

Antimicrobial susceptibility testing (AST) can be a powerful diagnostic tool to guide antimicrobial drug selection and help predict clinical outcomes for dogs with infectious diseases. The following recommendations on AST use are intended to assist veterinarians when making decisions about antimicrobial therapy for dogs.

// SCENARIOS WHEN CULTURE WITH AST IS RECOMMENDED TO IMPROVE OUTCOMES //

Urinary tract disease

Bacterial culture with AST can help rule in or rule out bacterial cystitis and guide therapy for suspected cases of bacterial infection in the kidney (pyelonephritis) or prostate (prostatitis).¹ To avoid contamination by commensal organisms on the skin, urine samples for AST need to be collected via cystocentesis. This is particularly important in these situations:

- Cases of recurrent cystitis (i.e., ≥ 3 episodes of clinical bacterial cystitis in the preceding 12 months or ≥ 2 episodes in the preceding 6 months)
- All cases of pyelonephritis

It is important for the submitting veterinarian to provide the receiving laboratory with information on patient signalment and clinical history, sample collection method, and any suspected infection site (e.g., lower vs. upper urinary tract) because laboratories use anatomical-specific testing protocols. Specifically, the sample's origin needs to be indicated as bladder vs. non-bladder because interpretation of the AST results for various antimicrobials (e.g., beta-lactam antibiotics: amoxicillin, amoxicillin-clavulanate, first-generation cephalosporins, and cefovecin) will differ due to the higher drug concentration in the urinary bladder.

The presence of bacteria in a urine sample does not necessarily indicate that those bacteria are the cause of disease.

- Commensal organisms commonly found on the skin may grow in culture and might not represent a pathogenic organism that needs to be treated.
- Growth of $< 1,000$ CFU/mL in a cystocentesis sample and $< 10,000$ CFU/mL in a clean, midstream free-catch sample are unlikely to represent disease.

- Growth of multiple organisms could indicate contamination.

Note that AST provides bacterial susceptibility to antibiotics *in vitro*, but patient factors can change the clinical efficacy of antibiotics.

Dermatitis/skin and soft tissue infections

The underlying cause of dermatological disease should be investigated and addressed in all cases, regardless of secondary bacterial infections. This is particularly crucial when clinical lesions persist or recur.² AST should be considered under the following circumstances:

1. Lesions have not improved by more than 50% after 2 weeks of antimicrobial therapy.
2. New lesions occur 5-7 days after starting antimicrobial therapy.
3. Cytology confirms intracellular rod-shaped bacteria.
4. The patient or a different pet from the same household has a prior history of an antimicrobial-resistant infection.

When clinical resolution occurs, culture is not required. Residual commensal bacterial growth is expected even when healthy skin is sampled for culture.

// SCENARIOS WHEN CULTURE ALONE MIGHT BE USEFUL //

Enteric infections without systemic involvement

Veterinarians might recommend performing bacterial culture to rule in or out important bacterial causes of enteritis when there is significant morbidity or mortality. However, AST should not be used to guide antimicrobial selection for treating enteric infections. There are no antimicrobial breakpoints approved in dogs (or any other species) to predict outcomes of antibiotic treatment for enteric pathogens (e.g., *Salmonella* spp. or *E. coli*).

Otic and ophthalmic infections

Although culture of an external ear or eye sample can establish the presence of bacteria, AST should not be used to predict the efficacy of topical antimicrobials since these products reach substantially higher concentrations in target tissues than do systemic products. Breakpoints are established for systemic, not topical, formulations.

// SCENARIOS WHEN CULTURE IS NOT RECOMMENDED //

Lack of signs of lower urinary tract infection

In the absence of clinical signs of lower urinary tract infection (e.g., pollakiuria, dysuria, stranguria, or hematuria), bacterial culture of urine is not recommended because antibiotics are not indicated, except in cases when dogs are unable to express these signs (e.g., dogs with partial or complete hind-limb paralysis).

After resolution of lower urinary tract signs

Culture is not needed after the treatment of sporadic cystitis if clinical signs of lower urinary tract disease have resolved.

// WHEN TO CHOOSE CULTURE OR AST ON BACTERIAL ISOLATES FROM DOGS //

Indication	Culture	AST
Enteric infection without systemic involvement	Yes	No
Otic and ophthalmic infections	Yes	No
Urinary tract disease	Yes	Yes
When there are no lower urinary tract signs	No	No
After resolution of lower urinary tract signs	No	No
Dermatitis/Skin and soft tissue infections	Yes	Yes

// ADDITIONAL RESOURCES //

AVMA Committee on Antimicrobials. What veterinarians need to know about antimicrobial susceptibility testing (avma.org/AntimicrobialTools):

- General overview
- Non-culture-based antimicrobial resistance genetic panels in animals

CLSI. *Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated From Animals*. 5th ed. CLSI standard VET01. Clinical and Laboratory Standards Institute; 2018.

CLSI. *Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated From Animals*. 6th ed. CLSI supplement VET01S. Clinical and Laboratory Standards Institute; 2023.

CLSI. *Understanding Susceptibility Test Data as a Component of Antimicrobial Stewardship in Veterinary Settings*. 1st ed. CLSI report VET09. Clinical and Laboratory Standards Institute; 2019.

International Society for Companion Animal Infectious Diseases. Antimicrobial guidelines. <https://www.iscaid.org/guidelines>

// REFERENCES //

1. Weese JS, Blondeau J, Boothe D, et al. International Society for Companion Animal Infectious Diseases (ISCAID) guidelines for the diagnosis and management of bacterial urinary tract infections in dogs and cats. *Vet J*. 2019;247:8-25. doi: 10.1016/j.tvjl.2019.02.008
2. Hillier A, Lloyd DH, Weese JS, et al. Guidelines for the diagnosis and antimicrobial therapy of canine superficial bacterial folliculitis (Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases). *Vet Dermatol*. 2014;25(3):163-e43. doi: 10.1111/vde.12118