

Acute Metabolic Acidosis

A plain-English guide for you and your family

WHAT IS HAPPENING

Your body keeps blood pH tightly controlled between 7.35 and 7.45 using three systems: chemical buffers (mainly bicarbonate, which neutralizes acid), your lungs (which blow off carbon dioxide), and your kidneys (which dump acid into urine). When pH drops below 7.35, it is called metabolic acidosis (acid building up in the blood). The first step is calculating the anion gap, a simple math formula from your basic metabolic panel. A high anion gap means acid is piling up—lactic acid from shock, ketones from uncontrolled diabetes or starvation, uremic toxins from kidney failure, or poisons like methanol, ethylene glycol, or aspirin overdose. A normal anion gap means bicarbonate was lost, usually from diarrhea, some kidney diseases, or IV saline overload. Your body fights back immediately: the brainstem forces deep, fast breathing (Kussmaul respirations) to blow off CO₂ and raise pH. But that compensation has limits—severe too much acid in the blood (acidosis) below pH 7.0 can stop the heart from responding to its own electrical signals, allow dangerous potassium levels to climb, drop blood pressure, and shut down organs. None of these findings is random; each one is the body buying time while you find and treat the root cause.

What you might feel

- Kussmaul respirations (deep, rapid breathing)
- Nausea and vomiting
- Belly pain
- Confusion, sleepiness, or trouble thinking
- Low blood pressure or shock
- Weakness and feeling exhausted
- Heart racing or skipping beats
- Peeing a lot and feeling very thirsty (in diabetic ketoacidosis (the acid crisis of missing insulin))
- Sweet or fruity breath smell (in ketoacidosis)
- Muscle cramps or twitching

Call the doctor right away if...

- Blood pH below 7.1 or bicarbonate below 10 mEq/L (heart can stop or shock may not respond to treatment)
- Potassium above 6.5 mEq/L or EKG showing peaked T waves, wide QRS, or sine wave (heart rhythm about to become lethal)
- Confusion, unresponsiveness, or coma (brain swelling risk in diabetic ketoacidosis (the acid crisis of missing insulin) or severe acid affecting brain function)
- Blood pressure staying low despite IV fluids or strong medicines (acidic blood blocks adrenaline from working on heart and vessels)
- Lactic acid above 4 mmol/L (signals shock, sepsis, or organs not getting oxygen—find and fix the cause now)
- Suspected poison ingestion—methanol, antifreeze, or aspirin—with vision changes, kidney failure, or ringing in ears

What the care team will do

- Obtain venous or arterial blood gas, basic metabolic panel with sodium, potassium, chloride, bicarbonate, glucose, and creatinine within 15 minutes of patient arrival.
- Place the patient on continuous cardiac monitoring and obtain a 12-lead EKG immediately, watching for peaked T waves, widened QRS complexes, or sine-wave pattern.
- Start a large-bore IV (18-gauge or larger) and infuse 0.9% normal saline at 10–20 mL per kg over the first hour, then continue at 250–500 mL per hour based on blood pressure and urine output.
- Assess and support airway and breathing; apply oxygen to keep saturation above 94%, and notify the provider immediately if respiratory rate exceeds 30 or the patient becomes too tired or confused to breathe deeply.
- If potassium is above 6.0 mEq/L or EKG shows high potassium (hyperkalemia) changes, immediately give calcium gluconate 1–2 grams IV over 2–3 minutes to stabilize the heart membrane, then prepare insulin plus dextrose and albuterol nebulizer to shift potassium back into cells.
- Identify and treat the underlying cause: give IV insulin for DKA (regular insulin 0.1 units/kg/hour after initial bolus), start antibiotics within 1 hour for sepsis, consult nephrology (kidney specialist) or toxicology for dialysis if methanol, ethylene glycol, severe severe waste buildup in the blood (uremia), or salicylate poisoning is suspected.
- Monitor blood glucose every 1–2 hours in DKA patients; once glucose drops below 250 mg/dL, add dextrose 5% to the IV fluids while continuing insulin to clear ketones and close the anion gap.

- Recheck blood gas, electrolytes, and anion gap every 2–4 hours; watch for signs of overcorrection such as pH rising above 7.45, tetany (muscle spasms), or confusion worsening despite improving lab values.

Medicines you may be given — and why

Insulin (regular, IV)

Insulin is the key that unlocks your cells so sugar can go inside and be burned for energy instead of building up in your blood. When you have diabetic ketoacidosis (the acid crisis of missing insulin) (DKA—a dangerous state where your body burns fat for fuel and makes acids called ketones because there is no insulin to help sugar get into cells), insulin stops your liver from making ketones, moves sugar out of your blood and into muscle and fat cells, and also pushes potassium (a mineral that keeps your heart beating normally) back into cells where it belongs.

Sodium bicarbonate (IV)

Sodium bicarbonate is baking soda given through an IV. It is a base (the opposite of acid) that soaks up extra hydrogen ions (the particles that make your blood acidic) like a sponge. When bicarbonate meets hydrogen in your blood, they combine and form water and carbon dioxide (which you breathe out), raising your blood pH and making it less acidic. It is used only in very severe too much acid in the blood (acidosis) (pH below 7.1) when the heart is struggling, potassium is dangerously high, or the patient is in shock and needs medications to keep blood pressure up.

Fomepizole (IV)

Fomepizole blocks an enzyme in your liver called alcohol dehydrogenase—the chemical scissors that normally cut apart alcohol molecules. When someone drinks methanol (wood alcohol found in antifreeze or fuel) or ethylene glycol (sweet-tasting chemical in antifreeze), the liver breaks these alcohols down into extremely poisonous acids: formic acid (from methanol) burns the optic nerve and causes blindness, and glycolic and oxalic acids (from ethylene glycol) destroy the kidneys. Fomepizole jams the scissors so the toxic alcohols stay whole and harmless in the blood long enough to be filtered out by the kidneys or removed by dialysis.

Potassium chloride (IV or oral)

Potassium is a charged mineral (electrolyte) that lives mostly inside your cells and keeps your heart beating in a steady rhythm and your muscles working. During too much acid in the blood (acidosis), hydrogen ions (acid particles) flood into cells and kick potassium out into the blood, so blood potassium looks normal or even high. When you fix the too much acid in the blood

with insulin or bicarbonate, hydrogen ions leave the cells, potassium rushes back inside, and the blood level can crash—triggering dangerous heart rhythms or even cardiac arrest. Giving potassium refills the tank so there is enough for both blood and cells.

Hemodialysis

Hemodialysis is a machine that does the work of failed kidneys by cleaning your blood outside your body. Blood is pumped out through a tube into a filter (dialyzer) that has thousands of tiny hollow fibers; waste products, toxins (like methanol, ethylene glycol, or salicylates), extra potassium, and acid pass through the fiber walls into a cleansing fluid (dialysate) and are thrown away, while cleaned blood flows back into your body. It removes small molecules that your kidneys cannot clear when they are shut down or overwhelmed, and it is the fastest way to pull out life-threatening poisons or correct severe too much acid in the blood (acidosis) from kidney failure (uremia).

Where this information comes from

- NEJM: Berend et al. Physiological Approach to Acid-Base Disturbances, 2014
- NEJM: Seifter. Integration of Acid-Base and Electrolyte Disorders, 2014
- ADA Standards of Care in Diabetes 2025 (Hyperglycemic Crises)
- NEJM: Kraut & Madias. Lactic Acidosis, 2014

Last reviewed: 2026-07-07