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Etiopathogenesis of feline otitis externa
The etiopathogenesis of otitis externa in the cat can generally be divided into various factors. Primary factors are those that are noted to cause inflammation in ears. The most common primary factors are ear mites (Otodectes cynotis), suggested to be responsible for about 50% of the cases of otitis externa seen in the cat. The next most commonly encountered primary factors are hypersensitivities (atopy, food sensitivity). Other primary factors tend to be much less common and include foreign bodies, other ectoparasites (Demodex, ticks), keratinization/lipid disorders (idiopathic ceruminous otitis), and autoimmune diseases (e.g. pemphigus foliaceus).

Predisposing factors are those that produce an environment conducive to the development of otitis externa. They include increased environmental temperature and humidity and systemic diseases (e.g. immunocompromising viral infections such as Felv or FIV).

Obstructive lesions (e.g. aural polyps, ceruminous cysts/adenometous hyperplasia and neoplasias) often function as predispositions to otitis initially. They do so by producing accumulations of ceruminous debris etc. Once the masses become large and fill the ear canal, they become a primary source of irritation within the ear and can be thought of as primary factors.

Perpetuating factors are those that are capable of perpetuating the otitis even if the primary factor has been removed/resolved. In the cat they include bacterial infections, fungal infections (e.g. Malassezia pachydermatis), ceruminous debris (i.e. ceruminolith’s), proliferative changes (marked thickening of epidermis/dermis), otitis media and treatment errors (e.g. overtreatment, undertreatment, inappropriate treatment).

Demodex
Cats with generalized Demodex cati infestations may have mites within the ears and a concurrent, usually mild otitis externa. Cats with generalized demodex are usually suffering from some underlying immunocompromising disease. Mites are usually easily found by swabbing the ears and doing a microscopic examination of debris that has been placed in mineral oil on a slide.

A focal form of demodicosis may occur in the cat wherein the mite problem is restricted to the ears. The otitis is usually bilateral and characterized by the accumulation of large amounts of brown, waxy debris. Pruritus and signs of discomfort are variable. Diagnosis is by swabbing (as noted above). In the authors experience, most cats with this problem have not been noted to have significant intercurrent immunocompromising disease. Therapies have included:

- Topical ivermectin – 1 part injectable ivermectin (10 mg/ml) to 9 parts propylene glycol – treat once every other day.
- Systemic ivermectin per os – 0.3 mg/kg once daily or once every other day
- Amitraz (Mitaban, Pharmacia and Upjohn; 19.9%) – 1 ml in 30 ml of mineral oil or propylene glycol. Treat once every other day. Make up new solution once every 2 weeks.
- Topical Tresaderm – q 24 hrs or BID
Atopy

Atopy tends to be under diagnosed as a cause of otitis externa in the cat. The incidence of otitis seen in atopic cats appears to be less than that seen in the atopic dog. Otitic involvement may be concurrent with more generalized skin disease, but may also be the only sign of atopy (i.e. ears the only area affected). Atopic otitis externa is usually bilateral, but may be predominantly or entirely unilateral. The most common secondary infection appears to be with Malassezia pachydermatis, although secondary bacterial infections (i.e. Staphylococcus intermedius; much less commonly gram negative organisms including Pseudomonas) are also seen. Progression to otitis media via perforation of the tympanum is not uncommon. In the author's practice, atopic otitis externa is the most common cause of aural hematoma seen in the cat.

Diagnostics routinely employed include otoscopic or video otoscopic examination and cytologic examination. Cultures are only done when resistant bacteria are suspected (i.e. bacteria persisting in the face of an apparently appropriate antibiotic; large numbers of “rods” on cytologic examination, suggesting the possibility of a more resistant gram negative infection). Radiographs or CT, looking for the presence of otitis media are done when proliferative changes or severe debris accumulation prevent observation of the tympanum (in chronic cases) or neurologic signs suggest the possibility of otitis media/interna. If middle ear disease is present, it should be seen radiographically (unlike in the dog where it may be missed in as many as 25% of cases). The finding of a peripheral eosinophilia and basophilia in a CBC is common in atopic cats. Biopsies from affected areas commonly show increased numbers of mast cells and eosinophils (suggesting a hypersensitivity disorder but not defining the type of hypersensitivity disorder). The above diagnostic aids are considered supportive. The diagnosis of atopy is largely based on history and rule out (e.g. seasonality; rule out food sensitivity).

Therapy

Therapy for a "flare" of atopic otitis is directed at resolving secondary infections, reducing inflammation and removing debris from the ears. Some controversy exists within the Veterinary community about preferred treatments for otitis externa in the cat (topical versus systemic). Because of the increased propensity of the cat to develop ototoxicity related to the use of some topical medications, some clinicians only use systemic therapies in managing otitis externa in the cat. These include oral glucocorticoids to reduce inflammation, oral antibiotics to resolve secondary infections and oral antifungals to resolve secondary Malassezia infections. The author generally uses topical and/or a combination of topical and systemic treatments, depending on the severity of the problem and the integrity of the tympanum.

Therapies to consider when the tympanum is intact:

- Combination products such as Tresaderm (neomycin, thiabendazole, dexamethasone) or Otomax (Schering - gentamicin, clotrimazole, betamethasone) are used in the ears BID to initiate therapy. Mometamax (Schering - gentamicin, clotrimazole, mometasone) is used once daily.
- Because the ear canals of the cat are relatively much shorter than in the dog, much debris from the ears can be shaken out, without the need for otic flushes. If necessary, the otic flushes used most commonly by the author in cats include EpiOtic Advanced (Virbac), Malaectic Otic (DermaPet Inc.), Douxo Micellar Solution (Sogeval) and, for drier concretions, Cerumene (Vetquinol). T8, T8 Keto (both from DVM Pharmaceuticals) and TrizEDTA (DermaPet) are used as both a cleanser and enhancer of antibiotic activity. Flushing regimens are often less aggressive than in the dog – i.e. beginning once every other day. They are often not started for 2-4 days after anti-inflammatory medications are started to facilitate greater tolerance to the flushing procedure. An exception might be with TrizEDTA containing products if they are being used prior to the instillation of a topical antibiotic – containing product. This is often done twice daily to initiate therapy.
- Oral glucocorticoids – if the ears are severely inflamed; if very painful; if very proliferative – start at
anti-inflammatory dosages (prednisolone, beginning at 1-2 mg/kg/day).
- Oral antibiotics – based on cytologic examinations: Clavamox, clindamycin, azithromycin, cephalixin, marbofloxacin, enrofloxacin for cocci; marbofloxacin, Clavamox for rods (rod are usually gram negative bacteria).
- Oral antifungal – primarily used if there are significant proliferative changes within the ears – itraconazole (5 mg/kg q 24 hrs).

Therapies to consider when the tympanum is perforated or integrity of tympanum unknown:

**Flush**

- Dilute white vinegar and water (1 : 2 or 1 : 3 dilution) – used daily or every other day
- TrizEDTA (DermaPet Inc.) – usually used to flush the ear about 10 minutes before placing appropriate antibiotic-containing product in ear.
- Cerumene (EVSCO/Vetiquinol; potentially very messy) – usually used once every other day; ear filled, massaged in, then several hours later, flushed out with dilute vinegar and water (1:2). Usually used for softening/lubricating drier concretions.

**Topical Anti-bacterial/Anti-fungal Therapies**

- For bacteria (cocci) – mix of dexamethasone sodium phosphate (2 parts) and enrofloxacin (injectable, 22.7 mg/ml) (1 part); use BID.
- For bacteria (rods, suggesting gram negative bacteria) – mix of enrofloxacin (22.7 mg/ml) and TrizEDTA (Dermapet) – enrofloxacin concentration of 10 mg/ml. Fill ear BID. If a steroid influence is necessary, consider systemic treatment.
- For Malassezia – mix of 1 part dexamethasone sodium phosphate and 1 part 1% miconazole (Confite); BID therapy; note – true safety of 1% miconazole product (with respect to ototoxicity) is unknown; the author, however, has found it to be well tolerated. Alternative would be to consider systemic anti-yeast therapy.
- For Malassezia and bacteria – combination of 1 part dexamethasone sodium phosphate, 1 part enrofloxacin, 2 parts 1% miconazole. BID

**Ceruminoliths – common perpetuator of problems in allergic ears:**

It is common to see concretions of material that have accumulated within the horizontal canals (covering the tympanum) in allergic cats. This debris serves as a nidus for infection, is a source of irritation, prevents medication from reaching the deeper aspects of the ear canal and may perforate the tympanum. This debris is often difficult to remove with “at home” flushing. It is best flushed from the ears under general anesthesia. It would appear that the induction of inner ear dysfunction (head tilt, nystagmus, ataxia, deafness) appears to occur more commonly in cats than in dogs following these “deep ear cleaning” procedures. In the authors experience, these side effects can be minimized by flushing (through open ended tomcat catheter) and suctioning (suction unit attached to a 14 gage teflon catheter; utilizing a suction unit which allows for the control of variable degrees of suction; alternative would be a hand held flush/suction unit such as the Storz Vetpump II). The use of grasping forceps through a video otoscope can greatly facilitate the removal of such debris. The use of ear curettes, alligator forceps and blind “feeding tube” flushing and suctioning is to be discouraged. Flushing is usually done with just saline. If concretions are dry, the heavier oil product Cerumene (EVSCO/Vetiquinol) can be worked in to the debris to both soften and lubricate and facilitate its removal. This product does not appear to be ototoxic Other ceruminolytics can be used, but if the tympanum is found to be perforated, they should be thoroughly flushed out of the middle ear.
Proliferative Changes:

The author most commonly encounters proliferative changes in ears (thickening of epithelium, dermis) in association with chronic allergic disease in cats. Proliferative changes are usually diffuse in nature and target the entrance to the vertical canal. The more rapid reduction of proliferative changes is most commonly associated with the use of both systemic and topical glucocorticoids. The author has also used intradermal injections of triamcinolone (2 mg/ml; maximum of approx. 4 mg per cat) following deep ear cleaning to hasten the resolution of these lesions and reduce the need for more aggressive oral glucocorticoid regimens.

Management for Chronic Atopic Otitis Externa

- Overall, major emphasis should be placed on managing the underlying allergy. The two most successful alternatives that have been used by the author are testing and hyposensitization (benefiting 60 – 70% of patients) and oral cyclosporine (5 – 10 mg/kg/day), benefiting 70% of patients. Other alternatives for managing allergic otitis externa have been much less successful in the authors hands (antihistamines such as chlorpheniramine, amitriptylline) and omega 3 fatty acids.
- As an alternative to systemic management of atopy or as an adjunctive therapy in those individuals who are not adequately controlled by systemic therapy, consideration can be given to chronic topical maintenance management: 1:1 mix of 1% miconazole and dexamethasone sodium phosphate (4 mg/ml) twice weekly.

FOOD SENSITIVITY

Otitis may be concurrent with more generalized dermatologic signs but disease may also be restricted to just the ears. Although the otitis is usually bilateral, it may be predominantly unilateral. The most common secondary infections are with Malassezia. Affected individuals may have circulating peripheral eosinophilias and basophilias. Skin biopsies from the ear are often characterized by significant increases in mast cells and eosinophilis, suggesting the presence of a hypersensitivity disorder. Diagnosis is by history, rule out and by assessing response to a restrictive diet (home prepared, novel protein; commercial novel protein or hydrolysate). During the early phases of the diet trial, every effort must be made to normalize the ear (resolve infections, remove debris, resolve proliferative changes). Medications are then slowly withdrawn to see if the problem remains controlled with just the diet alone. Duration of the diet trial is often 8-12 weeks or longer to meet the guidelines given above. The diagnosis of food sensitivity is usually confirmed by challenge. Exacerbation of otitis is often prompt (frequently 3-7 days) if food sensitivity is ultimately proven to be the source of problem.

IDIOPATHIC CERUMINOUS OTITIS EXTERNA

Some normal cats produce a very fine layer of a light oily secretion that lines the canals of the ear. This is often seen on the end of the otoscope cone after otoscopic examination. The author considers this to be “normal” finding in these cats. However, there is a subset of cats who have what is referred to as a “ceruminous” otitis wherein excessive amounts of cerumen are produced within the ears. These accumulations may be associated with mild inflammation. This problem may predispose to secondary Malassezia and/or bacterial infections. The controversy regarding this syndrome centers around whether this is a primary ceruminous otitis externa (i.e. primary seborrheic otitis externa) or the manifestation of low grade allergy. At present, the author has come to support the latter suggestion. Most successful therapies have involved the chronic use of a topical, steroid containing product. We most commonly use a formulation mde up of dexamethasone sodium phosphate 4 mg/ml and 1% miconazole mix (1:1). 0.3 mls is place in each ear twice weekly.

FELINE CERUMINOUS CYSTS / CERUMINOUS CYSTOMATOSIS

Ceruminous cystomatosis is a non neoplastic disorder that is relatively commonly seen in cats. Ceruminous glands become dilated with a brownish secretory material. Although the secretions are
brownish in color, grossly the lesions are a very dark blue. Lesions may be solitary or grouped and may originate anywhere from the tympanum, throughout the canals and over the proximal and medial aspects of the medial pinnae and base of the ear. The reason for cyst formation is not known. It has been suggested that the lesions may be a sequel to otitis externa. In the authors experience, it does appear that the concurrent presence of otitis externa does tend to worsen the clinical manifestations of this syndrome (more lesions, lesions larger), but otitis does not actually cause the lesions.

When ceruminous cysts are small, even in the ear canals, they are usually not symptomatic. As they become larger within the horizontal canal, they may become a predisposition to otitis by partially occluding the canal and resulting in the accumulation of debris. This produces a favorable microenvironment for yeast and bacterial proliferation. The ear becomes symptomatic with the development of these infections or if the lesion or lesions occlude the ear canal. With canal occlusion, debris accumulating behind the lesions may eventually perforate the tympanum and accumulate within the middle ear. Unless the lesions are occluding the canals, they are often tolerated and do not require therapy. In the presence of a concurrent, allergic otitis, control of the allergic and secondary infection components (e.g. chronic topical steroid /antibiotic/anti-fungal product) may reduce the numbers and size of lesions. The most effective options for management include chemical cautery, surgical resection, cryosurgery or laser removal. Chemical cautery involves lancing the cyst with a needle or blade and using silver nitrate sticks on the lining. Surgical resection (specifically for cysts within the canals) involves the removal of as much of the cystic tissue as possible utilizing biopsy or grasping forceps. The removal of remnant material is facilitated by the use of biopsy forceps through a video otoscope. The ears are treated with a steroid containing product for 3-4 weeks following the procedure. The incidence of regrowth is variable. Laser removal of especially the base of the cysts is very effective for removing tissue and reducing the incidence of re-growth (medial pinnae and canals). Difficult to remove lesions or recurrent lesions may require ear canal ablation.

AURAL POLYPS

Polyps are most commonly noted in young cats (variably reported with a mean age of about 1 year; range of 2.5 months to 18 years)1,2. Although most are unilateral, polyps can be bilateral. Most polyps appear to grow from the epithelial lining of the epitympanic cavity/tympanic cavity, then extend either through the tympanum in to the horizontal canal or down through the auditory canal in to the posterior pharynx. Although uncommon, it is possible to have polyps grow in both directions (about 10% of cases3). It has also been hypothesized that polyps may grow from the epithelial lining of the auditory canal or nasopharynx, although this would appear to be uncommon. Histologically, polyps consist of a core of loosely arranged fibrovascular tissue with variable numbers and types of inflammatory cells throughout (lymphoplasmacytic; lymphoid aggregates/follicles; pleocellular inflammation ). This core is covered by a stratified squamous to ciliated columnar epithelial layer that thickens, producing a capsular effect.

Clinical signs associated with aural polyps include signs of otitis externa (head shaking, scratching ears, otic exudate), and/or the development of neurologic signs (Horner’s syndrome, head tilt, nystagmus, ataxia). Growth in to the posterior pharynx is suggested by nasal discharge, sneezing, sterterous respiration, dyspnea, and dysphagia.

The etiology of polyps remains unknown. The young age of involvement and the notation that polyps may affect littermates suggests the potential for a genetic predisposition. It would be more attractive, however, to assume that an inflammatory process, perhaps initiated by an infectious agent that has ascended through the auditory canal, may play a role. Recently, attempts have failed to document the presence of viruses (calicivirus and herpesvirus) in polyp tissue4. Attempts to retrieve the DNA of various infectious agents (Bartonella, mycoplasma and feline herpesvirus 1 from 14 polyps and the middle ears of normal cats revealed only FHV-1 DNA from 2 of 14 normal bulla and mycoplasma DNA from 4 of 13 polyps 5. The significance of this (i.e. possible association with mycoplasma) requires further study. Although secondary bacterial infections are reasonably common, no particular bacterium appears to be over represented and systemic antibiotic therapy alone fails to significantly benefit the problem.
Current therapies of choice include removal by traction/avulsion or removal by ventral bulla osteotomy. Traction alone (through the ear or through the posterior pharynx) results in an overall cure in about 60% of cases. A significant reduction in the incidence of recurrence following traction has been noted in cats treated with oral prednisolone following traction removal. Glucocorticoids were used at anti-inflammatory dosages (1-2 mg/kg/day to initiate therapy) over several weeks. It would appear that traction/avulsion alone is more effective for nasopharyngeal polyps. Patients with nasopharyngeal polyps are less likely to have radiographic evidence of polypoid tissue within the middle ear, suggesting that they may grow from the auditory tube and are more completely removed with traction. A higher incidence of recurrence, following traction alone, has been associated with aural polyps. In another study, an increased incidence of recurrence appeared to be associated with the presence of radiographic evidence of tissue density within the middle ear and in individuals with both otic and respiratory signs. Ventral bulla osteotomy is noted to cure the vast majority of cases.

The author primarily deals with cats with aural polyps. Essentially all have had radiographic or CT evidence of soft tissue density within the middle ear. The authors therapy of choice for aural polyps is to remove as much of the polyp as possible from the ear via traction/avulsion. Deeper tissue removal is facilitated by utilizing biopsy forceps directed through a video otoscope. Cytologic examination dictates the need for systemic and topical antibiotic therapy. Post avulsion, the ear is flushed with dilute vinegar and water (1:2 to 1:3). Post avulsion, the cat is treated with oral prednisolone, beginning at 2-3 mg/kg/day for 2 weeks, then 1 – 1.5 mg/kg/day for 2 weeks, then 0.5 – 0.75mg/kg/day for 2 weeks, then 0.5-0.75 mg/kg once every other day for 2 weeks (6-8 weeks of therapy). This therapeutic attack has resulted in regression of remaining inflammatory tissue within the middle ear and healing of the tympanum (as documented by video otoscopy). The author is not aware of recurrences utilizing this protocol.

References