# Managing otitis

*An effective medical approach to this complicated problem starts with a thorough understanding of its causes.*

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It's no secret that otitis is one of the most common diseases treated by Pet practitioners. And because the disease is often caused by several interrelated factors, it can easily become chronic–leading to frustrated clients and miserable Pets.

Fortunately, a careful approach to diagnosis and treatment can result in positive outcomes in most cases. Read on to learn about the various causes of chronic otitis in dogs and cats–and what you can do to treat the condition effectively in your practice.

Figure 1

A Pet affected with otitis externa.

## A pervasive problem

Otitis has been reported to affect up to 20 percent of dogs and 6.6 percent of cats.[1] According to the Banfield Clinical Database, ear disease in dogs is the third most common disease seen in our practice. See *Otitis externa: facts and figures,* page 28, for an analysis.

Otitis not only causes discomfort for the patient, it also jeopardizes the relationship between the Pet and its family. Pain, pruritus and head shaking can affect Pet and human interaction. The presence of exudates and odors may make a Pet less desirable to be around. Some clients are anxious about the prospect of medicating their Pet. The tendency for the disease to become chronic only adds to clients' frustration–not to mention that of the veterinarian.

Empirical evidence suggests chronic otitis may be a major reason for premature euthanasia. Although no published studies directly link otitis to behavioral changes, the topic warrants further investigation. Consider the following: Otitis media was an incidental finding in 30 out of 35 dogs euthanized by a humane organization specifically for aggression. Their cadavers were subsequently used for a wet lab. Upon examination, most of the specimens had no external signs of otitis, but on otoscopic examination, 30 had bilateral or unilateral exudate in their tympanic bullae, consistent with otitis media. A majority of these specimens also had severe pathologic thickening of the bullae that would indicate chronic disease. These findings suggest a correlation between canine aggression and undiagnosed or inadequately treated otitis media. We know otitis in children is very painful and causes irritability. The same is true for Pets. Perhaps, we need to investigate further if ear infections do play a major role in behavioral changes in Pets and how this disease affects the family-Pet bond. Also, veterinarians must make every attempt to treat and manage this disease effectively to improve the lives of Pets and their families.

Diagnosis of otitis externa is based on observing signs of inflammation in the external ear canal. These signs include redness, swelling and the presence of exudates.

Otoscopy with a hand-held otoscope is the primary diagnostic procedure. If otitis media or interna is present, signs may include more severe pain, tympanic membrane rupture, hearing loss, keratoconjunctivitis sicca, Horner's syndrome or head tilt.

Several diagnostic procedures can help determine the cause and extent of otitis, including cytology, radiology and bacterial culture and sensitivity testing. (See page 18 for a discussion of ear-examination technique and additional diagnostic procedures.)

## A delicate balance

The normal environment of the ear canal is important in maintaining ear health. Secretions from sebaceous and ceruminous glands maintain proper pH and humidity and help capture debris and foreign material. Cerumen, or earwax, is composed of these secretions and cellular debris and tends to be more aqueous and thinner deeper in the ear canal. These secretions, along with outward epithelial migration toward the external meatus, help clear debris from the ear canal.

Otitis causes a breakdown of these mechanisms, disrupting the local environment of the ear canal. Epithelial changes include hyperplasia and hyperkeratosis; glandular changes lead to changes in secretions and cerumen. In otitis, there is failure of epithelial migration, increased cerumen with decreased lipid content, increased humidity and a higher pH in the ear canal. More severe and deeper changes occur over time and include stenosis, fibrosis and sometimes ossification of the ear canal.

The causes of otitis can be broken down into predisposing, primary and perpetuating factors *(Table 1)*. These factors frequently interact in chronic otitis cases.

**Table 1: Causes of Otitis**

**Predisposing Factors**

**Anatomic contributors**
- Pendulous ears
- Stenotic canals
- Increased ceruminous glands
- Excessive hair

**Environmental triggers**
- Increased humidity of ear canal
- High environmental temperature and humidity

**Swimming**

**Previous otitis**
- Abnormal epithelium
- Stenotic canals
- Failure of epithelial migration

**Tumors or growths**

**Primary Factors**

Allergies
Parasites
Foreign bodies
Keratinization disorders
Autoimmune diseases

**Perpetuating Factors**

Chronic changes of the ear canal
Otitis media
Chronic infection

## Predisposing factors

Predisposing factors increase a Pet's risk of developing otitis, usually by altering the ear canal environment in some way. Anatomic breed characteristics such as pendulous ears and narrow or stenotic ear canals can be predisposing factors. Labrador Retrievers and Cocker Spaniels have higher numbers of

ceruminous glands. Some breeds grow excessive hair in the ear canal, which is sometimes listed as a predisposing cause–perhaps because it can lead to slower drying and increased moisture in the ear canal when combined with other factors.

High environmental temperature and humidity as well as activities such as swimming can also increase humidity in the ear canal. Previous otitis and associated ear canal changes make a Pet more susceptible to future episodes, and growths in the ear canal alter the local environment, predisposing a Pet to otitis. These predisposing causes will make the ear more susceptible to primary causes.

## Primary causes

Primary causes of otitis are triggers that initiate the disease without other factors. Primary conditions, which often produce signs in addition to those of otitis, must be identified and treated or at least managed successfully. A complete medical history, general physical exam and thorough otoscopic exam are necessary to discover and diagnose these problems, which include:

- **Allergies.** Allergic disease is the most common primary cause of otitis. Otitis is reported as a sign in 55 percent of atopic and 80 percent of food-allergic dogs. Also, otitis may be the only sign in 5 percent of atopic and 25 percent of food-allergic dogs.[2] Systemic drug reactions can cause erythema and edema of the pinna and superficial ear canal. Any drug or product applied topically in the ear canal can cause a local reaction or allergic contact dermatitis. The early otic signs of allergy may be mild, such as erythema, pruritus and minimal exudation. A thorough physical exam and history often indicate other dermatologic signs of allergy, but not necessarily. Because allergic disease is such a common cause of otitis, investigate this possibility early in cases of otitis. When it is present, begin managing the primary allergic disease as part of otitis therapy before the problem becomes chronic.

- **Parasites.** Parasites that can affect the ear include ticks, fleas and mites. Common mites are *Otodectes cynotis*, *Sarcoptes scabiei*, *Notoedres cati* and *Demodex canis*. A careful otoscopic exam is necessary to identify the larger of these parasites. Remember that it's easy to overlook a tick in the superficial ear canal using the otoscope, so examine this area particularly closely. Also, *Otobius megnini* (the spinous ear tick) deserves mention–it is often deep in the ear canal, sometimes near the eardrum.

- **Foreign bodies.** Plant awns are the most common foreign body found in the ear, but any foreign object or material small enough to lodge in the ear canal can cause inflammation and subsequent problems. Small children can also introduce foreign bodies into a Pet's ear.

- **Keratinization disorders.** Keratinization disorders associated with otitis are hypothyroidism, sex hormone disorders, hyperadrenocorticism and idiopathic seborrhea in Cocker Spaniels. Hypothyroidism is most common.

- **Autoimmune diseases**. Autoimmune diseases such as pemphigus can be a primary cause of otitis. All of these keratinization and autoimmune diseases produce signs in addition to those of otitis.

## Perpetuating factors

Perpetuating factors typically come into play after predisposing and primary factors have resulted in otitis, and they can cause the disease to continue even after the primary prob-

lems are resolved. Perpetuating factors such as chronic infection, otitis media and chronic anatomic changes in the ear canal must be identified and resolved. If otitis is not addressed, end-stage ear can occur–changes in the epithelium and ear canal structures become so severe that they perpetuate otitis instead of merely predisposing to it. A severely hyperplastic, stenotic and calcified ear is no longer a candidate for medical therapy; at that point it's time for surgery.

Otitis media may be present in up to 80 percent of dogs with chronic otitis, and the tympanic membrane may or may not be intact in these cases.[3] As long as there is a source of inflammation and infection in the middle ear, otitis will recur. It's important to select initial cleaners and treatments with

## Otitis Media: A Deeper Challenge

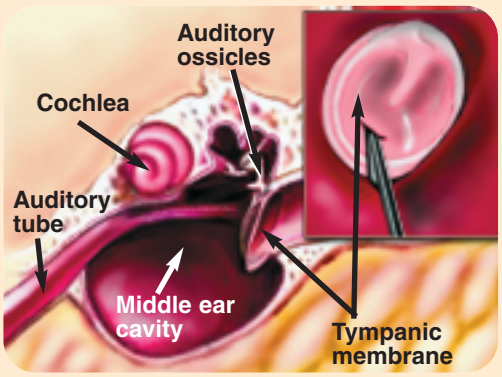
Otitis media is common in chronic otitis and can be a perpetuating factor. Assess the eardrum carefully for perforations during the examination and initial cleaning process. If the eardrum cannot be visualized because of swelling and proliferative changes, a course of corticosteroids may allow assessment on follow-up. Of course, sedation is frequently needed for examination of the middle ear.

If the eardrum appears intact but there are signs of middle ear involvement, consider performing a myringotomy. Signs of otitis media include pain on palpation of the base of the ear, pain on opening the mouth, dysphagia, deafness, marked discharge if the tympanum is ruptured, ipsilateral keratoconjunctivitis sicca, Horner's syndrome, head tilt and vestibular signs with inner ear involvement.

Myringotomy should be performed under general anesthesia. The technique involves puncturing the tympanum in the pars tensa area away from the visible attachment of the malleus. This area avoids the blood vessels of the pars flaccida and the blood vessels and germinal epithelium over the malleus. The area can be described as the five o'clock position on the left tympanum and the seven o'clock position on the right tympanum.[1,2] Using an otoscope to visualize the area, make the incision with a sharpened polypropylene catheter, a tomcat catheter or a spinal needle.[1]

It's important to obtain samples from the middle ear for cytology and culture and sensitivity testing (up to 2 ml of saline can be infused into the middle ear and then aspirated to help with sample collection). Topical and systemic medications can be selected based on these results. Treatment includes carefully flushing and cleaning the middle ear with saline under anesthesia, followed by application of the appropriate medication into the middle ear—corticosteroids to help decrease inflammation and systemic anti-infectives based on sensitivity results. The cases of otitis media that do not respond to therapy may require bulla osteotomy.

**Figure 1: Right ear**




With otitis media, exudates can fill the middle ear cavity and must be flushed out manually. When necessary, the appropriate myringotomy incision is made, avoiding the malleus attachment. If the tympanic membrane is ruptured, ototoxic substances and drugs can enter the middle ear and affect the sensitive structures of the inner ear.

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these statistics in mind—choose those that are safe for use with a ruptured tympanic membrane until you can see that it's intact (see *Choosing Safe Treatment*, page 38).

Chronic infection is a common perpetuating factor. Bacteria and yeast can be involved, either alone or in combination. Cytology is the primary method of identifying these infections. In chronic and recurring cases involving bacteria, culture and sensitivity testing is necessary to determine treatment. Keep in mind the normal flora of the ear canal; there may be up to two yeast and five bacteria per high-power field in normal canine and feline ears. The usual yeast organism is *Malassezia* species, but occasionally *Candida* organisms cause problems. The most common bacteria causing infection of the ear canal are *Staphylococcus*, *Pseudomonas*, *Proteus*, *Corynebacterium*, *Enterococcus* and *Streptococcus* species, along with *Escherichia coli*. The *Pseudomonas* organism is the most common bacteria involved in chronic recurrent bacterial otitis.[2]

## Treatment

Once otitis has been identified, the first goal is to discover and treat the primary cause. Larger parasites such as ticks and foreign bodies can be manually removed using an otoscope and alligator forceps. Sedation is frequently required for the procedure. Ear mites are easily treated with one of the many available products, including Acarexx (IDEXX) and Tresaderm (Merial). *Demodex* and *Sarcoptes* mite infestations of the ear canal are usually part of a generalized infestation and are treated with the primary disease. Appropriate treatment of endocrine and immune-mediated disorders helps resolve associated otitis, as does proper identification and management of allergic disease. Tumors and growths can be surgically removed.

The next concern is to treat the perpetuating causes of otitis. The process of discovering and treating these causes needs to occur at the same time as the search for and treatment of the primary causes. Infections in the external and middle ear are the top concern for practitioners. Finally, it's important to evaluate whether predisposing factors can be eliminated or managed.

Unfortunately, it's often not possible to completely resolve or eliminate all primary and predisposing causes of otitis in a particular patient. Allergic disease can often be managed only to a certain degree, and atopic patients may experience seasonal relapses in spite of therapy. Food-allergic dogs may accidentally gain access to other foods. Furthermore, clients may have difficulty complying with or paying for allergy treatment. Some diseases, such as idiopathic seborrhea in Cocker Spaniels, and predisposing breed characteristics, such as high numbers of ceruminous glands in the ear canal, pendulous ears, stenotic ear canals and excessive hair, cannot be eliminated, only managed. Likewise, it may not be possible to prevent water-loving retrievers from swimming.

So even after all causes of otitis in a particular case are discovered and treated to the best of the clinician's ability, some cases may still require long-term management. It's important to discuss this possibility with your clients so they have realistic expectations of what lies ahead.

## Cleaning

Cleaning is an important first step in treating the ear (but remember to take cytology and culture samples beforehand). First, cleaning may be necessary to visualize the canal and eardrum adequately. It also

removes exudates that cause inflammation, interfere with topical medications and act as a barrier between the tissues and medications. The intensity of the cleaning process varies with the severity of the case and amount of exudate present.

The simplest method is to fill the ear canal with cleaning solution and gently massage the base of the ear, then gently wipe away the solution and dislodged exudates with a soft cloth tissue or cotton ball. When necessary, sedate or anesthetize the Pet to clean the ear thoroughly. You'll need an otoscope with an operating head, a red rubber or tomcat catheter and a syringe for this procedure. (More sophisticated equipment and techniques are available, but you can do a thorough cleaning using these basic items.)

Attach the catheter to the syringe and clean the ear canal with gentle flushing and suctioning–if you don't know the status of the tympanum, use warmed saline or water. Use the otoscope for visualization while flushing the deeper ear canal to avoid damage to the tympanum. For stubborn exudates, use an ear loop or alligator forceps while visualizing the area through the otoscope. Though routine hair removal from the external ear canal is controversial, it can be beneficial to remove hair in cases of active otitis. Excessive hair in the ear canal can act as a matrix to collect exudate and interfere with the application and tissue contact of topical medications.

Cleaning agents can be classified as ceruminolytic or drying agents. Ceruminolytic agents break down cerumen and cells and may be oil-based (squalene, propylene glycol, glycerin and mineral oil) or water-based (dioctyl sodium sulfosuccinate, calcium sulfosuccinate, and carbamate and urea peroxide). Squalene deserves special mention because it is unlikely to cause ototoxicity,[1,4] although oil-based preparations can collect in the ear canal and may require additional cleaning. Drying agents are usually weak acids or alcohols (acetic acid, boric acid, salicylic acid and isopropyl alcohol) that tend to decrease the pH and humidity of the ear canal. Some have an antimicrobial effect. Many preparations combine ceruminolytics and drying agents. I prefer these combination products for routine cleaning in the hospital and at home. In cases involving a ruptured or nonvisualized tympanum, I use warmed, sterile saline or water.

Regular cleaning at home by the client is most important for controlling and preventing chronic otitis after you have addressed the primary and perpetuating causes. When prescribing home cleaning, demonstrate how to fill the ear canal with cleaner, massage the ear canal and then wipe it out with a cotton ball. To boost clients' confidence, you may want to have them try cleaning while you observe and offer suggestions. I usually recommend cleaning one to three times weekly and after swimming, bathing or grooming for general maintenance.

## Topical therapy

Topical therapy is indicated in otitis externa. Topical agents include antibiotics, antifungals and anti-inflammatories; many commercial products are combinations of these. Product choice should be based on cytology results, the condition of the tympanic membrane and the amount of inflammation. In recurrent or resistant cases, bacterial culture and sensitivity testing helps identify the correct treatment. Some expected antibiotic sensitivities of the most common otic pathogens are shown in *Table 2* on page 40.

Enrofloxacin, tris-EDTA, silver sulfadiazine, neomycin, polymyxin B and gentamicin are all available in veterinary otic products.[5] Silver sulfadiazine is effective against *Pseudomonas* and *Staphylococcus* species, including some resistant strains. It is included in a commercial otic product (Baytril Otic–Bayer), and the cream or powder can be compounded up to a 1 percent preparation for otic application.[1,6,7]

Several other antibiotics and preparations are useful with resistant bacteria, especially *Pseudomonas* species. When used as a cleaner before antibiotic application, tris-EDTA increases the susceptibility of *Pseudomonas* species to antibiotics.[1,6]

## Choosing Safe Treatment

Many products commonly used in the external ear can be toxic to the inner ear if the tympanum is ruptured—assume that it's ruptured until you can visualize it. When you're choosing treatment for a particular case, consider the potential ototoxicity of all the product's ingredients.

It's important to know which products can be used safely with a ruptured tympanum and in the middle ear. (Note that most of the products discussed below have been deemed safe through clinical observation, not controlled studies.) The safest cleaning solutions are saline and water. Two percent acetic acid and 2 percent boric acid, along with tris-EDTA,[1] are also considered safe in the presence of a ruptured tympanum. Dilute acetic acid, 1 to 2.5 percent, is available commercially or can be formulated at home using 5 percent white vinegar diluted with water or saline 1:1 to 1:3.[2,3]

Most ceruminolytic preparations are ototoxic because they contain alcohols, propylene glycol or detergents. Squalene is a ceruminolytic agent in the product Cerumene (Evsco) and is reported not to be ototoxic.[1,2] Nonototoxic antibiotics are fluoroquinolones, aqueous penicillin G, carbenicillin, ticarcillin, ceftazidime and cefmenoxime.[1] Most of the commonly used antifungals appear to be safe in the middle ear, including nystatin, thiabendazole, clotrimazole, miconazole, ketoconazole, itraconazole and terbinafine—but remember to consider all ingredients present in a particular preparation.[1,4] Aqueous corticosteroid preparations can also be used in the middle ear,[1] and a product containing fluocinolone and DMSO has not been ototoxic in one clinician's experience.[5]

The use of silver sulfadiazine in the presence of a ruptured tympanum is controversial. Some authors report it to be safe in these cases, but contact irritation may be a problem.[4,5] The package insert for Baytril Otic, the only commercial product containing silver sulfadiazine, includes cautions about using the product in the presence of a ruptured tympanum.

### Ototoxic Products*

| Antibiotics | Antiseptics | Ceruminolytics and Cleaners |
|---|---|---|
| Aminoglycosides | Chlorhexidine | Propylene glycol |
| Polymyxins | Iodines and iodophors | Detergents, surfactants |
| Minocycline | Alcohols | Salicylates |
| Erythromycin | Benzalkonium chloride | |
| Chloramphenicol | | |
| Vancomycin | | |

*Adapted from Ettinger SJ, Feldman EC. *Textbook of veterinary internal medicine*. 6th ed. Philadelphia, Pa: WB Saunders Co, 2004;1171-1186.

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**Table 2: Percentage of Susceptible Isolates from the External Ear Canal***

| Antibiotic | *Staphylococcus intermedius* | *Pseudomonas aeruginosa* |
|---|---|---|
| Cephalothin | 77.8% | NA |
| Amoxicillin-clavulanic acid | 100% | NA |
| Enrofloxacin | 96.3% | 12.5% |
| Gentamicin | 96.3% | 56.3% |
| Neomycin | 88.5% | 0% |
| Polymyxin B | 100% | 100% |
| Tobramycin | 100% | 85.7% |
| Trimethoprim-sulfa | 51.9% | NA |

*Adapted from Kwochka KW. Bacterial infections of the external and middle ear, in *Proceedings*. West Vet Conf 2004.

Many ceruminolytic and drying preparations have antibacterial effects,[1,5] and some antibiotics may be used off-label for resistant *Pseudomonas* infections. Tobramycin is available as a topical ophthalmic solution approved for humans and can be used in Pets at three to five drops per ear. Injectable amikacin (50 mg/ml) can be applied at three to five drops per ear twice daily.[6] Keep in mind that reported resistance based on concentrations attained with systemic therapy may not be accurate due to the high concentration of antibiotic when delivered topically.[7]

Yeasts are common in otitis. Antifungal agents commonly used to treat them include nystatin, thiabendazole, miconazole and clotrimazole.[1,5] Silver sulfadiazine is effective against yeast at concentrations available for otic therapy. A solution of ketoconazole can be formulated for resistant yeast infections by mixing 300 mg in one ounce of water or cleaning solution.[6] Acetic-boric acid solutions are effective against *Malassezia* species.[8]

Anti-inflammatories, especially corticosteroids, are an important part of otitis therapy. They decrease inflammation and associated pruritus, swelling and hyperplasia. In atopy cases, topical corticosteroids relieve pruritus and inflammation in the ear canal and may be necessary for management. Potent corticosteroids such as betamethasone and fluocinolone may cause systemic effects over time because of local absorption; therefore, they should not be used continually in chronic otitis cases. Silver sulfadiazine may be useful in ulcerative otitis by enhancing wound healing and epithelialization.[7]

## Systemic therapy

Systemic medications are sometimes used to treat otitis, especially systemic corticosteroids. They decrease inflammation so they are especially useful in cases with considerable swelling, hyperplasia and proliferation of the ear canal. As inflammation decreases, the corticosteroid dose should be tapered and then stopped to avoid systemic side effects. However, corticosteroids are sometimes necessary as part of the management regime for atopy.

Systemic antibiotics do not provide high drug concentrations in the external ear canal, so they are not as important as topical antibiotics in most otitis externa cases. However, higher tissue levels are attained in the middle ear, and systemic antibiotics are important in the treatment of otitis media.[7] Systemic antibiotics are indicated with concurrent pyoderma, or in cases with marked proliferative changes. Choose the antibiotic based on culture and sensitivity test results.

The systemic antifungals, ketoconazole and itraconazole, are sometimes indicated in otitis treatment. Though there is some controversy regarding their efficacy,[1,6] they are indicated when yeasts are involved in otitis media, when there is associated dermal yeast infection or when there are marked proliferative changes in the ear canal.

A final indication for systemic therapy is the owner's inability to treat the Pet topically either because of the Pet's personality or the owner's own limitations. In these situations, the only choice for treatment may be thorough cleaning and treatment under sedation followed by systemic therapy at home.

## Conclusion

When managing otitis, especially chronic otitis, it's essential to address all the causes–perpetuating, primary and predisposing factors. Clinicians need to discuss with their clients how these factors interact in the disease. In situations where not all the causes can be eliminated, clients must realize that ongoing management (*e.g.*, through allergy treatment and regular cleaning) will be necessary to keep ear problems under control.

Rechecking the patient's ears is also important. New cases should be seen every two weeks until infections are resolved and primary causes are either resolved or managed. Cytology, culture and sensitivity testing, cleaning or sedation may be necessary during these rechecks. Clients need to understand the importance of these follow-up examinations and expect regular diagnostic tests. They also need to be prepared for time and monetary commitments.

Once otitis is resolved, clients should be aware that relapses can occur. If seasonal factors such as atopy or swimming are involved, clients should be especially vigilant during these times. With routine cleaning at home, clients have the opportunity to assess the ears regularly and notice relapses early, when they are more easily treated.

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