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DRUG
ANTIBIOTICS

ACUTE OTITIS MEDIA (AOM) IN CHILDREN 3 MONTHS OF AGE OR OLDER

ACUTE OTITIS MEDIA (AOM)
IN CHILDREN 3 MONTHS OF AGE OR OLDER

This optimal usage guide is mainly intended for primary care health professionnals. It is provided for information purposes only and should not replace the clinician's judgement. The recommendations were developed using a systematic approach and are supported by the scientific literature and the knowledge and experience of Quebec clinicians and experts. For more details, go to inesss.qc.ca.

GENERAL INFORMATIONS

IMPORTANT CONSIDERATIONS

- **Most cases of AOM clear up without antibiotics.**
- Most of AOM-related complications (mastoiditis, etc.) occur in a pneumococcal otitis context and in children < 2 years of age.
- **Risk factors** of *Streptococcus pneumoniae* resistance :
  - Daycare attendance
  - Children < 2 years of age
  - Recent hospital stay
  - Recent antibiotic treatment (< 30 days)
  - Frequent AOM

Bacterial pathogens most frequently found in AOM

- ***Streptococcus pneumoniae***
- **Non-typeable *Haemophilus influenzae***
- *Moraxella catarrhalis*
- *Streptococcus pyogenes*

PREVENTIVE MEASURES

- Breastfeeding exclusively until child is at least 6 months of age
- Living in a smoke-free environment
- Practising nasal hygiene adapted to the child's age
- Following the recommended vaccination schedule under the Québec Immunisation Program

DIAGNOSIS

Clinical diagnosis is based on patient history and on a methodical assessment of the tympanic membrane position, colour/transparency and mobility.

Diagnosis of AOM is marked by :

- Recent, usually abrupt, onset of signs and symptoms
- The presence of the following **two** features :
  - **Mucopurulent effusion** in the middle ear indicated by at least one of the following :
    - Bulging of the tympanic membrane OR
    - Tympanic membrane coloured and opaque OR
    - Otorrhea not due to an external otitis OR
    - Mobility of the tympanic membrane absent or limited
  - **Middle-ear inflammation** as indicated by at least one of the following :
    - Marked erythema of the tympanic membrane OR
    - Otalgia (evidence of pain in the ear that interferes with normal activities or sleep)

Photos available to help with diagnosis

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When making a diagnosis of AOM, it is important to systematically search for complications :
Central nervous system changes, facial paralysis, retroauricular swelling

CAUTION :

Serous or mucoid otitis (effusion without inflammation with or without retraction of the tympanic membrane) does not require antibiotic therapy.

TREATMENT PRINCIPLES

Conditions that require urgent consultation with a specialist to consider an invasive medical workup and treatment :

- Infant under three months of age with temperature ≥ to 38°C
- Suspicion of meningitis or mastoiditis
- Toxicity or impairment of general condition

SUPPORTIVE TREATMENTS

- It is important to reduce pain and fever by using an analgesic/antipyretic (acetaminophen or ibuprofen*), especially in the first few days.
- Neither decongestants nor antihistamines have proven useful in treating AOM in children.

*Ibuprofen is not recommended for children under 6 months of age.

CRITERIA FOR INITIAL TREATMENT OR OBSERVATION OF CHILD		
AGE	**SEVERE SYMPTOMS** (moderate to severe otalgia for over 48 hours or temperature ≥ 39°C or **perforation of the tympanic membrane**)	**MILD SYMPTOMS** (mild otalgia for less than 48 hours and temperature < 39°C and **no perforation of the tympanic membrane**)
3 to 6 months	Antibiotic treatment	Antibiotic treatment
6 months to 2 years	Antibiotic treatment	**Close observation** OR Antibiotic treatment[Φ]
> 2 years	Antibiotic treatment	**Close observation** OR Antibiotic treatment

Φ The American Academy of Pediatrics (AAP) recommends antibiotic treatment for cases of **bilateral** otitis in children under 2 years of age. Although, the Canadian Paediatric Society (CPS), does not distinguish between unilateral or bilateral AOM.

Close observation consists of delaying antibiotic treatment for 48 hours :

- Appropriate if :
  - The prescriber deems it appropriate.
  - Antibiotic treatment can be started when symptoms persist or worsen.
  - There is collaboration with parents (shared decision).
- Not appropriate for children :
  - Under 6 months of age
  - With immunodeficiency, chronic cardiac or pulmonary disease, or head or neck abnormalities
  - With severe symptoms

HISTORY OF ALLERGIC REACTION TO A PENICILLIN ANTIBIOTIC

- True penicillin allergy is uncommon. For 100 children with a history of penicillin allergy fewer than 6 will be **CONFIRMED** to have a true diagnosis of allergy and the reactions will be mostly delayed non-severe rashes.
  - It is therefore important to carefully assess the allergy status of a patient who reports a history of allergic reaction to penicillin, before considering using alternatives to beta-lactams. For help, consult the decision-making tool in case of allergy to penicillins.

ANTIBIOTIC TREATMENT

The first-line antibiotic treatment for AOM is high-dose (90 mg/kg/day) amoxicillin :

- Helps achieve therapeutic concentrations in the middle ear for the treatment of pneumococci intermediately resistant to penicillin and of most highly penicillin-resistant pneumococci
- Generally well tolerated by children

However, in children who present no risk factors for resistance, amoxicillin 45 mg/kg/day, TID, can be considered.

FIRST-LINE ANTIBIOTIC THERAPY FOR ACUTE OTITIS MEDIA
(This recommendation remains appropriate even if the child has had prior episodes of AOM.)

	Antibiotic	Daily dosage	Maximum dosage	Treatment duration	
				Under age 2	Age 2 or older
	Amoxicillin	90 mg/kg/day PO ÷ BID	2 000 mg PO BID	10 days	Mild : 5 to 7 days Severe[2] : 10 days
If antibiotics have been used in the last 30 days **or** in the presence of purulent pinkeye	**Amoxicillin-clavulanate**[1] (7:1 formulation) **or** **Amoxicillin + Amoxicillin-clavulanate**[1] (7:1 formulation)	90 mg/kg/day PO ÷ BID or 45 mg/kg/day PO ÷ BID + 45 mg/kg/day PO ÷ BID	1 500 mg PO BID or 750 mg PO BID + 750 mg PO BID	10 days	Mild : 5 to 7 days Severe[2] : 10 days
EXTREME CASES If there is severe vomiting or nothing can be taken orally :	**Ceftriaxone**	50 mg/kg/day, intramuscular (IM) or intravenous (IV)	1 000 mg/dose	1 to 3 days	1 to 3 days
If history of allergic reaction to a penicillin antibiotic	**Click here to view the acute otitis media algorithm for help in choosing an antibiotic therapy**				

1. The 7:1 formulation (BID) of amoxicillin-clavulanate is preferred due to its higher digestive tolerance. The 200 mg/5 ml and 400 mg/5 ml formulations and 875 mg tablets contain the correct ratio of amoxicillin and clavulanic acid. Some clinicians use a combination of amoxicillin (45 mg/kg/day) and amoxicillin-clavulanate (7:1 formulation) (45 mg/kg/day) to reduce adverse effects (total of 90 mg/kg/day, 14:1 equivalent); volumes of amoxicillin and amoxicillin-clavulanate to be given could be different.
2. Severe symptoms: Moderate to severe otalgia for over 48 hours, or temperature ≥ 39°C or perforation of the tympanic membrane.

If there is no response after 48 to 72 hours of treatment and before starting second-line treatment :

- Verify acceptability and compliance with treatment

SECOND-LINE ANTIBIOTIC THERAPY FOR ACUTE OTITIS MEDIA						
		Antibiotic	Daily dosage	Maximum dosage	Treatment duration	
					Under age 2	Age 2 or older
Antibiotic therapy in the event that treatment fails after 48 to 72 hours	If amoxicillin fails	**Amoxicillin-clavulanate**[1] (7:1 formulation) or **Amoxicillin + Amoxicillin-clavulanate**[1] (7:1 formulation)	90 mg/kg/day PO ÷ BID or 45 mg/kg/day PO ÷ BID + 45 mg/kg/day PO ÷ BID	1 500 mg PO BID or 750 mg PO BID + 750 mg PO BID	10 days	10 days
		Ceftriaxone	50 mg/kg/day, IM or IV	1 000 mg/dose	3 days	3 days
	If amoxicillin-clavulanate fails	**Ceftriaxone**	50 mg/kg/day, IM or IV	1 000 mg/dose	3 days	3 days

1. The 7:1 formulation (BID) of amoxicillin-clavulanate is preferred due to its higher digestive tolerance. The 200 mg/5 ml and 400 mg/5 ml formulations and 875 mg tablets contain the correct ratio of amoxicillin and clavulanic acid. Some clinicians use a combination of amoxicillin (45 mg/kg/day) and amoxicillin-clavulanate (7:1 formulation) (45 mg/kg/day) to reduce adverse effects (total of 90 mg/kg/day, 14:1 equivalent); volumes of amoxicillin and amoxicillin-clavulanate to be given could be different.

Note **:** Treatment of **mild** AOM with otorrhea in a child with ventilation tubes consists of applying antibiotic ciprofloxacin drops, with or without corticosteroid, into the external auditory canal, twice daily, for a period including 2 days without discharge.

CRITERIA FOR REFERRAL TO OTORHINOLARYNGOLOGY (ORL)

- AOM that is resistant to second-line antibiotic treatments
- More than 4 episodes of AOM in 6 months or 6 episodes per year
- Perforation of the tympanic membrane that is not resolved after 6 weeks

MAIN REFERENCES

Le Saux N and Robinson JL. "La prise en charge de l'otite moyenne aiguë chez les enfants de six mois et plus." *Paediatr Child Health* 2016;21(1):45–50.

Lieberthal AS, Carroll AE, Chonmaitree T, Ganiats TG, Hoberman A, Jackson MA, *et al*. "Clinical Practice Guideline: The Diagnosis and Management of Acute Otitis Media." *Pediatrics* 2013;131(3):e964–99.

Please note that other references have been consulted.

Institut national d'excellence en santé et en services sociaux
Québec

ACUTE OTITIS MEDIA (AOM) IN CHILDREN

For dosages see next page

ASSESS THE SEVERITY OF THE INITIAL REACTION

SEVERITY OF PREVIOUS ALLERGIC REACTION TO PENICILLIN ANTIBIOTICS

Vague history

or

Unconvincing history reported by patient or family

Non-severe reaction

Immediate reaction[1]

Isolated cutaneous involvement

(urticaria and/or angioedema)

or

Delayed reaction[2,3]

Isolated cutaneous involvement

(Rash and/or urticaria and/or angioedema)

Severe reaction

Immediate reaction

Anaphylaxis[4]

or

Delayed reaction

Severe skin reaction

(desquamation, pustules, vesicles, purpura with fever or joint pain, but **no** DRESS, SJS/TEN, or AGEP)

Serum sickness[3]

or

Penicillin allergy CONFIRMED[5]

(severe or non-severe reaction only)

Very severe reaction

Immediate reaction

Anaphylactic shock

(with or without intubation)

or

Delayed reaction

Hemolytic anemia
Renal involvement
Hepatic involvement

DRESS, SJS/TEN, AGEP

DECISION-MAKING FOR CHOOSING A BETA-LACTAM AND THE CONDITIONS OF ADMINISTRATION

THE FOLLOWING CAN BE PRESCRIBED SAFELY

DISSIMILAR cephalosporins

Cefuroxime axetil[6] OR Ceftriaxone[7]

SIMILAR cephalosporins

Cefprozil if history of allergy does not suggest an immediate reaction…

If in doubt about the possibility of an immediate reaction…

a 1-hour observation period after the administration of the 1st dose of Cefprozil under the supervision of a health professional could be advised according to the clinician judgment.

or

PRESCRIBE THE FOLLOWING WITH CAUTION

Penicillins

Amoxicillin +/- Clavulanate

The 1st dose should **always** be administered under medical supervision.

If history of :

- **Immediate reactions,** a drug provocation test should be performed;
- **Delayed reactions,** the patient or his/her family should be informed of the possible risk of recurrence in the days following initiation of the antibiotic.

PRESCRIBE THE FOLLOWING WITH CAUTION

DISSIMILAR cephalosporins

Cefuroxime axetil[6] OR Ceftriaxone[7]

SIMILAR cephalosporins

Cefprozil ONLY if serum sickness-like reactions occurred in childhood[3].

The 1st dose should **always** be administered under medical supervision.

If history of :

- **Immediate reactions,** a drug provocation test should be performed;
- **Delayed reactions,** the patient or his/her family should be informed of the possible risk of recurrence in the days following initiation of the antibiotic.

and

AVOID PRESCRIBING

Penicillins

Amoxicillin +/- Clavulanate

SIMILAR cephalosporins

Cefprozil for all other clinical situations (with the exception of children with a history of serum sickness-like reactions[3], as described above).

!

IF A BETA-LACTAM[8] CANNOT BE ADMINISTERED, THE FOLLOWING CAN BE PRESCRIBED...

Clarithromycin OR Azithromycin

AVOID PRESCRIBING

Beta-lactams[8]

Choose another class of antibiotics.

and

PRESCRIBE THE FOLLOWING

Clarithromycin OR Azithromycin

1. Immediate reaction (type I or IgE-mediated): usually occurs within one hour after taking the **first dose** of an antibiotic.
2. Delayed reaction (types II, III and IV): may occur at any time from one hour after administration of a drug.
3. Delayed skin reactions and serum sickness-like reactions that occur in children on antibiotic therapy are generally non-allergic and may be of viral origin.
4. Anaphylaxis without shock or intubation: requires an extra level of vigilance.
5. With no recommendations concerning other beta-lactams.
6. Cefuroxime axetil as an oral suspension is not widely used due to its unpleasant taste. See the product monograph to learn how to improve the taste of this medication.
7. Exceptional cases; if severe vomiting or if oral administration is not possible.
8. Penicillins, cephalosporins and carbapenems.

For further information, see the interactive tool and the decision-making tool.

AGEP : acute generalized exanthematous pustulosis;
DRESS : drug reaction with eosinophilia and systemic symptoms;
SJS : Stevens–Johnson syndrome;
TEN : toxic epidermal necrolysis.

FIRST-LINE ANTIBIOTIC THERAPY FOR ACUTE OTITIS MEDIA
IF HISTORY OF ALLERGIC REACTION TO A PENICILLIN ANTIBIOTIC

	Antibiotic	Daily dosage	Maximum dosage	Treatment duration	
				Under age 2	Age 2 or older
Beta-lactams[5] recommended, according to the clinical judgement support algorithm	**Cefuroxime axetil**[1]	30 mg/kg/day PO ÷ BID	500 mg PO BID	10 days	Mild 5 to 7 days Severe[4] 10 days
	Cefprozil				
	Ceftriaxone[2]	50 mg/kg/day, IM or IV	1 g/dose	1-3 days	
	Amoxicillin !	90 mg/kg/day PO ÷ BID	2 000 mg PO BID	10 days	Mild 5 to 7 days Severe[4] 10 days
	Amoxicillin/Clavulanate[3] (7:1 formulation) **OR** **Amoxicillin +** **Amoxicillin-Clavulanate**[3] (7:1 formulation)	90 mg/kg/day PO ÷ BID **OR** 45 mg/kg/day PO ÷ BID + 45 mg/kg/day PO ÷ BID	1 500 mg PO BID **OR** 750 mg PO BID + 750 mg PO BID		
Alternative if a beta-lactam[5] cannot be administered	**Clarithromycin**	15 mg/kg/day PO ÷ BID	500 mg PO BID	10 days	5 to 7 days
	Azithromycin	10 mg/kg PO daily on day 1, then 5 mg/kg PO daily x 4 days	500 mg PO daily on day 1, then 250 mg PO daily x 4 days	5 days	

1. Cefuroxime axetil as an oral suspension is not widely used due to its unpleasant taste. See the product monograph to learn how to improve the taste of this medication.
2. Exceptional cases; if severe vomiting or if oral administration is not possible. Should be diluted with lidocaine 1 % without epinephrine.
3. The 7:1 formulation (BID) of amoxicillin-clavulanate is preferred due to its higher digestive tolerance. The 200 mg/5 ml and 400 mg/5 ml formulations and 875 mg tablets contain the correct ratio of amoxicillin and clavulanic acid. Some clinicians use a combination of amoxicillin (45 mg/kg/day) and amoxicillin-clavulanate (7:1 formulation) (45 mg/kg/day) to reduce adverse effects (total of 90 mg/kg/day, 14:1 equivalent); volumes of amoxicillin and amoxicillin-clavulanate to be given could be different.
4. Severe symptoms: Moderate to severe otalgia for over 48 hours, or temperature ≥ 39°C or perforation of the tympanic membrane.
5. Penicillins, cephalosporins and carbapenems.

! If the cautious administration of a penicillin is the option chosen, opt for amoxicillin/clavulanate instead of amoxicillin alone if either of the following applies : antibiotics used in the past 30 days or the child has not been vaccinated against *Haemophillus influenzae* type b.