

Título: Introduction to the Respiratory System



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Este recurso se ha confeccionado para los estudiantes de 2do año de las carreras de Medicina y Licenciatura en Enfermería en la asignatura Inglés IV.

Objetivos

Practice the communicative functions:

Describing body parts, organs and their functions.

Defining body parts, organs, processes and functions.

Expressing addition, cause- effect and contrast.

Introduction to the Respiratory System

When the respiratory system is mentioned, people generally think of breathing, but breathing is only one of the activities of the respiratory system. The body cells need a continuous supply of oxygen for the metabolic processes that are necessary to maintain life. The respiratory system works with the circulatory system to provide this oxygen and to remove the waste products of metabolism. It also helps to regulate pH of the blood.

Respiration is the sequence of events that results in the exchange of oxygen and carbon dioxide between the atmosphere and the body cells. Every 3 to 5 seconds, nerve impulses stimulate the breathing process, or ventilation, which moves air through a series of passages into and out of the lungs. After this, there is an exchange of gases between the lungs and the blood. This is called external respiration.

The blood transports the gases to and from the tissue cells. The exchange of gases between the blood and tissue cells is internal respiration. Finally, the cells utilize the oxygen for their specific activities: this is called cellular metabolism, or cellular respiration. Together, these activities constitute respiration.

Mechanics of Ventilation

Ventilation, or breathing, is the movement of air through the conducting passages between the atmosphere and the lungs.

The air moves through the passages because of pressure gradients that are produced by contraction of the diaphragm and thoracic muscles.

Pulmonary ventilation

Pulmonary ventilation is commonly referred to as breathing. It is the process of air flowing into the lungs during inspiration (inhalation) and out of the lungs during expiration (exhalation).

Air flows because of pressure differences between the atmosphere and the gases inside the lungs.

Air, like other gases, flows from a region with higher pressure to a region with lower pressure. Muscular breathing movements and recoil of elastic tissues create the changes in pressure that result in ventilation. Pulmonary ventilation involves three different pressures:

Atmospheric pressure
Intraalveolar (intrapulmonary) pressure
Intrapleural pressure

Atmospheric pressure is the pressure of the air outside the body. Intraalveolar pressure is the pressure inside the alveoli of the lungs. Intrapleural pressure is the pressure within the pleural cavity. These three pressures are responsible for pulmonary ventilation.

Inspiration

Inspiration (inhalation) is the process of taking air into the lungs.

It is the active phase of ventilation because it is the result of muscle contraction. During inspiration, the diaphragm contracts and the thoracic cavity increases in volume. This decreases the intraalveolar pressure so that air flows into the lungs. Inspiration draws air into the lungs.

Expiration

Expiration (exhalation) is the process of letting air out of the lungs during the breathing cycle. During expiration, the relaxation of the diaphragm and elastic recoil of tissue decreases the thoracic volume and increases the intraalveolar pressure. Expiration pushes air out of the lungs.

Respiratory Volumes and Capacities

Under normal conditions, the average adult takes 12 to 15 breaths a minute. A breath is one complete respiratory cycle that consists of one inspiration and one expiration.

An instrument called a spirometer is used to measure the volume of air that moves into and out of the lungs, and the process of taking the measurements is called spirometry. Respiratory (pulmonary) volumes are an important aspect of pulmonary function testing because they can provide information about the physical condition of the lungs.

Respiratory capacity (pulmonary capacity) is the sum of two or more volumes.

Factors such as age, sex, body build, and physical conditioning have an influence on lung volumes and capacities. Lungs usually reach their maximum in capacity in early adulthood and decline with age after that.

Conducting Passages

The respiratory conducting passages are divided into the upper respiratory tract and the lower respiratory tract. The upper respiratory tract includes the nose, pharynx, and larynx. The lower respiratory tract consists of the trachea, bronchial tree, and lungs. These tracts open to the outside and are lined with mucous membranes. In some regions, the membrane has hairs that help filter the air. Other regions may have cilia to propel mucus.

Conducting Passages

Upper Respiratory Tract

Nasal Cavity

Pharynx

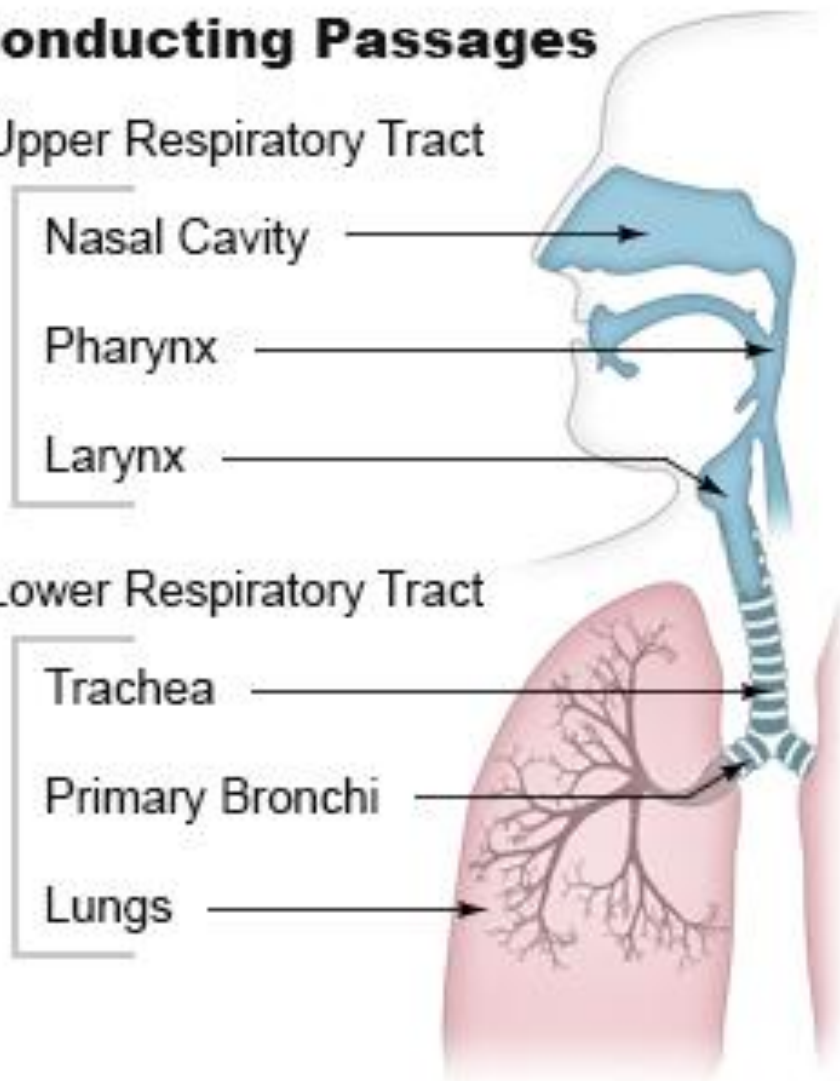
Larynx

Lower Respiratory Tract

Trachea

Primary Bronchi

Lungs



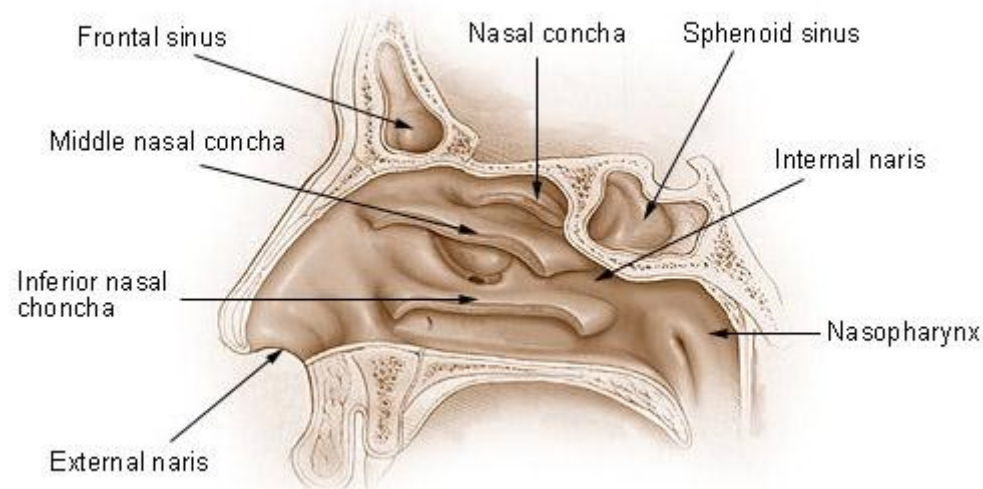
Nose, Nasal Cavities, & Paranasal

Sinuses

Nose & Nasal Cavities

The framework of the nose consists of bone and cartilage. Two small nasal bones and extensions of the maxillae form the bridge of the nose, which is the bony portion. The remainder of the framework is cartilage and is the flexible portion. Connective tissue and skin cover the framework.

Nose and Nasal Cavities



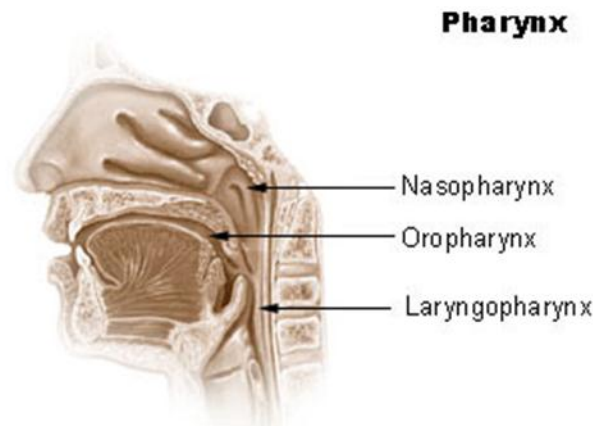
Air enters the nasal cavity from the outside through two openings: the nostrils or external nares. The openings from the nasal cavity into the pharynx are the internal nares. Nose hairs at the entrance to the nose trap large inhaled particles.

Paranasal Sinuses

Paranasal sinuses are air-filled cavities in the frontal, maxillae, ethmoid, and sphenoid bones. These sinuses, which have the same names as the bones in which they are located, surround the nasal cavity and open into it. They function to reduce the weight of the skull, to produce mucus, and to influence voice quality by acting as resonating chambers.

Pharynx

The pharynx, commonly called the throat, is a passageway that extends from the base of the skull to the level of the sixth cervical vertebra. It serves both the respiratory and digestive systems by receiving air from the nasal cavity and air, food, and water from the oral cavity. Inferiorly, it opens into the larynx and esophagus. The pharynx is divided into three regions according to location: the nasopharynx, the oropharynx, and the laryngopharynx (hypopharynx).



The nasopharynx is the portion of the pharynx that is posterior to the nasal cavity and extends inferiorly to the uvula. The oropharynx is the portion of the pharynx that is posterior to the oral cavity. The most inferior portion of the pharynx is the laryngopharynx that extends from the hyoid bone down to the lower margin of the larynx.

The upper part of the pharynx (throat) lets only air pass through. Lower parts permit air, foods, and fluids to pass.

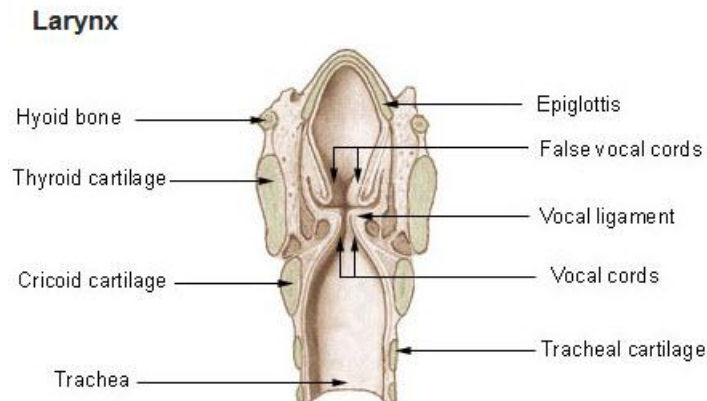
The pharyngeal, palatine, and lingual tonsils are located in the pharynx. They are also called Waldeyer's Ring.

The retromolar trigone is the small area behind the wisdom teeth.

Larynx & Trachea

Larynx

The larynx, commonly called the voice box or glottis, is the passageway for air between the pharynx above and the trachea below. It extends from the fourth to the sixth vertebral levels. The larynx is often divided into three sections: sublarynx, larynx, and supralarynx. It is formed by nine cartilages that are connected to each other by muscles and ligaments.



The larynx plays an essential role in human speech. During sound production, the vocal cords close together and vibrate as air expelled from the lungs passes between them. The false vocal cords have no role in sound production, but help close off the larynx when food is swallowed.

The thyroid cartilage is the Adam's apple. The epiglottis acts like a trap door to keep food and other particles from entering the larynx.

Trachea

The trachea, commonly called the windpipe, is the main airway to the lungs. It divides into the right and left bronchi at the level of the fifth thoracic vertebra, channeling air to the right or left lung.

The hyaline cartilage in the tracheal wall provides support and keeps the trachea from collapsing. The posterior soft tissue allows for expansion of the esophagus, which is immediately posterior to the trachea.

The mucous membrane that lines the trachea is ciliated pseudostratified columnar epithelium similar to that in the nasal cavity and nasopharynx. Goblet cells produce mucus that traps airborne particles and microorganisms, and the cilia propel the mucus upward, where it is either swallowed or expelled.

Bronchi, Bronchial Tree, & Lungs

Bronchi and Bronchial Tree

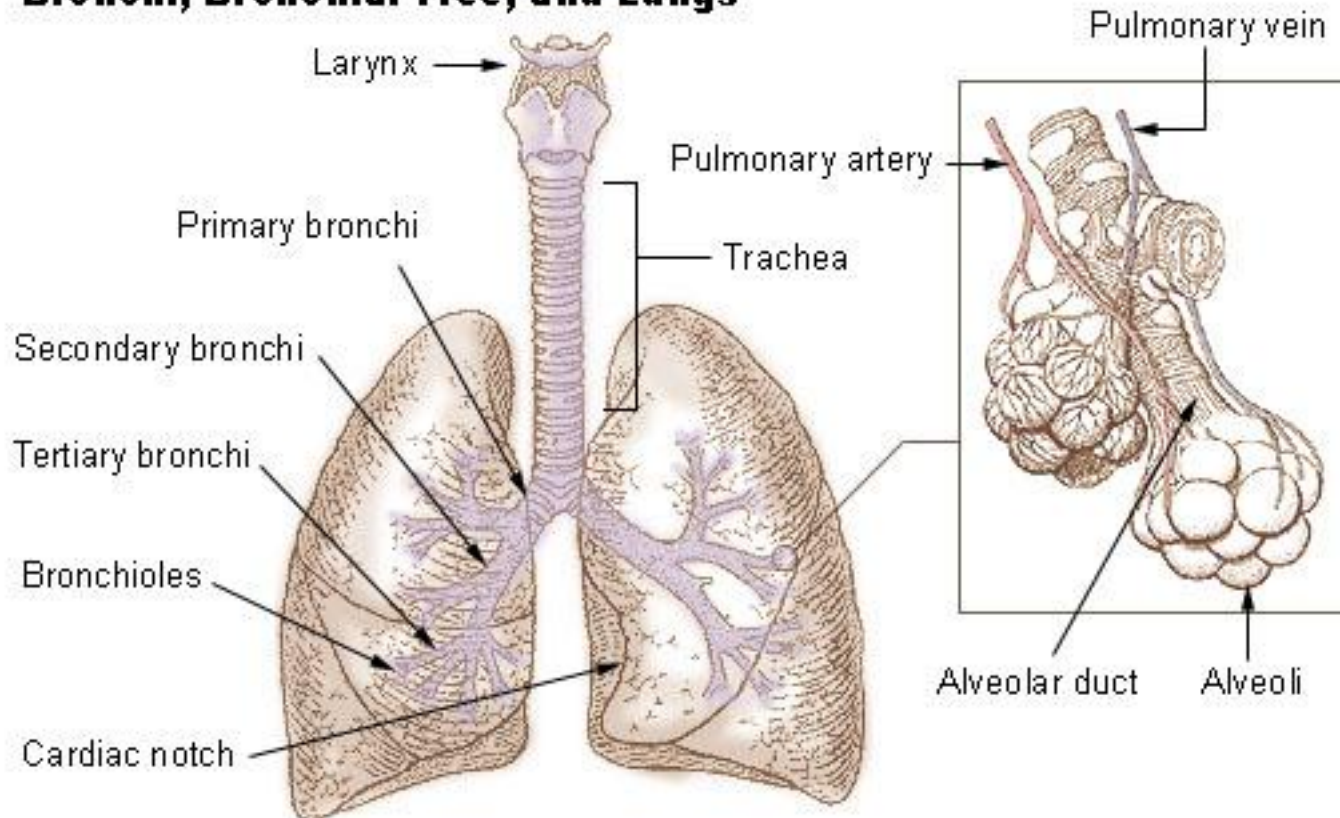
In the mediastinum, at the level of the fifth thoracic vertebra, the trachea divides into the right and left primary bronchi. The bronchi branch into smaller and smaller passageways until they terminate in tiny air sacs called alveoli.

The cartilage and mucous membrane of the primary bronchi are similar to that in the trachea. As the branching continues through the bronchial tree, the amount of hyaline cartilage in the walls decreases until it is absent in the smallest bronchioles.

As the cartilage decreases, the amount of smooth muscle increases. The mucous membrane also undergoes a transition from ciliated pseudostratified columnar epithelium to simple cuboidal epithelium to simple squamous epithelium.

The alveolar ducts and alveoli consist primarily of simple squamous epithelium, which permits rapid diffusion of oxygen and carbon dioxide. Exchange of gases between the air in the lungs and the blood in the capillaries occurs across the walls of the alveolar ducts and alveoli.

Bronchi, Bronchial Tree, and Lungs



Lungs

The two lungs, which contain all the components of the bronchial tree beyond the primary bronchi, occupy most of the space in the thoracic cavity. The lungs are soft and spongy because they are mostly air spaces surrounded by the alveolar cells and elastic connective tissue. They are separated from each other by the mediastinum, which contains the heart. The only point of attachment for each lung is at the hilum, or root, on the medial side. This is where the bronchi, blood vessels, lymphatics, and nerves enter the lungs.

The right lung is shorter, broader, and has a greater volume than the left lung. It is divided into three lobes and each lobe is supplied by one of the secondary bronchi. The left lung is longer and narrower than the right lung. It has an indentation, called the cardiac notch, on its medial surface for the apex of the heart.

The left lung has two lobes.

Each lung is enclosed by a double-layered serous membrane, called the pleura. The visceral pleura is firmly attached to the surface of the lung. At the hilum, the visceral pleura is continuous with the parietal pleura that lines the wall of the thorax. The small space between the visceral and parietal pleurae is the pleural cavity. It contains a thin film of serous fluid that is produced by the pleura. The fluid acts as a lubricant to reduce friction as the two layers slide against each other, and it helps to hold the two layers together as the lungs inflate and deflate.

Review:

Here is what we have learned from Introduction to the Respiratory System:

- . The entire process of respiration includes ventilation, external respiration, transport of gases, internal respiration, and cellular respiration.
- . The three pressures responsible for pulmonary ventilation are atmospheric pressure, intraalveolar pressure, and intrapleural pressure.
- . A spirometer is used to measure respiratory volumes and capacities. These measurements provide useful information about the condition of the lungs.

- .The frontal, maxillary, ethmoidal, and sphenoidal sinuses are air-filled cavities that open into the nasal cavity.
- .The pharynx, commonly called the throat, is a passageway that extends from the base of the skull to the level of the sixth cervical vertebra.
- .The larynx, commonly called the voice box, is the passageway for air between the pharynx above and the trachea below.
- .The trachea, commonly called the windpipe, is the main airway to the lungs.

.The trachea divides into the right and left primary bronchi, which branch into smaller and smaller passageways until they terminate in tiny air sacs called alveoli.

.The two lungs contain all the components of the bronchial tree beyond the primary bronchi.

.The right lung is shorter, broader, and is divided into three lobes. The left lung is longer, narrower, and is divided into two lobes.

Bibliografía

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