

Chorioamnionitis

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THE STORY IN ONE SENTENCE

Bacteria have infected the amniotic sac and the membranes that protect the baby during pregnancy.

“Chorioamnionitis is an infection inside the uterus during labor—bacteria invade the fluid and membranes around the baby, putting both mom and baby at risk.”

Normal anatomy — the body's job

Two thin membranes—the amnion (inner layer) and the chorion (outer layer)—seal around the baby like a sterile balloon filled with amniotic fluid. A thick mucus plug sits in the cervix, blocking bacteria from the vagina from climbing up into the uterus. This clean, closed system keeps the baby safe from infection throughout pregnancy.

BODY'S JOB

The amniotic membranes hold sterile fluid that cushions the baby, lets the baby move and grow, keeps temperature steady, and protects against infection. The cervical mucus plug acts like a locked door, preventing germs from the outside world from reaching the baby. Together, they create a germ-free space where the baby can develop safely for nine months.

1. Picture a clear, sealed water balloon inside the uterus—that is the amniotic sac.
2. The baby floats peacefully inside, surrounded by clean fluid that acts like a cushion and a shield.
3. At the bottom of the uterus, the cervix (the neck of the womb) stays tightly closed and plugged with thick mucus—like a cork in a bottle.
4. This mucus plug is sticky and full of immune proteins that trap and kill bacteria trying to climb up from the vagina.
5. The vagina naturally has bacteria living in it—that is normal—but the plug and sealed membranes keep those bacteria far away from the baby.

6. As long as the membranes stay intact and the mucus plug stays in place, the baby remains in a sterile, safe environment.

What breaks

The protective barrier breaks down, and bacteria that normally live in the vagina climb up into the uterus and invade the amniotic sac and membranes.

CLINICAL TERM

Ascending infection from vaginal flora is the most common route—bacteria migrate upward through the cervix, breach the amniotic membranes, and colonize the amniotic fluid and fetal membranes. Less commonly, bacteria arrive via hematogenous spread (through the bloodstream) or descend from the fallopian tubes. The infection is typically polymicrobial, involving group B *Streptococcus* (GBS), *Escherichia coli*, anaerobes like *Bacteroides* species, and genital mycoplasmas.

How the body compensates

The mother's immune system tries to fight the infection by raising her temperature, speeding up her heart, and flooding the uterus with white blood cells. The baby's heart also speeds up in response to stress and fever. These signs show the body is working hard to contain the infection, but they also warn that both mother and baby are at risk for serious complications if the infection is not treated quickly.

1. Mom develops a fever (temperature $\geq 38.0^{\circ}\text{C}$ or 100.4°F) as her immune system releases pyrogens (fever chemicals) to kill bacteria and alert the body to infection.
2. Her heart rate climbs (maternal a fast heart rate (tachycardia), often > 100 beats per minute) because fever, inflammation, and stress signal the heart to pump faster and deliver more oxygen and immune cells to the infected uterus.
3. The baby's heart rate also increases (fetal a fast heart rate (tachycardia), baseline > 160 beats per minute) because the baby senses the fever and stress—either from direct infection, fever passing through the placenta, or inflammatory chemicals crossing into the baby's bloodstream.
4. The uterus becomes tender and painful to touch (uterine tenderness) as the lining (decidua) fills with inflammatory cells fighting the bacteria, causing swelling and soreness.
5. Vaginal discharge may become cloudy, yellow-green, or foul-smelling because anaerobic bacteria break down tissue and release gas and dead cell debris into the amniotic fluid, which leaks out.

6. White blood cell count rises (maternal a high white blood cell count (leukocytosis), often > 15,000–20,000/ μ L) as the bone marrow cranks out more infection-fighting cells to send to the battlefield in the uterus.
7. If bacteria breach the uterine lining and enter the bloodstream, mom can develop bacteremia (bacteria in the blood), which may progress to sepsis—her blood pressure may drop, breathing may quicken, and organs may begin to fail as the infection spreads throughout her body.
8. The infection weakens the uterus, so after delivery the uterine muscle may not contract well (postpartum atony), leading to heavy bleeding because the open blood vessels at the placenta site cannot clamp down.
9. These compensations buy time, but they cannot cure the infection—without antibiotics and delivery, the infection will overwhelm both mother and baby, leading to septic shock in mom and sepsis, pneumonia, or meningitis in the newborn.

Domino effect

1. Bacteria ascend from the vagina and invade the amniotic membranes and fluid. — The protective mucus plug is lost or weakened (especially after membranes rupture), and bacteria from the vagina—normally kept far away—now have a clear path to climb up through the cervix into the sterile amniotic sac.
2. Bacteria multiply rapidly inside the amniotic fluid and attach to the membranes. — Amniotic fluid is warm, rich in nutrients, and initially has few immune cells—it is like a perfect incubator for bacteria. Without a strong immune presence yet, bacteria reproduce every 20–30 minutes, quickly reaching high numbers.
3. Mom's immune system detects the infection and releases pyrogens and inflammatory chemicals. — White blood cells recognize foreign bacterial proteins and release cytokines (immune alarm signals) and pyrogens (fever-causing chemicals) that reset the body's thermostat in the brain, raising mom's core temperature to make the environment less friendly for bacteria.
4. Mom develops a fever, and both mom's and baby's heart rates increase. — Fever speeds up the body's metabolism, and the heart must pump faster to deliver oxygen and immune cells. The baby's heart also speeds up because fever, stress hormones, and inflammatory chemicals cross the placenta, signaling danger to the baby's system.
5. The uterus becomes tender, swollen, and painful. — Inflammatory cells (neutrophils and macrophages) flood into the uterine lining to fight the bacteria, causing swelling, redness, and pain—just like when you get a cut and the area around it becomes sore and puffy.

6. Vaginal discharge becomes foul-smelling and discolored. — Anaerobic bacteria (which thrive without oxygen) break down dead tissue and release gases like hydrogen sulfide and putrescine—these smell rotten. The discharge turns cloudy or greenish because it now contains pus (dead white blood cells and bacteria).
7. Bacteria cross the damaged uterine lining and enter mom's bloodstream. — The infection erodes tiny blood vessels in the uterine wall, creating holes through which bacteria leak into the circulation. Once in the blood, bacteria can travel throughout the body, triggering a system-wide inflammatory response (sepsis).
8. The baby swallows or inhales infected amniotic fluid during labor or delivery. — Babies naturally swallow and practice breathing in the womb. During labor, the baby gasps and moves fluid in and out of the lungs. If that fluid is full of bacteria, the baby's lungs, stomach, and bloodstream become infected—newborns have immature immune systems and cannot fight off infection well, so they can quickly develop sepsis, pneumonia, or meningitis within hours of birth.

Symptoms · what the patient feels, and why

- Fever above 100.4°F (38.0°C) in mom during labor: Bacteria in the amniotic fluid (the water around the baby) and the membranes (the sac holding the baby) trigger the immune system to fight back, which raises body temperature like turning up a thermostat to kill germs.
- Baby's heart rate stays fast (above 160 beats per minute): Fever from mom heats the baby too, and heat makes the heart pump faster to try to cool down, like running harder when you're hot.
- Mom's heart rate stays fast (above 100 beats per minute)
- Uterus (womb) feels tender or painful when the doctor presses on the belly: Infected tissue swells and becomes sore because immune cells flood in to fight bacteria, stretching nerve endings and causing pain.
- Foul-smelling or cloudy fluid leaking from the vagina: Bacteria multiply in the amniotic fluid and produce waste products that smell bad and turn the normally clear fluid murky, like milk left out too long.
- White blood cell count above 15,000 per microliter: The bone marrow pumps out extra white blood cells (infection-fighting soldiers) when bacteria invade, so the count shoots up to defend the body.
- Mom feels shaky, chilled, or sweaty: The immune system releases chemicals called cytokines (alarm signals) that reset the brain's temperature control, causing shivering to heat up and sweating to cool down.

- Low blood pressure or mom feeling dizzy and weak: Bacteria release toxins that make blood vessels relax and leak fluid, so blood pressure drops like air leaking from a tire, and less oxygen reaches the brain.

Focused exam

- Maternal fever $\geq 38.0^{\circ}\text{C}$ (100.4°F): Fever is the key sign that bacteria have gotten into the amniotic sac and the membranes around the baby. Mom's body is fighting back with heat. Without fever, you should question whether this is really chorioamnionitis.
- Uterine tenderness when you press on the belly: The uterus hurts because bacteria are inside it, causing swelling and inflammation. When you gently push on the belly over the uterus, mom winces or pulls away. This tells you the infection is not just in her blood—it is in the womb itself.
- Fetal heart rate faster than 160 beats per minute: The baby's heart speeds up because bacterial toxins and inflammatory chemicals cross the placenta and stress the baby. A fast fetal heart rate is a warning that the baby is being hurt by the infection too.
- Maternal heart rate faster than 100 beats per minute: Mom's heart races because her body is fighting the infection. The fast pulse tells you her immune system is working hard and that the infection is stressing her whole body, not just the uterus.
- Amniotic fluid that smells bad or looks cloudy or yellow-green: Foul-smelling or discolored fluid means bacteria are growing inside the amniotic sac. The smell or color is a strong clue that chorioamnionitis is real. Clear, normal-smelling fluid makes the diagnosis much less likely.
- Membranes ruptured (water broke) more than 18 hours ago: When the bag of water breaks, the protective barrier between the vagina (which has bacteria) and the amniotic cavity (which should be sterile) is gone. The longer the membranes are ruptured, the more time bacteria have to climb up and cause infection.

Diagnostics · every test answers a question

- Complete blood count (CBC) with differential → Is mom's immune system flooding her blood with white cells to fight infection?
- Maternal blood cultures (two sets from different sites) → Are bacteria spilling from the uterus into mom's bloodstream?
- C-reactive protein (CRP) or procalcitonin → Is there a strong inflammatory response happening in the body?
- Amniotic fluid Gram stain and culture (if amniocentesis is done) → Are bacteria actually present in the amniotic fluid?

- Fetal heart rate monitoring (continuous electronic) → Is the baby showing signs of stress from the infection?
- Urine culture → Could the fever be coming from a bladder or kidney infection instead of chorioamnionitis?

Treatment logic

- Intravenous ampicillin plus gentamicin; add clindamycin or metronidazole if cesarean delivery is done → Antibiotics kill the bacteria that climbed from the vagina into the amniotic fluid and uterine membranes. Ampicillin covers Group B Strep and some gut bacteria; gentamicin covers Gram-negative bacteria like *E. coli*; clindamycin or metronidazole added after cesarean covers anaerobic bacteria that live deep in tissue. This stops the infection at its source and brings mom's fever down.
- Deliver the baby promptly (vaginally if labor is progressing well, or by cesarean if labor is stalled or the baby shows distress) → Removing the baby and placenta takes away the infected environment—the amniotic sac and membranes where bacteria are growing. Delivery is the only way to fully stop the infection source and prevent bacteria from continuing to reach the baby.
- Continue intravenous antibiotics until mom has been fever-free for at least 24 hours after delivery → Keeping antibiotics running after delivery makes sure any bacteria left in mom's bloodstream or uterus are killed. This prevents the infection from coming back or spreading into her blood (sepsis).
- Alert the neonatology team and evaluate the newborn for early-onset sepsis (blood culture, CBC, and antibiotics if indicated) → Early warning lets the baby doctors start antibiotics in the newborn if needed, catching infection before it becomes severe. Babies born to moms with chorioamnionitis are at higher risk for sepsis, pneumonia, and meningitis.
- Acetaminophen for fever control → Lowering fever makes mom more comfortable and helps prevent complications from prolonged high temperature, such as dehydration or increased heart rate. It also may reduce stress on the baby.
- Intravenous fluids to maintain hydration → Fever and infection increase fluid loss through sweating and faster breathing. IV fluids keep mom's blood pressure stable and her kidneys working well during labor and treatment.

Medications

Ampicillin · Beta-lactam antibiotic (penicillin family)

Ampicillin punches holes in the outer wall of bacteria so they burst open and die. It works best against bacteria that have a thick wall, like Group B Strep (a common germ in the vagina) and

E. coli (a gut bacterium that can climb up into the uterus). These bacteria often start the infection in chorioamnionitis.

1. You give ampicillin through an IV (a tube into a vein) so it reaches the bloodstream fast.
2. The drug travels to the uterus, where blood flow brings it into infected tissue.
3. Ampicillin locks onto proteins on the surface of bacteria that are building their outer wall.
4. When the wall-building stops, the bacteria can't hold their shape and they explode.
5. Dead bacteria release fewer toxins (poisons), so fever starts to drop and the infection calms down.

SAFETY WATCH

Allergic reactions: Some people get a rash, itching, or (rarely) trouble breathing. Always ask about penicillin allergy before giving this drug. · Diarrhea: Ampicillin can kill good bacteria in the gut, so loose stools are common. If diarrhea is severe or bloody, tell the team right away—it could be a serious gut infection called *C. diff*. · Seizures (very rare): In people with kidney failure or very high doses, ampicillin can build up in the brain and cause seizures. Dose is adjusted if kidney function is low.

Gentamicin · Aminoglycoside antibiotic

Gentamicin sneaks into bacteria and jams the machines they use to read their DNA instructions. Without working machines, bacteria can't make the proteins they need to survive, so they die. It hits gram-negative bacteria (like *E. coli*) especially hard—these are rod-shaped bugs with a thin outer wall and an extra greasy coat that many antibiotics can't cross.

1. Gentamicin is given through an IV because it does not absorb well from the stomach.
2. The drug circulates in the blood and crosses into infected tissue in the uterus.
3. It slips through tiny channels in the outer coat of gram-negative bacteria.
4. Inside the bacterium, gentamicin sticks to the ribosome (the protein factory).
5. The ribosome starts reading DNA instructions wrong, making broken proteins, and the bacterium dies.

SAFETY WATCH

Kidney damage: Gentamicin can hurt the tiny filters in the kidneys, especially if used for many days or if the mother is dehydrated. Doctors check creatinine (a waste product in blood) to watch kidney function. · Hearing loss: The drug can damage the inner ear, causing ringing, dizziness, or permanent hearing loss. This is rare with short courses but more common if kidney function is poor and the drug builds up. · Dosing once a day: Modern practice often gives the whole daily dose at once (instead of splitting it) to reduce kidney and ear toxicity while keeping strong bacteria-killing power. Blood levels are checked to make sure the dose is safe.

Clindamycin (or Metronidazole) · Lincosamide antibiotic (Clindamycin) or Nitroimidazole antibiotic (Metronidazole)

Both drugs kill anaerobes—bacteria that live without oxygen and thrive in the lower vagina and gut. In chorioamnionitis, these germs can climb up during labor (especially if membranes rupture early) or get into the uterus during a cesarean section when the cut goes through colonized tissue. Clindamycin stops bacteria from making proteins by blocking their ribosome. Metronidazole slips into bacteria, gets activated, and then breaks their DNA so they can't copy themselves.

1. Clindamycin or metronidazole is given through an IV during labor or right after delivery.
2. The drug travels in the bloodstream to infected tissue in the uterus and pelvis.
3. Clindamycin locks onto the bacterial ribosome (protein maker) and stops new proteins from forming. Metronidazole enters anaerobic bacteria, gets turned into a toxic form, and shreds their DNA.
4. Without working proteins (clindamycin) or intact DNA (metronidazole), the bacteria die.
5. Dead anaerobes release fewer toxins, so fever drops, pain eases, and the risk of spreading infection to the belly or blood falls.

SAFETY WATCH

C. difficile colitis: Both drugs (especially clindamycin) can wipe out good gut bacteria and let C. diff (a dangerous germ) grow wild, causing severe, watery, sometimes bloody diarrhea. If diarrhea starts, tell the team immediately. · Metallic taste (metronidazole): Many women notice a bitter, metal-like taste in their mouth. It's unpleasant but not dangerous. · Alcohol interaction (metronidazole): Drinking alcohol while taking metronidazole (or within 48 hours after stopping) can cause nausea, vomiting, flushing, and a racing heart. Avoid alcohol completely during treatment.

Acetaminophen (Tylenol) · Analgesic and antipyretic (pain reliever and fever reducer)

Acetaminophen turns down the brain's thermostat (the part that sets your body temperature) and blocks pain signals in the brain and spinal cord. It does NOT fight infection or kill bacteria—it only makes the mother more comfortable while antibiotics do the real work of clearing germs. Lowering fever also helps protect the baby, because high temperatures can stress the baby's heart and may slightly raise the risk of complications.

1. Acetaminophen is usually given by mouth (tablet or liquid) or through an IV if the mother can't swallow.
2. The drug travels to the brain and blocks enzymes (called COX enzymes) that make prostaglandins—chemicals that turn up pain and fever.
3. With fewer prostaglandins, the hypothalamus resets the body's thermostat to a normal level.
4. Blood vessels in the skin open up (dilate), letting heat escape, and sweating may start—both help cool the body down.
5. Pain signals quiet, and the mother feels more comfortable, which can help her rest and tolerate labor or recovery.

SAFETY WATCH

Liver damage: Taking too much acetaminophen (more than 3,000–4,000 mg per day, depending on guidelines) can poison the liver and cause life-threatening liver failure. Always follow dosing instructions and check that over-the-counter cold or pain medicines don't also contain acetaminophen—accidental doubling is common. · **Safe in pregnancy:** Acetaminophen is considered the safest pain and fever medicine during pregnancy and does not harm the baby at normal doses. NSAIDs like ibuprofen are avoided in the third trimester because they can affect the baby's heart and kidneys.

Red flags

- Mom's blood pressure dropping or she feels faint (possible sepsis, meaning infection spreading through the whole bloodstream)
- Baby's heart rate showing late decelerations or staying very low (sign the baby is not getting enough oxygen)
- Mom confused, extremely sleepy, or not responding normally (infection may be affecting the brain)
- Foul-smelling, green, or pus-like fluid coming from the vagina (heavy bacterial load)

- Mom's breathing becomes fast and shallow or she struggles to breathe (infection may be reaching the lungs or causing severe inflammation)

Nursing priorities

1. Establish large-bore intravenous access and draw blood cultures before starting antibiotics, then administer the first dose of intravenous ampicillin and gentamicin immediately. — Early antibiotic therapy kills bacteria in the mother's bloodstream and uterus, preventing sepsis and protecting the baby from severe infection, and blood cultures taken before antibiotics help identify the specific bacteria causing the infection.
2. Apply continuous electronic fetal monitoring and assess the fetal heart rate pattern every 15 minutes during active labor. — Chorioamnionitis causes fetal a fast heart rate (tachycardia) (heart rate above 160) and can lead to late decelerations (heart rate drops after contractions) or a slow heart rate (bradycardia) (very slow heart rate), all signs the baby is stressed and may need emergency cesarean delivery.
3. Monitor maternal vital signs (temperature, heart rate, blood pressure, respiratory rate, and oxygen saturation) every 1 to 2 hours and immediately report fever above 102°F, heart rate above 120, blood pressure below 90/60, or oxygen saturation below 95%. — Frequent vital signs detect early sepsis when infection spreads into the bloodstream, causing dangerous drops in blood pressure (septic shock) and fast breathing that can lead to organ failure if not treated immediately.
4. Assess the abdomen for uterine tenderness between contractions and monitor the amount, color, and odor of any vaginal fluid or bleeding. — Worsening uterine tenderness or foul-smelling, green, or pus-filled (purulent) discharge signals advancing infection in the uterus, and heavy bleeding may indicate the uterus is not contracting properly because of infection in the muscle.
5. Perform hourly intake and output measurement and maintain intravenous fluid administration at the ordered rate, watching for decreased urine output below 30 milliliters per hour. — Sepsis causes blood vessels to leak fluid and blood pressure to drop, so the kidneys receive less blood and make less urine; tracking fluid balance helps detect early shock and guides how much intravenous fluid the mother needs.
6. Assess maternal mental status and level of consciousness every 2 hours, asking orientation questions and watching for confusion, extreme sleepiness, or agitation. — The brain needs steady oxygen and glucose from good blood flow, so confusion or decreased alertness means sepsis is causing low blood pressure or the infection is releasing toxins that affect brain function.

7. Notify the neonatology (newborn intensive care) team before delivery and prepare for immediate newborn evaluation, including blood cultures and possible antibiotic treatment.
— Babies born to mothers with chorioamnionitis have high risk of early-onset neonatal sepsis (infection in the first 72 hours of life) because bacteria cross the placenta or the baby breathes in infected amniotic fluid during delivery.
8. Continue intravenous antibiotics after delivery until the mother has been fever-free for at least 24 hours and monitor for signs of endometritis (uterine infection after delivery), including fever returning, foul lochia (vaginal discharge after birth), or worsening abdominal pain. — Stopping antibiotics too early allows bacteria still hiding in the uterine lining to multiply again, causing postpartum infection that can lead to bleeding (hemorrhage) (heavy bleeding) or sepsis in the days after delivery.

Sources

- ACOG Committee Opinion No. 712: Intrapartum Management of Intraamniotic Infection (2017)
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- Cochrane Database: Antibiotic Regimens for Management of Intraamniotic Infection (2019)

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