

Commentary

Using antibiograms to promote antimicrobial stewardship during treatment of bacterial cystitis and superficial bacterial folliculitis in companion animal practice

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Companion animal veterinarians regularly examine patients with bacterial infections of the urinary tract and skin and commonly prescribe antimicrobial drugs empirically for treatment. However, the emergence of antimicrobial-resistant bacteria in companion animal practice complicates the initial choice of antimicrobial drugs because it is harder to predict which will be efficacious. Although the combination of culture and AST of patient samples is useful when choosing antimicrobial treatments, the cost and time lag between when samples are collected and when results are available are barriers to performing these tests.¹ A 2015 AVMA member survey² noted that 84% of respondents reported that the cost of AST deterred them from suggesting its use to clients. Although in-hospital tests exist to screen for bacteria in urine, they also are associated with additional costs for veterinary practices.³⁻⁵

Although AST remains the preferred method for diagnosing bacterial infections and guiding antimicrobial selection,^{1,6} companion animal practitioners can combine steps they are already taking (eg, history taking and physical examination) with simple, inexpensive, in-house tests (eg, modified Wright or Gram staining of cytologic samples), published guidelines (eg, International Society for Companion Animal Infectious Diseases guidelines⁷⁻⁹), and custom antibiograms for their practice or local practice group to customize their initial antimicrobial choices. The integration of these pieces of information affords a more judicious and informed clinical decision and narrows the list of available antimicrobial drugs down to a subset of reasonable first choices while, optimally, awaiting AST results.

ABBREVIATIONS

AST Antimicrobial susceptibility testing

Antibiograms have long been promoted as tools to enhance clinical decision-making and overcome the economic and time obstacles that culture and AST present.^{10,11} Up to this time, however, antibiograms have mainly been available in large private and academic veterinary specialty hospitals with dedicated clinical microbiology laboratories and infection control staff. Thus, companion animal practitioners may not be familiar with what antibiograms are or how they can enhance clinical decision-making and the judicious use of antimicrobials.

What Is an Antibiogram?

An antibiogram, also called a cumulative AST data summary, is a table of bacterial isolates and their antimicrobial susceptibilities for samples obtained from patients of a defined hospital or local area over a specific period of time (eg, 1 year).¹² These tables are specific to the population of patients from which the samples were obtained and generally should not be used to make decisions for patients treated at other hospitals or in other regions. To account for any changing patterns of antimicrobial resistance, they should be updated each year with the previous year's AST results.

To avoid biasing results toward patients with recurrent infections or from which multiple samples were collected, antibiograms should include only the first observation of a bacterial species from a patient within the specified time period. For patients with refractory or recurrent infections, only the first occurrence of a particular bacterial species should be included.

Commonly used guidelines for constructing antibiograms have been developed for human hospitals by the Clinical and Laboratory Standards Institute, using a group of subject matter experts in microbiology and pharmacology.¹² To our knowledge, no formal guidelines specific to veterinary medical settings have

been written; however, we recently showed that the human hospital guidelines can be adapted to a veterinary private clinical practice setting.¹⁵ Although antibiograms have been developed in veterinary teaching hospitals with large caseloads and dedicated laboratory and infection control staff, we believe these same principles can be adapted and used to promote antimicrobial stewardship in primary care practices.

What Does an Antibiogram Add?

The AVMA's core principles of antimicrobial stewardship in veterinary medicine support the premise that practitioners should use all available information when deciding whether to use an antimicrobial and, if so, which antimicrobial to choose.¹⁴ Although not a substitute for culture and AST results, an antibiogram can help practitioners make better-informed antimicrobial choices while waiting for those results to be returned. Once results of culture and AST are available, practitioners should then take the time to review their initial choice and decide whether to continue, stop, or switch the previously prescribed antimicrobial drug (**Figure 1**).^{1,8-10,15}

In creating antibiograms, veterinary practices can include information from all AST reports for a calendar year or can focus on a limited number of common bacteria or body sites. Antibiograms for common bacteria (eg, *Escherichia coli* and *Staphylo-*

coccus pseudintermedius) and body sites (eg, urine, skin, and respiratory tract) are particularly useful in companion animal practice because of the comparatively larger amount of available information, including veterinary-specific antimicrobial breakpoints (ie, antimicrobial concentrations at which bacterial isolates are interpreted to be susceptible, intermediate, or resistant),¹⁶ antimicrobial concentrations resulting from commonly used dosage regimens, guidelines for applying human breakpoints to interpret AST results,¹⁷ and consensus guidelines for the treatment of bacterial cystitis and superficial bacterial folliculitis.^{7,9}

Antibiograms for the Treatment of Bacterial Cystitis in Dogs and Cats

Consider a dog or cat with clinical signs suggestive of lower urinary tract disease (eg, hematuria, stranguria, and pollakiuria) and urinalysis results, including results of sediment examination, consistent with bacterial cystitis (eg, pyuria, hematuria, and bacteriuria [$> 1,000$ colony-forming units/mL in a urine sample collected by means of cystocentesis]).^{3,6,9} In this instance, a diagnosis of bacterial cystitis is warranted; however, results of culture and AST of a urine sample are needed to determine with certainty whether bacteria are present

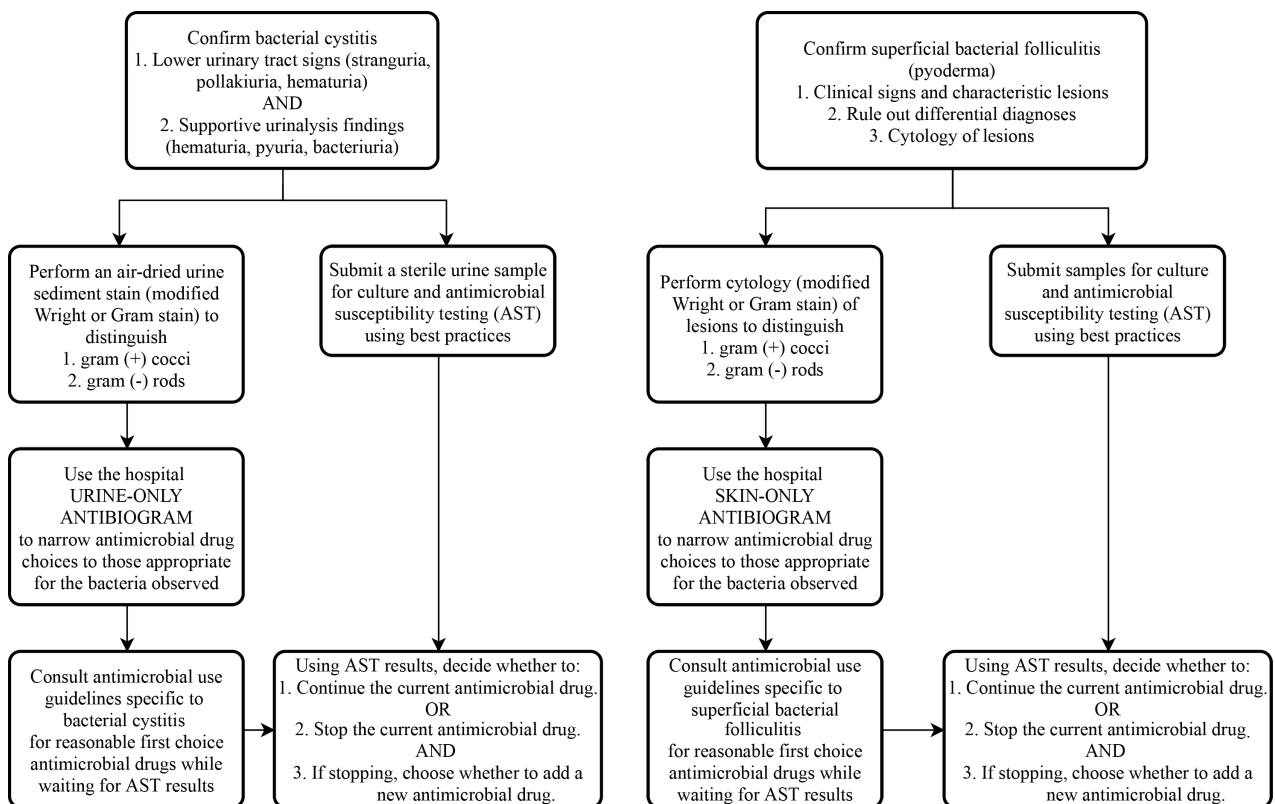


Figure 1—Workflow for incorporating an antibiogram into treatment of bacterial cystitis in dogs and cats and superficial bacterial folliculitis (pyoderma) in dogs.

and, if so, to which antimicrobial drugs they are susceptible. While those results are pending, an antimicrobial may be selected empirically so that treatment can be started immediately.

To help guide empirical selection of an appropriate antimicrobial, a dry-mount preparation of the urine sediment can be stained with a modified Wright stain or Gram stain to identify bacterial morphology (cocci vs rods) and Gram-staining characteristics (gram positive vs gram negative).¹⁸⁻²¹ Combining these findings with a practice-specific antibiogram developed from bacteria isolated from urine samples and published guidelines for the treatment of bacterial cystitis,⁹ veterinarians can narrow the range of antimicrobial drugs considered for empirical antimicrobial use, making it more likely that an appropriate antimicrobial will be chosen (Figure 1).

Antibiograms for the Treatment of Superficial Bacterial Folliculitis in Dogs

Similarly, for a dog with clinical signs and physical examination findings consistent with superficial bacterial folliculitis, cytologic examination of material from a pustule or lesion can be used to determine the morphology and Gram-staining characteristics of any bacteria that might be present (Figure 1).^{7,22} These results can then be combined with an antibiogram developed from bacteria isolated from skin to help guide empirical treatment while waiting for culture and AST results.^{10,15}

Conclusions

Although the combination of bacterial culture and AST remains the recommended method for selecting antimicrobial drugs when treating bacterial infections in animals, veterinarians can use simple, cost-effective tools while waiting for AST results or if client finances preclude this testing. Results of in-hospital testing for bacterial morphology and Gram-staining characteristics should be combined with local body site-specific antibiograms and published guidelines (eg, International Society for Companion Animal Infectious Diseases guidelines⁷⁻⁹) when making initial antimicrobial choices. This would also allow veterinarians to provide owners with information on the likelihood that the bacteria will be susceptible to the chosen antimicrobial and set expectations in case AST results show an interpretation of resistant. Importantly, antibiograms are only as robust as the susceptibility data provided. Therefore, it is important to promote culture and AST as frequently as possible to increase the number of isolates included in the antibiogram.

Veterinarians have reported² a desire to have more guidance related to antimicrobial choice. Combining antibiograms with clinical findings and consensus guidelines on treatment can increase practi-

tioners' confidence that they are making the most informed initial antimicrobial choice in keeping with antimicrobial stewardship principles.

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