# Arterial Blood Gas (ABG) Analyzer

## INPUTS

|  |  |
| --- | --- |
| pH | **Options:** |
| PₐCO₂ | **Options:** |
| HCO₃- | **Options:** |
| Sodium | **Options:** |
| Chloride | **Options:** |
| Albumin  *NOTE: Normal albumin levels are typically 4 g/dL in US units and 40 g/L in SI units.* | **Options:** |
| If respiratory process present, chronicity | **Options:**   * Acute * Chronic |

## FORMULA

This tool, developed by [Jonathan Chen, MD](https://profiles.stanford.edu/jonc101) first determines the primary process by looking at the pH and the PCO2. It then calculates compensations to determine chronicity, compensatory, and co-existing acid-base disturbances.

## FACTS & FIGURES

### Metabolic Acidosis (Anion Gap)

MUDPILES

* Methanol
* Uremia
* Diabetic Ketoacidosis (check serum ketones)
* Propylene Glycol (in BZD drips) or Paraldehydes
* Isoniazid
* Lactic Acidosis (check serum lactate)
* Ethylene Glycol (anti-freeze)
* Salycylates

GOLDMARK

* Glycols (ethylene or propylene)
* Oxoporin (reflects fatty liver damage from glutathione consumption, e.g. acetaminophen toxicity)
* L-Lactate
* D-Lactate (bacterial form)
* Methanol
* Aspirin (salycylate)
* Renal Failure (BUN uremia)
* Ketoacidosis

### Metabolic Acidosis (Non-Anion Gap)

GI Loss

* Diarrhea / Laxatives
* Fistula, (pancreatic, biliary)
* Uretero-intestinal diversion (ileal conduit)

Renal Loss

* Renal Tubular Acidosis (Type 1 Distal or Type 2 Proximal)
* Renal Failure
* Hyper-kalemia

Exogenous Acid

* HCl
* Amino Acids

FUSED CARS

* Fistula (pancreatic, biliary)
* Uretero-gastric conduit
* Saline admin (dilutional acidosis)
* Endocrine (hyper-PTH)
* Diarrhea
* Carbonic anhydrase inhibitor (acetazolamide)
* Ammonium chloride
* Renal tubular acidosis
* Spironolactone

### Metabolic Alkalosis

Alkaline Input

* Bicarbonate Infusion
* Hemodialysis
* Calcium Carbonate
* Parenteral Nutrition

Proton Loss

* GI Loss (vomiting, NG suction)
* Renal loss
* Diuretics
* Mineralocorticoids

### Respiratory Acidosis

Airway Obstruction

* Foreign body, aspiration
* OSA (obstructive sleep apnea)
* Laryngo- or broncho-spasm

Neuromuscular

* Myasthenia gravis
* Hypokalemic periodic paralysis
* Guillain-Barre
* Botulism, Tetanus
* Hypo-kalemia, hypo-phosphatemia
* Cervical spine injury
* Morbid obesity
* Polio, MS, ALS

Central

* Drugs (opiates, sedatives)
* Oxygen treatment in acute hypercapnia
* Brain trauma or stroke

Pulmonary

* Pulmonary edema
* Asthma
* Pneumonia
* ARDS
* COPD
* Pulmonary Fibrosis

Mechanical Ventilation

### Respiratory Alkalosis

Hypoxia

* High altitude
* CHF
* Pulmonary Embolism

Lung Disease

* Pulmonary fibrosis
* Pulmonary edema
* Pneumonia

Drugs

* Progesterone
* Nicotine

Stimulation of Respiratory Drive

* Psychogenic
* Neurologic (pontine tumor)
* Sepsis
* Pregnancy
* Mechanical ventilation

## EVIDENCE APPRAISAL