

### Definitions

Acid	CO <sub>2</sub> ; proton donor
Base	HCO <sub>3</sub> <sup>-</sup> ; proton acceptor
Acidemia	pH < 7.35
Alkalemia	pH > 7.45
Acidosis	Process that results in decreased blood pH
Alkalosis	Process that results in increased blood pH
Respiratory regulation	Regulates CO <sub>2</sub> ; compensation occurs in min to hrs
Renal regulation	Regulates HCO <sub>3</sub> <sup>-</sup> ; compensation takes up to 1wk

### Consequences of Alkalemia

Hypokalemia	Arteriolar constriction
Reduced coronary blood flow	Decreased plasma ionized [Ca]
Decreased Mg and PO <sub>4</sub>	Reduced cerebral blood flow
Tetany, seizures	

### Consequences of Acidemia

Hyperkalemia	Impaired cardiac contractility
Reduced ATP synthesis	Impaired response to catecholamines
Reduced cardiac output	Insulin resistance
Coma	

### Primary Disorders

	pH	PaCO <sub>2</sub>	HCO <sub>3</sub> <sup>-</sup>
Respiratory Acidosis	decreased	increased	normal
Respiratory Alkalosis	increased	decreased	normal
Metabolic Acidosis	decreased	normal	decreased
Metabolic Alkalosis	increased	normal	increased

### Partially Compensated States

	pH	PaCO <sub>2</sub>	HCO <sub>3</sub> <sup>-</sup>
Respiratory Acidosis	decreased	increased	increased
Respiratory Alkalosis	increased	decreased	decreased
Metabolic Acidosis	decreased	decreased	decreased
Metabolic Alkalosis	increased	increased	increased

### Fully Compensated States

	pH	PaCO <sub>2</sub>	HCO <sub>3</sub> <sup>-</sup>
Respiratory Acidosis	Normal, but < 7.40	increased	increased
Respiratory Alkalosis	Normal, but > 7.40	decreased	decreased
Metabolic Acidosis	Normal, but < 7.40	decreased	decreased
Metabolic Alkalosis	Normal, but > 7.40	increased	increased

### Arterial Blood Gas Ranges

pH	7.35-7.45
PaCO <sub>2</sub>	35-45mmHg
PaO <sub>2</sub>	80-100mmHg
HCO <sub>3</sub> <sup>-</sup>	22-26 mEq/L
SaO <sub>2</sub>	>95%

### Anion Gap (AG)

Definition	Concentration of unmeasured anions in plasma
Unmeasured anions	Sulfates, phosphates, blood proteins such as albumin
Use	Determines type of metabolic acidosis
Equation	[Na <sup>+</sup> ] - ([Cl <sup>-</sup> ] + [HCO <sub>3</sub> <sup>-</sup> ])
Normal AG	12 mEq/L; range of 8-16 acceptable
Elevated AG	>20 mEq/L
Metabolic alkalosis	Excess AG+HCO <sub>3</sub> > normal HCO <sub>3</sub> <sup>-</sup>
Metabolic acidosis	Excess AG+HCO <sub>3</sub> < normal HCO <sub>3</sub> <sup>-</sup>

AG: Difference in electrical charge between cations and anions in blood.

### Causes of Elevated Anion Gap

Methanol	Uremia	Diabetic ketoacidosis	Propylene glycol
Isoniazid	Lactic acidosis	Ethylene glycol	Renal Failure

\*MUDPILER

### Diagnosing Acid/Base Disorders

1. Determine if patient is acidic or basic
2. Determine if it is an anion gap acidosis (normally due to MUDPILER)
3. Determine if metabolic alkalosis or non-anion gap acidosis

