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Effect of gradual or abrupt cessation of milking at dry off on milk yield and somatic cell score in the subsequent lactation

P. N. Gott,* P. J. Rajala-Schultz,*¹ G. M. Schuenemann,* K. L. Proudfoot,* and J. S. Hogant

*Department of Veterinary Preventive Medicine, The Ohio State University, Columbus 43210

†Department of Animal Sciences, Ohio Agricultural Research and Development Center, The Ohio State University, Wooster 44691

ABSTRACT

The objective of this study was to assess the effect of milk cessation method (abrupt or gradual) at dry off on milk yield and somatic cell score (SCS) up to 120 d in milk during the subsequent lactation. Data from 428 cows from 8 dairy herds in Ohio were analyzed. Abrupt cessation cows kept the farm's regular milking schedule (2 or 3 times) through dry off and gradual cessation cows were milked once daily for the final week of lactation. Milk yield and SCS were collected using Dairy Herd Improvement Association test-day records. Aseptic quarter milk samples were collected approximately 1 wk before dry off, at dry off, and within 1 wk after calving for bacterial culture to determine the presence of intramammary infections. Overall, milk cessation method was not significantly associated with either milk yield or SCS in early lactation; however, interaction between the milk cessation method and herd was highly significant. Cows producing greater amounts of milk around dry off had significantly higher SCS in the following lactation. Shorter dry periods were significantly associated with decreased milk yield in the following lactation, especially among abruptly dried off cows. Additionally, as expected, several other factors, such as parity of cows and stage of lactation, were significantly associated with both outcomes. No interactions between the milk cessation method and the other explanatory variables in the final models were significant. The results of the current study suggest that higher milk yield at dry off was associated with higher SCS in the following lactation, even though milk cessation method at the end of lactation had a varying effect on test-day milk yield and SCS in different herds during the first 120 d in milk in the following lactation. The specific herd characteristics influencing this could not be identified within this study, warranting further research.

Key words: milk cessation method, dry off, milk yield, somatic cell score

INTRODUCTION

Mastitis is one of the most costly diseases of the dairy industry, partly due to its negative effect on milk production and quality (Seegers et al., 2003). Dairy producers in most countries are compensated based on milk components and the volume of milk shipped, along with the potential premiums they may be offered to improve milk quality by lowering SCC (Bailey et al., 2005). Therefore, prevention and control of mastitis is important for optimal milk production and milk quality and is also crucial due to animal welfare concerns associated with the disease (Leslie and Petersson-Wolfe, 2012).

The dry period is a crucial time in the lactation cycle for mastitis prevention and control (Neave et al., 1950; Oliver and Mitchell, 1983) and, under United Kingdom conditions, over 60% of new environmental IMI detected in early lactation were reported to be contracted during the dry period (Bradley and Green, 2004). The periods directly following dry off and before calving are associated with an increased susceptibility to new IMI (Oliver and Mitchell, 1983; Smith et al., 1985). This period of nonlactation allows producers to use antimicrobial dry-cow therapy (**DCT**), without needing to discard milk due to antibiotic residues, in an attempt to eliminate existing IMI and provide protection against new IMI during the early dry period (Natzke, 1981). However, many factors influence susceptibility to IMI (Dingwell et al., 2004) as well as efficacy of antimicrobial DCT products in prevention of new and elimination of existing IMI (Dingwell et al., 2002; Royster and Wagner, 2015); thus, use of DCT does not guarantee that all mammary glands will be free from IMI at calving. The use of antimicrobials in animal production, especially for prophylactic purposes, is under debate, as concerns about the development of antimicrobial resistance and its effect on human health have increased (Oliver et al., 2011; Landers et al., 2012). Identification

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¹Corresponding author: paivi.rajala-schultz@helsinki.fi

of additional management practices that reduce disease risk around dry off and increase productivity would be beneficial to the dairy industry.

Multiple studies have been conducted to investigate what the best method to dry cows off is, often in regard to mammary health, but many of these studies were done when milk production per cow was substantially lower than what is seen in most dairies today (Wayne et al., 1933; Neave et al., 1950; Oliver et al., 1956a). Abrupt and gradual milk cessation were 2 commonly investigated approaches to discontinue milking (Wayne and Macy, 1933; Espe and Smith, 1952; Oliver et al., 1956b). Abrupt cessation, or stop milking, occurs when normal daily milking is terminated on a set day, which is typically determined by the expected calving date and a desired dry period length. Gradual cessation of milking (also referred to as intermittent milking or reduced milking frequency) occurs when cows are weaned from milking over a period of days or weeks. The frequency of milking and the duration until dry off have varied by study, but a once-daily milking schedule for a week or less before dry off has been used previously (Natzke et al., 1975; Oliver et al., 1990; Gott et al., 2016). Gradual cessation of milking has been shown to reduce milk yield before complete cessation of milking at dry off (Bushe and Oliver, 1987; Oliver et al., 1990; Newman et al., 2010). Additionally, gradual cessation was associated with improved udder health when compared with abrupt cessation, especially for quarters uninfected at the time of dry off, as measured by fewer IMI during the dry period or lower prevalence of IMI at calving (Oliver et al., 1956a; Newman et al., 2010).

Although research has focused on the effect on IMI status as measured by microbiological culture of milk, only a few studies have reported the effects of milk cessation method on milk production and milk quality (e.g., SCC) in the following lactation. These studies date back to the 1930s and 1950s and no significant differences were found in the quantity or quality of milk in the following lactation when various methods of milk cessation were used at dry off (Wayne et al., 1933; Oliver et al., 1956a,b). The effect of milk cessation method on milk yield and SCC in the subsequent lactation is not, however, well characterized and has not been reported among modern high-producing dairy cows.

Despite the studies indicating the beneficial effects of gradual cessation of milking on udder health, abrupt cessation of milking is commonly recommended in the United States. The National Animal Health Monitoring System Dairy 2014 study estimated that 90% of US dairy cows were abruptly dried off, whereas only 10% of cows were dried off via gradual cessation (Lombard et al., 2015). Herds which participate in a DHIA test program can use milk yield and SCC data obtained

monthly to make important management decisions throughout lactation. The objective of the current study was to assess the effect of milk cessation method (abrupt or gradual) at dry off on milk yield and SCC up to 120 DIM during the subsequent lactation using DHIA test-day records. Our hypothesis was that gradual cessation of milking would improve udder health and productivity as measured by decreased SCC and increased milk yield in the subsequent lactation.

MATERIALS AND METHODS

Study Population

All procedures used in the present study were approved by The Ohio State University Institutional Animal Care and Use Committee. Eight dairy herds in Ohio were included in our study. Six herds were composed of Holstein cows and 2 herds were exclusively Jersey cows. Four of the study herds had less than 100 cows, 3 herds had between 100 and 499 cows, and 1 herd had over 500 cows. Herds were required to be enrolled in a DHIA testing program and willing to share their DHIA test-day data with the investigators to participate in the study. The willingness of the producers to follow study protocols was also a prerequisite for inclusion on the study. Dry off dates were based on breeding date and the individual herd's desired dry period length. All herds dried cows off abruptly once a week as their normal dry off protocol. After the final milking, all quarters of all cows were treated with a commercially available antimicrobial labeled for use in nonlactating cows, according to each herd's standard protocols. No alterations were made to the diet during the study period, so all cows remained on their farm's lactating ration for the final week of lactation.

Cows were enrolled and data were collected between May 2012 and October 2014. Clinically healthy cows were enrolled 7 to 14 d before their expected dry off date. All cows dried off in the same week within a herd were assigned to the same group to make management of the cows easier for the herd personnel. In each herd, the first set of cows was assigned to the abrupt cessation group; thereafter, group assignment alternated weekly between gradual and abrupt cessation groups. Cows were only enrolled on the study once, even if they were dried off again during the study period.

Abrupt cessation cows maintained the farm's regular milking schedule (2 or 3 times, depending on the herd) until the last day of lactation, whereas gradual cessation cows were milked once daily for the final week of lactation. Gradual cessation cows were housed and managed according to facility and labor confines in each of the 8 herds. One herd on the study was a ties-

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