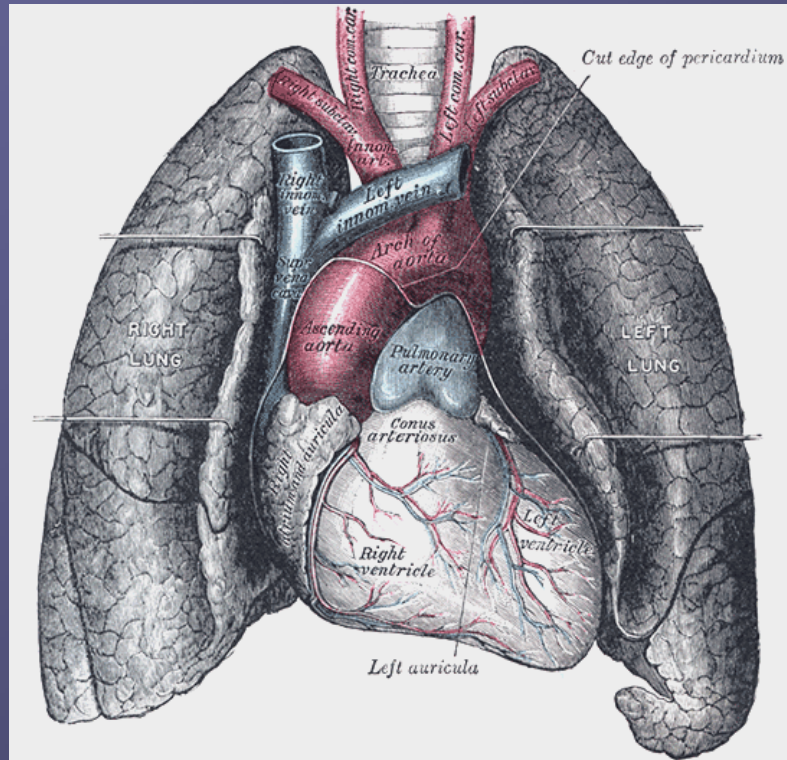


ANATOMY OF LUNGS



- 1. Gross Anatomy of Lungs**
- 2. Surfaces and Borders of Lungs**
- 3. Hilum and Root of Lungs**
- 4. Fissures and Lobes of Lungs**
- 5. Bronchopulmonary segments**
- 6. Histopathology of Alveoli**
- 7. Surfactant**
- 8. Blood supply of lungs**
- 9. Lymphatics of Lungs**
- 10. Nerve supply of Lungs**
- 11. Pleura**
- 12. Mediastinum**

GROSS ANATOMY OF LUNGS

Lungs are a pair of respiratory organs situated in a thoracic cavity. Right and left lung are separated by the mediastinum.

Texture -- Spongy

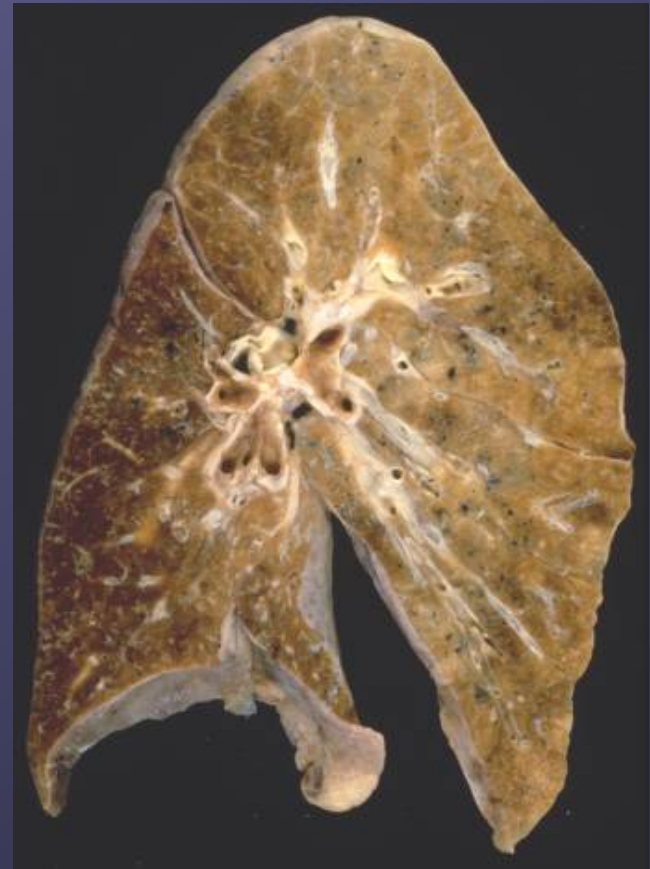
Color -- Young -- brown

Adults -- mottled black due to deposition of carbon particles

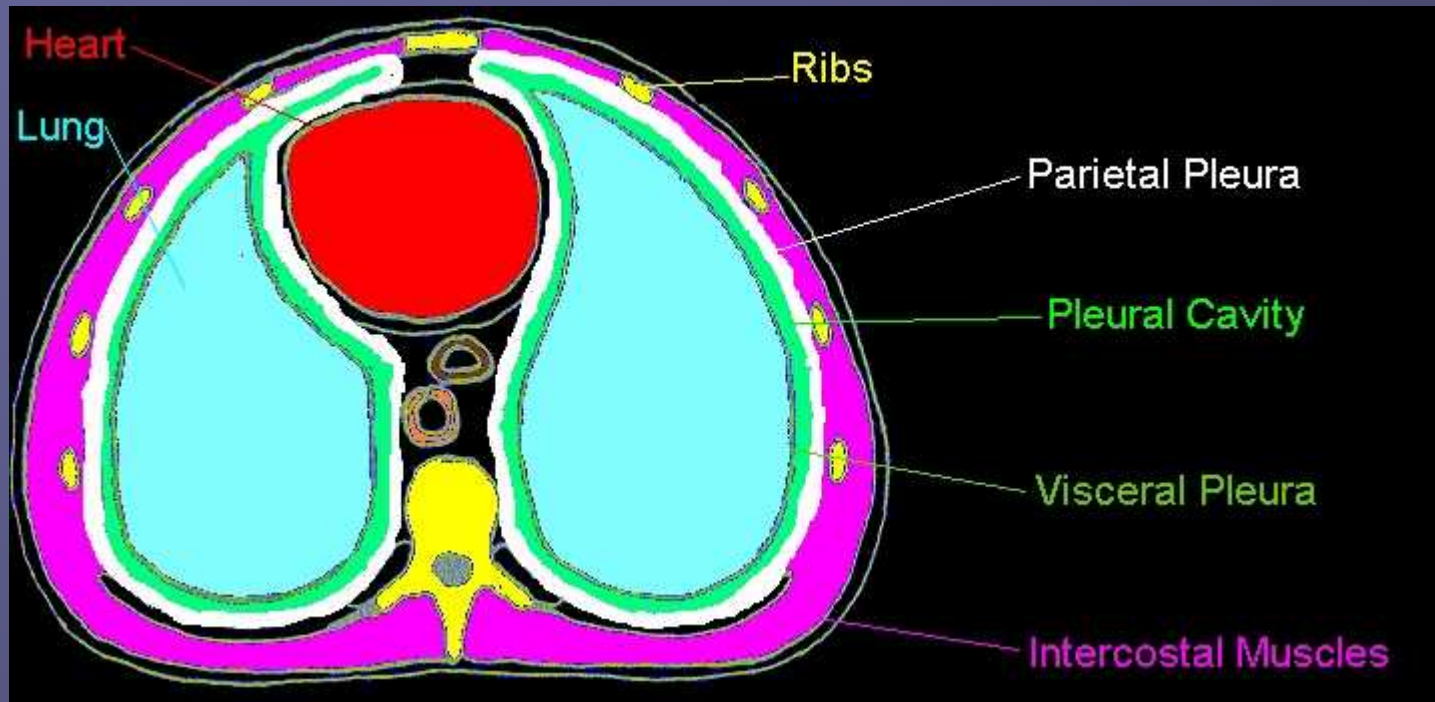
Weight-

Right lung - 600 gms

Left lung - 550 gms



THORACIC CAVITY



- Conical

Apex (*apex pulmonis*)

Base (*basis pulmonis*)

3 Borders

- anterior (*margo anterior*)
- posterior (*margo posterior*)
- Inferior (*margo inferior*)

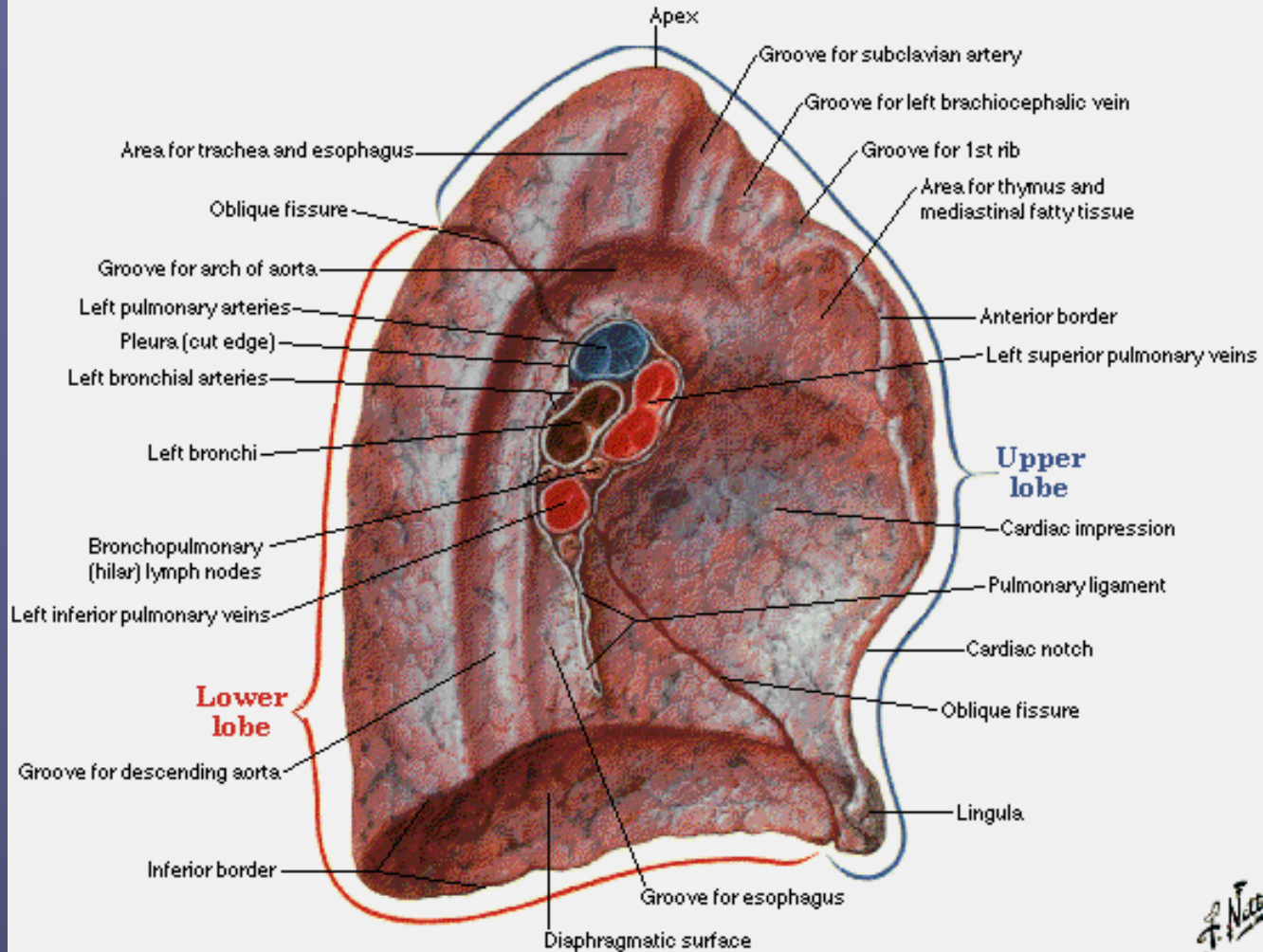
2 Surfaces

- costal (*facies costalis*)
- medial (*facies mediastinus*)
 - anterior (mediastinal)
 - posterior (vertebral)

APEX

- Blunt
- Lies above the level of anterior end of 1st Rib.
- Reaches 1-2 cm above medial 1/3rd of clavicle.
- Coverings –
 - cervical pleura.
 - suprapleural membrane
- Grooved by-
 - Subclavian artery
 - Subclavian vein

Left Lung Medial View



BASE

- Semilunar and concave.
- Rests on dome of Diaphragm.
- Right sided dome is higher than left.

BORDERS

● ANTERIOR BORDER –

1. Corresponds to the anterior (Costomediastinal) line of pleural reflection.
2. It is deeply notched in the left lung posterior to 5th costal cartilage by the pericardium and extends vertically downwards to form Lingula. This is called cardiac notch (percussion in this area gives a dull note as compared to dull note obtained over lung).

INFERIOR BORDER

- Thin and sharp
- It separates the base of lung from the costal surface and extends into phrenicocostal sinus.

POSTERIOR BORDER

- Thick and ill defined
- Fits into deep paravertebral gutter.
- Extends from C7 to T10.

SURFACES OF THE LUNG

1. Costal Surface

- It is in contact with costal pleura and overlying thoracic wall.

2. Medial Surface

- Posterior / Vertebral Part

- Anterior / Mediastinal Part

Relations of Posterior Part

1. Vertebral Part

2. Intervertebral Discs

3. Posterior Intercostal Vessels

4. Splanchnic Nerves

RELATIONS OF ANTERIOR PART

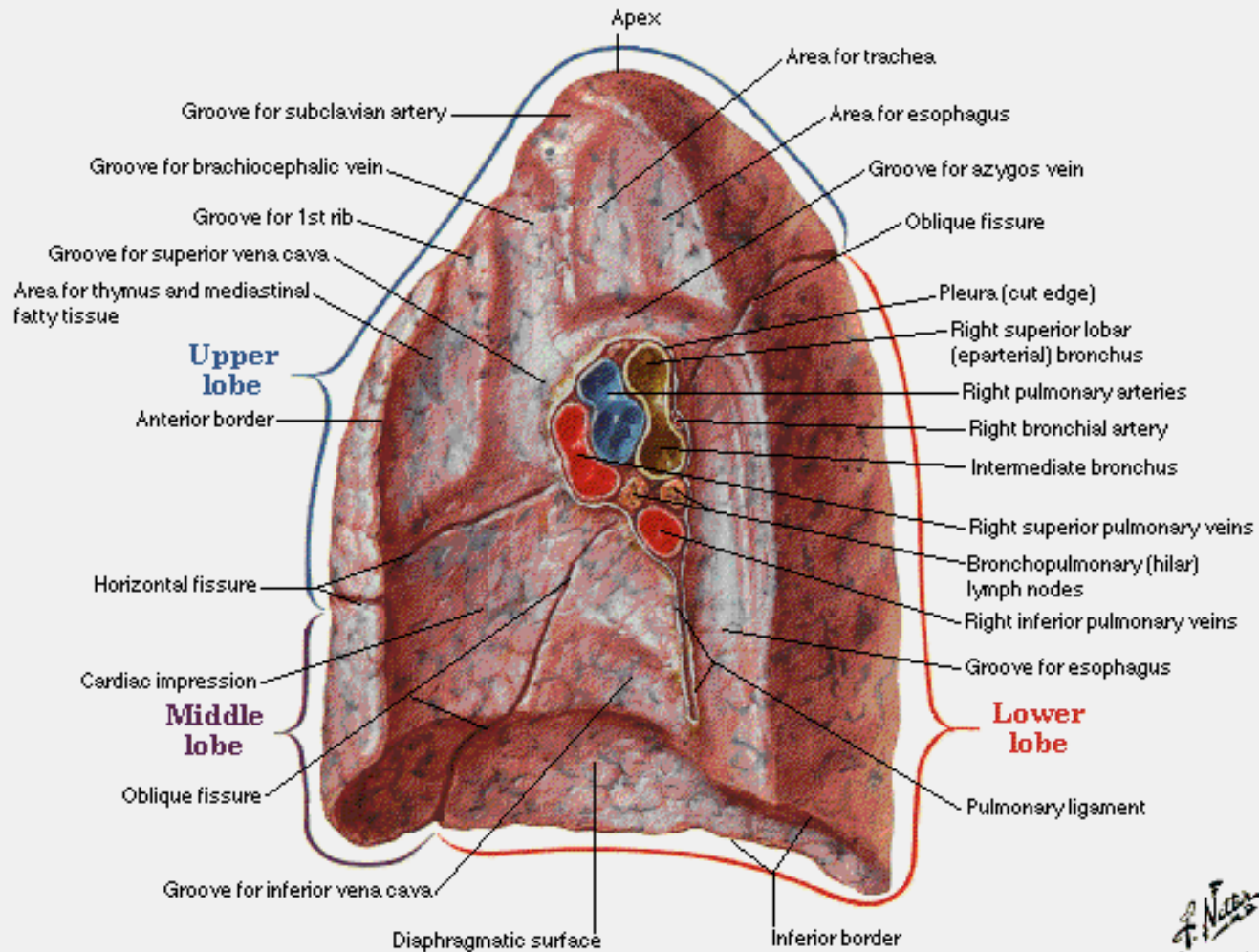
RIGHT SIDE

1. Right atrium
2. Small part of RV
3. SVC
4. Right brachiocephalic vein(lower part)
5. Azygos vein
6. Esophagus
7. IVC
8. Trachea
9. Right vagus nerve
10. Right phrenic nerve

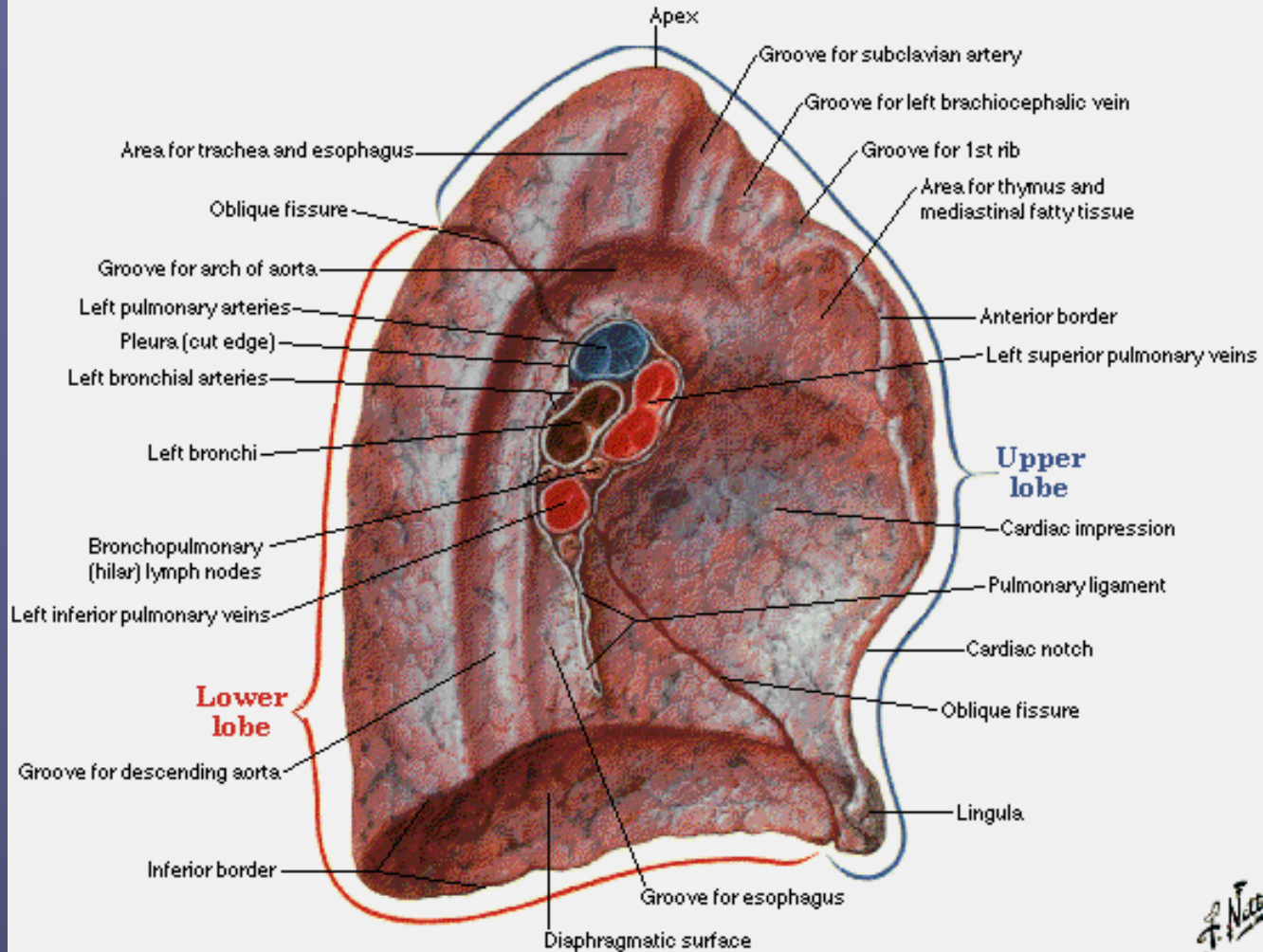
LEFT SIDE

1. Left ventricle
2. Pulmonary trunk
3. Arch of Aorta
4. Descending thoracic aorta
5. Left Subclavian Artery
6. Thoracic duct
7. Left Brachiocephalic Vein
8. Left vagus nerve
9. Left phrenic nerve
10. Left recurrent laryngeal nerve

Right Lung Medial View



Left Lung Medial View

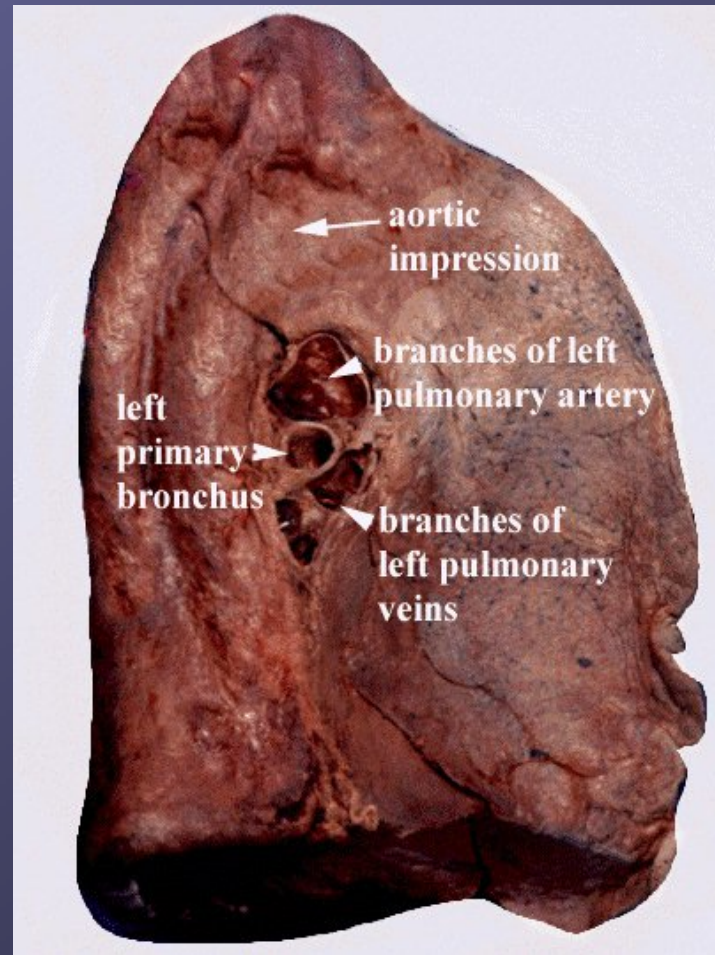


HILUM

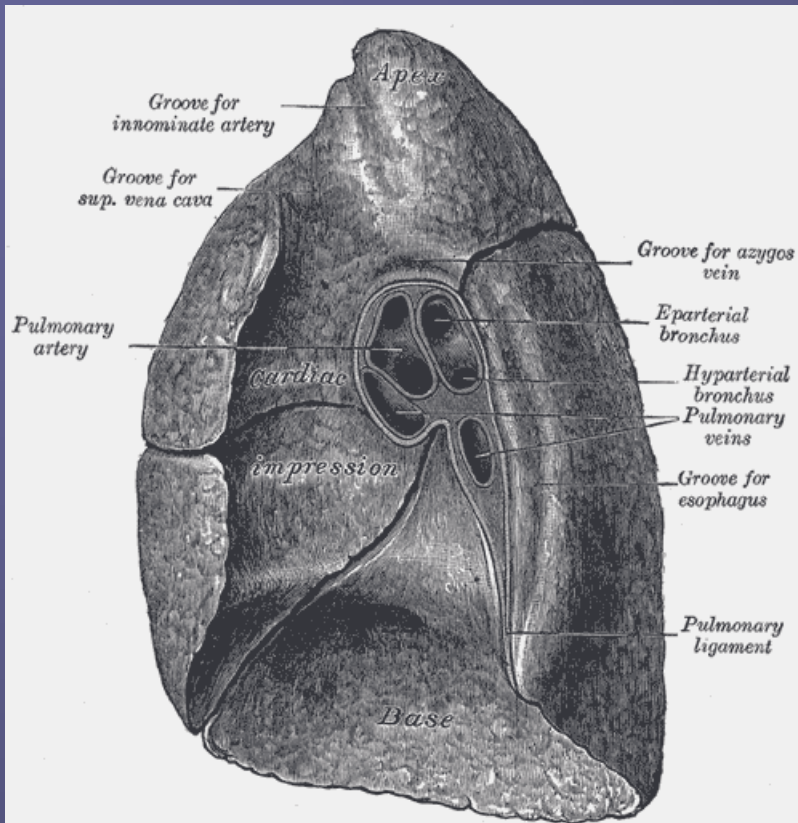
- It is a large depressed area that lies near the centre of the medial surface.
- Various structures enter and leave the lung via its root.

ROOT OF THE LUNG

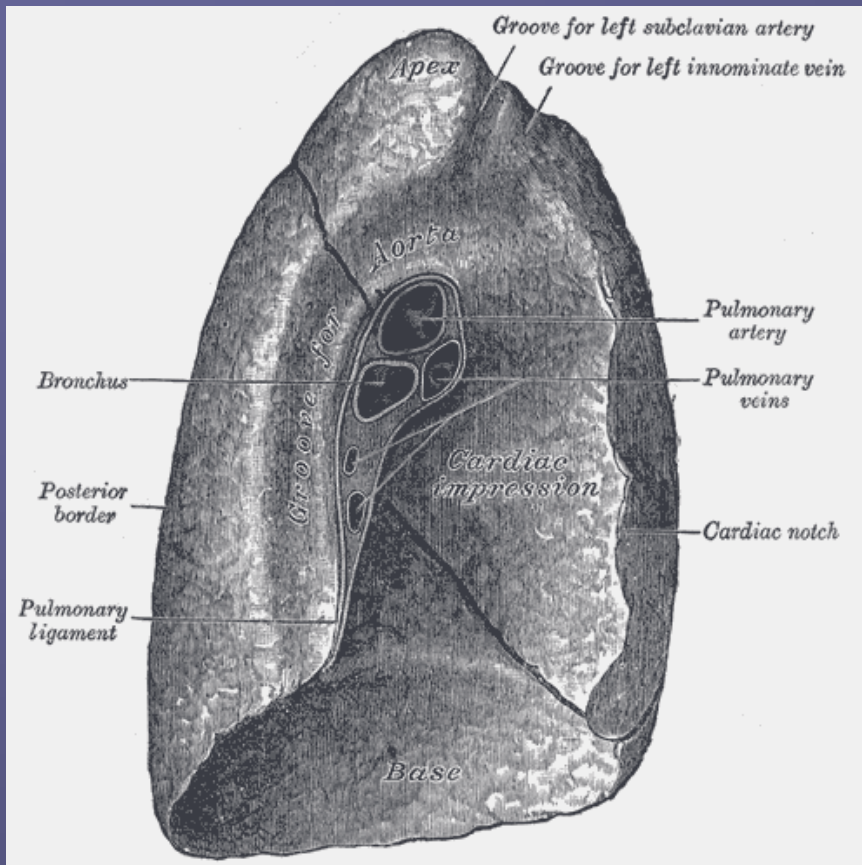
- The root is enclosed in a short tubular sheet of pleura that joins the pulmonary and mediastinal parts of pleura . It extends inferiorly as a narrow fold - The pulmonary ligament.
- It lies opposite of the bodies of 5th, 6th and 7th thoracic vertebra



STRUCTURES OF THE ROOT

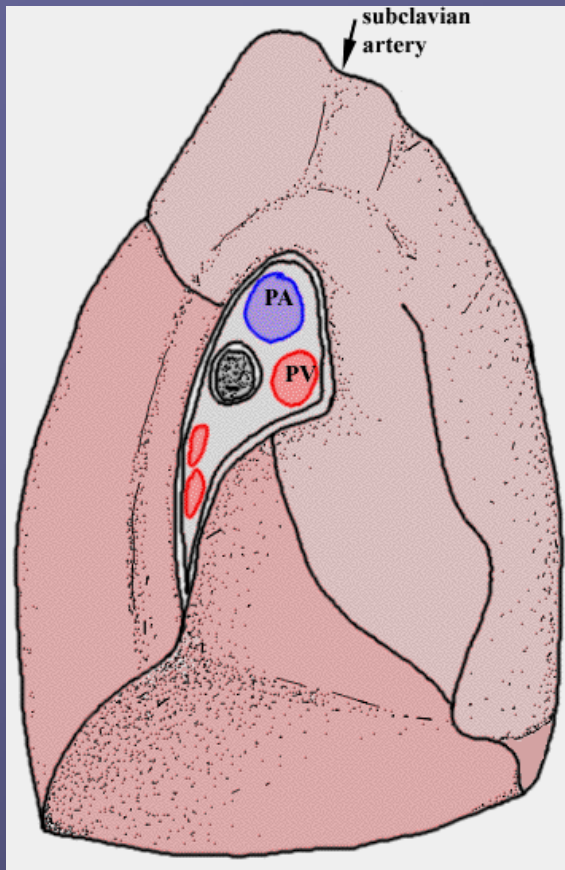


- Principal Bronchus on the left side.
- Eparterial and Hyparterial on the right side.
- One pulmonary artery .
- Two pulmonary veins -
Superior
Inferior
- Bronchial arteries
One on right side
Two on left side



- **Bronchial veins**
- **Anterior and posterior pulmonary plexus of nerves.**
- **Lymphatics**
- **Bronchopulmonary Lymphnodes**
- **Areolar tissue.**

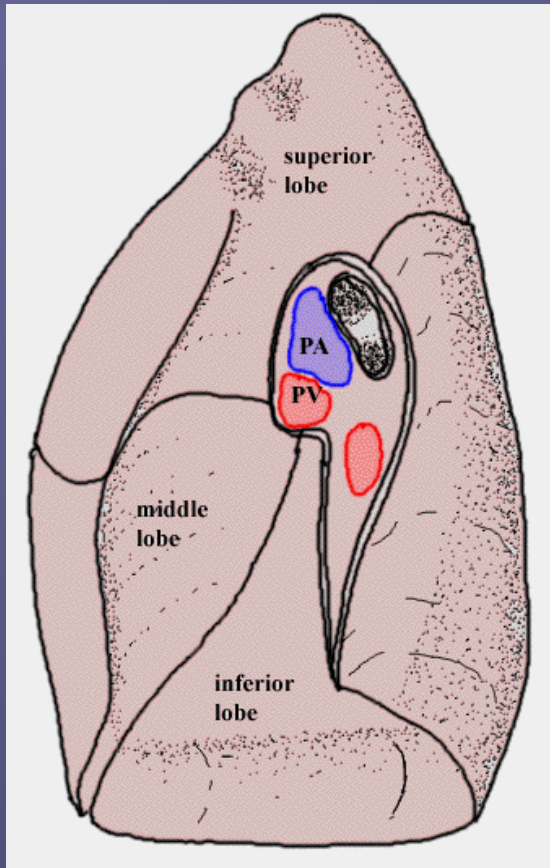
ARRANGEMENT OF STRUCTURES IN THE ROOT



● BEFORE BACKWARDS

1. Superior pulmonary vein.
2. Pulmonary artery.
3. Bronchus.

ARRANGEMENT OF STRUCTURES IN THE ROOT

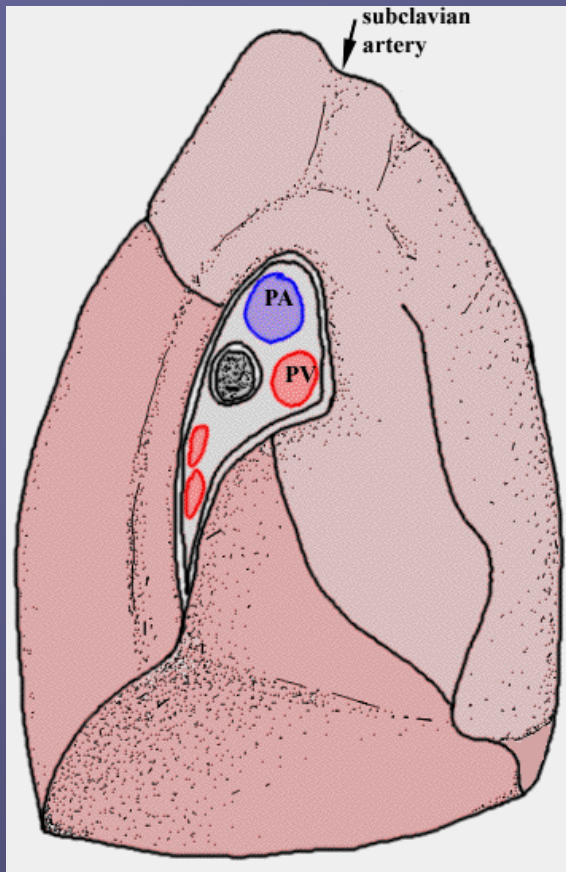


● ABOVE DOWNWARDS

A. Right Side

1. Eparterial Bronchus.
2. Pulmonary Artery.
3. Hyparterial Bronchus.
4. Inferior Pulmonary Vein.

ARRANGEMENT OF STRUCTURES IN THE ROOT

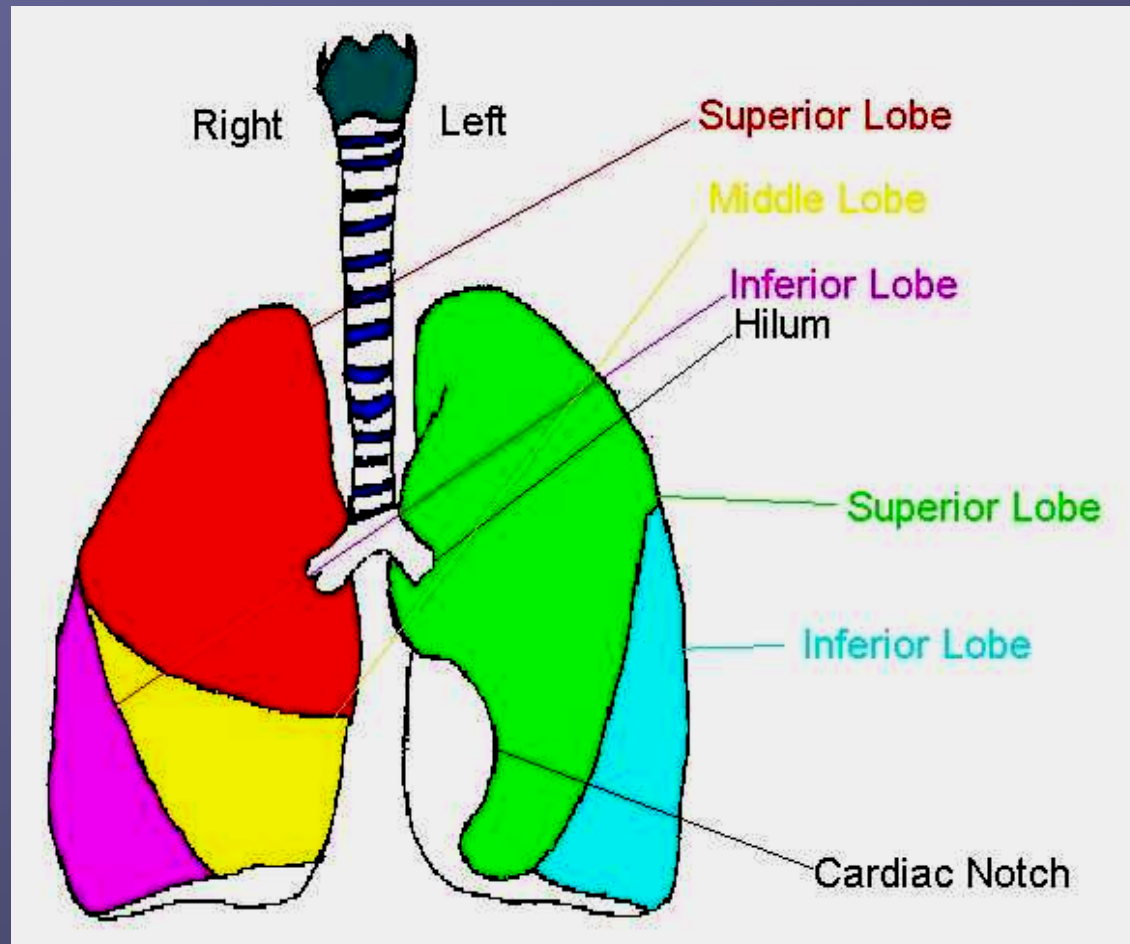


● ABOVE DOWNWARDS

B. Left Side

1. Pulmonary artery.
2. Bronchus.
3. Inferior pulmonary vein

FISSURES AND LOBES OF LUNGS



OBLIQUE FISSURE

- It begins posteriorly at the level of 5th thoracic vertebra.
- Passes antero-inferiorly in a spiral course to meet the inferior margin close to 6th costochondral junction.

HORIZONTAL FISSURE

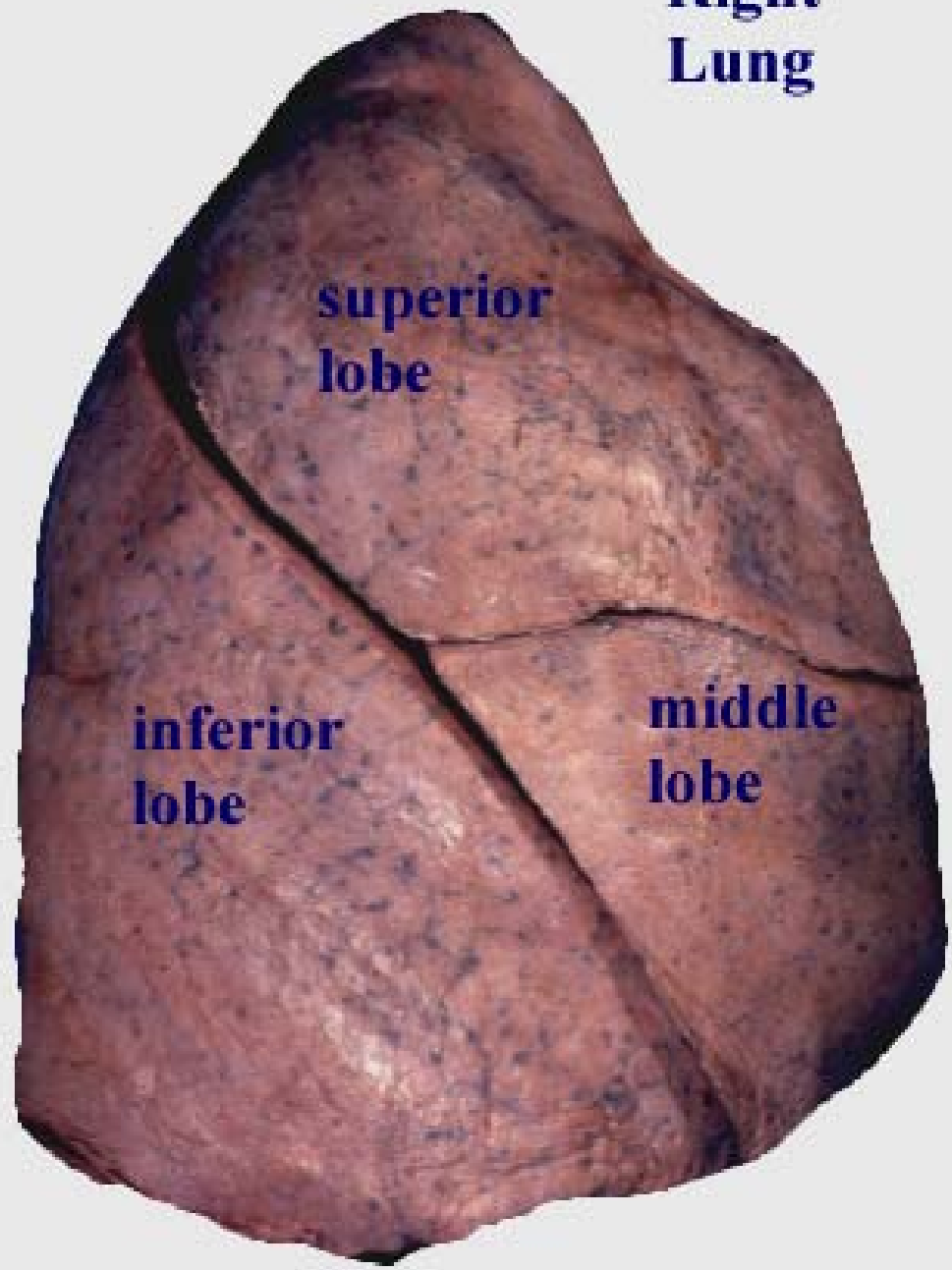
- It extends from anterior margin at the level of 4th costal cartilage.
- Runs horizontally backwards to meet the oblique fissure in the mid-axillary line.
- Pulmonary pleura extends into the fissures of the lungs so that the lobes can move on each other during respiration.

**Right
Lung**

**superior
lobe**

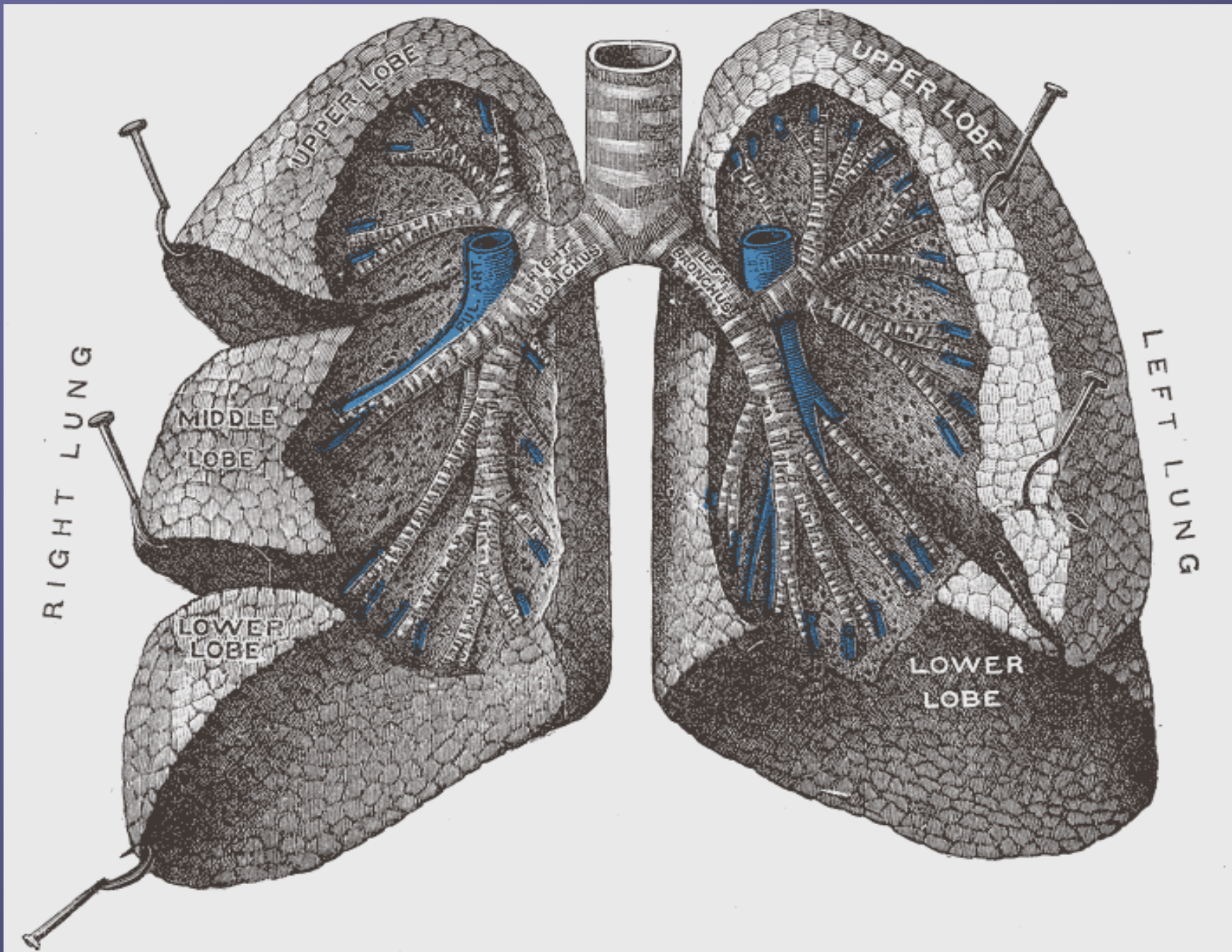
**inferior
lobe**

**middle
lobe**



BRONCHOPULMONARY SEGMENTS

- These are well defined areas of the lungs, each of which is aerated by a segmental / tertiary bronchus.



● Trachea



● Right and Left Principal Bronchus



● Lobar Bronchi(Secondary)[2L,3R]



● Segmental Bronchi(Tertiary)[8L,10R]



● Terminal Bronchioles(25000 in no.)



● Respiratory Bronchioles



● Alveolar ducts



● Alveolar sacs



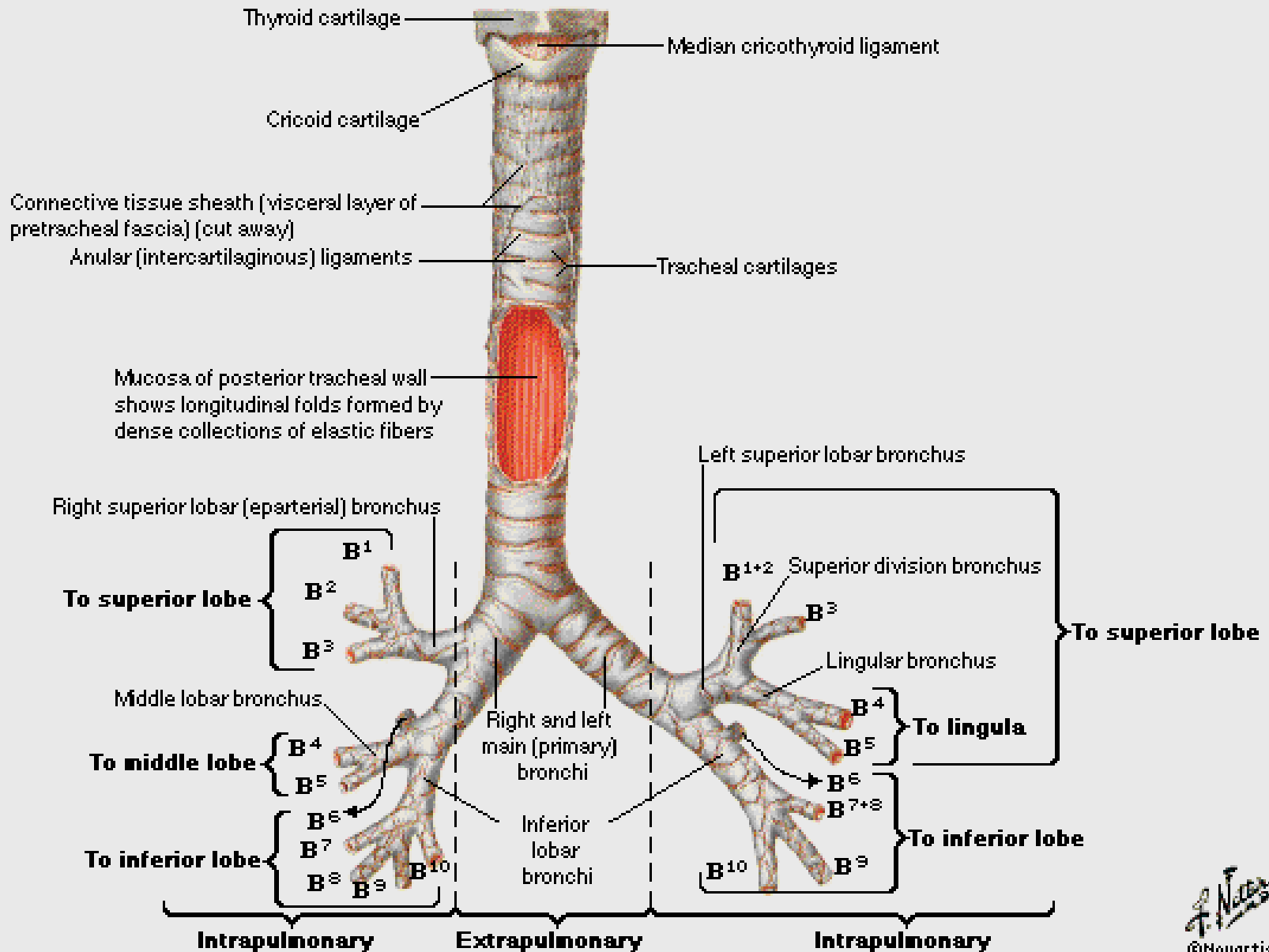
● Alveoli

ACINUS



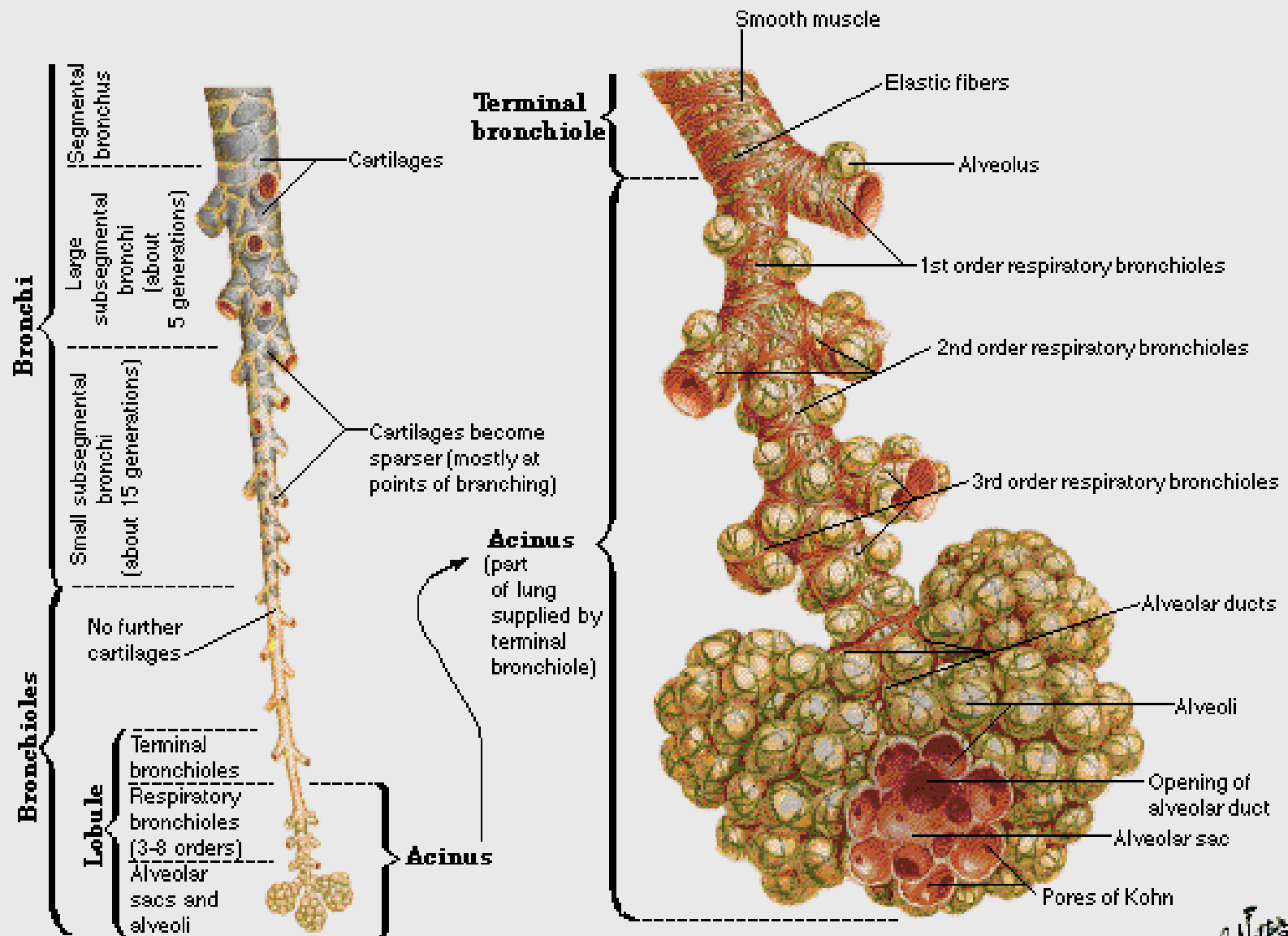
Trachea and Major Bronchi

Anterior View



- The ultimate pulmonary unit from respiratory bronchiole to alveoli is called Acinus.
- There are about 28 orders of division of tracheo-bronchial tree.
- Total no. of alveoli has been estimated to be between 200 - 600 million, with a total surface area of 40 - 80 meter square.

Intrapulmonary Airways Schema



Subdivisions of intrapulmonary airways

Structure of intrapulmonary airways

BRONCHOPULMONARY SEGMENTS

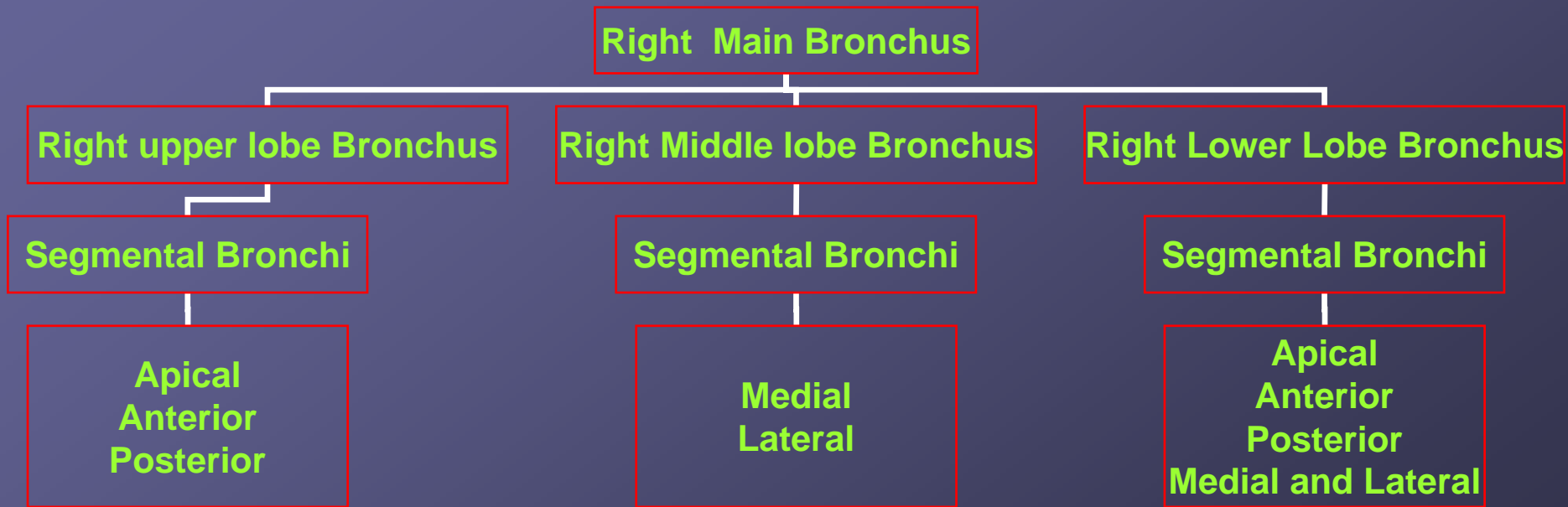
Right main bronchus

1. Shorter
2. Wider.
3. More in line with trachea.

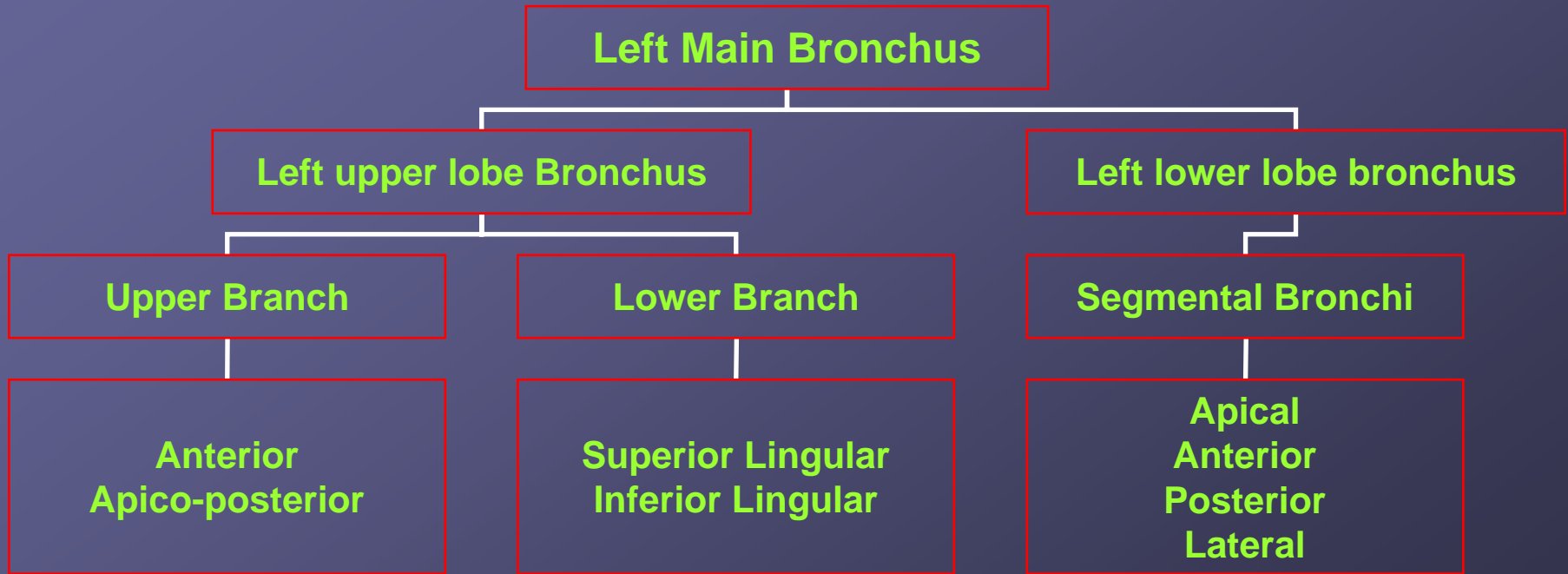
Left main bronchus

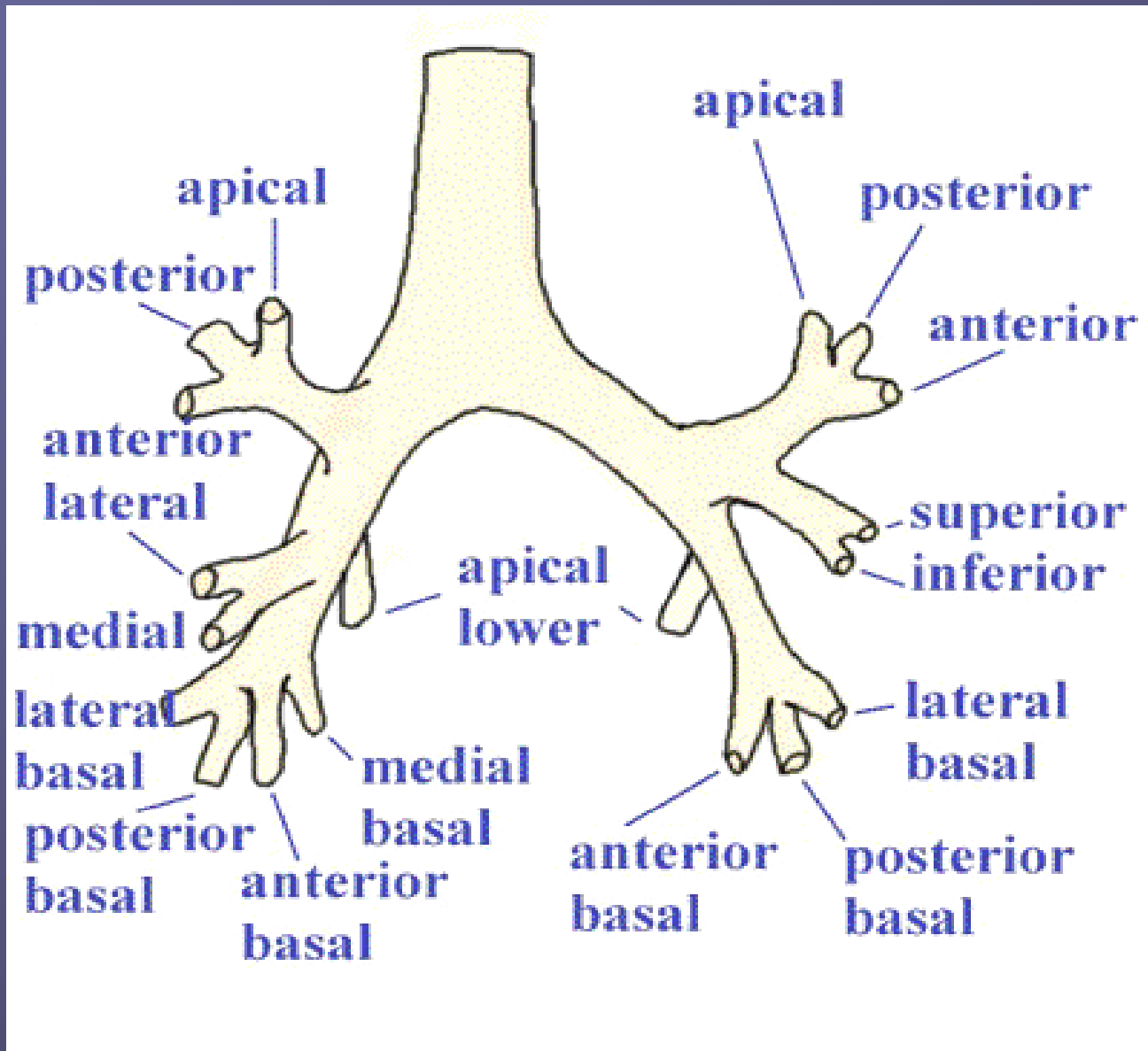
1. Longer
2. Narrower.
3. More oblique than the right.

BRONCHOPULMONARY SEGMENTS

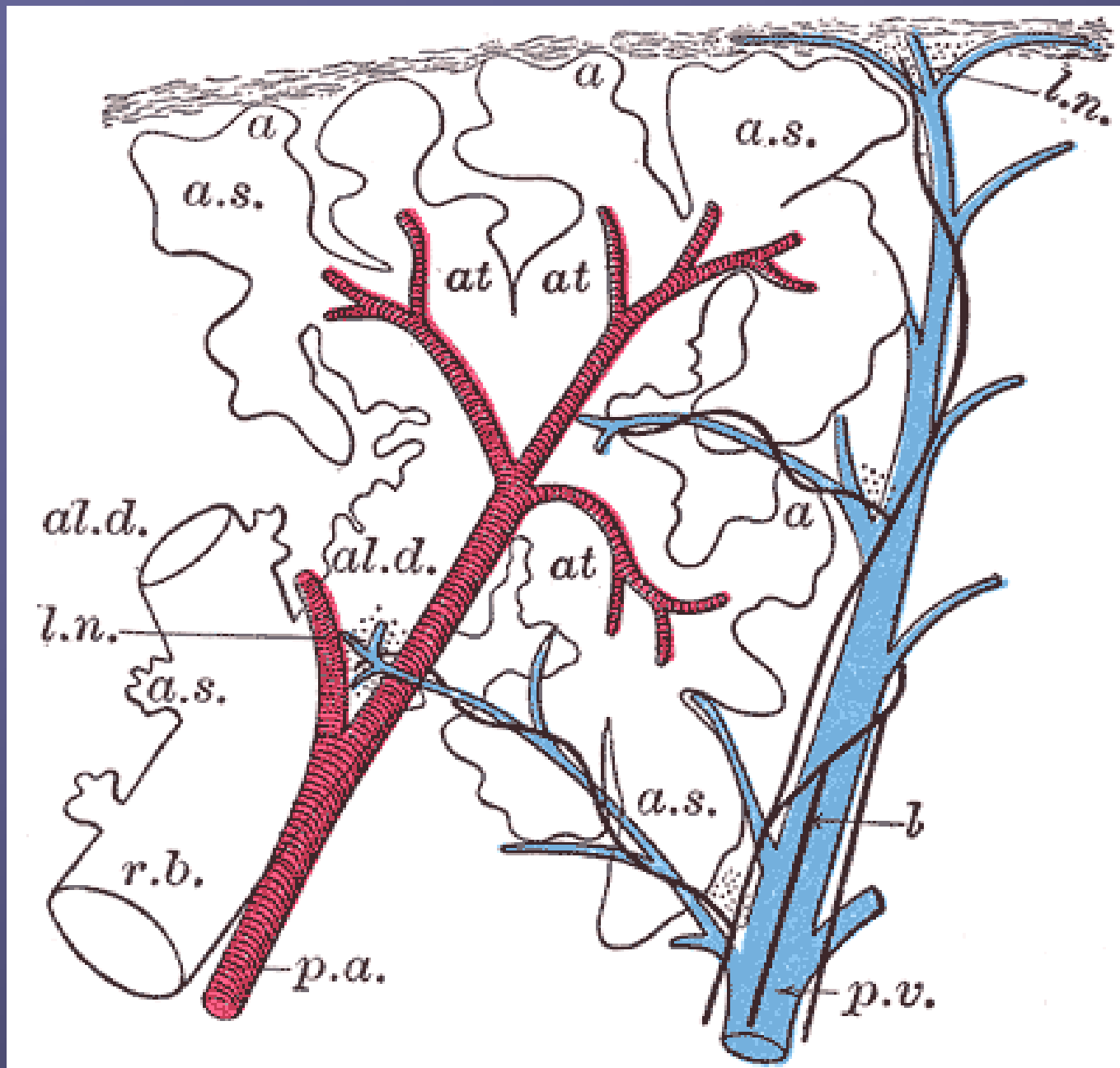


BRONCHOPULMONARY SEGMENTS





- These segments are pyramidal in shape with apex towards the root of lung.
- Each segment is an independent respiratory unit.
- Each segment has its own separate artery(branches of pulmonary artery).
- Pulmonary Veins run in inter-segmental planes between adjoining segments.
- Thus a bronchopulmonary segment is not a bronchovascular segment as it does not have its own vein.



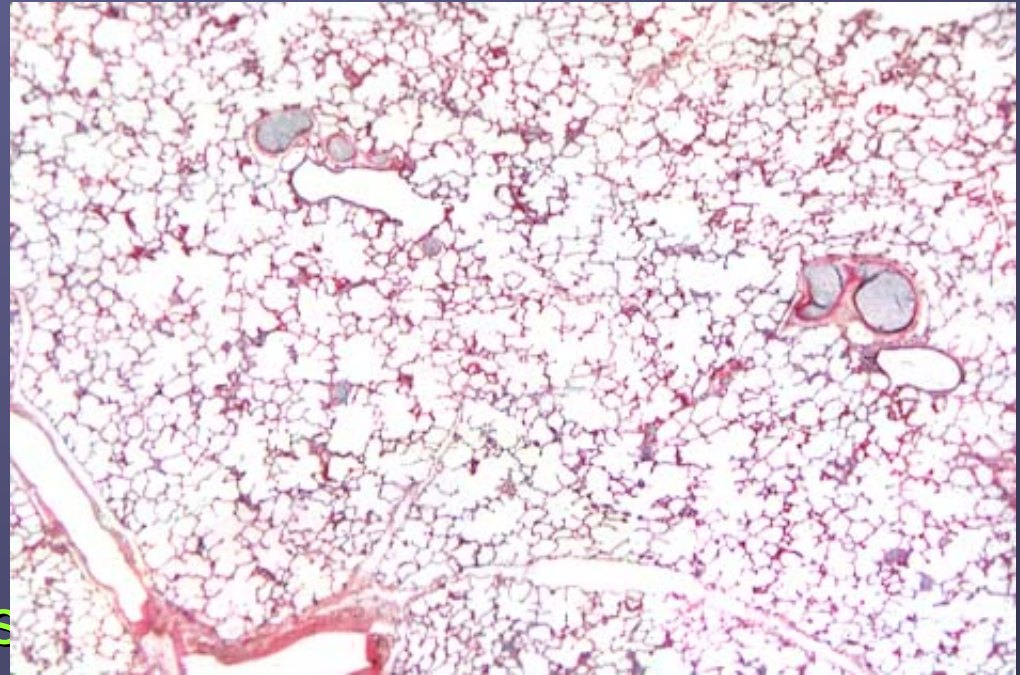
CLINICAL SIGNIFICANCE

- Segmental resection with minimal destruction to the surrounding lung tissue.
- To visualize the interior of a bronchi through a bronchoscope when diseases process is limited in a segment.

HISTOPATHOLOGY OF ALVEOLI

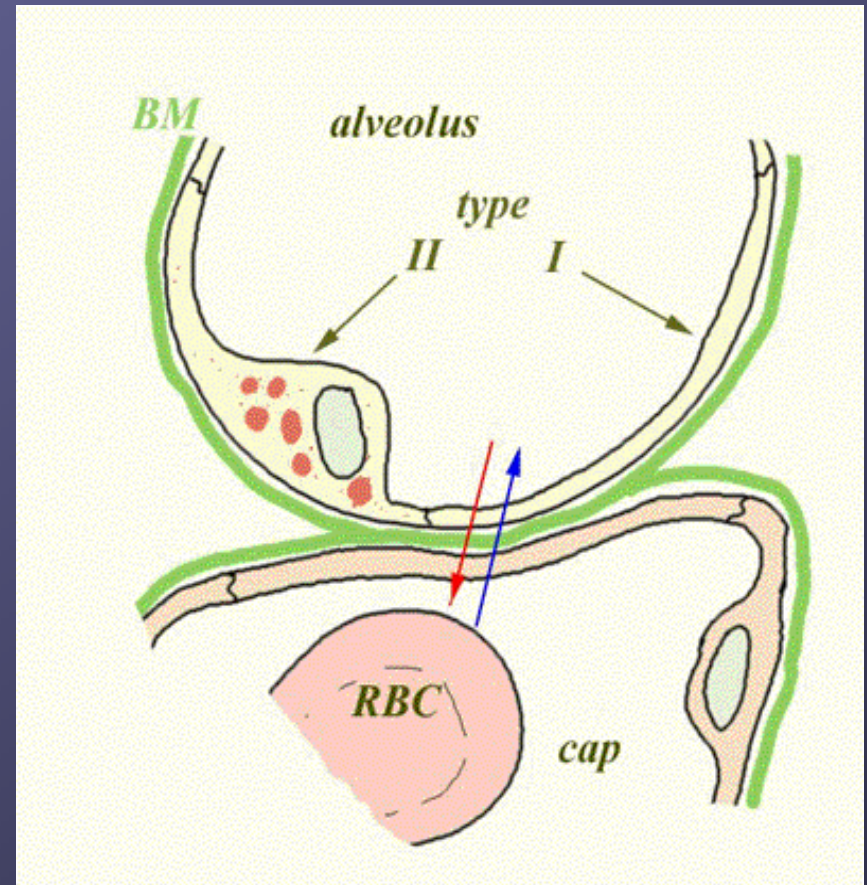
ALVEOLAR WALL

1. Alveolar epithelial cells-
 - Type I pneumocytes
 - Type II pneumocytes
2. Basement Membrane
3. Interstitial Space-
 - Collagen
 - Elastin
 - Unmyelinated Nerves
 - Macrophages
4. Capillary Basement Membrane
5. Capillary Endothelial Cells.



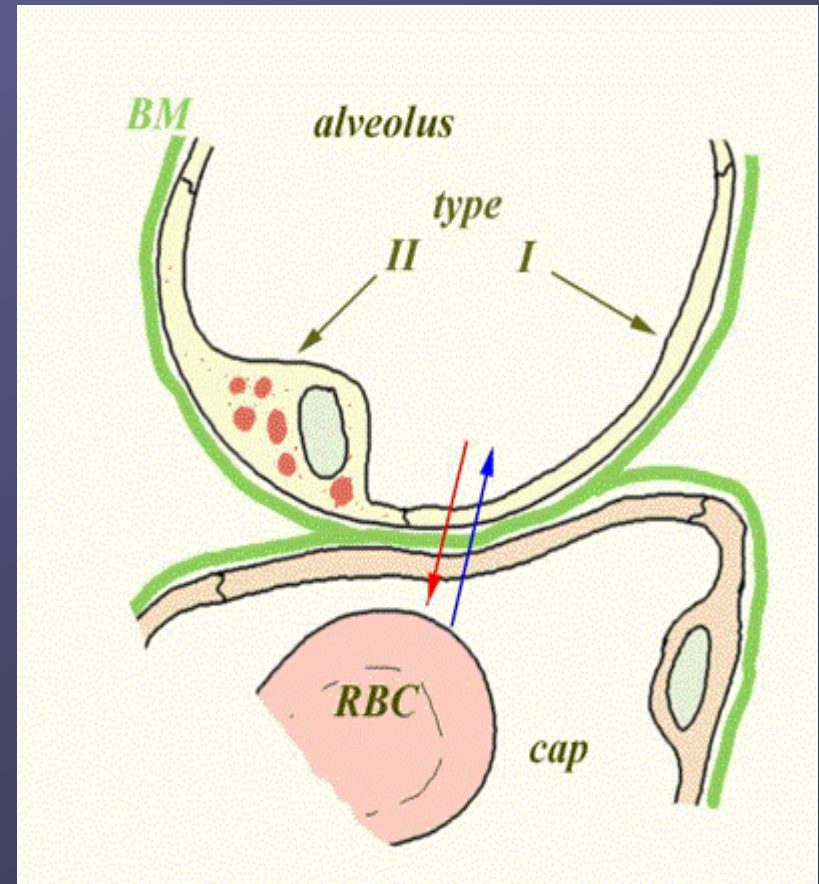
Type I Pneumocyte

- Pavement epithelial cells of alveoli .
- Less in no. than type II.
- More surface area(flattened)
- Contain pinocytotic vesicles.
- Specialized for diffusion of gases.



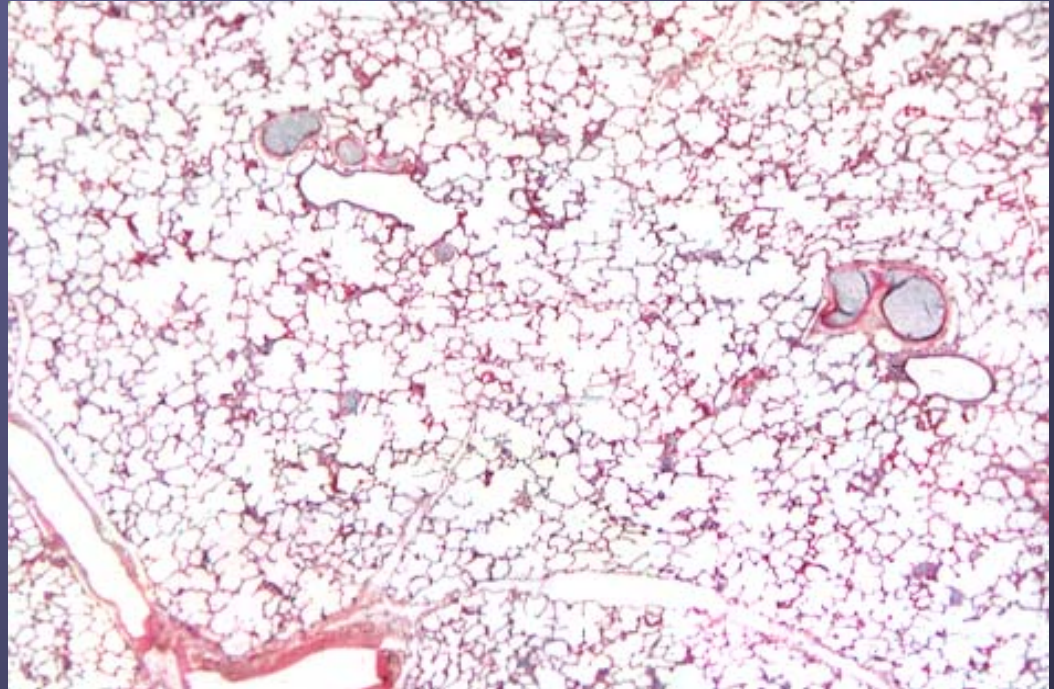
Type II Pneumocytes

- More numerous than type I.
- Cuboidal in shape.
- Rich in mitochondria, ER and vacuoles containing osmiophilic lamellar bodies.
- Type I are precursors of type II.

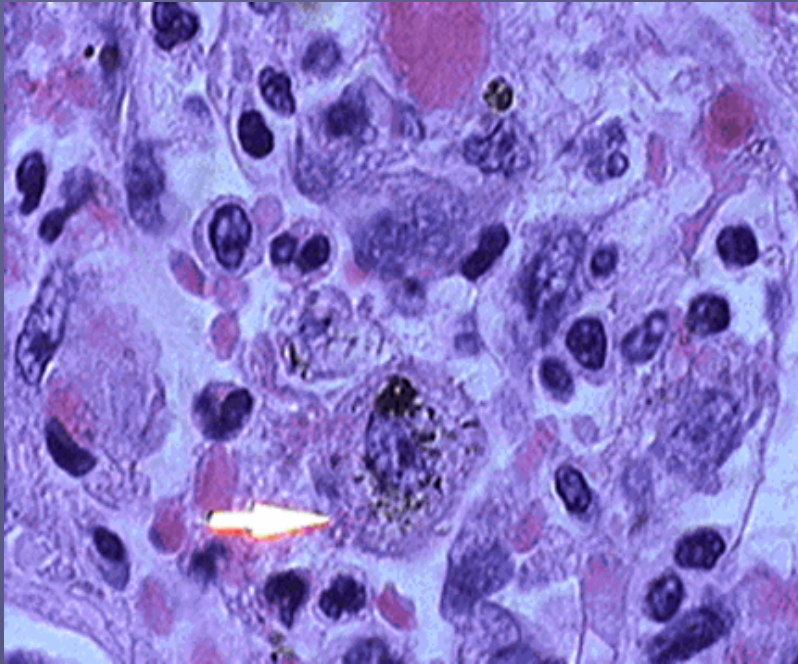


ENDOTHELIAL CELLS

- Most numerous .
- Presence of pinocytotic vacuoles that meet the luminal surface to form caveolae.
- Walls of caveolae has, ACE.
- Source of NO, natural pulmonary vasodilator.



ALVEOLAR MACROPHAGES



- Primary defence mechanism.
- Takes part in inflammatory and immunological reactions.
- Activates lysosomes , proteases, complement , thromboplastin, cytokines - IF- α , TNF- α , IL-1, IL-8.

SURFACTANT

- Lines the inner layer of alveolar epithelium.
- Synthesized by SER of type II pneumocytes.
- Function –
 1. To reduce the surface tension of alveoli mainly during expiration, thus reduces the work of lung inflation.
 2. Waterproofing.
- Surfactant synthesis starts after 26 weeks of fetal life. Therefore premature infants, with insufficient surfactant suffer from HMD.

A 3D grid of spheres on a blue background. The spheres are arranged in a regular pattern, receding into the distance, creating a perspective effect. The background is a solid, dark blue color.

● All the best...