

# Management of otitis externa

*Thorough ear cleaning and understanding product selection are essential components of managing otitis.*

**T**he frequent occurrence of occult and/or recurrent otitis externa in Pets can give owners the false impression that this disorder is easily managed or cured.

Given the numerous possible predisposing and primary causes, it is clear that resolving a case of otitis externa is often more challenging than many Pet owners appreciate. The previous article outlined a diagnostic approach to otitis externa, emphasizing the need to uncover and control the primary cause. This article will focus on the medical management of otitis externa, particularly the steps you can take to eliminate and prevent the bacterial and yeast infections that are often the result of a diseased ear canal. Managing otitis externa usually begins, but does not end, with treating for these organisms.

## **Understanding the normal versus diseased ear canal**

The normal ear canal produces cerumen that serves multiple purposes: lubrication of the tympanic membrane (TM) and epithelium, protection against transepidermal

water loss and collection of debris and organisms.<sup>1</sup> Cerumen is a mixture of secretions from the sebaceous glands and ceruminous glands (modified apocrine sweat glands). Breed differences exist; American Cocker Spaniels, for example, have more prominent ceruminous glands than other breeds, explaining, in part, their predisposition to otitis externa.<sup>2</sup>

Ceruminous glands are more abundant close to the tympanum, while sebaceous glands predominate near the ear canal opening and are associated with hair follicles. The normal secretion of ceruminous glands is a thinner consistency than that of sebaceous glands. Inflammation of the ear canal results in increased cerumen production, which shields bacteria and yeast from topical therapy and increases the humidity of the ear canal, favoring bacterial and yeast growth.<sup>3</sup> In dogs with otitis externa, the lipid content of cerumen is significantly lower, and the mean pH is different (lower in acute, higher in chronic otitis externa) than in normal ears.<sup>4</sup>

A healthy ear canal cleans itself. The mechanism by which cerumen, desquamated keratinocytes, and trapped debris



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and bacteria are slowly cleared from the normal ear canal involves the migration of the epithelium toward the external opening as it matures from deeper to superficial layers, a process that begins with germinal cells in the tympanic membrane. Most of the predisposing and primary causes of otitis externa (See *Pursuing the causes of otitis externa*, Table 1, page 20) may result in the failure of epithelial migration, causing a buildup of cerumen and keratinocytes in the proximal ear canal. Soft wax plugs or inspissated concretions (ceruminoliths) may form next to the eardrum (*Figure 1*, page 34), causing inflammation and compromising the tympanic membrane. It is not unusual to discover a perforated or missing tympanic membrane once ceruminoliths are removed. Pet owners should be explicitly advised before an ear flush procedure that the status of the eardrum is unknown if you haven't been able to visualize it yet.

### **Cleaning the ear canal**

The epithelium of the ear canal is thin and easily damaged by trauma (*e.g.*, rubbing with cotton swabs), ceruminoliths, and extracellular bacterial virulence factors (*e.g.*, proteolytic enzymes and exotoxins). Removing these irritants is critical to the successful management of otitis externa. The goal is to obtain a clean ear canal so otic medications can directly contact the epithelium. Applying ointment to an ear canal filled with exudate and/or cerumen is likely to result in treatment failure.

When deep ear flushing and cleaning are indicated, don't expect the Pet owner to do it effectively. The procedure is often painful (requiring immobilization or anesthesia) and challenges the Pet owner beyond his or her ability—and likely the Pet's tolerance. Ear cleaning by the Pet owner is appropriate for maintenance once the ears have been flushed out thoroughly (See *Effective ear cleaning techniques*, page 35).

It is important to advise Pet owners of possible complications prior to performing an ear flush. These include head tilt, nystagmus and deafness. Though rare and usually temporary, these side effects are quite troubling to all involved. Because Pets often effectively compensate for deafness with other senses, Pet owners often do not appreciate the degree of hearing loss already present. As part of your examination, evaluate the Pet's hearing prior to performing an ear flush. Otherwise, the owner may erroneously conclude that an ear flush has caused deafness when, in fact, the Pet could not hear before the procedure. Cats seem to be more prone than dogs to having adverse reactions to ear flushing. Warming the flushing solution to body temperature and using saline as the final irrigating solution (especially when you discover a compromised tympanic membrane) may help reduce the incidence of side effects.<sup>5</sup>

You may choose to postpone an ear flush when an ear canal is severely ulcerated or stenotic (*Figure 2*, page 34). Prescribing prednisone (1 to 2 mg/kg/day) for three to seven days to reduce inflammation, pain and swelling before an ear flush can improve the outcome. The ulcerated canal will be less exudative and the stenotic canal may be more accessible for cleaning. Topical therapy may be instituted during this period.

**Figure 1: Ceruminolith**



Failure of epithelial migration may result in the formation of a ceruminolith that may be attached to the tympanic membrane. Without adequate visualization, it may be mistaken for the tympanic membrane.

**Figure 2: Stenotic Ear Canal**



Figures courtesy of Jon Platt, DVM, DACVD

A severely stenotic and ulcerated ear canal such as this Cocker Spaniel's may be more effectively flushed after a short course of prednisone.

### Topical ear therapy

In most instances, topical therapy is indicated for otitis externa. In some instances, systemic therapy is prescribed in addition to topical therapy, but rarely without. Otitis usually calls for topical administration of a flush with cleansing, ceruminolytic, antiseptic, anti-inflammatory and/or antibiotic potentiating effects, plus an ointment or solution with antibiotic, antifungal and/or glucocorticoid ingredients.

Ear cleansers commonly contain emollients, fragrances and drying agents, including organic acids and alcohols, and are suitable for both initial in-hospital cleaning and maintenance cleaning by Pet owners once the ear is fairly clean. Most commercial cleansing products tested displayed very little ceruminolytic activity in an experimental model, and their ability to remove large amounts of waxy debris without ear flushing should not be overestimated.<sup>6</sup>

Ceruminolytic agents can help loosen the debris in very waxy ears. Emollients and surfactants are intended to dissolve and break up cerumen. Propylene glycol, squalene, glycerin, dioctyl sodium succinate (DSS) and sodium lauryl sulfate are common ingredients included for this purpose, but again, they are more effective as part of a flushing procedure. Products containing urea peroxide have a foaming action that helps break up cerumen, but they can be irritating to already inflamed ears and are best followed by a flush with saline or a less irritating ear cleanser. Antiseptic properties and agents are incorporated into some ear cleansers, providing synergy with topical antibiotics, antimicrobial activity suitable for long-term use, and preservative functions. Organic acids (acetic, salicylic and others) and boric acid may have direct antimicrobial effects and may acidify the ear canal in some products. The ototoxicity of these agents often varies with concentration and species. Chlorhexidine at low concentrations (<0.2%) appears to have low ototoxicity in dogs, but should be avoided in cats.<sup>7,8</sup> Alcohols and benzalkonium chloride are also incorporated in some products for their antiseptic properties. Dilute povidone-iodine should be used cautiously, especially in cats, and should be flushed out of the ear canal with saline, if used.

## Effective ear cleaning techniques

1. Collect diagnostic samples for cytology and bacterial culture. The culturette may be saved and submitted if indicated by cytology results or additional otoscopic findings.
2. Provide a level of sedation or anesthesia commensurate with the discomfort and pain that is expected to occur. For severe otitis externa or media, general anesthesia is almost always indicated.
3. Take into consideration the nature of the exudate (waxy, sticky or purulent), the integrity of the tympanic membrane, and microorganisms present on cytology when selecting a cleaning solution (*Table 1*, page 36). Until you see the tympanic membrane, assume it is perforated. Fill the ear canal with the cleaning solution, massage, and wait for five minutes while the solution is acting to soften and emulsify the exudate.
4. Perform a preliminary flush using a new, sterile bulb syringe and warmed flush solution. When the integrity of the tympanic membrane is in question, saline is the safest choice. Care must be taken to not create a seal between the syringe and the ear canal, which could result in the iatrogenic rupture of the tympanic membrane due to positive pressure. Flushing with the bulb syringe will help dislodge and remove much of the exudate or cerumen, but usually fails to thoroughly clean the horizontal canal.
5. A more thorough deep cleaning is performed with a TomCat catheter or red rubber feeding tube attached to a syringe while visualizing with an operating otoscope head or video otoscope. An ear loop aids in the removal of ceruminoliths or impacted cerumen, but care must be taken to avoid inadvertently perforating the tympanic membrane. The goal is an ear canal free of exudate. Commercially available ear flushing devices include the Auriflush™ by Schering-Plough, Earigator™ by MedRx, and VetPump® 2 by Storz. Each has advantages and disadvantages.
6. The tympanic membrane is assessed and further diagnostics are considered if otitis media is suspected (See *The challenges of otitis media*, page 42).
7. The ear canal is flushed a final time with saline and then suctioned to remove excess fluid.

## Antibiotic-potentiating agents

Tris-EDTA, a chelating agent, is incorporated into some commercial ear flushes (e.g., TrizEDTA, DermaPet®; P1/O, Glen-Haven™) that are intended to be used 15 to 30 minutes prior to topical antibiotic administration. By disrupting the bacterial cell wall and making it more porous, Tris-EDTA increases the efficacy of anti-

biotics, lowering the minimum inhibitory concentration (MIC).<sup>9</sup> This synergistic effect is particularly useful in the treatment of *Pseudomonas aeruginosa* infections.

## Antibiotic agents

Antibiotics commonly used topically, two to three times daily, for otitis externa include aminoglycosides, fluoroquinolones and sil-

**Table 1: Factors Influencing the Choice of Selected Ear Cleaners**

Product	Suitable with perforated TM	Character of exudate			Antiseptic activity against <i>Staphylococcus</i> , <i>Pseudomonas</i> and <i>Malassezia</i> <sup>12</sup>
		Waxy	Sticky-tenacious	Purulent	
Sterile saline	Yes	+	+	+	-
C1/O, GlenHaven™*, EpiOtic®, Virbac	No	++	+	++	++
C2/O**, GlenHaven™; CleaRX® Ear Cleansing Solution, DVM Pharmaceuticals, Teva Animal Health**	No	+++	++	-	+
F1/O, Glenhaven™; MalAcetic, DermaPet®	Yes	+	+	++	++
P1/O, GlenHaven™; TrizEDTA, DermaPet®	Yes	+	+	+	-
TrizPlus, DermaPet®	Yes	+	+	+	++
Cerumene™, Evsco Pharmaceuticals	Yes	++	++	+	-
Chlorhexidine (>0.2%)**	No	+	+	+	+
Povidone-iodine**	No	+	+	++	+

\*GlenHaven™ is a private label used by Banfield doctors.

\*\* Flush with saline after use: avoid use in cats.

**Key:** + = Effective  
- = Not effective

ver sulfadiazine. Considerations that should enter into the selection of topical antibiotic agents include the available formulations, potential for ototoxicity, cytology findings, and amount of otic exudate. On the other hand, bacterial culture and susceptibility data may not be very useful, as the MIC break-points are established for systemic therapy and may be several orders of magnitude lower than is achievable with topical therapy.

The aminoglycosides gentamicin and neomycin are found in many topical otic products and are often effective against both gram-positive and gram-negative bacteria, though neomycin is less effective against gram-negative bacteria. Neomycin is often implicated as a cause of contact dermatitis. Tobramycin ophthalmic solution is sometimes recommended for resistant

pseudomonal otitis externa as well. In general, aminoglycosides are potentially ototoxic (See *The challenges of otitis media*, page 42) and should be avoided when the integrity of the tympanic membrane is in question. However, gentamicin is considered relatively non-ototoxic and has been recommended for the treatment of otitis media in compounded aqueous formulations.<sup>10</sup> Because they are more active in an alkaline environment, it is best to wait one hour after using an acidifying ear cleanser before applying a topical aminoglycoside. This will allow the pH in the ear canal to return to a more alkaline level.

Enrofloxacin is available in combination with silver sulfadiazine for otic use (Baytril Otic®; Bayer). Generally, enrofloxacin has good activity against both gram-positive

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and gram-negative bacteria, however, bacterial resistance to enrofloxacin is becoming more common in pathogens isolated from Pets with otitis externa.<sup>11</sup> Since the commercial product does not contain a glucocorticoid, otic inflammation often needs to be addressed separately. To increase the volume available for contact with the diseased ear canal and gain the synergistic benefit of EDTA, many veterinary dermatologists recommend compounding a solution of injectable enrofloxacin (0.5 percent to 2.0 percent) in a Tris-EDTA ear flush. Silver sulfadiazine has excellent activity against *Pseudomonas* and *Staphylococcus*, but is less effective against *Malassezia*. It is available as a 1 percent solution (Baytril Otic®; Bayer) in combination with enrofloxacin. Based on the clinical impression of many veterinary dermatologists, silver sulfadiazine appears to be safe for use in face of a perforated tympanic membrane.<sup>11</sup> Other antibiotics infrequently compounded for topical therapy of otitis externa include polymyxin B, ticarcillin and chloramphenicol.

### **Antifungal agents**

Because *Malassezia pachydermatis* is a common ear pathogen, nystatin, thiabendazole, clotrimazole or miconazole are frequently incorporated into topical otic medications. Each exerts its effect by causing disruption of the fungal cell wall. Aqueous forms of these drugs have a low potential for ototoxicity, but most are commercially available in ointment forms which are best avoided in the case of a ruptured tympanic membrane.<sup>11</sup> Ear cleansers

containing boric acid (F1/O, GlenHaven™; MalAcetic, DermaPet®), acetic acid, and/or azole drugs (MalAcetic ULTRA™, DermaPet®) may be useful in resolving and preventing otitis externa complicated with *Malassezia pachydermatis* infection.

### **Anti-inflammatory agents**

Controlling inflammation in the ear canal is critical to the successful management of otitis externa. Inflammation may result from primary allergic or perpetuating infectious causes of otitis externa, leading to pain, swelling and ceruminous gland hyperplasia. Topical glucocorticoids are frequently incorporated into otic medications designed for the treatment of active infections. Cleansers containing hydrocortisone (e.g., MalAcetic ULTRA™, DermaPet®, F2/O, GlenHaven™) without an antibiotic can be useful for the long-term management of allergic otitis externa. Systemic glucocorticoids (prednisone, 1 to 2 mg/kg/day, for three to seven days) are often required to control severe inflammation, such as occurs with pseudomonal infections.

### **Topical product application**

Care should be taken to give the Pet owner clear instructions concerning cleaning and medicating the ear. Not applying a volume of medication sufficient to coat the entire ear canal is a common cause of treatment failure. One also needs to consider possible incompatibility of the cleansers and medications that may be prescribed. The bactericidal activity of fluoroquinolones and aminoglycosides is decreased in the presence of acidifying ear cleansers; Pet owners should be instructed to use them one hour apart.

The Pet should be re-examined before therapy is discontinued. Once clinical and cytological resolution has been achieved,



the medication is discontinued and the frequency of cleaning is reduced to an as-needed basis, often once or twice weekly. Cleaning too frequently can predispose the Pet to recurrent otitis externa. Normal Pets without a predisposition to otitis externa do not require routine ear cleaning.<sup>5</sup> A cleaning and drying solution incorporating acetic acid (F1/0, Glenhaven™ MalAcetic, DermaPet®) may be used after swimming to prevent otitis externa due to excessive moisture (swimmer's ear).

### Note on systemic therapy

Systemically administered glucocorticoids (e.g. prednisone 0.5 to 2 mg/kg/day) may help control the primary cause of inflammation, subsequent swelling or ceruminous gland hyperplasia that may occur with otitis externa. Reducing the inflammation, pain and stenosis may be critical to the management of a Pet's otitis externa. Systemic administration of antibiotics or antifungal drugs appears to be of limited benefit in treating otitis externa, though more appropriate when ear canal ulceration or otitis media are also present, as is often the case with pseudomonal infections.<sup>11</sup>

### Summary

An effective treatment plan for otitis externa begins with a thorough cleaning of the ear canal in the hospital to remove cerumen, exudate and microorganisms. The choice of flushing solution may be based on the integrity of the tympanic membrane, nature of the exudate, species, and ear cytology findings. Topical therapy is chosen based on cytology findings, degree of inflammation, and the integrity of the tympanic membrane. An ear cleanser and a medicated ointment or solution are indicated in most cases.

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