Cytology and Culture in Otitis

Underlying disease is present in most cases of recurrent or chronic otitis externa and a good history and physical examination are necessary in order to detect contributing factors. For example, patients with allergies or atopy may have only clinical signs of otitis and the absence of generalised skin involvement doesn't preclude the disease. Successful treatment requires identification and control or elimination of the contributing factors, otherwise recurrence is likely.

Cytology

Cytological evaluation of inflamed ears should be routine and carried out in all cases of otitis. Cytology can determine the presence and severity of secondary factors, response to treatment and whether culture is needed. However, it doesn't often determine the underlying cause for chronic otitis.

Ideally the sample is collected from the horizontal ear canal so that cytology reflects the infected area rather than a more peripheral and possibly unaffected site. When bilateral otitis is present, cytology should be carried out on both ears rather than assuming that the same disease is present.

The swab is rolled onto a clean, dry microscope slide. When looking for ear mites, the ear swabs are rolled in a drop of mineral oil on a different microscope slide to that used for cytology. Low power examination at 4 or 10x may show mites or dark brown Otodectes eggs.

Cytology of normal ears shows few if any cocci (<5), no rods, and a low number of yeasts (<3) in a 40-50x field. Large numbers of bacteria and/or yeasts are consistent with infection and the presence of neutrophils indicate severe disease. Cocci are usually *Staphylococcus*, and rods are often *Pseudomonas* or *Proteus*. Individual *Malassezia* in the background may not be significant, but large numbers of yeasts indicate infection. *Staphylococcus* and *Malassezia* are often found together.

The presence of numerous epithelial cells and few microorganisms suggests a non-infectious cause such as atopy, irritation from previous medications, seborrheic disease, hypothyroidism, or neoplasia. The presence of acantholytic cells may indicate immune-mediated disease.

Culture

Culture and sensitivity are recommended when rods are seen (they are more likely to be resistant to empirically used antibiotics), if infection is not responding to treatment, or when otitis media is suspected. Antibiotics (both systemic and topical) and ear cleaning solutions should be stopped for at least several days before the sample is taken.

The sample should be collected through a clean, disinfected otoscope from the horizontal ear canal. Samples taken from the vertical canal can be contaminated with skin commensals that are unrelated to the ear disease. When otitis media is present, sampling of the middle ear is necessary because bacteria infecting the horizontal ear canal may not reflect those in the middle ear, nor may antibiotic sensitivities be identical. Similarly, in bilateral disease culture ± sensitivities should be carried out on both ears.

Interpretation

The presence of bacteria doesn't necessarily indicate infection. Bacteria may reflect improper sampling or contamination of the swab, e.g. an otoscope inadequately cleaned between patients, or collection of normal commensal bacteria. Culture of the external ear canal may not reflect the causative agents in otitis media especially if the tympanic membrane is intact.

Interpretation of culture results should consider cytological findings and growth of the organism(s). Moderate to heavy growth of a single organism suggests that it is significant, whereas light growth can reflect normal flora or suppression of growth by antibiotics. If cytology shows numerous cocci then pathogenic cocci identified on culture should be treated. The absence of any growth on bacterial culture could suggest yeast infection, sterile otitis, suppression of bacteria by antimicrobials or bacteria (seen on cytology) may be dead.

The presence of mucus (biofilm produced by some bacteria) and debris inhibits antimicrobial activity regardless of being sensitive to the antibiotic on in-vitro testing. Flushing and deep cleaning to remove this material in mandatory in treating otitis. If you are planning on using parenteral antibiotics, inform the lab because we select different antibiotic discs and use different cut-off points.

Summary
• Undertake cytology on every otitis case • Culture may not be indicated in every case • In- vitro antibiotic sensitivities may not reflect in-vivo sensitivities • Topical antibiotics are usually not effective in the presence of mucus (biofilm) and debris

For further information on cytology of otitis externa reference to "The ears have it" A French *VetScript*, Volume 27, Issue 2, pp 24-26, Mar 2014