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Jeffrey S. Stevenson

John E. Shirley

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## **INCREASING MILKING FREQUENCY IN FRESH COWS: MILK CHARACTERISTICS AND REPRODUCTIVE PERFORMANCE**

*J.S. Stevenson and J.E. Shirley*

### **Summary**

Increased milking frequency during partial or whole lactations increases milk yields, but generally reduces percentages of milk fat and protein. Because of greater milk volume, total fat and protein are not reduced. Combining bovine somatotropin (bST) with increased milking frequency is additive. In other words, milk increases in response to both factors. In some studies, increased milking frequency during early lactation improves udder health, as evidenced by reduced somatic cell scores. Reproductive efficiency generally declines when examined on whole herd basis. When examined in single herds with or without bST, pregnancy rates may not be reduced because of increased milking frequency, and in some cases may be improved.

(Key Words: Milking Frequency, Milk Yields, Reproductive Performance)

### **Introduction**

In the dairy industry today, many factors determine profitability. High fixed costs associated with new, fast, and efficient rapid-exit parlor designs must be justified by maximal milk output. Increased use of these parlors by increasing milking frequency to three and four times daily, and adoption of recombinant-DNA technology in the form of bovine somatotropin (bST) for increased milk yields, have partly justified high fixed costs associated with limited daily parlor use. Greater interest in improving mammary health (reducing somatic cell counts,

etc.) and greater production of fresh cows milked at more frequent intervals during early lactation has initiated research in this area.

### **Whole Lactation Studies**

Studies of increased milking frequency during entire lactations have demonstrated that increasing milking frequency from once to multiple times daily increased milk yield from 80% (once daily) to about 120% with multiple daily milkings. Increased milking frequency from twice to thrice daily in one study of more than 10,400 herds per year during 1998 to 2000 resulted in a 15 to 16% increase in milk yields or 13 to 14% increase in energy-corrected milk (ECM) yields. Lower ECM yields occurred because higher milk yields generally reduced percentage yields of fat and protein. Only 7% of herds studied were milked thrice daily in the northern and southern United States.

Herds milked thrice daily had more days open, greater numbers of AI services per conception, longer actual calving intervals, and more cows entering and leaving the herd than herds milked twice daily. These measures of reproductive efficiency often are associated with prolonged days to first ovulation and estrus in individual cows. In contrast, somatic cell scores were reduced, with fewer cows per herd with scores in the high range (7 to 9), and more in the low range (0 to 3) after thrice daily milking.

The effects of combining bST and increased milking frequency are additive. Increasing milking frequency from twice to thrice daily increased fat-corrected milk (FCM) yield by 3.5% in both first (9.0 lb/day) and multiple (10.4 lb/day) lactation cows. Injection of bST increased FCM by 11 lb in first and 9.5 lb in multiple-lactation cows over 230 days in milk. Increased milking frequency did not prevent increases in body condition as lactation progressed, but bST prevented these increases.

### **Part Lactation Studies**

Studies of increased milking frequency or combinations of suckling and milking during various parts of the entire lactation revealed interesting results. Cows that were machine-milked in the morning and suckled by calves in the evening during the first 8 weeks of lactation produced 16% more milk (total of milk resulting from suckling and milking) during a 300-day lactation than cows milked twice daily. Suckling apparently increased milk yield by reducing the amount of residual milk in the udder after suckling during the first 4 days after parturition, but not at later periods.

Cows nursing their own calves plus one foster calf each during the first 8 to 9 weeks of lactation produced 18 to 55% more milk than cows with single calves, even after the foster calves were weaned. In a more recent study, cows milked thrice daily plus suckled thrice daily by two calves during the first 6 weeks of lactation produced more milk than cows milked six times daily. Cows milked six times daily during the first 6 weeks of lactation out-produced those milked thrice daily (86.6 vs. 77.8 lb), but yield was similar between 7 and 18 weeks of lactation (93.7 vs. 94.1 lb) when both groups of cows were milked only thrice daily.

Milk fat and protein percentages were slightly reduced during six times daily milking,

as shown by whole-lactation studies, but actual yields of fat and protein tended to be greater because of higher total milk volume in cows milked six times daily. However, in another study, only protein percentages were significantly reduced after six vs. three times daily milkings. In that study, conception rates of cows tended to be greater for those milked six times than thrice daily (31.0% vs. 23.3%) after a synchronized insemination between 69 and 76 days in milk.

A recent study at the University of Illinois compared cows that were milked thrice daily to those milked six times daily during the first three weeks of lactation, but thereafter milked only thrice daily. Daily yields of milk increased from 98.5 to 104.5 lb during the first 150 days in milk; peak yields increased from 113 to 126 lb; and actual 305-day yields increased from 27,029 to 29,520 lb, whereas SCC declined.

In an experiment conducted at Kansas State University, Holsteins were assigned to be milked four times daily for the first 30 days of lactation and twice daily thereafter, whereas the controls were milked twice daily. Cows were either treated or not treated with estradiol cypionate (ECP) as prophylactic therapy for improved uterine function, and were either treated or not treated with bST starting at 63 days in milk. Mature equivalent 305-day milk yields and components resulting from that study are summarized in Table 1. Ignoring the effects of ECP on milk yields, which were negative, milking four times daily for only the first 30 days in milk improved ECM yields by 2,180 lb compared with twice daily milkings with no bST, and by 771 lb with bST. Injection of bST increased ECM yields by 2,187 lb in twice daily milked cows and 778 lb in four times daily cows, or 2,564 lb overall. Somatic cell scores were not improved or harmed by increased milking frequency during the first 30 days in milk.

Conception rates after a synchronized insemination were not adversely affected by increased milking frequency. On the contrary, four times daily milking in conjunction with previous treatment with ECP produced greater pregnancy rates at first service (Table 1).

**Table 1. Mature Equivalent (ME), 305-day Energy-Corrected Milk Yields and First-Service Pregnancy Rates in Lactating Dairy Cows in Response to Milking Frequency (MF), ECP Therapy, and Bovine Somatotropin (bST)<sup>1</sup>**

Item	bST	Milked 2x		Milked 4x		bST total
		Oil	ECP	Oil	ECP	
No. of cows	-	15	16	15	17	63
	+	19	20	21	20	80
Energy-corrected milk <sup>2</sup> , lb	-	28,493	30,012	30,673	26,868	29,013
	+	30,680	31,473	31,451	32,703	31,577**
No. of cows	-	24	23	26	31	104
	+	9	12	10	5	36
First-service conception rate <sup>3</sup> , %	-	37.5	43.5	26.9	51.6	40.4
	+	44.4	50.0	30.0	60.0	44.4

\*\*Different (P<0.01) from no bST.

<sup>1</sup>Cows were milked either 2x vs. 4x daily for the first 30 DIM and then milked 2x thereafter; received 10 mg of ECP in oil vs. oil once between d 2 and 15 postpartum; and were treated with bST or not beginning in the ninth week of lactation.

<sup>2</sup>Interaction (P<0.01) of bST x lactation number (no bST-1st = 30,320 lb; no bST-2nd = 27,703 lb; bST-1st = 31,405 lb; and bST-2nd = 31,747 lb).

<sup>3</sup>Interaction (P=0.05) of milking frequency and ECP (2x-no ECP = 39.4% [n = 33]; 2x-ECP = 45.7% [n = 35]; 4x-no ECP = 27.8% [n = 36]; and 4x-ECP = 52.8% [n = 36]).