CONDITION

Neonatal sepsis

Neonatal sepsis is a serious whole-body response to infection during a baby's first 28 days after birth.

WHAT IT IS
Serious infection response during a baby's first 28 days

BODY SYSTEM
Whole body, often affecting lungs, brain, and circulation

MAIN SYMPTOMS
Poor feeding, temperature change, breathing trouble, unusual sleepiness

WHAT CAUSES IT
Usually bacterial infection; sometimes viral or fungal infection

HOW IT IS DIAGNOSED
Blood culture, examination, and supporting blood tests

MAIN TREATMENT
Urgent antibiotics and hospital supportive care

CAN IT BE CURED?
Yes - prompt treatment can clear the infection

IS IT AN EMERGENCY?
Yes - any suspected signs need immediate assessment

LONG-TERM OUTLOOK
Most recover; severe illness can cause lasting problems

Overview

Neonatal sepsis is a serious response to an infection in a newborn baby. "Neonatal" means the first 28 days after birth. Sepsis happens when the body's response to an infection begins to interfere with normal organ function.

Newborns have developing immune systems and may become unwell quickly. Premature babies are especially vulnerable. Signs can be subtle and may look like other newborn problems, so suspected neonatal sepsis needs urgent hospital assessment.

Doctors often describe neonatal sepsis as early-onset or late-onset. Early-onset sepsis usually begins during the first few days after birth and is often linked to bacteria acquired before or during delivery. Late-onset sepsis develops later and may come from the baby's surroundings, another person, or medical equipment. The exact time used to separate these groups differs

between healthcare systems.

Bacteria cause most cases. Viruses, including herpes simplex virus, and fungi can also cause serious newborn infections. Treatment often begins before the exact cause is known because waiting for test results may be unsafe.

Symptoms

A baby with neonatal sepsis may not have a fever. A low temperature or unstable temperature can also be a sign. Sometimes the main change is that the baby is feeding less, sleeping more, or behaving differently.

Possible symptoms include:

These signs do not always mean sepsis. Breathing conditions, low blood sugar, heart problems, and other newborn conditions can look similar. However, a newborn with these symptoms needs immediate medical assessment rather than observation at home.

- Difficulty waking, reduced movement, or unusual irritability
- Poor feeding, weak sucking, vomiting, or a swollen abdomen
- A temperature of 38°C or higher, or below 36°C
- Fast, difficult, noisy, or irregular breathing
- Pauses in breathing, known as apnoea
- Pale, blotchy, blue, grey, or unusually cold skin
- A very fast or unusually slow heartbeat
- Fewer wet nappies
- Jaundice that appears early or becomes worse
- Seizures or a bulging soft spot on the head

Causes and risk factors

Neonatal sepsis usually starts when bacteria enter the baby's blood. Common sources include the lungs, urinary tract, skin, bowel, or tissues around the brain and spinal cord. Infection of those surrounding tissues is called meningitis.

In early-onset sepsis, bacteria may pass to the baby from the mother's genital or digestive tract around the time of birth. Group B Streptococcus, often called group B strep or GBS, and

Escherichia coli are important causes. GBS can be carried without causing symptoms in the pregnant person.

Late-onset infection can be acquired at home or in hospital. Bacteria may enter through damaged skin, breathing tubes, feeding tubes, or intravenous lines. Hospital-associated infection is a particular concern for very premature babies who need prolonged intensive care.

Factors that can increase risk include:

Having a risk factor does not mean a baby has sepsis. Many babies with risk factors remain well, while sepsis can occur without an obvious risk factor.

- Premature birth or low birth weight
- The waters breaking a long time before birth
- Signs of infection or fever during labour
- Known GBS carriage without adequate antibiotics during labour
- A previous baby affected by GBS infection
- Intensive care treatment or long-term intravenous access
- Surgery, breathing support, or serious underlying conditions

Diagnosis

There is no single symptom or immediate blood test that can confirm or exclude neonatal sepsis. Doctors assess the baby's appearance, breathing, circulation, temperature, feeding, alertness, and medical history.

A blood culture is the main test used to identify bacteria or fungi in the bloodstream. A sample is placed in special containers to see whether an organism grows. When possible, it is collected before antibiotics like amoxicillin or doxycycline begin, but treatment should not be delayed when a baby is unwell.

Other tests may include:

A lumbar puncture may be needed to test the fluid around the brain and spinal cord for meningitis. This involves placing a small needle into the lower back. It may be delayed if the baby is too unstable for the procedure.

Blood counts and inflammation markers can support a diagnosis, but they do not confirm sepsis by themselves. Cultures can also remain negative, especially after antibiotics have been given. Doctors therefore consider the whole clinical picture and how the baby responds over time.[1,2]

- A full blood count to examine blood cells
- C-reactive protein or procalcitonin, which may rise with inflammation
- Blood gas and lactate tests to assess breathing and circulation
- Urine culture, particularly in later-onset illness
- A chest X-ray when pneumonia is possible
- Swabs or viral tests when a viral infection is suspected

Treatment and management

Suspected neonatal sepsis is treated in hospital. Antibiotics are usually given into a vein as soon as the necessary samples have been collected. The first antibiotics are chosen to cover the organisms most likely at the baby's age and in that healthcare setting.[1,2]

Treatment is reviewed when culture results and the baby's progress are known. If a specific bacterium is found, antibiotics may be narrowed to target it. If tests are reassuring and the baby remains well, the hospital team may stop antibiotics according to its neonatal protocol. Confirmed bloodstream infection or meningitis requires a longer course.

Antibiotics do not treat viruses. If herpes simplex or another serious viral infection is suspected, antiviral treatment may begin while testing is underway. Antifungal medicines are used when a fungal infection is confirmed or strongly suspected.

Some babies also need supportive care, such as:

Care may take place in a neonatal unit or neonatal intensive care unit. Parents can usually participate through touch, comforting, expressing breast milk, and feeding when the baby's condition allows. The care team can explain what is safe while lines or breathing equipment are in place.

- Oxygen or breathing support
- Fluids, nutrition, or medicines through a vein
- Treatment to support blood pressure and circulation
- Help maintaining a stable temperature and blood sugar
- Treatment for seizures or clotting problems

Complications

Many babies recover with prompt treatment. The risk of complications is higher when a baby is very premature, the infection is severe, treatment is delayed, or meningitis is present.

Sepsis can reduce blood flow and oxygen delivery to organs. Possible complications include:

Neonatal sepsis can be fatal, even with treatment. This does not mean that every baby with suspected sepsis will become critically ill. Starting treatment early is intended to prevent the infection from progressing.

Babies who had meningitis, seizures, severe shock, or a long intensive care stay may need hearing checks and developmental follow-up. Premature babies may already have follow-up arranged because prematurity itself can affect growth and development.

- Septic shock, meaning dangerously poor circulation caused by infection
- Breathing failure
- Meningitis
- Seizures
- Kidney, liver, heart, or brain injury
- Abnormal bleeding or blood clotting
- Hearing loss or later developmental difficulties

Prevention

Not every case of neonatal sepsis can be prevented. Some infections occur even when pregnancy, delivery, and newborn care have been managed appropriately.

Screening and prevention practices for GBS differ by country. Where routine screening is used, a swab may be offered late in pregnancy. Antibiotics during labour can reduce early-onset GBS infection when GBS is found or certain risk factors are present.[3,4]

In hospitals, hand hygiene, clean procedures, careful intravenous-line care, and removing tubes or lines when they are no longer needed reduce opportunities for infection.

At home, everyone should wash and dry their hands before touching the baby. People with fever, vomiting, diarrhoea, cold sores, or other active infections should avoid close contact. Nobody with a cold sore should kiss a newborn because cold sores are caused by herpes simplex virus, which can be dangerous for babies.

Keeping recommended pregnancy and household vaccinations up to date may reduce exposure to certain infections. Vaccines do not prevent every cause of neonatal sepsis.

Living with it and what to expect

During treatment, a baby will usually have repeated examinations and may have further blood tests. Hospital stay length depends on the baby's age, the organism involved, the source of infection, and whether complications occurred. A premature baby may need hospital care for reasons beyond the infection itself.

If cultures remain negative, tests are reassuring, and the baby stays well, treatment may be stopped relatively early. A confirmed infection generally needs a longer hospital course. Meningitis and infections involving bones, joints, or other deep tissues often need more prolonged treatment.

After discharge, feeding, alertness, temperature, breathing, and weight gain are important. Routine follow-up may be with a primary care clinician, neonatal team, paediatrician, or child development service. Keep these planned appointments even if the baby appears well.

Most babies who recover from an uncomplicated infection do not continue to have sepsis. Severe infection can have effects that become clearer over months or years, including hearing, movement, learning, or developmental difficulties. Follow-up is intended to identify these concerns early; it does not mean they are expected to occur.

When to get medical help

Possible sepsis in a newborn is an emergency. Do not wait for a routine appointment if a baby under 28 days old has a temperature of 38°C or higher, a temperature below 36°C, poor feeding, unusual sleepiness, breathing changes, or a marked change from their normal behaviour.

Call emergency services immediately if the baby:

Do not delay help while trying to lower a fever or waiting for another temperature reading. A newborn can be seriously unwell without a fever.

After hospital discharge, follow the care team's routine follow-up plan. Seek urgent reassessment if symptoms return, feeding drops significantly, breathing changes, or the baby becomes harder to wake.

- Is blue, grey, very pale, or blotchy
- Has severe difficulty breathing or pauses in breathing
- Cannot be woken or is unusually floppy

- Has a seizure
- Appears to be rapidly getting worse

Common questions

Can a newborn have sepsis without a fever?

Yes. Newborns may have a normal or low temperature instead. Poor feeding, breathing changes, reduced alertness, or unstable temperature may be the first signs.

How quickly can neonatal sepsis develop?

A newborn can become more unwell over hours. This is why suspected symptoms need immediate assessment, even if they initially seem mild.

Is neonatal sepsis contagious?

Sepsis itself is not contagious. The infection causing it may spread between people, depending on the organism. Hand hygiene and avoiding contact with people who are unwell help reduce exposure.

Can neonatal sepsis be completely cured?

Yes, many infections are cleared with appropriate treatment. Some babies need longer care, and severe sepsis or meningitis can leave lasting effects even after the infection has gone.

Why are antibiotics started before the culture result?

Blood cultures take time to show whether an organism is growing. Because newborn infections can progress quickly, doctors usually begin treatment when sepsis is suspected and review it as results become available.

Can neonatal sepsis come back?

The same infection does not usually return after successful treatment. A baby can develop a new infection, particularly if premature, medically fragile, or still using an intravenous line or other medical device.

Sources

- National Institute for Health and Care Excellence. Neonatal infection: antibiotics for prevention and treatment . NICE guideline NG195. Published 2021; updated 2024.

- Puopolo KM, Benitz WE, Zaoutis TE, American Academy of Pediatrics Committee on Fetus and Newborn and Committee on Infectious Diseases. Management of Neonates Born at 35 0/7 Weeks' Gestation or More With Suspected or Proven Early-Onset Bacterial Sepsis . Pediatrics. 2018;142(6):e20182894.
- American College of Obstetricians and Gynecologists. Prevention of Group B Streptococcal Early-Onset Disease in Newborns . Committee Opinion No. 797. Obstetrics & Gynecology. 2020;135(2):e51-e72.
- Centers for Disease Control and Prevention. Prevention of Perinatal Group B Streptococcal Disease: Revised Guidelines from CDC, 2010 . Morbidity and Mortality Weekly Report. 2010;59(RR-10):1-36.
- Shane AL, Sánchez PJ, Stoll BJ. Neonatal sepsis . The Lancet. 2017;390(10104):1770-1780.
- World Health Organization. WHO recommendations for management of serious bacterial infections in infants aged 0-59 days . World Health Organization; 2024.