

Acetaminophen Overdose

A plain-English guide for you and your family

WHAT IS HAPPENING

Most acetaminophen leaves your body safely. Your liver processes it through two safe exits that attach small molecules to the drug so your kidneys can flush it out in urine. A tiny bit goes through a backup exit that makes NAPQI, a poison. Normally your liver makes glutathione, a cleanup molecule that grabs NAPQI and throws it away before it hurts anything. In overdose, the safe exits get jammed. The liver shoves more and more drug through the backup exit, making floods of NAPQI. Your glutathione runs out. NAPQI then sticks to liver cells and kills them. The first 24 hours you may feel fine or just throw up. Between 24 and 72 hours, you get pain in your right upper belly and blood tests show liver damage climbing. By 72 to 96 hours, massive liver failure appears: yellow skin, confusion from waste buildup, bleeding because your liver cannot make clotting proteins, and kidney shutdown. After day 4, you either start to heal—if enough liver survived—or you need an emergency liver transplant. The antidote, NAC, works best in the first 8 hours because it refills glutathione and stops NAPQI from killing more cells. Every hour counts.

What you might feel

- Nausea and vomiting (first 24 hours)
- Feeling tired, weak, and generally unwell (first 24 hours)
- Right-upper-belly pain and tenderness (24–72 hours)
- Yellowing of the skin and eyes (Jaundice)—yellow skin, yellow whites of the eyes, and yellow mucous membranes (48–96 hours)
- Confusion, sleepiness, flapping hand tremor when arms are held out, or coma (72–96 hours)
- Bleeding—from gums, easy bruising, tiny red spots on skin, blood in vomit or stool (72–96 hours)
- Little or no urine, rising creatinine (acute kidney injury, 72–96 hours)
- Low blood sugar—shakiness, confusion, sweating, or unresponsiveness (72–96 hours)
- Fast, deep breathing and acid buildup in blood (lactic too much acid in the blood (acidosis), 72–96 hours)

Call the doctor right away if...

- INR over 3.0 or climbing fast, especially with any bleeding (gums, bruises, or blood in vomit or stool)
- Confusion, sleepiness, flapping tremor, or hard to wake (hepatic encephalopathy—brain shutting down)
- Creatinine rising or urine output less than 0.5 mL per kg per hour (kidneys failing)
- Blood pH below 7.30 or lactate over 3.5 mmol/L on blood gas (severe lactic acidosis (acid from oxygen-starved tissues)—body turning dangerously acidic)
- Blood sugar below 60 mg/dL despite giving sugar by IV (liver can't make or release glucose)

What the care team will do

- Start the NAC intravenous infusion within 8 hours of the overdose if possible—150 milligrams per kilogram over 1 hour, then 50 milligrams per kilogram over 4 hours, then 100 milligrams per kilogram over 16 hours.
- Draw serum acetaminophen level at 4 hours after ingestion (or immediately if the patient arrives late), then check ALT (alanine aminotransferase, a liver enzyme), AST (aspartate aminotransferase, another liver enzyme), INR (international normalized ratio, a clotting test), creatinine (a kidney test), and bilirubin (a liver waste product).
- Monitor for anaphylactoid reactions (flushing, itching, hives, wheezing, low blood pressure) during the NAC loading dose, especially in the first 15 to 60 minutes.
- Assess mental status every 2 to 4 hours—can the patient say their name, the date, and where they are? Watch for flapping tremor (asterixis) when the patient holds arms out with wrists bent back.
- Check for signs of bleeding—gums, bruising, pinpoint bleeding spots (petechiae) (tiny red dots on skin), blood in vomit or stool—and review INR and platelet results every 12 to 24 hours if liver injury is present.
- Measure urine output every hour with a Foley catheter if the patient is critically ill; notify the provider if output drops below 0.5 milliliters per kilogram per hour for 2 hours in a row.
- Place the patient on continuous pulse oximetry and cardiac telemetry (heart-rhythm monitor); check a venous or arterial blood gas if the patient looks very sick, is breathing fast, or has a lactate over 3.5 or pH below 7.30.
- Keep the patient NPO (nothing by mouth) if there is confusion, vomiting, or INR over 2.0, and consult the transplant hepatology team early if any King's College Criteria appear—pH below 7.30, INR over 6.5, or creatinine over 3.4 with grade III or IV encephalopathy.

Medicines you may be given — and why

N-acetylcysteine (NAC)

Acetaminophen (the medicine in Tylenol) is safe at normal doses. Your liver breaks it down using safe paths. But if you take too much — more than 7.5 grams at once in an adult, or more than 150 milligrams for every kilogram you weigh in a child — your liver runs out of room on the safe roads and switches to a back road. That back road makes a poison called NAPQI (say 'NAP-kwee'). Think of NAPQI like a tiny hot coal. It burns holes in liver cells. Your liver keeps a fire extinguisher on hand called glutathione (a small molecule made from three building blocks). Glutathione grabs every piece of NAPQI and carries it safely out of your body. But when you overdose, you make so much NAPQI that you run out of glutathione. Now the hot coals pile up and liver cells start to die. NAC fixes three things. First, NAC gives your liver the main piece it needs to rebuild glutathione — it turns into cysteine, which is one of the three building blocks glutathione is made from. Second, when glutathione is still too low, NAC itself can grab NAPQI and carry it out. Third, NAC helps liver cells get more oxygen and calms down swelling inside the liver. Doctors give NAC through an IV into your vein using a three-bag plan: 150 milligrams per kilogram over 1 hour (the loading dose), then 50 milligrams per kilogram over the next 4 hours, then 100 milligrams per kilogram over 16 hours. That adds up to 21 hours total. You can also take NAC by mouth: 140 milligrams per kilogram as the first dose, then 70 milligrams per kilogram every 4 hours for 17 more doses (72 hours total). Start NAC if the acetaminophen level in the blood is above the treatment line on the Rumack-Matthew nomogram (a graph that shows if the level is dangerous based on how many hours have passed since swallowing the pills), or if the person comes in more than 24 hours after swallowing the pills, or if liver blood tests (ALT or AST) are rising. Keep giving NAC until the INR (a blood test that checks how well your blood can clot) drops below 2.0 and liver enzymes are falling. Activated charcoal (a black powder given by mouth or through a tube, 50 grams) can soak up acetaminophen pills still sitting in the stomach if you give it within 1 hour of the overdose, but once the drug is in the blood, charcoal cannot help — only NAC works then.

Where this information comes from

- American Association of Poison Control Centers (AAPCC)
- American College of Medical Toxicology (ACMT) acetaminophen guidance
- American Association for the Study of Liver Diseases (AASLD) 2017 acute liver failure guideline
- Rumack-Matthew nomogram (standard acetaminophen toxicity treatment tool)

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