

Managing the Risk of *Cryptosporidium* on Dairy Farms in Watersheds

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Introduction

Cryptosporidium parvum is a coccidian protozoan that many published reports designate as the most prevalent organism isolated from diarrheic dairy calves. It is also zoonotic, potentially contaminating the environment with infective oocysts. To control this pathogen on dairy farms, rational and cost-effective measures need to be implemented. This study evaluated several management and therapeutic interventions for cost-effectiveness.

Materials and Methods

Data for this assessment was collected in a longitudinal observational study and a field trial. A total 10,862 fecal samples were collected from 2941 animals on 109 dairy farms in the New York City Watershed. The samples were analyzed for presence or absence of *C. parvum* oocysts by quantitative flotation microscopy and fecal enzyme-linked immunosorbent assay (ELISA) (Alexon-Trend, Ramsey, MN). Data on management practices hypothesized to be associated with the likelihood of shedding oocysts were collected by interviewing the farm manager. The probability that a calf was shedding oocysts, given a set of factors, was calculated using the logistic regression model as follows:

$$P(Cp) = \frac{1}{1 + \exp^{-(\alpha + \beta_i Z_i)}}$$

where: P(Cp) is the probability, α is the log odds of shedding, and β_i is the change in the log odds of shedding, given a factor Z_i . Using the calculated probabilities of

shedding oocysts based on a particular intervention, decision analysis techniques were used to calculate the expected monetary loss (EML) of the different management and therapeutic choices. Sensitivity analysis was performed to account for some of the uncertainties associated with the respective costs and probabilities.

Results and Conclusions

Several pre-weaning management practices were found to alter the risk of shedding *C. parvum* oocysts, including bedding management, use of ionophores, use of antibiotics, and type of liquid feed. In addition, many calving-area practices changed the probability of calves shedding oocysts, including colostrum management, flooring type, and frequency of cleaning. Furthermore, a therapeutic agent targeting scours decreased the cost of disease.

For example, the likelihood of shedding oocysts for calves fed milk replacer was 14%, whereas it was 49% for calves fed whole milk from the bulk tank. If one values 30 days of milk replacer at \$28.80, whole milk at \$31.20, treatment cost at \$4 and an episode of diarrhea at \$25.10, then the EML of feeding milk replacer is \$3.42 less than feeding whole milk. Sensitivity analysis showed that, under these conditions, a producer would have to value feeding whole milk at \$26.50/30 days before its EML is less than feeding milk replacer. Structured decision analysis techniques can be implemented to choose the most cost-effective methods of decreasing scour days in calves and reduce oocyst shedding into the environment.