dence that NSAID use leads to exacerbation of asthma in children.

In conclusion, NSAIDs can cause serious adverse effects, but the short-term use of the commonly available over-the-counter NSAIDs (ibuprofen) or acetaminophen, when dosed properly, has been shown to pose little risk of serious adverse events, even in children younger than 2 years of age. However, caution should be exercised with NSAID use in children who are even mildly dehydrated or have impaired renal function. Parents and health-care practitioners should be aware that NSAIDs can cause or exacerbate GI symptoms that may be ascribed mistakenly to the infection being treated.

Comment: NSAIDS are used commonly in pediatric practice. Because many can be purchased over the counter, parents and patients consider them to be safe. Specific education about the ages for use, such as in those older than 6 months for ibuprofen; the importance of correct dosing; avoidance of long-term use or overuse; clear instructions for indications; and awareness of potential adverse effects is essential for providing safe and high-quality care to patients.

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In Brief

Otitis Externa

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Otitis externa (OE), more commonly known as swimmer's ear, is predominantly a bacterial infection accompanied by inflammation and loss of skin integrity of the external ear canal. Although rare before 2 years of age, the peak prevalence occurs between 7 and 12 years. The most common infectious agents are *Pseudomonas aeruginosa* and *Staphylococcus aureus*, often co-existing, with yeast accounting for less than 1% of isolates. OE results most commonly from increased moisture in the ear canal due to high humidity, warm temperatures, and swimming. The moisture causes edema and skin breakdown, which allows bacterial proliferation. Predisposing factors include local trauma; swimming, especially in water that has high bacterial counts; irritation to the ear that may occur from trauma, a foreign body, or a hearing aid; severe dermatitis; or viral infections such as herpes simplex or varicella. The clinical presentation can range from mild inflammation to severe loss of skin integrity and maceration.

Patients usually present with acute onset of unilateral ear pain. Itching, a sense of fullness in the ear, and complaints of decreased hearing also may occur. Physical findings include pain with pushing on the tragus or tenderness with pulling the pinna, concentric edema of the external ear canal, and clear or mucopurulent secretions or debris. The swelling and debris may obstruct the canal, making visualization of the tympanic membrane difficult or impossible. Conductive hearing loss may occur, along with periauricular and preauricular lymphadenopathy. Rarely, cranial nerve palsies, sensorineural hearing loss, or vertigo may occur if the infection extends beyond the external canal.

The differential diagnosis of OE includes furunculosis, foreign body, acute otitis media with perforation, mastoiditis, viral exanthems, and contact or allergic dermatitis. Furunculosis usually presents with localized swelling in the external ear canal. A foreign body generally can be seen, although impacted cerumen may disguise it. Foreign bodies can predispose to OE, and this condition should be considered if the patient fails to respond to treatment or has recurrences. Acute otitis media with perforation may be difficult to distinguish from OE if ear drainage is present, but pain on manipulation of the tragus or pinna usually is absent in cases of acute otitis media. Acute otitis with perforation and OE may coexist from contact of the purulent drainage with the external canal. Mastoiditis presents with swelling posterior to the ear and blunt-

ing of the posterior auricular fold; in OE, this angle usually is preserved. A history of eczema, nickel earrings, hearing aids, or ear plugs can aid in the diagnosis of atopic or contact dermatitis.

Management of OE focuses on control of pain, eradication of infection, and prevention of reoccurrence. Pain can be severe, and oral medications such as acetaminophen, ibuprofen, or sometimes oral narcotics may be necessary for adequate analgesia. Topical anesthetics such as antipyrine/benzocaine may provide temporary relief but are contraindicated in tympanic membrane perforations due to their ototoxicity.

A variety of preparations have been used for treatment, ranging from topical acidic solutions to antibiotics. Acetic acid and boric acid decrease the pH of the external canal where applied, restricting bacterial and fungal growth. Potential problems with this treatment include the need for multiple applications per day, pain with application if the external canal is inflamed, and potential ototoxicity when the tympanic membrane is perforated. Topical antibiotics are the medications used most commonly and are preferred to systemic antibiotics because of the high concentration of antibiotic achievable by direct installation into the ear and minimal systemic absorption, leading to fewer systemic adverse effects and less bacterial resistance. Obtaining a culture is not necessary before initiating treatment. Antibiotic choice should be directed toward *P aeruginosa* and *S aureus*, including methicillin-resistant *S aureus*. Historically, polymyxin B/neomycin/hydrocortisone preparations given four times daily had been used, with clinical and microbiologic cure rates ranging from 84% to 93%. However, recent studies have shown increasing bacterial resistance in addition to adverse effects, including pain during administration, the potential for ototoxicity, and a high rate of hypersensitivity to neomycin.

Topical fluoroquinolones such as ciprofloxacin and ofloxacin have similar efficacy rates and have become the antibiotics of choice. Their neutral pH causes less pain during administration, and dosage is only twice daily, with rare reports of hypersensitivity. Little evidence supports the use of hydrocortisone in the treatment of OE, with one study finding the time to resolution of pain decreased by only 0.8 day. Because ciprofloxacin/hydrocortisone otic preparation is not approved for use when the tympanic membrane is perforated due to the risk of ototoxicity, ofloxacin is a better choice if membrane patency is a concern. Systemic antibiotics should be used only if the infection extends beyond the ear canal or if the patient is immunocompromised. The benefit of wicks to decrease pain and increase medication delivery has not been evaluated systematically.

Strategies for preventing OE include keeping the external ear canal as dry as possible and decreasing the pH of the external canal. Using ear plugs while swimming or drying the ear with a hair dryer on a low setting after swimming may prevent skin maceration. The instillation of isopropyl alcohol, acetic acid, or boric acid solutions before and after swimming decreases the pH of the ear and can help prevent bacterial proliferation.

OE is a common bacterial infection that usually can be treated effectively with topical antibiotics. Rare complications include stenosis of the ear canal and severe, progressive skin breakdown. Although rare in children, the development of severe necrotizing OE caused by *P aeruginosa* is a risk for patients who have impaired immune systems or diabetes. Prompt treatment of pain and appropriate use of topical antibiotics can reduce symptoms and prevent sequelae. Prevention of reoccurrence by educating the patient and family regarding prophylactic measures is the key to effective management.

Comment: Treatments for OE over the past 1,000 years have ranged from ear candling to topical fluoroquinolones. Although systematic reviews debate the benefits of topical antibiotics compared with other topical agents, such as acetic acid or steroids, one certainty is that ofloxacin is the only product that can be used with a tympanic membrane perforation because it does not have a risk of ototoxicity. Appropriate drug delivery techniques are important to reinforce and include having the patient lie down with the affected ear upward, filling the ear with the topical medication, using a to-and-fro motion of the pinna to dissipate air bubbles and ensure that the medication makes contact with the affected area, and having the patient remain in this position for 3 to 5 minutes. Patients who have not responded within 2 to 3 days after treatment has been initiated should be re-examined to determine if there has been extension beyond the external canal that may warrant use of systemic antibiotics.

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