Otitis externa is a prevalent complaint in patients presented to small animal practices. This inflammatory disease of the external ear canal and/or pinna can have an acute or chronic presentation. Management of otitis externa depends on identifying and treating predisposing and perpetuating factors, as well as primary and secondary causes (Table 1).

**FACTORS & CAUSES**

**Predisposing Factors**

Predisposing factors alone do not cause otitis externa, but increase risk for development and persistence of chronic infection. These factors work in conjunction with primary or secondary causes, allowing otitis externa to become a significant problem.

**Primary Causes**

Primary causes of otitis externa are the inciting agent or etiology that directly damages the ear canal’s epithelium, resulting in subsequent inflammation. To prevent recurrent episodes of otitis externa, it is critical that a primary cause be diagnosed and managed.

**Secondary Causes**

Secondary causes of otitis externa do not create pathology in a healthy ear; instead, they incite disease in ears affected by a primary cause or predisposing factor. If the inciting cause or factor is inadequately controlled, secondary causes, such as bacterial or yeast overgrowth, typically become chronic issues.

**Perpetuating Factors**

Perpetuating factors are changes in anatomy and physiology of the ear that occur in response to otitis externa. They are most commonly seen in chronic cases and are not disease specific. These factors can accentuate development of secondary infections by providing environments and microscopic niches that favor their persistence.

In severe cases, perpetuating factors can ultimately prevent the resolution of otitis externa by leading to irreversible changes of the ear canal. They are the most common reason that otitis externa fails to respond to medical therapy and, ultimately, requires surgical intervention.

**DIAGNOSTIC TESTING**

Diagnostic testing begins with a minimum database of:

- Detailed history
- Physical examination
- Ear canal cytology.

**Cytology**

Cytologic examination of ear canal discharge provides a brief overview of the aural environment, providing a foundation for therapeutic decisions and advanced diagnostics. It is also the primary tool in identifying bacterial or yeast overgrowth.

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This article—the first of a 2-part series—discusses diagnosis of otitis externa. Topical therapy for treatment of otitis externa will be discussed in the November/December 2014 issue of Today’s Veterinary Practice (tvpjournal.com).
### TABLE 1. Common Predisposing Factors, Primary & Secondary Causes, & Perpetuating Factors of Otitis Externa

<table>
<thead>
<tr>
<th>PREDISPOSING FACTORS</th>
<th>PRIMARY CAUSES</th>
<th>SECONDARY CAUSES</th>
<th>PERPETUATING FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Abnormal external ear canal and pinna conformation, such as congenital stenosis</td>
<td>• Atopic dermatitis (<a href="#">Figures 1 and 2</a>)</td>
<td>• Yeast overgrowth (<a href="#">Figures 1 and 2</a>)</td>
<td>• Ear canal/pinna fibrosis and stenosis (<a href="#">Figure 7</a>)</td>
</tr>
<tr>
<td>• Excessive moisture within ear canal</td>
<td>• Food allergy (<a href="#">Figures 3 and 4</a>)</td>
<td>• Bacterial overgrowth (<a href="#">Figures 3 through 6</a>)</td>
<td>• Calcification of tissues</td>
</tr>
<tr>
<td>• Adverse effects from previous treatments, such as topical reactions</td>
<td>• Epithelialization disorders, such as seborrhea (<a href="#">Figures 5 and 6</a>)</td>
<td>• Metabolic disorders, such as hypothyroidism</td>
<td>• Neoplasia (polyps, tumors, cysts) (<a href="#">Figure 8</a>)</td>
</tr>
<tr>
<td>• Metabolic disorders, such as hypothyroidism</td>
<td>• Neoplasia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yeast overgrowth</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.** Atopic dermatitis with Malassezia otitis externa  
**Figure 2.** Malassezia cytology from dog in Figure 1  
**Figure 3.** Adverse food reaction with mixed bacterial otitis externa  
**Figure 4.** Mixed bacterial cytology from dog in Figure 3  
**Figure 5.** Seborrhea with Pseudomonas otitis externa in cocker spaniel  
**Figure 6.** Pseudomonas cytology from dog in Figure 5  
**Figure 7.** Chronic proliferative otitis externa due to atopic dermatitis  
**Figure 8.** Ceruminous gland cyst causing obstructive otitis externa
Initial cytology should be performed prior to bacterial culture and sensitivity (C/S) testing because bacterial C/S is not recommended if only yeast overgrowth is noted. See In Practice: External Ear Canal Cytology for a stepwise approach to cytologic sample collection.

**In Practice: External Ear Canal Cytology**

1. Carefully insert an applicator tip in the ear canal and, near the junction of the vertical and horizontal canals, collect material for cytologic examination.
2. Collect deeper, and generally more representative, samples by passing an ear loop or pediatric feeding tube through an otoscopic cone.
3. Transfer samples onto a glass slide, heat fix, and stain with Diff-Quik.
4. When examining samples under the microscope, note the:
   - Number of bacteria and yeast per oil immersion field (100×)
   - Presence or absence of inflammatory cells.

**Culture & Sensitivity**

Indications for C/S include:

- Suppurative inflammation (including that with bacterial rods, cocci, or no visible organisms) revealed during initial cytology
- Lack of response to appropriate topical and systemic antibiotic therapy
- Systemic therapy required for otitis media or deeper, soft-tissue infections of ear canal
- Resistant strains of bacteria suspected.

Resistant bacteria should be suspected if:

- History of chronic topical therapy
- Rods observed on cytology
- Bacteria persistent on cytologic examination despite appropriate therapy (ie, suspect methicillin-resistant *Staphylococcus pseudintermedius*).

Ideally, topical or systemic antibiotic therapy should be discontinued 3 to 5 days prior to acquisition of culture samples.

**Laboratory Submission**

When preparing the sample for submission, include any pertinent information regarding the organisms seen on cytology and a representative cytology slide.

In addition, if rods are observed on cytology—suggesting the presence of *Pseudomonas* species—an additional antibiotic sensitivities should be requested with bacterial culture, including:

- Polymyxin B
- Ticarcillin
- Third-generation cephalosporin.

Once the laboratory report is in hand, in addition to susceptibility, it is important to review the reported minimum inhibitory concentration, which helps direct the choice or dose of antibiotic required.

**Middle Ear & External Ear Canal Bacterial Spectrums**

The spectrum of bacteria and their sensitivity patterns seen in the middle ear (which is lined with ciliated columnar epithelium) and external ear canal (which is lined with epidermis) may differ due to variations in cellular composition. In a study by Cole and colleagues, different strains of *Pseudomonas* species, based on sensitivity pattern, were cultured from each location. Other studies have shown different strains of a bacterial species from a single sampling site.

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**TABLE 2. Diagnostic Imaging for Ear Disease**

<table>
<thead>
<tr>
<th>IMAGING MODALITY</th>
<th>EAR DISEASE/CONDITION EVALUATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otoscopy</td>
<td>Identifies:</td>
</tr>
<tr>
<td></td>
<td>• Canal proliferation, masses, foreign bodies</td>
</tr>
<tr>
<td></td>
<td>• Ruptured tympanic membrane</td>
</tr>
<tr>
<td></td>
<td>• Changes in integrity and density of tympanic membrane</td>
</tr>
<tr>
<td></td>
<td>• Large bulging pars flaccida, suggesting primary secretory otitis media (seen in cavalier King Charles spaniels)</td>
</tr>
<tr>
<td>Radiography</td>
<td>Detects bony involvement of bullae; has limited value in soft tissue changes, especially in acute cases</td>
</tr>
<tr>
<td>Computed axial tomography</td>
<td>Aids in differentiation of bony lesions in the bullae from soft tissue reactions</td>
</tr>
<tr>
<td>Magnetic resonance imaging</td>
<td>Aids in visualizing middle and inner ear and detects presence of fluids, such as endolymph within the cochlea and semicircular canals</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>Detects fluid within the tympanic bullae</td>
</tr>
</tbody>
</table>
In Practice: Ear Cleaning & Flushing

1. Patient restraint is often required for thorough otoscopic examination; sedation or general anesthesia may be required.

General anesthesia is preferred for more aggressive flushing procedures, as placement of an endotracheal tube avoids aspiration of fluids (ie, those that may pass through a ruptured tympanic membrane into the middle ear, through the auditory canal, and into the posterior pharynx). For greatest safety, inflate the endotracheal tube cuff and pack the pharynx with gauze, which is removed prior to anesthetic recovery.

2. For client education and medical documentation, take an initial photograph prior to cleaning and then one after the procedure for comparison.

3. Use a handheld otoscope to determine the severity of disease and type and amount of debris in the external ear canal.

4. Use a combination of cleaning techniques to facilitate more rapid and effective removal of debris from the canals (Table 3):
   • Utilize forceps and ear curettes through a handheld otoscope head to remove larger debris.
   • After large debris is removed, typically a bulb and/or tube is used for flushing, with or without ceruminolytics (see Common Ceruminolytics).
   • Consider FVEO for deeper cleaning and evaluation of the ear canal. Deeper therapeutic flushes can be especially beneficial in cases of otitis externa with biofilm-producing organisms, such as Pseudomonas species (Figure 6), in which manual removal of debris is essential. Utilize a 5F feeding tube, cut to the appropriate size for the patient, for deep flushing and suctioning through the FVEO port.

5. If necessary, aspirate a sample of debris from the deeper ear canal, as well as the middle ear if the tympanic membrane is ruptured, for both cytologic examination and C/S testing. Use the FVEO port for passage of biopsy forceps or an appropriately modified ear curette.

   If you encounter any problems related to use of FVEO, refer to Table 4.

**Common Ceruminolytics**

Ceruminolytics help break down larger pieces of waxy debris, such as ceruminoliths, and are gentle and soothing to the epithelium of the ear canal.

- Squalene
- Urea peroxide
- Carbamide peroxide
- Hexamethyl tetracosane
- Dioctyl sodium/calcium sulfosuccinate
- Triethanolamine polypeptide elite condensate

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**TABLE 3. Additional Equipment for Diagnostic or Therapeutic Procedures**

<table>
<thead>
<tr>
<th>USE</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COLLECTION OF SAMPLES</strong></td>
<td></td>
</tr>
<tr>
<td>Break up concretions and remove small pieces of cerumen, debris, or foreign bodies</td>
<td>Ear curettes or loops (especially useful for material located near the tympanic membrane)</td>
</tr>
<tr>
<td>Collect large samples for histopathology</td>
<td>Large forceps that can pass through the handheld otoscope</td>
</tr>
<tr>
<td>Collect smaller samples for histopathology</td>
<td>Narrow alligator or biopsy forceps</td>
</tr>
<tr>
<td>Collect cytology samples from middle ear</td>
<td>Long, thin needles that can be passed through the otoscope cone and reach the deep ear canal (eg, 22-gauge spinal tap needles)</td>
</tr>
<tr>
<td><strong>FLUSHING OF EAR CANALS</strong></td>
<td></td>
</tr>
<tr>
<td>Initial flushing of ear canals</td>
<td>Bulb syringes and cleaning solutions</td>
</tr>
<tr>
<td>Flushing of ear canals</td>
<td>Tomcat catheters or infant feeding tubes</td>
</tr>
<tr>
<td>Deep flushing through handheld otoscope or FVEO</td>
<td>Feeding tubes trimmed down to allow better manual control but long enough to reach the deep ear canal (eg, 5F, 8F, and 10F)</td>
</tr>
<tr>
<td>Aggressive, deep ear flushing procedures that allow consistent fluid availability</td>
<td>Intravenous tubing and 3-way stopcocks</td>
</tr>
<tr>
<td></td>
<td>FVEO units with continuous flushing and suction options</td>
</tr>
<tr>
<td><strong>THERAPEUTIC PROCEDURES</strong></td>
<td></td>
</tr>
<tr>
<td>Intralerial injections</td>
<td>Long, thin needles (see Collection of Samples)</td>
</tr>
<tr>
<td>Myringotomy</td>
<td>Tomcat catheters, if the tip is cut at a sharp angle</td>
</tr>
</tbody>
</table>

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**TABLE 4. Common Problems with FVEO Use & Possible Solutions**

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens fogging</td>
<td>Remove the probe and clean tip</td>
</tr>
<tr>
<td>Use defogging solution</td>
<td>Warm probe tip in water</td>
</tr>
<tr>
<td>Obstruction of lens with debris</td>
<td>Wipe the lens with a cotton ball soaked in 70% isopropyl alcohol or a defogging solution</td>
</tr>
<tr>
<td>Decreased magnification &amp; visualization</td>
<td>Flush with water or saline during use</td>
</tr>
</tbody>
</table>
Various sizes of otoscopic cones are required to properly examine ear canals based on patient size.

Fiberoptic Video-Enhanced Otoscopy
Advancement of fiberoptics, improved lighting, and miniaturization of video cameras, combined with rigid endoscopy, has led to development of fiberoptic video-enhanced otoscopy (FVEO). FVEO, despite its expense to purchase and maintain, is extremely beneficial for improved diagnostics, therapy, and client education.

The camera within the fiberoptic tip significantly magnifies and improves visualization of the ear canal. FVEO also facilitates permanent recordings via picture or video of the ear canal—including debris, foreign bodies, and masses—which can be shared with clients and other veterinarians. Compared with handheld otoscopy, FVEO allows:
- Thorough flushing with water or saline, providing better visualization and magnification
- Observation of fine details, such as small tears of the tympanic membrane, consequently recognized as air bubbles extruding from the middle ear cavity through the tympanic membrane.

Additional Imaging
In chronic otitis cases, the following imaging techniques may be helpful diagnostic tools. Table 2 lists these additional imaging modalities as well as the types of conditions they can diagnose and evaluate. However, the cost and availability of these diagnostics may make them prohibitive for some clients.

Computed tomography (CT) and magnetic resonance imaging (MRI) have been shown to be more reliable and accurate than radiography.

CT is most commonly used due to efficiency and expense; however, if soft tissue masses or vestibular disease is suspected, MRI is more accurate. In one study, diagnosis of otitis media by CT was found to have 86% sensitivity and 89% specificity compared with the gold standard of histopathologic diagnosis.

Ultrasound has been used for the detection of fluid within the tympanic bulla, with 80% to 100% sensitivity and 74% to 100% specificity compared with the gold standard of CT.

EAR CLEANING & FLUSHING
Cleaning and flushing the ears is critical for:
- Proper visualization and examination of ear canal
- Determination of disease extent
- Indications for additional diagnostics and case management
- Determination of disease resolution.

See In Practice: Ear Cleaning & Flushing (page 18) for a stepwise description of appropriate cleaning and flushing. Typically, patients can be maintained with once to twice weekly flushing, but frequency of flushing should be determined on a case-by-case basis.

SUMMARY
Otitis externa is a multifactorial inflammatory disease of the ear canals and pinnae that may become chronic. Chronicity is usually due to inadequate control of the primary cause or the presence of a perpetuating factor. Detection of a primary cause and any perpetuating and predisposing factors is essential for complete resolution and prevention of recurrence of otitis externa.

Identification of infectious organisms through cytology is an essential first step for initial treatment. Thorough ear cleaning and flushing coupled with appropriate antimicrobials, based on C/S when necessary, enhance treatment success.

C/S = culture and sensitivity; CT = computed tomography; FVEO = fiberoptic video-enhanced otoscopy; MRI = magnetic resonance imaging

References