The use of antibiotics in the treatment of Acute Otitis Media (AOM) remains controversial, as reflected by the spate of recent papers on the management of this very common condition. The benefits of antibiotic treatment on short term and long term outcomes remain unproved; uncertainty exists over whether antibiotics prevent rare complications and studies on prevention of poor outcome in high-risk groups following antibiotic treatment are lacking.

It is broadly believed that community-based services would usually favour the use of antibiotics, especially in the U.K. and U.S. A\textsuperscript{5,6,7}, though not in the Netherlands\textsuperscript{8}. The hospital departments would be advocating its use whilst dealing with treatment failures, high-risk groups and the treatment of the complications of acute otitis media.

Conservative therapy

The mainstay of conservative therapy has been analgesics—Non-steroidal anti-inflammatory Drugs (NSAIDS) and paracetamol. A recent study by Bertin et al.\textsuperscript{9} has demonstrated the superiority of ibuprofen over paracetamol for pain relief, and analgesics were generally more effective compared to placebos. However the relative contraindication of prescribing ibuprofen to children would limit its use. The use of antihistaminics and decongestants, although traditional, has fallen into disrepute.\textsuperscript{10} Nasal decongestant drops too, are no longer popular.\textsuperscript{11}

The choice of antibiotics

There has been widespread acceptance for oral amoxycillin as the drug of first choice in AOM\textsuperscript{12,13,14} despite adverse side-effects like gastro-intestinal upsets in young children. This could be administered effectively per-rectally\textsuperscript{15} although gastro-intestinal problems were not circumvented, and compliance would be an added problem.

Penicillin-sensitive patients can be given erythromycin, cefixime\textsuperscript{16} or trimethoprim-sulphamethoxazole combinations. In a recent study\textsuperscript{17}, a single intramuscular...
A single dose of ceftriaxone was equal in efficacy to 10 days of oral co-trimoxazole. But the rare yet serious complications seen with the sulphonamide component such as pancytopenia, leucopenia and Steven-Johnson syndrome makes co-trimoxazole unsuitable as a first-line agent. Hence erythromycin remains popular in the U. K. as a second-line choice for those allergic to penicillin.

The majority of studies on the use of antibiotics in the treatment of AOM in recent literature compared the efficacies of different agents. Current trials include newer macrolides, Azithromycin and Clarithromycin, Amoxycillin-Clavulanate and Cefixime, for the treatment of beta-lactamase producing organisms i.e. Haemophilus influenzae and Moraxella catarrhalis. The recent emergence of penicillin resistant strains of M. catarrhalis and H. influenzae have caused concerns over the use of amoxycillin as the first-line agent for AOM in younger children.18,19 Indeed, numerous trials have been carried in recent years to assess the suitability of newer macrolides20,21,22,23 compared to amoxycillin-clavulanate and cefixime 24 as second-line agents; no single agent has been established to be distinctly superior over the others.

There has been an emerging awareness that the traditional methods of assessing clinical efficacy of an antibiotic by symptomatic response gives rise to the 'Polyanna' phenomenon (drugs with poor antibacterial activity appearing to be clinically effective in AOM and therefore not quite reliable to assess).25 Most clinical trials comparing the clinical efficacy of different antibiotics have failed to show statistically significant difference between the different agents.27

A number of randomised, placebo-controlled trials 28,29,30,31 have been carried out to evaluate the effectiveness of antibiotic regimes compared to the option of not using antibiotics at all in acute otitis media. Del mar and colleagues1 have recently carried out a meta-analysis of six of these trials. They have concluded that although early use of antibiotics did not influence resolution within 24 hours of presentation, after 2-7 days, fewer children in the antibiotic group had pain compared to those treated with placebos (9.7% vs. 14.3%). Moreover the risk of contralateral otitis media was reduced by 43%, although there was little influence on subsequent attacks of AOM or deafness. But antibiotics nearly doubled the risk of vomiting or rashes, Del Mar et al concluded that the benefits of early antibiotic use were modest. To prevent one child from experiencing pain by 2-7 days of presentation, 17 children must be treated early with antibiotics. They suggested a selective and more restricted use of antibiotics, and that looking for subgroups of children with otitis media who are going to suffer beyond one day and thus benefit most from antibiotics might be an useful of research in future.

**The role of Tympanocentesis**

More recently, measuring antibiotic concentrations in middle-ear fluid (MEF) has been used to assess the efficacy of antibiotic regime, especially in children who have had treatment failure in the presence of beta-lactamase.32 Several beta-lactamase stable drugs e.g. cefixime and amoxycillin-clavulanate achieve MEF concentrations well above the Minimum Inhibitory Concentration (MIC) 90-s for both beta-lactamase producing and non-producing Haemophilus influenzae, which was a distinct advantage over amoxycillin, as the latter failed to achieve the MIC 90 for most strains of beta-lactamase producing H. influenzae. But amoxycillin remains the first-line agent of choice by virtue of its superiority over amoxycillin-clavulanate or cefixime in reaching MEF levels that exceed the MIC 90 for penicillin-resistant Streptococcus pneumoniae at normal doses. Thus tympanocentesis with culture is the ideal method of antibiotic choice, at least in children with multiple antibiotic-regime failures 33 to decide between first and second-line agents. Clarithromycin34 has been reported to produce sustained MEF concentrations well above the MIC 90-s for most otitic pathogens with multiple oral doses.
Current Opinion in the Management in Acute Otitis Media—Abir K. Bhattacharyya—et al

It is possible that while empiric therapy could be restricted to first-line agents like amoxycillin, treatment of therapeutic failures with the former might be an indication to choose second-line agents based on tympanocentesis and culture in the near future. Moreover in the areas of high prevalence of beta-lactamase producing organisms, the appropriate first-line agent for empiric therapy could be chosen on the basis of clinical efficacy as predicted by MF levels. More prospective studies are required to establish a protocol for choosing second-line antibiotics.

**Prophylactic therapy for recurrent AOM**

At present the sub-population of children having recurrent episodes of acute otitis media can be best managed by a number of approaches. Long-term low-dose antibiotics have proved adequate with few side-effects, and overgrowth of Clostridium difficile has never been reported. A recent American study however found no benefit of continuous twice-daily or once-daily amoxycillin prophylaxis over placebo in preventing new AOM episodes. The use of routine antibiotic prophylaxis over placebo in preventing new AOM episodes. The use of routine antibiotic prophylaxis was therefore discouraged in this study, keeping in view the risk of acquisition of resistant pneumococci.

Surgical interventions like adenoidectomy and insertion of ventilating tubes have also been effectively used, although long-term sequelae of the later intervention might make it seem less than ideal. More recently, Uhari et al have reported from Finland the effectiveness of xylitol administered through chewing gums, which reduces the growth of Streptococcus pneumoniae in children with recurrent otitis media. There were fewer attacks as well as reduced antibiotic requirements in the above group of children.

**Prevention of AOM**

Preventing acute otitis media is a high-priority area and vaccines, both against bacteriae and viruses, appear to hold considerable promise for the ultimate prevention of AOM.

In a recent development, Respiratory Syncytial Virus-enriched Immunoglobulin (RSV Ig) has been successfully used in the prophylaxis of AOM in high-risk children. Although AOM develops in up to one-third of children with RSV illness, this approach appeared to have a significant impact on both RSV and non-RSV related AOM in high-risk children (e.g., broncho-pulmonary dysplasia, prematurity and heart disease). In the future, we are likely to witness significant work in the development of vaccines for the prevention of acute otitis media.

**Outcome and factors affecting outcome**

Acute otitis media is essentially a self-limited disease and a poor outcome is fortunately rare. Perforation of the tympanic membrane occurs in about one-third of cases, of which more than 90% close within one month. However, a middle-ear effusion persists for up to 3 months after the acute episode in about 70% of cases. In 10% it persists even beyond this period, usually requiring myringotomy with insertion of ventilating tubes. Air-conduction and inner-ear function are unaffected in the absence of complications, though recently hearing threshold elevation in the high-frequency range (> 8 kHz) has been reported following AOM.

Animal studies have indicated that this might be due to inner ear dysfunction. Rarely facial palsy may be the presenting feature of AOM. In most cases of facial palsy due to AOM, complete recovery is the rule, and antibiotics with myringotomy is all that is required. The risk of facial palsy in AOM seems to be highest in adults.

It is generally believed that acute mastoiditis has become very rare due to early antibiotic use. However the incidence of 'masked' or latent mastoiditis as a result of protracted sub-acute otitis has gone up significantly, as a result of disease modification by increasing early antibiotic administration in AOM.
Intra-cranial complications like meningitis have been shown to be predisposed by cochlear abnormalities like the Mondini deformity, or dehiscent facial nerve, especially in the horizontal part.\textsuperscript{55}

In a recent Finnish study\textsuperscript{56} of prognostic factors associated with a poor outcome of AOM, age below 2 years, history of allergic or respiratory symptoms, 6 hours or more of pe-treatment otalgia and Branhamella (Moraxella) catarrhalis in MEF were implicated with clinical failure of therapy. HIV infection and immuno-compromised states are also associated with a higher incidence of complications.

**Conclusions**

Although the majority of cases of Acute otitis media continue to be treated by early administration of antibiotics, there is increasing awareness that the benefits of antibiotic treatment are only modest.\textsuperscript{1} Despite increasing penicillin resistance, amoxycillin continues to be the drug of choice, though newer macrolides (Roxithromycin, Azithromycin and Clarithromycin), Amoxycillin-Clavulanate and Cefixime appear to be promising as second-line agents. Tymanocentesis with culture of mide-ear fluid is likely to be a key investigation for rational therapy in future, especially in cases of therapeutic failure of amoxycillin. Preventing AOM is a high-priority area at present, with current research aimed at developing vaccines and conducting trials.\textsuperscript{44} Although antibiotics have definitely improved the outcome of AOM with regard to complications, there is some concern about the rising incidence of masked or latent mastoiditis as a result of increased early antibiotic therapy.\textsuperscript{54} More prospective studies would be needed to elucidate the best mode of management of this very common condition.

**References**