

# Veterinary Microbiology Update

## **One Health Approach and Stewardship is a Unified Effort to Tackle Antimicrobial Resistance**

The Food and Agriculture Organization, World Organisation for Animal Health (OIE), and World Health Organization (WHO) recognize that addressing health risks requires strong partnerships among entities that may have varying perspectives and different levels of resources. These organizations have taken collective action with a “One Health” approach, to bring together public health, animal health and human sectors in a unified effort to tackle antimicrobial resistance (AMR). Their aim is to:

- Ensure that antimicrobial agents continue to be effective and useful to cure diseases in humans and animals.
- Promote prudent and responsible use of antimicrobial agents, as the same or similar antimicrobials may be used to treat infectious diseases in both humans and animals.
- Ensure global access to medicines of good quality.

On November 2016, the OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials was published. Aligned with the WHO Global Action Plan, the strategy recognizes the importance of a “One Health” approach involving human and animal health, agriculture and environmental needs.

As part of the OIE strategy, a call for action to all veterinarians and animal food producers is to:

- Ensure antimicrobials are used on prescription after diagnosis and under supervision by a veterinarian.
- Handle antimicrobials prudently and responsibly by respecting the dose directions and professional advice.

Over the past several years, the U.S. Food and Drug Administration (FDA) has taken important steps toward fundamental change. The agency is moving to eliminate the use of antimicrobials for production purposes and bring their remaining therapeutic uses in feed and water under the supervision of licensed veterinarians. These changes are critical to ensuring antimicrobials are used only when appropriate for specific animal health purposes:

- Full implementation of the FDA’s December 2016 Guidance for Industry #213 significantly changed the way medically important antibiotics have been used in animal agriculture for decades. Once the changes are fully implemented, it will be illegal to use these medically important antibiotics for production purposes, and animal producers will need to obtain authorization from a licensed veterinarian to use them for prevention, control or treatment of a specifically identified disease.

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- U.S. FDA requires veterinary oversight whenever such antibiotics are administered to any food animal species via feed or water, even if the animals are not intended for food production.
- All medically important antibiotics to be used in feed or water for food animal species require a Veterinary Feed Directive or a prescription.

The Thermo Scientific™ Sensititre™ ID/AST System aligns with this “One Health” approach by supporting a wide range of performing antimicrobial susceptibility testing (AST) customers in the human medicine, veterinary, and surveillance sectors to proactively minimize the emergence and spread of AMR.

## Announcing a New Host Animal-Specific Format for Bovine Respiratory Disease

Bovine respiratory disease (BRD) is the most frequent and economically important of the primary cattle diseases. Approximately 15 percent of cattle in North America are treated for BRD, which accounts for approximately 70 percent of cattle morbidity and about 40 percent of all mortality in feedlots.<sup>1</sup>

BRD control is a major target of antimicrobial usage and potentially an important source of AMR pathogens. The most significant bacterial pathogens of BRD are *Mannheimia haemolytica*, *Mycoplasma bovis*, *Pasteurella multocida*, *Histophilus somni*, and *Trueperella pyogenes*, which are all opportunistic bacterial agents that can be associated with BRD.

The Clinical and Laboratory Standards Institute (CLSI) Veterinary Antimicrobial Susceptibility Testing committee is in charge of defining breakpoints for veterinary agents. Most of the agents used for BRD treatment caused by *M. haemolytica*, *P. multocida*, and *H. somni* have vet-interpretive criteria.

The latest antimicrobials developed for managing BRD infections in cattle include tildipirosin and gamithromycin. These agents were approved in 2011 for treating BRD and provide veterinarians a rapid-response tool to combat BRD. Breakpoints for both agents were published in the 2015 CLSI Vet Standard.

Thermo Fisher Scientific introduced an updated veterinary Bovine and Porcine AST plate in 2018 (see Table 1 for updates compared to the Thermo Scientific™ Sensititre™ BOPO6F Plate). The Thermo Scientific™ Sensititre™ Bovine BOPO7F Plate includes gamithromycin and tildipirosin, as well as:

- Exact MIC values via microbroth dilution to offer greater precision to determine *how* susceptible the organism is, not just *if* it is susceptible, to help veterinarians make informed animal health decisions, optimize therapy options, and detect emerging resistance.
- Updated breakpoint ranges for tilmicosin, tulathromycin, and tiamulin to meet the latest standards designated by CLSI, and consolidation of tetracycline agents for more efficient AST.
- Epidemiological tracking of evolution of infectious organisms using MIC values, to help detect emergence of resistance over time and to ensure labs are supporting the “One Health” call to action in tackling AMR.
- Workflow tailored to your preference based on throughput, space requirements, and budgetary concerns with a range of manual to automated instrumentation, complemented by our Thermo Scientific™ Sensititre™ SWIN™ expert database software for automatic result interpretation based on CLSI vet guidelines.



**Table 1—Sensititre BOPO7F Plate Updates**

Antimicrobial	Code	BOPO6F	BOPO7F	Reason for change:
Tiamulin	TIA	1-32	0.5-32	Breakpoint Point change to meet CLSI VET01S
Chlortetracycline	CTET	0.5-8	n/a	Removed and replaced with TET
Oxytetracycline	OXY	0.5-8	n/a	Removed and replaced with TET
Tulathromycin	TUL	1-64	8-64	Breakpoint Point change to meet CLSI VET01S
Tilmicosin	TIL	4-64	2-16	Breakpoint Point change to meet CLSI VET01S
Gamithromycin	GAM	n/a	1-8	New antimicrobial for food animals and added to meet CLSI VET01S
Tetracycline	TET	n/a	0.5-8	Replaced CTET and OXY to meet MIC interpretation
Tildipirosin	TIP	n/a	1-16	New antimicrobial for food animals and added to meet CLSI VET01S

### Using Susceptibility Testing to Improve Antimicrobial Stewardship for Bovine Respiratory Disease

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BRD is currently one of the leading causes of morbidity and mortality in cattle production in the United States. Multiple factors contribute to the development of BRD, but it is bacterial pathogens (*Mannheimia haemolytica*, *Pasteurella multocida* and *Histophilus somni*) that are responsible for the fatal bronchopneumonia associated with this disease.

While therapy of BRD accounts for a large percentage of the total antimicrobial use in cattle production, antimicrobial stewardship programs in bovine medicine address the key means of improving the therapy of this disease.

Diagnostic testing, specifically AST, is one of the tools veterinary practitioners often use for optimizing BRD therapy. By determining the AMR pattern for a bacterial isolate, veterinarians can avoid using an antimicrobial for which a poor clinical outcome would be expected, i.e. “resistant” isolates.

Although the use of AST to assist with antimicrobial selection for an individual case has merit, practitioners should not underestimate the value of cumulative AST data, or “antibiograms,” in improving BRD therapy selection.

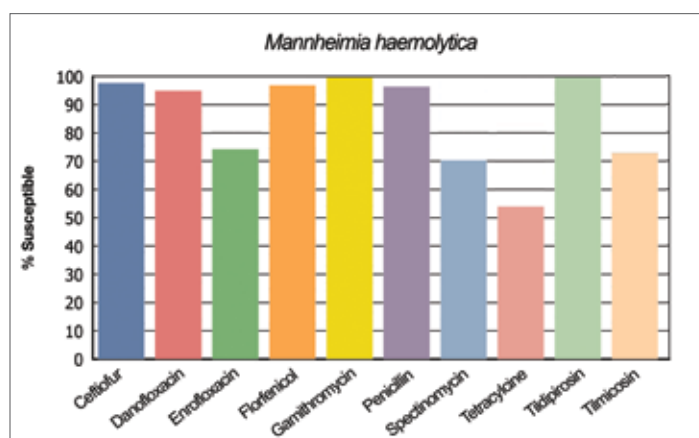


Figure 1. Representative antibiogram.

Antibiograms are cumulative antimicrobial susceptibility summaries that reflect local resistance patterns. They are used in human and veterinary medicine to guide empiric antimicrobial prescribing, while definitive AST on the specific isolate is pending, or to monitor changes in resistance patterns over time.

In veterinary medicine, diagnostic laboratories often publish antibiograms from case submissions. While these are a useful starting point for guiding BRD therapy, they often represent a wide variety of production systems (i.e., cow-calf, dairy, feedlot) and can be biased by a single laboratory’s caseload.

A more representative antibiogram can be developed using the cumulative AST data from a single production system or



veterinary practice through routine AST testing. Antibigrams can be tabulated based on any standardized testing methodology (disk diffusion [Kirby-Bauer], broth dilution, etc.).

However, the determination of the MIC is preferred since it allows laboratories and veterinary practitioners to evaluate subtle changes in resistance patterns that may signal an emerging, low-level resistance mechanism.

As antimicrobial stewardship programs are implemented across veterinary medicine, practitioners will be expected to use all the tools at their disposal to refine the use of antimicrobial therapies. The use of MIC-based AST, on an individual case and cumulative basis, can aid practitioners in selecting the most appropriate therapy for BRD.

## How Host Animal AST Benefits the Veterinary Microbiology Laboratory

AST on bacterial isolates from animal sources and the optimal reporting of results is multifaceted. Among the complexities are methodology chosen (agar or disc dilution, or broth microdilution, for example); interpretive criteria used (CLSI or other); and the use of reference strains relevant to the bacteria being tested for quality control.<sup>2</sup>

When it comes to veterinary AST, traditional microbiology offerings often fall short.

While some veterinary testing options may be available on many common automated systems, by and large, they are not formulated specifically for veterinary microbiology laboratories. In particular, these systems do not allow for the host animal-specific AST testing.

Host animal-specific formats include the antimicrobials that optimally treat diseases in that species, rather than a combination of drugs commonly used across many species.



This is associated with several benefits for the laboratory, including (1) promoting antimicrobial stewardship by providing relevant results that optimize the selection of the antimicrobials; (2) eliminating unnecessary testing, such as AST of chloramphenicol, when results are needed on a host food animal; and (3) reducing costs associated with offline testing, which are essential when a system does not include the right antibiotics necessary for treatment selection.

The Sensititre AST System includes 40+ veterinary-specific antimicrobials, available in more than 15 host animal-specific formats, as well as custom formats for susceptibility testing with true minimum inhibitory concentration (MIC) results. Combined with modular equipment options, the Sensititre System allows you to create the ultimate test program tailored to your laboratory's requirements. To learn more, visit [thermofisher.com/vetmicro](http://thermofisher.com/vetmicro).

## References

1. <https://jasbsci.biomedcentral.com/articles/10.1186/s40104-016-0127-3>
2. Schwarz S, Silley P, Simjee S, et al. Editorial: Assessing the antimicrobial susceptibility of bacteria obtained from animals. *Journal of Antimicrobial Chemotherapy*, Volume 65, Issue 4, 1 April 2010, Pages 601–604, <https://doi.org/10.1093/jac/dkq037>

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