Infection threatening the fetus

Intrauterine infections of the embryo or fetus are most often caused by viruses, bacteria and protozoa. The routes of penetration of infectious agents can be: ascending (per continuitatem from the birth canal/mother's endometrium, e.g. during urogenital infections), hematogenous (from the mother's bloodstream through the placental barrier) and descending (from the fallopian tubes).[1][2]

Congenital (inborn) infections of the fetus can be considered infections that, after they usually manifest course in the mother, also affect the developing embryo or fetus. The disease can manifest itself either intrauterinely or after birth. The clinical course and consequences of the infection depend not only on the type of causative agent and the infectious dose, but also on the current age of the infected embryo or fetus.[2]

The most common causes of congenital infections can be summarized by the abbreviation **STORCH'**: **S**syphilis, **T**oxoplasmosis, **O**status (parvovirus B19, varicella-zoster virus, Listeria monocytogenes, hepatitis B virus, HIV, Chlamydia trachomatis, Borelia burgdorferi, enteroviruses), **R**ubeola, **C**ytomegalovirus, **H**herpes simplex.[2]

Congenital infections of the newborn form a group of intrauterine infections that have a strong **teratogenic effect** and can manifest with a similar clinical picture:

- CNS: early CNS atrophy, microcephaly (CMV), calcification (toxoplasmosis), hydrocephalus, encephalitis,
- hepatosplenomegaly, hepatopathy, jaundice with an obstructive component,
- senses: deafness and cataract (rubeola), chorioretinitis, microphthalmia,
- myocarditis, pneumonitis, overall severe condition similar to sepsis, multiorgan failure.

The diagnosis is based on the detection of specific IgM antibodies in the newborn's serum.[3] In selected diseases (e.g. CMV infection), it is also possible to specify the transmission of the infectious agent from the mother to the fetus by examining the amniotic fluid obtained [[Amniocentesis|by amniocentesis]]. [4]

Syphilis

Congenital syphilis (*lues connata, congenita*) is infection of a fetus or neonate with the spirochete *Treponema pallidum* acquired from the mother transplacentally during pregnancy or by direct contact with lesions at birth. Infection of the fetus can occur during any stage of maternal syphilis. The longer the time that has passed since the mother's primary infection, the less likely the infection will be transmitted to the fetus. The disease is extremely serious – it leads to premature births, abortions, congenital infection or even the death of newborns.

File:The face of a newborn infant with Congenital Syphilis.tif

Congenital syphilis

Syphilis is a chronic systemic infectious disease that is mainly transmitted through sexual intercourse. Antibodies against syphilis are tested in all pregnant women. [5] In the case of a positive screening, treatment with penicillin is indicated, which has an effect in the therapy of pregnant women, the prevention of transmission to the fetus and the therapy of an infected fetus.[6]

Clinical manifestations of congenital syphilis[7]

Early form of congenital syphilis (up to 2 years of age)	Late form of congenital syphilis
Hepatosplenomegaly	Hutchinson's teeth
Hemorrhagic rhinitis (coryza)	Interstitial keratitis of the eyes (ages 5 to 20 years)
Condylomata lata	Deafness based on n. VIII (ages 10 to 14)
Osteochondritis, periostitis	Saddle nose, protruding mandible
Mucocutaneous lesions (bumps on palms and soles)	Perioral fissures
Icterus	Mental retardation, convulsions
Non-immune hydrops fetalis	Saber shins, Olympian forehead
Hemolytic anemia, coagulopathy, thrombocytopenia	Clutton's joints (symmetrical painless knee swellings)
Pneumonitis	
Nephrotic syndrome	
Intrauterine growth retardation (IUGR)	

Hutchinson's triad is a manifestation of late congenital syphilis and includes barrel-shaped incisors, damage to vision (interstitial keratitis) and hearing (damage to cranial nerve VIII).[7]

🔎 *For more information see Congenital syphilis.*

Toxoplasmosis

Toxoplasmosis is a parasitic disease caused by the element *Toxoplasma gondii*. People can become infected by eating undercooked meat or by contact with infected cats or their excrement. Toxoplasmosis is transmitted to the fetus especially during primary infection of a pregnant woman, and the risk of transmission of infection from a pregnant woman to the fetus increases with gestational age. Infection at the beginning of pregnancy has the most serious consequences. The clinical picture congenital toxoplasmosis most often includes chorioretinitis, intracranial calcification and hydrocephalus, with the current manifestation being referred to as the so-called **Sabino's Triad**.[8] Most infected children are asymptomatic.[9] Toxoplasmosis can be demonstrated serologically and by PCR from body fluids. Pyrimethamine, sulfadiazine, and folic acid are used for treatment.[8] Serological screening of pregnant women for toxoplasmosis is not established in the Czech Republic.

🔎 *For more information see Congenital Toxoplasmosis.*

Rubella

Rubella virus can cause congenital rubella (rubella embryo/fetopathy, Gregg syndrome).[2]

Clinical picture

The risk and extent of damage to the fetus depends on the gestational age at the onset of the maternal infection. The risk of damage to the fetus decreases with the length of pregnancy:

- infection of the mother before the 8th week of pregnancy – abortion or **Gregg's syndrome**':
  - deafness (deafness caused by damage to the function of the inner ear);
  - congenital heart defects;
  - eye damage (cataract, retinopathy);
  - often also affected CNS (microcephalus);
  - on the skin purpura or petechia ("Blueberry muffin" image of a child) as a result of thrombocytopenia;
  - sometimes present icterus caused by hepatitis, hepatosplenomegaly;[10]
  - myocarditis, interstitial pneumonia, meningoencephalitis.[3]
- infection at 13 to 16 weeks - about 1/3 of fetuses have hearing damage;
- infection after 18 weeks – the risk to the fetus is minimal.[9]

Diagnostics
Serum IgM against rubella.
Prevention
Rubella vaccination.[3]

Before planned conception, women are recommended to undergo a serological examination and possibly complete vaccination. If a pregnant woman is exposed to the infection **in the first trimester** and does not have protective antibodies, it is recommended to repeat the serological examination in 2-3 weeks and to *consider termination of pregnancy* if antibodies develop.[10]

Infectious hepatitis B

Vertical transmission of HBV from mother to child can rarely occur intrauterinely, mostly in the perinatal period during childbirth, but the child can also become infected postnatally, especially during breastfeeding and further contact with the mother (HBV can be excreted in milk) . HBsAg screening is mandatory during pregnancy. '*Newborns of HBsAg positive mothers are vaccinated on the day of birth* (passive + active immunization) and thus the vertical transmission of HBV is significantly limited. Thanks to this vaccination, vaginal delivery does not increase the risk of HBV transmission. After discharge from the maternity hospital, it is advisable to monitor HBsAg positive mothers and their children in the hepatology outpatient clinics of infectious diseases departments.[11]

Prevention of HBV transmission according to Decree of the Ministry of Health of the Czech Republic No. 537/2006 and 299/2010 Coll. on vaccination against infectious diseases - immunization schedule for newborns of HBsAg positive mothers:

- 0–12 (24) hours: immunoglobulin against hepatitis B (e.g. neoHepatect® i.v.);
- 0–24 h: 1st dose of HBV vaccine (e.g. Engerix B® 10 µg (0.5 ml) i.m.);
- 6 weeks: 1st dose of hexavaccine (e.g. Infanrix Hexa® 0.5 ml i.m.);
- 2nd dose of hexavaccine at the earliest in a month;
- 3rd dose of hexavaccine at the earliest in a month;
- further see regular vaccination schedule.[11][12]

In children with an adverse health condition after birth, active immunization can be postponed until the 7th day of life.[11]

In the perinatal period, the umbilical cord or venous blood of the child is not examined for the presence of HBsAg. These tests are burdened with significant false positive results, which could lead to incorrect termination of vaccination if interpreted incorrectly. After vaccination, due to the administration of 5 doses of hepatitis B vaccine, it is not necessary to test for anti-HBs antibodies. Most children will develop anti-HBs antibodies and will be protected against HBsAg positivity for life. Nevertheless, it is advisable to determine HBsAg at the age of 2-3 years, a negative result excludes a rare infection in a vaccinated child.[11]

🔎 *For more information see HBsAg positive mother and newborn.*

Infectious hepatitis C

Vertical transmission of HCV from mother to child can rarely occur intrauterinely, mostly in the perinatal period during childbirth, but the child can also become infected postnatally, especially during breastfeeding and further contact with the mother. Vertical transmission of HCV occurs in 5–10% of viremic mothers. Children are asymptomatic, they usually develop chronic hepatitis, but the development of cirrhosis in childhood is rare. There is practically no prevention of vertical transmission of HCV, the method of delivery or breastfeeding do not affect the frequency of infections (vaginal delivery does not increase the risk of HCV transmission; HCV can be excreted in colostrum to a small extent, which does not increase the risk of infecting children; HCV is practically not excreted in milk). Anti-HCV testing is not mandatory during pregnancy. It is advisable to perform it in women with risky behavior, especially with previous intravenous drug use. Children of anti-HCV positive mothers are vaccinated according to the classic vaccination schedule, they have no restrictions or exemptions in vaccination. After discharge from the maternity hospital, it is advisable to monitor anti-HCV positive mothers and their children in the hepatology outpatient clinics of the infectious disease department.[11]

In the perinatal period, the umbilical cord or venous blood of the child is not examined for the presence of anti-HCV antibodies or hepatitis C virus nucleic acid (HCV RNA). These examinations are burdened with significant false positive results, which, if interpreted incorrectly, could lead to a misdiagnosis of hepatitis C virus infection in a child. Anti-HCV positivity can persist in the child's first year, exceptionally even in the second year. Infection is ruled out by the disappearance of anti-HCV and a negative HCV RNA result. Conversely, infection in a child older than 1 year will be confirmed by the presence of HCV RNA and the long-term persistence of positivity of anti-HCV antibodies.[11]

Only for women who are simultaneously infected with HCV and HIV, cesarean delivery is indicated in the Czech Republic and breast-feeding is excluded, these measures mainly reduce the risk of HIV transmission to the child.[11]

HIV

Mandatory HIV screening during pregnancy - serology. Transmission of HIV is possible transplacentally, "intra partum" or by breastfeeding. Maternal IgG against HIV crosses the placenta, uninfected infants do not become seronegative until around 9 months of age. Diagnosis of neonatal HIV infection: PCR at birth, in the 1st month and between the 3rd and 4th month of life. Average time from infection to clinical manifestation of AIDS is 4-5 years, coincidence of CMV infection accelerates the progression of AIDS.[9]

The risk of perinatal transmission is reduced by the antiretroviral drug zidovudine - it is administered during pregnancy and then to the child up to 4-6 weeks of age. Prophylaxis of pneumocystis pneumonia with cotrimoxazole.

🔎 *For more information see HIV infection in pregnancy.*

Cytomegalovirus

Congenital cytomegalovirus infection is a relatively common congenital infection (3-4 cases/1000 live births). About 1/2 of women are susceptible to CMV infection and almost 1% of them may develop a primary infection during pregnancy. Approximately 40% will give birth to an infected newborn.

Clinical picture

Damage to the child is rare - 90% of newborns are asymptomatic and further development is favorable. 5% of newborns have clinical signs of infection (neurological and/or sensory impairment): growth failure, microcephaly, encephalitis, hearing impairment, petechiae, purpura, anemia, icterus, hepatosplenomegaly, pneumonia. In 5% of newborns, it manifests itself later - hearing damage.[9]

Therapy

Antivirals – ganciclovir, foscarnet, cidofovir, CMV-free blood products.[3]

🔎 *For more information see Congenital cytomegalovirus infection.*

Herpes simplex

Transmission during delivery from infected mother's birth canal or ascending route, mostly HSV-2. In case of primary genital infection of the mother, the risk of infection of the newborn is 40%, in case of recurrent infection <3%.

Clinical picture

Clinical manifestation at any time during the first 4 weeks after birth. Typical skin lesions on the skin, mucous membranes, conjunctivae. Encephalitis - poor prognosis, high mortality. Generalized systemic disease - poor prognosis, high mortality.

Therapy

Parenteral administration of aciclovir. In case of primary infection of the mother (genital herpetic lesions), cesarean delivery is indicated.[9]

🔎 *For more information see Adnate HSV infection.*

Varicela-zoster

In case of infection up to the 20th week of pregnancy – low risk of affecting the fetus (2%: severe cicatricial damage to the skin, damage to the eyes and CNS). In case of infection 5 days before delivery, up to 2 days after delivery (the fetus is not protected by maternal antibodies) – high risk of danger to the fetus/newborn, administration of VZIG and prophylactic protection with aciclovir is indicated. Mortality up to 5%.

Pregnant women exposed to VZV are given varicella-zoster immunoglobulin (VZIG) and aciclovir.[9]

Listeriosis

Listeriosis is a relatively rare disease caused by the bacterium *Listeria monocytogenes*, which mainly affects newborns, the elderly and immunocompromised individuals. A pregnant woman typically becomes infected by eating contaminated food. The fetus/newborn can become infected transplacentally or during or after birth (ascending, vertical). It takes place under the guise of sepsis, pneumonia or meningitis and has a high mortality rate. Severe infections can be accompanied by granulomatous exanthema (granulomatosis infantiseptica) - microabscesses all over the body, especially in the liver and spleen. In addition to meningitis, late-onset infections can also be manifested by colitis accompanied by diarrhea or sepsis without meningitis. Late-onset infections have a low mortality with adequate treatment. *L. monocytogenes* is proven by culture and treated with antibiotics, initially ampicillin with an aminoglycoside.[13][7]

🔎 *For more information see Congenital listeriosis.*

Other infections

Other infections mainly include bacterial infections of the fetus caused by a wide variety of bacteria. These are often species that are part of the normal microflora of the digestive tract and skin. However, the undeveloped immune system of the fetus is not able to defend itself adequately.

Overview

	Examination during pregnancy	Examination of the newborn	Treatment	Breast feeding
Syphilis	non-treponemal and treponemal test	non-treponemal and treponemal test or direct proof	penicillin	Yes
Hepatitis B	serology (HBsAg)	not	passive+active immunization	Yes
Hepatitis C	serology (optional)	not		Yes
HIV	serology	PCR	antiretroviral	NO

Links

Related articles

- Congenital syphilis • Congenital toxoplasmosis • HBsAg positive mother and newborn • Congenital listeriosis • Congenital herpes simplex virus infection • Congenital gonorrhea • Congenital cytomegalovirus infection • HIV infection in pregnancy
- Infection in the neonatal period • Neonatal sepsis
- Importance of chlamydia and mycoplasmas in perinatology
- Teratogens

External links

- JĚŽOVÁ, Marta – HOTÁRKOVÁ, Sylva – MŮČKOVÁ, Katarína, et al. *Hypertextový atlas fetální patologie : Multimediální podpora výuky klinických a zdravotnických oborů* [online]. Portál Lékařské fakulty Masarykovy univerzity [online], ©2008. [cit. 26.11.2011]. <http://portal.med.muni.cz/clanek-463-hypertextovy-atlas-fetalni-patologie.html>.
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