Managing otitis externa

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Abstract
Otitis externa is a common ear inflammatory condition, usually caused by infection, and affecting up to 10% of the population. It is especially common in children, and is more likely to occur in those who are frequently exposed to water. Cleaning the affected area, the application of topical agents and prevention are the cornerstones of treatment. This article will review the different types of otitis externa and treatment options.

Introduction
External otitis, also known as otitis externa or swimmer’s ear, is a condition in which there is inflammation of the external auditory canal. It can be caused by a number of factors, including infectious, allergic and dermatological disease. Acute bacterial infection is the most common cause of external otitis.1

External otitis can occur in all age groups.2 An estimated 10% of people develop external otitis during their lifetime. External otitis is more common in children, and peaks in the 10- to 14-year age group.3 Usually, it occurs in summer, rather than winter, due to increased participation in outdoor water activities, when it is warmer.2

Mechanism of otitis externa
The ear canal is designed to combat foreign particles and infection. The outer cartilaginous portion is lined with hair follicles and cerumen glands. The lining of the ear canal undergoes continual sloughing of cells, the migration of which allows removal of keratin debris and cerumen. Cerumen maintains an acidic environment in the external ear canal, and its sticky nature traps particles, preventing penetration deeper into the ear.

A breakdown of the skin-cerumen barrier is the first step in the pathogenesis of external otitis. This can be caused by:4-6

- Water exposure from swimming. Excess moisture leads to skin maceration and breakdown of the skin-cerumen barrier, changing the microflora of the ear canal to predominantly Gram-negative bacteria.
- Any trauma, such as that resulting from excessive cleaning or aggressive scratching of the ear canal. This creates abrasions along the thin layer of skin in the ear canal, allowing organisms to gain access to the deeper tissue.
- Devices that occlude the ear canal, such as hearing aids, earphones, or diving caps.
- Allergic contact dermatitis, which is usually caused by ototopical medication, e.g. neomycin, benzocaine, and propylene glycol,7,8 as well as cosmetics or shampoos. These are Gell and Coombs type IV delayed hypersensitivity reactions. Secondary exposure to the allergen initiates an inflammatory response.
- Dermatological conditions, e.g. psoriasis and atopic dermatitis.

Once the breakdown in natural defences occurs, pathogenic organisms such as Pseudomonas aeruginosa (38%), Staphylococcus epidermidis (9%) and S. aureus (8%) replace the natural flora.9 Other organisms which can cause infection include anaerobic pathogens (4-25%), such as Bacteroides and peptostreptococci, and fungal infection (2-10%).4,6,9-12

Signs and symptoms
Pruritis, ear pain, discharge, and hearing loss are the most common symptoms of otitis externa.2 The ear may be tender on examination and on otoscopy, usually the external ear canal appears to be oedematous and erythematous. If present, the ear discharge may be white, yellow, brown, or grey. Severe disease may result in intense pain, periauricular erythema, lymphadenopathy, and fever.5

Generally, fungal infections cause ear itching, discomfort, discharge, and a feeling that something is in the ear canal, whereas pain is more intense in patients with bacterial infections.13
Contact dermatitis also frequently causes pruritis. This is the dominant symptom. A lack of response to external otitis treatment over a one-week period can indicate contact dermatitis.14

**Complications**

Left untreated, external otitis can lead to periauricular cellulitis and malignant external otitis. Malignant external otitis, also known as necrotising external otitis, is a severe, potentially fatal complication of acute bacterial external otitis. It is most common in elderly diabetic patients or other immunocompromised individuals, and occurs when the infection spreads from the skin to the bone and bone marrow spaces of the skull base. It also affects the soft tissue and cartilage of the temporal region.14

**Treatment**

Usually, treatment of external otitis is topical drug therapy, rather than oral antibiotics or surgery, as the disease is limited to the skin of the ear canal.

Systemic antibiotics are indicated in patients with deep tissue infection (outside the external canal) and immunocompromised hosts.

**Cleaning the external canal (aural toilet)**

Cleaning out the external canal is the first step in treatment. The removal of cerumen, desquamated skin, and purulent material from the ear canal greatly facilitates healing, and enhances penetration of ear drops into the site of inflammation.15 Ear-canal cleaning should be performed through an otoscope that allows direct visualisation and use of a cotton swab to gently remove debris and cerumen. The ear canal may be irrigated with a 1:1 dilution of 3% hydrogen peroxide at body temperature.16

**Topical therapy**

Topical therapy is highly effective in treating external otitis, and delivers a high concentration of medication to the infected and inflamed tissue, with minimal side-effects.15,17 Several topical agents are available to treat external otitis, including antibiotics, antiseptics, glucocorticoids, and acidifying solutions.1,2 They are administered as single agents and combination formulas. Most are used in a liquid form, although ointments and powders are also available.

Table I lists the available ototopical agents in South Africa.

**Antiseptics**

Antiseptics function as bacteriostatic agents, not as bacteriocidal agents, like antibiotics. They are also effective against fungal infections. Their precise mechanism of action is not fully understood, but they make the ear canal less habitable for bacteria and fungi, and may loosen debris in the ear canal. Systemic reviews and meta-analyses suggest that these agents are as effective as other topical agents.15,17 Available antiseptics are listed in Table I.

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**Table I: Available ototopical agents in South Africa**18

<table>
<thead>
<tr>
<th>Type of agents</th>
<th>Active agents</th>
<th>Brand names</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antiseptic agents</strong></td>
<td>Thiomersal</td>
<td>Merthiolate®</td>
</tr>
<tr>
<td></td>
<td>Phenazone</td>
<td>Aurone®</td>
</tr>
<tr>
<td><strong>Acidifying agents</strong></td>
<td>Acetic acid</td>
<td>After Swim Ear Drops®, Dischem Swimmer’s Ear Cleanser®</td>
</tr>
<tr>
<td><strong>Corticosteroids</strong></td>
<td>Betamethasone</td>
<td>Betnesol®</td>
</tr>
<tr>
<td></td>
<td>Hydrocortisone</td>
<td>Dilucort®, Skin calm®, Mylocort®, Procutan®</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone</td>
<td>Maxidex®</td>
</tr>
<tr>
<td><strong>Corticosteroids plus antibiotics</strong></td>
<td>Hydrocortisone plus ciprofloxacin</td>
<td>Ciprobay HC Otic®</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone plus ciprofloxacin</td>
<td>Cilodex®</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone plus chloramphenicol plus neomycin</td>
<td>Covomycin-D’</td>
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<tr>
<td></td>
<td>Betamethasone plus neomycin</td>
<td>Betnesol-N®</td>
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<tr>
<td></td>
<td>Hydrocortisone plus polymyxin B</td>
<td>Otosporin®</td>
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<tr>
<td></td>
<td>Hydrocortisone plus polymyxin B plus tetracycline</td>
<td>Terra-Cortril®</td>
</tr>
<tr>
<td><strong>Corticosteroids plus antiseptics</strong></td>
<td>Flumethasone plus clioquinol</td>
<td>Locacortem-Vioform®</td>
</tr>
<tr>
<td></td>
<td>Dexamethasone plus framycetin</td>
<td>Sofradex®</td>
</tr>
<tr>
<td><strong>Antiseptics plus analgesics</strong></td>
<td>Phenazone plus benzocaine</td>
<td>Adco-Otised®</td>
</tr>
<tr>
<td></td>
<td>Phenazone plus Na-sulphacetamide plus benzocaine</td>
<td>Covancaine®</td>
</tr>
</tbody>
</table>
**Acidifying solutions**

The most common otitis externa pathogens, *P. aeruginosa* and *S. aureus*, grow well in mildly acidic environments (pH of 6-7), but grow less well at a lower pH.\(^9\) Thus, simply acidifying the ear canal inhibits bacterial growth. Acidifying agents help reacidify the ear canal, dry weeping lesions, and debride crust in contact dermatitis.\(^6\) The most commonly used acidifying solutions are acetic, boric, hydrochloric and sulphuric acids. Acidifying solutions are generally safe, but may be associated with local irritation, manifested by burning or stinging. In the presence of tympanic membrane perforation, acidifying solutions can be particularly irritating to the mucosa of the middle ear. Available acidifying solutions are listed in Table I.

**Antibiotics**

Topical antibiotics are highly effective in treating external otitis.\(^{20}\) One systematic review found that topical antibiotics increased absolute clinical cure rate, compared to placebo, by 46% [95% confidence interval (CI) 29-63%]. The review also found no significant difference when comparing topical antibiotics to antiseptics, or to combination antibiotic plus glucocorticoid preparations. There was also no difference in cure rates between quinolone and nonquinolone antibiotics.\(^{17}\)

The ideal antibiotic regimen should have specific coverage against the most common pathogens, *P. aeruginosa* and *S. aureus*. The fluoroquinolones (ofloxacin and ciprofloxacin), polymyxin B (a polypeptide-type antimicrobial), and the aminoglycosides, neomycin, tobramycin and gentamycin, are all effective against these pathogens.\(^{21,22}\)

Side-effects, such as ototoxicity with aminoglycoside agents, particularly where the tympanic membrane is perforated, are of concern.\(^{23}\) Allergic contact dermatitis is commonly associated with neomycin when used for prolonged courses.\(^{24}\) Antibiotic resistance, particularly against *P. aeruginosa* with chronic use of ototopical fluoroquinolones, is also of concern.\(^{25}\) Topical antibiotics are only available in combination with glucocorticoids in South Africa (see Table I).

**Antifungal agents**

Topical antifungals are considered to be the first-line treatment of fungal external otitis. Clotrimazole has the greatest zone of inhibition for common fungi. Clotrimazole and miconazole also have antibacterial effects against *S. aureus*, but not against *P. aeruginosa*. Some antifungals are available in liquid form, and others only as a cream or ointment that is either injected into the ear canal or swabbed in the lateral ear canal and allowed to melt down.\(^{26,27}\)

**Glucocorticoids**

Topical glucocorticoids decrease inflammation, resulting in relief of pruritus and decreased pain. Glucocorticoids that are used to treat external otitis include hydrocortisone, dexamethasone and prednisolone. A meta-analysis of
randomised trials, which included three studies comparing an antimicrobial plus glucocorticoid vs. an antimicrobial alone, found comparable clinical and bacteriological cure rates at seven days for regimens with and without glucocorticoids. The use of topical glucocorticoids decreased time to symptom resolution by one day. Glucocorticoids are the agents of choice when otitis externa is caused by contact dermatitis, but doesn’t respond to acidifying treatment. Available glucocorticoids are listed in Table I.

**Combination therapy**

Several combinations of topical agents are available in clinical practice. The efficacy of several different combination preparations has been examined in meta-analyses of randomised trials, with no specific combination therapy appearing as superior over other therapy. Available combination therapies are listed in Table I.

**Choice of topical agent**

Choosing the correct ototopical agent, or combination of agents, is difficult. The choice of agent depends on the type and severity of otitis externa.

- **Mild external otitis (bacterial, fungal and contact dermatitis):** A topical preparation containing an antiseptic and analgesic, or antiseptic and glucocorticoid (see Table I), is recommended. Antibiotics and antifungal agents may cause potential side-effects, and do not warrant use in mild cases.

- **Moderate and severe disease (bacterial and fungal):** A topical preparation that contains an antibiotic, an antiseptic and a glucocorticoid is recommended. Where a fungal infection is suspected, topical antifungal creams and ointments would need to be used. The antibiotic should have good coverage against S. aureus and P. aeruginosa. The antifungal agents, clotrimazole and miconazole, are recommended to treat fungal infections.

**Instillation and duration of therapy**

Proper instillation of ear drops entails tilting the head towards the opposite shoulder, pulling the superior aspect of the auricle upward, and filling the ear canal with drops. The person should lie on his or her side for 20 minutes, or place a cotton ball in the ear canal for 20 minutes, to maximise medicine exposure.

Most topical preparations should be given three to four times daily. Topical fluoroquinolones can be given two times daily.

The course of treatment varies. The initial treatment course is usually seven days, with follow-up. Further treatment may be continued for up to two weeks. Patients with symptoms that persist beyond two weeks should be re-evaluated for treatment failure.

**Wick placement**

Direct application of topical agents to the infected site is a key element in the treatment of external otitis, regardless of severity. Those with severe disease (i.e. a completely occluded canal) should also have a wick placed. Wicks are commercially available, and are made of compressed cotton. They expand as the ototopical medicine is applied. The wick allows topical medications to reach the medial aspect of the ear canal. They also facilitate longer retention of topical solutions in the affected areas. Wicks should be replaced every one to three days if significant swelling persists. Wicks can be removed once ear canal swelling subsides. Wick placement usually requires referral to an otorhinolaryngologist.

**Oral agents**

The addition of an oral antibiotic to topical antibiotic therapy does not appear to enhance treatment in uncomplicated external otitis. Systemic antibiotics, in addition to topical antibiotics, are indicated with deeper tissue infection, due to lack of adequate penetration with topical therapy. Combined systemic and topical antibiotics are also indicated in patients who are immunosuppressed, i.e. post-transplant, and those receiving chemotherapy or radiation therapy, or where there is a high risk of malignant external otitis.

Antibiotics need to be effective against the most common pathogens, P. aeruginosa and S. aureus. Quinolones (ciprofloxacin or ofloxacin) usually provide necessary coverage. Ciprofloxacin can be given at a dose of 500 mg twice daily, for seven to ten days.

**Pain control**

Pain from otitis externa can be mild to severe. Mild-to-moderate pain will respond to topical therapy. Many antiseptic plus analgesic combinations are available in South Africa (see Table I). Patients with severe pain may require paracetamol, an oral nonsteroidal anti-inflammatory agent (NSAID) or, in particularly severe cases, opioid analgesics. Care should be exercised to ensure that pain medications do not mask an inadequately treated case.

**Prevention**

Several factors can help in the recovery from, and prevention of, otitis externa:

- **Avoid trauma to the external ear canal:** The use of earbuds, or cleaning ears with fingers, should be avoided. The ear canal is self-cleaning, and any foreign object can cause damage to the epithelium, resulting in otitis externa.

- **Avoid exposing the external ear canal to water:** The ear should be protected from water during recovery from external otitis, and in patients who experience frequent bouts. This can be accomplished by placing a cotton ball, coated with petroleum jelly, in the ear canal, while bathing. Those with active external otitis should not swim, and ideally, should refrain from water sports for seven to ten days. Competitive swimmers should be encouraged to use well-fitting ear plugs. Hearing aids and ear phones should not be worn until pain and discharge have subsided. If there is exposure to water, active drying methods, such as shaking the ear of excess water, and gently blow drying the ear, can help avoid recurrent infections.
• **Prophylaxis:** Prevention should be considered in patients with recurrent external otitis, particularly swimmers, immunocompromised hosts, and in those with a systemic dermatological condition that affects the ear. Drops containing alcohol and acetic acid help to dry the ear, prevent skin maceration, and reacidify the ear canal. Hearing aids should be removed nightly, and regularly cleaned.16

**Treatment course and recovery**

Some symptom improvement should occur within 36-48 hours after treatment is initiated, and full symptom resolution by six days.15 Patients who do not respond to treatment should be referred to an otorhinolaryngologist for further evaluation.

**References**


