

Acidosis and Alkalosis

Acidosis is a condition in which the blood pH is below 7.35. Alkalosis is a condition in which the blood pH is higher than 7.45. A change in the blood pH that leads to acidosis or alkalosis may be countered by compensation, the physiological response to an acid-base imbalance that acts to normalize arterial blood pH. If a person has an altered pH due to a metabolic cause, changes in the respiratory rate can

help bring the pH back to the normal range. This form of compensation is called respiratory compensation and occurs within minutes. An altered blood pH due to a respiratory cause will cause the kidneys to start making changes in the secretion of hydrogen and bicarbonate. This is called renal compensation and takes days to reach maximum effectiveness.

Condition	Definition	Common Causes	Compensation
Respiratory Acidosis	Increased PaCO ₂ (above 45 mm Hg) and decreased pH (below 7.35)	Airway obstructions, hypoventilation due to emphysema, pulmonary edema, damage to the muscles of respiration, or respiratory center.	Renal: increased excretion of H ions and increased reabsorption of HCO ₃ . Compensation: pH within normal range but PaCO ₂ is increased.
Respiratory Alkalosis	Decreased PaCO ₂ (below 35 mm Hg) and increased pH (above 7.45)	Hyperventilation due to oxygen deficiency, pulmonary disease, stroke, anxiety, or drug overdose (ASA).	Renal: decreased excretion of H ions and decreased reabsorption of HCO ₃ . Compensation: pH normal, but PaCO ₂ is decreased.
Metabolic Acidosis	Decreased HCO ₃ (below 22 mEq/L) and decreased pH (below 7.35)	Loss of bicarbonate due to diarrhea, accumulation of acid (shock, starvation) or renal dysfunction.	Respiratory: hyperventilation increases loss of PaCO ₂ . Compensation: pH normal, but HCO ₃ is decreased.
Metabolic Alkalosis	Increased HCO ₃ (above 26 mEq/L) and increased pH (above 7.45)	Loss of acid due to overuse of diuretics, vomiting, excessive intake of alkaline drugs, or gastric suctioning.	Respiratory: hypoventilation slows loss of PaCO ₂ . Compensation: pH normal, but HCO ₃ is increased.