

RESPIRATORY SYSTEM

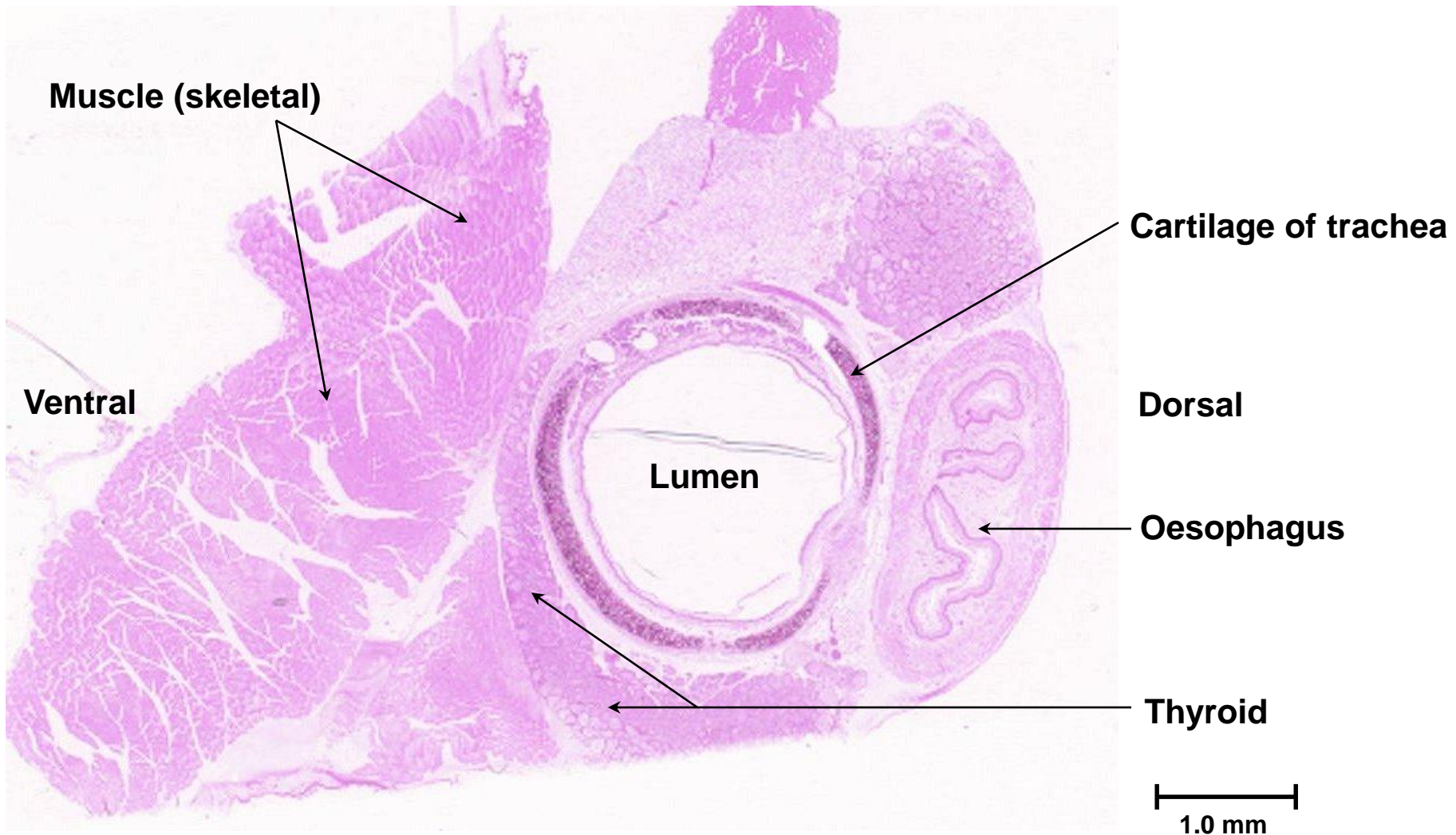
Objective

Students should be able to :

- 1. Describe the structure of the conducting and exchange parts of the respiratory system and relate this to function.**
- 2. Compare the microscopic structure of the walls of trachea, bronchi and bronchioles.**
- 3. Examine the structure of the alveolar wall.**

Trachea

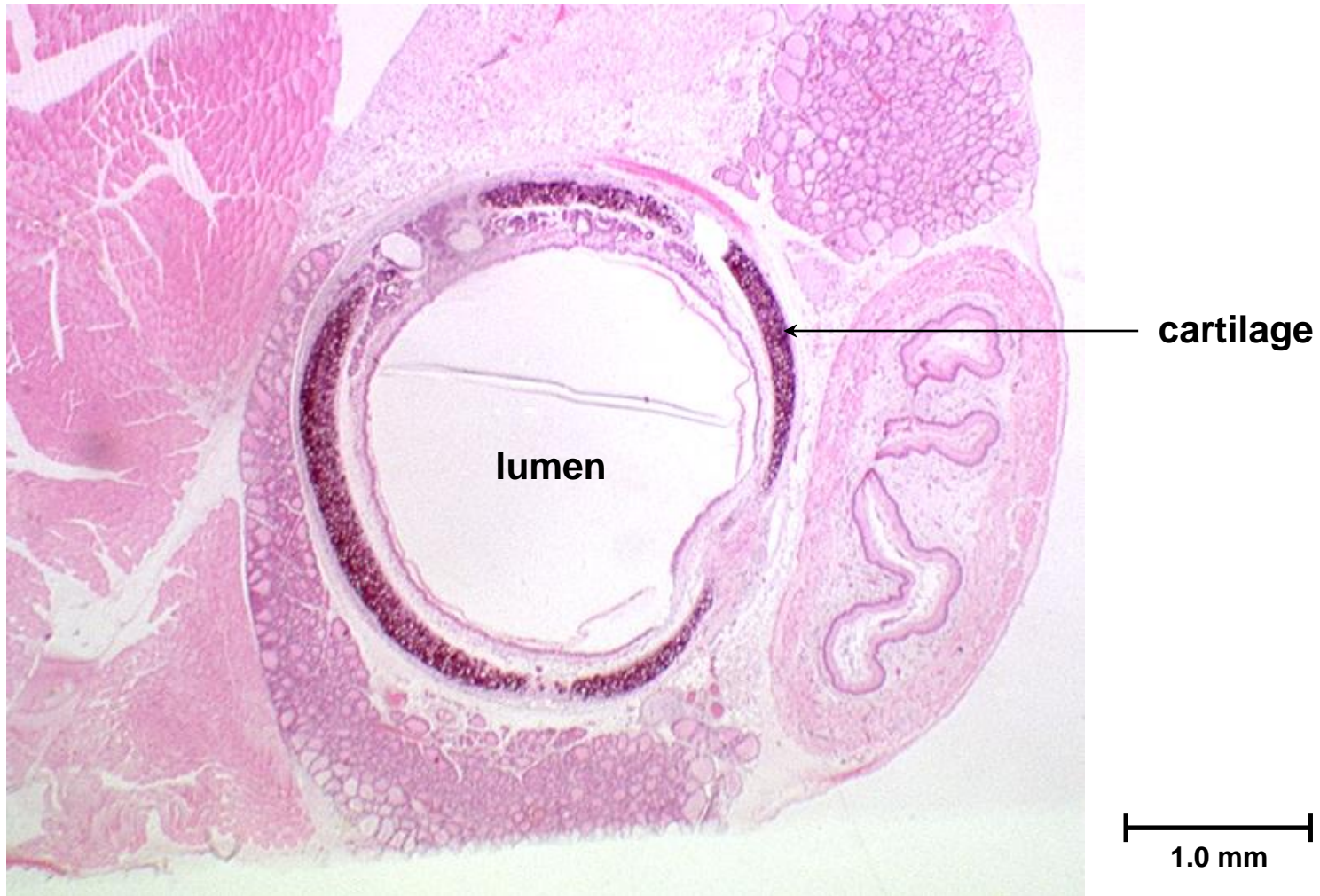
At low magnification identify the principal features.



Trachea Tracheal wall

What type of cartilage is present?

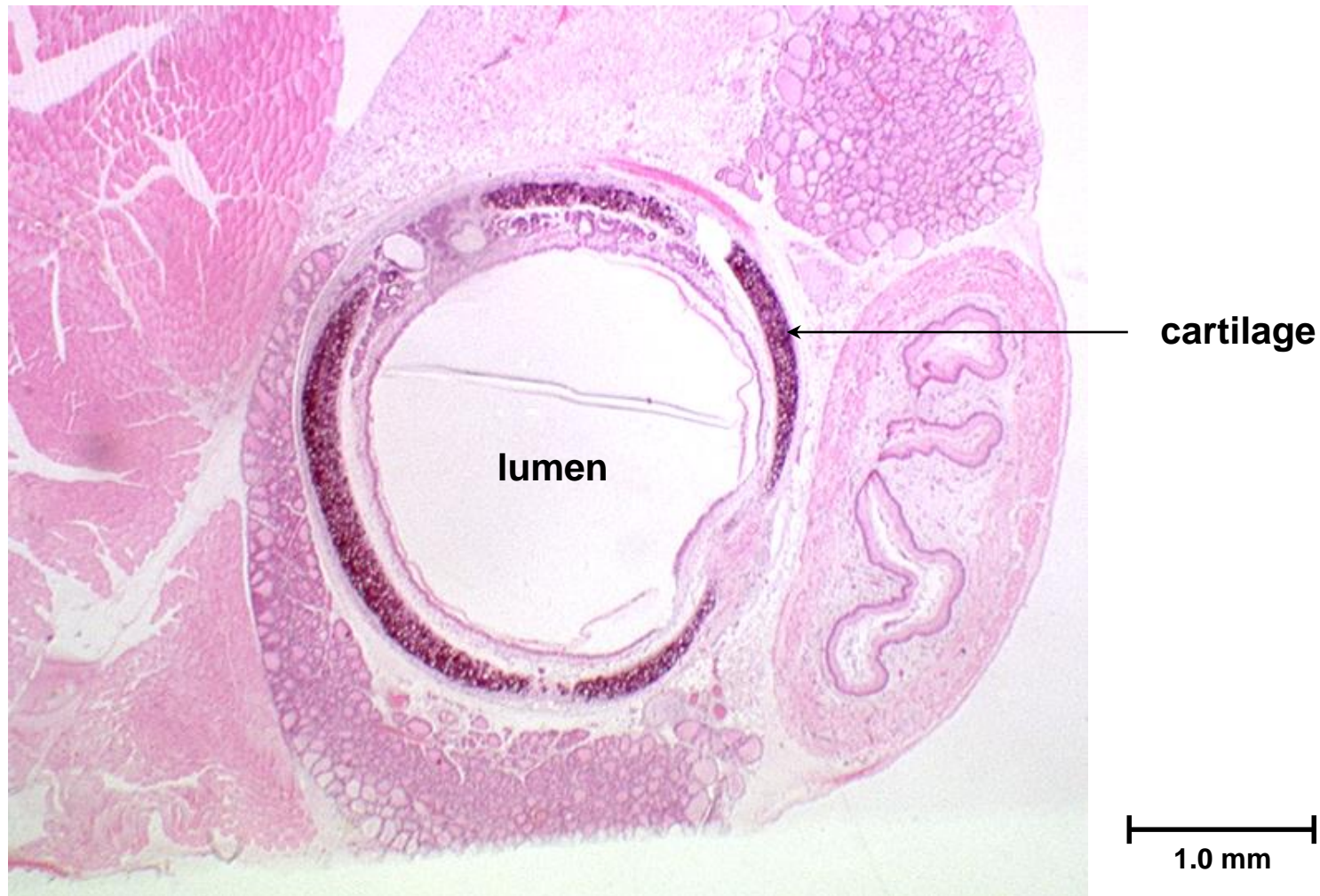
Hyaline.



Trachea Tracheal wall

Why is there a need for cartilage?

**Gives support during inspiration and expiration (radially and longitudinally).
Its rigidity prevents collapse of the trachea.**



Trachea Tracheal wall

Give two reasons why the cartilage rings are incomplete.

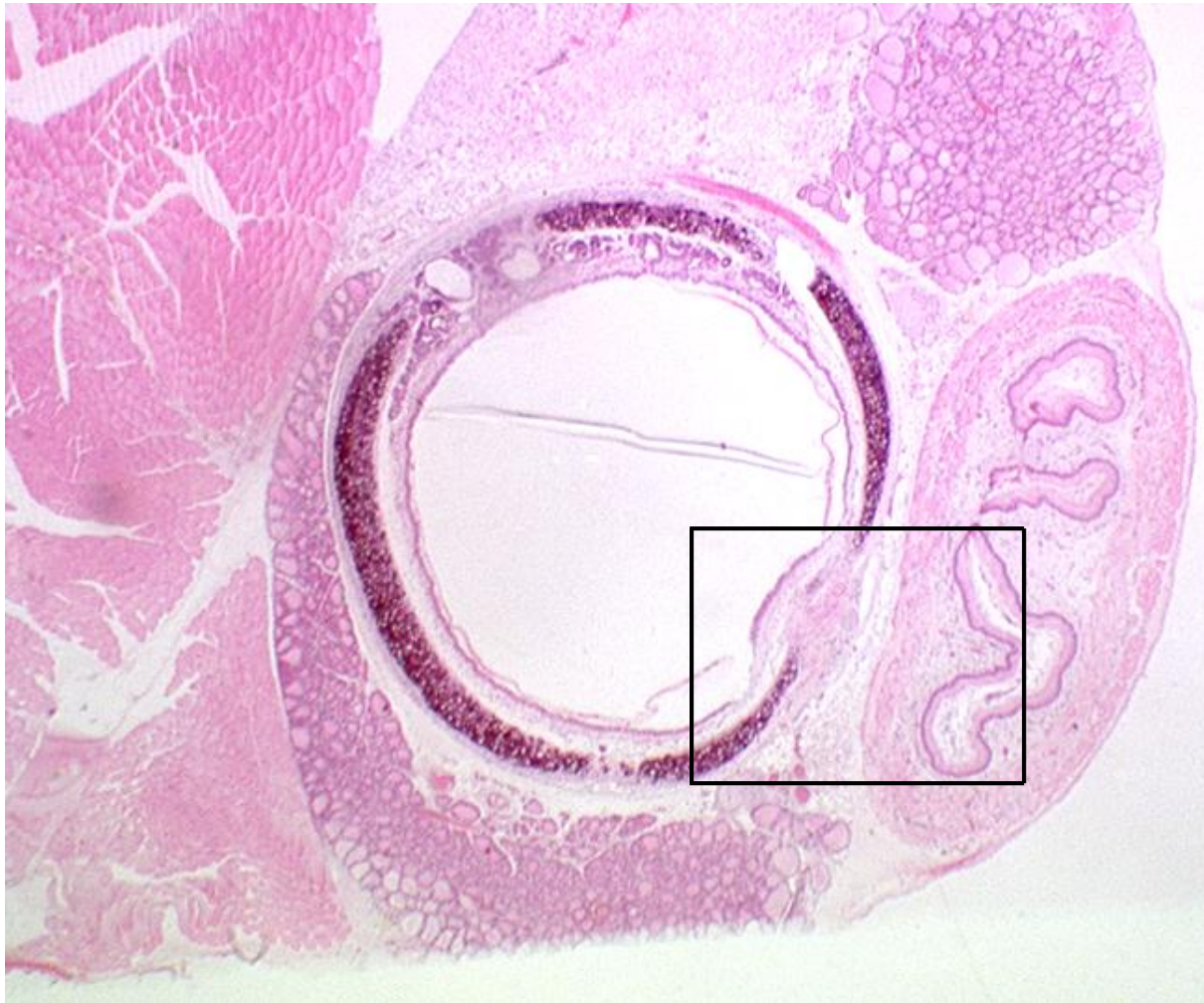
Radial expansion of the trachea is possible.

Bolus of food can pass down the oesophagus.



Trachea Tracheal wall

Find the trachealis muscle at the dorsal aspect of the trachea.

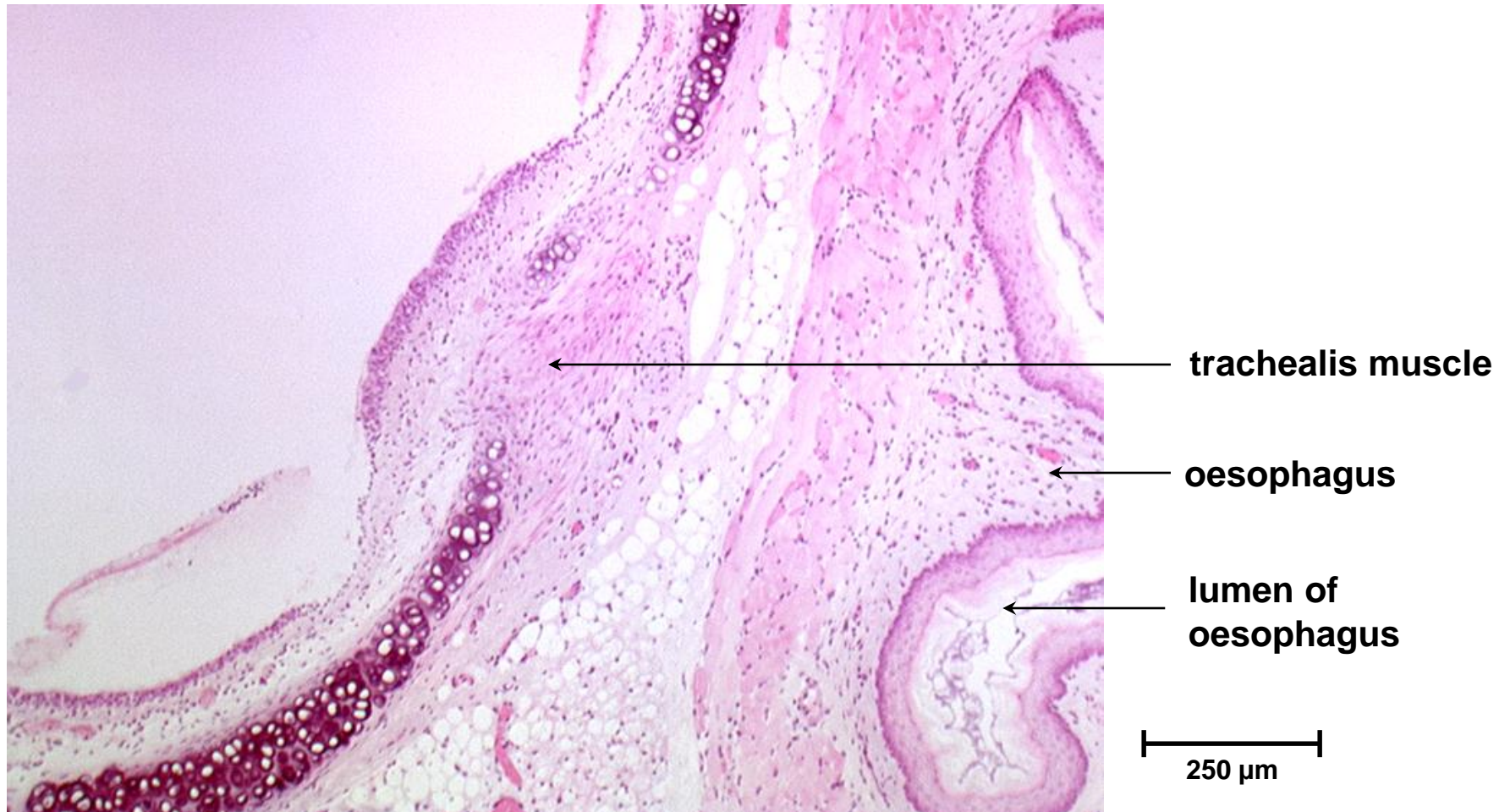


1.0 mm

Trachea Tracheal wall

What lies immediately dorsal to this?

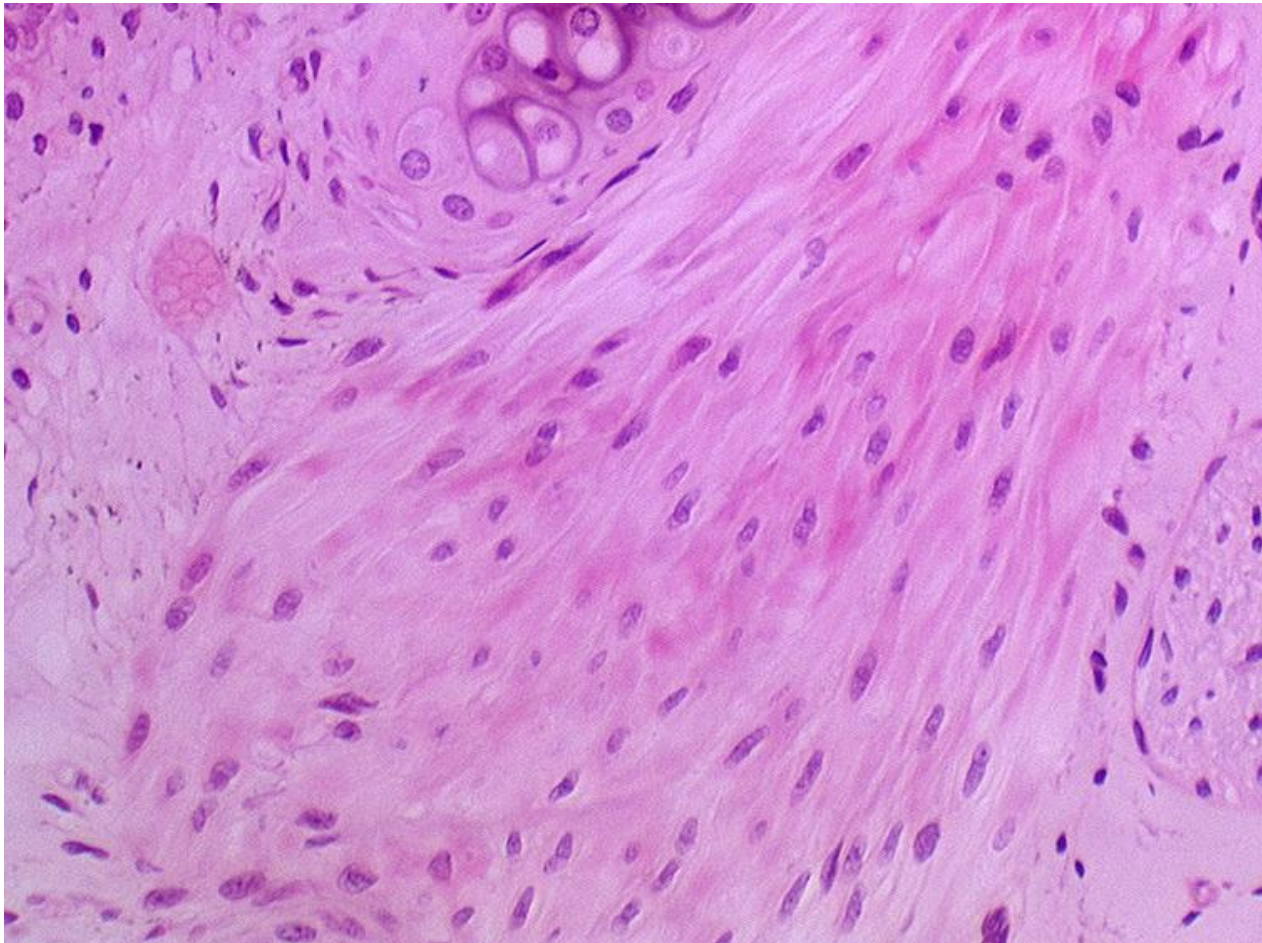
The oesophagus.



Trachea Trachealis muscle

Classify the type of muscle present.

Smooth muscle.



smooth muscle
spindle shaped cells
with single, central
nucleus

50 μ m

Trachea

Examine the epithelium lining the trachea.

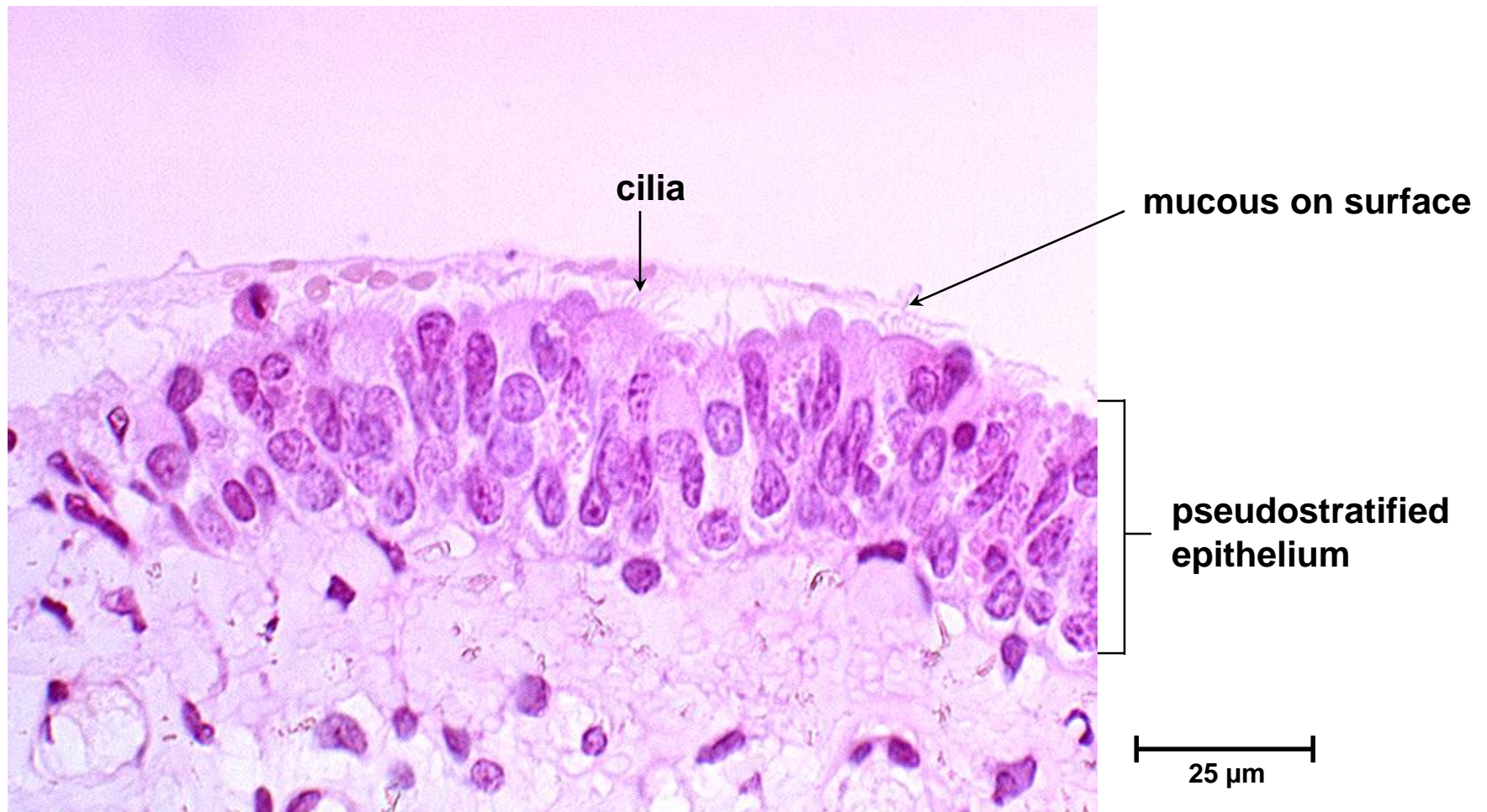


1.0 mm

Trachea Epithelial lining

What type of epithelium is it?

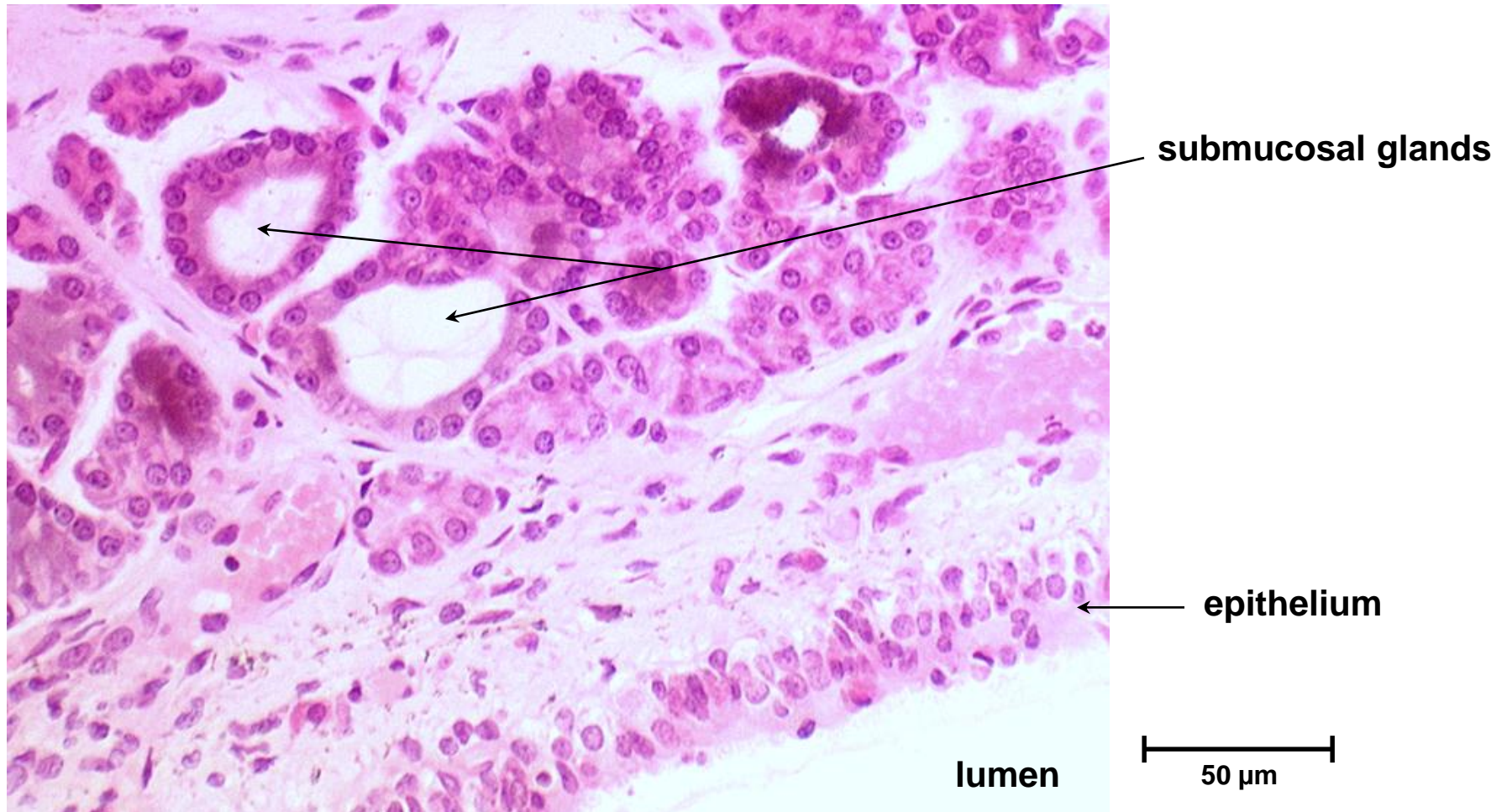
Pseudostratified, ciliated, columnar epithelium.



Trachea Tracheal wall

Are there any glands in the submucosa?

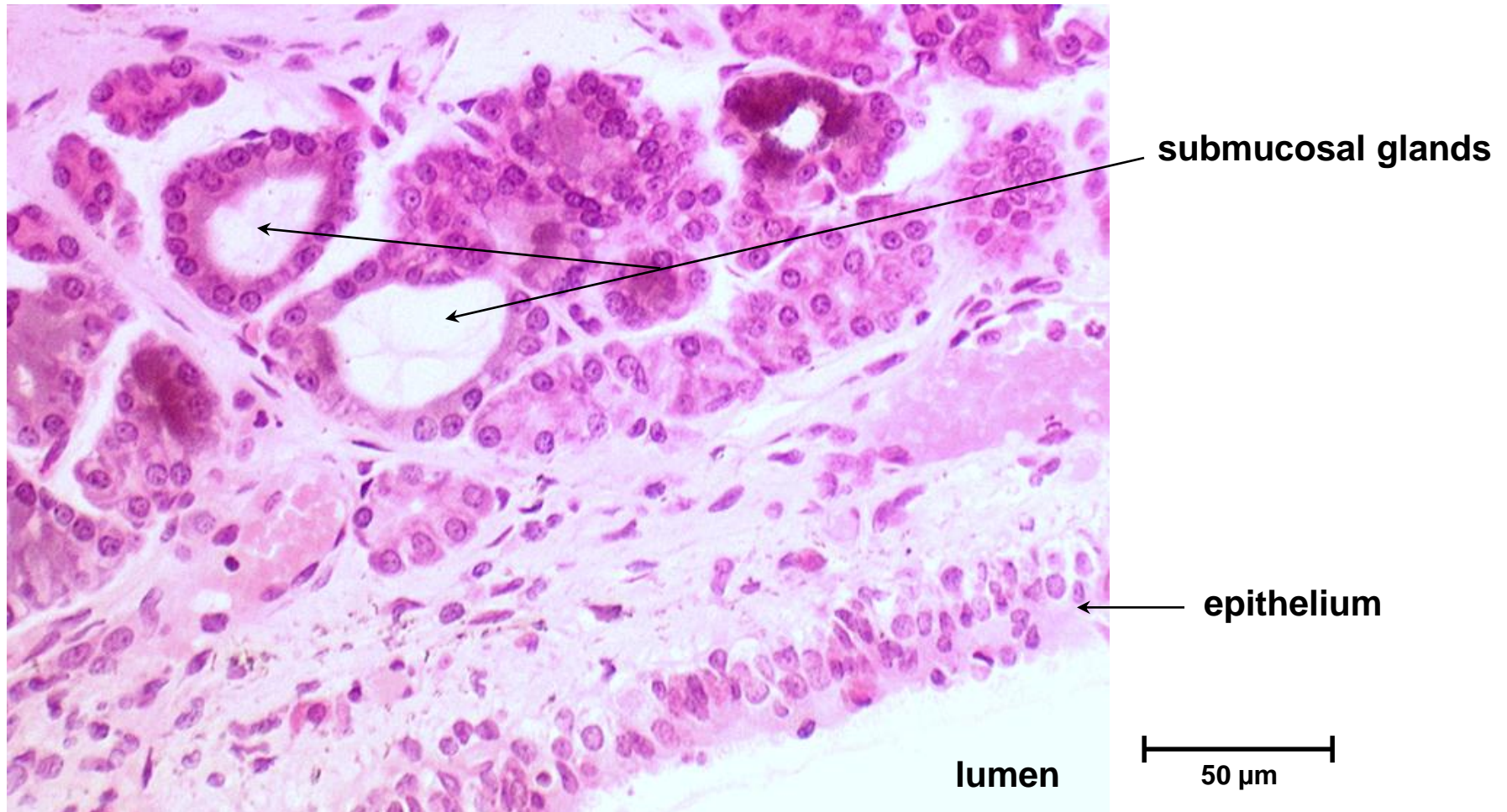
Yes.



Trachea Tracheal wall

What is their function?

They are mucoserous glands secreting mucous.



Trachea Stained for elastic fibres

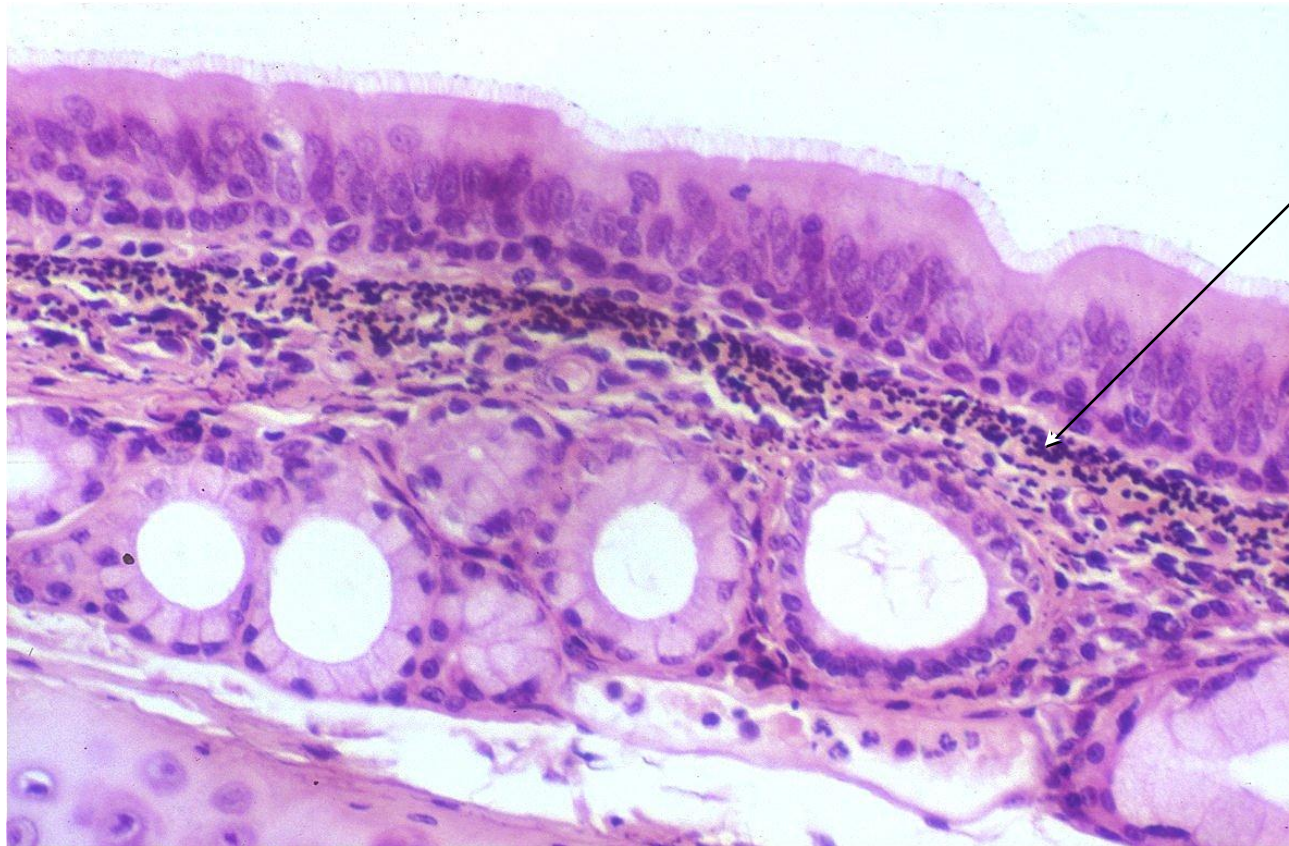
Observe the transversely sectioned elastic fibres. Where are they located?

Just below the epithelium.

Why are the fibres longitudinally arranged, and why are they so abundant?

Part of the elastic continuum of the lung.

Add to the elastic recoil of the lungs after inspiration and expiration.



band of black stained elastic fibres in lamina propria.

epithelium pseudostratified columnar, ciliated.

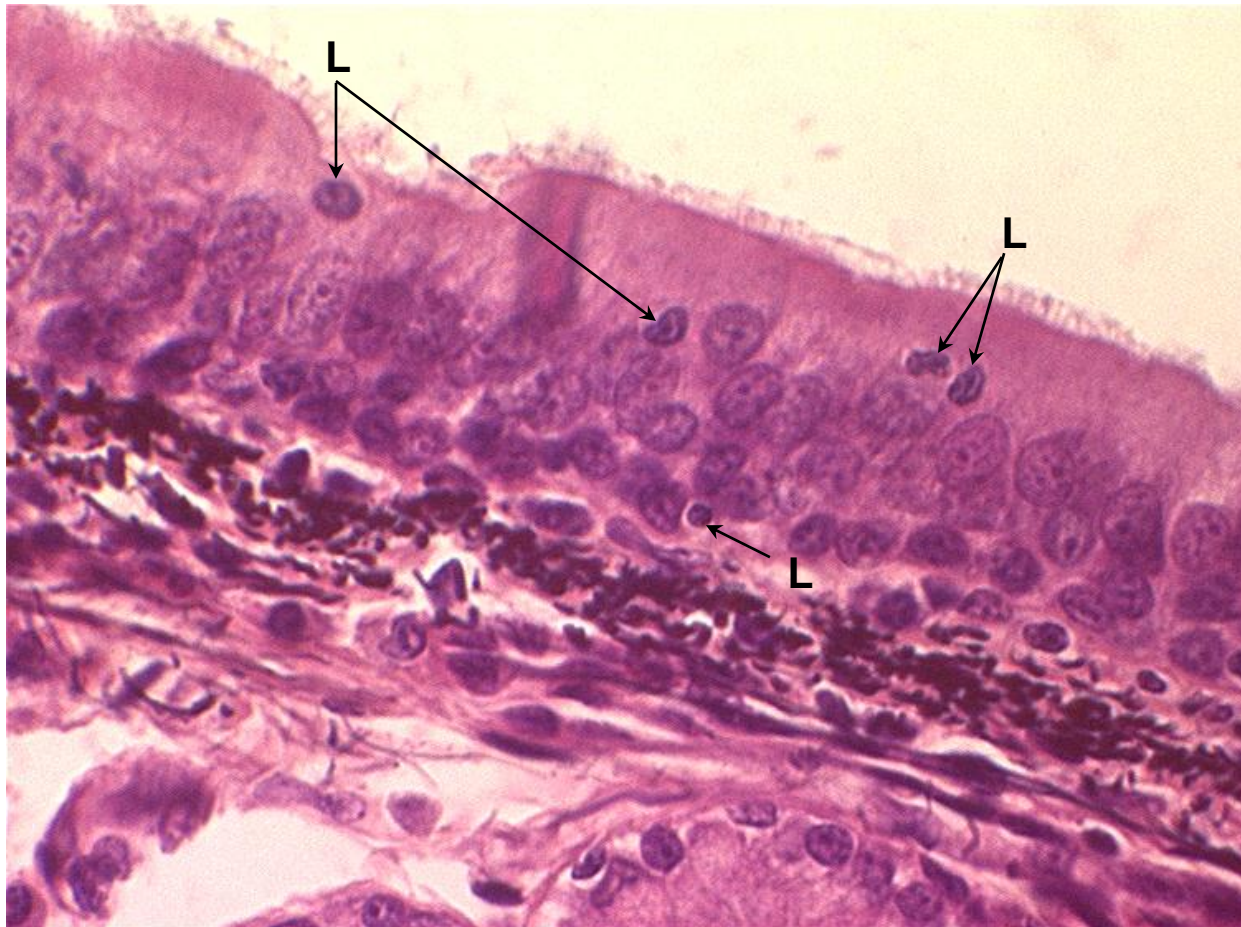
50 μ m

Trachea Stained for elastic fibres

Note the presence of lymphocytes.

How are they distributed?

Mostly sub epithelial, but some can be seen amongst the epithelial layer.



L : lymphocytes

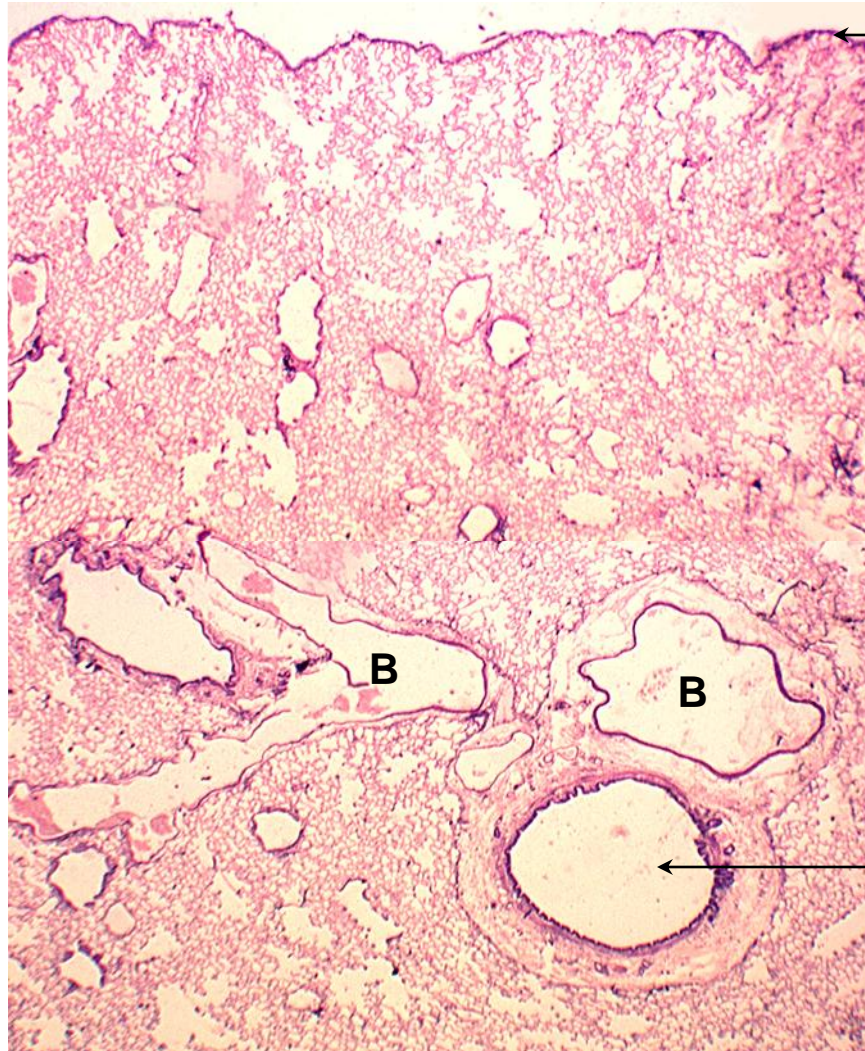
25 μ m

Lung

Examining the lung at low magnification.

What covers its surface?

Visceral pleura.



outer surface of lung covered by visceral pleura

B : blood vessels

small bronchus

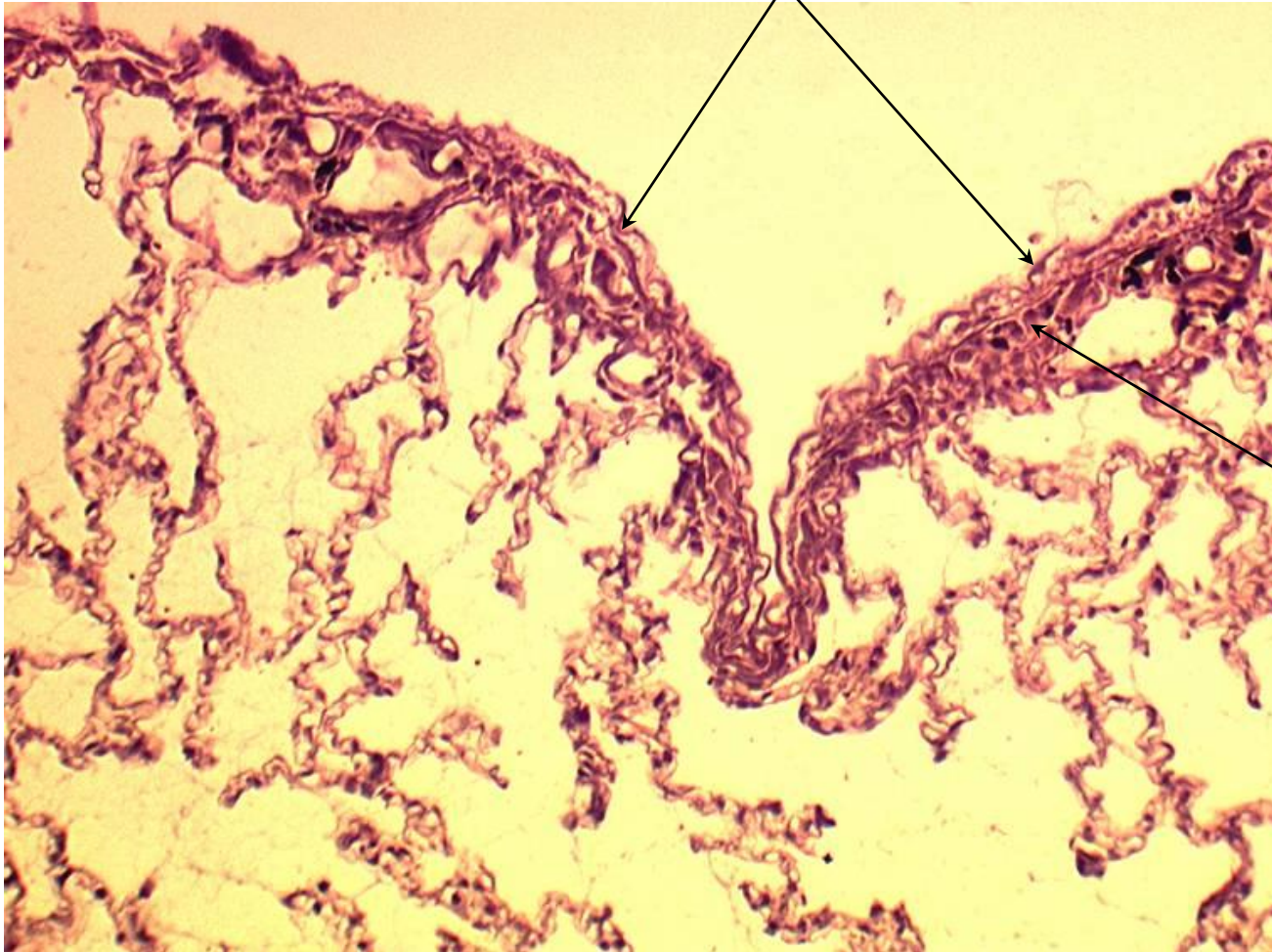
1 cm

Lung

Visceral pleura.

Surrounds the lungs.

surface mesothelium



connective tissue layer
with elastic fibres

100 μ m

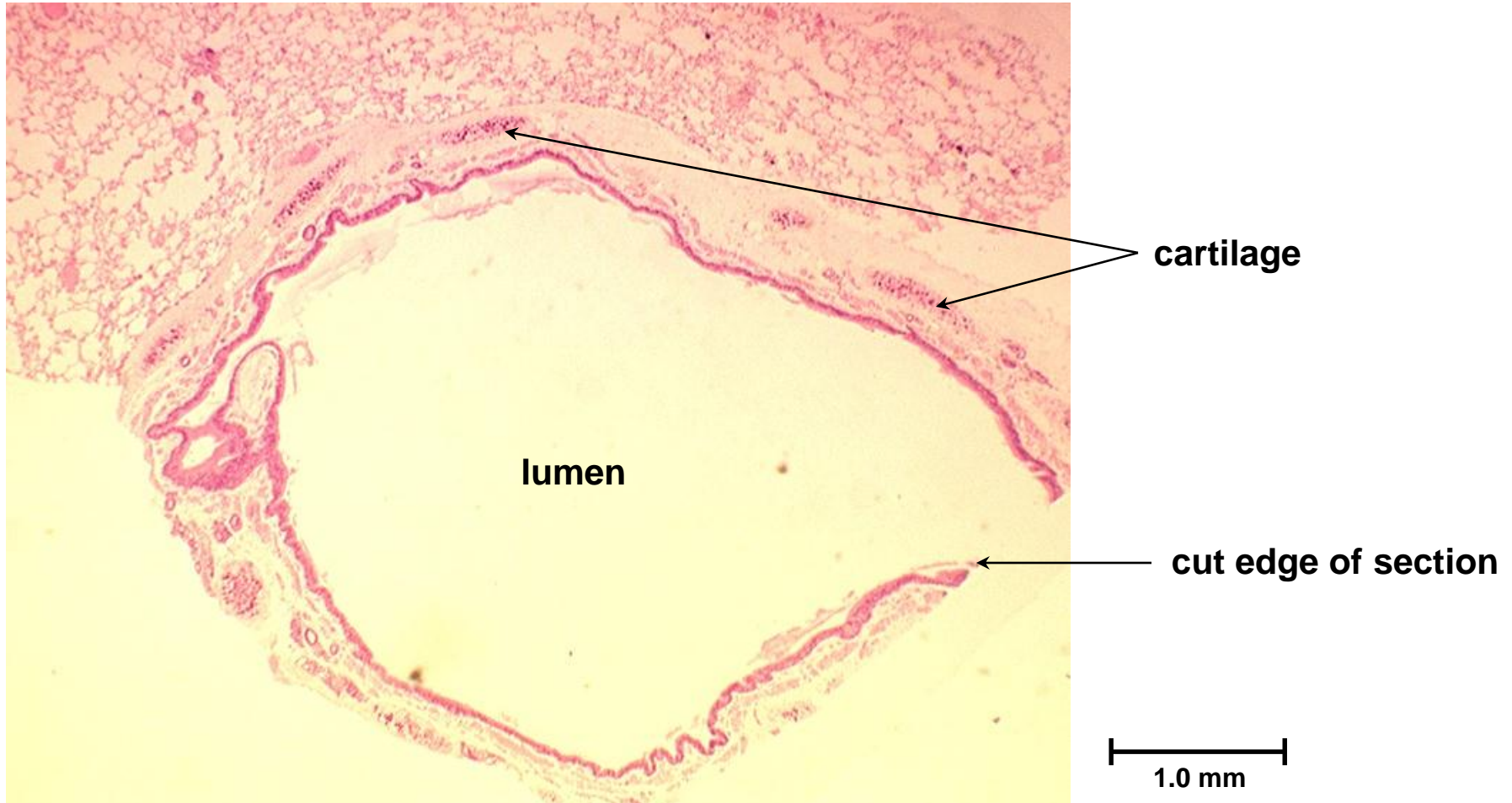
Lung

How can you distinguish between a bronchus and a bronchiole?

	Bronchus	Bronchiole
Lining cells	pseudostratified ciliated columnar epithelium	ciliated columnar epithelium
Cartilage	plates of cartilage	cartilage absent
Mucosal glands	present	absent

Lung (adult) Bronchus

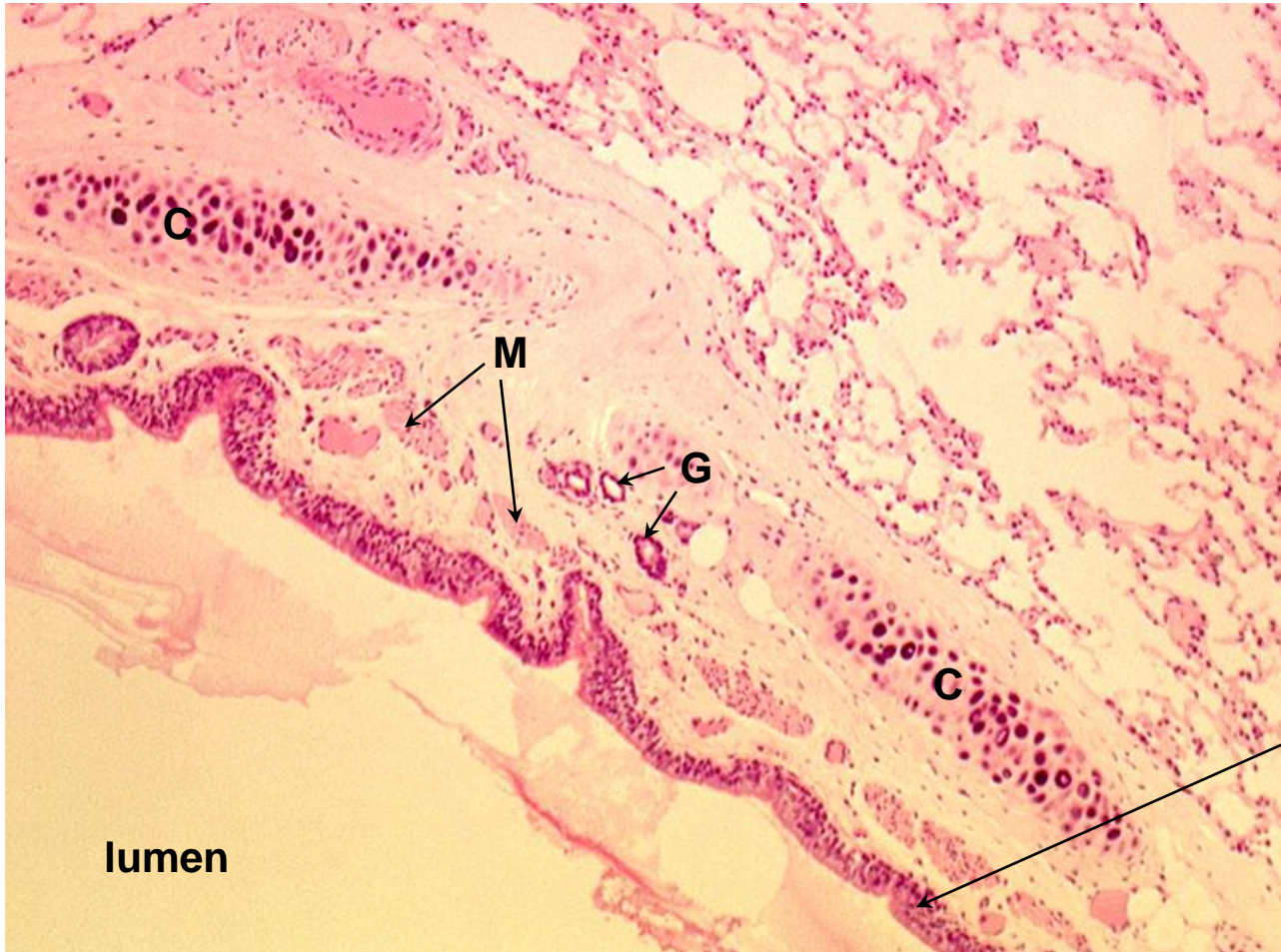
Low magnification view of bronchus.
Plates of cartilage can be identified.



Lung (adult) Bronchus

Identify : plates of cartilage
smooth muscle
glands

lining epithelium



C : cartilage

G : glands

M : smooth muscle

epithelium

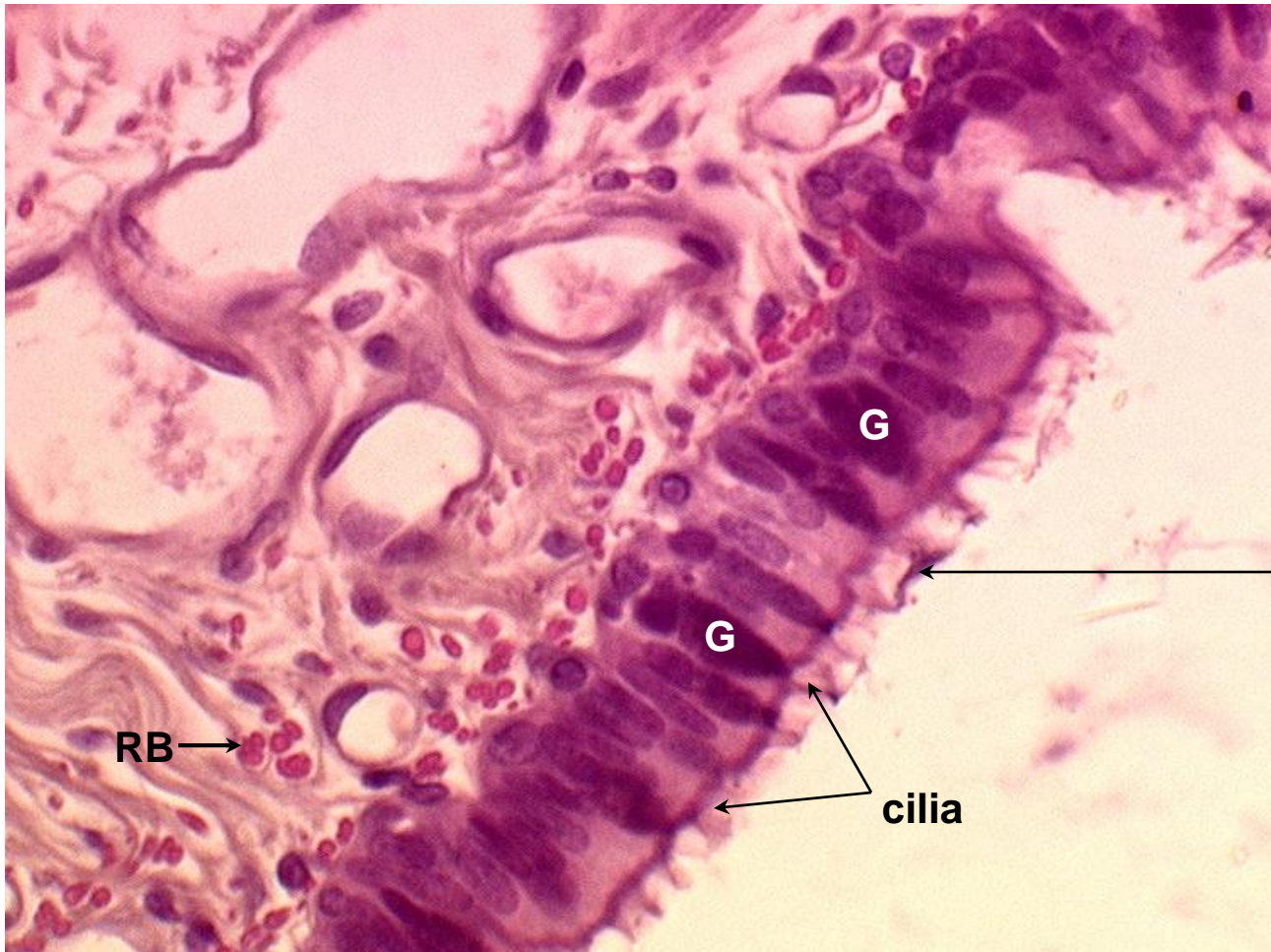
250 μ m

Lung (adult) Bronchus

Typical respiratory tract epithelium lines the bronchus.

Pseudostratified, ciliated, columnar with goblet cells.

Further down as the bronchus gets smaller the epithelial lining also reduces in height.



G : goblet cells

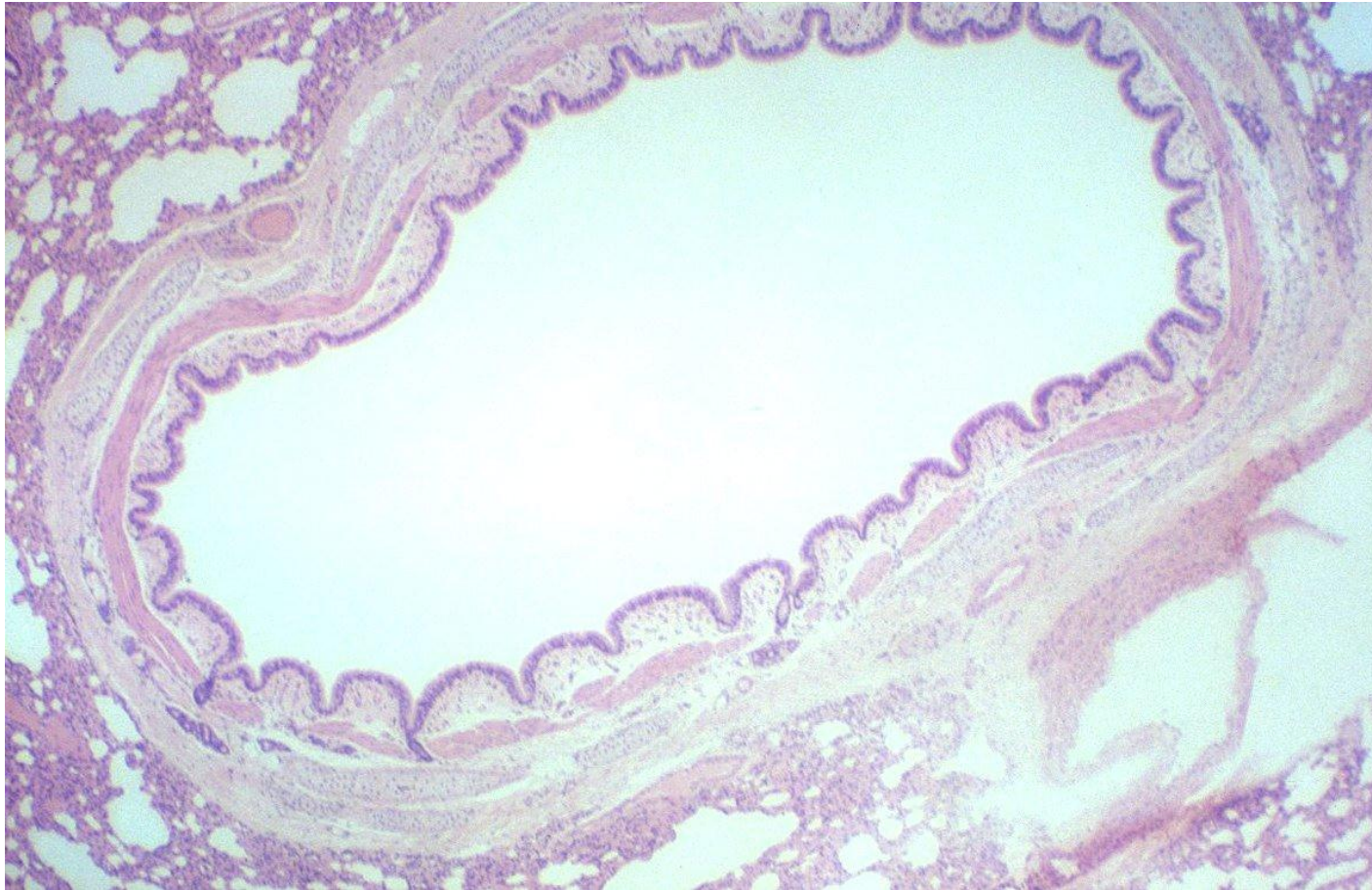
RB : blood cells
in capillary

mucous on surface

cilia

25 μ m

Lung (adult)



0.5 mm

Lung (adult)

Identify :

epithelium

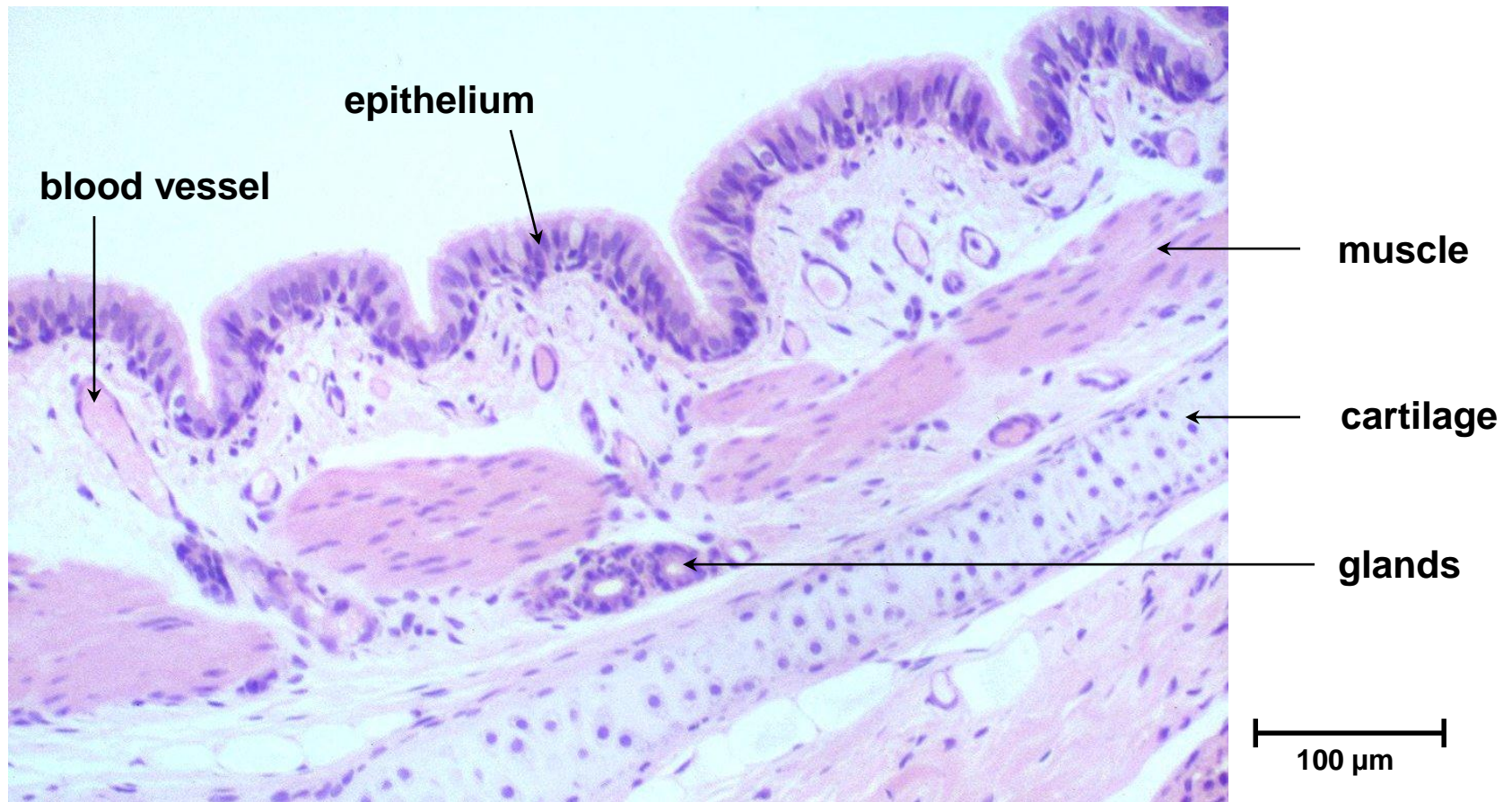
smooth muscle

blood vessels

glands

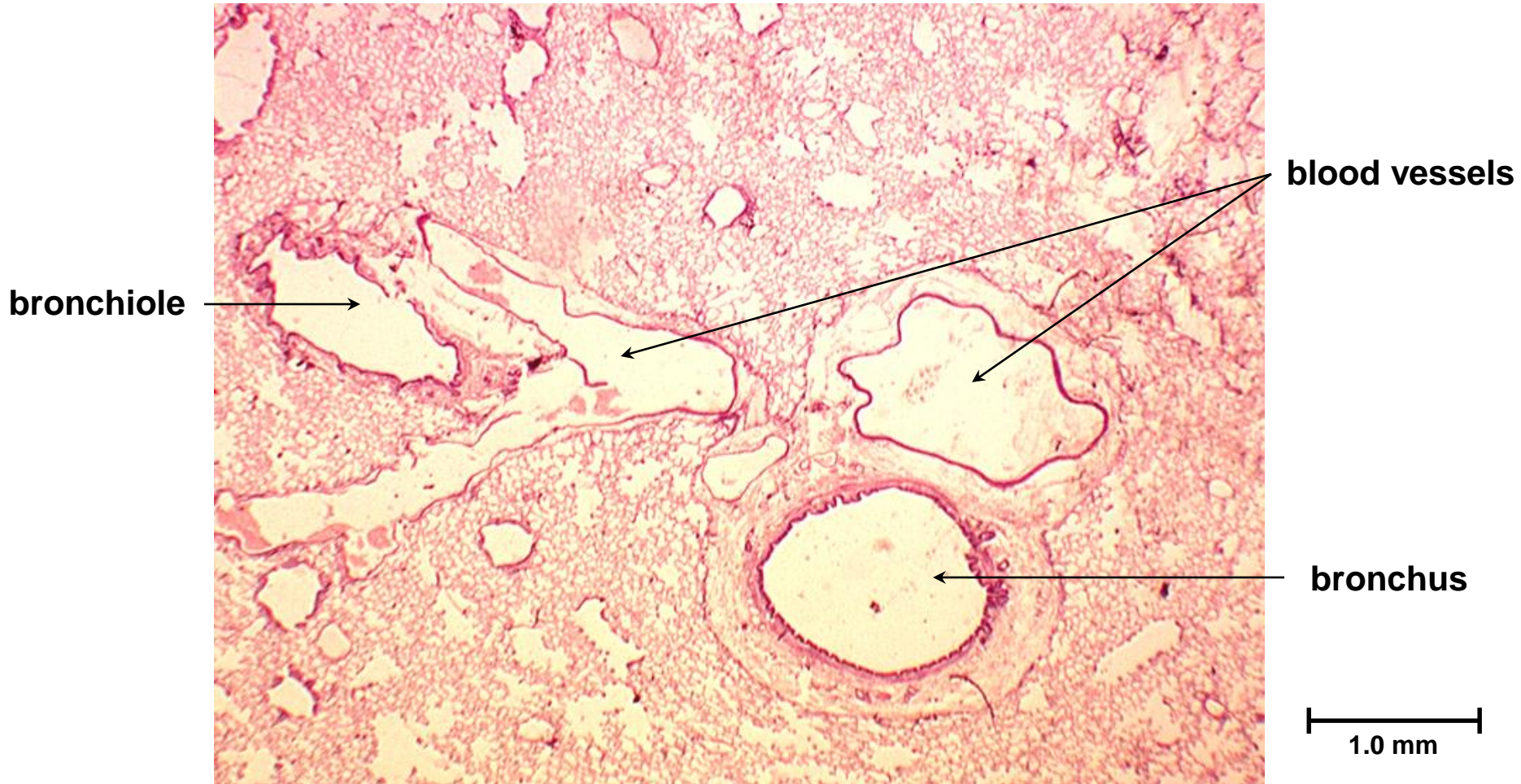
cartilage

Smooth muscle runs in a spiral around the bronchus.



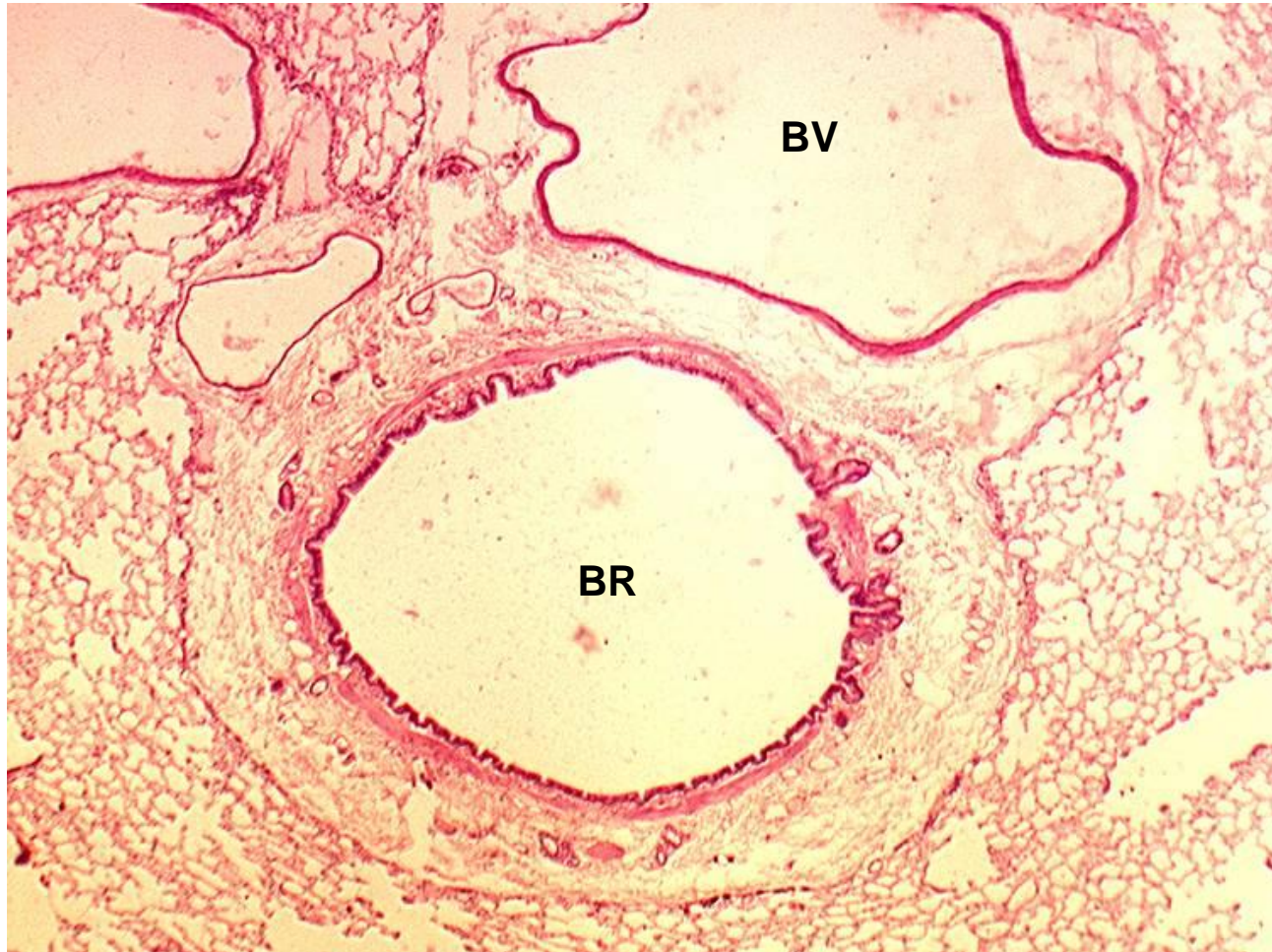
Lung (adult)

At low magnification identify :
bronchus
bronchiole
large blood vessels



Lung (adult)

Bronchus and blood vessels



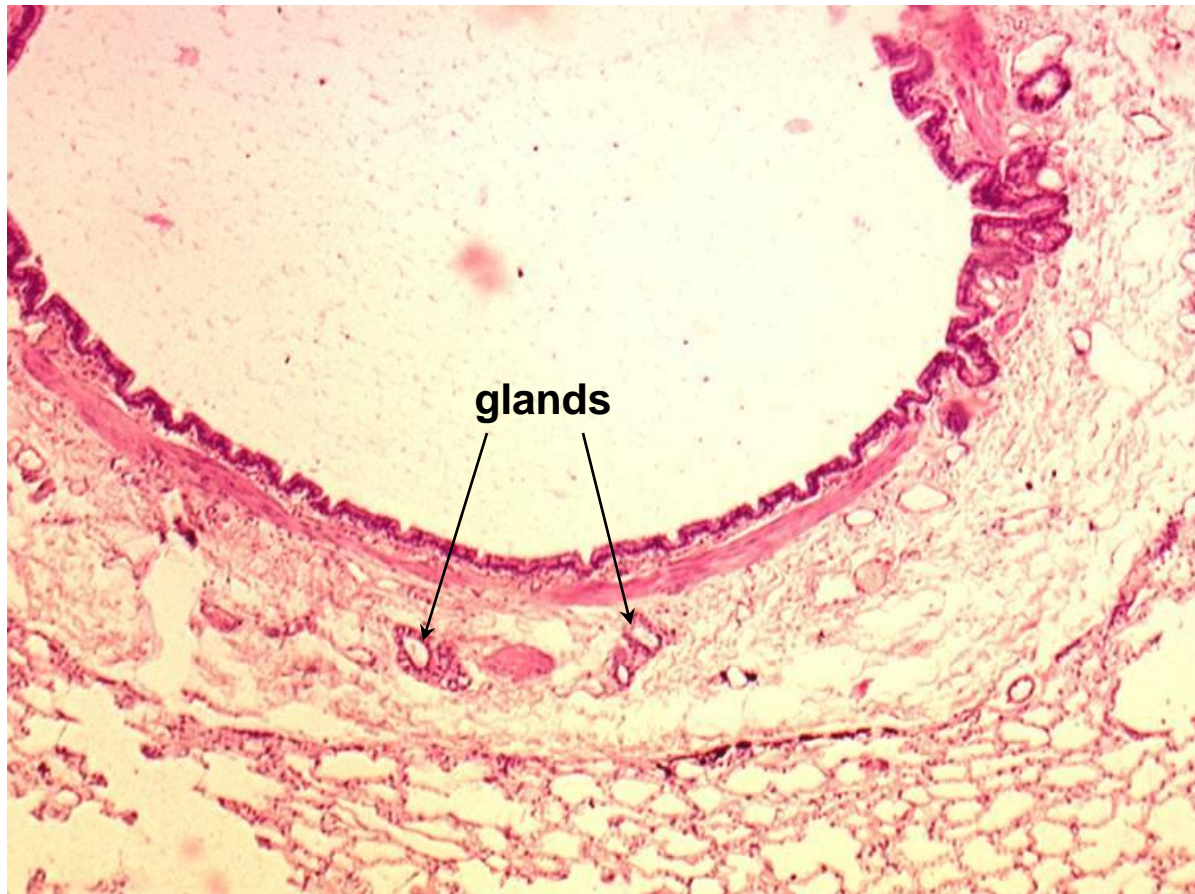
BR : bronchus

BV : blood vessel

0.5 mm

Lung (adult)

Although there is little evidence of cartilage in this structure, some glands can be seen suggesting that this is a small bronchus.

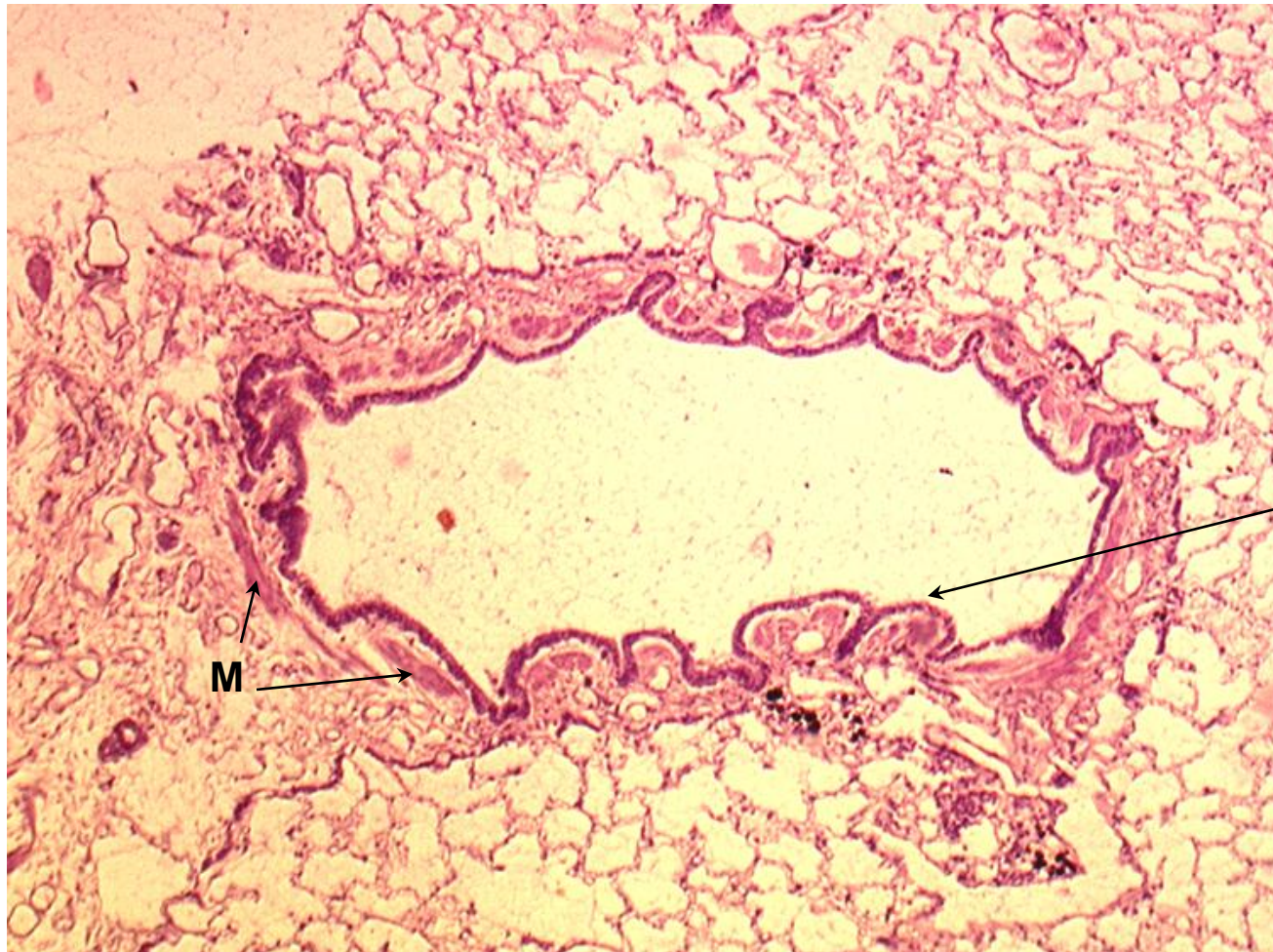


250 μm

Lung (adult) Bronchiole

Why is cartilage absent from the wall of a bronchiole?

To allow a change in diameter. They must be flexible in a way that minimises 'dead space' but does not cause too great a resistance to air flow.



M : muscle

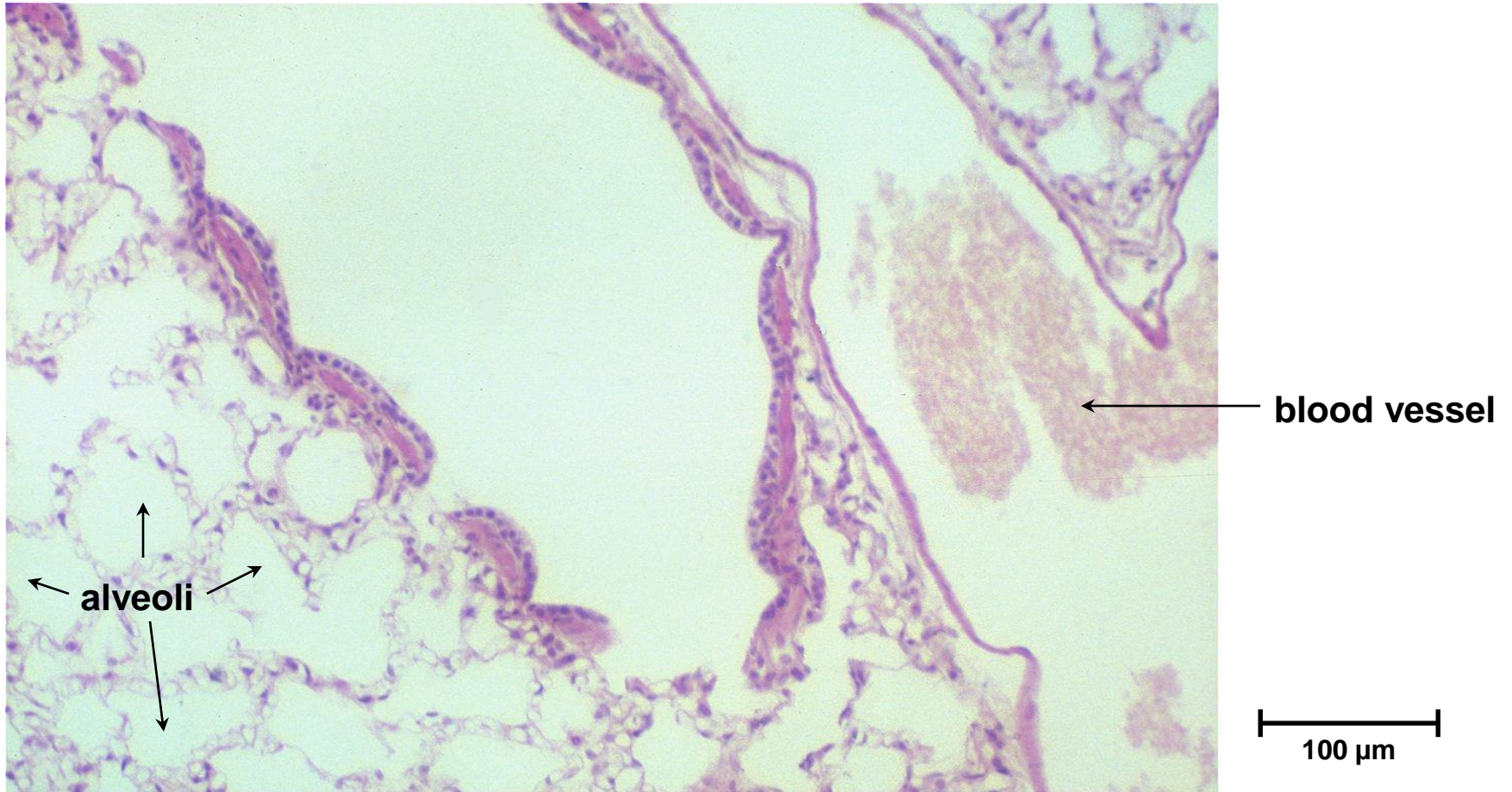
epithelium

M

250 μ m

Lung (adult) Respiratory Bronchiole

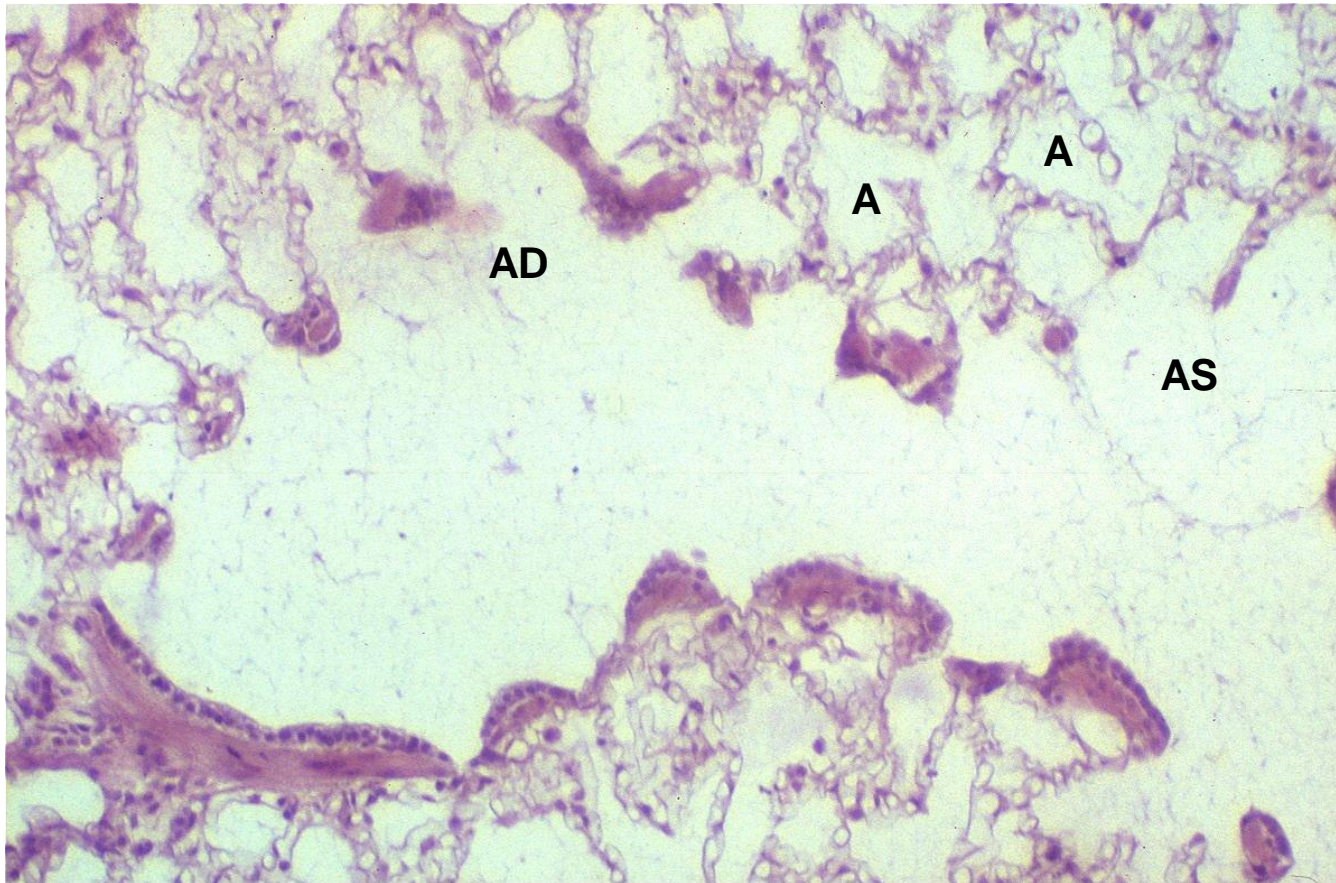
Respiratory bronchioles are lined by a cuboidal epithelium.
Alveolar ducts open into alveoli.



Lung (adult) Respiratory duct/sac

The lips of the alveoli contain smooth muscle.

Respiratory bronchiole → alveolar ducts → alveolar sacs → alveoli.



AD alveolar ducts

AS alveolar sacs

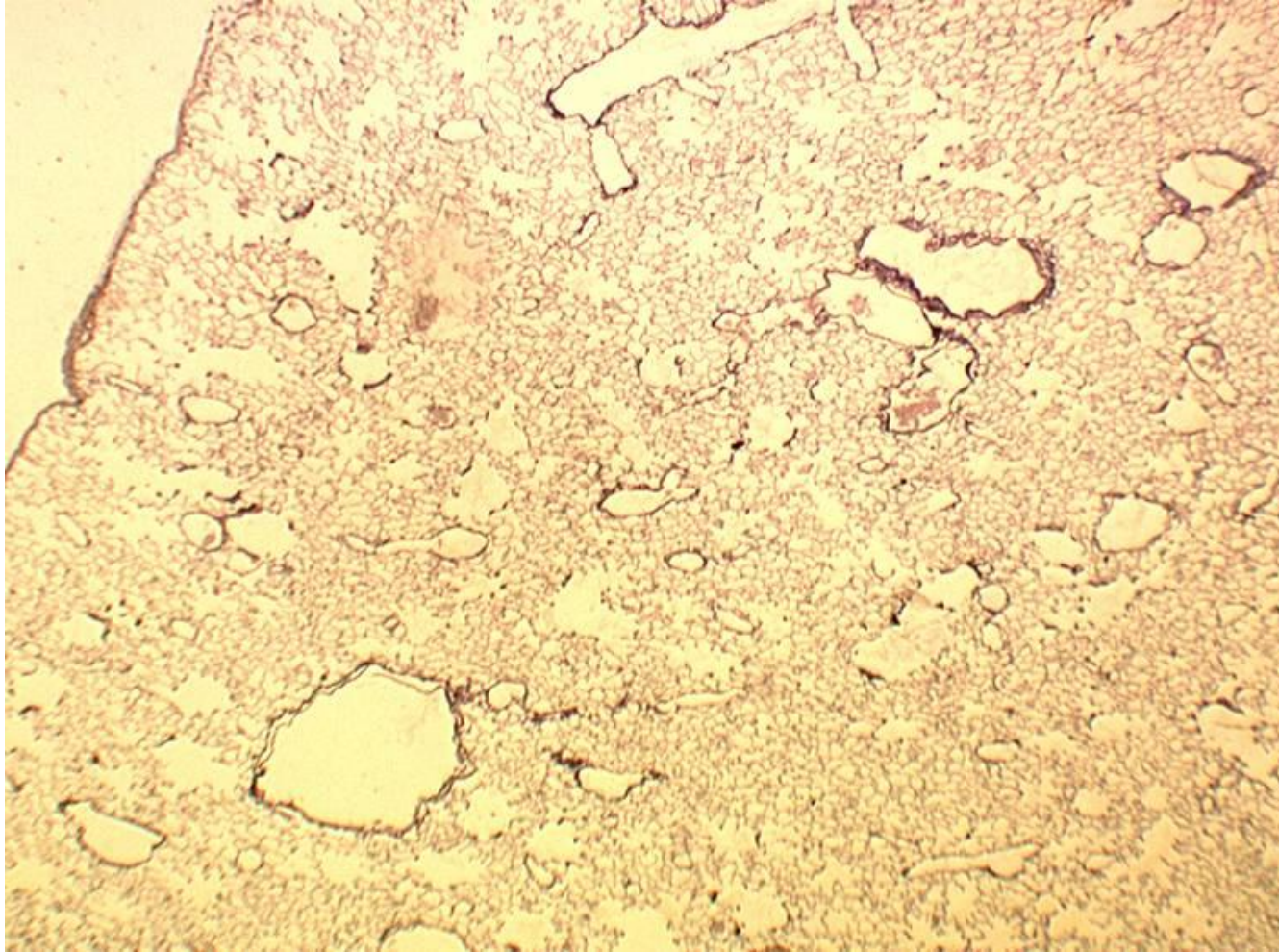
A : alveoli

100 μ m

Lung stained for elastic tissues

Examine this section stained for elastic tissue.

At low magnification.

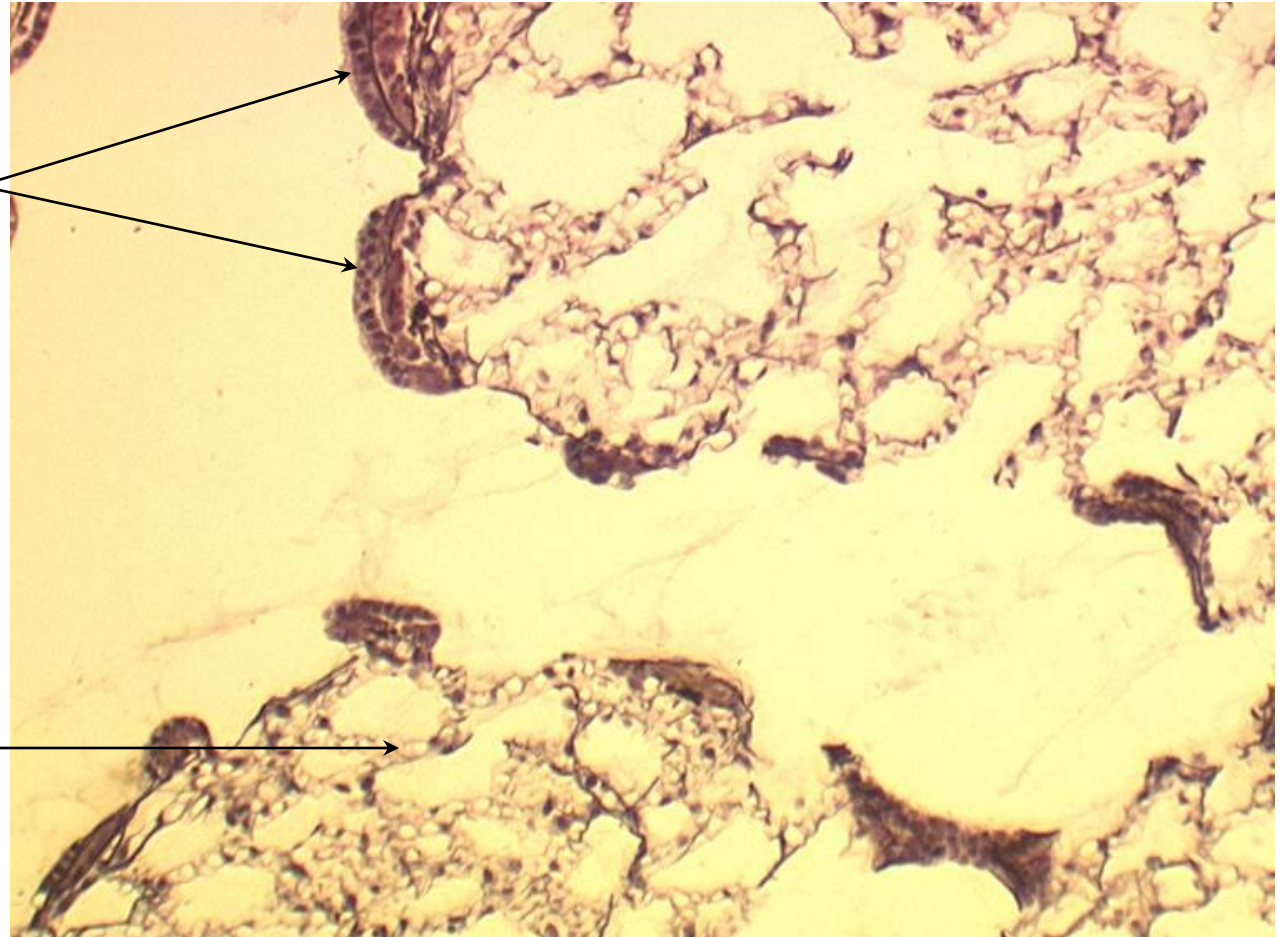


1 cm

Lung stained for elastic tissues

Note the distribution of these fibres throughout the section especially in relation to the alveolar ducts and alveoli.

elastic fibres and
smooth muscle cells
below the cuboidal
lining of the alveolar
ducts



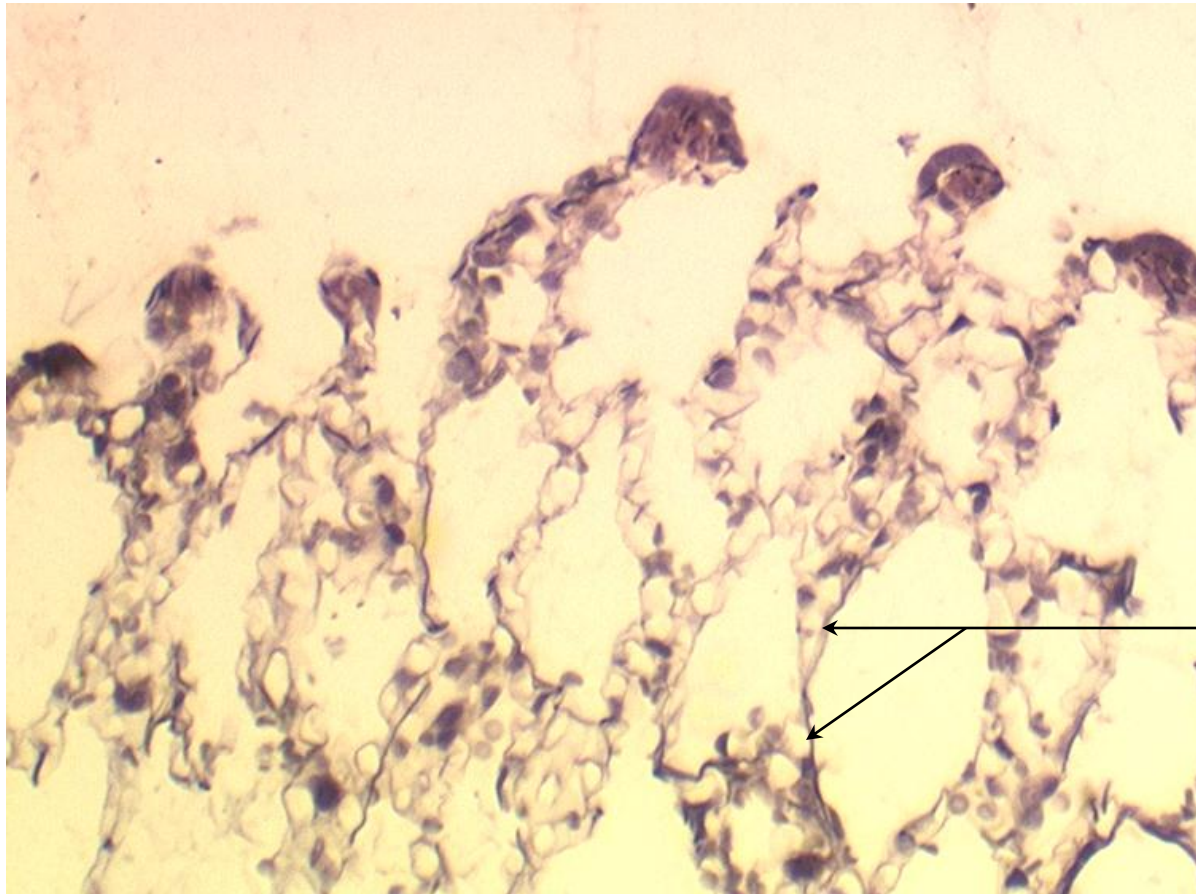
elastic fibres
surrounding alveoli

100 μm

Lung stained for elastic tissues

Why are there so many elastic fibres in the lung?

The lung is stretched during inspiration. The elastic fibres enable the elastic recoil during expiration.



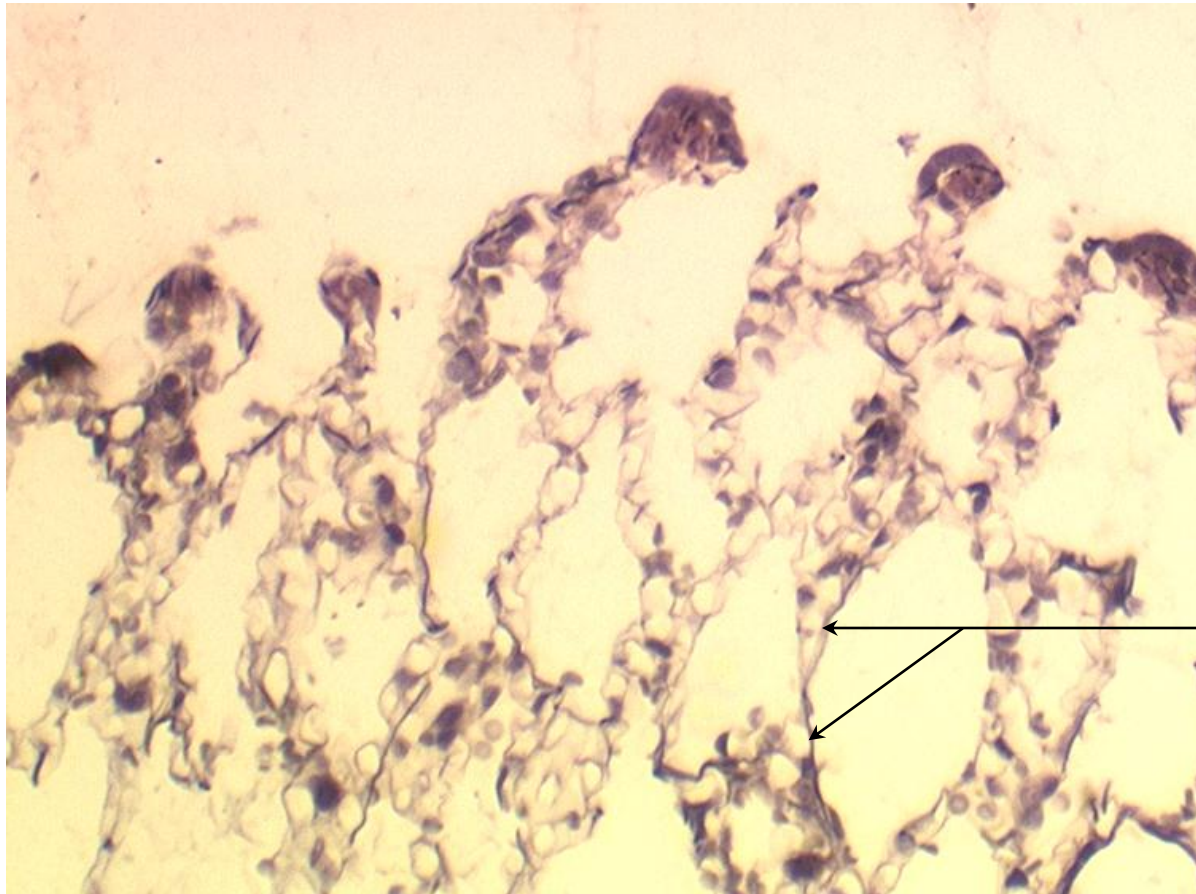
elastic fibres

50 μ m

Lung stained for elastic tissues

Why does their distribution differ in different parts of the respiratory tract?

There are more fibres in the parts that expand the most, the respiratory ducts and the alveoli.



elastic fibres

50 μ m