جامعة الملك سعود
King Saud University

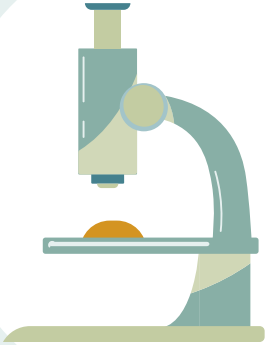
Editing file

02

اللهم لا سهل الا ماجعلته سهلا
وانت تجعل الحزن إذا شئت سهلا

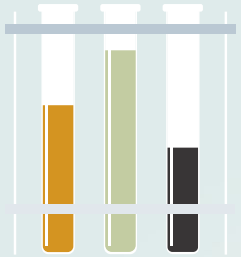
Histology

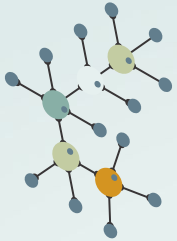
Lower Respiratory Tract (Trachea, Bronchi, Bronchioles) & the Lung



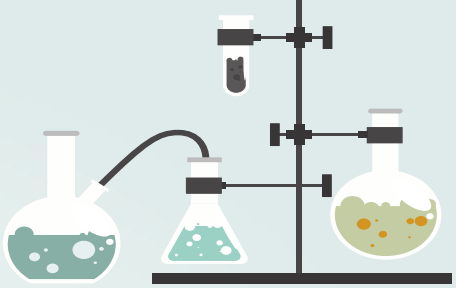
Revised & Approved by:
Shayma Abdullah Alghanoum
Faisal Alotaibi

Color index
- Important
- Doctor's note
- Extra info





Objective



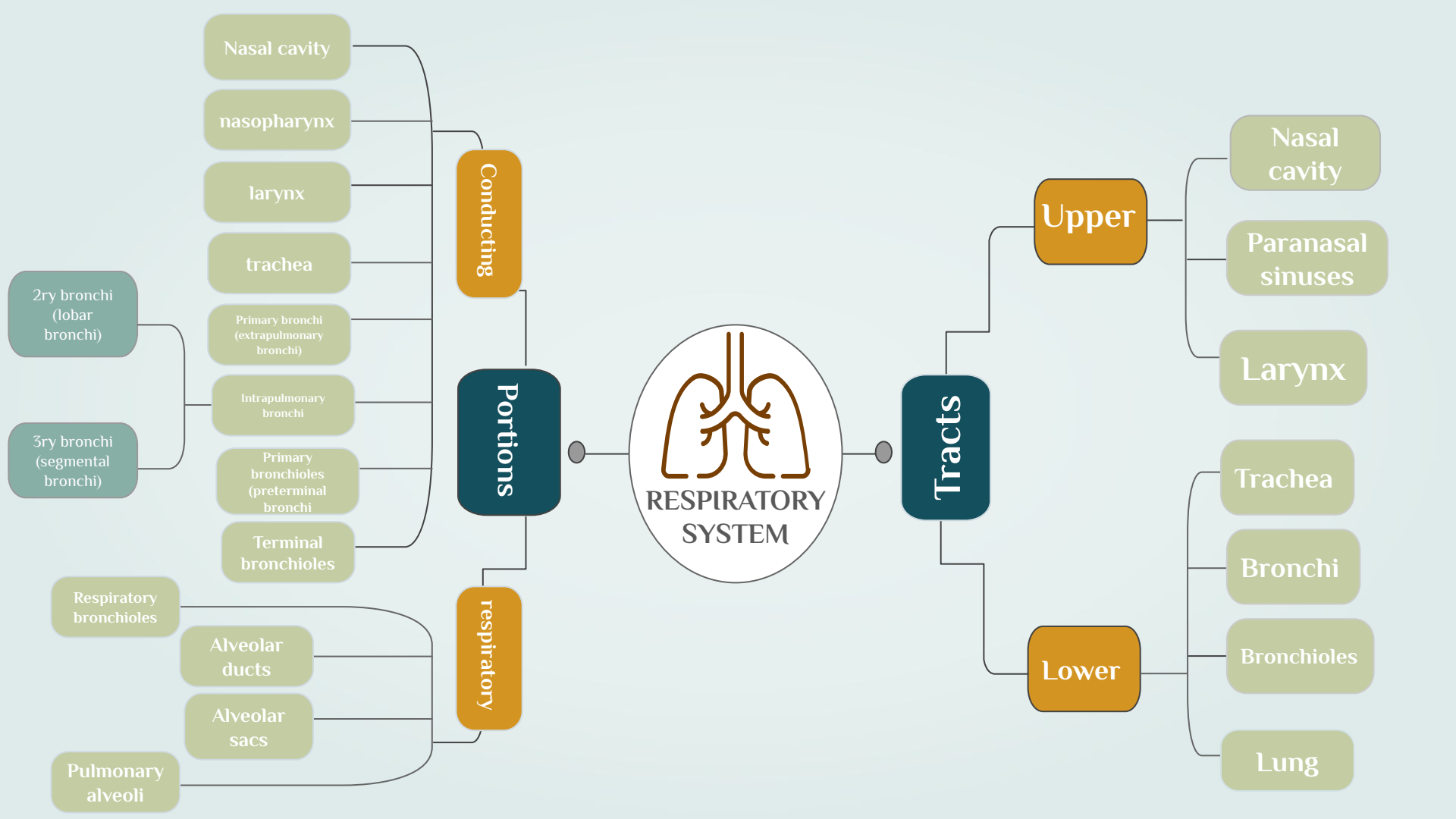
By the end of this lecture, the student should be able to describe:

01 The microscopic structures of the wall of:

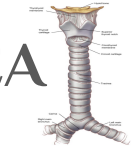
- Trachea
- Primary or extrapulmonary bronchi
- Intrapulmonary (secondary and tertiary) bronchi
- Bronchioles

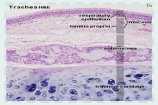
02 The microscopic structures of :

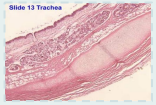
- Interalveolar septum
- Alveolar phagocytes
- Pleura


RESPIRATORY SYSTEM
Tracts
Upper
Nasal cavity
Paranasal sinuses
Larynx
Lower
Trachea
Bronchi
Bronchioles
Lung
Portions
Conducting
Nasal cavity
nasopharynx
larynx
trachea
Primary bronchi (extrapulmonary bronchi)
Intrapulmonary bronchi
2ry bronchi (lobar bronchi)
3ry bronchi (segmental bronchi)
Primary bronchioles (preterminal bronchi
Terminal bronchioles
respiratory
Respiratory bronchioles
Alveolar ducts
Alveolar sacs
Pulmonary alveoli

TRACHEA

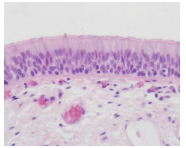


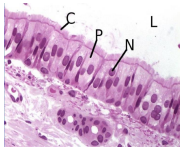




Mucosa

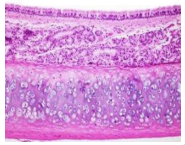
-Epithelium: Respiratory epithelium
-Lamina propria
-Elastic lamina:
-It is formed of elastic fibers
-It separates lamina propria from submucosa





Adventitia

-Fibroelastic C.T
-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

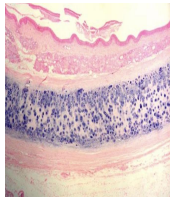


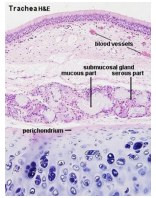
TRACHEA

The wall of trachea is formed of

Submucosa

-C.T
-Numerous mucous & seromucous glands
-Lymphoid elements





BRONCHI

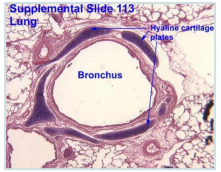
EXTRAPULMONARY BRONCHUS (1ry BRONCHUS)

Generally have the same histological appearance as the trachea.
(same structure but different in diameter)

INTRAPULMONARY BRONCHI (2ry & 3ry BRONCHI)

Mucosa

-**Epithelium**:
Respiratory epith
-**Lamina propria** N.B.
No elastic lamina

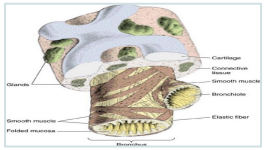


Muscle coat (complete)

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

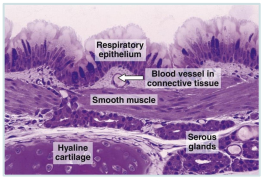
Submucosa

-C.T. contains:
Seromucous glands
Lymphoid elements



Adventitia

-Loose C.T Irregular plates of **hyaline cartilage** (complete layer)
-Solitary lymphoid nodules



Bronchioles

Preterminal (1ry) Bronchioles

- less than 1mm in diameter.

1- Mucosa: has longitudinal folds:

(A) Epithelium: Simple ciliated columnar Epithelium with occasional goblet cells.

(B) Lamina propria: Connective tissue rich in elastic fibers.

2- Smooth muscle: 2 helically arranged smooth muscle layers.

3- Adventitia: Connective tissue.

*No cartilage
*No seromucous glands
*No lymph nodules

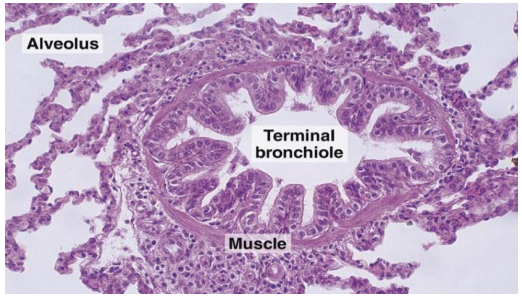
Irregular "wavy" to increase the surface area for lung expansion

Terminal (2ry) Bronchioles

- less than 0.5mm in diameter.
the last part of the conduction zone.

- Similar structure to preterminal bronchioles, but:

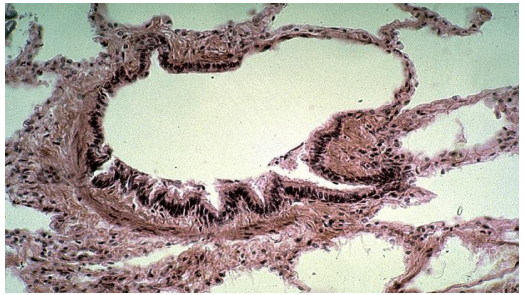
Epithelium: Simple cuboidal partially ciliated epithelium With Clara cells (With NO goblet cells).



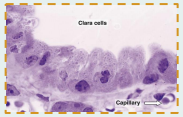
Respiratory Bronchioles

the first part of the respiratory zone

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



CLARA CELLS



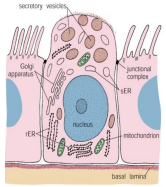
Note

-The goblet cells will decrease in number until they are replaced by the Clara cells. although the cilia will decrease in number but won't disappear completely

-found in 2ry & 3ry bronchioles

Structure

CLARA CELLS



columnar cells (non ciliated)

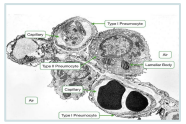
Function

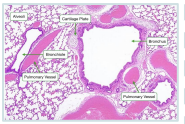
1- Degrade toxins in inhaled air.
2- Divide to regenerate the bronchiolar epithelium.
3- Produce surfactant-like material.
Secretory cells

PULMONARY ALVEOLI

Definition

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

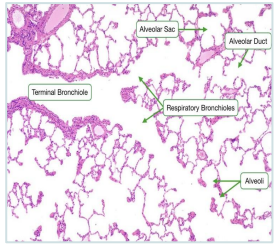




Component

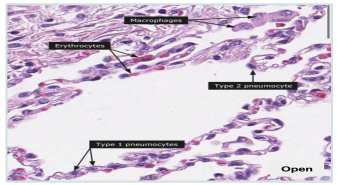
Alveolar duct

-The wall of alveolar ducts consist of pulmonary alveoli.
-Alveolar duct → ends by: atrium → communicates with: 2-3 alveolar sacs



Alveolar phagocytes

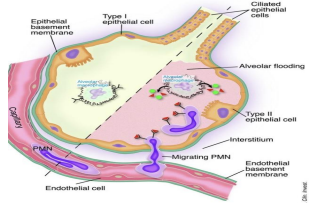
Sites:
(1) In the lumen of pulmonary alveoli.
(2) In the interstitium of interalveolar septa.
Function:
Phagocytose particulate matter (e.g. dust) & bacteria in the lumen of pulmonary alveoli and in the interstitium of interalveolar septa



INTERALVEOLAR SEPTA

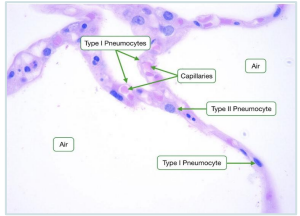
Interstitium

(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

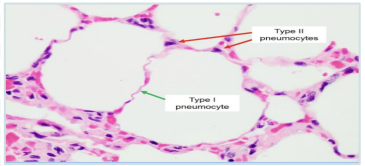


ALVEOLAR EPITHELIUM

(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

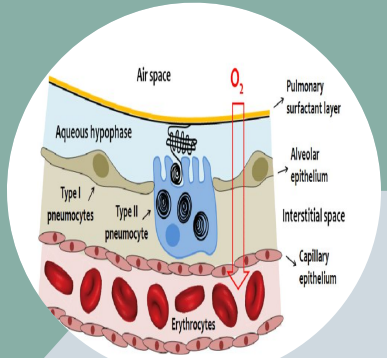


(2) Type II Pneumocytes:
- Line 5% of the alveolar surfaces. - Are more numerous than type I pneumocytes.
- Are cuboidal or rounded cells, With Foamy cytoplasm With central & rounded Nucleus.
- The cytoplasm contains membrane-bound Lamellar bodies (contain pulmonary surfactant)
-Function:
1- Synthesis & secretion of pulmonary surfactant.
2- Renewal of alveolar epithelial cells: Type II cells can divide to regenerate both type I & type II pneumocytes



Blood-Gas Barrier

Components



1- Thin layer of surfactant.
(Secreted from type 2 pneumocyte)
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.

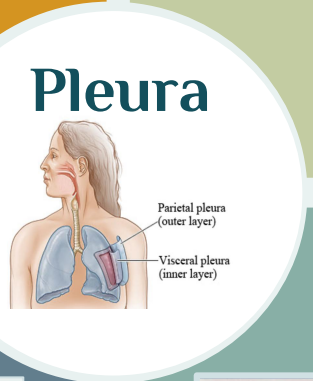
Definition

It is the region of the interalveolar septum that is traversed by O2 & CO2

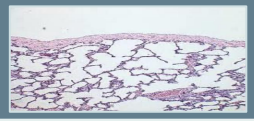
Pleura

It is formed of simple squamous mesothelium

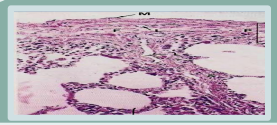
The Pleura ls formed of two layers: Parietal and Visceral



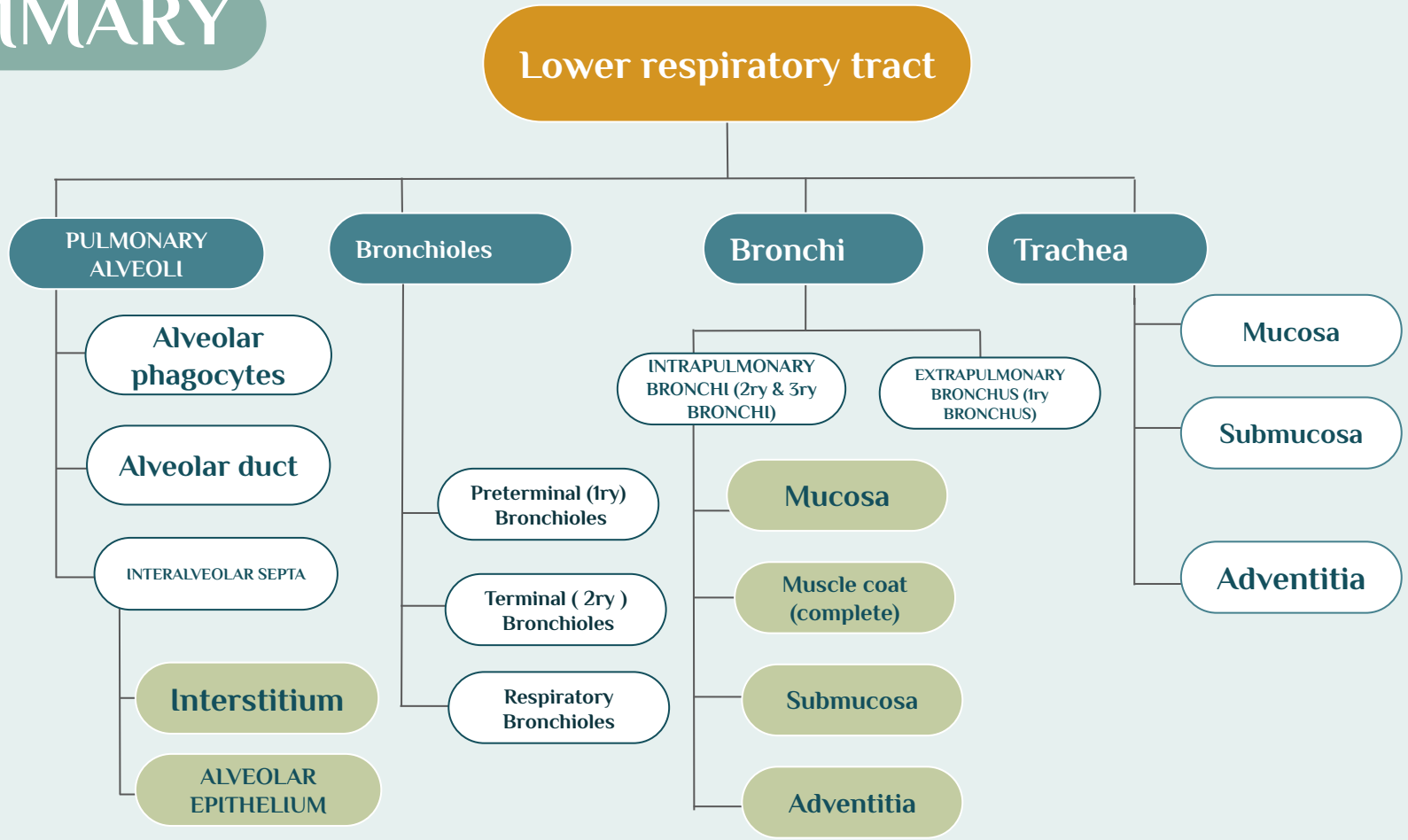
The visceral layer has sub-epithelium loose C.T that extends into the lung tissue



The two layers are separated by serous fluid



SUMMARY


Lower respiratory tract
PULMONARY ALVEOLI
Alveolar phagocytes
Alveolar duct
INTERALVEOLAR SEPTA
Interstitium
ALVEOLAR EPITHELIUM
Bronchioles
Preterminal (1ry) Bronchioles
Terminal (2ry) Bronchioles
Respiratory Bronchioles
Bronchi
INTRAPULMONARY BRONCHI (2ry & 3ry BRONCHI)
EXTRAPULMONARY BRONCHUS (1ry BRONCHUS)
Mucosa
Muscle coat (complete)
Submucosa
Adventitia
Trachea
Mucosa
Submucosa
Adventitia

MCQs :

Answer key:
1) B
2) A
3) D
4) A
5) D
6) A
7) C
8) A

01
production of surfactant like material is a function of?
A) Type I Pneumocytes
B) Clara cells
C) Pleura
D) Type II Pneumocytes

02
which feature is present only in respiratory bronchioles ?
A) presence of pulmonary alveoli
B) Clara cells
C) Presence of cilia
D) no cartilage

03
What type of cartilage is found in the Preterminal Bronchioles?
A) Elastic cartilage
B) Fibrocartilage
C) Hyaline cartilage
D) Have no cartilage

04
Pleura is formed of ?
A) simple squamous mesothelium
B) simple Columnar cells
C) Respiratory Epithelium
D) cuboidal cells

05
Which one of the following has an elastic lamina?
A) preterminal bronchioles
B) Terminal bronchioles
C) Esophagus
D) trachea

06
the incomplete ring of hyaline cartilage in trachea completed by:
A) Trachealis muscle
B) Tendon
C) ligament
D)elastic cartilage

07
Which of the following structures has the same histological appearance as the trachea?
A)Preterminal Bronchioles
B)Respiratory Bronchioles
C)Extrapulmonary Bronchus
D)Intrapulmonary Bronchus

08
Which of the following divides to regenerate new cells ?
A)Both B & C
B)Clara cells
C)Type 2 pneumocyte
D)Intrapulmonary Bronchus

Team leaders

Fatimah Alhelal
Albara Aldawoud

This Lecture done by

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Any future corrections will be in the editing file.
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Team members

Afnan AlMohsen
Nourah Alklaib
Sumo Abdulrahman
Mariam Alruhaimi
Joud Alarifi

Team members

Yazeed Alomar
Abdulmohsen Albesher
Mohamed Albabtain
Mohammed Ben Hajji
Mohamed Alquhidan
Nawaf Alshahrani
Abdullah Alburikan

Contact us through :
Histologyteam439@gmail.com