

Slide 1

Respiratory System

- Oxygen in need for survival and carried by the blood
- But it must first come into the body through the respiratory system!
- Inspiration
- Expiration

Slide 2

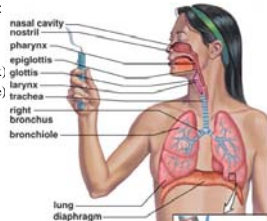
Respiratory System

- Functions
 - Works with CVS to supply O to & remove CO2 from tissues
 - RS: consists of organs that exchange gases between atmosphere & blood
 - CVS: transports gases within blood between lungs & all of body's cells

Slide 3

Respiratory System

- Basic Components:
 - Nose
 - Pharynx (Throat)
 - Larynx (Voice Box)
 - Trachea (Windpipe)
 - Bronchial Tree
 - Lungs
 - Diaphragm



Slide 4

Structure	Description	Function
Upper Respiratory Tract		
Nasal cavities	Hollow spaces in nose	Filters, warms, and moistens air
Pharynx	Chamber posterior to oral cavity, lies between nasal cavity and larynx	Connection to surrounding regions
Glottis	Opening into larynx	Passage of air into larynx
Larynx	Cartilaginous organ that houses the vocal cords; voice box	Sound production
Lower Respiratory Tract		
Trachea	Flexible tube that connects larynx with bronchi	Passage of air to bronchi
Bronchi	Paired tubes inferior to the trachea that enter the lungs	Passage of air to lungs
Bronchioles	Branched tubes that lead from bronchi to alveoli	Passage of air to each alveolus
Lungs	Soft, spongy organs that occupy lateral portions of thoracic cavity	Gas exchange

Slide 5

Respiratory System

- Nose
 - Only external RS portion
 - Nostrils
 - Air enters from external environment
 - Divided by the nasal septum
 - Conchae
 - Lateral bony ridges
 - Why?

Slide 6

Respiratory System

- Pharynx (Throat)
 - Length
 - 6 cervical vertebrae
 - 3 sections
 - Nasopharynx
 - Oropharynx
 - Laryngopharynx

Slide 7

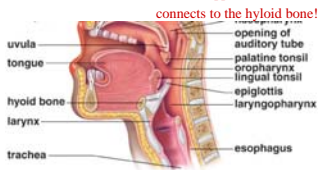
Respiratory System

- Pharynx (Throat)
 - Function
 - passage for food and air
 - Lining: Differing mucosal
 - At the oral opening
 - Tonsil ring with immune protection for homeostasis

Slide 8

Respiratory System

- Larynx
 - Location
 - Superior to & continuous with trachea
 - Connects pharynx to trachea
 - Also considered the Adam's Apple

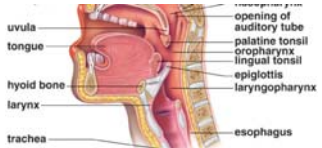


connects to the hyoid bone!

Slide 9

Respiratory System

- Larynx
 - Functions:
 - Voice
 - Open airway
 - Channels food & air



Slide 10

Respiratory System

- Larynx
 - Vocal Cords = Vestibular Folds = Superior-Most
 - Mucosal folds supported by ligaments
 - Some Play no role in sound production
 - Others play a major role in sound production
 - Glottis: medial opening between
 - Vibrating vocal folds from air passing over them produce basic sounds of speech

epiglottis
base of tongue
vocal cord
glottis

false vocal cord
glottis

Slide 11

Respiratory System

- Larynx
 - Epiglottis
 - Leaf-shaped piece of elastic cartilage
 - "stem" = attached to larynx
 - "leaf" = unattached & free to move up & down to form a lid over glottis when swallowing

uvula
tongue
hyoid bone
larynx
trachea

opening of auditory tube
palatine tonsil
oropharynx
lingual tonsil
epiglottis
laryngopharynx
esophagus

Slide 12

Respiratory System

- Trachea (Windpipe)
 - Location:
 - Ventral to esophagus
 - Give an other description of the location
 - Function
 - Connects the larynx to the bronchi
 - Passageway for air

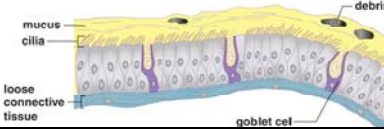
larynx
trachea
right bronchus
bronchiole

larynx
trachea
right bronchus
bronchiole

Slide 13

Respiratory System

- Trachea (Windpipe)
 - Stacked C-shaped hyaline cartilage rings
 - Fibrous & elastic CT between
 - Purpose of cartilage rings
 - prevent collapsing when flexible
 - Also lined with smooth muscle
 - Sends particles back up to the pharynx

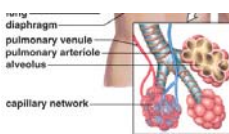


The diagram shows a cross-section of the trachea wall. It features a layer of mucus on top, with cilia pointing upwards. Debris is shown being trapped in the mucus. A goblet cell is shown secreting mucus. Below the epithelial layer is loose connective tissue.

Slide 14

Respiratory System

- Bronchial Tree
 - System of respiratory passages that branches greatly within lungs
 - Right and left
 - Smallest branch = Bronchioles
 - No cartilage within this portion
 - At the end of each = Alveolus
 - Air pockets or sacs




The diagram shows the lower respiratory tract. It includes the diaphragm, pulmonary venule, pulmonary arteriole, alveolus, and capillary network. The alveoli are shown as small air sacs at the end of the bronchioles.

Slide 15

Respiratory System

- Lungs (Pleura)
 - Gross Anatomy of Lungs
 - General
 - Paired
 - Thoracic cavity
 - Serous membrane: parietal & visceral pleurae
 - Pleural cavities with serous (pleural) fluid
 - Base (Where?)
 - Apex (Where?)
 - Costal Surface (Where?)
 - Mediastinal Surface



The diagram shows the lungs in the thoracic cavity. It highlights the diaphragm, the costal surface (outer surface), and the mediastinal surface (inner surface).

Slide 16

Respiratory System

- Lungs (Pleura)
 - Microscopic Anatomy of Lungs
 - Bronchioles (smallest tubes) give rise to:
 - Alveoli: air sacs, O₂-CO₂ exchange chambers
 - Alveolar Wall consists of:
 - Sim SE
 - Septal Cells (produce Surfactant)
 - » Prevents collapse
 - » Infant respiratory distress syndrome
 - Alveolar Macrophages (phagocytic cells)

Slide 17

Respiratory System

Copyright © The McGraw-Hill Companies, Inc. Permission is granted to reproduce in any form.

The diagram illustrates the branching of bronchioles into lobules and then into individual alveoli. It shows the pulmonary artery and vein branching to supply the alveoli, and a detailed view of a capillary network within an alveolus. Labels include: bronchiole, blood flow, lobule, pulmonary arteriole, blood flow, pulmonary artery, pulmonary vein, alveoli, blood supply of alveoli, pulmonary venule, and capillary network of one alveolus.

Slide 18

Respiratory System

- Respiratory Membrane

This microscopic view shows the interface between an alveolus and a capillary. Key components labeled are: surfactant-secreting cell, macrophage, alveolus, respiratory membrane, and capillary lumen.

Slide 19


Respiratory System

- Diaphragm
 - Skeletal Muscle
 - Separates: Thoracic & abdominopelvic cavities
 - Contracted Position
 - Contraction results in: Flattened : Inhale!
 - Relaxed position
 - Relaxation results in: Dome shaped : exhale

Slide 20

Respiratory System

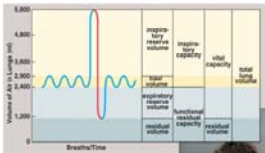
- Respiration Measurements
 - Technique for diagnosing breathing problems
 - Spirogram



Slide 21

Respiratory System

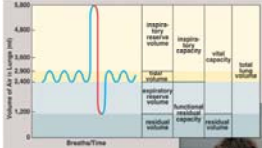
- Respiration Measurements
 - Tidal volume
 - Air in & out while relaxed : 500ml
 - Vital capacity (deep breathing)
 - The maximum volume in + max vol. out



Slide 22

Respiratory System

- Respiration Measurements
 - Inspiratory reserve volume
 - "space for increased inhaled volume"
 - Expiratory reserve volume
 - "space for increased exhaled volume"

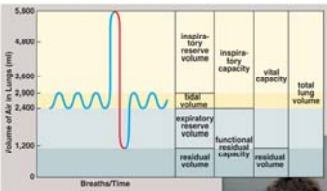


The graph shows lung volume in liters on the y-axis (0 to 5.000) and breaths on the x-axis. A blue line represents tidal volume, oscillating between approximately 1.2 and 2.4 liters. A red vertical line indicates the inspiratory reserve volume, extending from the peak of the tidal volume up to 4.8 liters. A green vertical line indicates the expiratory reserve volume, extending from the trough of the tidal volume down to 0.5 liters. Labels on the right side of the graph include: inspiratory reserve volume, inspiratory capacity, vital capacity, total lung volume, tidal volume, expiratory reserve volume, functional residual capacity, residual capacity, and residual volume.

Slide 23

Respiratory System

- Respiration Measurements
 - Residual volume
 - The amount of air left in the alveoli



The graph shows lung volume in liters on the y-axis (0 to 5.800) and breaths on the x-axis. A blue line represents tidal volume, oscillating between approximately 1.2 and 2.4 liters. A red vertical line indicates the residual volume, extending from the trough of the tidal volume down to 0.5 liters. A green vertical line indicates the functional residual capacity, extending from the trough of the tidal volume up to 2.4 liters. Labels on the right side of the graph include: inspiratory reserve volume, inspiratory capacity, vital capacity, total lung volume, tidal volume, expiratory reserve volume, functional residual capacity, residual capacity, and residual volume.

Slide 24

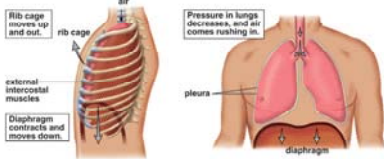
Respiratory System

- Ventilation
 - Movement of air in & out of the lungs
- Remember
 - Thoracic cavity
 - Adhere via pleura
 - Continuous air in pharynx to alveoli

Slide 25

Respiratory System

- Ventilation
 - Inspiration
 - Active phase
 - Contraction of diaphragm and intercostal muscles

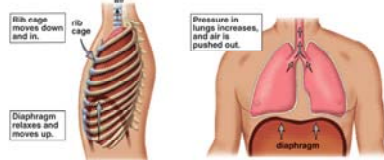


The diagram illustrates the mechanics of inspiration. On the left, the rib cage is shown expanding outwards and upwards, with labels: 'Rib cage moves up and out.', 'rib cage', and 'external intercostal muscles'. Below this, it says 'Diaphragm contracts and moves down.'. On the right, the lungs are shown with arrows indicating air entering. Labels include 'air', 'pleura', and 'diaphragm'. A text box states: 'Pressure in lungs decreases, and air comes rushing in.'. The caption below the diagrams is 'a. Inspiration'.

Slide 26

Respiratory System

- Ventilation
 - Expiration
 - Passive phase
 - Relaxation of diaphragm and intercostal muscles




The diagram illustrates the mechanics of expiration. On the left, the rib cage is shown contracting and moving downwards, with labels: 'Rib cage moves down and in.', 'rib cage', and 'Diaphragm relaxes and moves up.'. On the right, the lungs are shown with arrows indicating air leaving. Labels include 'air' and 'diaphragm'. A text box states: 'Pressure in lungs increases, and air is pushed out.'. The caption below the diagrams is 'b. Expiration'.

Slide 27

Respiratory System

- Ventilation
 - Expiration
 - Sometimes it can be active
 - Deep or rapid breathing



The diagram illustrates the mechanics of active expiration. On the left, the rib cage is shown contracting and moving downwards, with labels: 'Rib cage moves down and in.', 'rib cage', and 'Diaphragm relaxes and moves up.'. On the right, the lungs are shown with arrows indicating air leaving. Labels include 'air' and 'diaphragm'. A text box states: 'Pressure in lungs increases, and air is pushed out.'. The caption below the diagrams is 'b. Expiration'.

Slide 28

Respiratory System

- Control of Ventilation
 - Respiratory center
 - Within Medulla oblongata
 - Autonomic impulses to diaphragm & intercostals
 - Can be triggered by nervous and chemical inputs

Slide 29

Respiratory System

The structures labeled on the left are associated with inspiration.

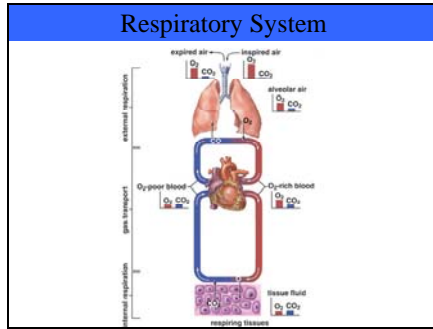
The structures labeled on the right are associated with expiration.

Slide 30

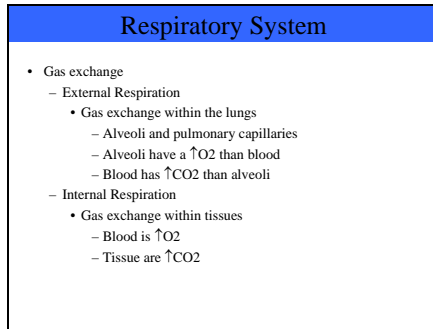
Respiratory System

- Control of Ventilation
 - Nervous inputs
 - Hering-Breuer reflex
 - Stretch receptors within alveolar walls
 - Chemical inputs
 - CO₂, H⁺ sensitivity
 - Carotid & Aortic bodies
 - Chemoreceptors

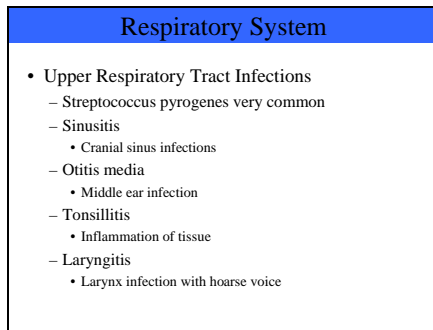
Slide 31



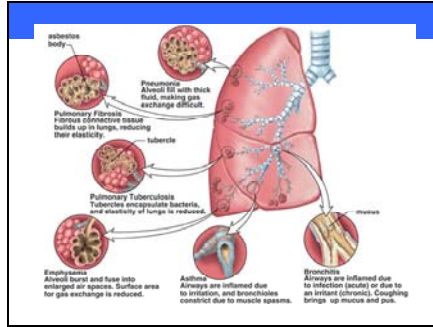
Slide 32



Slide 33



Slide 34



Slide 35

Respiratory System

- Lung Cancer
 - Refer to figure 14.11 in text

Slide 36

Respiratory System

- Aging
 - Decreases with age
 - Weakened muscles
 - More residual air
 - Cilia are weaker thus more fluid/debris
 - Less efficient air exchange
 - Due to tissue and blood changes
 - Blood pH changes due to CO₂ increase

Slide 37

Respiratory System

- List the systems the RS works with
 - We named some today in lecture
 - How do they function together?
