

Definitions

Acid	CO ₂ ; proton donor
Base	HCO ₃ ⁻ ; 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 ₂ ; compensation occurs in min to hrs
Renal regulation	Regulates HCO ₃ ⁻ ; compensation takes up to 1wk

Consequences of Alkalemia

Hypokalemia	Arteriolar constriction
Reduced coronary blood flow	Decreased plasma ionized [Ca]
Decreased Mg and PO ₄	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 ₂	HCO ₃ ⁻
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 ₂	HCO ₃ ⁻
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 ₂	HCO ₃ ⁻
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 ₂	35-45mmHg
PaO ₂	80-100mmHg
HCO ₃ ⁻	22-26 mEq/L
SaO ₂	>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 ⁺] - ([Cl ⁻] + [HCO ₃ ⁻])
Normal AG	12 mEq/L; range of 8-16 acceptable
Elevated AG	>20 mEq/L
Metabolic alkalosis	Excess AG+HCO ₃ > normal HCO ₃ ⁻
Metabolic acidosis	Excess AG+HCO ₃ < normal HCO ₃ ⁻

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

MUDPILES

Diagnosing Acid/Base Disorders

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