Longitudinal study of metritis risk in dairy cattle
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Metritis is a common and costly disease of dairy cattle. Cows that develop metritis are less likely
to become pregnant and are culled at the end of lactation. The incidence of metritis is higher in
primiparous heifers and lower in multiparous cows, and vaccination of cows against the common bacteria
associated with metritis is effective in reducing incidence. Taken together, these observations suggests
that cows may be developing immunity from previous exposure to the bacterial agents thus our
hypothesis is that cows affected by metritis in previous lactations will have a lower risk of developing
metritis. The objective was to determine if metritis occurrence in the previous lactation is an important
predictor of metritis risk in future lactations.

A longitudinal epidemiologic study was performed. Data of disease occurrence and signalment
of cows were obtained from the herd dairy management software of a large farm with a long-standing
working relationship with our group. Complete lifetime data were available for 15,692 Holstein dairy
cows. To determine the association between metritis in previous lactation and metritis risk in future
lactations, only cows that survived to at least two lactations were included. The association between
metritis in previous lactations and the development of metritis in future lactations were evaluated using
logistic regression (PROC GLIMMIX SAS version 9.4). A total of 15,692 dairy cows for a combined
35,247 lactations were analyzed. Overall metritis incidence was 15.61%. Metritis was highest for
primiparous heifers with 63.5 % of metritis cases occurring in the first lactation. For lactations 1 through
4, primiparous cows had metritis incidence of 20.63 % with second, third and fourth parity cows having
11.49 %, 11.54% and 11.45% metritis, respectively. Cows were also more likely to have metritis in the
last lactation before being culled or died. Cows culled after their 1st, 2nd, 3rd, 4th, 5th, 6th or 7th
lactations had a metritis incidence rate of 44.1%, 57.1 %, 73.4%, 82.12%, 85.11 %, 93.33%, 90.91%,
respectively. The odds of leaving the herd is 1.63 higher given metritis in the first lactation compared to
no infection. After removing 5,265 cows that did not make it to at least the second lactation, total metritis
incidence was 11.49 %. Contrary to our hypothesis, cows that had metritis in the first parity and survived
to the second parity were more likely to develop metritis again in her second lactation (odds ratio 1.61).
Cows that had metritis in the first parity were more likely to be culled, but more interestingly, these cows
were also more likely to develop metritis in the next lactation. This suggests that there is a stronger
individual cow predisposition to developing the disease than potential acquired immunity from natural
infection. This cow predisposition may be genetic or interaction with nutritional or immune status.
Acquired immunity through vaccination can reduce the incidence of metritis though this may be a short-
lived immunity. Further investigation on the duration of immunity from vaccination and predisposing
factors are needed. This study also highlights the value of longitudinal studies in understanding risk
factors for diseases especially when using genetic markers as many of the most severely affected cows
would not remain in the herd when using cross-sectional sampling designs. In the case of diseases that can
repeat over a cow’s lifetime and may result in culling or death, such as metritis, a prevalence-incidence
bias may occur and under-represent those with the disease. Overall, our findings reveal a longitudinal
study design may be the most accurate method to categorize disease risk since cross-sectional studies
provide differing results if one time-frame had been chosen compared to another.

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