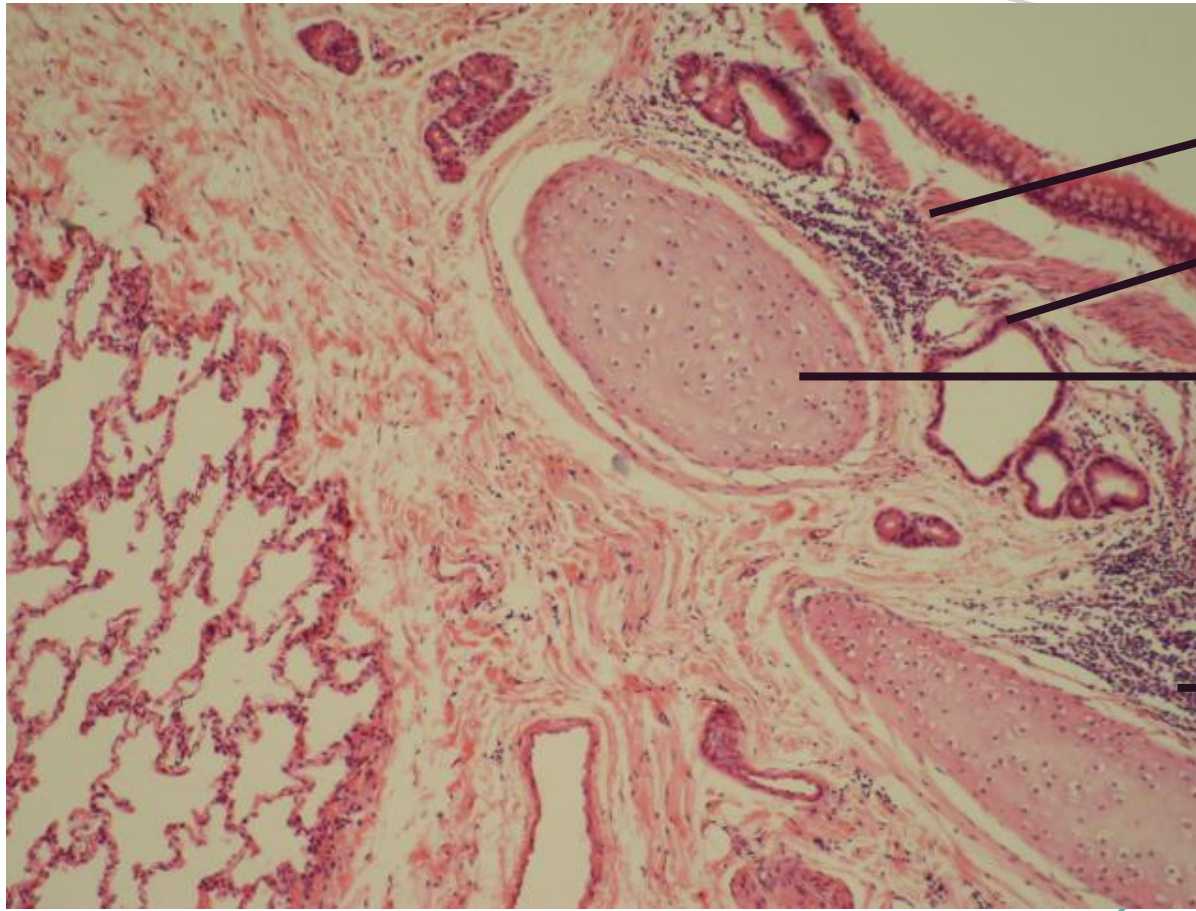
Intrapulmonary Bronchi

1- surrounded by lung tissue

2- same lining epithelium but has less goblet cells

3- appearance of lymphatic nodules



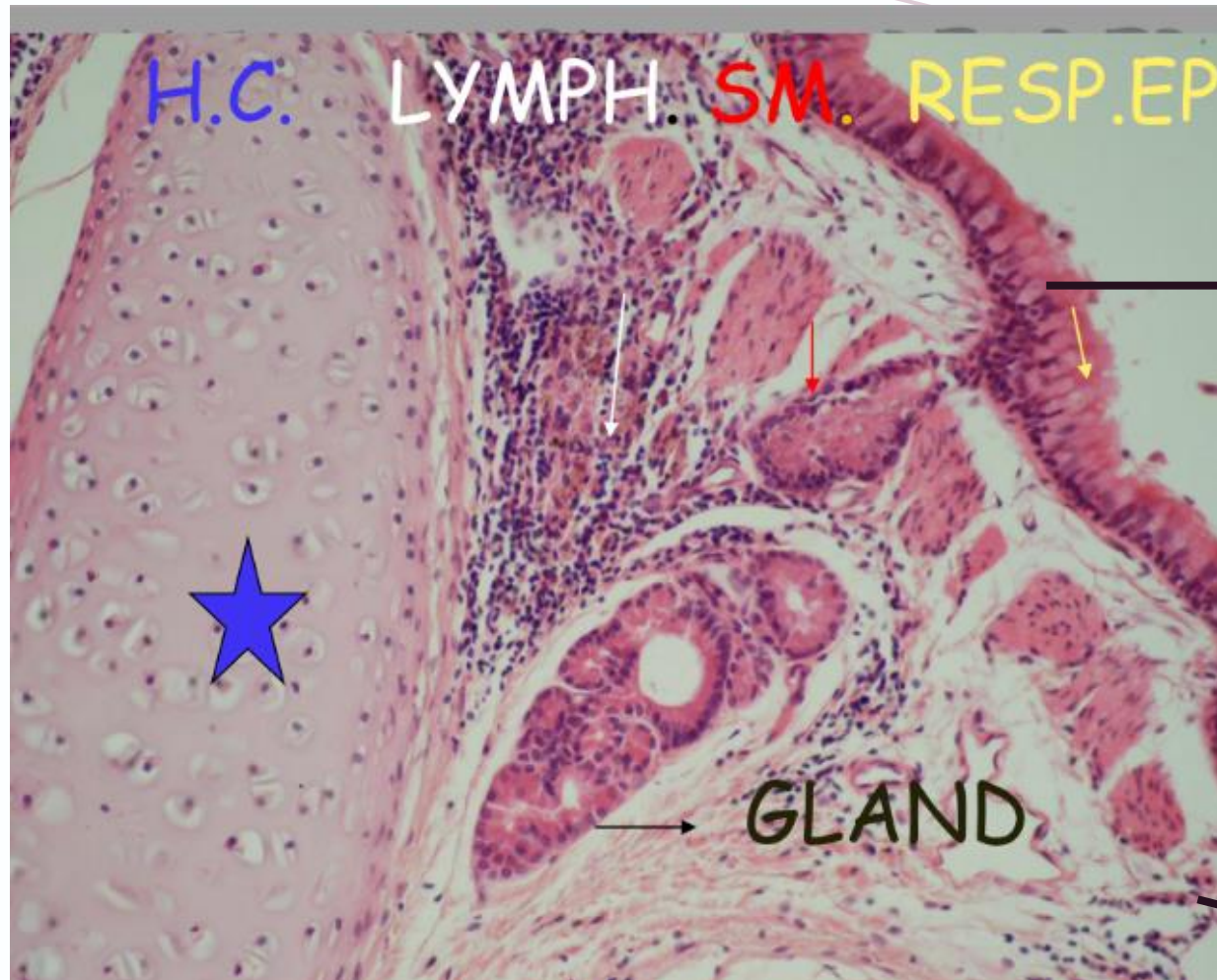


Smooth muscle in Lamina propria (could be found in submucosa)

Glands

Hyaline cartilage

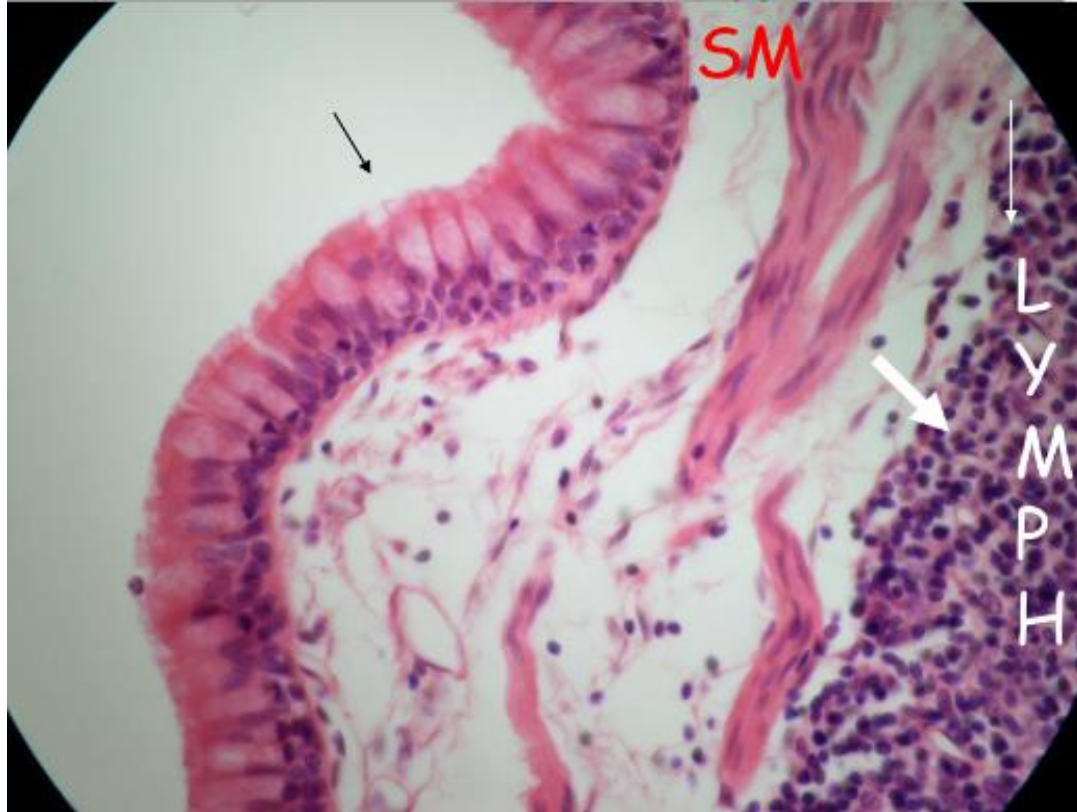
Lymphatic nodule



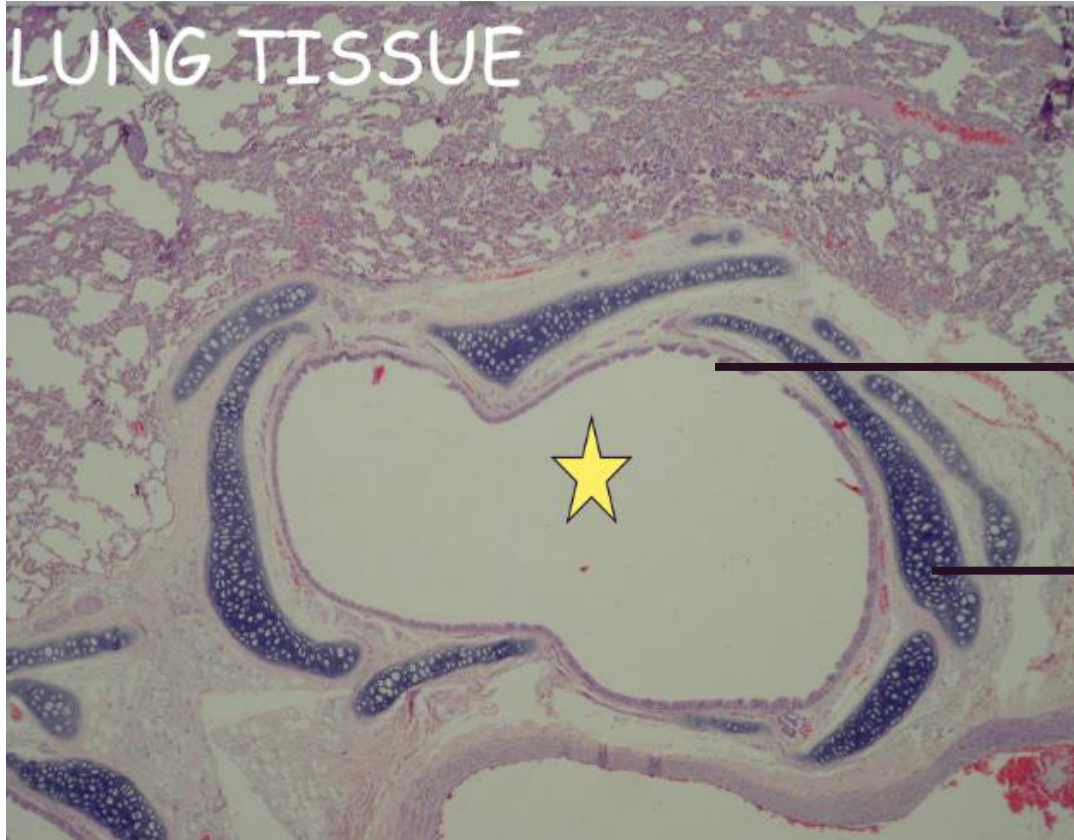
Goblet cells

Lung tissue

PSEUDOSTRATIFIED COLUMNAR CILIATED + GLOBLET CELL



INTRAPULMONARY BRONCHUS-LARGE



Patches of smooth
muscles

Hyaline cartilage

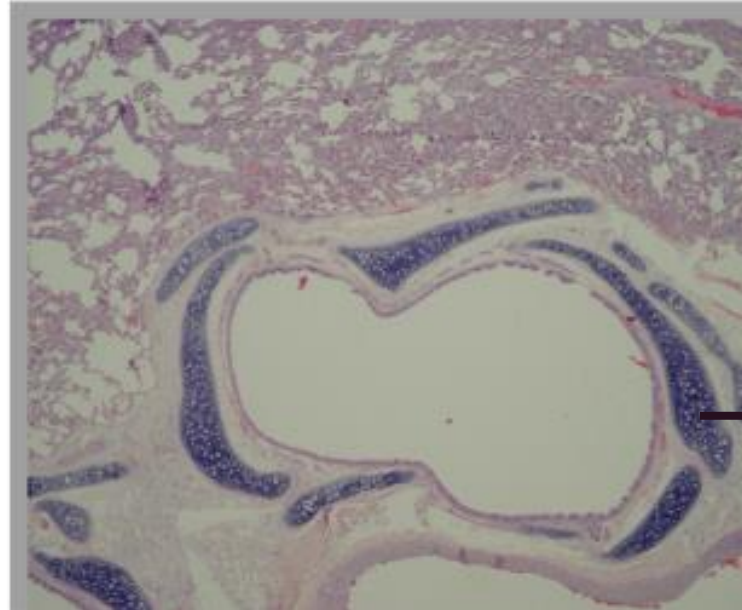
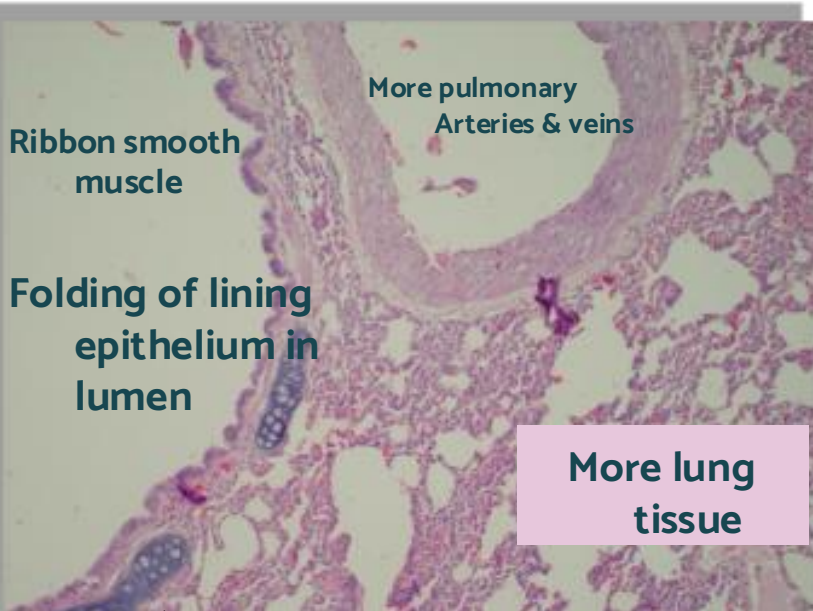
INTRAPULMONARY BRONCHUS:

SMALL

: SEGMENTED , less
goblet & glands

LARGE

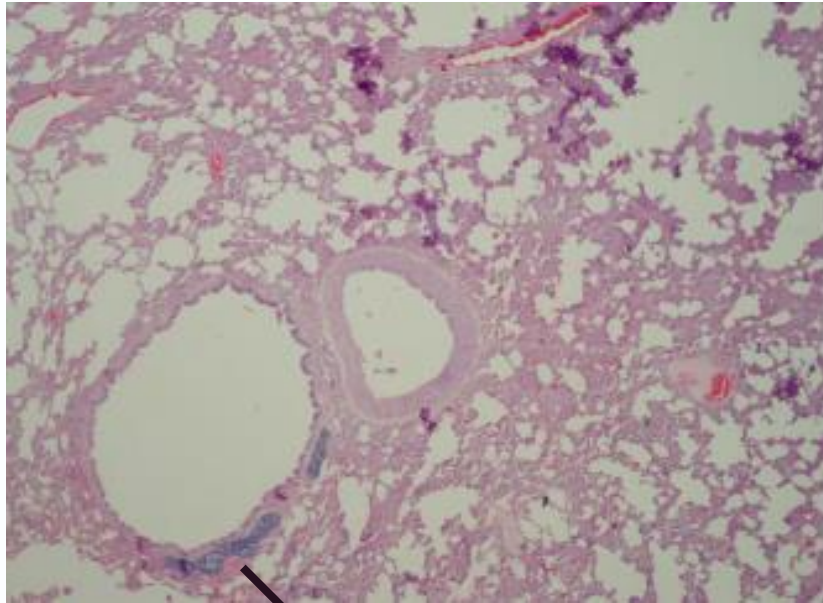
: LOBAR



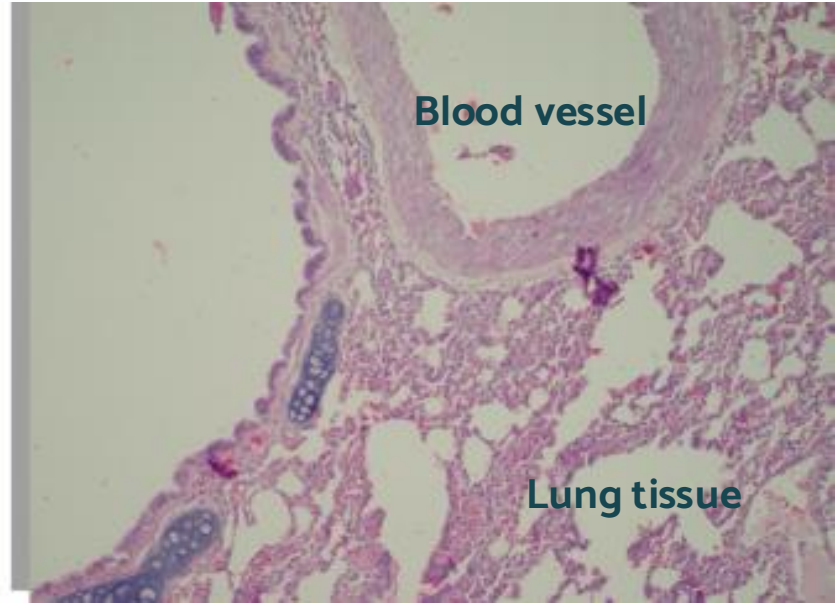
Less hyaline cartilage (2-3) not surrounding whole lumen

SMALL

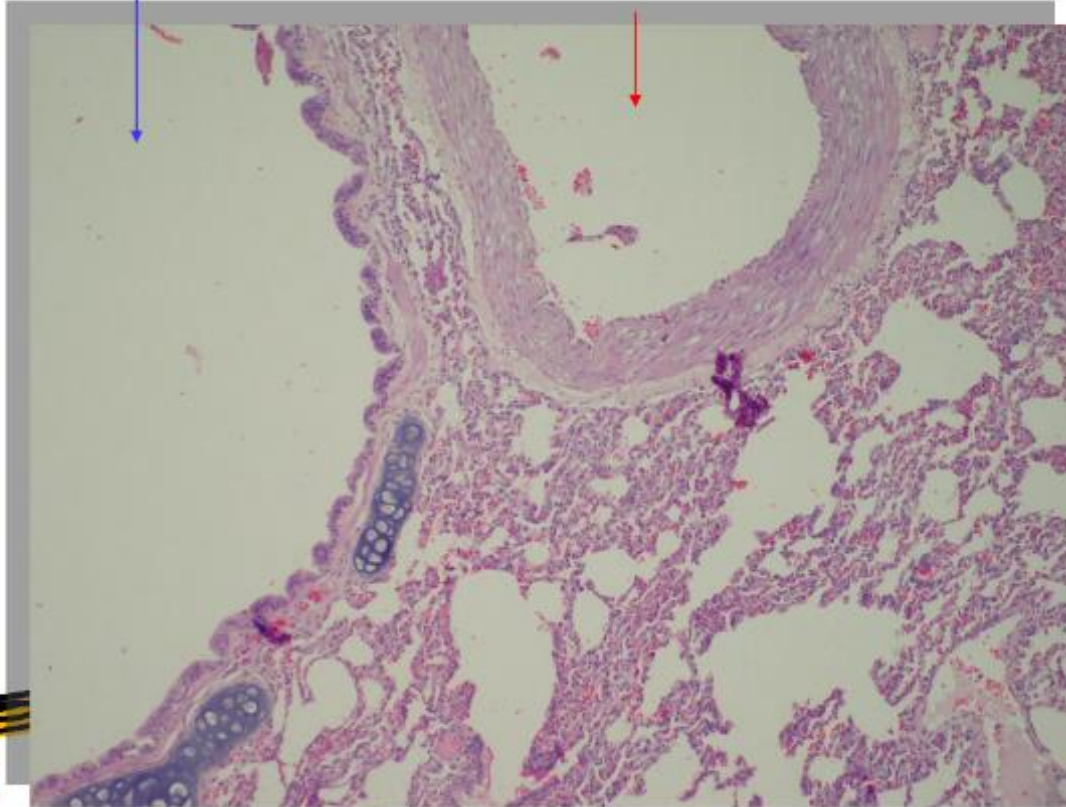
Prominent folding
Note the BVs



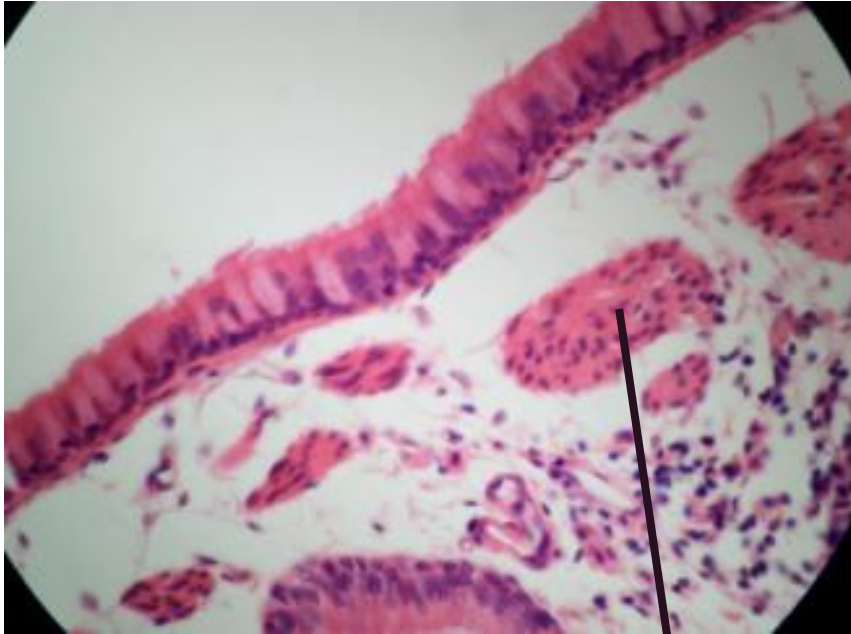
3 plates of cartilage



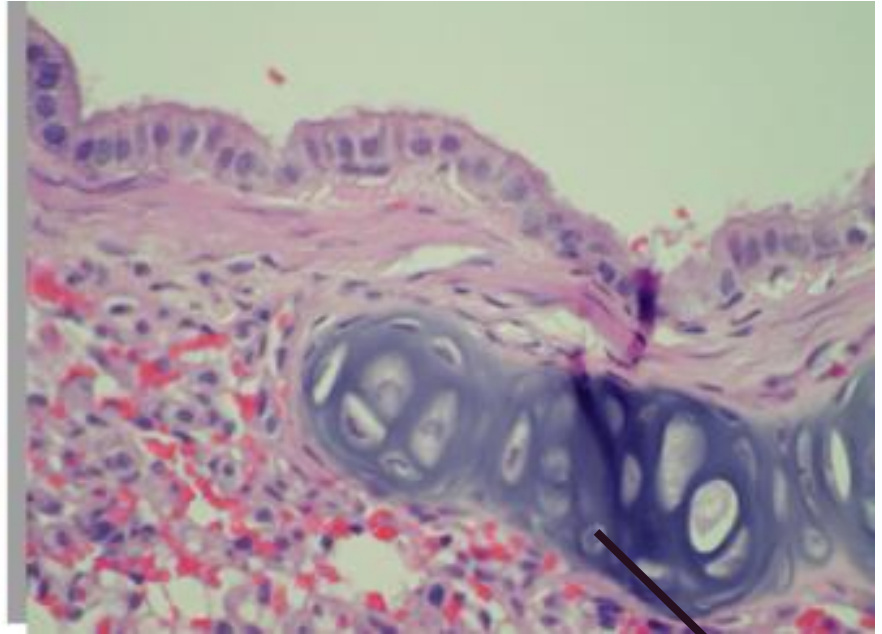
INTRAPULMONARY BRONCHUS PULMONARY VESSEL



Pseudostratified columnar but with LESS goblet cells

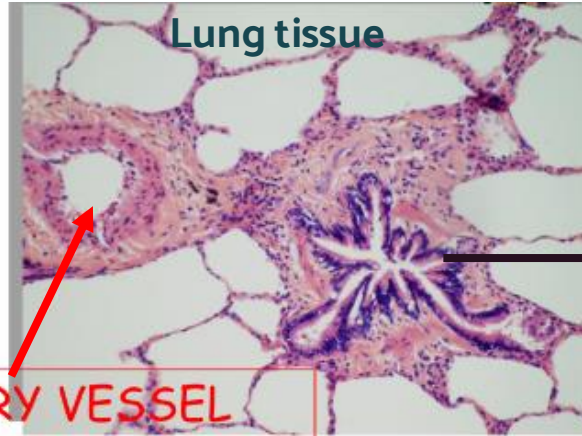
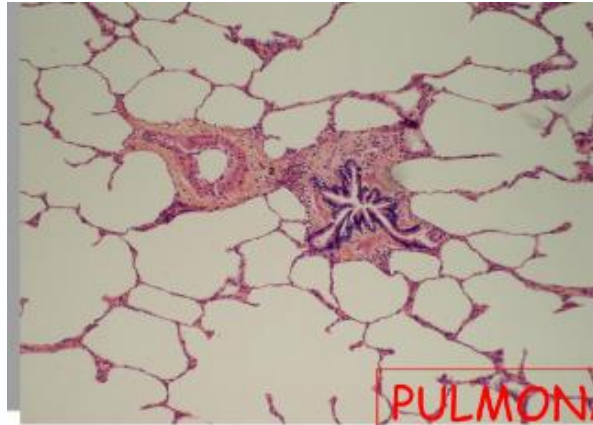


Smooth muscle

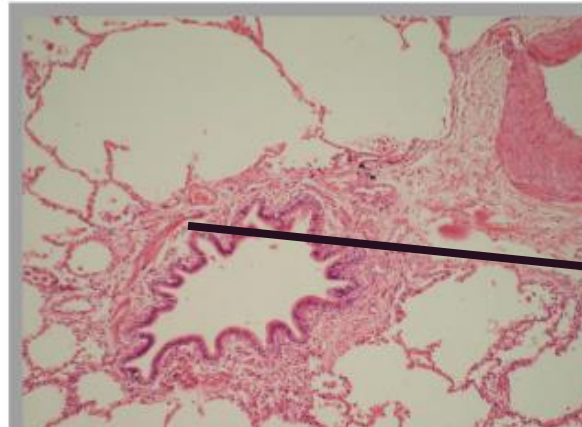
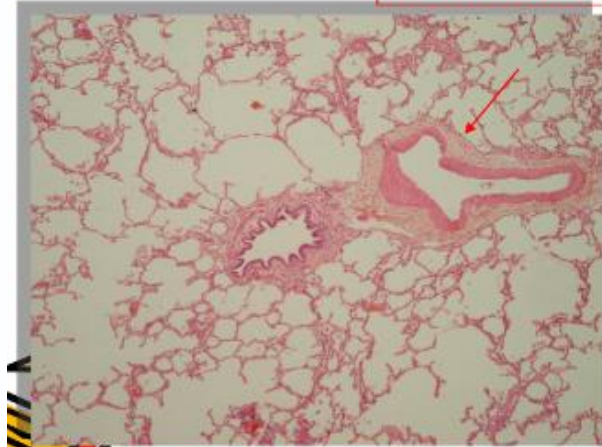


Hyaline cartilage

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



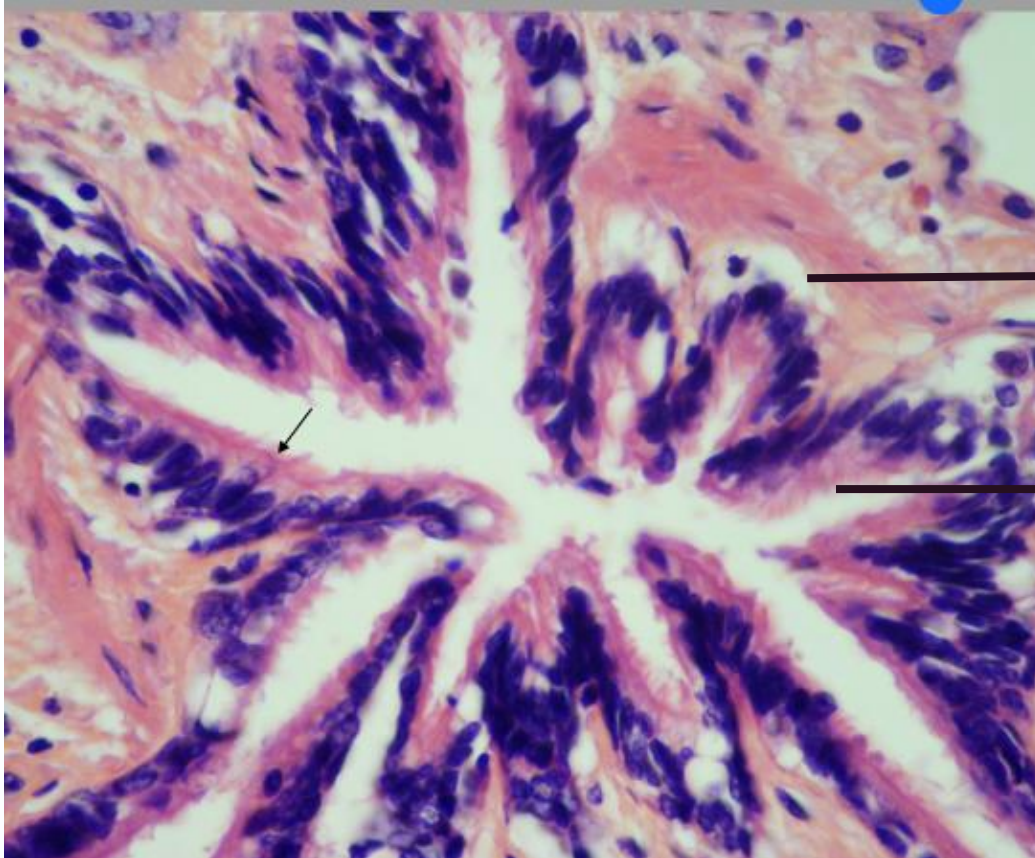
Prominent folding of lumen ; no Cartilage & more smooth muscles



Smooth muscle

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

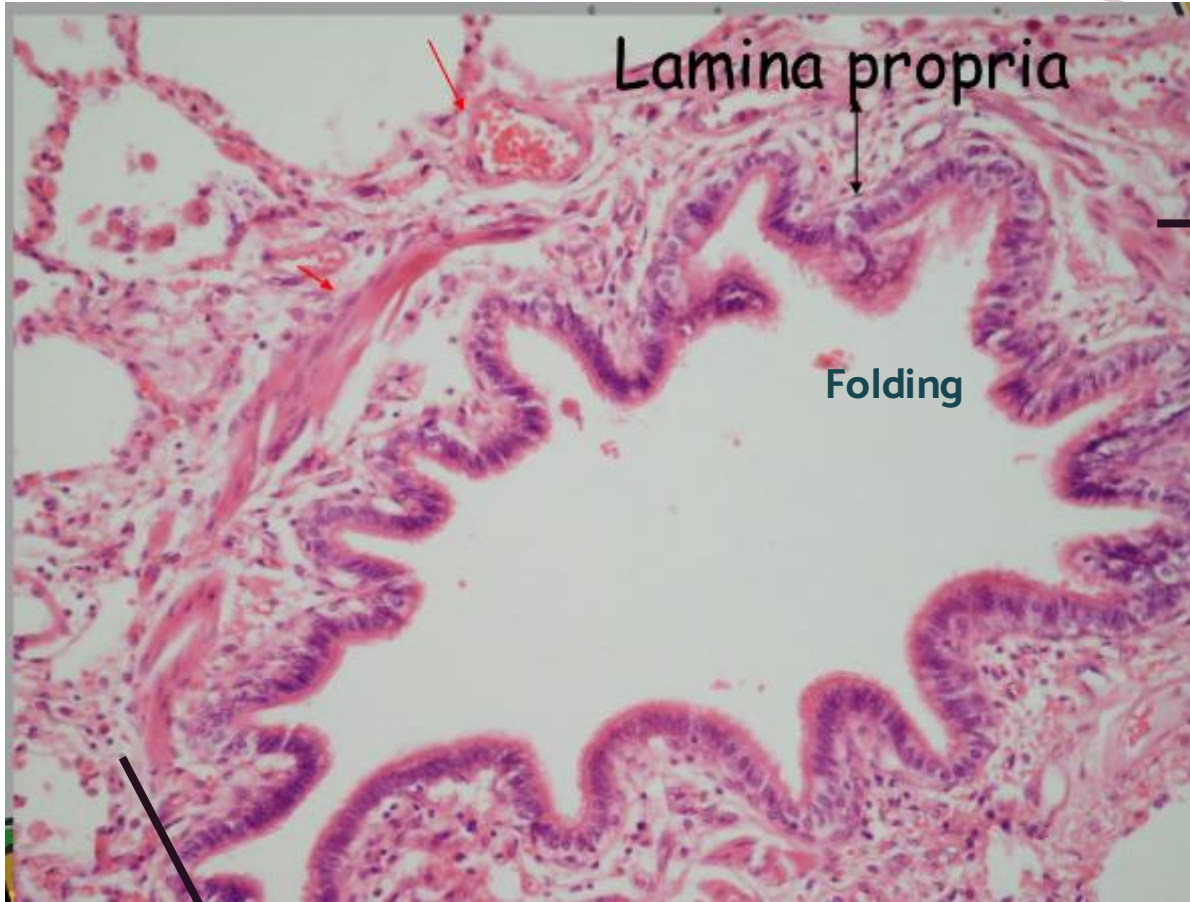
SIMPLE COLUMNAR CILIATED EP.



Smooth muscle

Simple columnar ciliated

Bronchiole = scattered
lymphocytes



Lamina propria

Folding

Smooth muscle

Simple columnar ciliated

NO CARTILAGE

scattered lymphocytes

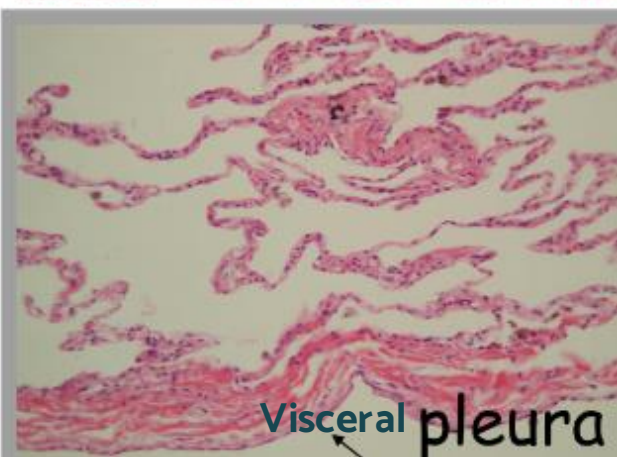
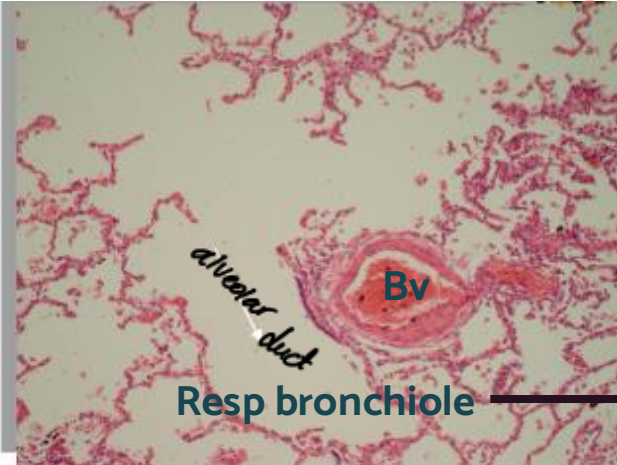
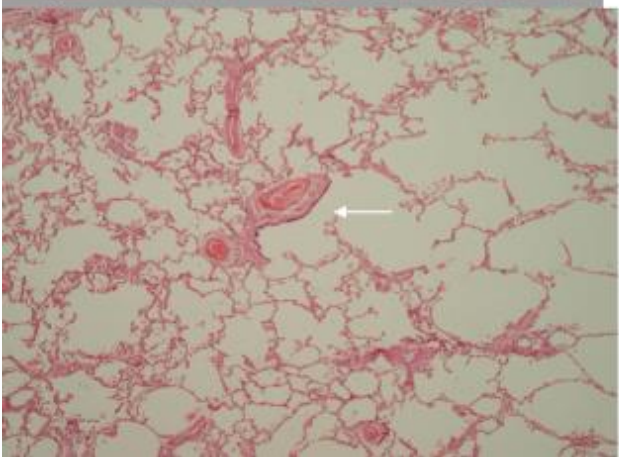
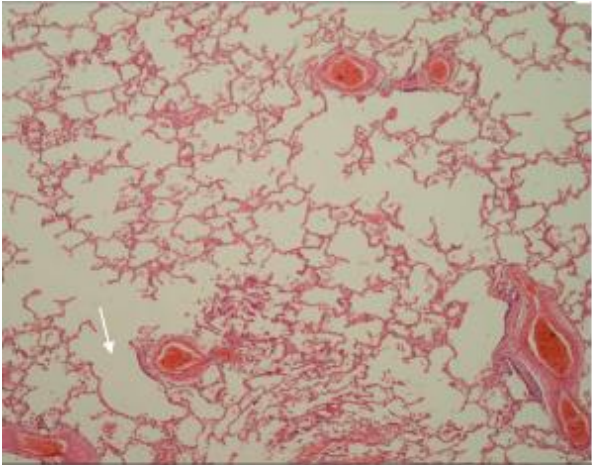


Few goblet cells

Absent gland

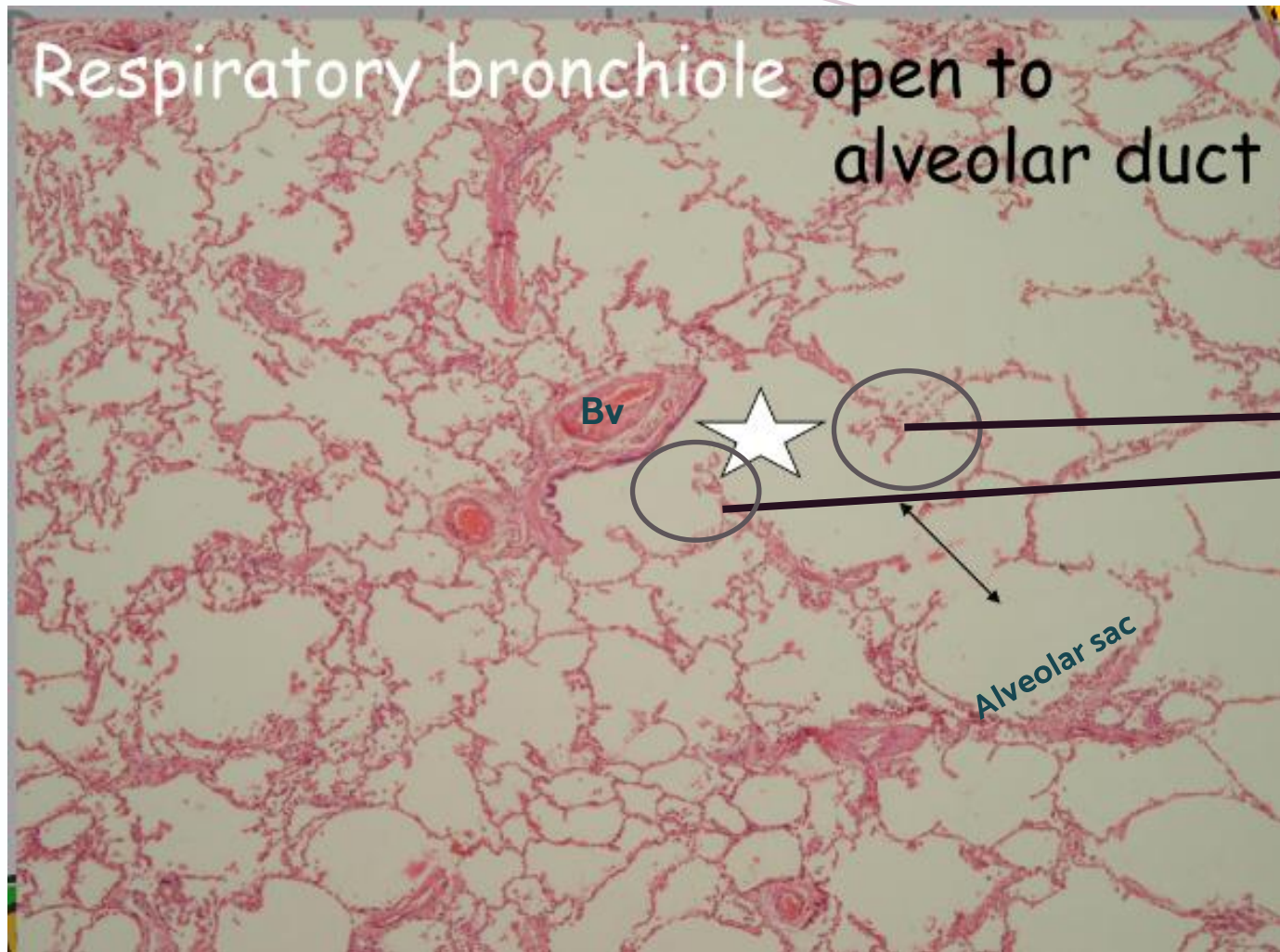
SIMPLE
COLUMNAR
CILATED EP.

Respiratory bronchioles in lung tissue



Open on alveolar duct

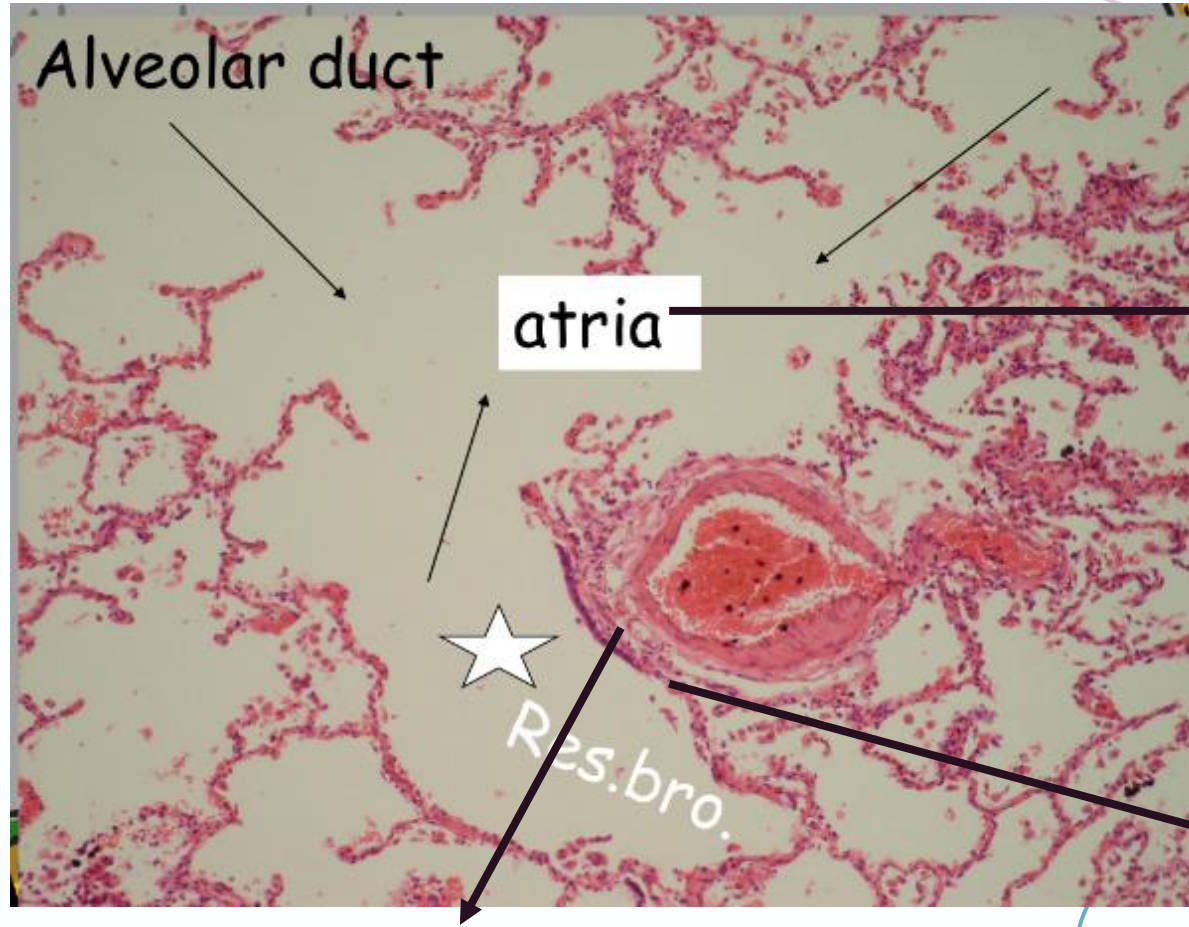
Respiratory bronchiole open to
alveolar duct



Bv

Knobs of smooth
muscles

Alveolar sac

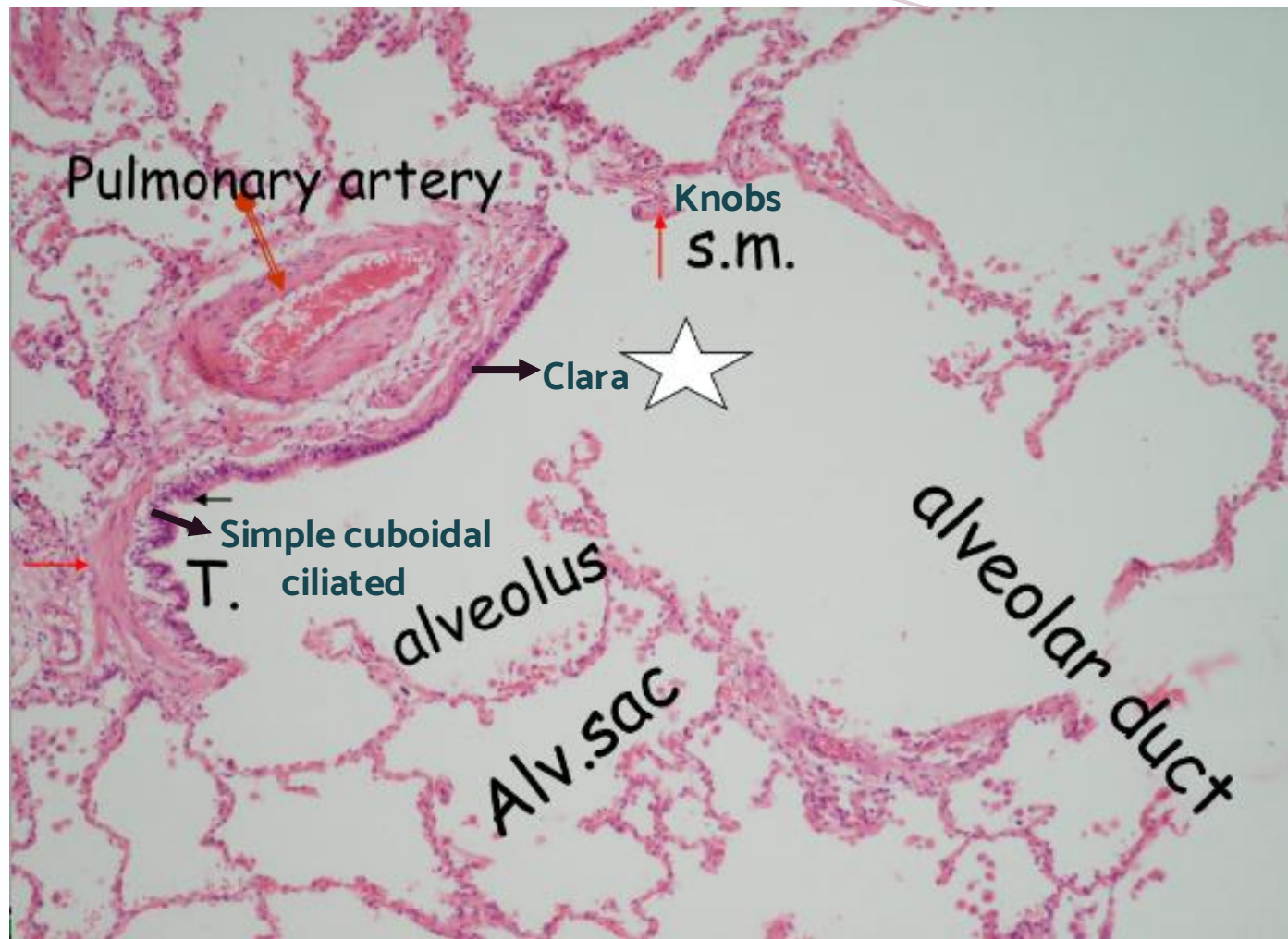


When there is two
passage to alveolar
duct

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

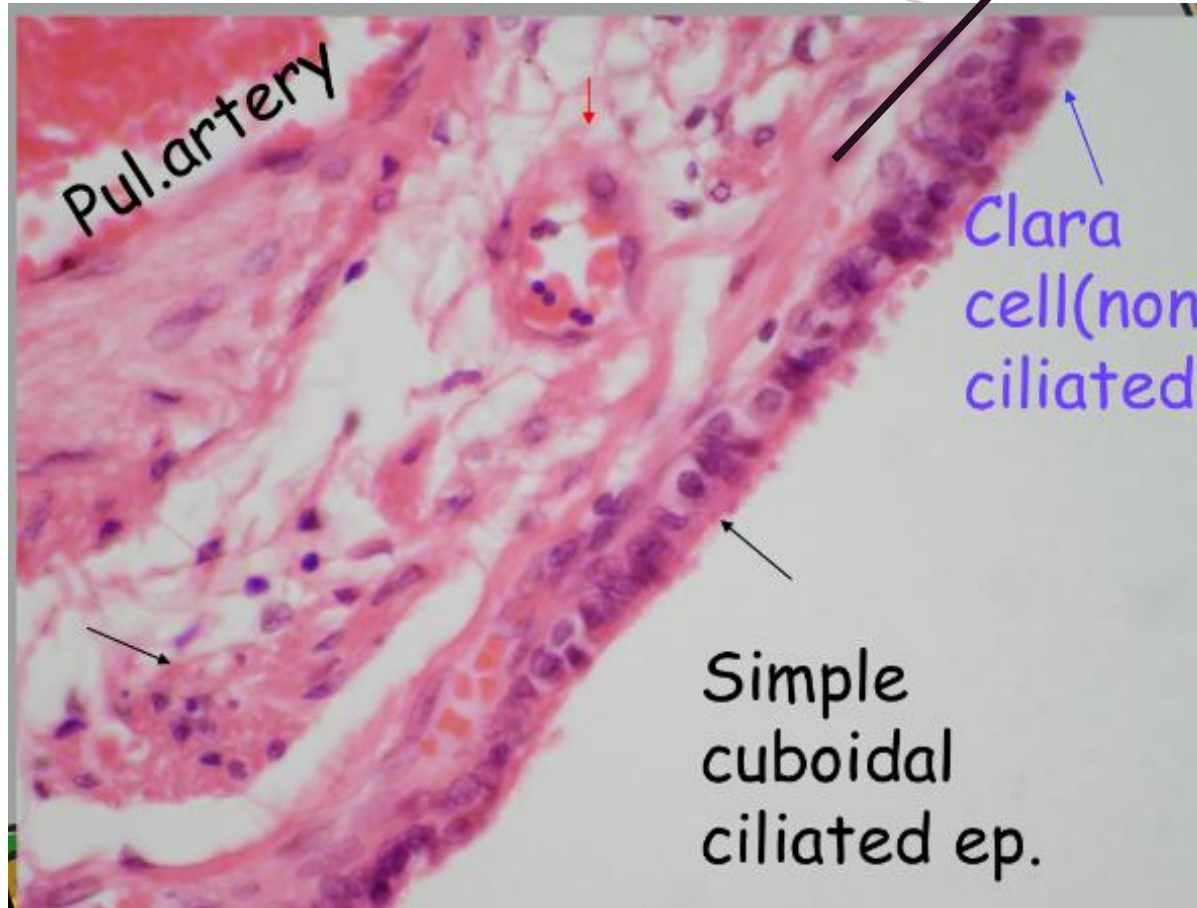
At the end simple
squamous
epithelium

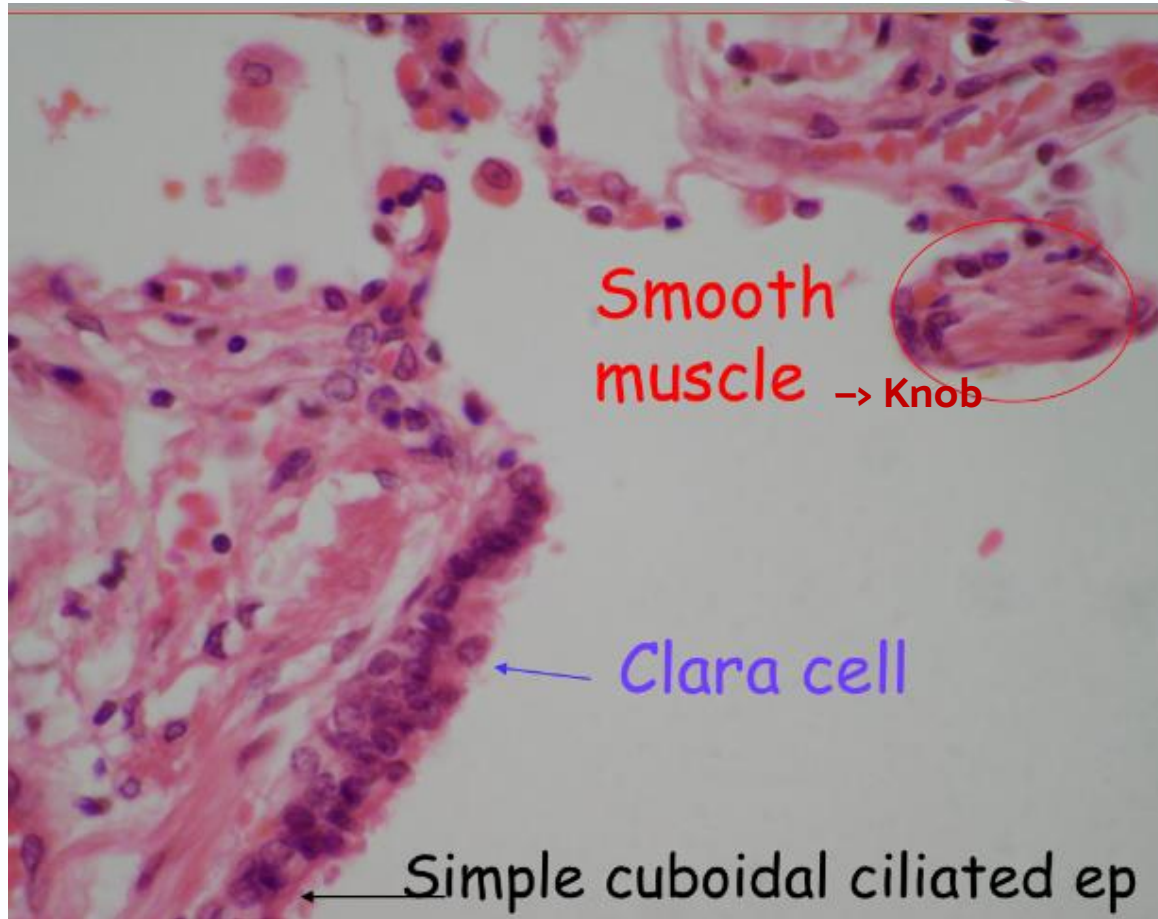
Smooth muscles are less than terminal bronchioles → knobs



Bronchial wall:





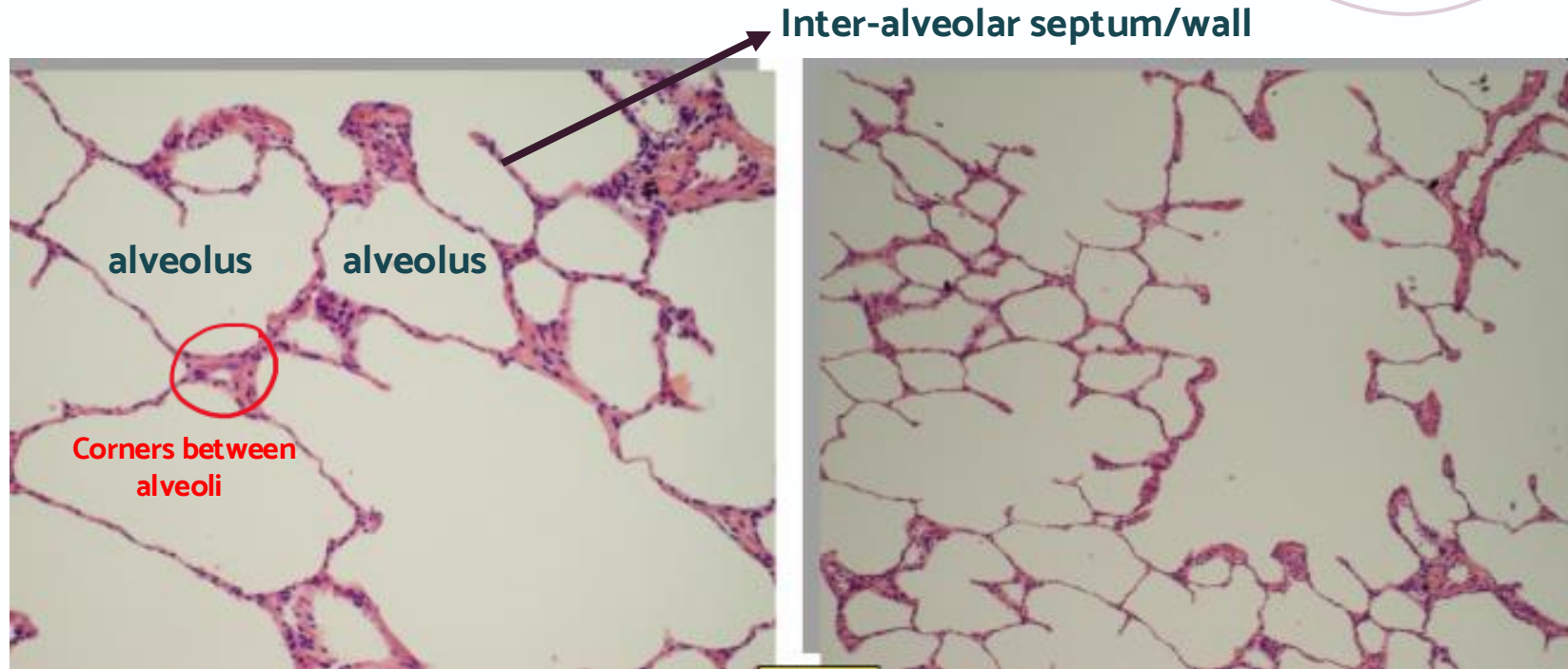


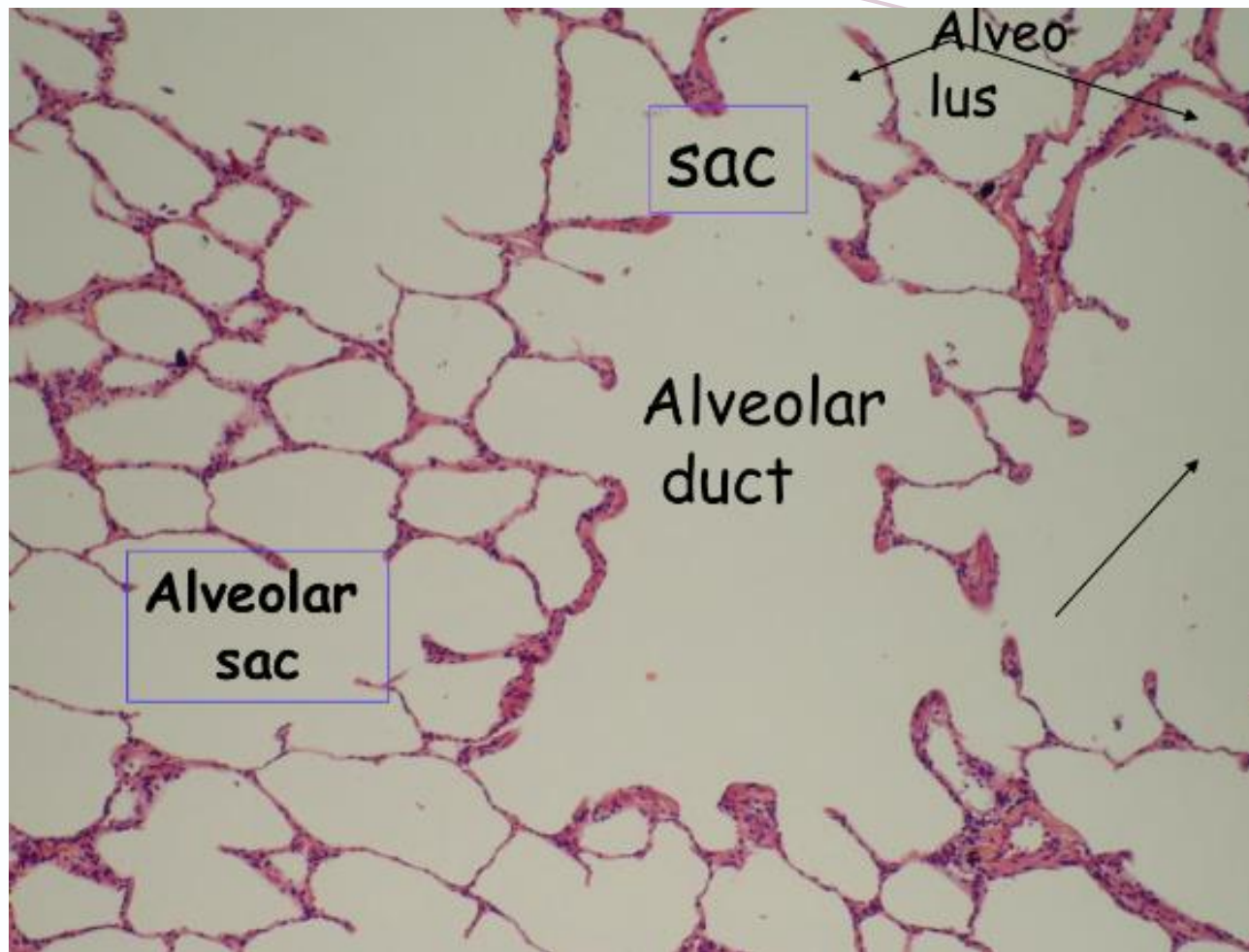
Smooth
muscle -> Knob

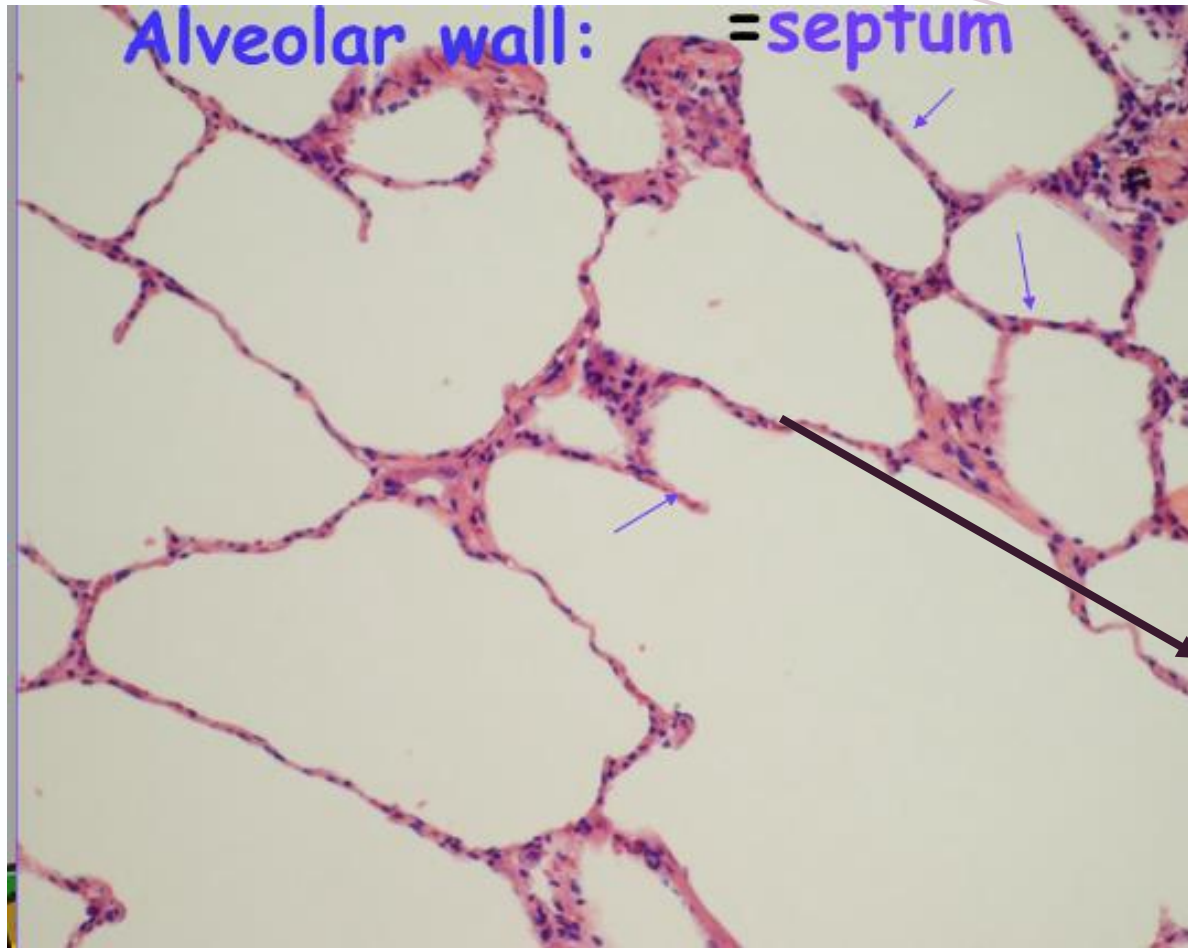
Clara cell

Simple cuboidal ciliated ep

Lung tissue = alveoli





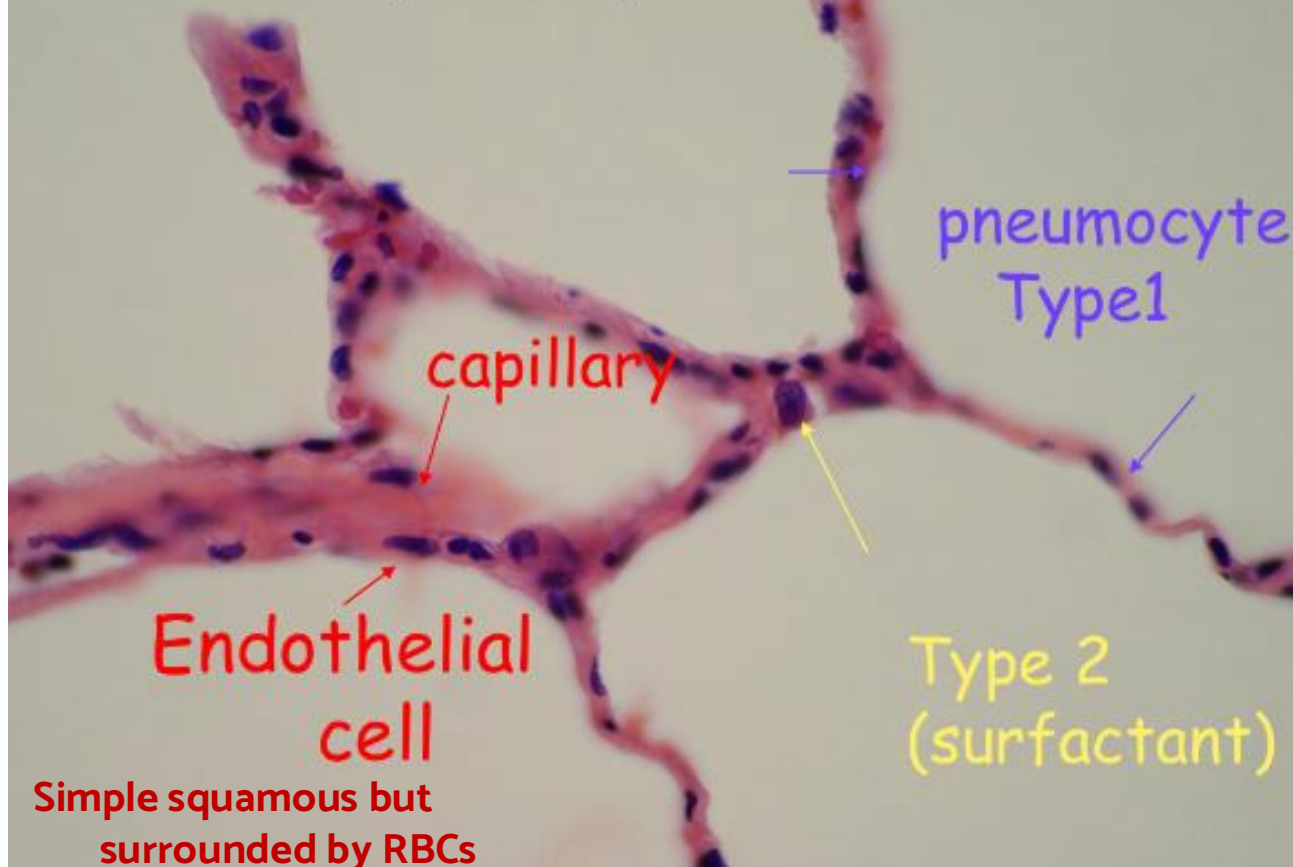


Alveolar wall: = septum

**Interalveolar septum :
Interstitium ; capillaries &
CTs**

**Within the wall
Respiratory membrane:
very thin**

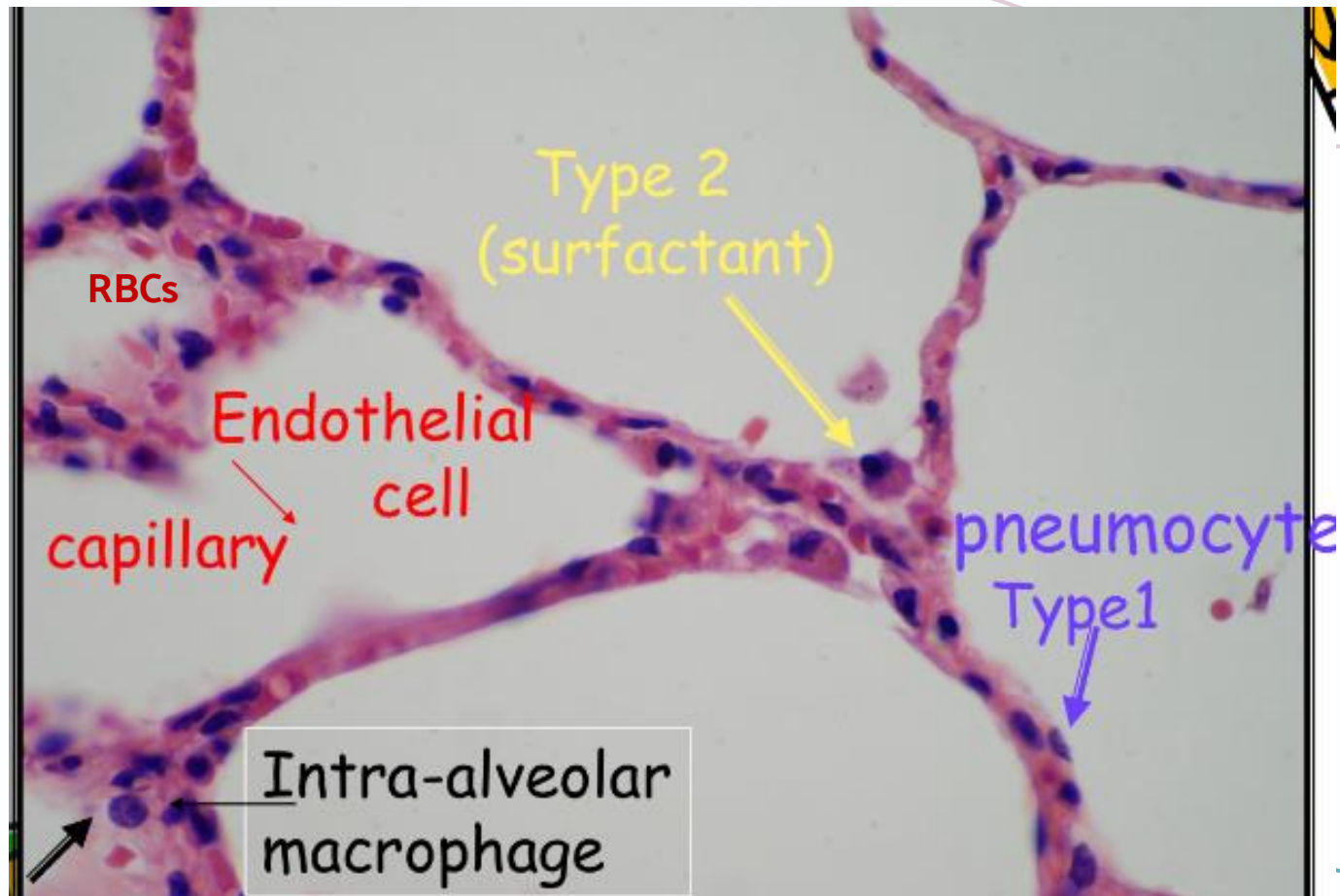
Alveolar septum epithelial cells:-

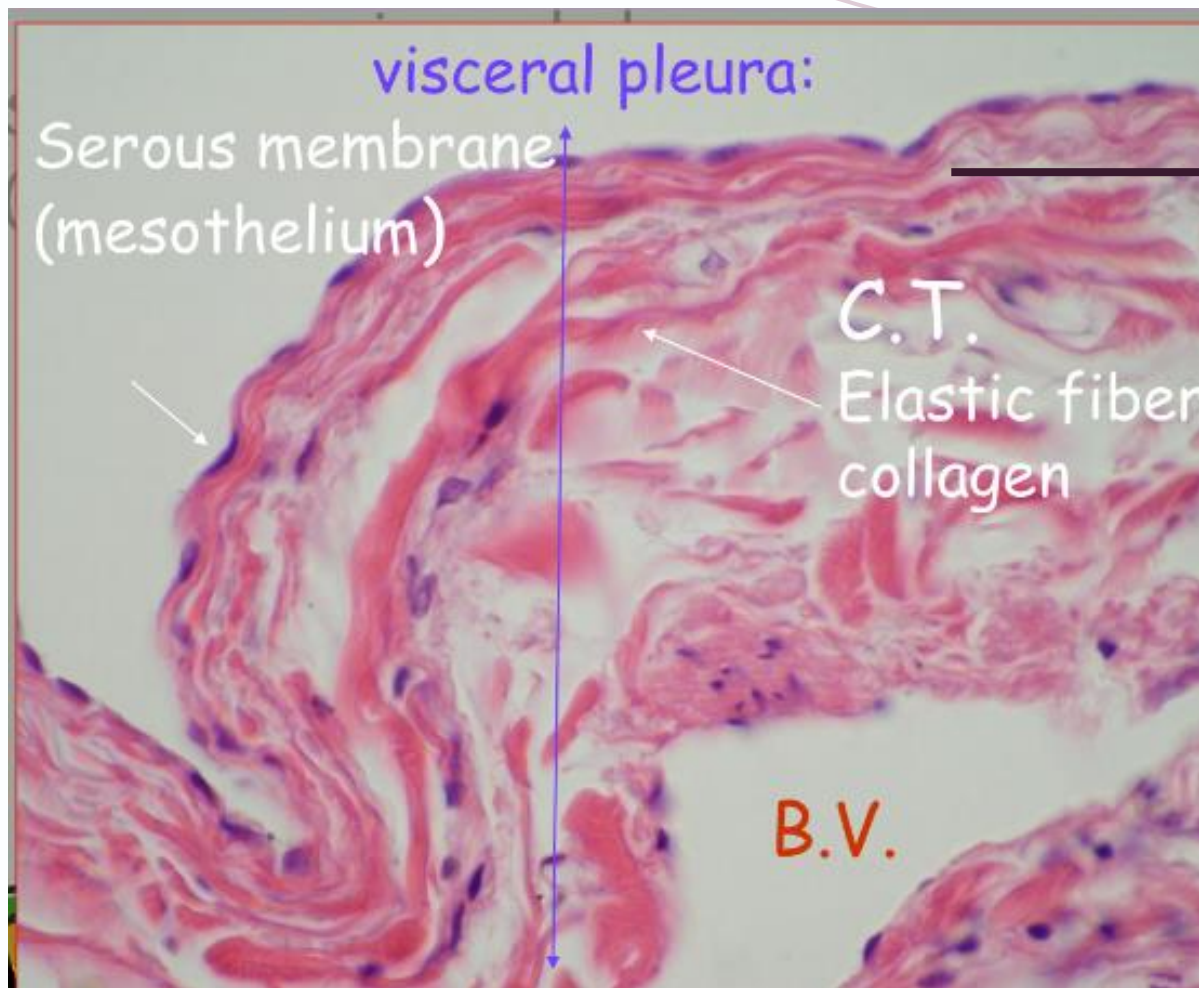


Flattened simple
squamous
epithelium

NOT SURROUNDED
BY RBCs

Large cells ,
cuboidal nucleus
, common on the
corner



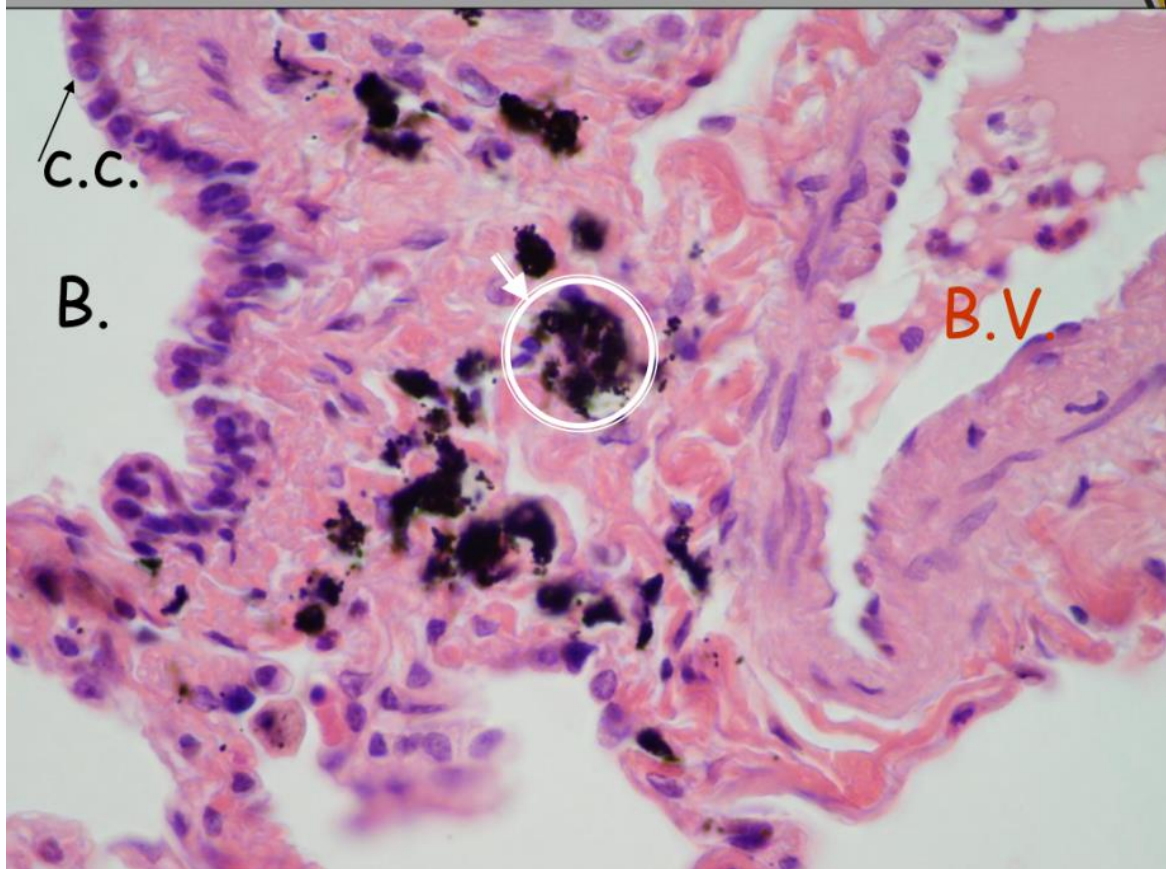


Elastic & reticular fibres
(inflation & deflation)

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