# *Acute Otitis Media in the Newborn and Infant*

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**Introduction**

The first months of life are a critical phase in the development of a child. The newborn (NB) emerges from a liquid, protected medium and must adapt to the terrestrial environment, becoming more susceptible to infections. The middle ear is an immature organ at birth, and is often a source of infections. The diagnosis of acute otitis media (AOM) is often difficult in the NB (0-1 month of age) and also in the infant (1-12 months of age), because of the anatomical characteristics of the ear [1].

**Epidemiology**

The precise rate of AOM occurrence of AOM in NB and infants is unknown. It is estimated that AOM occurs in at least 0.6% of the live births up to one month of age and that this percentage rises to 2-3% in premature infants. Prospective studies following children from birth to 3 months of age showed AOM rates varying from 9 to 34%[1].

As for older children, lack of breastfeeding, passive smoking and low socioeconomic level are risk factors for AOM in the NB. It has been established that the presence of AOM in the first months of life helps predispose the child to new episodes in the future. A lengthy period with ruptured membranes, low birthweight NB and a stay in a neonatal intensive care unit (NICU) with nasotracheal intubation are factors that increase the possibility of an AOM episode[2].

**Pathogenesis**

During fetal life, the middle ear is filled by circulating amniotic fluid (AF) and mesenchyma, and their presence is considered normal. As the cavity is aerated by the Eustachian tube (ET) this content is eliminated and is absent in almost all NB by 72 hours post-partum [2]. It is believed that the presence of a tube dysfunction favors the retention of AF, mesenchyma and cellular remnants in the middle ear. If not eliminated, they may cause an inflammatory reaction of the mucosa in the first days of life [3].

The infected AF or meconium entering through the ET may also cause AOM during the neonatal period [2]. Among the factors that may favor AOM during the neonatal period are tube dysfunction, the immune status of the child, the nature of the AF, the association with other infectious processes, the use of positive pressure ventilation and anatomical alterations such as cleft palate [1].

**Microbiology**

In some aspects, the microbiological profile of AOM during the neonatal period is different from that in older children. More than 50% of the episodes are caused by

*S. pneumoniae, H. influenzae* and *M. catarrhalis*, mostly in children over 2 weeks of age without neonatal events problems. However, NB up to 2 weeks of age, or who remained in the NICU, after this time may present AOM caused by Group B *Streptococcus, S. aureus* and coliforms (10-15%)[4].

In the NB with early sepsis (up to 72 hours) and AOM, microorganisms of the maternal genitourinary tract predominate: *E coli, Listeria sp*. In cases of late hospital sepsis, *S. aureus, Klebsiella sp, Pseudomonas aeroginosa* predominate[1].

**Diagnosis**

There are no pathognomonic symptoms of AOM in the newborn or infant. It is possible that AOM has already been around for some time until the symptoms indicate the need for an otoscopic examination. General manifestations of acute illness are observed, and the symptoms are non-specific, such as irritability, lethargy, fever, coughing, diarrhea, vomiting, tachypnea and anorexia [4]. A few studies mention rhinorrhea as the most frequent manifestation suggestive of AOM in the first month of life. The association with conjunctivitis, pneumonia or meningitis may occur in up to half of the cases[4]. It should be stressed that only 42% of the AOM are diagnosed with certainty in children less than 1 year old.

Diagnostic certainty is achieved with the use of otoscopy. The otoscopic signs such as the presence of purulent secretion in the middle ear, bulging tympanic membrane and signs of acute inflammation are the same as for older children [5]. A peculiarity is that these signs may be limited to the pars flacida of the TM [1].

However, there are characteristic factors in this age group that make the examination more difficult. In the newborn and in the small infant, otoscopy requires experience and a meticulous evaluation of the middle ear. During the first days of life, the external auditory canal (EAC) may be filled by vernix caseosa, which has to be removed using an otological curette or appropriate-sized aspirators. The EAC diameter is very small, the bony canal is not yet fully developed and the skin is redundant [1]. Thus, when the speculum inserted it is both being drawn and pushed in, makes it difficult to view the tympanic membrane. Different from the conventional technique, which uses a speculum with the largest possible diameter and introduces it only up to the external third of the EAC, it is important to use a smaller-diameter speculum in the NB, allowing it to be introduced further into the external canal, very close to the tympanic membrane without carrying the skin with it. It is normally possible to use the ear specula with a 2mm diameter (**Photo 1**). Care must also be taken with the shape of the speculum. It must be shaped so as to respect the anatomical characteristics of the NB, and have a straight part in the distal portion, long enough to penetrate up to the TM. The examiner must be aware that the TM presents a very marked inclination making it difficult to distinguish where the EAC ends and the pars flacida begins. A detail that makes it easier to identify the TM is that it has more blood

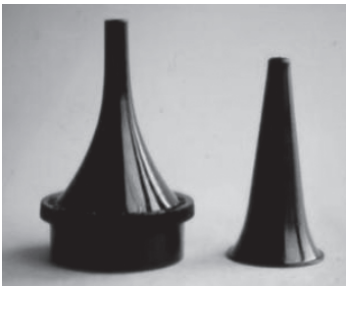

**Photo 1**: Left, 2mm otological speculum shaped appropriately for otoscopy in the NB. Right, inadequately-shaped 2mm otological speculum.

vessels as compared to the EAC skin [1]. Both the TM and the canal skin move in pneumatoscopy, making examination difficult to perform. Around the age of one month, the ear becomes more similar to that of older children.

**Treatment**

The type of antibiotic and the approach used for administration will depend on the child's age and general condition. A NB presenting AOM in the hospital environment - NICU - or less than 2 weeks old should be submitted to tympanocentesis to collect middle ear effusion, in order to perform a bacterioscopic and bacteriological examination. The picture is sufficiently serious to justify the procedure in order to choose the correct antimicrobial to be used. Bacterioscopic and culture tests are even more important in systemic infections in which the cultures of other secretions are sterile [4]. Tympanocentesis is not indicated when the diagnosis of AOM is performed in NB over two weeks of age or in infants at outpatient visits, suggesting that the infection was acquired in the community and is not severe. AOM can be treated with an oral antibiotic, considering the known microbiological profile (*S. pneumoniae* and *H. influenzae*). A child with signs of toxemia should be hospitalized for further investigations and to start treatment with intravenous antibiotics [4].

**Prognosis**

Children with AOM in the neonatal period are more susceptible to recurrent episodes of otitis media. It is not known whether this early episode causes alterations in the mucosa of the middle ear, rendering the child susceptible to future recurrences, or whether this episode in the NB simply identifies children with tube dysfunction or immunological immaturity, that are more predisposed to AOM.

## References

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