

Respiratory system: Anatomy of respiratory system with special reference to anatomy of lungs

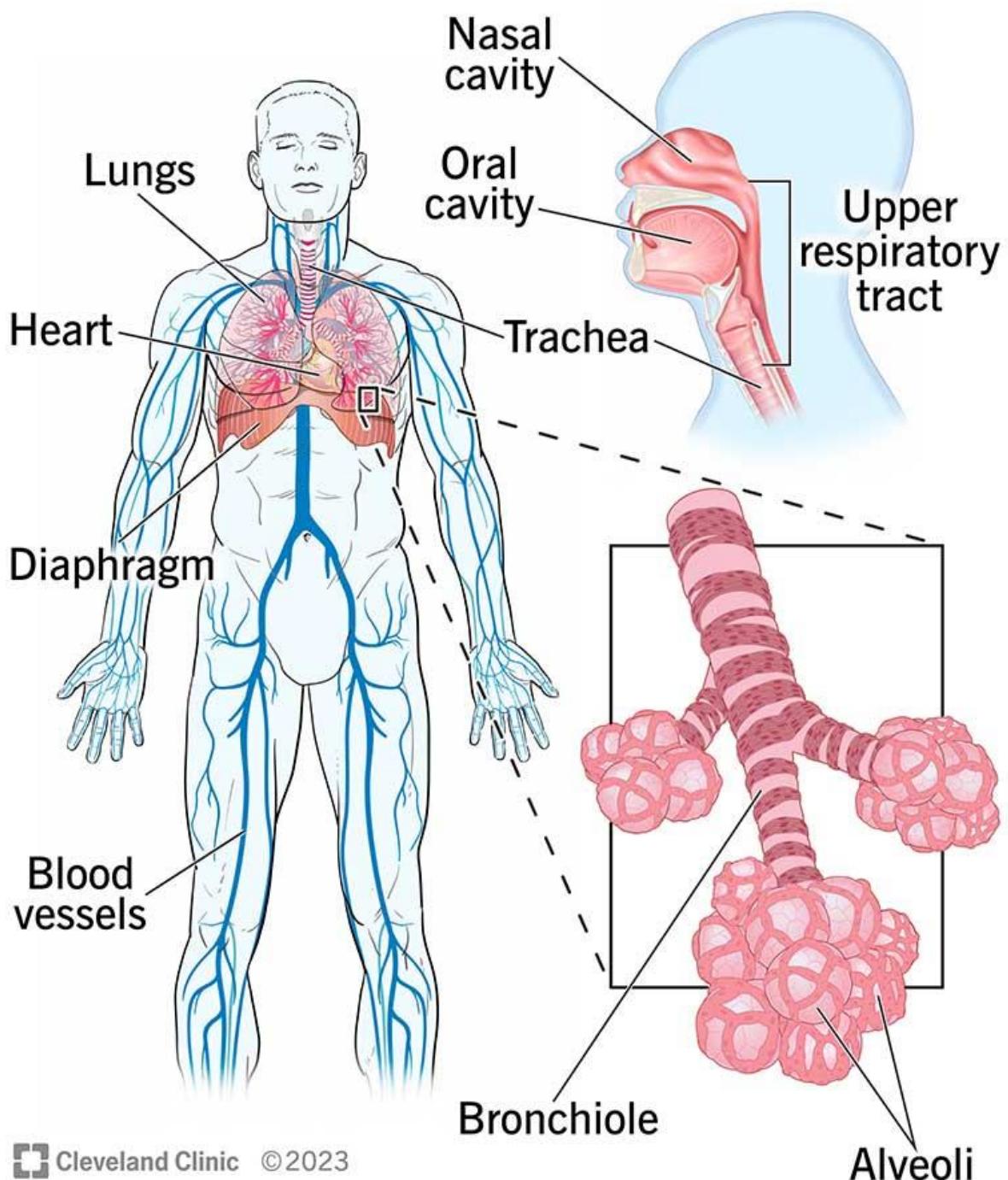
The respiratory system, also called the pulmonary system, consists of several organs that function as a whole to oxygenate the body through the process of respiration (breathing). This process involves inhaling air and conducting it to the lungs where gas exchange occurs, in which oxygen is extracted from the air, and carbon dioxide expelled from the body. The respiratory tract is divided into two sections at the level of the vocal cords; the upper and lower respiratory tract.

- The upper respiratory tract includes the nasal cavity, paranasal sinuses, pharynx and the portion of the larynx above the vocal cords.
- The lower respiratory tract includes the larynx below the vocal cords, the trachea, bronchi, bronchioles and the lungs.

The lungs are most often considered as part of the lower respiratory tract, but are sometimes described as a separate entity. They contain the respiratory bronchioles, alveolar ducts, alveolar sacs and alveoli.

<u>Key facts about the respiratory system</u>	
Upper respiratory tract	Nasal cavity, paranasal sinuses, pharynx and larynx above the vocal cords
Lower respiratory airways	Larynx below the vocal cords, trachea, bronchi, bronchioles and lungs
Functions	Upper respiratory tract: conduction, filtration, humidification and warming of inhaled air Lower respiratory tract: conduction and gas exchange

Respiratory system



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Upper respiratory tract

The upper respiratory tract refers to the parts of the respiratory system that lie outside the thorax, more specifically above the cricoid cartilage and vocal cords. It includes

the nasal cavity, paranasal sinuses, pharynx and the superior portion of the larynx. Most of the upper respiratory tract is lined with the pseudostratified ciliated columnar epithelium, also known as the respiratory epithelium. The exceptions are some parts of the pharynx and larynx.

Nasal cavity

The upper respiratory tract begins with the nasal cavity. The nasal cavity opens anteriorly on the face through the two nares, and posteriorly into the nasopharynx through the two choanae. The floor of the nasal cavity is formed by the hard palate, while the roof consists of the cribriform plate of the ethmoid bone posteriorly, and the frontal and nasal bones anteriorly. The nares and anterior portion of the nasal cavity contain sebaceous glands and hair follicles that serve to prevent any larger harmful particles from passing into the nasal cavity.

Paranasal sinuses

Several bones that form the walls of the nasal cavity contain air-filled spaces called the paranasal sinuses, which are named after their associated bones; maxillary, frontal, sphenoidal and ethmoidal sinuses.

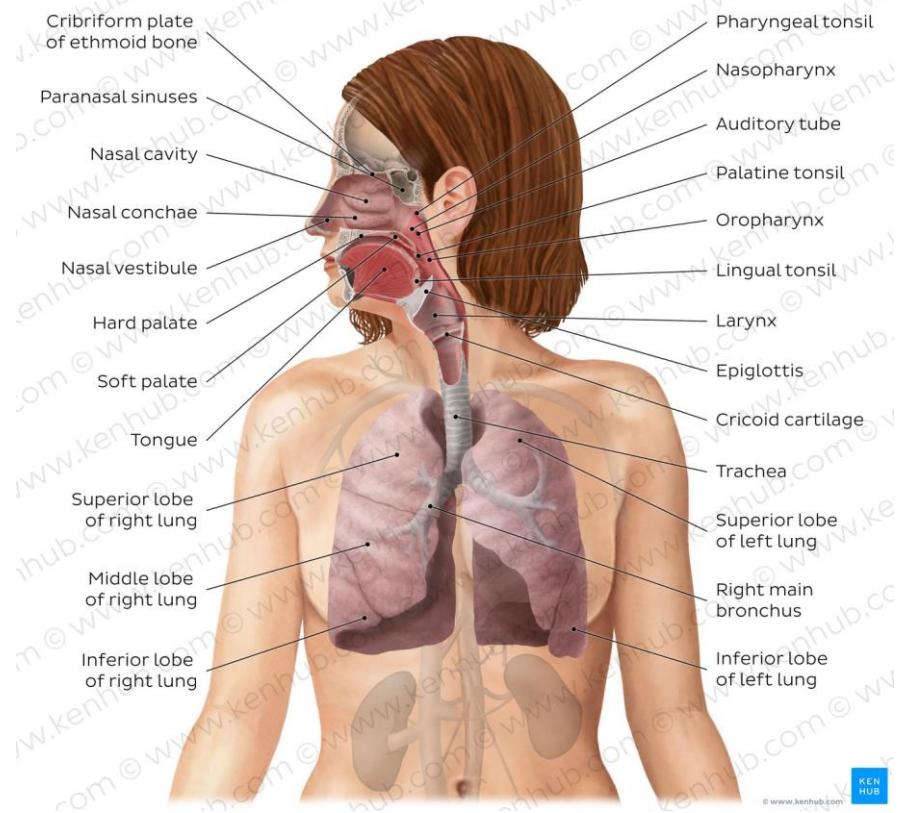
Pharynx

After passing through the nasal cavity and paranasal sinuses, the inhaled air exits through the choanae into the pharynx. The pharynx is a funnel-shaped muscular tube that contains three parts; the nasopharynx, oropharynx and laryngopharynx.

Larynx

The larynx is a complex hollow structure found anterior to the esophagus. It is supported by a cartilaginous skeleton connected by membranes, ligaments and associated muscles. Above the vocal cords, the larynx is lined with stratified squamous epithelium like the laryngopharynx. Below the vocal cords, this epithelium transitions into pseudostratified ciliated columnar epithelium with goblet cells (respiratory epithelium).

Besides its main function to conduct the air, the larynx also houses the vocal cords that participate in voice production. The laryngeal inlet is closed by the epiglottis during swallowing to prevent food or liquid from entering the lower respiratory tract.



Tracheobronchial tree

The tracheobronchial tree is a portion of the respiratory tract that conducts the air from the upper airways to the lung parenchyma. It consists of the trachea and the intrapulmonary airways (bronchi and bronchioles). The trachea is located in the superior mediastinum and represents the trunk of the tracheobronchial tree. The trachea bifurcates at the level of the sternal angle (T5) into the left and right main bronchi, one for each lung.

- The left main bronchus passes inferolaterally to enter the hilum of the left lung. On its course, it passes inferior to the arch of the aorta and anterior to the esophagus and thoracic aorta.
- The right main bronchus passes inferolaterally to enter the hilum of the right lung. The right main bronchus has a more vertical course than its left counterpart and is also wider and shorter. This makes the right bronchus more susceptible to foreign body impaction.

As they reach the lungs, the main bronchi branch out into increasingly smaller intrapulmonary bronchi. The left main bronchus divides into two secondary lobar bronchi, while the right main bronchus divides into three secondary lobar bronchi that supply the lobes of the left and right lung, respectively.

Each of the lobar bronchi further divides into tertiary segmental bronchi that aerate the bronchopulmonary segments. The segmental bronchi then give rise to several generations of intrasegmental (conducting) bronchioles, which end as terminal bronchioles. Each terminal bronchiole gives rise to several generations of respiratory bronchioles. Respiratory bronchioles extend into several alveolar ducts, which lead into alveolar sacs, each of which contains many grape-like outpocketings called alveoli. Since they contain alveoli, these structures mark the site where gas exchange begins to occur.

