

Mastitis causes negative reproductive performance similar to other genital diseases

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Introduction

Reproductive efficiency is directly related to economic efficiency in dairy farms. Genital diseases affect reproductive performance, but it is not well known which diseases have reproductive effects. In this study, the most frequently occurring diseases from calving to pregnancy in cows at a tie-stall dairy farm were investigated as to whether they affected reproductive performance.

Materials and Methods

This study was conducted using 725 cows (427 Holstein) between April 2016 and March 2018 in Hokkaido, northern Japan. All cows were reared at a 9 tie-stall commercial dairy farm. All cows received reproductive examinations every 2 weeks from 40 days after calving to pregnancy. The age, parity, medical records, all artificial insemination (AI) dates, and pregnancy or culling date were recorded until the next pregnancy or culling. Pregnancy was evaluated 30 and 60 days after AI by ultrasound.

Study 1: We investigated the correlation between the 15 most frequently occurring diseases and reproductive performance (especially days open) using logistic regression analysis. Control cows (no disease) were compared with each diseased cow (having a disease with negative reproductive effects) regarding reproductive performance using the Kruskal-Wallis test or Fisher's exact test.

Study 2: We classified mastitis into 4 grades: control, mild, moderate, or severe, using a scoring system based on observable systemic inflammation signs designed by Wenz in 2001. Bacterial categorization data were also included. The correlation between clinical grade of mastitis or bacterial categorization with days open was assessed by logistic regression analysis.

Results

In study 1, the 15 most frequently occurring diseases from calving to pregnancy according to medical records were mastitis, endometritis, milk fever, follicular cyst, ovarian quiescence, dystocia, ketosis, pneumonia, displaced abomasum, stillbirth, retained placenta, bloody milk, puerperal fever,

diarrhea, and uterine torsion. We found that mastitis (M), endometritis (En), follicular cyst (FC), and ovarian quiescence (OQ) significantly extended days open. The odds ratios for these diseases were 2.45, 5.55, 1.96, and 4.04, respectively, with p-values of $p < 0.001$, $p < 0.001$, $p = 0.046$, and $p < 0.001$. These 4 diseases also significantly increased the number of days until the first AI (control: 80.8 ± 31.7 vs M: 96.2 ± 37.3 , En: 99.9 ± 35.7 , FC: 94.2 ± 38.8 , OQ: 115.9 ± 30.9); decreased the pregnancy rate of the first AI (control: 40.9% vs M: 18.2%, En: 11.7%, FC: 18.9%, OQ: 17.3%), increased the culling rate (control: 4.5% vs M: 18.4%, En: 16.7%, FC: 23.0%, OQ: 13.5%); and extended days open (control: 127.3 ± 67.8 vs M: 178.9 ± 92.2 , En: 226.3 ± 105.3 , FC: 201.2 ± 120.6 , OQ: 195.4 ± 74.6).

In study 2, we found that mild mastitis significantly extended days open (odds ratio: 1.74, $p = 0.009$). Furthermore, *Staphylococcus aureus* (odds ratio: 6.89, $p = 0.072$) and environmental *Streptococcus* (odds ratio: 2.70, $p = 0.067$) infection slightly extended days open.

Significance

In study 1, mastitis, endometritis, follicular cyst, and ovarian quiescence were found to extend days open. As endometritis, follicular cyst, and ovarian quiescence are genital diseases, they are expected to have negative effects on reproductive performance. On the other hand, mastitis is udder infection disease and tends to misunderstand to have no relationship with reproduction. Actually, there are both reports that mastitis has negative reproductive effects and has not negative effects. In our study, mastitis significantly decreased reproductive performance, and mastitis had a similar odds ratio to ovarian diseases (FC and OQ).

Study 2 revealed that mild mastitis extended days open. Severe inflammation and Gram-negative mastitis causing the release of endotoxin did not affect reproductive performance.

In conclusion, mastitis negatively affected reproductive performance to a similar degree as other genital diseases, but mastitis inducing systemic inflammation did not.