Association between risk assessment scores and lactating cow *Mycobacterium avium* subsp *paratuberculosis* ELISA results on Ontario dairy farms

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Introduction

Johne's disease (JD) is a chronic, gastrointestinal disease of ruminants, including cattle, caused by *Mycobacterium avium* subsp *paratuberculosis* (MAP). After calves become infected by means of ingestion of MAP in feces, colostrum or milk, it usually takes years before signs of JD can be detected. Currently, there is no treatment for JD. Disease control strategies focus on farm management practices to prevent the disease from spreading. Subclinical and clinical JD significantly impairs the production and reduces the slaughter value of affected dairy cattle. Of great concern is the suspected association between JD in cattle and Crohn's disease in humans; however, a definite link between those two diseases has not yet been established. To control JD, the Ontario dairy industry launched the Ontario Johne's Education and Management Assistance Program (OJEMAP) in January 2010. The OJEMAP is based on a veterinary administered on-farm risk assessment and management plan (RAMP), where a high risk score indicates a high risk for MAP transmission. Farmers can test lactating cows for antibodies against MAP by use of an ELISA performed on milk or serum. The RAMP focuses on management strategies for biosecurity, calving area, calf and heifer rearing, lactating and dry-cow hygiene, and general manure handling. As of April 2013, half of all Ontario dairy farms have voluntarily participated in this program; however, an evaluation of the use of the RAMP and its association with Johne's disease in this broader Ontario program has not been conducted. The objective of this cross-sectional study was to determine relationships among RAMP scores, ELISA results, and the recommendations made by the veterinarians administering the RAMP.

Materials and Methods

Available data included RAMP scores and ELISA results from 1,668 dairy herds participating in the program between January 2010 and December 2012. Herds were classified as JD-positive if they had at least one ELISA-positive animal. Statistical analyses were conducted with STATA 10.1 (StataCorp, Texas, USA). Individual question scores were summarized to create section scores and tallied to create an overall RAMP score. RAMP scores and ELISA results were screened for variability with descriptive statistics and univariate logistic regression, with herd ELISA status (positive or negative) or recommendation given (yes or no) as dependent variables. Question scores were used as categorical variables, whereas section and overall scores were introduced as continuous variables. Linearity of continuous variables was assessed and transformations performed when necessary. Multivariable mixed logistic regression models were created with the assessing veterinarian included as a random effect, and the logarithmically transformed number of tested animals (lognotest) included as a fixed effect in all models.

Results

The apparent herd-level prevalence for JD was 25% (95% confidence interval, 23.0% to 27.1%). The overall RAMP score (OR, 1.01; $P < 0.001$) as well as the section scores for biosecurity (OR, 1.64; $P = 0.001$), calving area (OR, 1.03; $P < 0.001$), calf rearing (OR, 1.02; $P = 0.001$), cow cleanliness, and manure management (OR, 1.03; $P = 0.001$) were positively associated with the herd ELISA results. The section score for heifer cleanliness was not associated with the ELISA result (OR, 1.01; $P = 0.27$). Recommendations given for each section were positively associated with RAMP scores.

Significance

Results indicated that the Johne's RAMP, as used in the OJEMAP, is a valuable tool for determination of a JD risk-reduction strategy for Ontario dairy farms.