

Management and treatment of otitis externa and media

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Otitis externa is inflammation of the external ear canal and is very common in dogs and quite common in cats. Otitis media – an inflammatory disease in the middle ear cavity – is a disease process that goes unrecognised in most veterinary practices.

The aim of these notes is to describe the presentation and management options for otitis externa and media. While part one (VT44.50) covered pathogenesis and clinical signs, part two discusses principles of ear cleaning, ear flushing and myringotomy, along with medical therapy, including topical and systemic medications and ototoxicity.

Management

Otitis therapy consists of identifying and controlling all the factors involved and considering medical options, including topical and systemic therapy; these should be co-adjuvated by ear cleaning and, when needed, by ear flushing. Length of treatment and prognosis varies based on causes and factors.

The owner's involvement is important as most of the topical procedures will be performed at home by clients and this will probably influence the success of treatment. Additionally, the relevance of attending follow-up visits for examination and repeated cytology should be stressed, since getting clients to continue with regular treatment can often be challenging.

Ear cleaning

While it is commonly accepted cleaning is not necessary in healthy ears, it is beneficial in the following conditions:

- seborrhoeic ears

- hairy ears
- stenotic ears
- pendulous ears
- purulent discharge

Ear cleaning is valuable in any treatment regimen as it can remove debris and pus, adjuvate the action of topical antimicrobials and permit complete diagnostic evaluation of the ear canal and tympanic membrane. Manual cleansing can be done at home by the owners; however, it is important to instruct them on how to perform the cleaning and how often to use the different preparations.

The cleaning fluids most commonly contain:

- Ceruminolytics, surfactants and foaming agents. These help soften, emulsify and dissolve cerumen and debris. Sodium dioctyl sulphosuccinate and triethanolamine polypeptide oleate condensate are potent ceruminolytic agents; carbamide peroxide is slightly less potent and acts more as a humectant and foaming agent.

Other molecules include sodium lauryl sulphate and squalene. Less effective ingredients include propylene glycol, glycerine and lanoline.

- Astringents or drying agents. These are used to prevent maceration of the ear canal and include isopropyl alcohol, acetic acid, boric acid, benzoic acid and milder cleansing agents, such as salicylic acid and lactic acid.
- Antimicrobial agents. These are active ingredients of many ear-cleaning solutions and include parachlorometaxylenol (PCMX), as well as some astringent and drying agents, including isopropyl alcohol, acetic acid, boric acid and chlorhexidine (at a concentration lower than 2%).

Tromethamine–ethylenediaminetetraacetate (TrisEDTA) has no cleansing properties. It is commonly used as either a pre-soak or a carrier vehicle in the treatment of gram-negative infections.

EDTA promotes increased permeability to extracellular solutes and increased sensitisation to antibiotics, whereas Tris serves as a buffer. EDTA enhances the antibacterial action of PCMX.

Manual cleansing doesn't remove tightly adherent debris or material present in the deep portion of the ear canal and, therefore, is best used as routine cleaning at home once ear flushing has been performed.

Additionally, manual cleaning can be ineffective or challenging when ears are painful and ulcerated.

How to instruct owners

For good compliance, it is helpful to explain the cleaning step by step:

1. Squirt a good amount directly into the dog's ear canal, avoid touching the insides of the ear with the tip of the bottle ([Figure 1](#)).
2. Use the dog's ear to close the ear opening and massage all the liquid around inside its ear ([Figure 2](#)).
3. Let go of the ear and let the dog shake out all the excess ear wash.
4. Finally, wipe a small piece of cotton wool around the entrance and superficial portion of the ear canal ([Figure 3](#)).

Ear flushing

Ear flushing is indicated when the entire external ear canal and/or the middle ear need thorough cleaning. It should always be performed under general anaesthesia with an endotracheal tube placed and cuffed, to avoid the fluids running from the ear to the respiratory tract through the eustachian tube.

In the presence of hyperplastic, stenotic or particularly inflamed ear canals, systemic glucocorticoid treatment is recommended (0.5mg/kg to 1mg/kg once daily, two to three weeks prior to the flushing).

Ear flushing is best performed using a video otoscope or, if not available, with a urinary catheter or a feeding tube connected to a syringe and fluids (sterile saline), preferably through a three-way tap. Video otoscopes can be particularly helpful because they allow superior visualisation of the tympanum and part of the middle ear compartment. Specific procedures such as polyp removal or laser therapy are facilitated by their use.

Before ear flushing is performed, some cases may require use of an ear cleansing solution to emulsify and remove debris. If the eardrum cannot be visualised, care should be used, as ear cleaners are all potentially ototoxic, with the exception of those containing only squalene.

Myringotomy

Iatrogenic rupture of the tympanic membrane is indicated when otitis media is suspected and/or confirmed by diagnostic imaging techniques, to take samples for cytology and culture from the tympanic bulla and to allow flushing of the middle ear cavities.

It should be performed under general anaesthesia and under direct visualisation after lavage of the external ear, when the canal is dry.

The preferred method used by the author is using a 6 French urinary catheter cut obliquely to a 60° angle and attached to a 2ml syringe containing sterile saline solution. The catheter is advanced through the ventral and posterior quadrant of the membrane with subsequent aspiration of the fluids.

An aliquot can be used for direct cytological examination and the remaining for culture.

Medical treatment

Topical therapy

Depending on presentation and cytological findings, in most cases of infectious otitis externa topical therapy alone is sufficient. In fact, topicals often represent an appropriate choice since drugs can reach a concentration of 100 to 1,000 times superior to the minimum inhibitory concentration, overcoming antibiotic resistance.

On the other hand, unless the ear canal epithelium has been eroded or ulcerated extensively, systemic drugs rarely can reach therapeutic concentrations in the skin of the ear canal and within the fluid and waxy exudates.

Numerous topical preparations for the external ear canal are available, with most being products containing a combination of ingredients.

Topical antibiotics

Fusidic acid: bacteriostatic and effective against Gram-positive cocci. Its mechanism of action is interference with bacterial proteins synthesis. Fusidic acid and framycetin show synergistic activity against staphylococci and streptococci.

Aminoglycosides: bactericidal and large-spectrum. Their mechanism of action is interference with bacterial proteins synthesis.

Their efficacy is enhanced in an alkaline environment and impaired in an acidic environment; therefore concurrent treatment with cleansing agents is indicated, but should be applied at least one hour prior to their use.

With the exclusion of gentamycin, aminoglycosides have ototoxic potential when applied topically in the presence of a ruptured tympanic membrane.

Neomycin has been frequently reported in association with topical adverse reactions (contact/irritant dermatitis).

Polimixin B: bactericidal and effective against Gram-negative bacteria. In vitro studies have shown synergistic efficacy with miconazole was shown against multi-resistant staphylococci.

Its mechanism of action is alteration of cytoplasmic membrane permeability. It is ototoxic and inactivated by cellular debris, therefore the association with ear cleaning is important.

Fluoroquinolones: bactericidal and large spectrum. Their mechanism of action is inhibition of DNA replication and they are effective against Gram-positive and Gram-negative bacteria.

Other topical antimicrobials

Silver sulfadiazine has broad-spectrum antibacterial activity (most notably against *Pseudomonas aeruginosa*). Concentrations as low as 0.02% have shown 100% efficacy against *P aeruginosa* and *Staphylococcus* species.

It is available as a cream and, although not readily miscible in water, a homogeneous emulsion can be achieved with gentle mixing.

Topical antimycotics

Azoles: imidazoles (clotrimazole, miconazole, posaconazole and ketoconazole). Their mechanism of action is inhibition of ergosterol synthesis.

Polyenic: nystatin. Its mechanism of action is to bind to ergosterol, causing alterations of the cellular wall permeability.

Topical glucocorticoids

Glucocorticoids have anti-inflammatory, anti-pruritic and anti-proliferative properties. They can also reduce sebaceous and ceruminous gland secretions.

They can be systemically absorbed, with the adrenal glands function suppressed up to two weeks or more after administration of some glucocorticoids for more than one week. Long-term treatment can cause cutaneous atrophy, comedones and demodicosis. Their efficacy depends on:

- intrinsic potency
- concentration
- vehicle

Topical acaricides

Non acaricidal-containing products can be effective in the treatment of *Otodectes cynotis*

infestations in cats and dogs. They are thought to work by smothering the mites.

Topical acaricides are also available; however, in the author's opinion systemic acaricides are mostly preferable as they are easier to use and able to treat the whole body.

Systemic therapy

Antibiotics

Systemic antimicrobial treatment is indicated in cases of:

- otitis media
- stenosis
- ulcerations and deep infections

Systemic antimicrobials are helpful in otitis media because the middle ear contains a highly vascular mucous membrane lining, which, compared to the external ear canal, may allow for better diffusion of drugs from the vascular compartment to the bulla space.

In this case, the choice of systemic antibiotics should be based on culture and susceptibility testing and, results pending, empirical treatment should be started based on examination of cytological specimen from the bulla content.

Antibiotics recognised as effective for the treatment of otitis media include:

- enrofloxacin 5mg/kg to 20mg/kg once daily
- marbofloxacin 2mg/kg to 5mg/kg once daily
- orbifloxacin 2.5mg/ kg once daily
- cefalexin 20mg/kg to 30mg/kg twice daily

In some cases of multi-resistant *Pseudomonas* species infections, systemic aminoglycosides may be required; however, their use should be carefully evaluated in view of the possible severe side effects.

Antimycotics

Administration of systemic antimycotic agents is needed in patients with otitis media caused by *Malassezia* species, or when topical therapy is not an option.

Drugs used include:

- itraconazole 5mg/kg once daily

- fluconazole 2.5mg/kg to 5mg/kg once daily
- ketoconazole 10mg/kg once daily

In the author's opinion, ketoconazole should not be a first-line treatment for any fungal infection and preference should be given to itraconazole.

Glucocorticoids

Administered systemically, glucocorticoids can:

- reduce stenosis
- reduce oedema
- reduce hyperplasia
- allow otoscopic examination
- allow better cleaning process

The initial treatment consists of 0.5mg/kg to 1mg/kg once daily depending on the severity of clinical signs. Dose and frequency of administration should be reduced until discontinuation when the medication is no longer needed.

Ear wicks

Ear wicks are made of polyvinyl alcohol and are characterised by a hard compact structure. They are inserted in the ear canal under general anaesthesia and then soaked with a solution usually containing antibiotics, with or without TrisEDTA and/or glucocorticoids. The expansion produces a structure that adapts to the contours of the ear canal, slowly releasing the medication.

Ear wicks can be a useful alternative to daily topical therapy in those patients that do not tolerate administration of topical medications. It is paramount the ear canals and – in presence of otitis media, the tympanic bullae – are aseptically cleaned prior to the placement, as if the canal is not adequately flushed the wick can act as a lid, trapping infections.

Additionally, in dogs with large ear canals they often do not expand sufficiently to fill the ear canal in its entire diameter.

Ototoxicity

An ototoxic agent can cause damage to the ear in any of its anatomical components. Usually, ototoxicity can be divided into cochlear damage resulting in deafness, or vestibular damage with consequent vestibular syndrome. In both cases, the damage occurs to the inner ear. The ototoxic agent can reach the inner ear via a haematogenous route or directly through openings in the tympanic membrane.

In particular, given the middle and inner ear component can be damaged by topical medicaments, it is important that, before administration of a topical, the clinician performs an otoscopic examination.

Systemic ototoxicity

Examples of molecules that cause ototoxicity after topical administration are aminoglycoside antibiotics, furosemide, cisplatin, vinblastine and vincristine.

Local ototoxicity

- Cleaning agents. The only non-ototoxic agent is squalene.
- Antibiotics, antimycotic, steroids, miscellaneous. Aminoglycosides can cause cochlear damage when used topically, with the exclusion of gentamicin. Agents with recognised ototoxic potential are polymyxin B and ticarcillin.

Agents with low ototoxic potential are fluoroquinolones, some cephalosporins (for example, ceftazidime), the antifungal clotrimazole, miconazole, nystatin and tolnaftate, the steroids dexamethasone and fluocinolone, and TrisEDTA solution. Chlorhexidine does not carry risk of ototoxicity in dogs if used at a 0.2% or inferior concentration.

Remember all UK-licensed polypharmaceutical topical ear medications are not licensed to be used with ruptured or absent tympanic membrane and owners should be made aware of the risks of using these medications when the tympanic membrane cannot be assessed.

In pathologic conditions, even the use of simple saline solution during ear flushing may cause complications, although infrequently. For this reason, it is always important to inform owners about potential risks of ear flushing and topical therapy.

Finally, it is important to consider the majority of the studies on ototoxicity have been performed on laboratory animals or have been extrapolated by human studies. Although these studies represent guidelines for the clinician, further studies on other species are needed.

- Please note some drugs mentioned in this article are not licensed for use in dogs or cats, and are used under the cascade.

Further reading

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