REVIEW ARTICLE

Review article: Topical antibiotic treatments for acute otitis externa: Emergency care guidelines from an ear, nose and throat perspective

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Abstract
Acute otitis externa (AOE), also known as ‘swimmer’s ear’, is a common acute problem. It is one of the most common ED presentations. Atypical organisms, recalcitrant disease and antibiotic options contribute to making AOE a clinical challenge. There are a number of red flags associated with AOE which require consideration when treating patients with AOE. We discuss an evidence-based approach to management of AOE in the emergency setting, with indications for specialist referral.

Key words: acute otitis externa, emergency medicine, topical treatment.

Introduction
Otitis externa (OE), also known as ‘swimmer’s ear’, refers to an inflammatory pathology of the external auditory canal (EAC) and is a common ED presentation. Depending on the infection history it can be acute (lasting less than 4–6 weeks), recurrent or chronic (lasting more than 3 months). Acute OE (AOE) is one of the most common ED presentations.

The annual incidence is 0.4% in the USA, and 1% in the UK. In tropical Australia, the annual incidence is greater than 1.5% because of the ambient humidity. Incidence is increased by water sports, psoriasis, eczema, hygiene (cotton-bud usage and ear syringing), immunosuppression, diabetes and narrow EACs.

Complications of AOE

- Proximally contiguous infection can cause inflammation of the ear drum (myringitis) which can lead to perforation.
- Distally contiguous disease can cause periauricular cellulitis, perichondritis of the pinna, regional facial cellulitis and systemic toxicity.
- In immunocompromised patients and diabetics, malignant/necrotising OE can lead to temporal bone osteomyelitis.

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Pathogens
- AOE is secondary to bacterial or fungal infection.
- Although the most common bacteria in AOE are *Pseudomonas aeruginosa* and *Staphylococcus aureus*, in many cases infections are polymicrobial.\(^{10}\)

Table: Search strategy employed for literature review

| Search strategy                             | Database | Results |
|--------------------------------------------|----------|---------|
| 1. otitis externa.mp. or Otitis Externa     | PubMed   | 16      |
| 2. limit 1 to (english language and humans)|          |         |
| 3. acute.mp.                                |          |         |
| 4. Administration, Topical/ or topical.mp. | Medline  | 11      |
| 5. ear drops.mp.                            |          |         |
| 6. 4 or 5                                   |          |         |
| 7. 2 and 3 and 6                            | Embase   | 2       |
| 8. emergency.mp. or Emergencies             |          |         |
| 9. 7 and 8                                  |          |         |

Fungal AOE
- Choices such as Ciloxan (Novartis Pharma AG, Basel, Switzerland) and Soframycin (Sanofi-Aventis, Paris, France) will be ineffective.
- Locacorten Vioform (Novartis, Dorval, QC, Canada), Kenacomb Otic (Bristol Meyers Squibb, New York, NY, USA)/Otocomb Otic and topical Canesten (clotrimazole) are appropriate choices.
- Anecdotally, gramicidin-containing compounds are less effective than the other options listed.
- Fungal OE often requires referral to ear, nose and throat (ENT) specialists for ear toileting.

Adjuncts to topical antibiotics
- Severe cases of AOE may need wick insertion into the EAC to ease eardrop administration. Wicks must be completely inserted in the ear canal, and not prolapse out. Recent evidence indicates that wicks may remain *in situ* for up to 5 days.\(^{13}\) Systemic antibiotics may be indicated where contiguous infection of the pinna, or folliculitis is concerned – those with anti-pseudomonal coverage are wise given that *P. aeruginosa* is isolated in up to 55% of cases.\(^{14}\)

Advice on how to administer drops
- Patients should be advised on how to properly administer drops to

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provide maximum efficacy. Ear-drops should be placed in the EAC with the head in a dependent position, with tragal-pumping to allow maximum drop penetration (Fig. 4).

The role of ear toilet
In patients with discharge that occludes the canal, ear toilet should be considered, especially if infection is recalcitrant or not adequately cleared with gentle tissue spears. It is important that ear toilet is performed only by ENT surgeons, or physicians with advanced training to avoid iatrogenic injury to the tympanic membrane or ossicles.

Specific considerations
Perforated tympanic membrane
- If there is a perforated tympanic membrane, aminoglycoside-containing medications should be

| TABLE 2. Eardrops available for use in Australia for acute otitis externa |
| Brand name | Active ingredients | Indication | Dosage/duration |
|------------|--------------------|------------|----------------|
| Single agent | | | |
| Ciloxan† | Ciprofloxacin 0.3% | CSOM, OE, discharging grommets | Five drops, twice a day, until a few days after symptoms have cleared |
| Soframycin‡§ | Framycetin 0.5% | OE | Three drops, thrice a day, until a few days after symptoms have cleared |
| Multi-agent with steroid | | | |
| Sofradex/Otodex‡§ | Dexamethasone 0.05%, framycetin 0.5%, gramicidin 0.005% | CSOM, OE | Three drops, three to four times a day, until a few days after symptoms have cleared |
| Locacorten Vioform§¶ | Flumetasone 0.02%, clioquinol 1% | Fungal OE, bacterial OE | Three drops, twice a day, until a few days after symptoms have cleared |
| Ciprofloxacin HC¶ | Hydrocortisone 1%, ciprofloxacin 0.2% | CSOM, OE, discharging grommets | Three drops, twice a day, until a few days after symptoms have cleared |
| Kenacomb Otic‡§/Otocomb Otic‡§ | Triamcinolone 0.1%, neomycin 0.25%, gramicidin 0.025%, nystatin 100 000 units/g | OE (including fungal), CSOM | Three drops, twice to thrice a day, until a few days after symptoms have cleared |

†PBS, Pharmaceutical Benefits Scheme (authority required). ‡PBS (general). §Should not be used in patient with tympanic membrane perforations. ¶Non-PBS. CSOM, chronic suppurative otitis media; OE, otitis externa.
avoided because of their potential to cause ototoxicity.16

- These medications include framycetin (Soframycin/Sofradex/Otodex) and neomycin (Kenacomb Otic/Otocomb Otic).
- The only current topical treatment without risk of ototoxicity is ciprofloxacin.
- Locacorten Vioform is labelled ‘contraindicated’ in patients with tympanic membrane perforations; however, in clinical practice it is widely used and extremely effective.
- If Locacorten Vioform is used, counsel patients on potential for hearing impairment and vertigo, and immediately discontinue use if these symptoms are reported.
- Patients should also be counselled that the use of steroid-containing drops can cause discomfort when applied to the middle ear.

Pregnancy

- As listed in the Australian Medicines Handbook, all of the ear-drops listed above are listed as “safe to use” in pregnancy.
- If concerned, however, referral to an ENT specialist is recommended for ongoing ear toilet and topical administration of antimicrobial mixtures.

Prevention of recurrent disease

Dry ear precautions

- Particularly so in those with narrow/tortuous ear canals, moisture accumulation is a significant risk factor for the development of recurrent or recalcitrant infections.1,17
- For those whose hobbies involve water sports, particular care must be taken to prevent water exposure to the canals.

Figure 3. Management guidelines with topical antibiotics for acute otitis externa in the primary care setting. TM, tympanic membrane.

Figure 4. Visual representation of how to administer topical antibiotics to external auditory canal. Note that the head is in a dependent position, with demonstration of tragal pumping.15

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• Good ear hygiene after-the-fact using acidifying/astringent ear-drops, or even alcohol-containing drops can hasten drying of the ear canal to prevent infection.

Avoiding EAC trauma
• Cotton-tip usage by patients is discouraged as this can damage the ear canal, impact cerumen and even cause tympanic membrane perforations.18
• Ear syringing has similar complications and is not recommended.19

Specialist referral guidelines
Emergency treatment
• If the EAC is occluded secondary to inflammation, then wick placement in the ED is recommended.
• If there is associated perichondritis, particularly so with children, hospitalisation may be necessary for i.v. antibiotics.
• In poorly controlled diabetics and immunocompromised patients at risk of developing malignant OE, early referral and treatment is recommended to prevent temporal bone osteomyelitis.

ENT specialist referral
1. AOE refractory to at least 2 weeks of topical therapy, specialist ENT referral is needed.
2. Patients who develop complications, particularly a perforated tympanic membrane.

Red flags
• Perichondritis
  o Tenderness, erythema and swelling of the auricle.
• Facial cellulitis
  o Swelling of the facial soft-tissue which may track down towards the jaw.
• Malignant OE
  o Excruciating pain disproportionate to examination findings, granulation tissue seen in the EAC.
• EAC squamous cell carcinoma
  o Abnormal lesion in the EAC not responding to antimicrobial treatment.
• Intracranial infection (abscess/meningitis)
  o Altered consciousness, photophobia, headaches, visual symptoms, neck stiffness.

Conclusion
1. AOE is an extremely common ENT infection.
2. There are several topical antibiotics available.
3. Treatment is usually straightforward.
4. Prompt referral to an ENT specialist is recommended if the patient is acutely unwell or there are red flags.

Competing interests
None declared.

Data availability statement
Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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