

# Neonatal sepsis

**Neonatal sepsis** is currently defined on the basis of positive blood culture (sepsis) or cerebrospinal fluid culture (meningitis) of the newborn. A distinction is made between *early neonatal sepsis*, which is diagnosed within 72 hours of life, and *late neonatal sepsis* after 72 hours of life.

**The clinical signs of sepsis are nonspecific** in neonates and occur in a variety of non-infectious conditions, so clinical diagnosis is often difficult. Symptoms of sepsis include: difficulty breathing (tachypnea, dyspnea, apnea), circulatory instability (tachycardia, prolonged capillary return, hypotension), thermal instability (hypothermia, fever), eating disorders (refusal to eat, vomiting), neurological symptoms (apathy, increased irritability, disturbances of consciousness, convulsions), event. metabolic disorders (hypoglycemia, metabolic acidosis).

**Early-onset sepsis** (EOS) most often occurs as a result of **ascending colonization** and infection of the uterine compartment or transmission to the baby as it passes through the infected birth canal and is caused mainly by bacteria of the gastrointestinal and urogenital tract of the mother, rarely **transplacental** (hematogenous) transmission from mother to fetus (e.g. *Listeria monocytogenes*). In 85% of cases, EOS manifests clinically within the first 24 hours. Typical agents include: *Streptococcus agalactiae* (GBS) and *Escherichia coli*. The following are less common: *coagulase-negative Staphylococcus*, *Haemophilus influenzae*, *Listeria monocytogenes*.

**Late-onset sepsis** occurs after 72 hours of life and its most common pathogens include: *coagulase-negative Staphylococcus*, *Staphylococcus aureus*, *E. coli*, *Klebsiella*, *Pseudomonas*, *Enterobacter*, *Candida*, *GBS*, *Serratia*, *Acinetobacter*, anaerobic bacteria and others.

## Therapy

### Early-onset neonatal sepsis

- 1st choice antibiotics: penicillin + gentamicin, if *Listeria monocytogenes* is suspected, we administer ampicillin + gentamicin;
- empirical antibiotic therapy should be discontinued after 36-48 hours if the blood culture is negative and the neonate has no clinical signs of infection.

### Late-onset neonatal sepsis

- 1st choice antibiotics: oxacillin + gentamicin;
- in suspected sepsis with negative blood culture ("clinical sepsis"), antibiotics are usually given for 5 days;
- in case of positive blood culture, antibiotics are administered for at least 10 days; in the treatment of *St. aureus* are administered for at least 14 days - in consultation with a microbiologist.

### Meningitis

- antibiotics: cefotaxim + amoxicillin or penicillin G ± gentamicin;
- in case of positive cultivation of cerebrospinal fluid or clinical signs of meningitis, the treatment lasts at least 21 days;
- treatment of osteomyelitis, endocarditis or deep abscess takes weeks.

## American Academy of Pediatrics (AAP) Recommendation

Definition of early-onset sepsis (EOS): blood culture or cerebrospinal fluid culture, collected within 72 hours of birth, positive for the presence of pathogenic bacteria. Unlike the definition of sepsis in pediatrics or adult medicine, it is a microbiological definition. EOS cannot be diagnosed by culturing swabs from the skin or gastric aspirate of the newborn, urine culture is not indicated before 72 hours of age.

### Newborns born $\geq 35 + 0$ weeks pregnant

#### Risk factors EOS

- (1) a newborn who looks clinically ill;
- (2) mother with clinically diagnosed chorioamnionitis (*intraamniotic infection*, IAI);
  - confirmed IAI: positive amniotic fluid cultivation, positive histopathological examination of the placenta;
  - suspicious IAI: mother's fever during childbirth ( $1 \times \geq 39.0^\circ\text{C}$  or  $38.0\text{--}38.9^\circ\text{C}$ , which last longer than 30 minutes) and at least one of the following RFs: maternal leukocytosis, purulent cervical discharge, fetal tachycardia.
- (3) mother colonized with GBS without adequate intrapartum antibiotic prophylaxis with amniotic fluid drainage more than 18 hours before delivery or with delivery before week 37 of pregnancy;
- (4) mother colonized with GBS without adequate intrapartum antibiotic prophylaxis without other risk factors;

#### Recommended Action

- groups 1+2: laboratory examination and empirical antibiotic treatment;
- group 3: laboratory examination;

- group 4: hospital observation for  $\geq 48$  hours.

## Premature newborns $\leq 34 + 6$ weeks pregnant

### Premature infants with low EOS risk

- obstetric indications for preterm birth (maternal preeclampsia or other non-infectious maternal diseases, placental insufficiency);
- cesarean delivery;
- absence of labor, attempt to induce labor, or amniotic fluid outflow before delivery.

### Recommended Action

- no laboratory tests and no antibiotic therapy or blood culture collection and clinical monitoring.

### Premature infants with a higher risk of EOS

- cervical incompetence, premature birth, premature amniotic fluid, chorioamnitis or IAI, and / or acute or otherwise unexplained onset of *nonreassuring fetal status*.

### Recommended Action

- blood culture collection and empirical antibiotic therapy, event. lumbar puncture.

## Therapy

- empirical antibiotic therapy of the 1st choice: ampicillin + gentamicin;
- definitive antibiotic therapy - according to sensitivity, an attempt at an antibiotic of the narrowest possible spectrum.
- In case of negative blood culture, empirical antibiotic therapy should be discontinued after 36 to 48 hours of incubation, unless it is a site-specific infection. Continuation of empirical antibiotic treatment solely due to laboratory abnormalities is rarely justified, especially in full-term preterm infants.
- Lumbar puncture should be performed when EOS is diagnosed with a positive blood culture. Blood cultures should be collected daily until negativity (microbiological sterility) is reached.

## Prevention

- intrapartum antibiotic prophylaxis in mothers with GBS colonization and mothers with suspected or confirmed intraamniotic infection.

## Links

### External links

- Doporučení ČNeoS: Doporučený postup k profylaxi a léčbě infekcí vyvolaných *Streptococcus agalactiae* (GBS) 2020 (<http://www.neonatology.cz/doporuceni-a-postupy>)
- Management of Infants at Risk for Group B Streptococcal Disease (AAP 2019) (<https://pediatrics.aappublications.org/content/144/2/e20191881.long>)
- Management of Neonates Born at  $\geq 35$  0/7 Weeks' Gestation With Suspected or Proven Early-Onset Bacterial Sepsis (AAP 2018) (<https://www.ncbi.nlm.nih.gov/m/pubmed/30455342/?i=5&from=puopolo%20management>)
- Management of Neonates Born at  $\leq 34$  6/7 Weeks' Gestation With Suspected or Proven Early-Onset Bacterial Sepsis (AAP 2018) (<https://pediatrics.aappublications.org/content/142/6/e20182896.long>)

## Reference

1. PUOPOLO, Karen M., William E. BENITZ a Theoklis E. ZAOUTIS. Management of Neonates Born at  $\geq 35$  0/7 Weeks' Gestation With Suspected or Proven Early-Onset Bacterial Sepsis. *Pediatrics*. 2018, roč. 6, vol. 142, s. e20182894, ISSN 0031-4005. DOI: 10.1542/peds.2018-2894.
2. ↑ ČNeoS. *Doporučený postup k profylaxi a léčbě infekcí vyvolaných Streptococcus agalactiae (GBS) 2020* [online]. ©2020. [cit. 2021-02-03]. <<http://www.neonatology.cz/upload/www.neonatology.cz/Legislativa/Postupy/gbs-doporuceny-postup.pdf>>.
3. ↑ Skočit nahoru k:a b GOLLEHON, N S. *Neonatal Sepsis* [online]. ©2019. [cit. 2021-02-03]. <<https://emedicine.medscape.com/article/978352-overview>>.
4. ↑ RENNIE, JM, et al. *Textbook of Neonatology*. 5. vydání. Churchill Livingstone Elsevier, 2012. s. 1025. ISBN 978-0-7020-3479-4.
5. ↑ *Nekompletní citace článku*. . Committee Opinion No. 712. *Obstetrics & Gynecology*. 2017, roč. 2, vol. 130, s. e95-e101, ISSN 0029-7844. DOI: 10.1097/aog.0000000000002236.
6. ↑ Skočit nahoru k:a b PUOPOLO, Karen M., William E. BENITZ a Theoklis E. ZAOUTIS. Management of Neonates Born at  $\leq 34$  6/7 Weeks' Gestation With Suspected or Proven Early-Onset Bacterial Sepsis. *Pediatrics*. 2018, roč. 6, vol. 142, s. e20182896, ISSN 0031-4005. DOI: 10.1542/peds.2018-2896.