Notes for Monday November 11, 2002
Outline

• Larynx
• Trachea & bronchial tree
• Alveoli & respiratory membrane
• Lungs
• Pulmonary ventilation

Larynx
• Glottis
• Epiglottis
• Thyroid cartilage = Adam’s apple
• Vocal cords
• Laryngitis = inflammation of the mucous membrane

Trachea
• Hollow walls supported by 15-20 C-shaped rings of hyaline cartilage connected by smooth muscle
• ANS stimulation regulates diameter of lumen

Tracheal blockage
• Aspiration
• Heimlich maneuver

Bronchial tree
• L & R primary bronchi enter L & R lung
• Secondary bronchi
• Tertiary bronchi
• Bronchioles
• Terminal bronchioles

**Structural changes**
• As branches become narrower the amount of cartilage decreases - none in bronchioles
• Amount of smooth muscle circling lumen increases
• Reduction in cilia & goblet cells

• Bronchodilation
• Bronchoconstriction
• Asthma: smooth muscle spasms, bronchoconstriction; increase mucus secretion obstruction of airway

**Respiratory portion**
• Terminal bronchioles divide into microscopic branches = respiratory bronchioles.
• Divide into alveolar ducts surrounded by ALVEOLI (2-5 alveoli = alveolar sac)
  Alveoli walls
  • Type I alveolar cells (95%) simple squamous epithelium where gas exchange occurs
  • Type II alveolar cells (5%) cuboidal cells that secrete alveolar fluid (includes surfactant that prevents alveoli from collapsing)

• Alveolar macrophages

**Respiratory membrane**
• Alveolar wall/epithelium
• Alveolar basement membrane
• Capillary basement membrane
• Capillary endothelium
• 0.5 micrometers thick
• 1 micrometer = 1/25,000 of an inch
• Lungs contain approx. 300 million alveoli huge surface area for gas exchange
Lungs
- Pleural (serous) membranes:
- Visceral pleura; parietal pleura; pleural cavity filled with serous fluid
- Reduces friction & allows movement of lungs while breathing

Pulmonary Ventilation
= inhalation/inspiration + exhalation/expiration
- Air flow into & out of lungs is due to PRESSURE gradient.

Boyle’s Law
- The pressure of a gas within a chamber is inversely proportional to the volume of the chamber: \( P = \frac{1}{V} \)
- Increase in the size of the chamber decrease in pressure of gas within

Lung Volume
- Changes due to contraction of diaphragm & intercostal muscles

Atmospheric Pressure
at sea level = 760 mm Hg
- Inter pleural pressure is ALWAYS lower that atmospheric pressure to prevent the lungs from collapsing
- Pneumothorax (pneumo = air) lung collapse

At REST
- Alveolar pressure is equal to atmospheric pressure & interpleural pressure = 756 mm Hg

Normal resting inspiration
- Diaphragm contracts
- Thoracic cavity expands
- Lungs volume increases
- Alveolar pressure decreases
• Air enters into lungs

**Normal resting expiration**

• Muscles relax
• Thoracic cavity reduces
• Lung volume decreases
• Alveolar pressure increases
• Air flows out of lungs