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OTITIS EXTERNA DECISION MAKING USING OTIC CYTOLOGY

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Otic cytology is a simple, practical, and inexpensive diagnostic test that should be part of the minimum database collected for all patients with clinical signs of otitis externa. Cytology provides the practitioner with abundant information regarding the presence or absence of pathogens, severity of overgrowth or infection, and relative significance of bacteria in mixed infections. During the initial visit this information can be used to guide diagnostic and therapeutic decisions, and on subsequent recheck visits serial cytology is an excellent method for monitoring response to therapy. Cytology does not require special skills, expensive equipment, or long turnaround time at an outside laboratory. Indeed, cytology’s main value is that results are available immediately.

PROCEDURE
Consistent samples can be easily obtained from most patients by inserting a cotton-tipped applicator into the vertical canal to the level of the 75° bend in the cartilage. In awake patients, avoid straightening the cartilage or advancing too deeply. In mild-mannered or anesthetized patients, samples can be safely collected from the horizontal canal by inserting a disinfected otoscopic cone to the junction of the vertical and horizontal canal, straightening the cartilage and advancing a cotton-tipped applicator beyond the tip of the cone. In either case, be sure to collect and evaluate each ear independently of the other, as findings may differ from side to side.

Roll the swab on a clean glass slide to evenly spread a thin layer of material. Briefly heat-fix the material to the slide using a match or other open flame. The most commonly used stain for otic cytology is a modified Wright’s stain, Diff-Quik (Baxter Scientific). This stain is excellent for identifying bacteria, yeast, and white blood cells. Scan the slide at low magnification to locate an area of interest then advance to the high-dry 40x objective. At this level yeast and white blood cells are easily identified. Always use the oil-immersion, 100x objective to identify and characterize bacteria as small or lightly stained bacteria can be easily missed at 40x.

WHAT TO LOOK FOR
Otic cytology provides a snapshot of the current state of the external ear canal for each patient. Three key features should be identified as present or absent on each specimen: bacteria, yeast, and leukocytes. If present, a rough estimate of numbers should be recorded for comparison with subsequent examinations. Estimates help determine potential significance of organisms seen (normal vs. overgrowth vs infection); trends in numbers provides an excellent means for monitoring response to therapy. For bacteria, a brief description of morphology (rod vs coccoid) should also be recorded. Gram stain characteristics are not always necessary since most pathogens are either gram negative rods or gram positive cocci. Corynebacterium is the only gram positive rod commonly isolated from small animal patients.

INITIAL VISIT
Important questions to answer during initial evaluation include: should I use topical therapy, if so which one(s); should I use systemic therapy, if so which one(s); and should I perform addition diagnostics, if so which one(s).

The decision of topical vs topical + systemic therapy is based on the relative severity of the infection seen. In general terms, overgrowth of normal flora can be managed with topical therapy alone, while infection by opportunistic pathogens may require systemic therapy.

Most mild to moderate cases of Malassezia overgrowth can all be managed with topical therapy alone, using acidifying flushes and topical antifungal ointments or solutions. Since Malassezia is a normal inhabitant of canine and feline ear, identification of presence alone is not sufficient reason for therapy; a semi-quantitative estimate of numbers should guide decisions. Based on recently published studies, 1 or 2 yeast per 40x field is normal, 3-4 is a grey zone, and greater than 5 may be abnormal. In cats the grey zone is a bit broader: 1-2 normal, 3-11 grey zone, greater than 12 abnormal. This guideline should not replace clinical impression. If an animal is severely pruritic and inflamed, but no organisms are seen other than 3 yeast per 40x field, then treat the yeast and re-evaluate. Likewise, if a patient is normal but has more yeast than normal according to these guidelines then treatment is not required.

Bacteria can be more complicated than yeast. First, decide if the bacteria seen are normal flora or opportunistic pathogens. Coagulase negative Staphylococcus spp, Coagulase positive Staphylococcus spp, Streptococcus spp, and Corynebacterium are considered normal flora; however, under the right circumstances, these organisms can overgrow to the point of contributing to ongoing inflammation and disease. For these organisms fewer than 5 bacteria per 40x field is considered normal; while greater than 25 is definitely abnormal. 5-25 per field represents a grey zone.

Small rod bacteria are almost always opportunistic pathogens; and any small rod bacteria should be considered a target for therapy.

Second, determine if the bacteria present represent overgrowth or true infection. Overgrowth of normal flora can usually be adequately managed with topical therapy, while true infection warrants intervention with systemic antibiotic. The best indicator of overgrowth vs infection is the presence of leukocytes. Neutrophils and macrophages are not normally found in the external ear canal of dogs unless there is breakdown of the epithelial barrier (erosion, ulceration, infection with exudation) or inflammation of the middle ear (otitis media); both of these events warrant antibiotics. So, the decision of placing an animal on systemic antibiotics on the initial visit can generally be determined by the presence or absence of leukocytes. Of course if the animal is severely affected or has abundant rod bacteria present, systemic antibiotics may be indicated even in the absence of leukocytes.

Third, if systemic antibiotics are indicated, cytology helps determine which antibiotic to use. In general, cephalixin is an excellent antibiotic for monocolures of Staphylococcus or Streptococcus. If only cocoid bacteria are seen, then cephalixin may be the drug of choice. If abundant rod bacteria are seen enrofloxacin or amoxicillin-clavulanic acid may be more rational selection. Bear in mind that enrofloxacin does not have good action against Streptococcus spp or Enterococcus spp and therefore should
not be employed as a sole antibiotic in cases with mixed coccoid and rod bacterial infections. Also, a recent study demonstrated that up to 82% of *Pseudomonas* isolates are resistant to enrofloxacin in vivo at standard 2.5mg/kg BID dosage.

Fourth, when should a culture be submitted? Cultures are valuable for determining antimicrobial susceptibility of resistant organisms. A culture should be performed on the initial visit if cytology shows infection by an organism likely to have unpredictable resistance patterns, such as small rod bacteria.

If mixed infections are submitted, cytology can be used to rank the relative significance of different species based on semi-quantitative estimates and phagocytosis by leukocytes. In general, regardless of what the culture shows, the more abundant bacteria and the bacteria being targeted by leukocytes is more important. Direct therapy at the more important bacteria, not the most resistant.

Remember, during the initial visit the most important thing is to simply record findings for comparison with subsequent examinations. The statement “bacterial otitis” does not provide sufficient useful information to monitor response to therapy. Instead, a statement such as “30-40 paired cocci/hpf, 10-15 Malassezia/hpf, no neutrophils” provides abundant information for later comparison.

**RE-EVALUATION**

On each recheck examination, always repeat cytology and record any changes relative to the previous findings. Failure of response to topical therapy, such as reduction in numbers, may indicate the need for addition of systemic therapy even if leukocytes are not present. Arrival of leukocytes or failure to eliminate leukocytes is a good indication to submit a bacterial culture and redirect empirical therapy. Changes in dominant bacteria may indicate either an excellent response to therapy or a definite need to change therapy. For example, if on the initial visit, a vast number of rods with phagocytosis by neutrophils were seen and on the second exam, few rods, occasional cocci, and no neutrophils were reported, then clearly therapy can be interpreted as being effective. However, if the order of these findings is reversed there is an indication to modify therapy.

**SUMMARY**

Otic cytology should be a routine diagnostic test for every patient with clinical significant ear disease. For each sample, record observations of bacteria (morphology and number), yeast (number), and leukocytes (presence, phagocytosis). Serial cytology permits accurate monitoring of response to therapy and rational treatment decision making.

**RECOMMENDED READING**