

The Respiratory System

This system is responsible for conveying the air from the external environment to the lung, it is divided into:

- 1. Air conducting portion**
- 2. Respiratory portion**

The air conducting portion is formed by:

- A. Nasal cavity**
- B. Naso pharynx**
- C. Larynx**
- D. Trachea**
- E. Bronchi**
- F. Bronchioles**

The respiratory portion is formed by:

- A. Respiratory bronchioles**
- B. Alveolar duct**
- C. Alveolar sacs**
- D. Alveoli**

The nasal cavity:

Is the first part of this system that the air pass through it to other ducts, this cavity is lined by three epithelia:

- a) Stratified squamous epithelium is lining the entrance of the nasal cavity and consider as reflection from the skin.**
- b) Pseudo stratified ciliated columnar epithelium, is consider as respiratory epithelium, lining the most of cavity.**
- c) Olfactory epithelium, is the sensory epithelium, responsible for detection the particles of odors and transmit these to the brain for analysis for the type of olfaction, it is formed by bipolar neurons, surrounded by supporting cells, this bipolar neurons have sensory hairs and the other pole have sensory nerves.**

The whole epithelia are resting on the basement membrane and below it there is a layer of C-T called lamina propria containing blood vessels and this layer is continuous with another layer below which is called sub mucosa containing mucus glands and a great number of blood vessels for warming the inspired air in case of cold or cooling the air in case of hot.

The Naso pharynx:

Is lined by respiratory epithelium with cilia (for expel) the foreign bodies and mucus cells (goblet cells) to trap these foreign bodies. There is lamina propria and sub mucosa associated with blood vessels and muscle fibers.

Larynx:

Is formed by two:

- a) Cartilages
- b) Muscles

The cartilages are hyaline and elastic, these cartilages form the framework of the larynx.

The muscles are skeletal muscle fibers, the interior of the larynx is lined by stratified squamous epithelium at the vocal cords and folds of sinus of larynx at the middle of larynx, the second type of epithelia is called pseudo stratified epithelium.

Trachea:

Is lined by pseudo stratified columnar epithelium resting on the basement membrane and below it there is lamina propria continuous with sub mucosa associated with blood vessels and mucus glands, these are encircled by hyaline cartilage which present in the form of rings, and the whole these layers are surrounded from outside by C-T with blood vessels, so this layer is called Tunica Adventitia.

Bronchus:

Is the bifurcation of trachea, gives the two bronchi, each bronchus have the same structure to that of trachea, except that the cartilage is here segmented. Bronchi are usually extrapulmonary and intrapulmonary type and both are same structure.

Bronchioles:

Are the final distribution of the bronchi in the lung, these are forming the bronchial tree. Its structure is usually lined by simple columnar epithelium, resting on basement membrane with presence of delicate C-T below it and surrounding it from outside and these are usually devoid for the hyaline cartilage in its wall which given its characteristic features from bronchus. Finally, the termination of bronchioles are usually in respiratory bronchiole which have simple cuboidal epithelium.

The alveolar duct, sacs and alveoli:

Are the respiratory portion of the respiratory system, the wall of each one is lined by two types of cells:

- a. Squamous cells type I
- b. Cuboidal cells type II

The first type assist in the formation of the air-blood barrier, the second type is secreting a surfactant which is phospholipid material responsible for prevention of collapse of lung tissue.

Blood-air barrier:

Is a passage of the air from the alveolar cavity to the blood through capillary wall and opposite, it is usually formed by either three or five layers:

- a. In case of three layers: the structure is
 - i. Squamous cells type I.
 - ii. Basement membrane which is communicating with endothelial cells of the blood capillary.
 - iii. Endothelial cells of the blood capillary.
- b. The second type is that the structure is formed by five layers:
 - i. Alveolar epithelial squamous cells type I.
 - ii. Basement membrane of capillary of blood.
 - iii. Interstitial CT inbetween the basement membrane of the alveolar epithelium and the endothelium of the blood capillaries
 - iv. Basement membrane of endothelial cells of the blood capillaries
 - v. Endothelial cells

So the O₂ or CO₂ must be cross this barrier (three or five layers) to arrive either to the blood capillary if it is O₂ or cross from blood capillary to the alveoli which is CO₂.

Pleura: is a delicate membrane surrounding the lung consisting of delicate C-T and elastic fibers mainly containing blood vessels and surrounded by simple squamous epithetic from outside.