

Transfusion Reactions

A plain-English guide for you and your family

WHAT IS HAPPENING

When someone needs blood, a matched bag of red cells is supposed to quietly top up oxygen-carrying power without waking up the immune system. The donor plasma is mostly removed. The surface markers (antigens) on the donor red cells are compatible with the receiver's antibodies, so the immune system stays calm. Citrate in the bag keeps the blood from clotting. That is the normal job. When it breaks, the body reacts in one of several ways. Most dangerous: the receiver's immune system has antibodies that attack the donor red cells and blow them apart (hemolytic reaction) — the cells burst, spill hemoglobin into the blood, clog the kidneys, use up clotting factors, and cause shock. Another serious break: donor plasma has antibodies that attack the receiver's lung blood vessels, making fluid flood the air sacs within six hours (TRALI — transfusion-related acute lung injury). Or bacteria grew in the bag and now dump toxins into the bloodstream (septic reaction). Or leftover donor white cells release chemicals that trigger fever without killing red cells (febrile non-destroying red blood cells (hemolytic)). Or the receiver's immune system sees harmless donor proteins as invaders and makes hives or, rarely, full allergic shock (anaphylaxis). Or the bag simply adds too much volume too fast for a weak heart to pump (volume overload, also called TACO). Each type leaves clues: red blood cell destruction (hemolysis) shows back or flank pain, dark tea-colored urine, fever, low blood pressure, and bleeding from clotting failure (DIC). TRALI shows sudden shortness of breath, low oxygen, and white lung patches on X-ray within six hours of starting the transfusion. Septic reactions show spiking fever, shaking chills, and crashing blood pressure right away. Allergic reactions show itchy hives and swelling; anaphylaxis adds throat tightness, wheezing, and shock. Volume overload shows trouble breathing, jugular veins bulging in the neck, and leg swelling. None of this is random. The body is trying to restore oxygen delivery, close leaking vessels, fight infection, or pump out extra fluid — so every sign you see is the body's attempt to cope, not the disease itself. Trace it backward: normal transfusion tops up oxygen quietly, then an immune mismatch or contaminated bag breaks that plan, and the cascade you see at the bedside is the body buying time.

What you might feel

- Fever (temperature rises above 100.4°F / 38°C) during or right after the transfusion

- Pain in your back, sides, or chest
- Trouble breathing or breathing faster than usual
- Hives or itchy red welts on your skin
- Blood pressure drops suddenly (systolic falls below 90 or drops more than 30 points from baseline)
- Dark brown or cola-colored urine
- Chills and shaking (rigors)
- Nausea or vomiting
- Bleeding that won't stop or oozing from IV sites
- Confusion, restlessness, or feeling like something is very wrong

Call the doctor right away if...

- Blood pressure drops below 90 systolic or falls more than 30 points suddenly — sign of shock
- Trouble breathing, gasping, or oxygen saturation below 90% — may be fluid in the lungs (TRALI) or volume overload
- Dark brown or red urine during or right after transfusion — means red cells are bursting (hemolysis)
- Chest or back pain with fever — can mean acute destroying red blood cells (hemolytic) reaction, which can damage kidneys fast
- Bleeding that won't stop from gums, IV sites, or anywhere — may be DIC from massive cell destruction

What the care team will do

- Stop the transfusion immediately at the first sign of reaction and keep the IV line open with new normal saline tubing
- Keep the blood bag, all tubing, and attached labels and send them to the blood bank with a fresh patient blood sample
- Monitor vital signs every 5 to 15 minutes including blood pressure, heart rate, oxygen saturation, temperature, and respiratory rate
- Start or increase IV normal saline to keep urine output at least 1 milliliter per kilogram per hour (roughly 75 to 100 milliliters every hour for an average adult)

- Measure urine color and send first urine sample to lab for hemoglobin and test blood for signs of red blood cell destruction (hemolysis) including free hemoglobin, haptoglobin (a protein that binds loose hemoglobin), bilirubin (breakdown product), and direct Coombs test (shows antibodies stuck to red cells)
- Draw blood cultures from two different sites on the patient (not from the IV line) and notify provider to culture the blood bag if patient has fever above 38.5 degrees Celsius or rigors
- Prepare emergency medications at bedside: epinephrine 0.3 milligrams intramuscular for anaphylaxis, diphenhydramine (an antihistamine) 25 to 50 milligrams IV for allergic symptoms, and acetaminophen for fever after destroying red blood cells (hemolytic) and septic causes are ruled out
- Watch for fluid overload signs (crackles in lungs, neck vein swelling, new oxygen need) especially in patients with heart or kidney failure

Medicines you may be given — and why

Epinephrine (intramuscular, 0.3-0.5 mg for adults)

Epinephrine is the body's emergency hormone that quickly reverses life-threatening allergic reactions (anaphylaxis). It squeezes blood vessels tight to lift blood pressure, opens up the breathing tubes, and stops mast cells (the immune cells that explode and release histamine) from dumping more chemicals. Think of it as hitting the emergency brake and the gas pedal at once: it stops the allergic avalanche and restarts the organs.

Normal saline (0.9 % sodium chloride IV)

Normal saline is salt water that matches the salt level of your blood. When you pour it into a vein, it fills up the blood-vessel 'pipes' without shifting water in or out of cells. In destroying red blood cells (hemolytic) reactions (donor red cells bursting) and in anaphylaxis (blood vessels leaking), the circulation loses volume fast. Saline refills the tank so blood pressure stays up and kidneys get enough flow to wash out the red-cell debris (hemoglobin) before it clogs the kidney filters.

Acetaminophen (paracetamol, 650-1 000 mg by mouth or IV)

Acetaminophen lowers the brain's thermostat set-point and blocks pain signals. In feverish (febrile) non-destroying red blood cells (hemolytic) transfusion reactions (FNHTR), the patient's white-cell antibodies attack donor white cells, releasing cytokines (immune alarm chemicals) that tell the hypothalamus (the brain's temperature control center) to crank up body heat. Acetaminophen turns that alarm down, bringing fever and chills under control. It does NOT stop the immune reaction—it just makes the patient comfortable.

Diphenhydramine (25-50 mg IV or by mouth)

Diphenhydramine blocks histamine receptors (the docking ports for histamine, an itch-and-swallow chemical) on blood vessels and skin. In mild allergic transfusion reactions, mast cells release histamine, which makes vessels leak (hives, swelling) and itch. Diphenhydramine plugs the receptors so histamine cannot land and trigger those symptoms. It calms hives and itch but does NOT reverse severe reactions like anaphylaxis—epinephrine is still first for that.

Furosemide (20-40 mg IV) — used ONLY in TACO, NOT in TRALI

Furosemide tells the kidneys to dump salt and water into the urine by blocking the pump (the sodium-potassium-chloride cotransporter) in the loop of Henle (the kidney's recycling tube). In transfusion-associated circulatory overload (TACO), you gave blood faster than the heart could handle, so fluid backs up into the lungs. Furosemide pulls that extra fluid out through the kidneys, shrinking lung congestion and easing breathing. You do NOT use it in TRALI (lung injury from immune attack), because TRALI is NOT a fluid problem—dumping fluid makes TRALI worse.

Broad-spectrum antibiotics (e.g. vancomycin + ceftriaxone or piperacillin-tazobactam)

If bacteria contaminated the blood unit (septic transfusion reaction), they multiply in the patient's bloodstream and release endotoxin (a poison from bacterial walls) that triggers massive inflammation, fever, and shock. Broad-spectrum antibiotics kill the bacteria by breaking their cell walls (beta-lactams like ceftriaxone, piperacillin-tazobactam) or blocking their wall assembly (vancomycin). You start antibiotics immediately—within the first hour—because septic shock can kill fast, and you choose drugs that cover both Gram-positive (like *Staphylococcus*, common in platelet units stored at room temperature) and Gram-negative bacteria (like *Yersinia*, *Serratia*, which grow in refrigerated red cells).

Norepinephrine (0.05-2 mcg/kg/min IV infusion)

Norepinephrine is a powerful vessel-squeezing hormone that raises blood pressure when it has crashed. In severe destroying red blood cells (hemolytic) reactions, anaphylaxis, or septic transfusion reactions, blood vessels relax too much or leak, so blood pressure falls dangerously low and organs (brain, kidneys, heart) do not get enough blood flow. Norepinephrine binds alpha-1 receptors on vessel walls and clamps them tight, lifting pressure. It also nudges the heart to squeeze a bit harder (beta-1 effect). You give it through a central line or large IV because it is so strong that a small peripheral IV can cause tissue damage if it leaks out.

Supplemental oxygen (nasal cannula, high-flow, or mechanical ventilation)

Oxygen is the gas your red blood cells carry to feed every cell. In TRALI (transfusion-related acute lung injury), anaphylaxis, or severe TACO, the lungs fill with fluid or the airways close, so

oxygen cannot cross into the blood—your oxygen saturation (O₂ sat) drops. Giving extra oxygen through a mask, nasal prongs, or a breathing tube raises the amount available in the air sacs so more can push across into the bloodstream despite the damage. If that is not enough, a ventilator (breathing machine) can push air in under pressure to open collapsed sacs and hold them open. Oxygen does NOT fix the lung injury—it buys time while you treat the cause.

Where this information comes from

- AABB (American Association of Blood Banks) Technical Manual, 21st edition
- SHOT (Serious Hazards of Transfusion) Annual Report 2023
- FDA Blood Safety Guidance 2022
- American Red Cross Transfusion Medicine Guidelines

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