

Neonatal Sepsis

A newborn with an infection that can turn deadly fast because the baby's immune system is brand new and cannot fight germs yet.

THE STORY IN ONE SENTENCE

A newborn with an infection that can turn deadly fast because the baby's immune system is brand new and cannot fight germs yet.

“Newborn infection is a race against time — broad antibiotics within one hour can save the baby's life, and most babies caught early do well.”

Normal anatomy — the body's job

A newborn's immune system is brand new and still learning to recognize and fight germs. For the first weeks, the baby depends on antibodies passed from mom during pregnancy (mainly IgG antibodies that crossed the placenta) and on physical barriers like intact skin, mucous membranes in the nose and throat, and stomach acid to keep bacteria and viruses out.

BODY'S JOB

The immune system's job is to tell the difference between the baby's own cells and foreign invaders (bacteria, viruses, fungi), then destroy the invaders without harming the baby. White blood cells called neutrophils eat bacteria, and antibodies tag germs so other immune cells can find and kill them. In a newborn, neutrophils are fewer in number and slower to respond, and the baby has not yet made many of its own antibodies — so the baby relies heavily on mom's antibodies and on keeping germs out in the first place.

1. Mom's IgG antibodies cross the placenta in the third trimester and coat the baby's blood, ready to tag any germs that slip in.
2. The baby's skin and mucous membranes form a tight wall that blocks most bacteria and viruses from entering the body.
3. If a germ gets through a cut, the umbilical stump, or the birth canal, white blood cells (neutrophils and monocytes) in the baby's blood are supposed to recognize it, swarm to the spot, and eat it.

4. At the same time, proteins in the blood called complement help punch holes in bacteria, and the baby's tiny thymus (a small gland behind the breastbone) is training T-cells to remember germs for the future.
5. Because all these systems are immature, even a small number of bacteria can multiply faster than the baby's immune system can clear them, leading to infection spreading into the bloodstream (sepsis).

What breaks

The baby's immune defenses are too weak or too slow to stop bacteria from multiplying and spreading into the blood. Early-onset sepsis (in the first 72 hours of life) usually comes from germs the baby picks up from mom's birth canal during delivery — most commonly Group B Streptococcus (GBS), *E. coli*, or *Listeria*. Late-onset sepsis (after 72 hours) comes from germs in the hospital environment or at home, such as coagulase-negative staph, *Staphylococcus aureus* (including MRSA), *E. coli*, *Klebsiella*, or *Candida* (a yeast). Once bacteria enter the blood, they release toxins that trigger a massive inflammatory response. The baby's blood vessels leak fluid, blood pressure drops, and organs (brain, lungs, kidneys, liver) do not get enough oxygen and nutrients. The infection can spread to the fluid around the brain and spinal cord (meningitis), the lungs (pneumonia), or the bones and joints.

CLINICAL TERM

Neonatal sepsis is bloodstream infection in the first 28 days of life caused by bacterial (or occasionally fungal) invasion that overwhelms the immature neonatal immune system. Early-onset sepsis (≤ 72 hours) is typically vertically transmitted (GBS, *E. coli*, *Listeria monocytogenes*); late-onset sepsis (> 72 hours) is often nosocomial or community-acquired (coagulase-negative staphylococci, *S. aureus*, Gram-negatives, *Candida*). The pathogen triggers systemic inflammatory response syndrome (SIRS), leading to capillary leak, distributive shock, disseminated intravascular coagulation (DIC), and multiorgan dysfunction.

How the body compensates

A newborn's body tries to keep blood pressure, oxygen, and glucose steady even as infection spreads. Early on, the baby may look almost normal — only subtle signs like poor feeding, floppy tone, or slight temperature instability appear. This is the dangerous window, because the baby can look deceptively stable while the infection is racing ahead. The crash point comes

suddenly when the body's compensations fail and septic shock, meningitis, or DIC sets in. Once shock develops, the window to reverse it narrows fast.

1. {'what': 'Increased heart rate and respiratory rate', 'whyItMatters': "The baby's heart beats faster (tachycardia >160 bpm) to pump more blood per minute and keep blood pressure up. Breathing speeds up (tachypnea >60 breaths/min) to blow off carbon dioxide and bring in more oxygen. These are the body's first moves to maintain oxygen delivery to the brain and heart."}
2. {'what': 'Peripheral vasoconstriction (cool, mottled skin)', 'whyItMatters': "Blood vessels in the skin, arms, and legs clamp down to shunt blood toward the core organs (brain, heart, kidneys). The baby's hands and feet feel cold, and the skin looks pale or has a lacy, mottled pattern (livedo reticularis). Capillary refill (the time it takes for color to return after pressing on the skin) slows to >3 seconds."}
3. {'what': 'Behavioral changes (lethargy, irritability, poor feeding)', 'whyItMatters': "The baby becomes very sleepy (lethargic) or floppy (hypotonic) because the brain is not getting enough oxygen and glucose, or because inflammatory signals (cytokines) are affecting brain function. The baby may also be fussy or hard to console. Poor feeding happens because the baby does not have the energy to suck and swallow, and because blood is being diverted away from the gut.'}
4. {'what': 'Temperature instability (fever or hypothermia)', 'whyItMatters': "Cytokines released during infection reset the hypothalamus (the brain's thermostat) to a higher set-point, causing fever (>38°C or 100.4°F). But newborns, especially preemies, often cannot generate enough heat and instead become hypothermic (<36.5°C or 97.7°F), which is a red flag for severe infection."}
5. {'what': 'Increased glucose consumption and impaired glucose production', 'whyItMatters': "The baby's cells burn through glucose (blood sugar) rapidly during infection. At the same time, the immature liver cannot make new glucose fast enough (poor gluconeogenesis). Blood sugar drops (hypoglycemia <40–45 mg/dL), leading to jitteriness, seizures, or further lethargy."}
6. {'what': 'Deceptively stable vital signs in early compensated sepsis', 'whyItMatters': "For hours, the baby's blood pressure may stay in the normal range because the heart is beating fast and blood vessels are clamped down. This is the dangerous middle — the baby looks 'stable,' but is actually on the edge of decompensation. The team must recognize the subtle signs (poor feeding, mottling, lethargy) and treat immediately, because once blood pressure drops (hypotension), the baby has tipped into septic shock and the risk of death or permanent brain damage rises sharply."}

7. {'what': 'Crash point: septic shock, meningitis, DIC', 'whyItMatters': 'When compensations fail, blood pressure drops, organs shut down (acute kidney injury, liver failure), the baby stops breathing (apnea) or needs a ventilator, and bleeding or clotting problems (DIC) appear. Meningitis can cause seizures, hearing loss, and long-term developmental delays. Once shock sets in, even with aggressive treatment in the NICU, mortality is 10–20 % for early-onset sepsis and higher for late-onset sepsis or meningitis.'}

Domino effect

1. Bacteria enter the baby's bloodstream during birth (from mom's birth canal) or after birth (through the umbilical stump, skin, or medical devices like IV lines or breathing tubes). — The baby's immune system is brand new. Neutrophils (the white blood cells that eat bacteria) are fewer and slower, and the baby has not yet made antibodies against most germs. If mom did not pass enough protective antibodies through the placenta (for example, if she was not screened or treated for Group B Strep), the baby has almost no defense. Bacteria multiply quickly in the blood because nothing is stopping them.
2. The bacteria release toxins (endotoxin from Gram-negative bacteria like *E. coli*, or exotoxins from Gram-positive bacteria like Group B Strep) into the baby's bloodstream. — These toxins are recognized by the baby's immune cells (macrophages and endothelial cells lining blood vessels). The immune cells release inflammatory signals called cytokines — especially tumor tissue death (necrosis) factor-alpha (TNF- α), interleukin-1 (IL-1), and interleukin-6 (IL-6) — trying to sound the alarm and recruit more defenses. But in a newborn, this response is clumsy and overshoots, causing widespread inflammation instead of staying local.
3. Cytokines make blood vessels leaky (capillary leak) and cause blood pressure to drop (distributive shock). — TNF- α and IL-1 tell the endothelial cells lining blood vessels to loosen their tight junctions. Fluid (plasma) leaks out of the blood into the surrounding tissues, so the baby's blood volume drops and blood pressure falls. At the same time, blood vessels dilate (widen) instead of staying firm, which also lowers blood pressure. The baby's heart tries to compensate by beating faster, but eventually cannot keep up.

4. Organs do not get enough oxygen and nutrients (multiorgan dysfunction). The baby becomes lethargic, stops feeding, breathes fast or grunts, has low blood sugar (hypoglycemia), and may have seizures or pauses in breathing (apnea) (stop breathing). — With low blood pressure and leaky vessels, oxygen-rich blood cannot reach the brain, kidneys, liver, and gut. The brain becomes sluggish (lethargy, poor tone, seizures if severe). The liver cannot make new glucose, and the baby's cells are burning glucose rapidly to fight infection, so blood sugar drops. The kidneys make less urine (oliguria). The gut lining is starved of oxygen, so the baby cannot digest food and stops feeding. The lungs may fill with fluid (pulmonary swelling (edema)) or become stiff (acute respiratory distress syndrome, ARDS), making it hard to breathe — the baby breathes fast (tachypnea), grunts with each breath (to keep the lungs open), or stops breathing altogether (apnea).
5. The baby's temperature becomes unstable — either too high (fever $>38^{\circ}\text{C}$) or too low (hypothermia $<36.5^{\circ}\text{C}$). — Cytokines (especially IL-1 and IL-6) reset the hypothalamus (the brain's thermostat) to a higher set-point, causing fever. Fever helps the immune system fight infection but uses a lot of energy. Newborns, especially premature babies, have very little body fat and a large surface area relative to their weight, so they lose heat easily. If the baby cannot generate enough heat, body temperature drops (hypothermia), which is a sign of severe, life-threatening sepsis.
6. The blood clotting system goes haywire (disseminated intravascular coagulation, DIC). Tiny clots form throughout the body, using up platelets and clotting factors, and then the baby bleeds easily. — Bacterial toxins and cytokines activate the clotting cascade everywhere at once. Clots form in tiny blood vessels (capillaries) in the kidneys, lungs, brain, and skin, blocking blood flow and causing organ damage. Because platelets and clotting factors (like fibrinogen) are used up making all these clots, the baby's blood cannot clot normally. Bleeding appears — pinpoint bleeding spots (petechiae) (tiny red spots) or purple bleeding blotches (purpura) (larger bruises) on the skin, oozing from IV sites, or life-threatening bleeding in the brain (intraventricular bleeding (hemorrhage)) or lungs.
7. If bacteria reach the fluid around the brain and spinal cord (cerebrospinal fluid, CSF), the baby develops meningitis. Signs include a bulging soft spot (fontanelle), high-pitched cry, seizures, and worsening lethargy. — The blood-brain barrier in newborns is more permeable than in older children, so bacteria can cross into the CSF more easily. Once in the CSF, bacteria multiply and trigger inflammation in the meninges (the membranes covering the brain and spinal cord). The inflammation increases pressure inside the skull (because the brain swells and CSF production rises), which causes the soft spot to bulge. The inflamed brain is irritable (seizures, high-pitched cry) and does not function normally (deep lethargy, coma). Even with treatment, meningitis can cause permanent hearing loss (because the cochlear nerve is damaged), developmental delays, cerebral palsy, or hydrocephalus (fluid buildup in the brain).

8. Without fast treatment, the baby progresses to septic shock (blood pressure so low that organs shut down), then multiorgan failure, and death. — Once blood pressure drops below the level needed to perfuse vital organs (hypotensive shock), the kidneys stop making urine (acute kidney injury), the liver cannot clear toxins (jaundice worsens, lactate builds up), the heart muscle weakens (myocardial dysfunction), and the brain suffers irreversible damage from lack of oxygen (hypoxic-blood-starved (ischemic) encephalopathy). Even with IV fluids, vasopressors (medicines to raise blood pressure), mechanical ventilation, and antibiotics, mortality in septic shock is high. Early recognition and treatment — ideally starting antibiotics within one hour of recognizing sepsis — is the only way to stop this cascade before it becomes irreversible.

Symptoms · what the patient feels, and why

- Temperature instability — baby is too hot (fever over 100.4°F) or too cold (under 97.7°F): When bacteria or viruses invade a newborn's blood, the hypothalamus (the brain's temperature dial) gets confused by infection signals and can't hold a steady temperature, so the baby swings too hot or too cold.
- Poor feeding or won't suck: The infection uses up the baby's energy and makes the baby feel too tired and sick to eat; also, low blood sugar from fighting the infection dulls hunger.
- Breathing fast (over 60 breaths per minute) or grunting with each breath: Bacteria in the blood can spill into the lungs (pneumonia) or trigger inflammation that stiffens the lungs, so the baby has to work harder and breathe faster to pull in enough oxygen.
- Floppy or limp body (low muscle tone): The infection releases toxins that slow down signals in the nervous system, and low blood pressure from sepsis means less oxygen reaches the muscles, making the baby weak and floppy.
- Irritability or high-pitched cry: Bacteria or their toxins can irritate the meninges (the protective wrapping around the brain and spinal cord), causing pain and making the baby unusually fussy or cry in a shrill way.
- Skin looks pale, mottled (blotchy), or has a blue-gray tint: In sepsis, blood vessels leak and clamp down unevenly, so blood doesn't flow smoothly to the skin; also, low oxygen in the blood makes the skin look dusky or patchy.
- Vomiting or belly swelling: Infection can inflame the gut or slow the bowel's movement (ileus), so milk backs up and the baby vomits or the belly puffs out with trapped gas and fluid.
- Yellowing of the skin and eyes (Jaundice) (yellow skin and eyes) that appears in the first 24 hours or gets worse fast: Bacteria break open red blood cells faster than normal (hemolysis) and overwhelm the newborn liver's ability to clear bilirubin (the yellow pigment from old red cells), so it builds up in the skin.

- Seizures (jerking movements, staring spells, or cycling motions with the arms and legs): Bacteria or toxins in the cerebrospinal fluid (the cushion around the brain) irritate the cortex (the brain's outer layer that controls movement), causing abnormal electrical bursts that show up as seizures.
- Low blood sugar (glucose under 40 mg/dL): The baby's small glucose stores burn up fast fighting the infection, and the sick liver can't make new glucose quickly enough, so blood sugar drops and the baby becomes weak or jittery.

Focused exam

- Temperature unstable—fever (over 100.4°F or 38°C) or too cold (under 97.7°F or 36.5°C): The hypothalamus (the brain's temperature dial) loses control when infection floods the baby's blood with inflammatory signals like interleukins (molecules that tell cells there is danger). A newborn's body cannot regulate heat the way an older child's can, so fever or cold means the infection is overwhelming the system.
- Poor feeding, weak suck, or refuses to eat: Infection drains the baby's energy supply (ATP, the fuel every cell runs on) and shifts blood flow away from the gut to the heart and brain. When a normally hungry newborn stops eating, it means the body is using every calorie to fight the invader, not to grow.
- Lethargy—baby is too sleepy, floppy, or hard to wake: The brain needs constant oxygen and glucose (blood sugar). In sepsis, low blood pressure and poor oxygen delivery starve the cortex (the thinking layer of the brain), making the baby less responsive. This is a red flag that the infection is affecting the central nervous system.
- Respiratory distress—fast breathing (over 60 breaths per minute), grunting, or flaring nostrils: The lungs try to pull in more oxygen because sepsis damages the tiny air sacs (alveoli) and makes blood acidic. Grunting (a sound on every breath out) is the baby's way of keeping the lungs partly open when they are stiff. Fast breathing means the body is working overtime to survive.
- Yellowing of the skin and eyes (Jaundice)—yellow skin or eyes, especially in the first 24 hours: Sepsis breaks red blood cells (hemolysis) and overloads the liver, which cannot clear bilirubin (the yellow breakdown product) fast enough. Early yellowing of the skin and eyes (jaundice) (in the first day of life) is not normal and suggests serious infection, not the gentle yellowing of the skin and eyes many healthy babies get after day two.
- Seizures, jitteriness, or tremors: Low blood sugar (under 40 mg/dL), low oxygen, or bacteria invading the brain (meningitis) cause neurons (brain cells) to misfire. Shaking or seizures mean the brain is starving or under attack, and permanent damage can happen within hours.

Diagnostics · every test answers a question

- Complete blood count (CBC) with differential → Is the immune system fighting an infection, and is the baby making enough white blood cells to win?
- C-reactive protein (CRP) → How much inflammation is happening right now?
- Blood culture (aerobic and anaerobic bottles) → What bacteria is in the bloodstream, and which antibiotic will kill it?
- Lumbar puncture (spinal tap) with cerebrospinal fluid (CSF) culture, cell count, protein, and glucose → Has the infection reached the brain and spinal cord (meningitis)?
- Procalcitonin (PCT) → Is this bacterial sepsis, or could it be something else (like a virus or just stress)?
- Blood glucose (fingerstick or lab) → Does the baby have enough fuel for the brain and heart?
- Chest X-ray → Is there pneumonia (lung infection) as part of the sepsis?
- Urine culture (if baby is over 72 hours old or late-onset sepsis) → Is the urinary tract the source of the infection?

Treatment logic

- IV ampicillin + gentamicin (early-onset sepsis, under 72 hours) or IV vancomycin + gentamicin (late-onset sepsis, over 72 hours) → Ampicillin kills Group B Streptococcus (GBS), Listeria, and Enterococcus by breaking down their cell walls. Gentamicin (an aminoglycoside) stops E. coli and Klebsiella from making proteins they need to survive. Vancomycin is used late because hospital germs are often methicillin-resistant Staph aureus (MRSA). Together they cover the most likely bacteria while you wait for the culture.
- IV fluids with dextrose (sugar), usually D10W (10% dextrose in water) at 60–80 mL/kg/day → Delivers glucose directly into the bloodstream when the baby cannot eat. The brain uses 5 grams of glucose per kilogram per day, and without it, neurons die. IV fluids also keep blood volume up so blood pressure does not crash.
- Supplemental oxygen or mechanical ventilation (CPAP, intubation with a ventilator) → Oxygen raises the amount of O₂ dissolved in blood (measured as SpO₂, kept above 90–95%). CPAP (continuous positive airway pressure) holds the alveoli (air sacs) open so they do not collapse. A ventilator breathes for the baby when the diaphragm (breathing muscle) is too tired or the brain is too sick to send breathing signals.

- IV acyclovir (60 mg/kg/day divided every 8 hours) if herpes simplex virus (HSV) is suspected → Acyclovir stops herpes virus from copying its DNA, so it cannot spread to the brain, liver, and lungs. Herpes in newborns (caught from mom's genital herpes during birth) is deadly without treatment and looks like bacterial sepsis—blisters on the skin, seizures, lethargy. If there is any suspicion (mom with herpes history, vesicles on the baby, CSF with high red cells), start acyclovir while waiting for the HSV PCR test.
- Fluid bolus (10–20 mL/kg normal saline IV push) and vasopressors (dopamine 5–20 mcg/kg/min or epinephrine) if blood pressure is low → A bolus of saline fills the blood vessels quickly, raising blood pressure by increasing volume. Dopamine and epinephrine (catecholamines) squeeze blood vessels (vasoconstriction) and make the heart pump harder, pushing blood to the brain, kidneys, and heart. In septic shock, vessels leak and widen (vasodilation) because bacterial toxins (like endotoxin from Gram-negative bacteria) damage the lining, so you need pressure support to keep organs alive.
- Lumbar puncture before or within 24–48 hours of starting antibiotics → Tells you whether bacteria crossed the blood-brain barrier into the CSF (meningitis). If meningitis is present, treatment lengthens to 14 days (Gram-positive like GBS) or 21 days (Gram-negative like E. coli) because the brain clears infection slowly. Doing the LP early (before antibiotics sterilize the CSF) gives you the best chance of growing the germ.
- Narrow antibiotics once culture and sensitivity results return (antibiotic stewardship) → Switching from broad-spectrum (covers many germs) to narrow-spectrum (targets the one germ identified) reduces side effects (like gentamicin damage to kidneys and ears), lowers the risk of creating resistant superbugs, and is safer for the baby's developing gut microbiome (healthy bacteria). For example, if the culture grows GBS sensitive to penicillin, you stop gentamicin and give penicillin alone.

Medications

Ampicillin · Penicillin antibiotic

Ampicillin punches holes in the outer wall that bacteria need to survive. Without a strong wall, the bacteria burst and die. It works especially well against Group B Streptococcus (GBS, the most common germ passed from mom during birth) and Listeria (a germ that can cross the placenta before birth). It also covers many strains of E. coli, though some are now resistant.

1. Ampicillin sneaks into the bacteria and blocks the enzymes (proteins that build things) that link together pieces of the cell wall.
2. Without those links, the wall becomes weak and full of gaps.
3. Water rushes into the bacteria through the gaps, the pressure builds, and the bacteria explode and die.

SAFETY WATCH

Watch for allergic reactions: rash, swelling of the face or tongue, trouble breathing (rare but serious, especially if the baby has a penicillin allergy in the family). · Check kidney function because the drug is cleared by the kidneys; premature babies have immature kidneys and may need dose adjustments. · Monitor for diarrhea or changes in stool, which can signal that the medicine is also killing good gut bacteria.

Gentamicin · Aminoglycoside antibiotic

Gentamicin slips inside bacteria and jams up the ribosome (the factory inside the germ that reads genetic instructions and makes proteins). Without working proteins, the bacteria cannot grow, repair themselves, or survive. It is especially strong against Gram-negative bacteria like *E. coli*, *Klebsiella*, and *Enterobacter*, which are common causes of early-onset and late-onset neonatal sepsis.

1. Gentamicin crosses into the bacteria and locks onto the 30S subunit of the ribosome.
2. When the ribosome tries to read the genetic code (mRNA), gentamicin causes it to read the code wrong and make broken, useless proteins.
3. The bacteria fill up with junk proteins, cannot carry out life functions, and die.

SAFETY WATCH

Monitor kidney function closely with blood tests (creatinine and urine output) because gentamicin can damage the filtering tubes in the kidneys, especially in premature or dehydrated babies. · Check hearing if treatment lasts more than a few days, because gentamicin can harm the inner ear and cause permanent hearing loss. · Measure drug levels in the blood (peak and trough) to keep the dose high enough to kill germs but low enough to avoid toxicity; newborns clear the drug slowly and dosing is weight-based and interval-adjusted.

Vancomycin · Glycopeptide antibiotic

Vancomycin blocks bacteria from building their cell wall by grabbing onto the building blocks (peptides) before they can be glued together. It is the first-choice drug for methicillin-resistant *Staphylococcus aureus* (MRSA) and coagulase-negative Staph (common in babies with central lines or who have been in the NICU for days to weeks). It also covers *Enterococcus* and *Streptococcus* species.

1. Vancomycin binds tightly to the D-alanyl-D-alanine tail on the peptide building blocks of the cell wall.
2. This prevents the enzyme (transglycosylase and transpeptidase) from linking the blocks into a strong wall.

3. The bacteria cannot finish building their outer shell, the wall becomes weak, and the bacteria lyse (break apart) and die.

SAFETY WATCH

Monitor kidney function (creatinine, urine output) because vancomycin can harm the kidneys, especially when combined with gentamicin or in dehydrated babies. · Watch for Red Man Syndrome: flushing, red rash on the face and upper body, low blood pressure, and itching during or right after the infusion; this is NOT a true allergy but a histamine reaction from infusing the drug too fast. Slow the infusion rate to prevent it. · Check vancomycin trough levels in the blood before the next dose to keep levels in the safe and effective range; too high increases kidney and ear toxicity.

Cefotaxime · Third-generation cephalosporin antibiotic

Cefotaxime, like ampicillin, attacks the bacterial cell wall, but it is stronger against Gram-negative bacteria like *E. coli*, *Klebsiella*, and *Enterobacter*. It also crosses into the brain and cerebrospinal fluid well, making it a good choice when meningitis is suspected. It is often used instead of gentamicin in babies with meningitis or when kidney toxicity is a concern.

1. Cefotaxime binds to penicillin-binding proteins (PBPs) on the inside of the bacterial cell wall.
2. This stops the cross-linking step that makes the wall strong and rigid.
3. The wall becomes weak, water floods in, and the bacteria burst and die.

SAFETY WATCH

Watch for allergic reactions, especially in babies with a family history of penicillin or cephalosporin allergy (cross-reactivity is possible but uncommon). · Monitor liver function tests (bilirubin, ALT, AST) because cefotaxime can occasionally raise liver enzyme levels. · Be alert for diarrhea or changes in stool, as the drug can disrupt normal gut bacteria and rarely allow overgrowth of harmful bacteria like *C. difficile* (though very rare in newborns).

Acyclovir · Antiviral (nucleoside analog)

Acyclovir is used when herpes simplex virus (HSV) is suspected, especially in babies born to mothers with active genital herpes or babies with skin blisters, seizures, or liver inflammation without another clear cause. Acyclovir looks like one of the building blocks of viral DNA. When the virus tries to copy itself, it accidentally uses acyclovir instead of the real building block, and the copying stops. The virus cannot multiply, and the infection is controlled.

1. Acyclovir enters the infected cell and is activated (phosphorylated) by a viral enzyme called thymidine kinase.

2. The activated acyclovir gets mistaken for a natural DNA building block (deoxyguanosine) and is added to the growing viral DNA chain.
3. Once acyclovir is in the chain, the viral DNA polymerase cannot add any more pieces. The DNA chain stops growing.
4. Without complete DNA, the virus cannot make new copies of itself, and the infection is halted.

SAFETY WATCH

Monitor kidney function closely (creatinine, urine output, and IV fluid intake) because acyclovir can crystallize in the kidney tubules and cause kidney injury, especially if the baby is dehydrated. Keep the baby well-hydrated with IV fluids. · Watch for signs of kidney damage: decreased urine output, rising creatinine, or changes in blood electrolytes (especially sodium and potassium). · Check liver function and complete blood counts, as acyclovir can rarely cause liver inflammation or low white blood cell counts. · Ensure the IV line is working well — if acyclovir leaks into the tissue around the vein, it can cause skin irritation and damage.

Red flags

- Pauses in breathing (Apnea) (baby stops breathing for more than 20 seconds) or turning blue
- Shock signs: very fast or very slow heart rate, weak pulses, capillary refill over 3 seconds, blood pressure dropping
- Bulging fontanelle (the soft spot on top of the head pushes outward) or stiff neck — signs meningitis may be present
- Pinpoint bleeding spots (Petechiae) or purple bleeding blotches (purpura) (tiny red or purple dots or larger bruises on the skin that don't fade when you press them) — may mean bacteria are causing blood to clot in small vessels

Nursing priorities

1. Check blood sugar (glucose) every 2 to 4 hours and keep it above 40 to 50 mg/dL with IV dextrose (sugar water) — Sepsis burns through the baby's small sugar stores very fast causing low blood sugar (hypoglycemia) (low blood sugar) which damages the developing brain; newborns cannot make enough glucose on their own when they are sick

2. Monitor vital signs every 1 to 2 hours including temperature, heart rate, respiratory rate, blood pressure, and oxygen saturation — Sepsis causes instability in temperature control (too hot or too cold), a fast heart rate (tachycardia) (fast heart rate over 160) or a slow heart rate (bradycardia) (slow heart rate under 100), fast breathing (tachypnea) (fast breathing over 60), low blood pressure from vasodilation (widening blood vessels), and low oxygen (hypoxia) (low oxygen) from lung inflammation
3. Give IV antibiotics within 1 hour of sepsis recognition and before blood culture results come back — Every hour of delay in antibiotics increases mortality (death rate) and risk of permanent brain damage; broad-spectrum antibiotics kill the most likely bacteria while we wait 24 to 48 hours for cultures to grow and identify the specific germ
4. Watch closely for signs of respiratory distress including grunting, nasal flaring, chest retractions, or oxygen saturation below 90 percent — Sepsis causes ARDS (acute respiratory distress syndrome) where fluid leaks into the lungs and surfactant (slippery coating) breaks down; babies may need CPAP (continuous positive airway pressure), high-flow oxygen, or mechanical ventilation to survive
5. Assess neurologic status every 2 to 4 hours checking for lethargy, irritability, poor feeding, weak cry, seizures, or a bulging fontanelle (soft spot) — Meningitis (brain lining infection) happens in 25 to 30 percent of babies with sepsis; inflammation and pus around the brain cause permanent damage including cerebral palsy, deafness, blindness, and developmental delays if not treated immediately
6. Monitor urine output every 4 hours and keep it above 1 to 2 mL per kilogram per hour — Sepsis causes acute kidney injury from low blood flow to the kidneys and direct toxin damage; low urine output (oliguria) (low urine output) means the kidneys are failing and fluid balance becomes dangerous
7. Keep the baby warm in an isolette or radiant warmer with skin temperature between 36.5 and 37.5°C (97.7 to 99.5°F) — Septic babies cannot regulate their own temperature and hypothermia (being too cold) or hyperthermia (being too hot) both worsen outcomes by increasing oxygen demand and slowing immune response; temperature instability itself is a sepsis sign
8. Watch for bleeding signs including oozing from IV sites, blood in stool or vomit, pinpoint bleeding spots (petechiae), or bruising and check coagulation labs if present — Severe sepsis triggers DIC (disseminated intravascular coagulation) where clotting factors get used up throughout the body causing both dangerous clots in small vessels and life-threatening bleeding; this signals multi-organ failure

Sources

- AAP Committee on Fetus and Newborn 2018
- CDC group B streptococcus prevention guidelines 2019

- Cochrane neonatal sepsis reviews
- IDSA clinical practice guidelines

Last reviewed: 2026-07-07