Arterial Blood Gases

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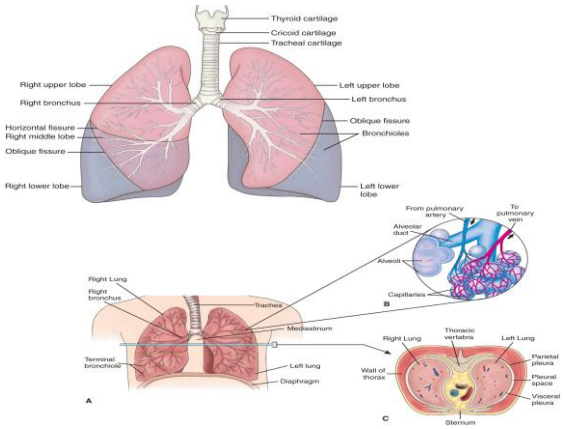
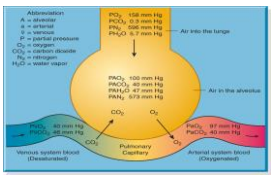


Gas Exchange

- Perfusion
  - Oxygen Transport
  - Carbon Dioxide Transport
- Ventilation
  - Inspiration
  - Expiration
- Ventilation-Perfusion
  - Depends upon V/Q ratio balance
  - Imbalance causes shunting of blood resulting in hypoxia



Acid-Base Balance

Acid-Base Balance

- pH 7.35-7.45
  - ↑ H+ concentration= acidic ↓ pH
  - ↓ H+ concentration= alkaline ↑ pH
- Buffer Systems
  - Extracellular fluid (ECF)
    - Bicarbonate (HCO_3^-) - carbonic acid (H_2CO_3)
  - Kidneys
    - Regulate bicarbonate in ECF
  - Lungs
    - Control of medulla
    - Regulate CO_2
    - Carbonic acid in ECF
  - Other
    - ECF: inorganic phosphates, plasma proteins
    - ICF: proteins, organic, inorganic phosphates
    - Hemoglobin

Arterial Blood Gas: Basics

- Indications
- Sites
  - Radial
  - Brachial
  - Femoral

ABG Components

	Normal values
pH	7.35- 7.45
PaCO2	35- 45 mmHg
PaO2	80- 100 mmHg
HCO-3	22-26 mEq/L
O2 sat	95- 100%
Base Excess	± 2 mEq/L
Oxygen Saturation	95- 100%

Acid-Base Imbalances

- pH
  - ↑ H+ concentration= acidic ↓ pH
  - If pH < 7.35 ↓ = acidosis
  - ↓ H+ concentration= alkaline ↑ pH
  - If pH > 7.35 ↑ = alkalosis
- ABG Imbalances
  - Respiratory Acidosis
  - Respiratory Alkalosis
  - Metabolic Acidosis
  - Metabolic Alkalosis

Respiratory Acidosis

pH <7.35 ↓ CO2> 45 ↑

- Etiology
  - Always due to respiratory problem
  - Inadequate excretion of CO_2
  - May asymptomatic if chronic
- Manifestations
  - Sudden ↑ pulse, RR, and BP; mental changes; feeling of fullness in head
- Treatment management
  - Potential to ↑ ICP
  - Improve ventilation

Respiratory Alkalosis

pH >7.45 ↑ CO_2< 45 ↓

- Etiology
  - hyperventilation
- Manifestations
  - lightheadedness, inability to concentrate, numbness and tingling, sometimes loss of consciousness
- Treatment management
  - Correct cause of hyperventilation

Metabolic Acidosis

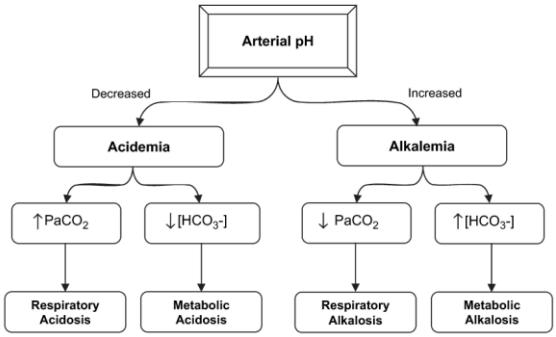
pH <7.35 ↓ HCO3 <22 ↓

- Etiology
- Manifestations
  - Headache, confusion, drowsiness, ↑ RR and depth, ↓bp, ↓ CO, dysrhythmias, shock, or asymptomatic
- Treatment management
  - Correct underlying problem
  - Bicarbonate may be administered
  - Hyperkalemia
  - Calcium levels may be ↓

Metabolic Alkalosis

pH >7.45 ↑ HCO3 >26 ↑

- Etiology
  - Vomiting
  - Gastric suctioning
  - Medications
  - Hypokalemia
- Manifestations
  - Symptoms related to hypocalcemia, respiratory depression, tachycardia, symptoms of hypokalemia
- Treatment/ Management
  - Correct underlying problem
  - Chloride
  - NaCl IVF



Compensation

- Uncompensated
  pH ↑ or ↓ and **either** CO_2 or HCO_3 abnormal
- Partially compensated
  All 3 abnormal
- Compensated
  pH normal and CO_2 **and** HCO_3 are abnormal

Practice ABG Interpretation 1

1. pH 7.36 O_2 95 CO_2 47 HCO_3 27
2. pH 7.46 O_2 95 CO_2 46 HCO_3 30
3. pH 7.33 O_2 92 CO_2 36 HCO_3 21

Practice ABG Interpretation 2

1. pH 7.34 O_2 90 CO_2 48 HCO_3 29
2. pH 7.48 O_2 93 CO_2 46 HCO_3 29
3. pH 7.35 O_2 100 CO_2 34 HCO_3 20