



Economic evaluation of participation in a voluntary Johne's disease prevention and control program from a farmer's perspective—The Alberta Johne's Disease Initiative

R. Wolf,*¹ F. Clement,† H. W. Barkema,* and K. Orsel*

*Department of Production Animal Health, Faculty of Veterinary Medicine, University of Calgary, Calgary, Alberta T2N 4N1, Canada

†Department of Community Health Sciences, Faculty of Medicine, University of Calgary, Calgary, Alberta T2N 4N1, Canada

ABSTRACT

The Alberta Johne's Disease Initiative (AJDI) is a Johne's disease (JD) control program with the goal of reducing the spread of *Mycobacterium avium* ssp. *paratuberculosis* (MAP) through implementation of best management practices. The objective was to estimate the economic benefit of participation in the AJDI. A decision tree was constructed in which disease prevalence, test characteristics, and probabilities for implementation of best management practices suggested by herd veterinarians were implemented. Analysis was performed using a Markov analysis, and input data were assigned using estimates from the AJDI and published data. A cost-effectiveness analysis was performed and the net benefit of participation (from the perspective of a dairy farmer) in the AJDI compared with no participation was calculated. A series of 1-way sensitivity analyses were used to control for uncertainty. Farms participating in the AJDI were estimated to have a net benefit of Can\$74 per cow over the course of 10 yr. If project costs were covered by the participating farm, the net benefit was Can\$27. In addition to the effects on MAP infection, a reduction in calf diarrhea was modeled for farms that improved their calf management through the use of pasteurizers. In that case, the additional costs outweighed additional revenues compared with the baseline analysis, resulting in a reduced net benefit of Can\$19. Participation would not be cost effective if cows in early stages of MAP infection did not have decreased production and if prevalence of MAP infection did not increase on farms with poor management. A limitation of the study, despite high uncertainty in some input parameters, was the lack of knowledge regarding changes in prevalence on farms with various management strategies. In conclusion, participation in the AJDI was cost effective for the average Alberta dairy farm.

Key words: Johne's disease, management practices, economic benefit, Alberta

INTRODUCTION

Johne's disease (JD) is a chronic progressive enteritis caused by *Mycobacterium avium* ssp. *paratuberculosis* (MAP). In cattle, infection usually occurs in young calves by ingestion of infectious feces. The incubation period is typically 2 to 5 yr, but can be as long as 10 yr after initial infection. Cattle that develop clinical symptoms suffer from a chronic untreatable diarrhea that leads to cachexia and ultimately culling or death (Fecteau and Whitlock, 2010). Direct losses for the dairy industry are due to decreased milk production, premature culling, and decreased slaughter value of infected animals (McKenna et al., 2006). Annual losses due to JD were estimated at Can\$2,472 for a 50-cow herd with a mean MAP within-herd prevalence of 7% (Chi et al., 2002). However, in addition to direct losses, an unproven association exists between MAP infection in cattle and Crohn's disease in humans (Barkema et al., 2010; Behr, 2010). Should this association be proven, consumers would reduce consumption of cattle products, which would decrease prices for both dairy and beef products (Groenendaal and Zagmutt, 2008). These factors motivate producers to participate and decision makers to give JD control programs a high priority. In countries with endemic MAP infection, the focus of almost all control programs is to promote implementation of best management practices on dairy farms, with the aim of reducing transmission of MAP and therefore reducing the within-herd prevalence to a low level, or keeping the herd uninfected (McKenna et al., 2006; Bakker, 2010; Kennedy and Citer, 2010; Whitlock, 2010). Knowing the expected costs and benefits due to participation in a JD prevention and control program is essential for farmers to make an informed decision whether to participate or not.

In previous studies, changes in management were cost effective but estimates varied widely (Appendix). Most of the studies were conducted in the United States,

Received September 3, 2013.

Accepted January 9, 2014.

¹Corresponding author: rwolf@ucalgary.ca

where herds are larger and production costs and revenues are lower than in Canada. In addition, these studies did not include detailed information on management strategies used and expected changes in management available to accurately estimate all expected costs and benefits that arise through participation for a whole population of farmers. However, the large amount of data collected by the Alberta Johne's Disease Initiative (AJDI), with participation exceeding 50% of the approximately 580 Alberta dairy farms, provided a great opportunity to assess accurate data on management, changes in management, and the prevalence of the disease in a simulation model. The objective of the study was therefore to determine whether participation in a JD prevention and control program such as the AJDI is cost effective for a dairy farm. As implementation of best hygiene management practices will also reduce the transmission of other diseases (Johnson et al., 2011), expected additional benefits through reduction of losses caused by other fecal-orally transmitted diseases were also incorporated.

MATERIALS AND METHODS

Alberta Johne's Disease Initiative

In 2010, Alberta Milk and the Department of Production Animal Health of the University of Calgary (Calgary, AB, Canada) launched the AJDI. The aims of the program were to increase awareness of JD among dairy farmers and to decrease the prevalence of MAP infection in the province through implementation of best management practices (BMP). The program has 3 components: (1) collection of 6 environmental samples each year to assess the infection status of a herd. These are processed using a commercial liquid culture protocol (Trek Diagnostic Systems, Cleveland, OH) and subsequent *IS900* PCR for detection of the MAP-specific insertion sequence 900. The case definition used is positive for *IS900* PCR; (2) a risk assessment to analyze strengths and weaknesses in farm management; and (3) a management plan that includes implementation of a maximum of 3 changes in management, agreed upon by the herd veterinarian and the farmer(s), which should reduce the risk of MAP transmission. In contrast to many other programs, the AJDI does not include individual cow testing. Procedures are conducted by specially trained herd veterinarians and the costs for veterinarians' time and sample processing are covered by the project. However, the participating farm is responsible for costs associated with changes in management.

Design

This economic analysis was conducted following Canadian guidelines for economic evaluation of health

technologies (CADTH, 2006). TreeAge Pro (TreeAge Software Inc., Williamstown, MA) was used to construct a decision tree to evaluate the cost effectiveness of participation in the AJDI compared with no participation, from the perspective of an Alberta dairy farmer (Dijkhuizen et al., 1995). The calculation used farm characteristics and economic input data that were preferably recently estimated in Canada (Table 1). Farms entered the tree in 1 of 4 management profiles (Figure 1). Management profiles reflected the risk of horizontal transmission of MAP between adult infectious and young susceptible animals, with profiles 1 and 4 having, respectively, the best and worst within-herd prevention of MAP transmission. Assignment to the 4 management profiles considered management in 3 important areas, using evidence from previous randomized controlled clinical trials (Stabel, 2008; Pithua et al., 2013) and conditions similar to those reported in previous simulation studies (Groenendaal et al., 2002; Dorshorst et al., 2006). Conditions for assignment included the following: (1) calving—only 1 cow present in the calving pen at least 75% of the time, <10% of the calves born outside the calving pen, and <50% of the calves nurse the cow; (2) diet—calves are not regularly fed unpasteurized pooled colostrum, unpasteurized bulk tank milk, or nonsaleable milk; and (3) housing—calves do not have any direct or indirect contact with cows or cow manure. Farms that met the criteria in all 3 areas were assigned to management profile 1 (low risk), farms that met the criteria in 2 of 3 areas were assigned to profile 2, farms that met the criteria in 1 of 3 areas were assigned to profile 3, and farms that did not meet the criteria in any of the 3 management areas were assigned to profile 4 (high risk). A total of 369 first-year AJDI risk assessments, from 64% of the Alberta dairy farms, were used to assess the distribution of management profiles on Alberta dairy farms (Table 2).

The probability of farms changing management profiles was assessed through comparison of management profiles in yr 1 with management profiles in yr 2 on 227 farms participating in the AJDI for 2 consecutive years. Management costs and changes in within-herd MAP prevalence were dependent on the management profile. The tree also incorporated the risk of introduction of MAP infection into previously uninfected herds through purchase of MAP-infected animals. The tree was populated using real-time data from the AJDI and published data. The databases Scopus (Elsevier, Amsterdam, the Netherlands) and Medline (Atlanta, GA) were used to search the scientific literature. Variables were entered in form of distributions to enable probabilistic sensitivity analysis. The weighted averages of estimates from different input sources were used as means of the assigned distributions. The standard deviations

Download English Version:

<https://daneshyari.com/en/article/10974424>

Download Persian Version:

<https://daneshyari.com/article/10974424>

[Daneshyari.com](https://daneshyari.com)