Dry-off Milk Yield and Postpartum Udder Health on United States Dairies

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Introduction

The new 7-point Recommended Mastitis Control Program continues to highlight the importance of managing milk production at dry-off, recommending cows produce ≤15kg/day (≤33lbs./day). However, this recommendation is challenged by decades of genetic selection and improved management leading to higher milk yield and persistency, resulting in more milk production at the end of lactation (Cattaneo et al. 2023). Historically, this guideline was based on the increased risk of intramammary infections (IMI) during the dry period (Vilar and Rajala-Schultz 2020) due to elevated udder pressure in high-yielding cows. However, improved management and the use of internal teat sealants have substantially reduced the risk of new IMI occurring during the dry period (Bradley and Green 2004). Given that modern genetics have pushed yields higher while modern management may have mitigated the primary risk, the relationship between dry-off milk yield and udder health in the subsequent lactation warrants reevaluation. Therefore, the objective of this study was to characterize the association between milk yield at dry-off and the risk of postpartum clinical or subclinical mastitis, specifically evaluating whether this relationship follows a simple linear pattern or a more complex, non-linear distribution in modern dairy herds.

Materials and Methods

For this study, lactation (daily milk yield and monthly DHIA test results) and health records were collected from three commercial dairy farms: two in New York (n = 3,017 and n = 1,583) and one in Minnesota (n = 1,475). We defined the average daily milk yield at dry-off (MYDO) as the mean milk production recorded over the 7 days leading up to dry-off. Postpartum udder health events within the first 90 days in milk (DIM) were defined as follows: a cow was classified as having subclinical mastitis (SCM90) if at least one DHIA test had a somatic cell count (SCC) exceeding 200,000 cells/mL, while clinical mastitis (CM90) was defined as the occurrence of at least one clinical mastitis event as diagnosed and recorded by farm personnel in the herd management software. The association between MYDO and SCM90 and CM90 was evaluated using two approaches. First, cows were categorized based on the cut-off (15 kg/day) recommended by the NMC, and the odds of SCM90 and CM90 were compared between groups. Second, to further explore the shape of the relationship, MYDO was evaluated as a continuous variable in logistic regression models, which tested both linear and quadratic terms. All models adjusted for lactation number, farm, and clinical mastitis in the previous lactation as fixed effects.

Results and Discussion

The mean MYDO among cows was 29.1 kg/day. Cows were entering into the second (n = 2,151), third (n = 1,643), and fourth or higher (n = 1,696) lactation, with mastitis prevalence increasing with lactation group. In our study population, 95% of cows (n = 5,788) exceeded the

15 kg/day NMC recommendation. When categorized based on this threshold, cows producing >15kg/day had lower odds of SCM90 (OR = 0.72; 95% CI: 0.56, 0.93) with no evidence of a difference for CM90 (OR = 1.10; 95% CI: 0.78, 1.57) between groups. Analysis of MYDO as a continuous variable revealed a more complex relationship. Clinical mastitis in the previous lactation was associated with risk of SCM90 and CM90 ($P < 0.01$; both). There was a negative linear relationship between MYDO and SCM90 risk (OR = 0.97; $P = 0.12$) and CM90 (OR = 0.97; $P = 0.17$). The quadratic association for SCM90 ($P = 0.29$) and CM90 ($P = 0.11$) is presented in Figure 1. We speculate that this U-shaped distribution reflects three risk profiles: the highest risk in low-producing cows (likely due to pre-existing health issues), the lowest risk in healthy, moderate-to-high producers, and a rising risk in the very highest producers (consistent with increased intramammary pressure). This interpretation provides a more nuanced framework than a simple production threshold. To effectively manage at-risk cows during this period, it is crucial to differentiate between those different production groups.

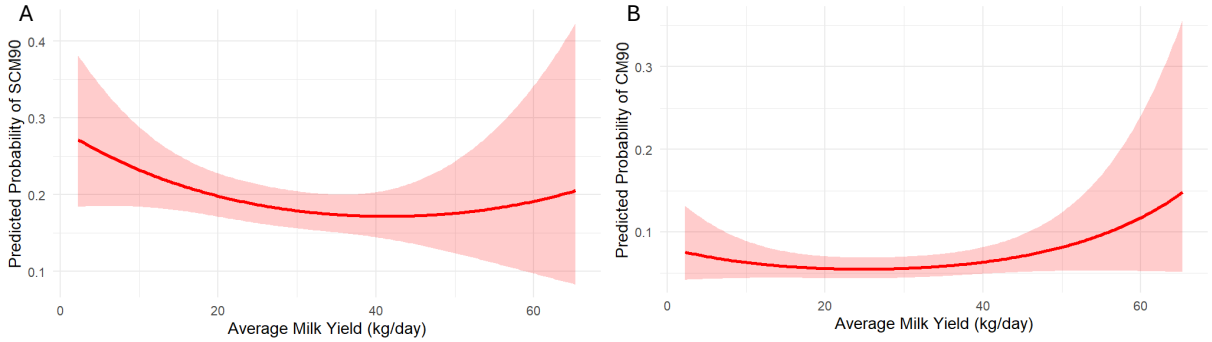


Figure 1. Predicted probability of A) subclinical mastitis (SCM90) and B) clinical mastitis (CM90) within the first 90 days in milk, according to the average daily milk yield (kg) at dry-off (MYDO). Shaded areas indicate the 95% confidence interval.

In conclusion, these results confirm that clinical mastitis in the previous lactation is associated with future udder health and suggest that the current MYDO recommendation may not reflect postpartum udder health risk in modern herds. Based on our data, we speculate that the association between MYDO and udder health is more complex than a simple linear association. While this initial investigation provides a strong foundation, a more in-depth investigation is needed to translate this complex association into practical management strategies.

References

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