FERTILITY, UDDER HEALTH AND MILK PRODUCTION IN COWS THAT HAVE HIGH MILK ANTIBODIES TO PARATUBERCULOSIS

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Key words
Paratuberculosis, productivity, udder health, fertility, MAP antibodies

Introduction
This paper describes an observational study carried out on a 500 cow dairy herd undertaking a Johne’s control programme.

The dairy herd comprising 509 adult Holstein Friesian cows was identified as being of high risk of Johne’s disease using a predictive model incorporated within a herd health management system (myhealthyherd.com). Although the herd had high levels of biosecurity, there were high risks of spread of Johne’s disease. These were due mainly to the seasonal calving pattern, with many cows sharing communal calving accommodation with a high risk of environmental contamination, had Mycobacterium avium subsp. paratuberculosis (MAP) shedders been present. A historic biosecurity risk was identified using the biosecurity assessment tool within the myhealthyherd software programme; a stock bull had been introduced some 10 years previously but had been culled due to weight loss and poor performance.

No clinical signs of Johne’s disease had ever been diagnosed in the herd, but the risks were such that a screening test was performed using a targeted screen of 30 high risk cows. Two cows showed the presence of high levels of antibody against MAP using a milk ELISA test (IDEXX) which prompted a whole herd screen and the implementation of a control programme of regular testing and management of high risk cows identified by the regular screening.

Method
At the milk recording of May 2011, 48 cows in the herd were consistently testing positive (>20) for antibody against MAP using ELISA tests on their milk recording samples. These cows were identified using an automated testing programme (Herdwise, National Milk Records (NMR)) as having at least three positive tests in the previous six months. None showed clinical signs of Johne’s disease. Milk yields, milk quality, somatic cell counts, and all fertility events were recorded by the farmer and the data was downloaded into a cow management programme for analysis (Interherd, NMR). Yields, somatic cell counts, and fertility events of the 48 MAP positive cows were compared with the rest of the herd and with the performance of the 48 MAP positive cows in their previous lactation when they were testing negative for antibodies against MAP. Yields were compared around the date of May 2011 to attempt to avoid the confounding factors that the herd is increasing in yield over time through better nutrition and management.

Results
Of the 48 cows testing positive for antibodies against MAP, 12.5% were 1st lactation, 16.7% were 2nd lactation and 29.2% were 3rd lactation cows. This compared to 27.5%, 24.1% and 20.4% of these lactation animals in the herd as a whole. This demonstrates that there is a high prevalence in 3rd lactation animals, as may be expected by the normal incubation period of the disease and the production of detectable antibodies later in the infection cycle.

The average 305 day yield of the herd as a whole was 10,130kg for completed lactations in the year prior to May 2011, and predicted (using standard lactation curves within the Interherd programme) as 10,203kg for cows in their current lactations in May 2011. The 305 day completed lactations for the 48 test positive cows (completed before they tested antibody positive) was 10,146kg, and the predicted lactations for these cows was 9,424kg. Because first lactation test positive animals had no previous lactation at the time that they tested positive, they were excluded from this analysis.
Third lactation animals had the biggest difference between yields, with the mean predicted production for the 3rd lactation being 10,059kg and 8,562kg for 3rd lactation cows testing positive. The most noticeable effect at farm level was that the test positive cows (easily identified by the presence of a red ear tag to enable their specific management to prevent spread) averaged 26kg of milk per day compared to the test negative cows mean production of 31kg per day over the period from calving to the recording date of 16th May 2011. There was considerable variation between individuals, with some cows producing more than their predicted production.

Somatic cell counts are monitored monthly for all cows in the herd. The lactation mean of the herd at the milk recording of May 2011 was 155,000 cells/ml. The mean somatic cell count in the previous lactation of all cows that tested positive was 270,000 cells/ml and the mean somatic cell count of test positive cows in their current lactation was 238,000 cells/ml. The calculated mean milk somatic cell count at the milk recording of May 2011 was 155,000 for the herd, while the 48 test positive cows had a calculated mean cell count of 334,000.

The management system used to prevent the spread of Johne’s disease within the herd as part of the Johne’s control programme includes the culling of cows that consistently test positive at the end of their lactations if their milk yield drops or they show signs of mastitis or infertility. Thus, some test positive cows are not submitted for service if they have already tested positive prior to their voluntary waiting period (normally 42 days), or are not pregnant by the time the third test result shows positive. Of the 48 test positive cows, 29 were submitted for service and conceived. The median calving to conception interval in these cows was 136 days, compared to 106 days for the herd as a whole, and 103 days for the cows in the herd that calved up to May 2011. The fertility effect was not seen in the lactation previous to testing positive, where the calving to conception interval was 106 days for the 48 test positive cows.

### Table

<table>
<thead>
<tr>
<th></th>
<th>Mean 305 day yield (Kg)</th>
<th>Mean somatic cell count (,000 cells ml)</th>
<th>Calving to conception Interval (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole herd in current lactation</td>
<td>10,203</td>
<td>155</td>
<td>106</td>
</tr>
<tr>
<td>Whole herd in previous lactation</td>
<td>10,130</td>
<td>n/a</td>
<td>102</td>
</tr>
<tr>
<td>Test positive cows in current lactation</td>
<td>9,424</td>
<td>238</td>
<td>136</td>
</tr>
<tr>
<td>Test positive cows in previous lactation</td>
<td>10,146</td>
<td>270</td>
<td>106</td>
</tr>
</tbody>
</table>

### Discussion

This commercial dairy herd is run efficiently and effectively by expert stockmen with considerable veterinary input to maintain the health and productivity of the cows. The high risk of Johne’s disease was identified at an early stage by the risk analysis used in the health management programme provided as part of the veterinary service to the farm. Herd screening of targeted high risk cows detected a significant prevalence of infection as determined by the presence of antibodies against MAP in milk. A strategy of regular routine testing of all milking cows and the management of high risk animals to prevent the spread of disease was introduced to control the prevalence of Johne’s in the herd. This required a significant financial investment for testing costs, veterinary advice, and the husbandry changes required to manage high risk cows. In this high yielding herd with expert husbandry, classical clinical cases of Johne’s disease had not been observed or recognised, although it is likely that many had been culled prematurely due to associated health issues.

The financial investment and resources required for Johne’s control can be justified by the association of subclinical disease with the presence of antibodies against MAP, demonstrating that subclinical Johne’s disease has a significant effect on productivity, fertility and udder health. An economic cost can be applied to these effects, which justifies to the farmer that Johne’s control is worthwhile, despite the prolonged period of investment that is required to reduce the prevalence to insignificance.