

Economic benefits of diagnostic testing in livestock: Anaplasmosis in cattle

Thomas L. Marsh, PhD

School of Economic Sciences, Washington State University, Pullman, WA 99164

Introduction

Anaplasmosis is an economically important livestock disease that can result in death loss, productivity loss, and burdensome treatment costs. Uncontrolled outbreaks can impose a significant financial burden on cattle producers worldwide, which may be mitigated by diligent surveillance and management. Evaluating the economic benefit of various management tools can be complicated, and in the case of diagnostic testing, is influenced by disease prevalence as well as the test and individual herd characteristics. This study applies an economic model to determine the value of anaplasmosis testing in various scenarios representative of cow-calf operations.

Materials and Methods

For this model, we assume a producer maximizes profit (revenues minus costs) and we define fixed and variable costs associated with veterinary care. Decision processes for herd health management are made under conditions of uncertainty, meaning that for each possible management action taken there are multiple possible outcomes. Managing anaplasmosis is an example of one such process with several potential actions and associated uncertainty. Diagnostic testing to establish presence or absence of disease in a herd and in individual animals can reduce this uncertainty and mitigate costs.

The model provides a systematic procedure to determine the optimal combination of decisions in an uncertain decision process over time that will maximize profit for a given producer. In Stage 1 of the model, the producer decides whether to test an animal for anaplasmosis. The test outcome then classifies an animal in either the infected or uninfected state. In Stage 2 the producer decides upon intervention options. Expected benefits and costs are calculated and compared across the stages and states of the decision process.

Results

The average cost of anaplasmosis has been previously estimated at \$424 per clinical case (Alderink and Dietrich, 1983). Adjustment for 2016 dollar value and recalculation

based on published morbidity and mortality rates coupled with current market prices yielded a revised estimate of \$627/case. Average costs were also calculated for medical control options (vaccination, antibiotic injections, or chlortetracycline feed additive).

Selected scenarios were based on a beef cattle breeding herd of 100 cows with 4 bulls. Scenario 1 evaluated a herd in a non-endemic region, without exposure to anaplasmosis. If a producer chose to test incoming animals, the estimated cost would be \$6.50/hd. A producer could then decide to not introduce any positive animals to the herd. Without testing, a producer may unknowingly introduce infected animals, with an expected cost of \$6,520.26 if 10% of the herd became infected in the subsequent outbreak. In a more extreme herd outbreak of 50%, the cost for the infected animals was calculated at \$32,601.31.

In scenario 2 the herd is in an endemic region where the cattle are considered 100% infected. Negative animals brought in to such a herd are at very high risk for infection. If a producer chooses to test incoming animals, the cost of testing (\$6.50/hd) is still far lower than the expected cost of a clinical case (\$627/hd) or prophylactic measures.

Significance

The cost of an anaplasmosis outbreak clearly outweighs the cost of testing any new herd additions in the presented scenarios. Although this may not be true for every management situation, producers and veterinarians can use this model to consider options such as diagnostic testing and design an integrative management plan that best fits a specific herd. Current trends in the regulatory environment strongly suggest ongoing restrictions for livestock antibiotic use, including chlortetracycline and oxytetracycline. Progressive cattle producers need to fully consider all available options that may enhance product quality, improve reputation, and lead to more efficient, effective, and sustainable livestock production.