Association between somatic cell count after first parturition and cumulative milk yield in dairy cows

S. C. Archer, F. McCoy, W. Wapenaar, M. J. Green

Context
Heifer mastitis has been recognised as a common and financially important problem in many countries worldwide. In Irish dairy herds, elevated milk somatic cell count (SCC) between five and 30 days in milk (DIM) during parity 1 has been shown to have a large negative impact on the cumulative milk yield of cows. The association between SCC early in the first lactation and cumulative milk yield has not been evaluated for cows in English and Welsh dairy herds. This is important to demonstrate potential savings that could be made by controlling mastitis in pre- and peripartum heifers.

Main conclusion
For cows in English and Welsh dairy herds, elevated SCC between five and 30 DIM during parity 1 (SCC1) had a large negative impact on cumulative milk yield assessed over two years.

Approach
Production data from 2004 to 2006 (provided by National Milk Records) were analysed for 43,461 cows in 2111 dairy herds. Cows were selected based on having had a first calving in 2004, as well as having a record of SCC between five and 30 DIM during parity 1. For the selected cows, survival time was defined as the number of days between the first calving date in 2004, and their last recording date. Cows were censored if present at the final available recording date for their respective herd; otherwise it was assumed that disposal occurred at the last recording date for each cow. Kaplan-Meier survival curves were plotted for cows grouped by SCC1. Lactation milk yields over two years were calculated for the selected cows, and these were added to give an estimate of cumulative milk yield over the study period. Cumulative milk yield was used as the outcome for a random effects linear model that accounted for the clustering of cows in different herds. The model was built using variables available by 30 DIM during parity 1, and developed in a Bayesian framework to enable posterior predictions of cumulative milk yield that were used to verify model fit.

Results
Median survival time decreased from 796 (interquartile range [IQR] 660 to 883) days to 767 (IQR 432 to 882) days for cows with SCC1 <55,000 cells/ml, and SCC1 >400,000 cells/ml, respectively (Fig 1). Following adjustment for month of first calving in the model, a one unit increase in the natural logarithm of SCC1 (for example, from 55,000 to 150,000 cells/ml, or from 150,000 to 400,000 cells/ml) was associated with a median decrease in cumulative milk yield of 482 kg (95 per cent Bayesian credible interval 431 to 534) over approximately two years.

Interpretation
Reduction in cumulative milk yield attributable to high SCC early in the first lactation comprises both decreased daily milk yield and reduced longevity. Comparison of the results from this study with those from earlier studies highlights the importance of considering cumulative measures of milk loss to understand the economic impact of high SCC1 more fully. Cows with high SCC1 had a substantial reduction in milk yield over the following two years.

Significance of findings
The reduced milk yield from cows with high SCC early in the first lactation results in significant financial losses, and this can be used to guide budgets for the control of mastitis in pre- and peripartum heifers. Further research is needed to identify cost effective interventions for different circumstances.
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