

Hypophosphatemia and Hyperphosphatemia

A plain-English guide for you and your family

WHAT IS HAPPENING

Phosphorus is a tiny mineral that does three big jobs: it is the main ingredient in ATP (the molecule every cell burns for energy), it builds 2,3-DPG (the switch inside red blood cells that lets them release oxygen to your tissues), and it forms the hard crystal in bone that keeps your skeleton strong. Your kidneys keep the blood level in a tight safe range by throwing out extra or holding on when you need more. When phosphorus drops too low — usually because a starving body suddenly gets food again (refeeding), alcohol shuts down the gut and kidneys, or recovery from diabetic ketoacidosis (the acid crisis of missing insulin) pulls it into cells — your muscles cannot make enough ATP to squeeze, your red blood cells cannot let go of oxygen, and your diaphragm (the main breathing muscle) weakens until breathing stops. When phosphorus climbs too high — usually because failing kidneys cannot clear it or a huge wave of cells dies all at once (tumor lysis, rhabdomyolysis) — it grabs calcium out of the blood, which makes muscles stiffen and twitch, and then deposits the calcium-phosphorus crystals in soft tissues like blood vessels and skin. Every weird finding you see — the weak legs, the confusion, the stopped breathing, the numb fingers, the stiff jaw — traces back to one upstream break: either cells are starving for phosphorus energy, or there is so much phosphorus that it is stealing calcium and hardening tissues. None of it is random; it is the body trying to survive with broken fuel delivery or dangerous overload.

What you might feel

- Muscle weakness or pain
- Confusion, irritability, or trouble thinking clearly
- Numbness or tingling in hands and feet
- Bone pain or easy fractures
- Heart rhythm changes or palpitations
- Trouble breathing or needing the ventilator longer
- Seizures

- Red blood cells breaking apart (hemolysis)

Call the doctor right away if...

- Seizures or sudden confusion
- Severe muscle weakness or trouble breathing
- Heart rhythm changes or chest pain
- Red or brown urine (sign that red blood cells are breaking apart)

What the care team will do

- Watch breathing rate, depth, and oxygen saturation every 1 to 2 hours during treatment for severe low phosphorus below 1.0 mg/dL
- Check the IV phosphate infusion rate every 30 minutes and never give faster than 7.5 mmol per hour
- Monitor heart rhythm on telemetry (heart monitor) continuously during phosphate replacement
- Measure phosphorus, calcium, magnesium, and potassium levels every 6 hours during active treatment
- For high phosphorus from tumor lysis syndrome, measure strict intake and output hourly and keep urine output above 100 mL per hour with IV fluids
- Give phosphate binders like sevelamer or calcium acetate with every meal and snack for chronic high phosphorus
- Restart nutrition very slowly at 10 calories per kilogram per day for malnourished or starved patients, and add thiamine 100 mg IV before any feeding
- Check for muscle pain, dark urine, or rising creatine kinase (muscle enzyme) levels that signal rhabdomyolysis

Medicines you may be given — and why

Intravenous (IV) sodium phosphate or potassium phosphate

Delivers phosphate straight into the bloodstream to quickly raise the blood phosphate level back toward normal. Phosphate is a mineral the body needs to make energy inside every cell, keep bones strong, and help nerves and muscles work. When phosphate drops too low (hypophosphatemia), cells can't make enough ATP (the molecule cells burn for energy), so muscles get weak, the heart can struggle, and in severe cases the person can become confused or have trouble breathing. IV phosphate skips the gut and refills the blood supply directly, so cells can grab what they need right away.

Oral phosphate supplements (sodium phosphate or potassium phosphate tablets or liquid)

Raises blood phosphate by giving phosphate through the mouth, which the gut absorbs into the bloodstream. Used when phosphate is low but not dangerously low (mild to moderate hypophosphatemia) and the person can swallow and absorb food normally. Oral replacement is slower and gentler than IV but works well when there is time and the gut is healthy.

Sevelamer

Binds to phosphate in the food you eat so your gut cannot absorb it, and the bound phosphate leaves the body in stool instead. Used in hyperphosphatemia (high blood phosphate), most commonly in people with chronic kidney disease whose kidneys cannot filter out enough phosphate. By blocking phosphate absorption, sevelamer keeps blood phosphate from climbing even higher, which protects blood vessels and soft tissues from dangerous calcium-phosphate deposits.

Calcium acetate

Binds to phosphate in food inside the stomach and intestine so the body cannot absorb it, and the bound phosphate is eliminated in stool. Used in hyperphosphatemia, especially in chronic kidney disease. At the same time, the calcium part of the pill is absorbed, which can help if the patient is also low in calcium – but it can be a problem if calcium is already normal or high because too much calcium in the blood can deposit in arteries and heart valves.

Rasburicase

Breaks down uric acid (a waste product) into a more soluble compound that the kidneys can easily clear. Used to prevent or treat tumor lysis syndrome (TLS) – a dangerous condition that happens when cancer treatment causes a huge number of tumor cells to burst open all at once, dumping potassium, phosphate, and uric acid into the blood faster than the kidneys can handle. The flood of phosphate can cause severe hyperphosphatemia, kidney failure, and dangerous heart rhythms. Rasburicase lowers uric acid quickly, which helps protect the kidneys so they can better clear the phosphate and other wastes.

Where this information comes from

- American Society of Nephrology
- National Kidney Foundation KDOQI guidelines
- UpToDate clinical reference
- New England Journal of Medicine

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