

RESPIRATORY SYSTEM – Textbook and Lecture Slides

Anatomically, the respiratory system consists of an upper respiratory tract and a lower respiratory tract.

Functionally, it can be divided into a conducting portion, which transports air, and a respiratory portion, where gas exchange with the blood occurs. The **conducting portion** includes the nose, nasal cavity, and pharynx of the upper respiratory tract and the larynx, trachea, and progressively smaller airways (from the main bronchi to the terminal bronchioles) of the lower respiratory tract. The **respiratory portion** is composed of small airways called respiratory bronchioles and alveolar ducts as well as air sacs called alveoli in the lower respiratory tract.

FUNCTIONS

The primary function most of us associate with the respiratory system is **breathing**, also termed pulmonary ventilation. Breathing consists of two cyclic phases: **inhalation**, also called inspiration, and **exhalation**, also called expiration. Inhalation draws gases into the lungs, and exhalation forces gases out of the lungs.

Breathing (pulmonary ventilation), gas exchange, acid balance, filters and protects respiratory surfaces from pathogens and dehydration, vocalisation and olfaction.

Breathing in oxygen – into blood and cardiovascular system – blood supply and oxygen for all organs and tissues – exhale carbon dioxide. Your PH drops when exercising and because carbon dioxide doesn't leave the body, polluted air, good endothelia around respiratory tract that protect from pathogens and humidify the air. The larynx is made up of cartilage except for the hyoid bone.

NOSE AND NASAL CAVITY

The **nose** is the main conducting airway for inhaled air. The nose is supported superiorly by paired **nasal bones** that form the bridge of the nose. Anteroinferiorly from the bridge is the fleshy, cartilaginous **dorsum nasi**. The dorsum nasi is supported by one pair of **lateral cartilages** and two pairs of **alar cartilages**.

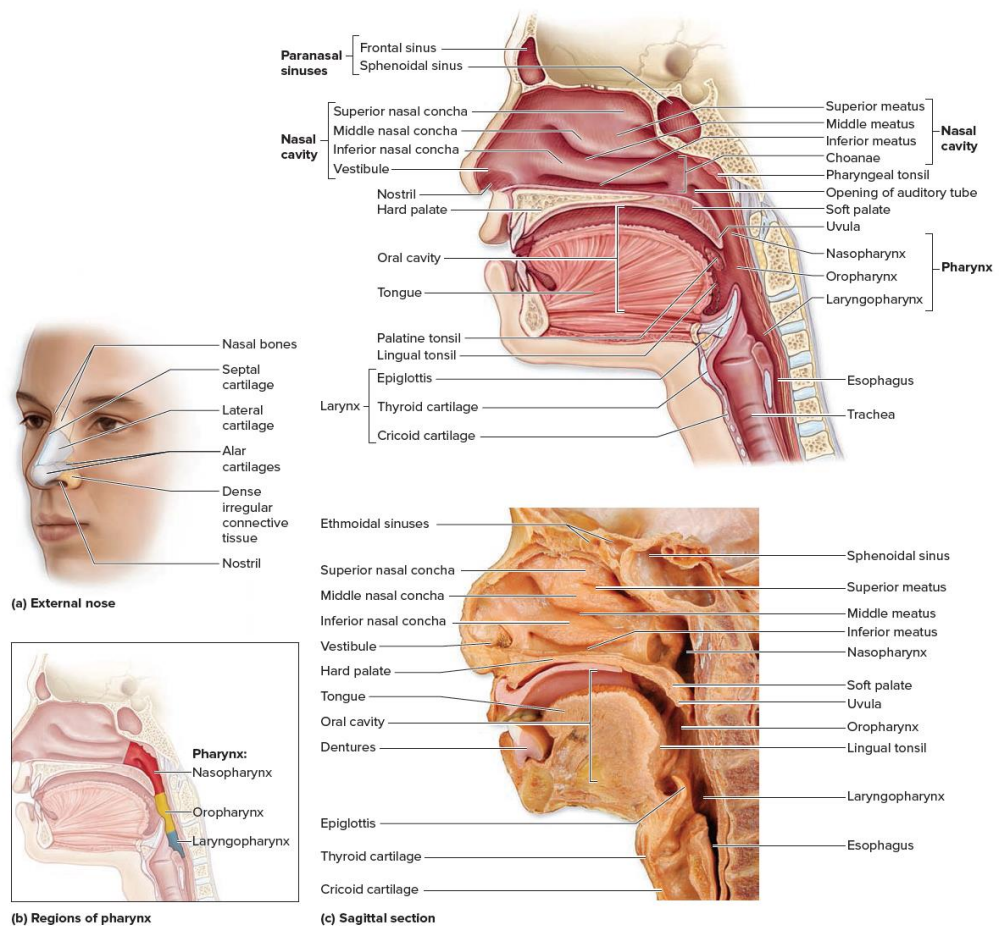
Paired **nostrils**, or *nares*, open on the inferior surface of the nose. The internal surface of the nose leads to the **nasal cavity**.

The nasal cavity is continuous posteriorly with the nasopharynx via paired openings called **choanae** or *internal nares*. The frontal bone, nasal bones, cribriform plate of the ethmoid, and sphenoid bone form the roof of the nasal cavity. The palatine process of the maxillae and the horizontal plate of the palatine bones form the hard palate, which is the nasal cavity floor. The anterior region of the nasal cavity, near the nostrils, is called the **vestibule**. The nasal cavity is lined with **pseudostratified ciliated columnar epithelium**. Within this epithelium are numerous goblet cells that produce mucin, and immediately deep to this epithelium is an extensive vascular network. Near the vestibule are coarse hairs called **vibrissae** that help trap larger particles before they pass through the nasal cavity. The most superior part of the nasal cavity contains the **olfactory epithelium**, which is composed of both a **pseudostratified ciliated columnar epithelium** and olfactory receptor cells.

The **nasal septum** divides the nasal cavity into left and right portions. It is formed anteriorly by **septal nasal cartilage**. A thin, bony sheet formed by the perpendicular plate of the ethmoid bone (superiorly) and the vomer bone (inferiorly) forms the posterior part of the nasal septum.

Along the lateral walls of the nasal cavity are three paired, bony projections: the **superior, middle, and inferior nasal conchae**. These conchae subdivide the nasal cavity into separate air passages, each called a **nasal meatus**. The superior, middle, and inferior meatuses are located immediately inferior to their corresponding nasal conchae. As inhaled air passes over constricted, narrow grooves in each meatus, the inhaled air becomes turbulent. Increased turbulence ensures that the air remains in the nasal cavity for a longer time, so that the air becomes warmed and humidified. Because the conchae help produce this turbulence, they are sometimes called the “turbinate” bones.

Mucous glands can protect and warm air that enters the nasal cavity from external nares, lysozyme prevents bacterial infection and the meatuses are between the conchae to make the air more turbulent and stay within the nasal cavity for longer. The epiglottis prevents the entrance of food particle into the larynx so you don't choke. The upper respiratory tract is pseudo stratified columnar – goblet cells – mucin, mucus glands – lysozyme. Pharynx (stops at the soft palate – nasopharynx) becomes oropharynx then laryngopharynx at the trachea (breath air from mouth).



The hair in the nose stops bigger structures entering it but the hair doesn't protect from dust molecules from smoke but big quantities are prevented from going into your lungs.

The nasal septum is the central wall of bone cartilage that divides the nasal cavity into right and left parts (wall of bone and cartilage) – vomer, palatine, maxilla and ethmoid.

Conchae are bony plates found on the lateral walls of the nasal cavity that increase the surface area of the mucous membrane and in between them are meatuses which are little grooves that make the air more turbulent and makes it stay there for longer to warm it up.

PHARYNX

The common space used by both the respiratory and digestive systems is the **pharynx**, commonly called the throat. The pharynx is funnel-shaped, meaning that it is slightly wider superiorly and narrower inferiorly. The pharynx originates posterior to the nasal and oral cavities and extends inferiorly to the level of the bifurcation of the larynx and esophagus. For most of its length, the pharynx is the common pathway for both inhaled and exhaled air (the respiratory system) and ingested food (the digestive system).

The pharynx is lined by a mucosa and contains skeletal muscles that are primarily used for swallowing. Its flexible lateral walls are distensible to force swallowed food into the esophagus. The pharynx is partitioned into three adjoining regions (listed from superior to inferior): the nasopharynx, oropharynx, and laryngopharynx.

