



# ANTIBIOTIC TREATMENT FOR OTITIS

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## ABSTRACT

Otitis is an ear infection that presents with inflammation. It can be classified into internal otitis or labyrinthitis, acute otitis media, and external otitis. It is a common disease in Europe and can be treated with different therapies. Otitis media is usually caused by bacteria, in about 70% of cases, or viruses, in about 30%. Immediate antibiotic treatment has been shown to be ineffective for reducing pain and it has been observed that the timely use of antibiotics only slightly reduces the risk of vomiting, rashes, or diarrhea. If the disease worsens after 48-72 hours, therapy with antibiotics and analgesics can be adopted. Otitis media is usually caused by *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Streptococcus pneumoniae*, which have a fair rate of spontaneous eradication.

**KEYWORDS:** *Otitis, ear infection, middle ear, antibiotic, inflammation*

## INTRODUCTION

Otitis is an infection of the ear that causes inflammation and pain which often affects children. Otitis is classified into three types: internal otitis, acute otitis media, and external otitis. Internal otitis, also called labyrinthitis, is a serious internal pathology which can lead to balance problems with vertigo and dizziness.

Otitis media can follow a cold or a respiratory infection, which leads to the accumulation of fluid behind the eardrum. The patient often experiences hearing problems, ear pain, and fever. External otitis is an infection of the external auditory canal with symptoms that include ear pain, itching, and sometimes discharge (1).

Otitis media is the most common type of otitis experienced, particularly in children (2). Acute otitis media is a very common condition, and in Europe, it is estimated that every year, at least 1% of the population suffers from this disease (3).

## DISCUSSION

Therapeutic strategies for otitis can vary widely (4). Placebo-controlled studies have shown that many otitis cases can be resolved naturally, which has helped refine antibiotic stewardship strategies, and in some cases, it has been shown that antibiotic treatment may not accelerate the disappearance of pain (5). In 65% of cases, both in the placebo and control groups, the ear pain disappeared within 24 hours of its onset and the onset of complications such as perforation, mastoiditis, and recurrent or effusion otitis media, did not increase in untreated subjects (6). In fact, the timely use of antibiotics reduces the risk of vomiting, rash, and diarrhea by only 6%.

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The decision to administer antibiotic therapy should be postponed for 48-72 hours following diagnosis. If symptoms worsen or persist, the antibiotic should be administered immediately. During the 48-72 hour waiting period, the physician should prescribe analgesic therapy with nonsteroidal anti-inflammatory drugs, adequately informing the patient about his or her health status and the reasons for the wait-and-see strategy (7). There is no indication for the use of antihistamines or mucolytic decongestants (8). However, there is no doubt that early antibiotic therapy can shorten the course of the disease and prevent the onset of complications.

The most common etiological agents of otitis media are *Haemophilus influenzae*, *Moraxella catarrhalis*, and *Streptococcus pneumoniae*, all of which have a fair rate of spontaneous eradication or healing in the absence of treatment (9) (Table I). Furthermore, although 70% of cases are of bacterial origin, in 30%, the microbial agent is viral in nature and therefore does not respond to antibiotics (10). If symptoms persist after the watchful waiting period, the empirically chosen antibiotic should be active against all bacteria that cause otitis media, but especially against *S. pneumoniae*, the bacterium with the lowest spontaneous eradication rate and which most frequently causes serious complications (11).

**Table I.** Percentage of spontaneous eradication of otitis media according to the causative agent.

Bacteria	%/S.D.
<i>Moraxella catarrhalis</i>	80 +/- 7
<i>Haemophilus influenzae</i>	55 +/- 5
<i>Streptococcus pneumoniae</i>	10 +/- 4

US and European guidelines agree in recommending amoxicillin in combination with clavulanic acid as the first-line drug to be administered at 8-hour intervals in 3 daily doses (3). Cotrimoxazole, trimethoprim, and erythromycin are equally effective, but are generally not used because they are less safe than amoxicillin (12). However, guidelines disagree on whether to use a high dose of amoxicillin (90 mg/kg/day) or a standard dose (40–45 mg/kg/day) (5). Recent double-blind studies have shown that there are no significant differences in efficacy and tolerability between the two doses of amoxicillin (13).

Regarding the duration of treatment, data suggest that 5-7 days are sufficient to treat otitis media. A systematic study evaluated the efficacy of short-term antibiotic therapy of 5-7 days compared to the traditional 10-15 days on thousands of patients diagnosed with otitis media. The frequency of therapeutic failures after 20 days and after 1 month from the start of therapy did not differ between the two groups. Furthermore, a lower incidence of side effects emerged in the first group (14).

Traditional antibiotic therapy has shown a lower risk of therapeutic failure only in the 8-19 days following the start of therapy, but this is probably too short of a time interval for a correct evaluation of relapses (15). According to some authors, a valid alternative to amoxicillin is ceftibuten, a third-generation cephalosporin that, thanks to a high bioavailability (95%, compared to 80-90% of amoxicillin-clavulanic acid), is rapidly distributed in the interstitial fluids, including those of the middle ear, and therefore acts more effectively on *H. influenzae*, *M. catarrhalis*, and *S. pneumoniae* (16). Ceftibuten is also able to inhibit bacterial adhesion to the epithelial cells of the upper airways and to counteract the production of biofilm by pathogens. These modes of action, which are added to the bactericidal action common to all beta-lactams, give ceftibuten a high efficacy in the treatment of otitis media.

Beta-lactam antibiotics, such as amoxicillin, inhibit bacterial cell wall synthesis by binding to penicillin-binding proteins (17). This prevents cross-linking of peptidoglycan chains, which is essential for the strength and rigidity of the bacterial cell wall. The indicated dosage of the drug for the treatment of otitis media should be determined by the physician based on the pharmacological indications. (18)

## CONCLUSIONS

Antibiotics are used to treat otitis and function by affecting bacterial cell wall synthesis, protein synthesis, and DNA replication. Overuse of antibiotics for ear infections can lead to drug resistance, making it more difficult to treat future infections. It is important to remember that viral infections in the ear and other parts of the body do not respond to antibiotics.

### Conflict of interest

The authors declare that they have no conflict of interest.

## REFERENCES

1. Bojrab DI, Bruderly T, Abdulrazzak Y. Otitis externa. *Otolaryngologic clinics of North America*. 1996;29(5):761-782.
2. Edelstein DR, Parisier SC. Otitis media. *Comprehensive therapy*. 1988;14(1):37-45.
3. Suzuki HG, Dewez JE, Nijman RG, Yeung S. Clinical practice guidelines for acute otitis media in children: a systematic review and appraisal of European national guidelines. *BMJ Open*. 2020;10(5):e035343. doi:<https://doi.org/10.1136/bmjopen-2019-035343>
4. Leichtle A, Hoffmann TK, Wigand MC. Otitis media – Definition, Pathogenese, Klinik, Diagnose und Therapie. *Laryngo-Rhino-Otologie*. 2018;97(07):497-508. doi:<https://doi.org/10.1055/s-0044-101327>
5. El RE, Nedved A, Katz S, Frost HM. New insights into the treatment of acute otitis media. *Expert Review of Anti-infective Therapy*. 2023;21(5):1-12. doi:<https://doi.org/10.1080/14787210.2023.2206565>
6. Schilder AGM, Marom T, Bhutta MF, et al. Panel 7: Otitis Media: Treatment and Complications. *Otolaryngology–Head and Neck Surgery*. 2017;156(4\_suppl):S88-S105. doi:<https://doi.org/10.1177/0194599816633697>
7. de Sévaux JLH, Damoiseaux RA, van de Pol AC, et al. Paracetamol (acetaminophen) or non-steroidal anti-inflammatory drugs, alone or combined, for pain relief in acute otitis media in children. *The Cochrane Database of Systematic Reviews*. 2023;8(8):CD011534. doi:<https://doi.org/10.1002/14651858.CD011534.pub3>
8. Marchant CD, Shurin PA. Therapy of Otitis Media. *Pediatric Clinics of North America*. 1983;30(2):281-296. doi:[https://doi.org/10.1016/s0031-3955\(16\)34358-9](https://doi.org/10.1016/s0031-3955(16)34358-9)
9. Yokota S, Harimaya A, Sato K, Somekawa Y, Himi T, Fujii N. Colonization and Turnover of *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* in Otitis-Prone Children. *Microbiology and Immunology*. 2007;51(2):223-230. doi:<https://doi.org/10.1111/j.1348-0421.2007.tb03904.x>
10. Pichichero ME. Otitis Media. *Pediatric Clinics of North America*. 2013;60(2):391-407. doi:<https://doi.org/10.1016/j.pcl.2012.12.007>
11. Li L, Ma J, Yu Z, Li M, Zhang W, Sun H. Epidemiological characteristics and antibiotic resistance mechanisms of *Streptococcus pneumoniae*: An updated review. *Microbiological Research*. 2023;266:127221. doi:<https://doi.org/10.1016/j.micres.2022.127221>
12. Bottone E, Baldini G, Macchia P, Soldateschi M, Fridlevski A. Evaluation of the clinical efficacy of erythromycin, amoxicillin and co-trimoxazole in the treatment of acute respiratory tract infections in paediatric patients. *Current Medical Research and Opinion*. 1982;8(2):67-74. doi:<https://doi.org/10.1185/03007998209109760>
13. Anon JB, Jacobs MR, Poole MD, et al. Antimicrobial Treatment Guidelines for Acute Bacterial Rhinosinusitis. *Otolaryngology–Head and Neck Surgery*. 2004;130(1\_suppl):1-45. doi:<https://doi.org/10.1016/j.otohns.2003.12.003>
14. Principi N, Autore G, Argentiero A, Esposito S. Short-term antibiotic therapy for the most common bacterial respiratory infections in infants and children. *Frontiers in Pharmacology*. 2023;14. doi:<https://doi.org/10.3389/fphar.2023.1174146>
15. Pichichero ME. Short course antibiotic therapy for respiratory infections: a review of the evidence. *The Pediatric Infectious Disease Journal*. 2000;19(9):929-937. doi:<https://doi.org/10.1097/00006454-200009000-00037>
16. Tikhomirova A, Zilm P, Trappetti C, Paton JC, Kidd SP. The central role of arginine in *Haemophilus influenzae* survival in a polymicrobial environment with *Streptococcus pneumoniae* and *Moraxella catarrhalis*. *PLOS ONE*. 2022;17(7):e0271912. doi:<https://doi.org/10.1371/journal.pone.0271912>
17. Molloy L, Barron S, Khan N, Abrass E, Ang J, Abdel-Haq N. Oral  $\beta$ -Lactam Antibiotics for Pediatric Otitis Media, Rhinosinusitis, and Pneumonia. *Journal of Pediatric Health Care*. 2020;34(3):291-300. doi:<https://doi.org/10.1016/j.pedhc.2019.11.001>
18. Hajioff D, Mackeith S. Otitis externa. *BMJ clinical evidence*. 2010;2010:0510. Published 2010 Aug 3.