

Title: Changes in milk yield in the proximity of AI as predictors of conception risk

Introduction

Adequate increments in milk yield during early lactation are an indication of proper transition from the negative energy balance after calving to more stable stages as lactation progresses. Most research in this area has focused on the transition period, encompassing the 3 weeks before and after calving. However, changes in milk yield in proximity of AI may better predict the probabilities for a successful insemination. We hypothesize that the change in milk yield in two consecutive monthly test days around AI is associated with potential fertility of insemination. Therefore, our objective was to test the effect of magnitude of change in milk production in the proximity of AI on the risk of conception in a large population of Holstein cows. The potential associations with cow survival also were analyzed as a secondary objective.

Materials and methods:

Cows (n = 11,733) calving in 16 farms located in 4 regions (Northeast [4 herds], Midwest [6 herds], Southeast [1 herd], and the Southwest [5 herds]) were enrolled at parturition and monitored weekly for multiple reproductive events and survival. Pregnancy diagnosis was performed by ultrasonography on d 32±3 d after AI and reconfirmed at d 60±3 of gestation. Subsequently, pregnancy loss between d 32 and d 60 after AI was calculated. In addition, DHI test day milk (TDM) yield performed monthly were recorded for the complete lactation. The difference in milk yield between TDM 3 and TDM 2 (TDM3_2 change) was calculated for each cow. The resulting values were categorized as negative (NEG) for cows in the lowest quartile (TDM3 – TDM2 < -2.72 kg) or normal (NOR) for the population of cows above the 25% quartile (TDM3 – TDM2 ≥ -2.72 kg). The relative risks for pregnancy at first AI (PAI1) and for pregnancy loss at first AI (PLAI1) by category of TDM3_2 change were calculated using PROC GENMOD (SAS). In addition, the risk for survival after 50 DIM by category of TDM3_2 change was assessed. Parity, season, farm, and region were included as control variables in the models.

Results:

Average (SE) TDM2 and TDM3 were 41.9 (0.001) kg and 42.3 (0.001) kg, respectively. Average (SE) DIM were 46.8 (0.006) d and 77.1 d (0.008) for TD2 and TD3, respectively, while the average (SE) for DIM at first AI was 73.9 (0.01) d. Overall, PAI1 for NEG and NOR cows were 35.4% and 37.8% (P = 0.04), while PLAI1 were 9.40% and 9.95%, respectively (P = 0.63). Combined culling and death after 50 DIM were 24.0% and 14.9% for NEG and NOR cows (P < 0.0001). Consequently, cows in the NEG category were at lower risk of conceiving at first AI: Relative risk (RR; 95%CI) = 0.93 (0.88-0.99; P = 0.03) indicating that risk of pregnancy was reduced by 7% in NEG cows. However, no association was determined between TDM3_2 change and pregnancy loss that was similar in both groups (RR = 0.86 [0.67-1.09; P = 0.21]). The risk of leaving the herd after 50 DIM (death and live culling) was greater in NEG cows compared to cows in the NOR category (RR = 1.69 [1.55-1.86]; P < 0.0001).

Conclusion:

Negative changes in milk yield in consecutive monthly test days during early lactation are likely an indication of cows facing health, nutritional, or management challenges. Our results indicated that cows with pronounced decreases in milk yield between their second and third TDM had lower chances of conceiving at their first AI and greater chances of leaving the herd after 50 DIM. The effects on fertility and survival, though, were of moderate magnitude.