Ear Culture and Antimicrobial Susceptibility Testing (AST): A Crash Course

Management of recurrent otitis externa is complicated—both clinically and in the laboratory. Antimicrobial susceptibility testing is not appropriate for prediction of treatment response for otitis externa.

Why?

- AST interpretations (Susceptible, Susceptible Dose Dependent, Intermediate, and Resistant or S, SDD, I, and R, respectively) are based on systemic pharmacokinetic/pharmacodynamic evaluations of achievable antimicrobial concentrations in the plasma. Simply put, our AST is only appropriate for oral, intramuscular, or intravenous routes of administration.
  - Due to lower potential for toxicity and ability to achieve much higher concentrations with topical treatments, systemic interpretations will not accurately predict treatment response.
- Example:
  - Commercially available gentamicin drops for otitis externa contain 3 mg per gram of solution, roughly equivalent to 3000 µg/mL. Our AST methods call *Pseudomonas aeruginosa* “Resistant” at 8 µg/mL or *Staphylococcus pseudintermedius* “Resistant” at 16 µg/mL. The amount of antimicrobial available topically far exceeds the achievable amount in plasma; therefore, what might be “Resistant” if systemic treatment were attempted is likely treatable with appropriate topicals.
- In rare cases, systemic treatment for otitis externa and more invasive ear infections may be necessary. Culture and AST are still the gold standard for prediction of response to systemic treatment options.

Tips and tricks for management of otitis externa:

- Most cases of otitis externa are secondary to a primary cause such as allergies or an endocrine issue. Hairy ears, ear obstruction, owner compliance, and patient predilection for swimming, among other factors confound proper treatment.
- Management of the primary causes and adjustment for any predisposing or complicating factors will often help with infection.
- Effectiveness of antimicrobials is impacted by biofilm production or presence of debris such as wax, purulent exudate, and dirt. Cleaning the ears to optimize antimicrobial contact with bacteria is a critical step in management. Chelating agents such as Tris-EDTA can enhance effectiveness of antimicrobials.

Resources:


Please contact the microbiology laboratory at 701-231-7519 or Kelli Maddock at 701-231-5191 with any questions.