

Viral Hepatitis

Five different viruses (A, B, C, D, E) can attack the liver; some leave fast, others hide for years and slowly scar it.

THE ONE-LINE TRUTH

A virus sneaks into liver cells, your immune system fights back hard, and the battle makes you tired, yellow, and sick—but most people win and heal completely.

The chain — how it unfolds

1. Virus enters liver cells — why: Hepatitis A and E spread fecal-oral (contaminated food, water) and land in the gut, then hitch through the portal vein into hepatocytes. Hepatitis B, C, and D spread through blood or body fluids (needle-stick, sex, childbirth) and enter the bloodstream directly, docking onto hepatocyte surface receptors and injecting their genetic code inside.
2. Virus hijacks the cell and copies itself — why: Once inside, the virus uses the hepatocyte's ribosomes and enzymes to make thousands of new virus particles, which bud off to infect neighboring cells—this direct hijacking damages the cell's normal protein-making and detox machinery.
3. Immune system spots the invader and attacks — why: Infected hepatocytes display viral protein fragments on their surface (via MHC class I). Cytotoxic T cells (CD8+ T cells) recognize these flags and release perforin and granzymes to punch holes in the infected cell and trigger apoptosis (controlled cell death), killing the virus but also the hepatocyte.
4. Inflammation swells the liver; cytokines flood the body — why: Dying hepatocytes release damage signals (DAMPs); macrophages and natural killer cells rush in, releasing cytokines like TNF-alpha and interleukin-6, which cause fever, fatigue, muscle aches, and loss of appetite—the 'flu-like' early-warning phase (prodrome) of acute hepatitis—and swell the liver capsule, stretching it and causing right upper quadrant pain.
5. Bilirubin backs up, causing yellowing of the skin and eyes (jaundice) and dark urine — why: Damaged hepatocytes cannot conjugate bilirubin or pump it into bile, so both unconjugated (indirect) and conjugated (direct) bilirubin spill into blood. Unconjugated stains the skin and sclera yellow; conjugated is water-soluble, so kidneys filter it into urine, turning it dark brown or tea-colored.

6. Acute hepatitis resolves (A, E) or becomes chronic (B, C, D) — why: In hepatitis A and E, the immune system clears the virus completely in weeks to months, hepatocytes regenerate, and you're immune for life. In hepatitis B and C (and D, which needs B), the virus can evade immune surveillance—B integrates into hepatocyte DNA, C mutates rapidly—so the infection persists, the low-grade immune attack continues, and repeated rounds of cell death and repair lay down collagen scar tissue (fibrosis).
7. Chronic inflammation scars the liver into cirrhosis — why: Over 10–30 years, fibrosis bands harden into cirrhosis—thick scar walls choke blood flow through the portal vein, raising pressure (portal high blood pressure (hypertension)), which forces blood to detour through fragile veins in the esophagus (varices that can bleed) and belly (ascites fluid), and leaves too few working hepatocytes to clear toxins (encephalopathy) or prevent cancer (5% annual risk of hepatocellular carcinoma in cirrhosis).
8. Treatment or vaccination breaks the domino chain — why: Hepatitis A and B vaccines train your immune system to block the virus before it ever infects a cell. Direct-acting antiviral pills (sofosbuvir, ledipasvir, glecaprevir/pibrentasvir) cure >95% of hepatitis C by stopping viral replication, letting the immune system mop up leftovers. Nucleos(t)ide analogs (tenofovir, entecavir) suppress hepatitis B replication for life, halting fibrosis and dropping cancer risk. Caught early, even significant fibrosis can partially reverse when the virus is gone.

Spot it — what you see, and why

- Feeling tired all the time, even after rest: The liver is working overtime to fight the virus and clear damaged cells, so less energy is left for the rest of the body. Also, the liver makes less glycogen (stored sugar fuel), leaving muscles low on power.
- Yellow skin and eyes (jaundice): The damaged liver cannot properly process bilirubin (a yellow waste product from broken-down red blood cells), so it builds up in the blood and spills into the skin and whites of the eyes.
- Dark urine, like cola or strong tea: Excess bilirubin in the blood gets filtered by the kidneys and dumped into the urine, turning it dark brown or amber.
- Pale or clay-colored stools: The liver is not releasing enough bile (which contains bilirubin) into the intestines, so the stool loses its normal brown color.
- Nausea, loss of appetite, or feeling sick to the stomach: Inflammation in the liver releases inflammatory signals (cytokines) that travel to the brain's vomiting center (the area postrema in the brainstem) and slow down digestion.
- Pain or tenderness in the upper right belly, just below the ribs: The liver is swelling because it is inflamed and filled with immune cells fighting the virus. The liver's capsule (the thin outer wrapping) stretches and triggers pain nerves.

Red flags — act now

- Confusion, extreme sleepiness, or slurred speech (sign the liver is failing and toxins are reaching the brain)
- Vomiting blood or black, tarry stools (sign of bleeding from swollen veins in the esophagus or stomach)
- Severe belly pain with rapid swelling (could mean infection of fluid in the belly, called spontaneous bacterial peritonitis)
- Trouble breathing or very fast heart rate with yellowing of the skin and eyes (jaundice) (sign of liver failure affecting the whole body)
- New bruising, nosebleeds, or bleeding gums without injury (sign clotting factors are dangerously low)

Treat it — in this order

1. Supportive care: rest, hydration, nutrition, and serial liver function tests every few days to weeks → Keeps the body strong and hydrated while the immune system fights and clears the virus; monitoring ALT, AST, bilirubin, and INR tells you if the liver is recovering or failing.
2. Hepatitis A vaccine and hepatitis B vaccine for unvaccinated close contacts within 2 weeks of exposure → Trains the immune system to recognize and block hepatitis A or B virus before infection takes hold, preventing illness in exposed people.
3. Hepatitis B immune globulin (HBIG) within 24 hours of exposure (e.g., needle stick, newborn of HBsAg-positive mother) → Gives ready-made antibodies that neutralize hepatitis B virus immediately, before the person's immune system can make its own, preventing or reducing infection.
4. Antiviral therapy for chronic hepatitis B: entecavir or tenofovir daily, often for years or lifelong → Blocks the reverse transcriptase enzyme (the tool HBV uses to copy its DNA inside liver cells), stopping viral replication and reducing inflammation and scarring; lowers risk of cirrhosis and liver cancer.
5. Direct-acting antivirals for hepatitis C: sofosbuvir/velpatasvir or glecaprevir/pibrentasvir for 8–12 weeks → Blocks the proteins HCV needs to copy itself (NS5A, NS5B polymerase), stopping viral replication completely and curing > 95% of people (undetectable HCV RNA 12 weeks after finishing treatment = sustained virologic response = cure).

Your top priorities at the bedside

1. Monitor for signs of hepatic encephalopathy every 4 to 6 hours: check orientation to person, place, and time; look for hand flapping tremor called asterixis; ask family if personality changed — why: The liver normally removes ammonia (a toxin) from blood. When the liver fails, ammonia builds up in the brain causing confusion, coma, and death. Early detection allows treatment with lactulose (a laxative that removes ammonia through stool) before brain damage occurs.
2. Check for bleeding every shift: inspect skin for new bruises or pinpoint bleeding spots (petechiae) (tiny red dots), test stool for blood, watch IV sites for oozing, measure any vomit or stool blood loss — why: The liver makes clotting factors (proteins that stop bleeding). A damaged liver cannot make enough, so patients bleed easily. The international normalized ratio or INR (a blood test measuring clotting) rises above 1.5 when the liver is failing. Portal high blood pressure (hypertension) also causes varices in the esophagus (food tube) that can bleed massively.
3. Give IV fluids at ordered rate if patient is vomiting or cannot drink, and measure urine output every hour; notify provider if urine drops below 30 milliliters per hour — why: Viral hepatitis causes nausea and vomiting, leading to dehydration (low body water). The kidneys need good blood flow to work. Dehydration plus liver failure can cause hepatorenal syndrome (kidney failure from liver disease). Maintaining hydration protects the kidneys and helps the liver heal.