INTRODUCTION — The term external otitis (also known as otitis externa or swimmer’s ear) refers to inflammation of the external auditory canal or auricle.

There are five fundamental steps in the management of external otitis:

- Thoroughly clean the ear canal
- Treat inflammation and infection
- Control pain
- Avoid promoting factors
- Follow-up and culture recalcitrant cases (as well as consider alternative diagnoses)

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

This topic will focus on the management of external otitis. The clinical manifestations and diagnosis of external otitis are discussed elsewhere. (See “External otitis: Pathogenesis, clinical features, and diagnosis”, section on ‘Diagnosis’.)

CLEANING THE EAR CANAL — Cleaning out the external canal (aural toilet) 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. [1]

Ear canal cleaning should be performed through an otoscope that allows direct visualization and use of a wire loop or 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 if the tympanic membrane is visible and intact.

Patients with a ruptured tympanic membrane (or those in whom the tympanic membrane cannot be clearly seen) should be referred to an otolaryngologist for further management.
Otolaryngologists often clean infected ears under a microscope; this provides binocular magnified vision and liberates both hands. The ability to use both hands with magnified vision may also facilitate cleaning when the ear is extremely tender. (See "Evaluation and management of middle ear trauma" and "Evaluation of earache in children", section on 'Traumatic tympanic membrane (TM) perforation' and "Acute otitis media in adults (suppurative and serous)", section on 'Ruptured tympanic membrane'.)

**TREATMENT OF INFLAMMATION AND INFECTION** — Treatment of inflammation and infection primarily involves use of topical agents. Systemic antibiotics are indicated only in patients with deep tissue infection (outside the external canal) and immunocompromised hosts.

**Topical therapy** — Topical therapy is highly effective for external otitis, delivering a high concentration of medication to the infected and inflamed tissue with minimal side effects [1-3].

**Topical preparations** — Several topical agents are available for treating external otitis, including antibiotics, antiseptics, glucocorticoids, and acidifying solutions [1]. They are administered as single agents and combination formulas (table 1). Most are used in a liquid form, although ointments and powders are also available.

**Antibiotics** — Topical antibiotics are highly effective for treating external otitis [4]. One systematic review found that topical antibiotics increased absolute clinical cure rate compared to placebo by 46 percent (95% CI 29-63 percent) [2]. The review also found no significant difference comparing topical antibiotics to antiseptics, or to combination antibiotic/glucocorticoid preparations. There was also no difference in cure rates between quinolone and nonquinolone antibiotics.

Certain factors should be considered when selecting an ototopical antibiotic: coverage of specific pathogens (table 2A-B), side effect profile (including ototoxicity and contact dermatitis), and drug resistance.

The ideal antibiotic regimen should have specific coverage against the most common pathogens, P. aeruginosa and S. aureus:

- The fluoroquinolones ofloxacin and ciprofloxacin provide excellent coverage against both pathogens. In two clinical trials, ofloxacin appeared to be as effective as polymyxin B-neomycin-hydrocortisone formulation (Corticospolin otic suspension) [5,6]. Another trial found that ciprofloxacin-dexamethasone was superior to polymyxin B-neomycin-hydrocortisone in decreasing inflammation, edema, and achieving pain control [7].
- Polymyxin B (a polypeptide type antimicrobial) and neomycin (an aminoglycoside) are antibiotics combined in many frequently used ototopical medications (eg, Cortisporin, Colymycin, Pediotic). Neomycin is effective against S. aureus, while polymyxin B is effective against P. aeruginosa.
- The aminoglycosides tobramycin and gentamicin are also effective against both P. aeruginosa and S. aureus.

Side effect profile can also influence choice of treatment. Ototoxicity is the most important concern with aminoglycoside agents, including neomycin, tobramycin, and gentamicin [8]. Aminoglycosides are a significant potential source for iatrogenic hearing loss and balance dysfunction, particularly in the presence of tympanic membrane perforation. Allergic contact
dermatitis is commonly associated with neomycin when used for prolonged courses [9]. Topical fluoroquinolones can cause local irritation. (See "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Contact dermatitis'.)

Concerns have been raised about the development of antibiotic resistance, particularly against P. aeruginosa with chronic use of ototopical fluoroquinolones. However, in vitro, P. aeruginosa sensitivity to norfloxacin remained high (98 percent) in one study despite long-term antibiotic use [10]. Drug resistance may be important in the setting of treatment failure, requiring culture of the ear canal. (See 'Follow-up' below.)

**Antiseptics** — Antiseptics function as bacteriostatic agents, not as bactericidal agents like antibiotics. Their precise mechanism of action is not fully understood, but they make the ear canal less habitable for bacteria and may loosen debris in the ear canal. Systemic reviews and meta-analyses, albeit of low-quality trials, suggest that these agents are similarly effective as other topical agents [1,2].

Available antiseptics are listed in a table (table 1). Alcohol is the most commonly used antiseptic component of many ototopical preparations.

**Glucocorticoids** — Topical glucocorticoids decrease inflammation, resulting in relief of pruritus and decreased pain. Glucocorticoids used to treat external otitis include hydrocortisone, dexamethasone, and prednisolone (table 1) [1]. These topical agents are well-tolerated.

A meta-analysis of randomized trials, which included three studies comparing antimicrobial/glucocorticoid versus antimicrobial alone, found comparable clinical and bacteriologic cure rates at seven days for regimens with and without glucocorticoids [2]. The addition of a hydrocortisone to either acetic acid or ciprofloxacin, however, did decrease time to symptom resolution by one day.

**Acidifying solutions** — P. aeruginosa and S. aureus readily grow in environments with a pH of 6 to 7, but grow less well at a lower pH [11]. Thus, simply acidifying the ear canal inhibits bacterial growth. Acetic acid 2 percent is a commonly used acidifying solution (table 1). 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.

One meta-analysis found no clinically meaningful differences between acidifying agents and other topical interventions [1]. However, there was one trial of high quality that found acetic acid was less effective than acetic acid plus glucocorticoid and antibiotic plus glucocorticoid drops at two and three week follow-up [12].

**Combination therapy** — Several combinations of the above topical agents are available in clinical practice (table 1). The efficacy of several different combination preparations have been examined in meta-analyses of randomized trials, with no specific combination therapy superior over other therapy [1].

**Choice of topical agent** — Choosing the proper ototopical agent or combination of agents is difficult given the wide array of choices (table 1). The choice frequently becomes a personal one based upon clinical experience. One meta-analysis of nineteen randomized trials found no
clinically meaningful differences between various topical interventions, except that acetic acid was less effective than antibiotic/glucocorticoid drops for patients whose symptoms had not resolved by one week [1]. The overall quality of the studies was low.

In our practice, we select therapy based on the severity of external otitis (see "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Clinical features'):

- **For mild external otitis**, we use a topical preparation such as acetic acid with hydrocortisone, which has an acidifying agent and a glucocorticoid. We prefer not using an antibiotic due to potential adverse effects that are not likely warranted in mild external otitis. (See 'Antibiotics' above.)

- **For moderate and severe disease**, we use ototopical medication that is acidic and contains an antibiotic, an antiseptic, and a glucocorticoid. The antibiotic should have good coverage against S. aureus and P. aeruginosa (table 2A-B). There should be limited risk of an allergic reaction. Cipro HC and Cortisporin are good first-line agents (table 1). Cipro HC is associated with fewer side effects than Corticosporin but Cipro HC is more costly.

Oral antibiotics should be used for patients with evidence of deeper tissue infection (outside of the external auditory canal). (See 'Oral antibiotics' below.)

**Installation and duration of therapy** — Proper installation of ear drops entails tilting the head toward the opposite shoulder, pulling the superior aspect of the auricle upward, and filling the ear canal with drops. Patients should lie on their side for 3 to 5 minutes or place a cotton ball in the ear canal for 20 minutes to maximize medicine exposure.

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

A common cause of failure for topical treatment is underdosing. Patients should be sure that sufficient medication is placed to adequately coat the entirety of the ear canal.

It is reasonable to prescribe an initial seven day course of topical medication with instructions to continue up to a total of two weeks for unresolved symptoms. Patients with symptoms persisting beyond two weeks should be re-evaluated for treatment failure. (See 'Follow-up' below.)

**Wick placement** — Direct application of topical agents to the infected site is a key element in the treatment of external otitis, regardless of severity. Patients with severe disease (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 otolaryngologist, but can also be performed by the primary care clinician who has previous experience with wick placement.

**Oral antibiotics** — There are no randomized trials directly comparing oral antibiotic therapy and topical antibiotic therapy. However, the addition of an oral antibiotic to topical antibiotic therapy does not appear to enhance treatment in uncomplicated external otitis. One randomized trial in Australia of patient with mostly mild to moderate infection found no difference in clinical response score comparing a topical ointment (containing an antifungal, a glucocorticoid, and two
antibiotics) plus oral placebo with the same topical ointment plus oral trimethoprim-sulfamethoxazole [13]. These patients were seen in general practice and comprised mostly of mild to moderate cases of external otitis. In comparison to topical therapy, systemic antibiotics may increase rates of infection resistance and recurrence, possibly due to lower antimicrobial concentrations at the site of infection [14].

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 (ie, post-transplant, receiving chemotherapy or radiation therapy). Patients with deeper tissue infection and with immunosuppression may be at risk for malignant external otitis and should be referred to an otolaryngologist. (See "Malignant (necrotizing) external otitis".)

When systemic antibiotics are necessary, we recommend a quinolone antibiotic, such as ciprofloxacin or ofloxacin, for coverage of P. aeruginosa and S. aureus [15]. Strains of community-acquired methicillin resistant S. aureus continue to emerge [16] and should be taken into account in patients who fail to respond. Ciprofloxacin can be given at a dose of 500 mg twice daily for 7 to 10 days. (See "Treatment of skin and soft tissue infections due to methicillin-resistant Staphylococcus aureus in adults".)

PAIN CONTROL — The pain from external otitis can be variable. Most patients with mild to moderate levels of ear pain will have prompt relief from topical therapy. Those with severe pain will generally respond to oral nonsteroidal anti-inflammatory agents (NSAIDs) such as ibuprofen, which can be started at the initial visit. (See "NSAIDs: Therapeutic use and variability of response in adults".)

Some patients with severe, persistent pain will require opioid analgesics. Care should be exercised to ensure that pain medications are not masking an inadequately-treated case.

AVOIDING PROMOTING FACTORS — Patient education regarding proper ear hygiene cannot be overemphasized. The adage "don't put anything smaller than your elbow in your ear" to clean the ear canal is valuable advice. Patients should be told that the ear canal is self-cleaning and should not be cleaned with fingers, towels, cotton swabs, or other foreign objects.

The ear should be protected from water during recovery from external otitis. This can be accomplished by placing a cotton ball coated with petroleum jelly in the ear canal while bathing. Patients with active external otitis should not swim. Ideally, patients should refrain from water sports for 7 to 10 days. Competitive swimmers may consider return at two to three days if pain has resolved and they wear well-fitted ear plugs. Hearing aids and ear phones should not be worn until pain and discharge have subsided.

Prevention should be considered in patients with recurrent external otitis, particularly swimmers, immunocompromised hosts, and patients with a systemic dermatologic condition affecting the ear. Specific preventive measures for those who engage in water sports include use of ear plugs, shaking the ear dry after swimming, and blow drying the ear after water exposure (placing the blow dryer on a low setting 12 inches away from the ears) [17]. Drops containing alcohol and/or acetic acid help to dry the ear, prevent skin maceration, and re-acidify the ear canal, but it is unclear if any type of treatment prevents recurrence of external otitis. Hearing aids should be removed nightly and regularly cleaned.
FOLLOW-UP — The timeframe for follow-up depends on the severity of external otitis. Patients with mild external otitis can be told to return if symptoms persist or worsen. For patients with moderate disease, follow-up is recommended at one to two weeks. Patients may need to be followed sooner for severe disease.

Patients will generally experience some symptom improvement within 36 to 48 hours after treatment is initiated, with full symptom resolution by about six days [1].

In patients who do not respond to treatment within 48 to 72 hours, culture of the ear canal and/or referral to an otolaryngologist should be considered. The patient should be questioned regarding compliance, especially water precautions and avoidance of ear manipulation. Patients who do not respond to initial treatment should also be evaluated for other conditions that may mimic, complicate, or underlie external otitis. (See "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Differential diagnosis'.)

TREATMENT OF ASSOCIATED CONDITIONS — The treatment of other conditions that present similarly to or complicate bacterial external otitis varies based on the underlying etiology. These conditions should be suspect in patients who fail to respond to initial therapy. (See "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Differential diagnosis'.)

Otomycosis — Otomycosis is a fungal infection of the external auditory canal (picture 1). Otomycosis can occur as the primary infection or can develop along with bacterial external otitis, usually as a result of antibiotic therapy. (See "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Otomycosis'.)

The mainstay of therapy for otomycosis is meticulous cleaning of the ear canal and topical antifungal therapy [18]. All debris and visible fungal elements must be removed by the clinician. This should be done under direct vision with a cerumen loop or cotton swab. Binocular magnified vision facilitates removal of debris that is often focused in the medial aspect of the ear canal, coating the tympanic membrane.

Several ototopical medications are used adjunctively to treat otomycosis, including antifungals, antiseptics, acidifying solutions, glucocorticoids, and drying agents [18]. Topical antifungals are considered first-line pharmacologic treatment (table 3) [19]. Clotrimazole has the greatest zone of inhibition for common fungi. Clotrimazole and miconazole also have antibacterial effects against S. aureus but not P. aeruginosa. Some antifungals are available in liquid form, 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 in the ear canal. We use clotrimazole 1% solution, applied twice daily for 10 to 14 days, and then reassess the ear canal. If fungal elements are identified, the ear canal should again be meticulously cleaned and undergo a further 10 to 14 day course of topical antifungal with reassessment thereafter. Persistent otomycosis should be managed by an otolaryngologist to ensure optimal cleaning of the external canal (usually with microscopic otoscopy). Ear cleaning followed by topical therapy and reassessment in two weeks may be required for several cycles to achieve eradication.

Oral antifungals may be used in refractory cases. Intravenous antifungals are reserved for patients suspected of having invasive otomycosis.
Contact dermatitis — Contact dermatitis in the external auditory canal can be caused by ototopical medication, cosmetics, or shampoos and thus can mimic or complicate treatment for external otitis. (See "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Contact dermatitis'.)

Initial treatment of contact dermatitis involves eliminating the causative agent. The ear should be thoroughly cleaned. Acidic solutions such as Acetic Acid Otic help re-acidify the ear canal, dry weeping lesions, and debride crust. Topical glucocorticoids can be used in combination with acidic solutions to control the inflammatory response (table 1).

Carcinoma of the ear canal — Given the aggressive nature of cancer of the ear canal, management generally combines surgery and radiation therapy.

Periauricular cellulitis — Periauricular cellulitis without evidence of deep tissue infection is generally treated with oral antibiotics (table 4). (See "Cellulitis and erysipelas", section on 'Treatment'.)

Malignant external otitis — Malignant (necrotizing) external otitis is a severe, potentially fatal complication of acute bacterial external otitis when the infection spreads from the skin to the skull base (soft tissue, cartilage, and bone of the temporal region). Patients with malignant external otitis should be promptly started on antipseudomonal antibiotics (eg, ciprofloxacin 750 mg orally twice daily) and referred to an otolaryngologist. (See "Malignant (necrotizing) external otitis", section on 'Treatment'.)

INFORMATION FOR PATIENTS — UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient information: Outer ear infection (The Basics)" and "Patient information: Removing objects stuck in the ear (The Basics)"
- Beyond the Basics topics (see "Patient information: External otitis (including swimmer's ear) (Beyond the Basics)"

SUMMARY AND RECOMMENDATIONS

- There are five fundamental steps in the management of external otitis (see 'Introduction' above):
  - Thoroughly clean the ear canal
  - Treat inflammation and infection
  - Control pain
  - Avoid promoting factors
follow-up and culture of recalcitrant cases (as well as consider alternative diagnoses)

- Cleaning out the external canal is an essential 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. (See 'Cleaning the ear canal' above.)
- For immunocompetent patients with external otitis who do not have infection of soft tissues outside the external auditory canal, we recommend topical therapy rather than oral therapy for initial treatment (Grade 1B). Many topical preparations are available alone or in combination, which include antibiotics, antiseptics, glucocorticoids, and/or acidifying solutions (table 1). The choice of topical therapy depends on the severity of external otitis (see"External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Clinical features'):
  - Mild disease is characterized by minor discomfort and pruritus (picture 2). There is minimal canal edema.
  - Moderate disease is characterized by an intermediate degree of pain and pruritus. The canal is partially occluded (picture 3).
  - Severe disease is characterized by intense pain, and the canal is completely occluded from edema. There is usually periauricular erythema, lymphadenopathy, and fever (picture 4).

- For patients with mild disease, we suggest a non-antibiotic topical preparation containing an acidifying agent and a glucocorticoid (eg, acetic acid/hydrocortisone) (Grade 2C). For patients with moderate and severe disease, we suggest an ototopical medication that is acidic and contains an antibiotic, an antiseptic, and a glucocorticoid (eg, Cipro HC, Cortisporin) (Grade 2C). (See 'Choice of topical agent' above.)

- Patients with severe external otitis will need placement of a wick, which allows topical medications to reach the medial aspect of the ear canal; they also facilitate longer retention of topical solutions in the affected areas. (See 'Wick placement' above.)

- We suggest systemic, in addition to topical, antibiotics for patients with deeper tissue infection beyond the external auditory canal (Grade 1B). Combined systemic and topical antibiotics are also indicated in patients who are immunosuppressed (ie, post-transplant, receiving chemotherapy or radiation therapy). Antibiotic coverage should include the most common pathogens, P. aeruginosa and S. aureus. Quinolones (eg, ofloxacin, ciprofloxacin) are a good first-line option that are effective and have few side effects. Patients with evidence of infection outside of the auditory canal may be at risk for malignant external otitis and should be referred to an otolaryngologist for further evaluation. (See 'Oral antibiotics' above and "Malignant (necrotizing) external otitis".)

- Patients with severe ear pain can also be treated with oral nonsteroidal anti-inflammatory agents. Some patients with persistent, severe pain may require opioid analgesics. (See 'Pain control' above.)

- The ear should be protected from water during recovery from external otitis. This can be accomplished by placing a cotton ball coated with petroleum jelly in the ear canal while bathing. Specific preventive measures for those who engage in water sports include use of ear plugs, shaking the ear dry after swimming, and blow drying the ear after water exposure.
(placing the blow dryer on a low setting 12 inches away from the ears). (See 'Avoiding promoting factors' above.)

- Patients will generally experience some symptom improvement within 36 to 48 hours after treatment is initiated, with full symptom resolution by about six days. In patients who do not respond to treatment within three days, culture of the ear canal and/or referral to an otolaryngologist should be considered. Patients who do not respond to initial treatment should also be evaluated for other conditions that may mimic or complicate external otitis. (See 'Follow-up' above and "External otitis: Pathogenesis, clinical features, and diagnosis", section on 'Differential diagnosis'.)

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