Prevalence of *Mycobacterium avium* subsp *paratuberculosis* (MAP) ELISA-positive cows and assessment of MAP transmission risk on organic dairy farms in Ontario, Canada

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Introduction

Johne's disease (JD) is caused by *Mycobacterium avium* spp *paratuberculosis* (MAP). It is an incurable, chronic inflammation of the gastrointestinal tract of cattle that causes diarrhea, weight loss, and reduced production. Commonly recognized risk factors for MAP transmission include purchase of subclinically infected cows and the infection of calves through ingestion of manure, colostrum or milk containing MAP shed by infected cattle. To limit the negative effects of JD on the dairy industry in Ontario, Canada, the voluntary Ontario Johne's Education and Management Assistance Program (OJEMAP) was implemented in January 2010. Producers can participate in MAP antibody ELISA testing and an on-farm risk assessment and management plan (RAMP) with their herd veterinarian. High RAMP scores are associated with high risk for MAP transmission.

Organic farming is one of the fastest growing agricultural sectors worldwide. In Ontario, approximately 80 dairy farms (2% of all dairy farms) are certified organic. While most organic farmers tend to maintain closed herds, which would reduce the risk for JD introduction, they also often support prolonged contact between newborn calves and their dams. These and other factors could potentially influence the risk of MAP transmission as well as JD prevalence and prevention efforts on organic dairy farms. The aim of this cross-sectional study was to assess the Johne's ELISA prevalence and Johne's disease transmission risk on organic dairy farms in Ontario.

Materials and Methods

Between January 2010 and December 2012, 31 organic and 1,703 conventional dairy farms participating in the OJEMAP completed the RAMP, and 29 organic and 1,640 conventional farms tested all the cows in the milking herd for antibodies against MAP by means of a milk or blood ELISA. Herds were considered positive if they had at least 1 ELISA-positive animal.

The statistical analyses were conducted by use of STATA 10.1 (StataCorp, Texas, USA). Overall RAMP scores and section scores (e.g., calving area) were calculated by summing up the scores of the respective individual questions. The data were screened for variability between organic and conventional herds by means of descriptive statistics, and univariable and multivariable linear (RAMP scores), logistic (herd ELISA result), and negative binomial regression (number of positive animals per herd). Linearity of continuous variables was assessed and transformations were applied when necessary. Multivariable mixed linear and logistic models were built with veterinarian included in each model as a random effect. As a proxy for herd size, the covariate logarithmically transformed number of tested animals (lognotest) was forced into all models.

Results

The herd JD test–positive prevalence was 25.0% (95% confidence interval [CI], 22.9% to 27.1%) and 27.6% (95% CI, 11.0% to 44.2%) for conventional and organic farms, respectively. The unadjusted within-herd JD ELISA test-prevalence among all conventional and organic farms was $0.8 \pm 2.0\%$ and $1.6 \pm 3.4\%$, respectively, and among only positive farms, $3.0 \pm 3.0\%$ and $6.0 \pm 3.9\%$, respectively. The herd-level prevalence did not differ after adjusting for veterinarian and lognotest ($P = 0.39$); however, the number of JD test–positive cattle was higher on organic farms, compared with that on conventional farms (IRR, 2.37; $P = 0.017$). As expected, organic farms had significantly lower scores in the biosecurity management section ($P = 0.01$) and higher scores in the calving ($P < 0.001$) and calf management area ($P = 0.021$), compared with those for conventional farms. However, the overall RAMP score did not differ significantly ($P = 0.78$) between organic and conventional herds.

Significance

Results indicated that organic and conventional dairy farms had a similar herd-level JD ELISA prevalence, but the within-herd prevalence was higher in organic herds. Organic farms showed different risk patterns than did conventional farms, with highest risks for JD transmission in the calving and calf rearing areas. Current recommendations for disease prevention may need to be modified so that they are compatible with organic practices and can be implemented by organic dairy producers.