

Respiratory System (Acid) CO₂ is a volatile acid

Change • The respiratory system can effect a change in 15-30 minutes

ACIDOSIS • **Decrease your respiratory rate (hypoventilation)** you **retain CO₂** (acid) therefore increasing your CO₂ (acid)

ALKALOSIS • **Increased respiratory rate (hyperventilation)** "blow off" CO₂ (acid) therefore **decreasing CO₂** acid

The Renal System (Base)

Renal System (Base) • Kidneys rid the body of the nonvolatile acids H⁺ (hydrogen ions) and **maintain a constant bicarb (HCO₃⁻)**.
• Bicarbonate is the body's base

Acidosis • **Kidneys** try to adjust for this by **excreting H⁺ and retaining HCO₃⁻ base**.
• **Respiratory System** will try to **compensate by increasing ventilation to blow off CO₂** (acid) and therefore decrease the Acidosis.
• Have **excess H⁺ and decreased HCO₃⁻** causing a decrease in pH.

Alkalosis • **H⁺ decreases and you have excess (or increased) HCO₃⁻ base**.
• The **kidneys excrete HCO₃⁻** (base) and **retain H⁺ to compensate**.
• The **respiratory system** tries to **compensates with hypoventilation** to retain CO₂ (acid) to decrease the alkalosis

Change • The renal system takes several hours to days to have an effect.

The Land of the ABG

The • First, look at her pH (normal is
Last 7.35 - 7.45)
Name • If her pH is < 7.35; her name is ACIDOSIS
• If her pH is > 7.45; her last name is ALKALOSIS
• NOTE: To have an absolutely perfect last name; her pH needs to be 7.40. So, keep in mind that if her pH is 7.35 - 7.39 she's thinking about marrying into the ACIDOSIS family. If her pH is 7.41 - 7.45 she's thinking about marrying into the ALKALOSIS family

The • Look at her pH again.
First • If it is 7.35 - 7.45 (normal) then
Name her first name is COMPENSATED.
• If the pH is < 7.35 or > 7.45 then her first name is UNCOMPENSATED.

The • First you need to look at the CO₂
Middle and HCO₃⁻. Remember : **normal**
Name **CO₂ 35 - 45; and HCO₃⁻ 22 - 26**.
1.
• The middle name will either be Respiratory or Metabolic.
2.
• If the **CO₂ is < 35 or > 45** her middle name is RESPIRATORY.
3.
• If the **HCO₃⁻ is < 22 or > 26**, her middle name is METABOLIC.

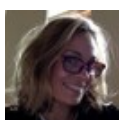
The Land of the ABG (cont)

The • **pH and HCO₃⁻** are "kissin'
Family cousins" they like to **go in the**
Feud **same direction**
• CO₂ is the "black sheep" pH runs the **opposite direction** when it sees him Coming. THEREFORE:
• Decreased pH with decreased HCO₃⁻: ACIDOSIS
• Increased pH with increased HCO₃⁻: ALKALOSIS
• **Decreased pH with increased CO₂**: ACIDOSIS
• **Increased pH with decreased CO₂**: ALKALOSIS

Metabolic Acidosis

• pH < 7.35 (Normal: 7.35 - 7.45)
HCO₃⁻ < 22 (normal: 22 - 26)

Causes • **Increased H⁺, excess loss of HCO₃⁻**
• Overproduction of organic acids (starvation, ketoacidosis, increased catabolism)
• Impaired renal excretion of acid (renal failure)
• Abnormal loss of HCO₃⁻ (diarrhea, biliary fistula, Diamox)
• Ingestion of acid (salicylate overdose, oral anti-freeze)



By [xkissmekatex \(kissmekate\)](#)

Not published yet.

Last updated 17th January, 2017.

Page 1 of 3.

Sponsored by [Readable.com](#)

Measure your website readability!

<https://readable.com>

Metabolic Acidosis (cont)

Signs and Symptoms	<ul style="list-style-type: none"> • CNS depression (confusion to coma) • Cardiac Dysrhythmias (elevated T wave, wide QRS to ventricular stands-till) • Electrolyte abnormalities (elevated K⁺, Cl⁻, Ca²⁺) • Flushed skin (arteriolar dilation) • Nausea
Treatment (treat the underlying cause)	<ul style="list-style-type: none"> • NaHCO₃- (sodium bicarbonate) based on ABGs only and with caution • IV fluids and insulin for DKA • Dialysis for renal failure • Antibiotics, increased nutrition for tissue catabolism • Increased cardiac output and tissue perfusion for low CO states • Rehydrate, monitor I and O • Treat dysrhythmias, support hemodynamic and respiratory status

Metabolic Alkalosis

- pH > 7.45 (Normal: 7.35 - 7.45) HCO₃⁻ > 26

Metabolic Alkalosis (cont)

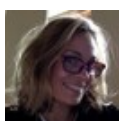
Causes	<ul style="list-style-type: none"> • Loss of H⁺ or increased HCO₃⁻ • Loss of K⁺ (diarrhea, vomiting) • Ingestion of large amounts of bicarbonate (antacids, resuscitation) • Prolonged use of diuretics (distal tubule lose ability to reabsorb Na⁺ and Cl⁻ therefore NaCl); Ammonia is in the urine and then binds with H⁺
Signs and Symptoms	<ul style="list-style-type: none"> • Similar to the disease process • Diaphoresis • Nausea and Vomiting • Increase neuromuscular excitability (Ca²⁺ binds with protein) • Shallow breathing (respiratory compensation) • EKG changes (increased QT, sinus tachycardia) • May also see confusion progressing to lethargy to coma • Electrolyte abnormality (decreased Ca²⁺), normal or decreased K⁺, increased base excess on the ABG

Metabolic Alkalosis (cont)

Treatment (treat the underlying cause)	<ul style="list-style-type: none"> • Replace potassium (KCl) losses in 0.9% NaCl (rehydrates and increases HCO₃⁻ excretion) • Diamox (acetazolamide, increases HCO₃⁻ excretion) • Monitor neuro status, re-orient, seizure precaution, monitor I and O
--	---

RESPIRATORY ACIDOSIS

	<ul style="list-style-type: none"> • pH < 7.35 (Normal: 7.35 - 7.45) CO₂ > 45 (Normal: 35 - 45)
Causes	<ul style="list-style-type: none"> • Hypoventilation • Depression of the Respiratory Center (sedatives, narcotics, drug overdose, CVA, cardiac arrest, MI). • Respiratory muscle paralysis (spinal cord injury, Guillian-Barre, paralytics). • Chest wall disorders (flail chest, pneumothorax). • Disorders of the lung parenchyma (CHF, COPD, pneumonia, aspiration, ARDS). • Alteration in the function of the abdominal system (distension)



By [xkissmekatex \(kissmekate\)](#)

Not published yet.

Last updated 17th January, 2017.

Page 2 of 3.

Sponsored by [Readable.com](#)

Measure your website readability!

<https://readable.com>

RESPIRATORY ACIDOSIS (cont)

Signs and Symptoms

- CNS depression (**decreased LOC**)
- Muscle twitching which can progress to convulsions
- Dysrhythmias, tachycardia, diaphoresis (related to hypoxia secondary to hypoventilation)
- Palpitations
- Flushed skin
- Serum electrolyte abnormalities including elevated K⁺ (potassium leaves the cell to replace the H⁺ buffers leaving the cell)

Treatment

- Physically stimulate the patient to improve ventilation
- Vigorous pulmonary toilet (chest PT, coughing and deep breathing, spirometer, respiratory treatments with bronchodilators)
- Mechanical ventilation (to **increase the respiratory rate and tidal volume**)
- Reversal of sedatives and narcotics
- Antibiotics for infections
- Diuretics for fluid overload
- NOTE: beware of NaHCO₃- sodium bicarbonate—can compensate and cause metabolic alkalosis. Also, if patient has been hypoxic and this is a lactic acidosis; NaHCO₃- can be dangerous)

Respiratory Alkalosis

pH > 7.45 (Normal: 7.35 - 7.45) CO₂ < 35 (Normal: 35 - 45)

Causes

- **Alveolar Hyperventilation**
- Psychogenic (fear, pain, anxiety)
- CNS stimulation (brain injury, ETOH, early salicylate poisoning, brain tumor)
- Hypermetabolic states (**fever**, thyrotoxicosis)
- Hypoxia** (high altitude, pneumonia, heart failure, pulmonary embolism)
- Mechanical overventilation (**ventilator rate too fast**)

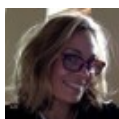
Signs and Symptoms

- Headache
- Vertigo
- Paresthesias (numb fingers/toes, circumoral, carpal pedal spasms and tetany)
- Tinnitus (ringing in the ears)
- Electrolyte abnormalities (**decreased Ca⁺, K⁺**)

Respiratory Alkalosis (cont)

Treatment (treat the underlying cause)

- Sedatives or analgesics
- Correction of hypoxia (possible diuretics, mechanical ventilation to also **decrease respiratory rate and decrease the tidal volume**)
- NOTE: patients with brain injury may need hyperventilation
- Antipyretics for fever
- Treat hyperthyroidism
- Breathe into a paper bag for hyperventilation



By [xkissmekatex \(kissmekate\)](#)

cheatography.com/kissmekate/

Not published yet.

Last updated 17th January, 2017.

Page 3 of 3.

Sponsored by [Readable.com](#)

Measure your website readability!

<https://readable.com>