

Stimulant Use and Intoxication

Stimulant intoxication means dopamine and norepinephrine surge out of control, pushing the body toward three deadly endings: heart attack, brain bleed, or organ shutdown from overheating.

THE ONE-LINE TRUTH

Cocaine, meth, or MDMA flood the brain with dopamine and norepinephrine—the heart races, blood pressure spikes, body heat soars, and thinking goes off the rails.

The chain — how it unfolds

1. Stimulant blocks or reverses the dopamine and norepinephrine transporters — why: Cocaine plugs the dopamine transporter (DAT) and norepinephrine transporter (NET) so the chemicals cannot be pumped back into storage. Amphetamines (meth, MDMA) go further—they reverse the pumps, forcing stored dopamine and norepinephrine to flood OUT into the space between brain cells. Either way, the synapse is flooded and the signal keeps firing without stopping.
2. Dopamine floods the nucleus accumbens and prefrontal cortex → euphoria, invincibility, then impaired judgment — why: The nucleus accumbens (the brain's reward hub) lights up far beyond any natural reward—the person feels intense pleasure, energy, and confidence. But the prefrontal cortex (the front of the brain that weighs risk and applies brakes) gets overwhelmed by the chemical storm and goes offline—impulse control, insight, and the ability to recognize danger all vanish. The person may believe they can fly, that everyone is plotting against them, or that they need to keep using no matter what.
3. Norepinephrine floods the body → heart races, blood pressure spikes, pupils dilate, body heat climbs — why: Norepinephrine hits alpha and beta receptors throughout the body like a stuck accelerator. The heart beats faster and harder (tachycardia, often 120–180 bpm), blood vessels clamp tight (vasoconstriction), so blood pressure can shoot to 180/110 or higher. Pupils blow wide open (mydriasis). Muscles twitch and burn fuel non-stop, and the hypothalamus (the brain's thermostat) is overridden—core temperature climbs toward 104°F (40°C) or beyond.

4. Vasoconstriction and demand mismatch → chest pain, heart attack, or aortic dissection — why: The coronary arteries (the vessels feeding the heart muscle) squeeze shut just when the heart is working hardest and needs the most oxygen. Even in a young person with no plaque, the mismatch can cause starved blood flow (ischemia) (not enough blood reaching the tissue to feed it) → chest pain, EKG changes, troponin leak, and sometimes full heart attack (myocardial infarction) (heart muscle dies). Cocaine is especially notorious for this. If blood pressure spikes above ~200 systolic, the aorta (the body's main artery) can tear along its inner lining—this is aortic dissection, a surgical emergency.
5. Hyperthermia (body overheats) → rhabdomyolysis, kidney failure, and multi-organ collapse — why: When core temperature stays above 104°F (40°C), proteins inside cells start to denature (unfold and stop working), cell membranes leak, and muscle cells break open (rhabdomyolysis). Myoglobin (the oxygen-carrier inside muscle) spills into the blood and clogs the kidney's filters, causing acute kidney injury. Meanwhile the clotting system goes haywire (DIC), the liver fails, and the brain swells. This is why untreated hyperthermia from stimulants can kill in hours.
6. Dopamine overload → hallucinations, delusions, paranoia, and agitation (stimulant psychosis) — why: Too much dopamine in the mesolimbic pathway (the circuit from the ventral tegmental area to the nucleus accumbens and prefrontal cortex) scrambles perception and thinking—the person sees, hears, or believes things that are not real (psychosis). Paranoid delusions ("everyone is after me") and aggressive, agitated behavior are common. Because the prefrontal cortex is offline, the person cannot reality-test or calm down, so they may become violent toward others or themselves.
7. Seizure from overstimulation of the brain's electrical system — why: The chemical flood (especially cocaine and meth) lowers the seizure threshold—the normal brakes on runaway electrical activity in the cortex (provided by GABA, the brain's main calming neurotransmitter) are overwhelmed by the excitatory storm. The brain misfires into a generalized tonic-clonic seizure (whole body shakes, person loses consciousness). Seizures burn even more energy, worsen hyperthermia, and can cause permanent brain injury if they do not stop (status epilepticus).
8. Dopamine crash and severe depression after the high ends — why: After hours of forced dopamine release, the brain's stores are empty and the receptors are exhausted or down-regulated (the brain turns down the volume to protect itself). Dopamine drops far below baseline, leaving the person in a deep pit: nothing feels good (anhedonia), energy is gone, thinking is slow and dark, and intense cravings for the drug spike because the brain remembers the shortcut to feeling normal. This crash is when suicide risk is highest, because the neurochemical safety net is gone and hopelessness floods in.

Spot it — what you see, and why

- **Racing heartbeat (tachycardia):** Stimulants like cocaine, methamphetamine, and ADHD medicines trigger the sympathetic nervous system (the body's 'gas pedal'), releasing norepinephrine (a chemical that speeds the heart) and making the heart pound faster, sometimes over 100 beats a minute at rest.
- **High blood pressure (hypertension):** The same sympathetic surge tightens blood vessels all over the body, so the heart has to pump harder against stiffer pipes, pushing pressure up and sometimes causing headache or nosebleeds.
- **Wide, large pupils (mydriasis):** Stimulants block the brake on the muscles that open the pupil, so even in bright light the black circle stays big and the person may look startled or wired.
- **Sweating and feeling too hot:** The drugs crank up metabolism (how fast the body burns fuel) and narrow skin blood vessels, trapping heat inside; sweat glands work overtime to cool the body down, but the person still feels overheated.
- **Restlessness, jitteriness, or agitation:** Extra dopamine (the brain's reward and 'go' signal) and norepinephrine flood the basal ganglia (the movement-control center) and limbic system (the emotion hub), so the person cannot sit still and may pace, fidget, or feel wound up inside.
- **Chest pain:** Stimulants tighten the coronary arteries (the small pipes feeding the heart muscle) and make the heart work harder at the same time, so part of the muscle may not get enough oxygen (ischemia), causing sharp or squeezing pain that can mimic a heart attack.

Red flags — act now

- Chest pain or pressure (may signal heart attack or torn aorta)
- Seizure or uncontrollable shaking
- Severe confusion, hallucinations, or violent agitation
- Temperature above 104°F (40°C) or muscle rigidity (risk of dangerous overheating)
- Sudden worst-ever headache or one-sided weakness (possible stroke or brain bleed)

Treat it — in this order

1. Benzodiazepines—lorazepam 2–4 mg IV or IM, or diazepam 5–10 mg IV, repeated every 10–15 minutes as needed → Benzodiazepines boost GABA (the brain's main brake chemical) in the amygdala (the alarm center) and motor cortex (movement control). This calms agitation, lowers blood pressure and heart rate, stops seizures, and brings down body temperature by quieting muscle overactivity. It breaks the cascade: agitation → high pressure → heart attack → seizure.
2. Active cooling—remove clothing, apply ice packs to groin/armpits/neck, spray with cool water and fan, or use a cooling blanket if core temperature is above 39°C (102°F) → Cooling pulls heat out of the body faster than it is being made. This prevents the proteins inside muscle cells from denaturing (unfolding and breaking), which stops rhabdomyolysis and protects the kidneys, heart, and brain from heat damage.
3. IV fluids (normal saline or lactated Ringer's) at 200–500 mL/hour, aiming for urine output above 200–300 mL/hour; add sodium bicarbonate (150 mEq in 1 liter D5W) if urine is dark or myoglobin-positive → High-volume fluids dilute myoglobin in the blood and flush it through the kidneys before it can crystallize and clog the tubules. Bicarbonate makes urine alkaline (pH above 6.5), which keeps myoglobin soluble. Together they prevent acute kidney failure.
4. Antipsychotic—haloperidol 5 mg IM or olanzapine 10 mg IM, only if psychosis (paranoia, hallucinations, delusions) persists after adequate benzodiazepine dosing → Antipsychotics block dopamine D2 receptors in the prefrontal cortex (the thinking center) and limbic system (fear and emotion center), which quiets false beliefs and stops hallucinations. This makes the person safer and less terrified.
5. Avoid beta-blockers (like metoprolol or propranolol) for high blood pressure or fast heart rate → Beta-blockers block only beta receptors (which open blood vessels). In stimulant intoxication, alpha receptors (which squeeze vessels) are still firing hard. Blocking beta leaves alpha unopposed, so vessels clamp down even tighter and blood pressure can paradoxically spike higher.

Your top priorities at the bedside

1. Place patient on continuous cardiac monitor and pulse oximeter; obtain baseline vital signs every 5–15 minutes until stable. — why: Stimulants trigger dangerous heart rhythms (ventricular a fast heart rate (tachycardia), ventricular fibrillation) and sudden cardiac arrest. Continuous monitoring catches lethal arrhythmias early so we can defibrillate immediately and save the patient's life.

2. Obtain IV access and prepare to give benzodiazepines—lorazepam 2–4 mg IV or diazepam 5–10 mg IV—immediately if the patient is agitated, has chest pain, or systolic blood pressure above 180 mmHg. — why: Benzodiazepines calm the overactive sympathetic nervous system (the fight-or-flight response), slow the heart, lower blood pressure, prevent seizures, and reduce the oxygen demand on the heart. They are the first-line treatment for almost every stimulant complication.
3. Measure core body temperature with a rectal or esophageal thermometer; if above 39°C (102°F), begin active cooling immediately—remove all clothing, apply ice packs to groin, armpits, and neck, and use evaporative cooling with a fan and water mist. — why: Hyperthermia (overheating) above 40°C (104°F) causes proteins in the body to denature (unfold and stop working), leading to multi-organ failure, brain damage, and death. Aggressive cooling within the first hour dramatically improves survival.