

Thyroid Storm

A plain-English guide for you and your family

WHAT IS HAPPENING

Your thyroid is a small butterfly-shaped gland in the front of your neck that makes hormones to control how fast your body burns energy. Normally, the pituitary (a pea-sized boss gland at the base of your brain) releases a messenger called TSH (thyroid-stimulating hormone) that tells your thyroid to make two hormones: T4 and T3. Your body's tissues then convert most of the T4 into T3, the active form that actually speeds up your heart, raises your temperature, and keeps your brain alert. T3 fits into tiny docking sites (receptors) on almost every cell, like a key in a lock, and tells that cell to burn fuel faster. A feedback loop keeps everything balanced: when hormone levels rise, the pituitary slows down TSH, and when levels drop, the pituitary speeds it back up. In thyroid storm, that balance shatters. A person who already has hyperthyroidism (an overactive thyroid making too much hormone) suddenly hits a trigger—like an infection, surgery, a bad car accident, a big dose of iodine (in contrast dye or certain medicines), or stopping their thyroid medicine cold. The trigger causes a massive flood of thyroid hormone to pour into the bloodstream all at once, far more than the body can handle. The heart races wildly because the hormone overstimulates every beat. The body temperature shoots up because cells are burning fuel so fast they give off heat like an engine revving too hard. The brain gets overstimulated and then starts to fail, causing confusion, agitation, or even unconsciousness. The heart, already exhausted from racing, cannot keep up and begins to fail, and fluid backs up into the lungs. Sweating, vomiting, and fast breathing drain the body's water and salt, dropping blood pressure. Every one of these problems is the body's desperate attempt to cope with the hormone flood, but without emergency treatment to block the hormone and cool the body down, the storm can be deadly within hours.

What you might feel

- Heart rate much faster than the fever would explain
- Agitation, confusion, or delirium
- Warm, flushed, sweaty skin
- Tremor (shaking hands or body)
- Irregular, racing heartbeat (often atrial fibrillation (an irregular, quivering heartbeat))

- New heart failure in a young person with a swollen thyroid (goiter)
- High fever (often 104–106 °F or higher)
- Nausea, vomiting, or diarrhea

Call the doctor right away if...

- High fever above 104 °F that does not respond to usual measures
- New confusion, delirium, or loss of consciousness (coma)
- Sudden trouble breathing or signs of fluid in the lungs (pulmonary swelling (edema))
- New irregular heartbeat or heart rate persistently above 140 even at rest
- Signs of heart failure (swollen legs, shortness of breath lying flat, inability to lie down without gasping)

What the care team will do

- Give propranolol (beta blocker heart medicine) as ordered to slow the heart rate below 100 beats per minute
- Start aggressive cooling with ice packs to the groin and armpits, cooling blankets, and cold IV fluids to bring temperature below 101°F
- Give antithyroid medicine (PTU or methimazole) first, then wait one full hour before giving iodine solution
- Give hydrocortisone (steroid medicine) as ordered every 6 to 8 hours
- Monitor heart rhythm continuously and watch for atrial fibrillation (an irregular, quivering heartbeat) or other arrhythmias on telemetry
- Give IV fluids at 200 to 300 mL per hour unless heart failure signs appear
- Recheck temperature, heart rate, blood pressure, and mental status every 15 to 30 minutes
- Do NOT use aspirin or NSAIDs like ibuprofen for fever; use only acetaminophen

Medicines you may be given — and why

Propranolol

Propranolol blocks beta receptors (docking spots) on the heart and blood vessels that thyroid hormone and adrenaline normally latch onto. This slows the racing heart, lowers blood pressure, and calms the shaking and sweating. At high doses, propranolol also blocks the enzyme (deiodinase) that clips T4 (the storage form of thyroid hormone) into T3 (the active form that cranks up the body's engine), so less active hormone reaches the cells.

Propylthiouracil (PTU)

PTU blocks thyroid peroxidase (the enzyme inside thyroid cells that glues iodine onto thyroglobulin to build T3 and T4), so the gland cannot make new thyroid hormone. PTU also blocks deiodinase (the enzyme in the liver, kidneys, and other tissues that clips T4 into active T3), which is especially helpful in thyroid storm. Because PTU stops both production and activation of thyroid hormone, it is preferred over methimazole in thyroid storm.

Methimazole

Methimazole blocks thyroid peroxidase (the enzyme that attaches iodine to thyroglobulin inside thyroid cells), stopping the gland from making new T3 and T4. Unlike PTU, methimazole does NOT block peripheral conversion of T4 to T3, so it is less preferred in thyroid storm. Methimazole is used when PTU is not available or not tolerated.

Saturated solution of potassium iodide (SSKI) or Lugol's iodine

High-dose iodine floods the thyroid gland and temporarily shuts down the release of stored thyroid hormone through the Wolff-Chaikoff effect (the gland's built-in brake when iodine is suddenly very high). It also blocks the enzyme that clips stored thyroglobulin into T3 and T4. This buys time while antithyroid drugs block new hormone production. Iodine must be given at least one hour AFTER PTU or methimazole, because if given first, the gland will use the iodine as raw material to make even more hormone before the antithyroid drug can block the machinery.

Hydrocortisone

Hydrocortisone blocks the deiodinase enzyme in the liver and other tissues, reducing conversion of T4 (the storage form) into T3 (the active form that revs up metabolism). It also supports the adrenal glands, which may be exhausted from the stress of thyroid storm and unable to make enough cortisol on their own (relative adrenal insufficiency). By replacing cortisol and damping down T3 production, hydrocortisone helps stabilize blood pressure and cool the metabolic fire.

Where this information comes from

- American Thyroid Association 2016 Guidelines for Hyperthyroidism and Thyrotoxicosis
- Burch-Wartofsky Point Scale for Thyroid Storm Diagnosis
- Endocrine Society Clinical Practice Guideline on Thyroid Dysfunction
- NEJM Clinical Practice Review on Thyroid Storm

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