

# Making antibiotic choices in bovine medicine

**Benjamin W. Newcomer, DVM, PhD, DACVPM, DACVIM**

*Department of Pathobiology, College of Veterinary Medicine, 127 Sugg Lab, Auburn University, AL 36849-5522, bwn0001@auburn.edu, 1-334-844-4952 (phone), 1-334-844-4955 (fax)*

## Abstract

Selection of therapeutic antibiotics for use in bovine patients can be a difficult decision, particularly when clinical experience is limited. A limited number of antimicrobial drugs are available to the bovine practitioner, and extra-label drug use is restricted in food animal medicine. Factors of the target infectious agent, the host and management scheme, as well as the drug must be considered when prescribing or administering antibiotics. The goal of this presentation is to review the major antibiotics available to the bovine practitioner, and provide a brief outline of the restrictions of extra-label drug use in cattle with the aim of applying this knowledge to selection of antibiotics for use in beef or dairy cattle.

## Résumé

Le choix d'antibiotiques thérapeutiques pour les bovins est souvent difficile surtout lorsque l'expérience clinique est limitée. Le praticien bovin dispose d'un nombre limité de produits antimicrobiens et l'utilisation des médicaments en dérogation des directives de l'étiquette est restreinte en médecine des animaux destinés à l'alimentation. Les facteurs reliés à l'agent infectieux ciblé, à l'hôte, au système de gestion de même qu'au médicament doivent être considérés lors de la prescription et de l'administration des antibiotiques. Le but de cette présentation est de faire un survol des principaux antibiotiques disponibles pour le praticien bovin et de donner un bref aperçu des restrictions reliées à l'utilisation des médicaments en dérogation des directives de l'étiquette chez les bovins dans le but d'appliquer ces connaissances au choix des antibiotiques utilisés chez les bovins laitiers et de boucherie.

## Introduction

The bovine veterinarian must take several factors into account when prescribing or administering antibiotics. In addition to the considerations specific to the infectious agent and the drug that must be contemplated for any species, the food animal practitioner must exercise prudence to avoid drug residues and abide within the additional regulations governing antibiotic use in food animal species. The economics and duration of action/treatment are also important factors to keep

in mind when using antibiotics in cattle. Making antibiotic choices can be daunting for veterinary students and new graduates. Though there are relatively few labeled antibiotics that are available for use in bovine patients, particularly in lactating dairy cattle, choosing a suitable drug can be challenging when one does not have extensive clinical experience. Understanding the legal constraints of extra-label drug use (ELDU) in food animal species and the characteristics of individual drugs will provide clarity and assist in making prudent antibiotic choices that will improve animal health while safeguarding public health through the avoidance of antibiotic residues in meat and milk.

## Legal Constraints of Antibiotic Usage in Cattle

The Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA) provides food animal veterinarians the legal framework for ELDU when certain conditions are met. In cattle, ELDU is allowed under a valid veterinarian-client-patient-relationship (VCPR) under the following circumstances:

- ELDU is not permitted if another drug exists that is labeled for cattle, contains the needed ingredient in the proper dosage form, is labeled for the desired indication, and is clinically effective.
- ELDU is only permitted when an animal's health is suffering or threatened; for example, ELDU for production purposes is not permitted. ELDU is allowed for preventive purposes when an animal's health is threatened.
- Only FDA approved animal and human drugs may be used in an extra-label manner.
- ELDU in feed is prohibited.
- ELDU is only permitted by or under the supervision of a veterinarian who is responsible for ensuring the record and labeling requirements are met. The veterinarian must also use scientifically based drug withdrawal times to ensure that ELDU does not result in violative food residues or any residue that poses a risk to public health.

In addition to the general considerations, there are several specific prohibitions, such as chloramphenicol, sulfonamide drugs in lactating cattle, and fluoroquinolones, that the bovine practitioner must be aware of. A current list of banned and restricted drugs is available



from the FDA website ([www.fda.gov](http://www.fda.gov)). The Food Animal Residue Avoidance Databank (FARAD) ([www.farad.org](http://www.farad.org)) is another valuable resource for decisions regarding ELDU. The primary mission of FARAD is to prevent or mitigate illegal or harmful residues from drugs or other agents in foods of animal origin. Veterinarians may consult FARAD for scientifically-based recommendations regarding safe withdrawal intervals in food producing animals.

### Drug Characteristics

Judicious antibiotic use, whether on- or off-label, requires maximizing a drug's benefits and effectiveness while minimizing its shortcomings. The desired characteristics of an antibiotic may vary from farm to farm. For example, the drug's duration of action may more greatly influence the antibiotic choice when treating an unruly herd bull on a cow-calf operation as opposed to a lactating dairy cow. However, in general, one would desire an antibiotic that is effective against the causative (or suspected) infectious agent, is distributed to the site of infection, does not result in violative residues in meat or milk, is in the preferred dosing formulation, and is cost effective. For example, a dairy operation may be experiencing an outbreak of respiratory disease in unweaned heifers accompanied by swollen joints and head tilts due to otitis media/interna, suggestive of *Mycoplasma* spp. infection. The  $\beta$ -lactam drugs would not be the ideal choice for treatment as they act by inhibition of the cell

wall, which is lacking in *Mycoplasma* spp. Conversely, in the case of a pinkeye outbreak in stocker calves where systemic treatment is desired, oxytetracycline represents a potential option as the drug is excreted in the tears and will reach the site of infection in therapeutic concentrations. In the interest of public health, the potential for violative residues must always play a role in the bovine practitioner's choice of antibiotics, especially when ELDU is performed. For example, gentamicin binds to bovine renal tissue and may cause prolonged tissue residues (exceeding 18 months) following systemic administration. When considering cost of treatment, one must consider not only the price of the drug but also the duration of action, labor cost of retreatment if necessary, and estimated treatment efficacy.

### Conclusions

The decision-making process for selecting an antibiotic for therapeutic use in cattle can be complex and is affected by several factors. The responsibility of the bovine veterinarian to protect animal and public health dictates that antibiotics should be chosen wisely with regard to legal restrictions, animal well-being, and avoidance of violative drug residues. Antimicrobial drugs are an important tool for the bovine veterinarian; selection of antibiotics appropriate for individual scenarios will improve animal health in a cost-efficient manner while providing a wholesome product to the end-consumer.