

Respiratory System Anatomy

Function of Respiratory System:

1. Gas exchange
2. Immune function – sweep away dust, bacteria etc.
3. Regulation of acid-base balance – by regulating blood CO₂

Inspiration:

- Chest wall increases in size → Diaphragm contracts and moves down → expansion of chest cavity → pressure drop in lungs → air rushes in

The lungs are a passive organ: their volume and respiratory air flow is dictated by the volume of the thoracic (chest) cavity.

Thoracic volume is determined by contraction of the diaphragm and intercostal muscles.

Lungs have an elastic recoil – surface tension within alveoli, as well as the pleural layers.

The upper airway: Nose → nasal cavities → pharynx → larynx

- Important in airway protection, warming and humidifying air, phonation (voice)
- Larynx is supported by cartilage plates; pharynx is unprotected
- Obstructive sleep apnea occurs when unsupported parts of the upper airway (e.g. pharynx) collapse during inspiration.

The lungs:

Branching of bronchial tree:

Trachea → Primary bronchi → secondary bronchi → tertiary bronchi → bronchioles → terminal bronchioles

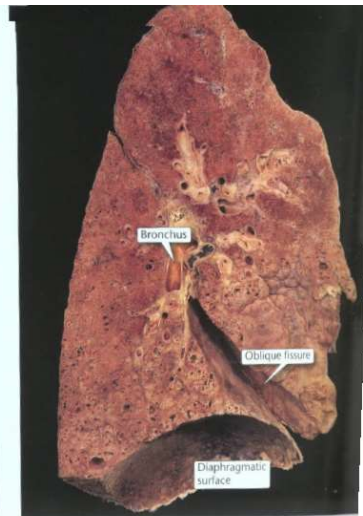
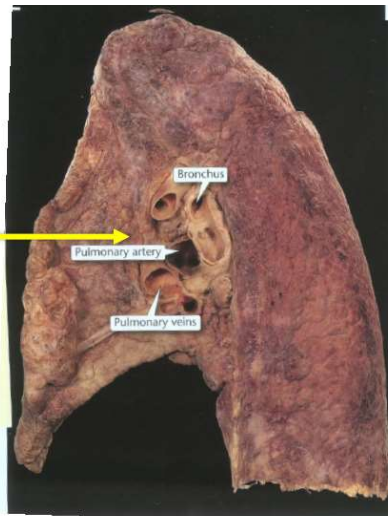
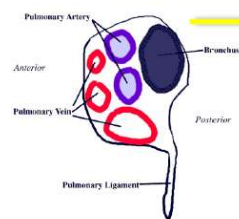
** Trachea is surrounded by rings of cartilage

Lung: Gross appearance

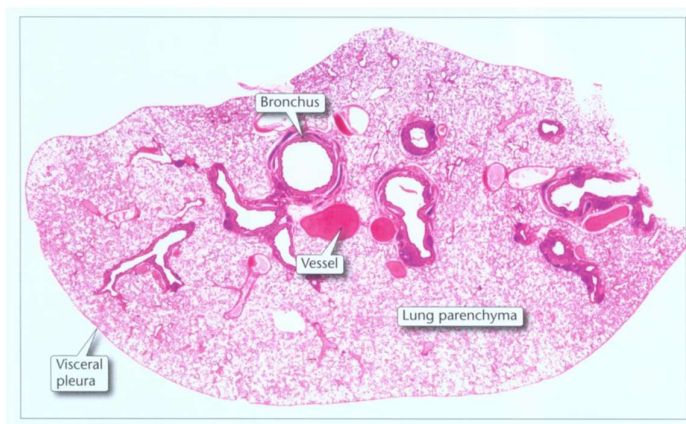
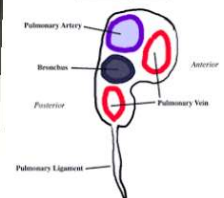
** Lobar bronchi – one in each lobe

The hilum
- where airways,
vessels and nerves
enter and leave
the lung.

Right Lung Hilum



Left Lung Hilum



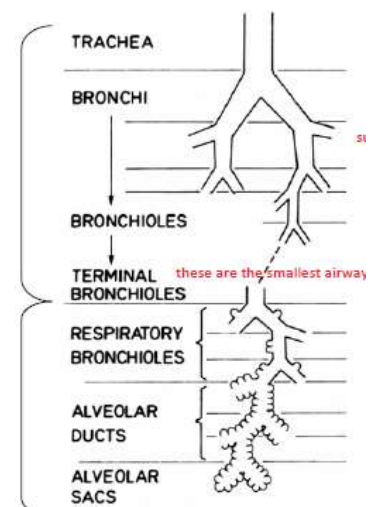
Lung is highly vascular.

The conducting vs respiratory zones.

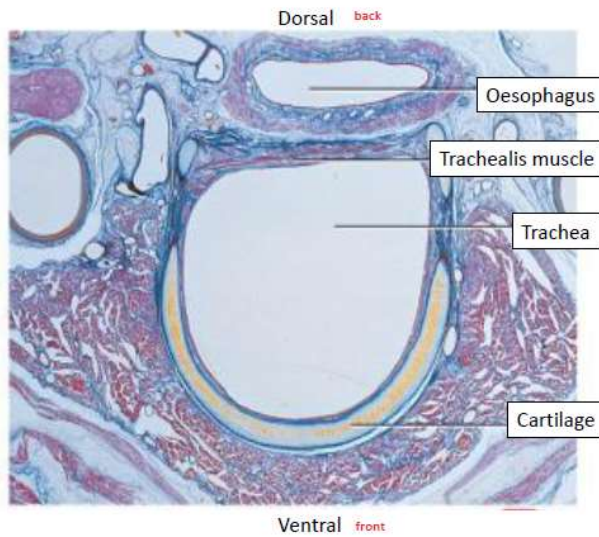
- The bronchial tree is formed by dichotomous branching of tubes.
- Up to **23 generations** of branching in human lung
- Each lung has multiple lobes: each lobe is supplied by a lobar bronchus.

Conducting zone
(no gas exchange)

Respiratory zone
(gas exchange in alveoli)



Trachea (cross-section)



The trachealis muscle is attached to the C-shape ring that can contract the trachea – used in coughing or exercising etc.

The cartilage provides mechanical support. Pressure will drop in the trachea when exercising. When the pressure drops, the cartilage ensures the trachea does not collapse.

- Supported by **Hyaline Cartilage**
 - C-shaped, open ended on the posterior side
- **Epithelium** of the trachea:
 - **Pseudostratified ciliated columnar cells**
 - Warms and humidifies air
 - **Goblet cells** – unicellular exocrine cells that secrete mucous (glycoproteins)
 - **Basal cells** – stem cells or local neuroendocrine function
 - Attached to the basement membrane (basal lamina).
- **Submucosal (seromucous) glands**
 - Secrete mucous onto the epithelium (it is a different composition than mucous secreted by the goblet cells).

