

Investigating the dynamics of Johne's Disease on Ontario dairy farms

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Introduction

Johne's disease (JD) is an untreatable disease of ruminants caused by *Mycobacterium avium* subspecies *paratuberculosis*. The long latent period and variable manifestation in clinical presentation poses some significant challenges in its detection and control on farms. JD results in economic losses from early culling and production loss due to chronic enteric disease. In January 2010, Ontario began a voluntary control program called the Johne's Education and Management Assistance program. The program consisted of an on-farm risk assessment survey and whole herd testing by either milk or serum ELISA with subsequent permanent removal of any high titre cow. The purpose of the risk assessment surveys or RAMPs (Risk assessment and management plans) were to identify areas on farm that would result in increased risk of acquiring or transmitting JD. After completing the RAMP, the farm would be given a score out of 300; a higher score correlating with a higher risk of JD. The veterinarian would then make a maximum of three recommendations for improvement of facilities or management for JD control. Based on data collected from over 2,000 dairy farms in Ontario from 2010 to 2013, using individual animal ELISA testing of milk or serum, approximately 26% of farms had at least one test positive animal. Through testing of bulk tank (BT) milk from all Ontario farms in 2013, roughly 50% of farms had a positive bulk tank test for Johne's. There are numerous barriers to the efficacy of extension programs targeting JD control, and the benefit of risk assessment-based programs for a disease such as Johne's remains unclear. The objectives of the study are to 1) assess changes in herd-level prevalence of JD 2) to describe associations between RAMP score and herd bulk tank test changes.

Materials and Methods

Samples were obtained through regular BT sample collection from all licensed Ontario dairy farms. Samples were tested using the modified IDEXX ELISA technique described by Wilson et al (2010). The results from the 2017 test were compared to the 2013 results to describe changes in the proportion of BT samples testing positive, and to identify herds which had, based on these BT results, changed in status over

the 4-year period. RAMP scores for participants in the control program were matched to herd BT test results. Section scores were used to evaluate the strength of assessments in each separate management area in predicting herd risk. The data were modelled in 2 separate logistic regression models. One model, representing the failure of Johne's control, included herds with an original negative BT test and a follow up negative test, compared to those who began with a negative test and a follow up positive BT test. The other model represented successful Johne's control, comparing the herds with an initial positive BT test and a follow up positive test to herds with an initial positive test and a follow up negative test.

Results

The change in BT milk ELISA test positive prevalence in Ontario appeared to increase. Using the modified ELISA technique, 46.8% of the BT samples tested positive in 2013 while 71.4% tested positive in 2017. 10% of herds tested moved from positive to negative BT status, 37% remained positive, 34% went from negative to positive, and 19% remained negative. There were no significant RAMP variables that were at all correlated with either a positive or negative change in BT test status.

Significance

These results suggest that there has been an apparent increase in the prevalence of JD in the Ontario dairy industry with a positive BT representing herds with high risk and prevalence of JD. Based on RAMP scores performed in 2013, there were no associations found between risk assessment elements and herd status change. This finding may suggest recommendations and risk assessments are temporally dependent and that management changes made on farms in the intervening years impacted the herd BT test status. This may suggest that risk assessments need to be conducted more frequently.