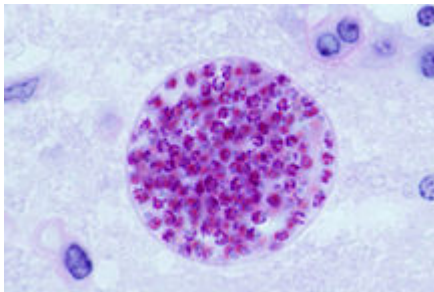


Perinatal Infections — Symptoms and Treatment

[See online here](#)

Approximately, 3% of all congenital anomalies are caused by perinatal infections which include toxoplasmosis, other (syphilis, varicella-zoster, parvovirus B19), rubella, cytomegalovirus (CMV), and herpes infections (TORCH). The mother may be asymptomatic during the antenatal period. Diagnosis of the infection in the mother and monitoring the fetus/baby is essential.



Definition of Perinatal Infections

A perinatal infection (PN) refers to a **bacterial or viral infection** that a **mother passes to her baby** during pregnancy, during delivery, or immediately after the delivery.

Etiology of Perinatal Infections

PNs include **TORCH infections**, listeriosis, **human immunodeficiency virus infection** (HIV), **hepatitis B**, **hepatitis C**, **lymphocytic choriomeningitis virus** (LCV), and **enterovirus infections**. TORCH infections include the following congenital infections: *Toxoplasma gondii*, others (including *Treponema pallidum*, *Listeria*, *Varicella*, and parvovirus B19), rubella virus, cytomegalovirus (CMV), and herpes simplex virus (HSV).

The transmission of the infection can occur transplacentally, hematogenously, or during passage through the cervicovaginal birth canal. First trimester infections usually lead to **miscarriages** or **fetal malformations**. Infections later in pregnancy rarely cause **fetal anomalies**.

Clinical Presentation of Perinatal Infections

The common features of all perinatal infections are **icterus**, **hepatosplenomegaly**, **fetal growth restriction**, and **microcephaly**. Some features are specific to individual infections.

Chlamydia can result in ophthalmia neonatorum in the immediate neonatal period and chlamydial pneumonia, with [cough](#) and dyspnea within three months of birth.

Cytomegalovirus infection (CMV): If the mother has a CMV infection prior to or during the first trimester, the fetus can develop blindness, hearing loss, mental retardation, and [epilepsy](#) due to anomalous embryogenesis.

- Transmission: Body fluids such as urine, saliva, blood, tears, semen, and breast milk
- Diagnosis: PCR of amniotic fluid
- Effect on the fetus: Congenital hearing loss, vision loss, seizures
- Treatment: None available during pregnancy

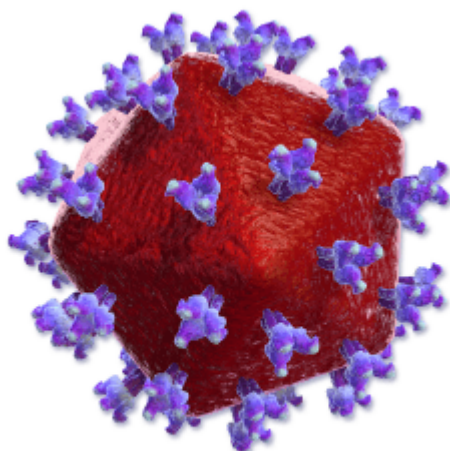
Enterovirus infection can present in the neonatal period and is characterized by [myocarditis](#), meningoencephalitis, hepatitis, and disseminated intravascular coagulation (DIC).

Congenital HSV infection is caused more commonly by herpes simplex virus 2 (HSV-2), and rarely by herpes simplex virus 1 (HSV-1). The infection can be transmitted to the fetus via transplacental transmission from an infected mother or to the neonate during birth if the mother has active genital sores. It can cause neonatal encephalitis, [fever](#), seizures, keratoconjunctivitis, a vesicular rash, and neonatal sepsis syndrome, which has a high incidence of mortality and morbidity.

- Transmission: direct contact with mucosal tissue or secretions of another infected person, especially through sexual transmission via body fluids (HSV-2)
- Diagnosis: serologic
- Effect on the fetus: life-threatening CNS infection or death
- Treatment: antivirals

Gonorrhea leads to neonatal conjunctivitis and colonization of the upper respiratory tract. It can be transmitted by the infected mother to her baby during labor.

Hepatitis B: Vertical transmission of the infection can occur due to exposure of the baby to infected maternal blood during delivery.



Human Immunodeficiency Virus (HIV)

Picture: "HIV" by BruceBlaus. Lizenz: [CC BY-SA 4.0](#)

Human immunodeficiency virus (HIV): Vertical transmission of HIV from mother to infant can result in babies developing HIV infection or AIDS. It is associated with a high incidence of mortality.

- Transmission: Via contact through body fluids.
- Diagnosis: ELISA, Western blot.
- Effect on the fetus: None.
- Treatment: HAART.

Listeriosis is a rare food-borne disease that can lead to fetal death or chronic intrauterine and perinatal infection.

Lymphocytic choriomeningitis virus (LCMV) infection is associated with [hydrocephalus](#) and chorioretinitis.

Parvovirus B19 infections cause hydrops fetalis and [anemia](#).

Rubella: Antenatal maternal infection with rubella can lead to anomalies during embryogenesis with cardiac, ophthalmic, and aural malformations, as well as mental retardation. Specific features of congenital rubella are cataracts, glaucoma, chorioretinitis, “blueberry muffin” rash, pulmonary artery stenosis, and [patent ductal arteriosus](#).

- Transmission: Cough or sneeze.
- Diagnosis: Serologic.
- Effect on the fetus: Congenital hearing loss, cataracts, “blueberry muffin” rash.
- Treatment: None available during pregnancy.

Group B streptococcus (GBS): Maternal GBS infection can cause premature labor, and transmission to the baby can lead to neonatal [meningitis](#), [pneumonia](#), and sepsis.

Syphilis infection can be transmitted transplacentally by the infected mother, leading to **premature labor, stillbirths, or neonatal death**. Infected babies may be born with **severe malformations**, and those who survive infancy may develop symptoms of syphilis later.

Features specific to congenital syphilis include Hutchinson molar (blunt upper incisors with enamel hypoplasia), metaphyseal osteochondritis, periostitis, osteomyelitis lesions of the humerus and tibia, saber shins, hemolytic anemia, maculopapular rash on the palms, face and soles and bullous lesions on the palms and soles, snuffles (rhinitis), mucocutaneous lesions, interstitial keratitis, deafness, saddle nose deformity, and palatal defects.

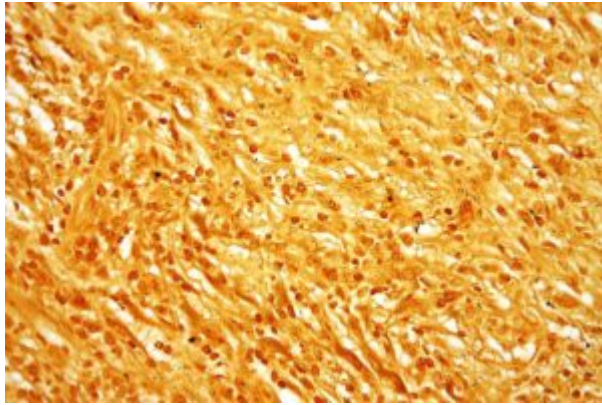
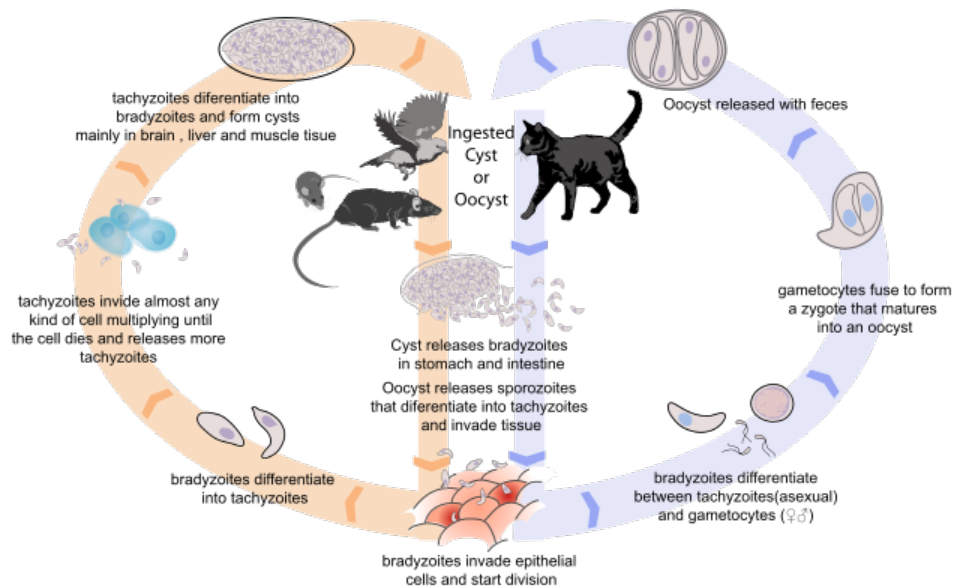


Image: "Micrograph showing Treponema pallidum, the spirochete that causes syphilis. Dieterle stain." by Nephron - Own work. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

- Transmission: Sexual contact
- Diagnosis:
 - Screening: RPR/VDRL.
 - Confirmation: FT-Abs or dark-field microscopy.
- Effect on the fetus: Hepatomegaly, CNS abnormalities, saddle nose, Hutchinson's, and FTA-ABS.
- Treatment: Penicillin.

Toxoplasma infection leads to neonatal [hydrocephalus](#) with diffuse intracranial calcifications and isolated to late-onset chorioretinitis.

- Transmission: direct contact with cat feces and consumption of raw or insufficiently cooked meat or unpasteurized milk
- Diagnosis: Serologic.
- Effect on the fetus: Chorioretinitis, hydrocephalus.
- Treatment: Pyrimethamine (daraprim) and sulfadiazine.



Varicella causes scarring of the skin with atrophy of the limbs.

- Transmission: Respiratory.
- Diagnosis: Serologic.
- Effect on the fetus: Chorioretinitis, encephalitis, muscle atrophy.
- Treatment: None.

Diagnosis of Perinatal Infections

Maternal workup

- Inquire about the **maternal history of exposure to sick children** in daycare (rubella and herpes can be transmitted by infected children), history of fever with a rash (rubella), exposure to sexually transmitted diseases, multiple sexual contacts, intravenous drug usage, and exposure to raw meat, soil, or animals (toxoplasma).
- **Antenatal screening** with serology for TORCH titers, Venereal Disease Laboratory test (VDRL), HIV, rectovaginal swab for GBS.
- **Amniotic fluid testing** may be required to confirm fetal infection.

Neonatal workup

This should include the following tests; additional tests can be performed based on the clinical presentation:

- Complete blood count, peripheral smear, reticulocyte count, platelet count
- Liver function tests with bilirubin and transaminase levels
- Toxoplasma IgM and IgG
- Rubella IgM, rubella culture
- Cytomegalovirus testing with urine culture if the neonate is <2 weeks old
- Parvovirus: Polymerase Chain Reaction (PCR) from the blood sample
- LCMV: Test IgM in the infant and IgG in the mother and the infant
- HIV: HIV testing with PCR

Treatment of Perinatal Infections

Depending on the gestation stage, the extent of fetal anomalies, and fetal compromise, a decision may have to be taken regarding **the termination of pregnancy, inducing labor or cesarean section.**

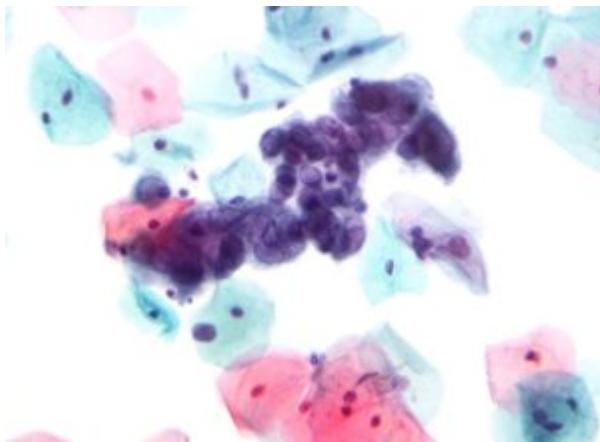


Image: "Micrograph showing the changes of herpes simplex virus (HSV). Pap test. Pap stain." by Nephron – Own work. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

- **Chlamydia:** Maternal infection can be treated in the third trimester with oral erythromycin, while neonatal infection can be treated at birth with

erythromycin suspension

- **Cytomegalovirus:** Currently, there are no medicines or vaccines to either treat or prevent CMV infection
- **Genital herpes:** Antenatally, the mother can be prescribed antiviral drugs like acyclovir or famcyclovir, while acyclovir can be administered to infants with suspected HSV-2. Cesarean section is the preferred mode of delivery in cases where the mother has active genital herpes
- **Hepatitis B:** All infants should receive the hepatitis B vaccine at birth as part of the routine immunization schedule. In addition, babies born to mothers who are HbsAg positive should receive hepatitis B immune globulin at birth
- **Hepatitis C (HCV) infection:** Currently, there is no immunoprophylaxis for HCV, and [breastfeeding](#) is not contraindicated because HCV RNA and HCV antibodies have been detected in the breast milk of infected mothers
- **Human immunodeficiency infection:** All pregnant women with HIV should be treated with retroviral drugs during pregnancy and should be counseled against breastfeeding their infants to avoid vertical transmission of the infection. Babies born with HIV should be treated aggressively with retroviral drugs to prevent the development of AIDS
- **Human papillomavirus:** Maternal genital warts can be treated antenatally with cryotherapy, laser, electrocautery, or surgical excision and cesarean section is the preferred mode of delivering babies in the presence of maternal genital warts.
- **Rubella:** Ideally, women with no previous history of exposure to rubella should receive the rubella vaccine immediately after their first pregnancy. There is no treatment for rubella and pregnancy termination should be considered on a case-by-case basis
- **Streptococcus (GBS):** Maternal GBS bacteriuria of any significance or a positive rectovaginal swab at 35-37 weeks is an indication for chemoprophylaxis. Intravenous [antibiotic](#) prophylaxis is administered in all women with a positive GBS status and it is also administered to women with unknown status during premature labor pending results of the rectovaginal swab. Neonates suspected to be infected or with symptoms are also treated with antibiotics
- **Syphilis:** Penicillin is the antibiotic of choice in the antenatal period if the mother is suspected to have syphilis. If given in the first trimester, vertical transmission of the infection to the fetus can be prevented

Prognosis of Perinatal Infections

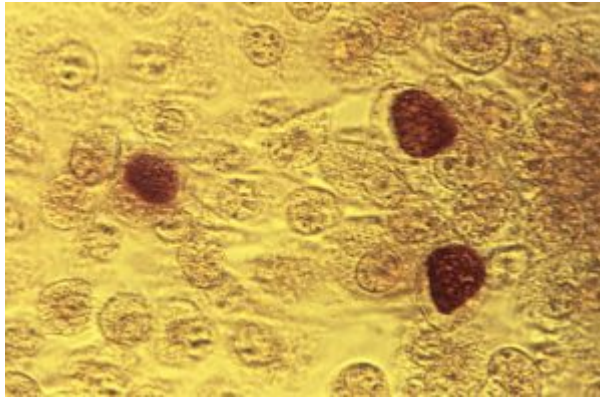


Image: "This photomicrograph reveals McCoy cell monolayers with Chlamydia trachomatis inclusion bodies; Magnified 200X." by CDC/Dr. E. Arum; Dr. N. Jacobs - This media comes from the Centers for Disease Control and Prevention's Public Health Image Library (PHIL), with identification number #3802. License: Public Domain

Adverse outcomes can be prevented by **antenatal screening and counseling**.

- **Chlamydia infection** is associated with premature delivery in untreated cases and infected neonates usually recover with **antibiotic treatment**
- **Cytomegalovirus:** Lifelong sequelae can be expected in neonates born with CMV infection and the infection can be life-threatening if there is concomitant HIV/AIDS
- **Genital herpes:** Once infected, genital herpes can recur anytime during the lifetime of the baby
- **Hepatitis B:** Neonates treated with hepatitis B immunoglobulin and vaccination are protected from the infection, but babies infected with hepatitis B can develop chronic hepatitis and have a higher risk of developing chronic liver disease
- **Human immunodeficiency virus:** Antenatal treatment with retroviral drugs decreases the risk of vertical transmission and the infant can be protected. Avoiding **breastfeeding** also prevents the baby from getting infected
- **Human papillomavirus:** If infected with HPV, the infant has a lifelong risk of developing warts and some types of malignancies
- **Rubella:** Intrauterine rubella infection is associated with a high incidence of cardiac anomalies, cataracts, and deafness
- **GBS infection** is associated with a high risk of premature labor and life-threatening GBS meningitis and sepsis in the neonate. If the baby recovers, it may still develop sequelae and neurological deficits
- **Syphilis:** Untreated pregnant women with syphilis are at high risk for premature labor and their babies may be stillborn or may be born with birth defects discussed above

Prevention of Perinatal Infections

Multiple sexual partners and intravenous drug use are the most important risk factors for PNs. **Pre-pregnancy and antenatal counseling** about barrier contraception, antenatal maternal screening, and **nutritional support** can help prevent these infections.

References

[Perinatal Infection](#) via [medical-dictionary.thefreedictionary.com](#)

[Other Congenital and Perinatal Infections](#) via [ucsfbenioffchildrens.org](#)

[TORCH Infections. Toxoplasmosis, Other \(syphilis, varicella-zoster, parvovirus B19\), Rubella, Cytomegalovirus \(CMV\), and Herpes infections](#) via [nih.gov](#)

[Infections in pregnant women](#) via [mja.com.au](#)

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