

## **Johne's ELISA prevalence and assessment of disease transmission risk on organic dairy farms in Ontario, Canada**

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Johne's Disease (JD) is caused by *Mycobacterium avium* spp. *paratuberculosis* (MAP). It is an incurable, chronic inflammation of the gastrointestinal tract of cattle, causing 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. To limit the negative effects of the disease on the dairy industry in Ontario, Canada, the voluntary Ontario Johne's Education and Management Assistance Program (OJEMAP) was implemented in January 2010. As a part thereof, farmers could participate in Johne's 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 disease transmission.

Organic farming is one of the fastest growing agricultural sectors worldwide. In Ontario, close to 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 after birth. Those and other factors could potentially influence the Johne's disease prevalence and prevention efforts on organic dairy farms.

Therefore, 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.

Between Jan 2010 and Dec 2012, 31 organic and 1703 conventional dairy farms participating in the OJEMAP completed the RAMP, and 29 organic and 1640 conventional farms tested their entire milking herd for Johne's antibodies using milk or blood ELISA. Herds were considered positive if they had at least one ELISA positive animal.

The statistical analyses were conducted using 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 was screened for variability between organic and conventional herds

using 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 performed accordingly. Multivariable linear and logistic mixed models, using assessing veterinarian as a random effect, were built. The logarithmic transformed number of tested animals (lognotest), as a proxy for herd size, was forced into all models as a covariate.

The herd test-positive prevalence was 25.0% (95% Confidence Interval [CI]: 22.9-27.1%) and 27.6% (95% CI: 11.0-44.2%) for conventional and organic farms, respectively. The unadjusted within-herd Johne's ELISA prevalence among all conventional and organic farms was  $0.8 \pm 2.0\%$  and  $1.6 \pm 3.4\%$ , and  $3.0 \pm 3.0\%$  and  $6.0 \pm 3.9\%$  among positive farms, respectively. The herd-level prevalence did not differ after adjusting for assessing veterinarian and lognotest ( $p=0.39$ ); however, the number of positive animals was higher on organic than conventional farms (IRR=2.37,  $p=0.017$ ). As expected, organic farms had lower scores in the biosecurity area ( $p=0.01$ ) and higher scores in the calving ( $p<0.001$ ), and calf management area ( $p=0.021$ ) when compared to conventional farms. However, the overall RAMP score did not differ between organic and conventional herds ( $p=0.78$ ).

In this study, organic and conventional dairy farms had a similar herd level Johne's disease ELISA prevalence but the within herd prevalence was higher in organic herds. Organic farms showed different risk patterns than conventional farms, with highest risks for Johne's disease 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.

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