

# Case-control Study: Productivity and Longevity of Dairy Cows that Tested Positive for Infection with *Mycobacterium avium paratuberculosis* as Heifers Compared to Age-matched Controls

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## Introduction

*Mycobacterium avium paratuberculosis* (MAP), the cause of Johne's disease (JD), is common in US dairy herds with over 68% of herds containing infected cattle. As there is no approved or effective treatment for JD, control depends on minimizing transmission of MAP to uninfected cattle. Early identification and removal of infected cattle would help minimize JD transmission. Unfortunately, because of the slow progression of JD, early identification of infected cattle is problematic due to poor sensitivity and specificity of currently available diagnostic tests in young, subclinically infected heifers. Moreover, it is unclear whether testing young heifers is cost-effective, given the constraints and costs of current tests, as well as the indefinite effects of subclinical MAP infection on individual cow productivity reported in the literature. Repeated exposure to high levels of MAP accelerates JD progression such that clinical signs are exhibited in relatively young cattle. Accordingly, these cattle should test positive for MAP at a younger age. Multiple studies have documented fecal shedding of MAP in naturally infected calves less than 24 months of age, but none have followed these calves into adulthood to see how they perform as mature cows. The objective of this study was to compare herd longevity, production performance, and adult MAP test status of cows testing positive for MAP <24 months of age to age-matched herdmates.

## Materials and Methods

A case-control study was performed using cattle from four dairy herds in Michigan. Cases were cows that had tested positive for MAP by fecal culture or serum ELISA as heifers in a previous study. Each case was individually matched to four controls. To ensure the cases and controls were similar in age, MAP exposure, and management, the controls were the two heifer calves born immediately prior to and after the case on each herd. Data was collected from April 2004 through August 2009 and included: date of birth, adult MAP test

status, dam's MAP test status, production data (milk, fat, protein, linear somatic cell count (LSCC)), cull date, and if the cow was culled due to clinical JD. Survival analysis was used to determine if there was a difference in time spent in the herd between cases and controls. Conditional logistic regression was used to assess differences in mean production indices, adult JD test status, removal from herd during the observation period, and MAP test status of dam between cases and controls.

## Results

A total of 25 cases were identified from the four study herds in the previous study, resulting in a total study population of 125 cows. As adults, five (23%) cases and 17 (17%) controls tested positive for MAP by either FC or serum ELISA. A total of 11 (44%) cases and 39 (39%) controls were culled from the herds during the observation period, with only one case and three controls being culled due to clinical signs of JD. On survival analysis the mean number of days in the herd for cases was 1591 (95% CI: 1422–1761) while that for controls was 1711 (95% CI: 1623–1799); however this difference was not statistically significant ( $P=0.43$ ). Conditional logistic regression revealed no statistically significant difference between cases and controls in terms of mean 3.5% fat corrected milk, milk fat, or milk protein produced, LSCC, MAP test status as adults, or being culled during the observation period. The only statistical difference found was that cases were 4.5 (95% CI: 1.6–12.9) times more likely to have a MAP-positive dam than controls.

## Significance

In this study there were no significant differences in longevity, production performance, or adult MAP test status between cases and controls. Based on these results, it appears the MAP test status of young dairy heifers using currently available FC and serum ELISA tests is not a reliable indicator of true MAP infection status or future impaired performance. Thus, testing young heifers does not appear to be economically justifiable.