ACUTE OTITIS MEDIA

Antibiotic Treatment Considerations

February – 2001[ii]

INTRODUCTION

Acute otitis media (**AOM**) is the most frequent bacterial infection in childhood. In a study of Saskatchewan preschoolers, AOM accounted for 33% of visits and 39% of antibiotic prescriptions; 80% of children diagnosed with AOM received an antibiotic.[1]

The diagnostic criteria for AOM vary, and it is generally agreed that there is difficulty in consistent diagnosis.[2] It has been recommended that the diagnosis should be based on the finding of at least one symptom (pain, irritability, fever or GI upset) and two tympanic findings (loss of ossicular landmarks, red color, opaque or dull appearance, decreased or absent TM mobility).

CAUSATIVE ORGANISMS[3]

In children with AOM, bacterial pathogens are absent in samples of middle ear fluid in up to 38 percent; viral RNA for human rhinovirus, RSV and coronavirus is present in 48 percent of middle fluid samples.[4] Bacterial causes include *Streptococcus pneumoniae* (40-50%), nontypable strains of *Hemophilus influenzae* (20-25%), and *Moraxella catarrhalis* (10-15%). Drug resistant *Streptococcus pneumoniae* (**DRSP**) is more common in children than adults.[5]

TREATMENT

AOM resolves spontaneously in 80% of patients with placebo or no drug therapy.[6] With antibiotic treatment, resolution of AOM rises to 95%. Stated another way - for every 7 children treated with antibiotics for AOM, only one will benefit.[7] There is no way to distinguish a child who will benefit from antibiotics versus a child who will not. While several European countries do not routinely treat AOM, the North American standard has been to offer antibiotics. However, there has been some movement towards watchful waiting in certain parts in Canada. **"Watchful waiting"** for 48-72 hours may be feasible for select children at low risk for serious sequelae.[8,9,10]

Children with AOM at low risk for serious sequelae
Older than 2 years of age
Mild and/or unilateral AOM
No toxicity or severe pain
Late presentation e.g. >36hrs & mild or improving (ENT opinion)
Normal host; no chronic disease
No otorrhea
No history of chronic or recurrent AOM
Availability of good follow-up

ANTIBIOTIC THERAPY[5]

Significant differences in comparative efficacy of various antimicrobial agents have NOT been demonstrated. Interestingly, drugs which cover β-lactamase producing organisms do not increase the response rate. Oral cephalosporins generally perform poorly for DRSP.[11,12]

AMOXICILLIN - still the drug of choice[5]

Despite the rise in bacterial resistance, amoxicillin has remained the drug of choice for initial empiric therapy; other antibiotics have not been found to be more effective. Advantages include:

- excellent middle ear penetration: 40-50 mg/kg/d usually exceeds the minimum inhibitory concentration (MIC) of penicillin sensitive *S. pneumoniae* and frequently exceeds the MIC for intermediately resistant *S. pneumoniae*
- >78% of *S. pneumoniae* are penicillin sensitive[13] and 57% of *H. influenzae* are β-lactamase negative and adequately covered by amoxicillin[14]
- clinical cure is often demonstrated even when β-lactamase producing organisms are cultured
- narrower spectrum of activity than many alternatives
- inexpensive
- well tolerated

High-Dose Amoxicillin[4,15]

The Drug Resistant *S. pneumoniae* (DRSP) Working Group recommends children receive high-dose amoxicillin (**80 - 90 mg/kg/d**) when penicillin resistant strains of *S. pneumoniae* are more likely:

- those who have failed initial therapy
- those who have recently received antibiotics
- age < 2
- attendance at a day care

High-dose amoxicillin is recommended for increased coverage of intermediately penicillin resistant *S. pneumoniae*. Although a maximum dose has not been specifically established, 1.5 g appears to be the North American norm while doses of 2-3 g/d are not infrequent in Europe. Studies directly assessing tolerance have not been done, but do comment that the drug was 'well tolerated.[15,16,17,18]

As the overall percentage of children having AOM caused by DRSP is fairly small, the actual number who would derive great benefit from the high-dose amoxicillin may be small. **Adequate dosing** (at least 40mg/kg/day) and **compliance** are essential in achieving optimal pharmacotherapy for AOM.

ALTERNATE THERAPY

If initial treatment fails (check patient compliance!) there are basically 2 options:

- **target β-lactamase producing organisms** with **one of**:
  - amox/clav (40mg/kg/d) + additional amox (40mg/kg/d)
  - 2nd and 3rd generation oral cephalosporins
  - TMP/SMX (although resistance is rising in SK) or new macrolides are options in severe penicillin allergy.

OR

- **target highly resistant *DRSP*** with **one of**:
  - IM ceftriaxone (50mg/kg IM Q24h X3 for recurrence)
  - (or clindamycin possible option; Note: clindamycin has no activity against *H. influenzae* or *M. catarrhalis*)

Note: Patients who have failed amoxicillin are more likely to have macrolide or TMP/SMX resistant infections.

NOTES ON 2nd LINE ANTIBIOTICS

AMOXICILLIN CLAVULANATE (Clavulin®)

- Clavulin® provides coverage for β-lactamase producing organisms such as *H. influenzae*. It does not provide additional coverage for DRSP over what would be expected for amoxicillin alone. Adding amoxicillin (40mg/kg) to Clavulin® (40mg/kg) provides additional DRSP coverage.
- Higher cost and rates of diarrhea (related to the clavulanate content) are potential disadvantages of Clavulin® use. Products with a higher amox/clavulanate ratio (e.g. 7:1) may be preferred for their BID dosing and lower incidence of diarrhea.

MACROLIDES

- erythromycin is not active against *H. influenzae*
- clarithromycin (Biaxin®): the active metabolite active against *H. influenzae*; active against *S. pneumoniae*, but not all are sensitive
- azithromycin (Zithromax®) is less active *in vitro* than erythromycin against *S. pneumoniae* and more active than either erythromycin or clarithromycin for *H. influenzae*
- pneumococcus resistant to one macrolide are generally resistant to all macrolides
- DRSP are more likely to be resistant to macrolides than penicillin sensitive *S. pneumoniae*[14]

ORAL CEPHALOSPORINS

- cephalexin (Keflex®) should **not** be used for AOM
- cefuroxime axetil (Ceftin®), cefaclor (Ceclor®), cefprozil (Cefzil®) and cefixime (Suprax®) are **2nd line** agents
- advantage: active against β-lactamase producing organisms
- disadvantages: many DRSP are resistant to these agents; broader spectrum of activity; more costly

TRIMETHOPRIM-SULFAMETHOXAZOLE (TMP/SMX)

(Cotrimoxazole, Bactrim®, Septra®)

- TMP/SMX is relatively safe and inexpensive and has commonly been used for AOM, especially in penicillin allergic children.
- resistance to TMP/SMX is rising; results of a Saskatchewan study of 198 isolates of *S. pneumoniae* (1995-6) showed 40% TMP/SMX resistance in strains otherwise sensitive to penicillin.[19] In a Canadian study 9.5% of all *S. pneumoniae* isolates were resistant to TMP/SMX and 13.7% of β-lactamase positive *H. influenzae* were resistant. No *M. catarrhalis* were resistant.[19]

See also ORAL ANTI-INFECTIVE - REFERENCE CHART

We wish to acknowledge those who have assisted in the development & review of this newsletter: Dr. P. Spafford (ENT), Dr. T. Laubscher (Family Medicine), Y. Shevchuk (U. of S. C. of Pharmacy), & the *RxFiles* Advisory Committee. *L. Regier BSP, BA; B. Jensen BSP*

DURATION OF TREATMENT[2,20]

The standard duration of oral antibiotic therapy for AOM is 10 days. Short course therapy **(**5 - 7 days**)** is appropriate for children > 2 years of age with uncomplicated AOM, no underlying disease and an intact ear drum. It may be especially appropriate for those with mild pain upon presentation and late presentation. Advantages of short course therapy include lower cost, potentially fewer side effects (not proven), less impact on normal flora, reduced antibiotic resistance and enhanced compliance.

OTITIS MEDIA WITH EFFUSION (OME)

Distinguishing AOM from OME promotes the judicious use of antibiotics.[2] Two weeks following AOM, 70-80% of children still have fluid in the middle ear. Asymptomatic middle ear effusion (e.g. no pain) does NOT require treatment with an antimicrobial agent (see ENT Perspectives below). Antihistamines and decongestants are ineffective for treatment of OME and can have significant adverse effects in children.

MANAGEMENT OF RECURRENT OTITIS MEDIA

Antibiotic prophylaxis for 3-6 months is usually undesirable. It is generally ineffective and within three to four months on prophylactic antibiotics, virtually all children will have β-lactamase resistant bacteria in their upper respiratory tract.[5]

ENT PERSPECTIVES (COURTESY DR. P. SPAFFORD)

When to refer: Referral to an Otolaryngologist for recurrent otitis media is recommended when a child has had 3 or more episodes of acute otitis media in 3 months or 4 or more episodes of acute otitis media in 1 year. More importantly, children with persisting middle ear fluid lasting longer than 3 months should be referred for evaluation of chronic otitis media with effusion as well as for hearing testing.

Surgical options: The main indications for myringotomies and tympanotomy tube insertion are:

- chronic otitis media with effusion (OME). That is, middle ear fluid persisting 3 months or more with abnormal hearing testing
- frequent recurrent otitis media – 3 episodes or more in 6 months or 4 or more episodes in 1 year

In terms of treatment, myringotomy alone **without** tympanotomy tube insertion is generally **not** accepted for the indications mentioned above. This is because the myringotomy opening closes within 24 hours and the benefits from consistent airation and provision of neutral middle ear pressure are lost.

Aspiration of middle ear fluid for diagnostic purposes to determine the exact causative bacterial organism is rarely indicated. This is because the causative bacterial organisms are predictable and empirical treatment is usually all that is necessary. In the rare instances of children with immunosuppression or complications related to acute otitis media, aspiration for diagnostic purposes may be indicated.

Follow-up for AOM: OME can be mistaken for AOM resulting in the pitfall of inadvertently treating sterile middle ear fluid with antibiotics. A child without pain usually does not require follow-up before at least 30days to avoid this pitfall. This is due to the slowness of the natural spontaneous resolution of middle ear fluid following AOM.

References available on request

References:
The RxFiles **– Acute Otitis Media – February, 2001**

[1] Wang EEL, Einarson TR, Kellner JD, Conly JM. Clin Inf Dis 1999;29:155-60.
[2] Dowell SF, Schwartz B, Phillips WR. Am Fam Phys 1998
[3] Sandford Guide to Antimicrobial Therapy 2000, pg 7.
[4] A. Pitkaranta, et al., "Detection of Rhinovirus, Respiratory Syncytial Virus and Coronavirus Infections in Acute Otitis Media by Reverse Transcriptase Polymerase Chain Reaction" Pediatrics, 1998, 102, pp291–296.
[5] Dowell SF, Butler JC, Giebink GS, et al. Ped Infect Dis J 1999;18:1-9.
[6] Moshe Ipp. New evolving strategies for the management of acute otitis media. Paediatr Child Health 1999;4(7):451-2.
[7] Rosenfeld RM, Vertrees JE, Carr J. et al. J. Pediatr 1994;124:355-67.
[8] Van Buchem FL, Peeters MF, Van M. BMJ 1985;290:1033-1037.
[9] Pennie R. Can J CME 1999 September 51-68.
[10] Antibiotic Resistance Education Project, University of British Columbia, February 1999.
[11] Ball P. Am J Med 1999;107(5A):77S-85S.
[12] Lund B, Ernst EJ, Klepser ME. Am J Health-Syst Pharm 1998;55:1987-94.
[13] Saskatchewan 2000 data on file.
[14] Davidson RJ, Canadian Bacterial Surveillance Network, Low D. Can J Infect Dis 1999;10:128-133.
[15] Infectious Diseases and Immunization Committee, Canadian Pediatric Society. Can J Infect Dis 1999;10:277-278.
[16] Seikel K, Shelton S, McCracken GH. Pedr Infect Dis J 1998:17:969-70.
[17] Harrison CJ, Welch DF. Ped Infect Dis J 1998;17:657-8.
[18] Ped Infect Dis J 1998;17:631-8.
[19] Personal communication - J. Blondeau.
[20] Kozyrskyj AL, Hildes-Ripstein GE, Longstffe SEA, et al. JAMA 1998;279:173.