

HIV · Human Immunodeficiency Virus

HIV is now a chronic disease you can live with for decades. Daily pills called ART (antiretroviral therapy) stop the virus from copying, drop it to undetectable levels, and keep your immune system strong. Undetectable equals untransmittable — you cannot pass the virus to others.

THE ONE-LINE TRUTH

HIV is a virus that gets inside CD4 cells — the white blood cells that direct your immune system — copies itself, and kills those cells one by one until your body can't fight off germs anymore.

The chain — how it unfolds

1. HIV enters the body through mucous membranes (vagina, rectum, mouth, tip of the penis) or blood (shared needles, transfusion, childbirth). — why: The virus crosses the mucous membrane barrier or is injected directly into the bloodstream. It immediately infects CD4 T cells and dendritic cells (scout cells) that carry it to the nearest lymph node.
2. Acute retroviral syndrome (first 2–4 weeks): fever, sore throat, rash, swollen lymph nodes, muscle aches. — why: The virus copies explosively in the lymph nodes, and billions of virus particles flood the bloodstream. Your immune system sounds the alarm — the hypothalamus (the brain's thermostat) raises your temperature to slow the virus, cytokines cause muscle aches and fatigue, and lymph nodes swell as they fill with activated immune cells trying to trap and kill the virus.
3. The symptoms fade after 2–4 weeks, and you feel fine again for years. — why: CD8 killer T cells and antibodies bring the viral load down from millions to a lower set point (usually 10,000–100,000 copies per mL). The virus hides in long-lived CD4 memory cells in lymph nodes and keeps copying slowly. You feel healthy, but the virus is quietly killing 1–2 billion CD4 cells every day.
4. CD4 count drops slowly over 8–10 years (untreated), falling about 50–100 cells per year. — why: Your bone marrow and lymph nodes make new CD4 cells to replace the ones dying, but over time the factories burn out from overwork. Chronic inflammation damages the bone marrow and the gut lining becomes leaky, letting bacterial toxins into the blood and driving more inflammation.

5. When CD4 drops below 200, opportunistic infections appear: PCP pneumonia (dry cough, shortness of breath), oral thrush, chronic diarrhea from *Cryptosporidium*, *Toxoplasma* brain abscesses (headache, confusion, seizures), CMV retinitis (floaters, vision loss). — why: With fewer than 200 CD4 cells, your immune system cannot recognize or fight off fungi, parasites, and viruses that live quietly in most people. These germs multiply unchecked and cause life-threatening infections.
6. ART stops the cascade: viral load drops to undetectable, CD4 count climbs back up, opportunistic infections stop, and lifespan normalizes. — why: The pills block reverse transcriptase or integrase, so the virus cannot copy its RNA into DNA or insert into your chromosomes. No new virus is made, so no new CD4 cells are killed. Your bone marrow rebuilds the CD4 population over 1–2 years, and your immune system works normally again.
7. Undetectable equals untransmittable (U=U). — why: When ART keeps the viral load below 200 copies/mL for at least 6 months, there is not enough virus in blood, semen, vaginal fluid, or rectal fluid to infect another person — even during condomless sex. This is proven by large studies (HPTN 052, PARTNER 1 and 2) with zero transmissions.
8. If ART is stopped or doses are missed, the virus rebounds within 2–4 weeks and CD4 cells start dying again. — why: The virus is still hiding in long-lived memory cells. When drug levels drop, the hidden virus wakes up, copies again, and the whole cascade restarts. That is why daily adherence (taking every dose on time) is critical.

Spot it — what you see, and why

- Fever and flu-like illness 2–4 weeks after exposure (acute retroviral syndrome): The immune system is fighting the virus as it multiplies quickly in the blood and lymph nodes (the body's germ-filtering stations). This big immune battle feels like the flu.
- Widespread rash (trunk, face, arms, legs): HIV triggers inflammation in small blood vessels in the skin, causing pink or red flat spots or bumps.
- Sore throat and painful mouth sores: The virus infects CD4 cells (white blood cells that direct the immune response) in the throat and mouth lining, causing swelling and breaks in the tissue.
- Swollen lymph nodes in the neck, armpits, or groin: The lymph nodes trap and try to destroy the virus, filling up with immune cells and swelling as a result.
- Night sweats and muscle aches: Cytokines (chemical messengers released during infection) reset the body's thermostat and make muscles ache, just like other viral infections.
- Diarrhea: HIV can infect immune cells in the gut lining, causing inflammation and loose, watery stools.

Red flags — act now

- Fever, rash, and sore throat 2–4 weeks after unprotected sex or needle sharing — do not dismiss as 'just a virus'; test for acute HIV with HIV RNA or combination antigen/antibody test.
- Sudden confusion, severe headache, or stiff neck in someone with HIV — may be meningitis or brain infection from the virus or an opportunistic germ.
- CD4 count below 200 or unusual infections (thrush in the mouth, pneumonia from *Pneumocystis*, vision changes) — signals AIDS and needs urgent treatment and infection prevention.

Treat it — in this order

1. Start antiretroviral therapy (ART) immediately—recommended regimen is an integrase inhibitor (bictegravir or dolutegravir) plus two nucleoside reverse transcriptase inhibitors (tenofovir alafenamide and emtricitabine) → ART blocks three steps in HIV's life cycle: reverse transcriptase (which copies HIV's RNA into DNA), integrase (which stitches that DNA into the cell's genome), and protease (which cuts new virus proteins into working pieces). Blocking these steps stops the virus from copying itself, so CD4 cells stop dying and the immune system can rebuild over months to years. Viral load drops to undetectable in 3 to 6 months in most people.
2. Give prevention (prophylaxis) for opportunistic infections when CD4 is below 200 cells per microliter—trimethoprim-sulfamethoxazole (one double-strength tablet daily) prevents *Pneumocystis pneumonia* and toxoplasmosis → When CD4 cells drop below 200, the immune system cannot fight off *Pneumocystis jirovecii* (a fungus in the lungs) or *Toxoplasma gondii* (a parasite that infects the brain). Prevention (Prophylaxis) kills these germs before they can take hold, preventing deadly pneumonia and brain abscesses. You can stop prevention once CD4 climbs back above 200 for at least 3 months on ART.
3. Screen for and treat hepatitis B and hepatitis C; vaccinate against hepatitis B if the person is negative → Treating hepatitis B with drugs that also work against HIV (tenofovir and emtricitabine) stops the virus from destroying liver cells. Treating hepatitis C with direct-acting antivirals cures it in 8 to 12 weeks, stopping liver scarring and cancer. Vaccinating people who are hepatitis B-negative protects them from future infection.
4. Prescribe post-exposure prevention (prophylaxis) (PEP) within 72 hours to anyone with recent high-risk exposure (needlestick, condomless sex with someone who has HIV, sexual assault) → PEP is a 28-day course of antiretroviral drugs (usually tenofovir, emtricitabine, and dolutegravir) started within 72 hours of exposure. It stops HIV from setting up permanent infection in the body by blocking the virus before it can copy itself and hide in cells. The earlier you start (ideally within hours), the better it works.

5. Offer pre-exposure prevention (prophylaxis) (PrEP) to HIV-negative people with ongoing high-risk behavior—daily tenofovir/emtricitabine or long-acting injectable cabotegravir every 2 months → PrEP keeps HIV out of the body before exposure happens. Daily pills reduce the risk of getting HIV from sex by over 99% and from injection drug use by over 74% when taken as prescribed. The injectable form works the same way but lasts 2 months per shot, so you do not have to remember daily pills.

Your top priorities at the bedside

1. Check vital signs and oxygen saturation every 4 hours and watch for fever above 100.4°F or oxygen below 92 percent — why: Fever and low oxygen mean possible opportunistic infection like PCP pneumonia (a fungal lung infection) or bacterial pneumonia; patients with CD4 below 200 cannot fight infections and can get very sick quickl
2. Give antiretroviral therapy (ART) at the same time every day and teach the patient never to skip doses — why: HIV copies itself millions of times each day; missing even one dose lets resistant virus (virus the medicine cannot kill) grow, and then the treatment stops working
3. Give trimethoprim-sulfamethoxazole prevention (prophylaxis) once daily if CD4 count is below 200 cells per microliter — why: This antibiotic prevents PCP pneumonia which kills patients with weak immune systems; PCP is the most common serious infection in people with advanced HIV