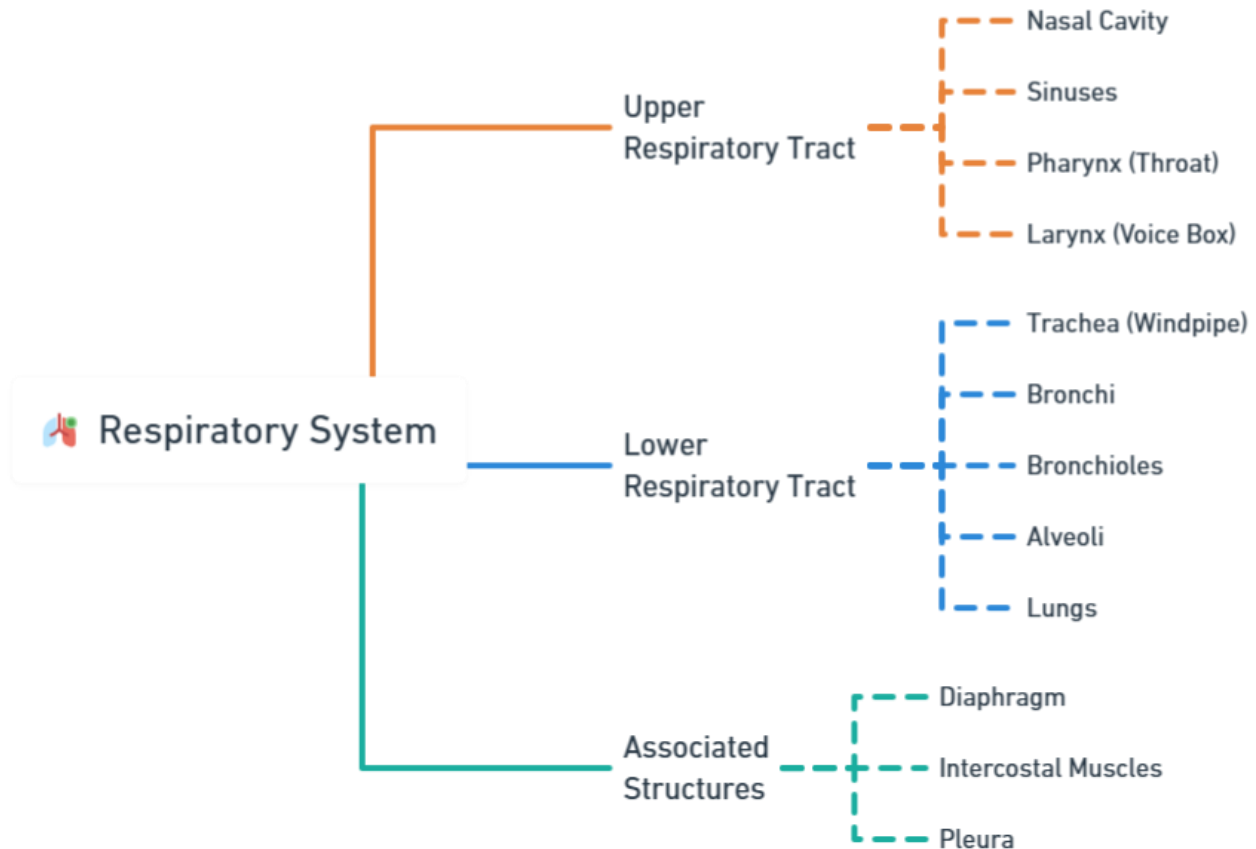


Respiratory system

Anatomy of respiratory system

- The respiratory system is a vital organ system responsible for gas exchange, supplying oxygen to the body and removing carbon dioxide.

Here's an overview of its anatomy, divided into the upper respiratory tract and the lower respiratory tract:



Upper Respiratory Tract

1. Nasal Cavity:

- **Structure:** Divided by the nasal septum; contains turbinates (conchae) to increase surface area.
- **Function:** Filters, warms, and moistens incoming air; houses olfactory receptors for smell.

2. Sinuses:

- **Structure:** Air-filled cavities in the skull (e.g., frontal, maxillary, sphenoid, and ethmoid sinuses).
- **Function:** Lighten the skull, enhance voice resonance, and aid in warming/moistening air.

3. Pharynx (Throat):

➤ **Sections:**

- **Nasopharynx:** Connects to the nasal cavity; contains the adenoids and openings of the Eustachian tubes.
- **Oropharynx:** Shared passageway for air and food.
- **Laryngopharynx:** Leads to the larynx and esophagus.

➤ **Function:** Directs air to the larynx.

4. **Larynx (Voice Box):**

- **Structure:** Composed of cartilage (e.g., thyroid cartilage, cricoid cartilage, and epiglottis).
- **Function:** Protects the airway during swallowing (via the epiglottis) and facilitates sound production.

Lower Respiratory Tract

1. **Trachea (Windpipe):**

- **Structure:** A tube supported by C-shaped cartilage rings, lined with ciliated epithelium and mucus-producing goblet cells.
- **Function:** Provides a clear airway to the lungs and filters debris.

2. **Bronchi:**

- **Structure:** Two main bronchi (left and right), branching into smaller secondary and tertiary bronchi.
- **Function:** Distribute air to each lung.

3. **Bronchioles:**

- **Structure:** Smaller branches of bronchi without cartilage, ending in alveolar ducts.
- **Function:** Control airflow resistance and air distribution within the lungs.

4. **Alveoli:**

- **Structure:** Tiny air sacs surrounded by capillaries, with thin walls for efficient gas exchange.
- **Function:** Site of oxygen and carbon dioxide exchange.

5. **Lungs:**

- **Structure:** Paired organs divided into lobes (3 on the right, 2 on the left due to the heart's position).
- **Function:** Expand and contract during breathing to facilitate gas exchange.

Associated Structures

1. Diaphragm:

- **Structure:** A dome-shaped muscle located below the lungs.
- **Function:** Primary muscle for respiration; contracts to draw air into the lungs.

2. Intercostal Muscles:

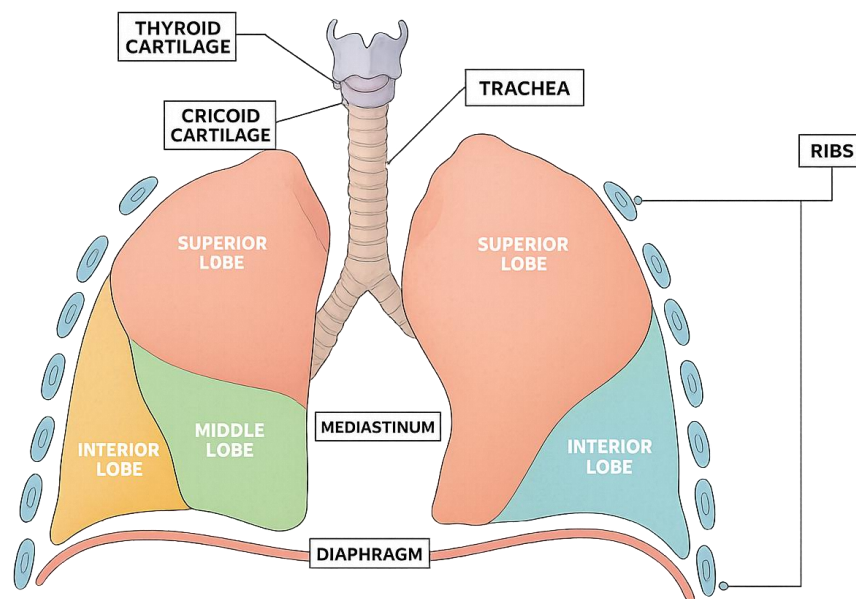
- **Structure:** Located between ribs.
- **Function:** Assist in expanding and compressing the thoracic cavity during breathing.

3. Pleura:

- **Structure:** Double-layered membrane surrounding each lung.
 - **Visceral pleura:** Covers the lungs.
 - **Parietal pleura:** Lines the chest wall.
- **Function:** Reduces friction during breathing and creates a pressure gradient for lung expansion.

Anatomy of lungs

- The lungs are essential respiratory organs located in the thoracic cavity, flanking the heart and mediastinum.
- They are primarily responsible for the exchange of oxygen and carbon dioxide between the air and the bloodstream.
- The anatomy of the lungs is both complex and designed to maximize efficiency in gas exchange.



External Anatomy

A. Number and Position:

- Humans have two lungs: a right lung and a left lung, housed within the ribcage.
- The right lung is larger with three lobes, while the left lung has two lobes to accommodate the heart's position.

B. Lobes:

- **Right Lung:** Divided into three lobes – superior, middle, and inferior – separated by the horizontal and oblique fissures.
- **Left Lung:** Divided into two lobes – superior and inferior – separated by the oblique fissure.

C. Pleura:

- The lungs are encased in a double-layered membrane called the **pleura**:
 - **Visceral Pleura:** Directly covers the lung surface.
 - **Parietal Pleura:** Lines the inner chest wall and diaphragm.
- The **pleural cavity** (space between the layers) contains lubricating fluid for smooth lung movement during respiration.

D. Hilum:

- The medial surface of each lung features the **hilum**, an opening through which the bronchi, blood vessels, lymphatic vessels, and nerves enter and exit the lung.

Internal Anatomy

A. Bronchial Tree:

- The **trachea** divides into:
 - Right and left main bronchi → branch into lobar bronchi → segmental bronchi → smaller bronchioles → terminal bronchioles.

B. Alveoli:

- Terminal bronchioles connect to **alveolar ducts**, leading to **alveolar sacs** containing **alveoli**.
- **Gas Exchange:** Occurs in the alveoli, where oxygen diffuses into the blood and carbon dioxide diffuses out via a thin capillary network.

C. Blood Supply:

- **Bronchial Arteries:** Provide oxygenated blood to lung tissues.
- **Pulmonary Arteries:** Deliver deoxygenated blood for oxygenation.
- **Pulmonary Veins:** Return oxygenated blood to the heart.

D. Lymphatics and Nerves:

- Lungs have a lymphatic system for fluid removal and immune defense.
- The **pulmonary plexus** supplies nerves for bronchial regulation.

Function in Respiration

1. Ventilation:

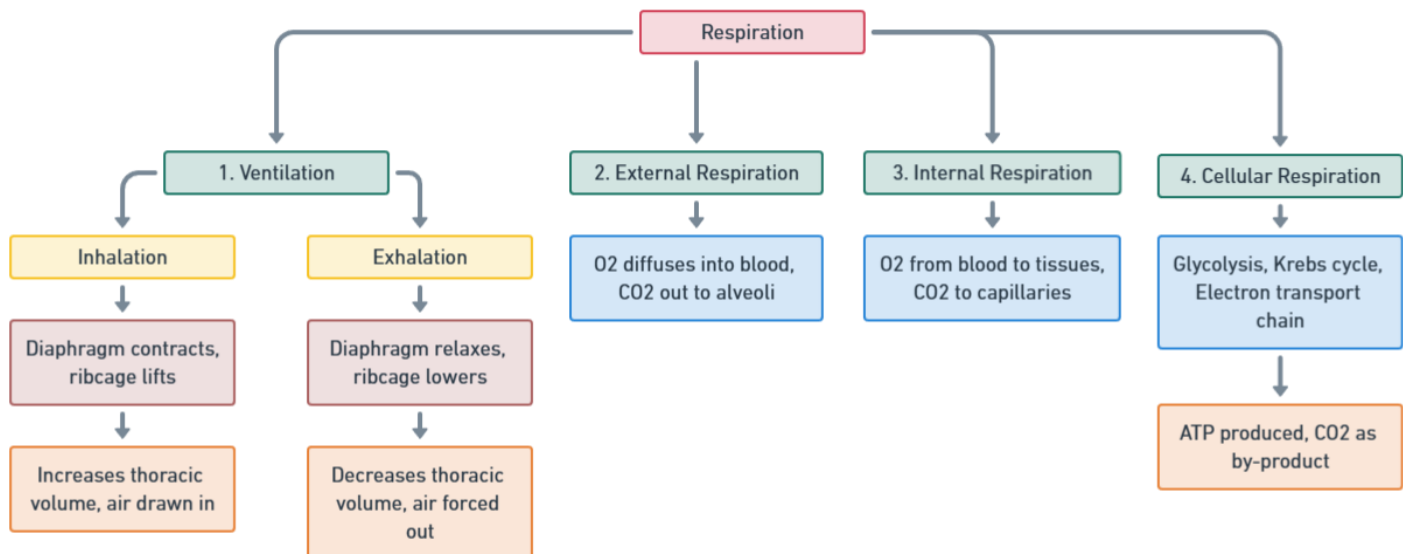
- The mechanical process of moving air into and out of the lungs, facilitated by the **diaphragm** and **intercostal muscles**.

2. Gas Exchange:

- Takes place in the alveoli:
 - **Oxygen** diffuses into the blood.
 - **Carbon dioxide** diffuses out to be expelled.

Mechanism of Respiration

- Respiration is the process by which the respiratory system facilitates the exchange of gases, primarily oxygen and carbon dioxide, between the body and the environment.
- The mechanism of respiration can be divided into four main processes: **ventilation, external respiration, internal respiration, and cellular respiration**.



1. Ventilation (Breathing)

A. Inhalation:

- **Mechanism:** The **diaphragm** contracts and moves downward, while the **external intercostal muscles** lift the ribcage, expanding the thoracic cavity.
- **Effect:** This increases thoracic volume, creating **negative pressure** that pulls air into the lungs via the respiratory tract, reaching the **alveoli**.



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