Otitis externa is a common problem in dogs, and its treatment can become frustrating for owners, dogs, and veterinarians! Acute uncomplicated infectious otitis can often be treated easily and quickly, but chronic or recurrent otitis externa can be difficult. Repeated bouts of inflammation and infection can cause secondary changes in the ear canal that ultimately lead to end stage ear, requiring a total ear canal ablation. Treating ear infections effectively, and determining why they recur is critical to success. Cytology is one of the most useful tools we have. Culture and sensitivity has become more important as we continue to deal with resistant staphylococcal and pseudomonal infections. Cleaning the ears is very critical to break up the biofilm that protects the bacterial colonies from the topical or systemic antibiotics. Once infections are cleared, maintenance ear flushes can be used to prevent recurrence as we work to determining the underlying causes.

**Etiologic and Pathophysiologic Points:**
1. Dogs, by the nature of the L-shape of their ear canals, are prone to ear infections.
2. Underlying causes of otitis include predisposing factors (e.g. conformation), primary factors (e.g. allergies, foreign bodies), and perpetuating factors (bacterial, yeast, fungal infections).
3. Any swelling or inflammation in the ear causes closure, retention of moisture and secretions, and increase in cerumen gland secretions. Infection subsequently results.
4. Secondary hyperplastic and inflammatory changes complicate our treatment plan and must be addressed.
5. Major bacterial causes of otitis include Staphylococci, Pseudomonas, Streptococcus. We also see Enterococcus, other gram negative infections, and Corynebacteria. Malassezia is also a major cause of otitis; some dogs appear to develop an allergic response to the yeast, creating great pruritus. Occasionally fungi such as Aspergillus spp can cause otitis externa.
6. Staphylococci and Pseudomonas produce biofilm, which must be disrupted before any topical therapy or systemic antibiotics can be effective.
7. Dogs with chronic ear infections, particularly those caused by Pseudomonas often develop otitis media, which may not be associated with vestibular signs.

**Clinical Diagnostic Points:**
1. Thorough otic exam and ear canal palpation.
   a. Hand-held otoscope.
   b. Video-otoscopy
2. Cytology to select appropriate treatment empirically.
3. Culture and sensitivity when empirical choices fail.
4. When indicated, advanced imaging (CT, MRI) is required to check for the presence of middle ear infection or masses, as well as bony infection.
5. Determine underlying cause to prevent or reduce recurrent infections.

**Therapeutic Points:**
1. The use of steroids (topical, systemic) to reduce inflammation and pain, and to prevent secondary changes
2. Cleaning the ear to remove biofilm and exudate (sedation or anesthesia if indicated).
3. Topical therapy based on cytologic findings. Be sure to use enough medication to completely coat the ear canal.
4. Systemic antimicrobial therapy may be required for some patients (otitis media, erosive/ulcerative otitis externa).
5. Correct the underlying cause if you can, manage it if you can’t.

**Prognostic Points:**
1. Effective use of steroids will help prevent secondary changes that lead to end stage ear.
2. Topical and/or systemic therapy should be based on cytology, and when indicated, culture and sensitivity; duration should be long enough to completely resolve infection.
3. Monitoring by cytology every 2-3 weeks will determine when treatment can be stopped. If stopped too soon, relapse results.
4. Regular ear care is required to prevent recurrence.
5. Calcification and/or the presence of secondary proliferative changes in the ear canal are indications for total ear canal ablation

Otitis externa is a common and frustrating clinical problem in dogs. The L-shaped ear canal allows for accumulation of exudation deep in the ear. Anything that permits inflammation in the ear canal will cause swelling, and this swelling further promotes exudate occlusion. Breeds such as Pugs, English bulldogs, and Sharpeis have a twist in their ear canals; any inflammation can swell the ear canal shut. For these reasons, we emphasize not only treating the infection but trying to determine why they are occurring.

Most dermatologists and otologists separate the causes of otitis into the 3 P’s: predisposing factors, primary factors, and perpetuating factors. Predisposing factors are those that make an individual dog more susceptible to developing ear infections. These include conformation as we alluded to above, as well as activities such as swimming and environmental conditions such as humidity and high temperature. Other predisposing factors can include trauma to the ear canal, such as over aggressive cleaning or hair plucking. Primary factors are those causes that directly initiate inflammation in the ear canals. These can include parasites such as ear mites or ticks, foreign bodies such as grass awns, allergies such as food allergy, atopic dermatitis and perhaps flea allergy, keratinization disorders such as those seen in Cocker spaniels, tumors or polyps within the ear, and sometimes immunologic diseases such as pemphigus foliaceus. Perpetuating factors are what we most often treat: infections with bacteria, yeast, or fungi. But chronic changes in the ear will also perpetuate ongoing inflammation and make infections particularly difficult to cure.

The general tools that I like to use when treating otitis include a good history, a thorough otic and dermatologic exam, and the use of cytology to determine what type of infection is present.
Historical facts of importance will include whether the otitis is acute, recurrent, or chronic, whether the signs have been seasonal, whether other dermatologic disease has been observed, and whether vestibular signs have been seen. A thorough otoscopic exam is really important and this may require sedation. If the ear is too painful or swollen shut, it is best to put the dog on a course of glucocorticoids and recheck the ear in 7-10 days. Sedation may still be needed, but at least the dog will be feeling much better and good cytologies will be easier to obtain. Cleaning the ear is a critical part of the treatment plan, and I really believe the initial cleaning is best done in the veterinary office. Cleaning is essential because the bacteria causing these infections can often make biofilm, which protects the bacteria from any topical antibiotics we would like to use. I like to use Cerumene, a squalene-based cleaner, which seems to be very good at emulsifying thick waxy or mucous-like exudates. The use of the Auriflush (Intervet/Schering-Plough) can really enhance removal of exudates so that you can start with a clean ear. Prior to dispensing otic medications, it is essential to determine whether the owners will be able to treat the ears at home. If not, it is better to consider the use of BNT ointment or preferably ear wicks. BNT (Baytril, Nizoral, triamcinolone) is made by BCP Compounding Pharmacy in Houston, TX. This ointment is a repositol which is very good for yeast infections and mild bacterial infections, but it is imperative that the ear drum is intact. Ear wicks are great as they minimize owner contact with the ear. The wicks are placed into a cleaned and dried ear, then wetted with the solution of choice. They can be left in for 1-2 weeks, with wetting every 3-4 days. We obtain our ear wicks from Jorgenson Laboratories, Loveland CO (www.JorVet.com).

No matter the cause of otitis, we have learned that nearly all dogs with inflammatory ear disease will benefit from glucocorticoid therapy. Glucocorticoids help to reduce pain and swelling, opening the ear canal so that we can clean and medicate it. Furthermore, by drying the ear, glucocorticoids actually can reduce bacterial counts and in some cases, seems to disrupt the formation of biofilm. Glucocorticoids, used early in the course of disease, can help prevent the development of chronic changes that perpetuate the disease.

There will be differences in the approach to acute vs chronic otitis, but cytology is always essential in order to pick the correct medication. Swabs are taken and rolled onto glass slides. Otic cytologies are heat-fixed to help prevent the loss of diagnostic material for yeast. Our practice uses Diff-Quick stain for ear cytologies, which is helpful to diagnose yeast, cocci, and rods. Gram staining is an additional tool that will help differentiate Gram positive organisms from Gram negative. The slide is dried, then examined under oil immersion. Many clinicians use a semi-quantitative grading (0-4+) system to help quantify organisms; this approach is helpful when following progress by cytology but keep in mind that ear cytology is a crude test and there are many variables that affect the number of organisms counted on cytology.

Acute otitis externa is often characterized by edematous swelling and closure of the ear canal; many dogs are quite painful. A few days of steroid therapy and just about any of the commercial topical products used for 5-10 days will resolve the issue. Still, it is best to make a cytology and try to cater the treatment to what you find. If just bacteria are found, using a product like Cortisporin Otic, which contains polymyxin B, neomycin, and hydrocortisone is useful; I also like Tresaderm for these cases. For yeast only otitis, I like Tris-EDTA with ketoconazole or a mix of Conofite with Synotic (see recipes below). For very early cases, using
EpiOtic Advanced daily for 3-5 days will often arrest the infection before it builds to a significant level. The key to success here is to avoid being parsimonious with the ear medication. It is best to ask owners to fill the ear canals so that we can be sure that medication is reaching the horizontal canal. These cases may not require an extensive search for underlying cause. It is the recurrent and chronic cases that give us our biggest challenges.

Patients with chronic or recurrent otitis externa should have their infection cleared, then a search for underlying causes made before they relapse again. Most dogs with this disorder will relapse until a maintenance ear cleaning program is instituted. I believe every dog with a history of chronic or recurrent otitis should have weekly ear flushes with a good quality cleansing agent. My personal favorites are EpiOtic Advanced (Virbac) and DOUXO Micellar (Sogeval), but I also like the Dermapet line, particularly Malacetic Otic. This product line recently has been acquired by Dechra.

Patients with recurrent or chronic otitis, in addition to cytology, will benefit from culture and sensitivity. This will tell us what organisms are involved and what antibiotic choices we have. Most of these animals may need an anesthetic ear procedure to clean the ears and verify the status of the tympanic membranes. Most of our problem cases involve resistant Pseudomonas aeruginosa or methicillin resistant Staphylococcus spp. (S. pseudintermedius, S. schleiferi). In some cases, dogs have both these difficult organisms!

Otitis externa associated with Pseudomonas aeruginosa is a very difficult problem. These are diabolical opportunistic bacteria that thrive in a moist environment. There are several characteristics that make these infections difficult to treat. First, these bacteria produce endotoxins that are tremendously irritating to the skin, thus substantial swelling and ulceration occur, making it difficult and painful to medicate the ears. Second, they rapidly become resistant to a variety of antibiotics. Third, they produce mucopolysaccharide biofilms that protect the colonies that help resist antibiotic killing. We have developed a strategy for treating these infections that seems to salvage the ear for most of our patients. The key features are oral steroids, thorough cleaning under general anesthesia and high volume liquid topicals.

1. Establish the infection by making cytologies. If gram negative rods are seen, then culture and sensitivity is warranted in order to determine if Pseudomonas is present and what options are available for treatment.
2. Prior to cleaning or treating the ear, consider a 2 week course of oral steroids at 1 mg/kg prednisone or prednisolone divided BID. This opens up an ear canal that is often swollen shut, helps to heal the ulcers, and reduces pain.
3. Anesthetize the dog for a thorough exam and cleaning. We perform CT scans as well to check for bony involvement and/or the presence of masses. If there is extensively bony involvement, then medical therapy is highly unlikely to be effective. A total ear canal with bulla osteotomy/ectomy is then indicated. If the bullae are not abnormal, we proceed with a thorough cleaning using the video-otoscope to direct our exam and cleaning. It is critical to do this anesthetic procedure because most dogs with Pseudomonal infections in the external ear canal have otitis media as well.
4. If culture has not been done and you wish to sample the middle ear, you can use a hard plastic tom-cat catheter. You can puncture the ear drum if it is intact (it usually isn’t!) and flush the middle ear for a culture sample. The syringe is capped and submitted to the lab for bacterial culture and sensitivity.

5. Flush the middle and external ear with sterile warm saline or distilled water. If necessary, Cerumene can be instilled to help loosen up and emulsify the exudates.

6. Instill antibiotics and antifungal agents into the middle ear via syringe and clean catheter. It is safe to put enrofloxacin and miconazole into the middle ear. I like to use 10 mg/ml enrofloxacin in Tris EDTA ear cleaner or TrisEDTA/keto if yeast are also present.

Once the cleaning is done, these dogs usually feel much better. There are a number of topical treatments that can be sent home for continued ear treatment. I usually continue the oral steroids for an additional 2 – 4 weeks, tapering the dose. A very useful topical ear treatment for many dogs with Pseudomonas is high concentration enrofloxacin in Tris EDTA ear wash. Even if the Pseudomonas is reported as resistant, it is important to remember that these sensitivities and resistances are based on achievable blood levels by oral or systemic administration. Putting a high concentration of enrofloxacin directly onto the bacteria can be very effective, especially after the biofilm has been disrupted.

The final concentration is 10 mg/ml of enrofloxacin, so Large Animal injectable Baytril (100 mg/ml) is recommended. It is easy to take a 4 oz bottle of T8 or Tris EDTA and subtract 12 mls; then add back 12 mls of Baytril. This is a 1:10 dilution. I don’t usually add steroid to this, but you can. We generally add injectable dexamethasone so that there are 6 mg of dexamethasone per oz. The instructions to the client are to fill the ear canal twice daily. If yeast are also present, then I make this up in T8/keto.

We do rechecks every 2 weeks and check cytology. For long standing infections we like to obtain 2 negative cytologies before we stop treatment. Thus treatment times can vary from 4-12 weeks!

We do not routinely use systemic therapy for these dogs as we have so few options. If the bacteria are sensitive to marbofloxacin, we will use it in cases with otitis media. A recent study showed, though, that most ear isolates are resistant to marbofloxacin compared to skin isolates of Pseudomonas, a high percentage of which are sensitive to marbofloxacin.

Once we are finished treatment, all dogs go on maintenance ear cleaning forever. Currently my favorite is EpiOtic Advanced. It contains a sugar cocktail that inhibits the binding of bacteria and yeast to the skin and in my experience, it really helps to reduce recurrences when used regularly. For those dogs that don’t tolerate the EpiOtic Advanced, you can substitute a product like DOUXO Micellar ear cleaner.

Unfortunately, high concentration enrofloxacin does not always work. Other useful topical remedies for Pseudomonas include amikacin, tobramycin, polymyxin B (contained in Cortisporin Otic), ticarcillin/clavulanate, and ceftazadime. Pretreatment with Tris EDTA or T8 often makes treatment more successful. Amikacin can be added to Tris EDTA or
HydroPlus brand of HB101 (available from Webster) to a final concentration of 5 mg/ml. For tobramycin, we generally use the generic eye drops. Here is the way we recommend using ticarcillin/clavulanate: take a 3.1 gm bottle of Timentin and add 26 mls diluent so the final concentration is 100 mg/ml. Freeze in 2 mls aliquots. The working solution is one of these 2 ml aliquots + 18 mls saline. Store in 1 cc syringes and freeze. Thaw and add 1/2 ml to each ear twice daily. Others will take a 6 gm vial and reconstitute with 12 mls sterile water and freeze into 2 mls aliquots as a stock solution. This will be good for 3 months. To make the final concentration, thaw one of these and add 40 mls sterile saline. Divide into 4 10 ml aliquots and freeze. Thaw one at a time and use for one week. Use 1/4 to 1/2 ml per ear twice daily depending on the size of the dog. Some of our colleagues in England are using ceftazadime. They take one gram of this injectable antibiotic with 16 mg dexamethasone and add it to 100 mls of Auroclens (available from Dechra). We have taken 1 gram and diluted it into 100 mls saline, then added 24 mg (12 cc) dexamethasone. This mix yields 3 oz, and it does not have to be frozen.

A second problem infection is otitis associated with methicillin resistant S. pseudintermedius or methicillin resistant S. schleiferi. Diagnosing this infection often precludes the use of a systemic antibiotic, but we have found topical mupirocin to be very effective. Mupirocin is safe in the middle ear, and is often placed into the middle ear of human patients. We make a mix of mupirocin in HB101 (Hydroplus brand preferred) and have the owners fill the ear canals twice daily. These patients are followed with cytologies as well.

Once the infection with either Pseudomonas or Staph is brought under control, we institute maintenance ear cleaning and work on finding and controlling the underlying cause.

Useful ear recipes:

For MRS in the ear: take 1/2 tube of mupirocin, add to a 2 oz squeeze bottle and fill to 2 oz with HydroPlus brand of HB101 (available from Webster). Mix thoroughly. Fill the ear canals twice daily.

For yeast in the ear: take one bottle of Conofite, and remove 3-5 mls. Add back 3-5 mls Synotic. Put several drops in each ear twice daily.

New Approaches to Otic Treatment:

Aqueous gels that polymerize at body temperature: used once weekly
  e.g. Ketocort-Otic, Tri-Logic
  e.g. compounded by Daugherty’s (amikacin, fluconazole, dexamethasone as one example)

Otic Armor Veterinary Otic Bandage, All-Accem, applied every 3 months as a preventive treatment

Cameo Otic, PRN Pharmaceutical, herbal remedy used once weekly.
Useful References:

Books:

Papers: