

The Respiratory System

Respiratory system functions mainly as gas exchange system for O₂ and CO₂
→ **cellular respiration** (energy production)

closely tied to circulatory system

General Functions of Respiratory System:

1. O₂ and CO₂ exchange between blood and air
2. speech and vocalization
3. sense of smell
4. helps control acid base balance of body
5. breathing movements help promote blood and lymph flow

air conducting passageways must be held open at all times

→ nasal passageways and throat follow passages in skull bones and cartilage

→ others held open by rings of cartilage

Principal Organs of Respiratory System

nose
pharynx
larynx
trachea
primary bronchi
lungs:
 bronchioles
 alveoli/respiratory membrane

these organs can also be subdivided into:

conducting division

passageways that serve only for airflow

respiratory division

alveoli and gas exchange areas

and

upper respiratory tract

nose → pharynx → larynx

lower respiratory tract

respiratory organs of the thorax

the lower respiratory tract fills most of the **Thorax (Thoracic Cavity)**

major portion is occupied by **lungs**

Lungs

located in pleura cavity

visceral pleura covers outer surface of lungs

additional space given to heart

all organs between the two lungs are located in the **mediastinum**

mediastinum includes:

heart

heart is in its own sac = pericardium

esophagus

trachea

major blood vessels attached to heart

the **pleurae** and **pleural fluid**:

1. help reduce friction
act as a lubricant
pleurisy=pleurae are dry and inflamed
2. create a pressure gradient
as rib cage expands to draw air into the lungs
3. compartmentalization
surround each lung and isolate it from other and pericardial sac
prevent infections from spreading easily from one thoracic organ to another

1. Nose

separated from mouth by hard and soft palate

cleft palate – bones don't unite completely
produces difficulties in swallowing

each nasal cavity is divided into 3 passageways by **turbinates**

→ creates narrow, turbulent passageways to insure that all air makes contact with mucous membranes

membranes are heavily vascularized

→ remove bacteria, debris and particles

→ warms and moisturizes air entering lungs

→ also contains receptors for smell

nasolacrimal ducts drain into nasal cavity

paranasal sinuses are accessory structures:

sound resonance (other animals)

warm and moisten air

lighten skull

2. Pharynx (throat)

from base of skull to junction with esophagus and trachea

5" long

made of muscle and lined with mucous membrane

junction between digestive and respiratory systems

divided into three regions:

a. Nasopharynx

behind nose to level of soft palate

includes uvula

tonsils (adenoids)

auditory tube (eustachian tube) drains here

b. Oropharynx

behind mouth

from soft palate to level of hyoid bone

palatine and lingual tonsils

c. Laryngopharynx

from hyoid bone to esophagus/larynx

3. Larynx (voice box)

enlarged beginning portion of trachea

composed of cartilage and muscles

opening into larynx = **glottis**

functions:

prevent food from entering lower respiratory system
sound → speech, singing, etc

9 cartilages (3 large, 6 small):

epiglottis –covers glottis when swallowing

thyroid cartilage

largest cartilage of larynx

testosterone stimulates the growth of the laryngeal prominence so it becomes larger in males than in females = **adam's apple**

cricoid cartilage

smaller cartilage below thyroid
connects larynx to trachea

two muscular folds within larynx:

upper: (false) vocal cords (=vestibular folds)
close glottis during swallowing

lower: (true) vocal cords

4. Trachea

extends from larynx to bronchi

surrounded by "C" – shaped bands of cartilage
ends joined by bands of muscle tissue

→holds walls open, prevents collapse

lined by pseudostratified ciliated columnar epithelium

5. Bronchi

trachea divides into two branches = **bronchi**
which enter each lung

Lung

right lung has 3 lobes
left lung has 2 lobes

bronchi resemble trachea in structure
→ also supported by C-shaped cartilages

also have lots of elastic connective tissue

each bronchus enters lung and continues to divide into smaller and smaller branches = **bronchi**, then = **bronchioles**

because of the extensive branching = **bronchial tree**

2 **primary bronchi**

branches into 5 **secondary bronchi** (1 for each lobe of lung)

each of these branches into **tertiary bronchi**

secondary and tertiary bronchi kept open by complete rings of cartilage

6. **Bronchioles**

smallest branches of "respiratory tree"

<1mm diameter

no supportive cartilage

Alveoli

smallest bronchioles (respiratory bronchioles) have clusters of tiny sacs branching off = **alveoli**

"grapelike clusters"

300-500 Million alveoli/lung

single cell layer thick (squamous epithelium)

enveloped by capillaries

are functional unit of respiratory system

actual site of gas exchange with blood