Infections caused by Streptococcus agalactiae

Streptococcus agalactiae is a group B gram-positive β-hemolytic coccus, often referred to as **GBS** ("Group B Streptococcus"). It is often a part of the flora of the gastrointestinal and urogenital tract in asymptomatic carriers. During delivery, transmission from a pregnant woman to a newborn is possible. In neonates, GBS is significantly involved in perinatal morbidity and mortality, so in indicated cases, colonized women are given antibiotics during childbirth as a precaution.

In newborns, it causes early and late infections - bacteremia, sepsis, pneumonia, and meningitis. **In adults** (especially with chronic diseases such as diabetes mellitus), infections manifest themselves in the form of bacteremia (including sepsis) and soft tissue infections. **In pregnant women**, GBS causes bacteremia (sepsis), amnionitis,and urinary tract infections.

The Czech Gynecological and Obstetrics and Neonatology Society has developed a recommended procedure for GBS screening, antibiotic prophylaxis during childbirth, and follow-up care for newborns.

Streptococcus agalactiae precautions during pregnancy

- **Recommended screening:**
  - In all pregnant women between 35 and 37 weeks of gestation
  - Cultivation from the lower third of the vagina and rectum
  - The result is recorded in the pregnancy certificate; the examination is valid for 5 weeks
- **Indications for intrapartum antibiotic prophylaxis:**
  - Positive GBS screening
  - GBS bacteriuria at any time during pregnancy
  - Previous child with invasive GBS infection in neonatal age
  - Inconclusive result of GBS screening + risk factors (delivery before 37 gestational weeks, amniotic fluid outflow > 18 hours, fever)
- **Intrapartum antibiotic prophylaxis is not indicated:**
  - Negative GBS screening (regardless of risk factors)
  - Cesarean delivery before the onset of labor and with intact amniotic sacs (regardless of the outcome of the GBS screening)
  - Positive GBS screening/bacteriuria in previous pregnancy
- **Intrapartum antibiotic prophylaxis:**
  - First choice ATB: intravenous penicillin G (there is still good sensitivity in the Czech Republic)
  - ATB alternative: intravenous ampicillin, or 1st generation cephalosporin (cefazolin, cephalothin) or clindamycin if allergic to penicillins.
  - ATB therapy is terminated at the birth, and is continued only if there is a clear clinical finding of maternal infection.

Infections caused by Streptococcus agalactiae in neonates

Streptococcus agalactiae (GBS) is the main and most common cause of early neonatal infections, significantly contributing to neonatal morbidity and mortality. In an effort to reduce the incidence of early neonatal GBS infections, screening for GBS colonization in pregnant women has been introduced and, in indicated cases, intrapartum antibiotic prophylaxis is performed. Prophylaxis is considered sufficient if antibiotics are given at least 4 hours before the birth of the newborn. After birth, the procedure developed by the Czech Neonatological Society is followed. According to this procedure, high-risk newborns are rigorously observed in the first 48 hours of life and laboratory signs of inflammation are examined.

Newborns are most often colonized by GBS during childbirth. Only a small proportion of colonized newborns develop invasive GBS infections. Risk factors include, in particular, prematurity, and premature amniotic fluid outflow.

GBS causes early and late infections in newborns. Early sepsis usually manifests in the first 24 hours, but can occur at any time during the first week of life. The symptoms are the same as in early neonatal sepsis of a different etiology. Pneumonia with bacteremia is also common, while meningitis is less common. Late GBS infection can occur at any time between the first week of life and 3 months of age. These are typically bacteremia and meningitis.

Recommendations of the American Academy of Pediatrics (AAP)

Early GBS infection is defined as the isolation of group B streptococcus (GBS) from blood, cerebrospinal fluid, or other normally sterile sites from birth to day 6 of age.

An early GBS infection manifest itself clinically at or shortly after delivery. Most babies are symptomatic within 12 to 24 hours of birth, while about 95% of infections are diagnosed within 48 hours of birth.

An early GBS infection most often arises from the ascending colonization of GBS of the uterine compartment from the gastrointestinal and urogenital flora of the mother. About 50% of newborns to GBS positive mothers are colonized with GBS and about 1-2% develop early GBS infections.

Risk factors include: lower gestational age (less effective opsonization and neutrophil-mediated immune response, lower levels of protective antibodies transmitted from the mother), longer amniotic fluid outflow (ascending colonization and infection), maternal fever (evidence of maternal inflammatory response to developing intraamniotic infection), a child with early GBS infection from a previous birth (impaired maternal immune response, increased GBS virulence), GBS bacteriuria (a sign of a high degree of maternal colonization).

Following intrapartum antibiotic prophylaxis (IAP), recolonization occurs within 24-48 hours after delivery. IAP does not protect against the development of late GBS infections. A woman colonized with GBS during pregnancy has about a 50% risk of colonization in the following pregnancy.

Antenatal screening GBS

- Cultivation of swab from vagina and rectum during weeks 36 + 0 - 37 + 6 of pregnancy or in case of imminent preterm birth and/or amniotic fluid outflow before the 37th week of pregnancy.
- In GBS bacteriuria, it is not necessary to confirm colonization by culturing a swab from the vagina and rectum.
- Traditional microbiological or molecular methods can be used to detect GBS: NAATs (*nucleic acid amplification tests*). However, NAATs do not allow the determination of allergies to antibiotics, which is important, for example, in women with allergies to penicillin.

Intrapartum antibiotic prophylaxis

- **Objective**: to reduce the incidence of invasive early GBS infections by interrupting the vertical transmission of GBS (transient reduction of colonization of the mother's vagina, prevention of colonization of the fetal/neonatal surface and mucous membranes, reaching the level of antibiotic in the neonatal blood exceeding MIC - minimum inhibitory concentration)
- **Indication**:

- Pregnant women with positive antenatal screening GBS (positive cultivation from vagina or rectum)
- Women with GBS bacteriuria diagnosed at any time during pregnancy
- Women who had a child with GBS infection from a previous pregnancy
- Premature birth and/or premature amniotic fluid before 37 + 0 week of gestation
- Women giving birth at 37 + 0 week of gestation with unknown GBS status and risk factors during labor (maternal temperature at labor ≥ 38 ° C, amniotic fluid outflow ≥ 18 hours)
- NAAT positive for GBS

- **Antibiotics**:
  - Beta-lactam antibiotics: penicillin G (crosses the placenta and is excreted by the fetal kidneys into amniotic fluid), ampicillin (broader antimicrobial spectrum than penicillin)
  - In case of penicillin allergy with low risk of anaphylaxis: cefazolin
  - In case of an allergy to penicillin with a high risk of anaphylaxis: clindamycin (examine antibiotic susceptibility- increasing resistance of GBS to clindamycin; metabolized fetal liver, poorly excreted in the amniotic fluid, reaches significant concentrations only after multiple doses)
  - In the case of penicillin allergy with high risk of anaphylaxis and clindamycin-resistant GBS, vancomycin is used.

Early GBS infection risk assessment

In the United States, the incidence of early GBS infection has decreased significantly following the introduction of antenatal screening and intrapartum antibiotic prophylaxis of GBS. Meningitis was diagnosed in 9.5% of neonates with early GBS infection. GBS meningitis demonstrated by positive cerebrospinal fluid culture was accompanied by a negative blood culture in 9.1% (i.e., the incidence of these cases was about 2.5 cases per 1 million live births). GBS infections account for about 45% of all cases of early infection with positive blood culture in full-term neonates and about 25% in very low birth weight infants. 28% of GBS early infections are neonates born before 37 weeks of gestation. GBS early infections mortality is 2.1% in full term infants and 19.2% in preterm infants (<37 weeks of gestation).

Late GBS infection

It is defined as the isolation of GBS from day 7 to day 89 of life from a normally sterile site. Rarely, very late GBS infections may occur after 3 months of age, especially in very premature infants or in children with immunodeficiency. The incidence of late GBS infections did not decrease after the introduction of intrapartum antibiotic prophylaxis. The most common form of GBS late infections is bacteremia. Another form of GBS late infections is meningitis, bone, and joint infections or isolation of GBS from peritoneal fluid are relatively rare.

Links

Related articles

- Streptococcal infections
- Streptococcus agalactiae

External links

- Recommended procedure of the Czech Gynecological and Obstetrical Society (2013) (http://www.perinatologie.cz/dokumenty/doc/doporucene-postupy/p-2013-diagnostika-a-lecba-streptokoku-skupiny-b-v-tehotenstvi.pdf)
- Recommended procedure of the Czech Neonatological Society (2006) (http://www.neonatologie.cz/klinicke-postupy/gbs-cneos-pdf/)
- Management of Infants at Risk for Group B Streptococcal Disease (AAP 2019) (https://pediatrics.aappublications.org/content/144/2/e20191881.long)

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