

# Antimicrobial stewardship in small ruminant practice

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## Abstract

Protecting the resource of antimicrobial susceptibility and effectiveness of antimicrobial drugs is the goal of antimicrobial stewardship (AMS). Examples of ways to implement AMS into small ruminant practice are provided herein.

**Key words:** antimicrobial stewardship, antibiotic use, antibiotic resistance

## Introduction

Antimicrobial stewardship (AMS) is defined as, “...the actions veterinarians take individually and as a profession to preserve the effectiveness and availability of antimicrobial drugs through conscientious oversight and responsible medical decision-making while safeguarding animal, public, and environmental health.”<sup>3</sup> Core principles of AMS include commit to AMS, advocate for a system of care to prevent common diseases, select and use antimicrobials judiciously, evaluate antimicrobial use (AMU) practices, and educate and build expertise.<sup>1,3</sup>

## Commit to AMS

Actions that demonstrate commitment include appointing a staff person with responsibility for AMS practices, writing AMS into job descriptions and performance evaluations, and developing agreed-upon treatment protocols for antimicrobial prescribing based on consensus within the practice and any available published guidelines.

## Advocate for a system of care to prevent common diseases

Actions that demonstrate this principle include identifying barriers for your clients in adoption of disease prevention strategies, making infection prevention and control supplies readily available at your practice site or on-farm, and focusing attention on husbandry and management practices. Barriers to adoption of disease prevention strategies may be as simple as a lack of awareness, as well as the fact that some small ruminant owners seek veterinary care infrequently. Opportunities to connect about husbandry and sound disease prevention principles such as ensuring adequate colostrum ingestion and coccidia control, whether in-person or electronic platforms, may result in less AMU and better AMS.

## Select and use antimicrobials judiciously

Given that all antimicrobial use selects for resistance at some level, using them only when their use may affect outcome is critical. Some actions that demonstrate this principle include considering how to shorten duration of therapy in an evidence-based manner rather than rote use of durations, using preventive antimicrobials when there has been demonstrable evidence of need, recording indication on all records of AMU, considering non-antimicrobial alternatives or local uses when

appropriate, and consider an antimicrobial “time out” in certain cases to reassess the ongoing need and choice of antimicrobial. Identifying AMU that is unlikely to lead to better animal outcomes is another action toward AMS. For example, are sulfonamide drugs useful for respiratory disease? Does benzathine penicillin reach therapeutic concentrations for all the pathogens for which it is used? Does chlortetracycline in feed? Are remote delivery devices useful and prudent when used to deliver antimicrobial drugs to groups of animals? The most rewarding decisions would be the ones that prevent the “ultimate antimicrobial transgression”<sup>7</sup>: exposure to selection pressure from antimicrobial drug with no improvement in disease outcome.

Ensuring a systematic evidence-based approach to making antimicrobial decisions is another action that demonstrates AMS. A systematic approach includes the following steps:

1. Determine that an antimicrobial is necessary and will alter outcome – diagnostics (e.g., setting and adhering to accurate case definitions), prognostics (e.g., natural history of disease), and economics play a role in this determination.
2. Evaluate which antimicrobials are most likely to lead to the desired outcome – is the likely bacterial isolate susceptible, does the drug get to the site of infection, is there appropriate exposure of the drug to the pathogen (pharmacodynamics such as peak-dependent or concentration-dependent activity), and is there unbiased evidence of efficacy, published or other? For example, important systematic reviews and consensus statements have been published on AMR in sheep in Britain<sup>8</sup> and on *Coxiella* in sheep and goats.<sup>12</sup>
  - a. There are no breakpoints approved for sheep or goats by the Clinical and Laboratory Standards Institute (CLSI), so susceptibility reports and publications should be interpreted cautiously. Cattle breakpoints might be helpful for some drugs, but available pharmacokinetic data should be reviewed to integrate with known MICs in the case of systemic infections. Minimum inhibitory concentrations for mastitis pathogens cannot be interpreted easily, although the interpretation of “resistant” is likely to be accurate.
3. Track and assess outcomes of therapy – beware of cognitive biases<sup>11</sup> such as the “post hoc ergo propter hoc” fallacy, confounding, and selection bias, and be cautious of inappropriately assuming that the cause of a successful outcome is your intervention.

## Evaluate antimicrobial use practices

Actions that demonstrate this principle include evaluating medical or treatment records to see the percentage of cases that are prescribed antimicrobials and working with your regional diagnostic laboratory to provide local antibiograms for common pathogens. Comparison of AMU practices with published guidelines is problematic in small ruminant practice, because few exist; however, small ruminant practitioners could promote and support the development of clinical guidelines,

such as those developed for small animal bacterial diseases by the International Society of Companion Animal Infectious Diseases.<sup>9,10</sup>

## Educate and build expertise

Actions that demonstrate this principle include attending CE about disease prevention, antimicrobial selection, and related topics, as well as ensuring technical staff are knowledgeable about AMS. Consider also creating alerts for current published literature on relevant small ruminant topics in Google Scholar or PubMed, and review evidence-based sources of information on AMS and antimicrobial therapy.<sup>2,4-6</sup>

## Conclusion

A systematic approach to AMS is likely to lead to defensible actions in the fight to keep antibiotics effective and to maintain the right to use antimicrobials in animals. Veterinarians can take specific actions to contribute to the societal resource of antimicrobial susceptibility.

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