Economic Impact of Antimicrobial Use in Feedlots

Calvin W. Booker, *DVM, MVetSc;* **P. Timothy Guichon,** *DVM;* **Oliver C. Schunicht,** *DVM, BSc;*
Brian K. Wildman, *DVM;* **G. Kee Jim,** *DVM*
Feedlot Health Management Services, #7 – 87 Elizabeth Street, Postal Bag Service #5
Okotoks, Alberta, Canada

Introduction

In beef feedlot production, antimicrobials are used daily to control disease and improve production. The vast majority of feedlot animals receive ionophores in the feed to control coccidiosis and improve feed efficiency, and antimicrobials in the feed to reduce the incidence of liver abscesses. Other antimicrobials, such as decoquinate, chlortetracycline and sulfamethazine occasionally are used according to label recommendations to prevent or control specific disease outbreaks and/or to "aid in the maintenance of weight gains and feed efficiency in cattle during periods of stress, due to weaning, shipping or handling." Parenteral antimicrobials also are used in high-risk populations according to label recommendations to prevent, control and/or treat disease.

Because increasing antimicrobial resistance in human pathogens poses a serious threat to the treatment of infectious disease in humans, use of antimicrobials in animal agriculture is under heavy scrutiny from several prominent scientists. The source of this resistance is speculated to lie with in the widespread use of antimicrobials in farm animal production. As a result, it has been suggested that the use of antimicrobials in animal agriculture be limited to therapeutic applications, which would substantially reduce the cost of production associated with antimicrobial costs. The latter theory ignores the economic benefits associated with non-therapeutic antimicrobial usage. It is imperative that these economic benefits are accurately described so that rational, informed, data-based decisions regarding the future of antimicrobial usage in food animal production can be made.

Feedlot Production Variables

The first step toward building appropriate production models is to have accurate estimates of important feedlot production variables describing morbidity, mortality, performance and carcass characteristics. Morbidity variables should accurately characterize the occurrence of specific animal health events that may have an economic impact. These morbidity variables also should clearly describe initial disease occurrence, subsequent recurrence, and outcome. Mortality variables should accurately account for overall and cause-specific mortality.

With respect to feedlot performance, average daily gain (ADG) and the dry matter intake-to-gain ratio (DM:G), calculated over the entire feeding period, are the most relevant indices. Accurate calculation of these performance variables requires the measurement of initial and final weight for all animals; documentation of all animal purchases, sales, and deaths; and recording of all dry matter consumed. When appropriate, final weight should be based on carcass weight rather than live weight.

Quality grade and yield grade generally are the most important carcass characteristics in most economic models. In Canada, variables describing Canada grade (Prime, AAA, AA, A, B1-B4, D1-D4, and E) of all carcasses and yield class (1-3) of Prime, AAA, AA, and A carcasses are appropriate. In the United States, variables describing USDA quality grade (Prime, Choice, Select, and Standard, "off-grades" (cow grades and "house" packer grades), and USDA yield grade (1-5) are appropriate. In both countries, variables describing carcass size ("lights" and "heavies") may be necessary.

Feedlot Economic Factors

Subsequent to identification and calculation of appropriate feedlot production variables, these need to be evaluated to create differential cost of treatment, mortality, wastage, production, performance, and grading. Treatment costs should include pharmaceuticals, consumables, and labor required to detect and treat the initial occurrence of a disease. Costs associated with recurrence of a disease or its consequences, such as wastage, should be calculated separately to allow separate evaluation of these effects in an economic model. Mortality costs should include purchase price of the animals, disposal costs

and feed consumption until death (if an accurate estimate can be made). Production costs should include incremental costs associated with prevention and management. Performance costs should include incremental costs associated with disadvantages in ADG and/or DM:G. It should be noted that in economic terms, a 1 percent change in DM:G is 5 to 10 times more important than a 1 percent change in ADG. Moreover, measurement of ADG as a reliable proxy for DM:G is inappropriate. Grading costs should include actual costs associated with premiums and discounts due to quality grade, yield grade and/or carcass size. Note that it is inappropriate to calculate grading costs when premium and discounts for quality grade yield grade, and/or carcass size do not contribute to the determination of final animal value.

Feedlot Economic Models

Finally, economic models that simulate all aspects of feedlot production are used to summarize the net effects of the feedlot production variables and the associated economic factors. To facilitate this, it is essential that all prices, premiums, discounts, weights, interest rates, and base costs are standardized to remove market and positive feeding margin effects. Removal of market effects results in a base slaughter price that is standardized prior to calculation of grading costs. Moreover, removal of positive feeding margin effects results in shorter production times with improved ADG as opposed to heavier carcass weights. It also is important that only feedlot production variables that are significantly ($p<0.05$) affected be incorporated into the models. Unaffected feedlot production variables should be standardized in the models. This approach allows for individual isolation of the economic effects attributable to each production variable.

Summary

Unfortunately, many of the economic benefits described in veterinary literature are confounded by inappropriate calculations and assumptions. This makes it difficult, if not impossible, to determine the actual economic impact. This presentation will describe the principles of feedlot production models in a way that the economic impact of management strategies can accurately be characterized. Specific examples of the economic impact of antimicrobial use in feedlot production also will be covered.