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THE IMPLICATIONS OF MILKING MANAGEMENT STRATEGIES INVOLVING VARIATIONS OF MILKING FREQUENCY IN THE IMMEDIATE POST-PARTUM PERIOD

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SUMMARY

Two experiments with identical-twin cows are described. The first compared once-daily milking and concurrent continuous single suckling for 4 days *post partum* with twice-daily machine milking and twice-daily suckling. The two treatment groups showed a mean total lactation gain of 4.8% ($P < 0.05$) in milk and 4.6% ($P < 0.01$) in milkfat. The second compared twice-daily milking, commenced immediately *post partum*, with thrice-daily milking, for periods of 7 days and 8 weeks. Treatment period gains of 9.9% in milk and 16% in milkfat were recorded for the 7-day \times 3 group. The 8-week \times 3 group showed a gain of 9.4% in milk and 12.2% in milkfat in the first 7 days, reducing to 6.0% and 6.6% at the completion of the treatment phase.

Body-weight changes in early lactation appear to be implicated in production responses.

INTRODUCTION

Earlier work has shown the beneficial effect of multiple suckling in the first few weeks of lactation (Everitt and Phillips, 1971). Experiments carried out over 4 years, using identical-twin Jersey cows and heifers, and Friesian steer calves, for suckling periods of 7 to 10 weeks, indicated increased peak milk production, with the higher production of suckler cows continuing in the post-weaning period. The post-weaning productions of suckler cows were on average 24% greater than those of their machine-milked twin mates.

Further trials were carried out in the seasons 1967-8 and 1968-9, eight sets of identical-twin Jersey heifers being used each season. The treatment combined machine milking and suckling for 3 weeks *post partum*, treatment animals being machine milked once daily in the presence of their calves which were tied next to them to produce a good ejection response: Post machine milking, the cows were allowed to suckle their calves for the following 7 hours, after which they were separated, to be reunited at the following morning milking. These cows outproduced their twice-daily machine-milked twin mates in milk by 14% in 1967-8 and

7% in 1968-9. This milk production response was in addition to the amount of milk consumed by the calf. The 1967-8 season was terminated prematurely because of acute feed shortages.

Using a half udder technique, Walsh (1967, 1969) has shown reductions in milk production in the subsequent lactation when milkings have been omitted in the early post-partum period. In an experiment using 39 primiparous Friesian heifers, quarters in which the 1st, 4th, 6th and 8th milkings immediately *post partum* were omitted gave 9.9, 13.0 and 6.3% less milk than quarters which were milked twice daily following parturition. The reductions following omission of the 4th and 6th milkings *post partum* were significant ($P < 0.01$). However, adverse effects from the omission of milkings in mid-lactation were small and largely transitory in nature. Milk production from infection-free quarters in the period subsequent to omission of the 4th and 8th milkings in mid-lactation was reduced by 1.0 and 3%, respectively, relative to quarters in which normal milking intervals were observed. The differences were non-significant.

More recently, similar results have been reported using Friesian cows in half udder comparisons (Walsh, 1976).

In continued focus on the early lactation period, a trial was carried out at No. 1 Dairy in 1973-4 using 10 twin sets of mixed age and breed. A comparison was made between the lactational yields of cows milked twice daily from calving and those which retained their calf for 7 days *post partum* and were machine milked once daily during this period. Cows milked twice daily outproduced their twin mates by 13% ($P < 0.05$) in milk and 9% in milkfat, lactation length being of a similar order for both management groups.

In the New Zealand dairy industry, calves not required for herd replacement must be retained for 4 days before disposal as "bobby" calves. Twice-daily machine milking from calving would require that these calves be artificially fed for this period.

To accommodate bobby-calf rearing within a twice-daily machine milking regime, a further experiment was carried out (Experiment 1) in which part of the treatment group were twice daily machine milked while the remainder fed all the calves for the first 4 days *post partum* by multiple suckling.

The study was further extended in a later season by Experiment 2, to measure production gain from increased milking frequency in the immediate post-partum period.

EXPERIMENT 1

Eighteen sets of identical-twin cows of mixed age and breed were used. Twin sets were split between treatment and control groups to give each the same mean expected calving date. Cows joined their experimental group immediately after calving and the groups were managed separately for the first 4 days. They were then combined, and all subsequently milked twice daily.

TREATMENT GROUP

Cows in this group were separated from their calves as soon as practicable after calving and were thereafter milked twice daily.

Thirteen of the 18 cows (Group 1) were machine milked, using a warm-water pre-milking preparation with a pre-squirt (Phillips, 1969) sufficient to produce a letdown response. The remaining five cows (Group 2) were "milked" for the first eight milkings after calving, by multiple suckling, using an under-rail suckling system.

CONTROL GROUP

The calf was allowed to remain with its dam for 4 days after birth. The cow was milked once daily at 4 p.m. in the absence of the calf. Pre-milking preparation was a warm wash of sufficient length to produce a letdown, and included a pre-squirt. Control cows and their calves were run as a separate group until the end of the treatment period.

This management system was similar to that applied in 1973-4 experiment mentioned in the introduction where calves remained with their dam for 7 days.

RESULTS

Production data for Experiment 1 are shown in Table 1. The "treatment" achieved good udder evacuation while enabling bobby calves to be well fed before disposal at 4 days of age. In contrast, it is a common experience that cows with a calf at foot do not respond well to machine milking, and consequently milk ejection is extremely variable. This was the situation with the cows in the control group. Total production of treatment cows showed an average increase of 4.8% ($P < 0.05$) in milk and 4.6% ($P < 0.01$) in milkfat when compared with the productions of their control twin mates.

TABLE 1

Production results of identical-twin experiment comparing twice-daily machine milking or multiple suckling with combined calf suckling and once-daily milking in the 4 days immediately *post partum* (Experiment 1).

	Milk (litres)		Milkfat (kg)		Days	
	Treatment	Control	Trt	Cnt	Trt	Cnt
Group 1 (13)	2 543	2 471	126.7	123.6	256.2	260.5
Group 2 (5)	2 597	2 386	123.8	113.6	213.2	204.5
Overall†	2 561	2 444	126.1	120.6	244.2	244.9
Difference ± SE	117 ± 48*		5.5 ± 1.6**		-0.7 ± 4.3	

† Adjusted for days in milk.

The difference in response between "suckled" and "non-suckled" cows was not significant, and only the production difference for the entire treatment group is given.

DISCUSSION

The production differences noted are consistent with results of earlier experiments and indicate that worthwhile gains in total production can be achieved by a simple modification of the milking management in the 4 days after calving. The under-rail suckling of part of the herd can be turned to advantage particularly when bobby calves cannot be disposed of quickly. It may also have advantages in the management of first-lactation cows where the initiation of an adequate milk ejection response sometimes presents problems in early lactation.

The relevance of this work to the dairy industry was established by a survey carried out during the calving season of 1978. This survey was designed to reveal current post-calving management systems and the manner in which farmers fed bobby calves before disposal.

The data show that 54% of farmers left calves with their dam for 4 days *post partum*, the majority of these cows being machine milked once daily during this period. Removal of the calf at birth was the most common management practice employed by the remaining 46% of farmers.

Since the gain in total production appears to be attributable to improved udder evacuation immediately *post partum*, it seemed possible that an increase in milking frequency during this period might conceivably enhance this effect and lead to further production gains. This hypothesis was tested in the second experiment.

EXPERIMENT 2

The experiment used 29 sets of identical-twin cows of mixed age and breed. Fourteen twin sets were allocated to Experiment 2A and 15 sets to Experiment 2B, twin sets being split between treatment and control groups. Uniformity of feeding was maintained by grazing the same paddocks, the groups being separated by an electric fence.

TREATMENT GROUP

Treatment cows were machine milked three times daily (at 6 a.m., 2 p.m. and 10 p.m.), the experimental period commencing *post partum* and continuing for 7 days in the case of Experiment 2A and for 8 weeks in the case of Experiment 2B.

CONTROL GROUP

Cows in the control groups were machine milked twice daily at 5 a.m. and 3 p.m., commencing *post partum*.

At the conclusion of the experimental period, all cows joined a single group and were machine milked twice daily at 5 a.m. and 3 p.m., under uniform feeding and management.

RESULTS

Production

Milk production data for Experiments 2A and 2B are summarized in Tables 2 and 3 and Figs. 1 and 2. Treatment cows of Experiment 2A outproduced their control twin mates by 9.9% in milk and 16% in milkfat during the 7-day treatment period.

TABLE 2

Average milk production (litres) at 1, 8 and 20 weeks post calving for identical-twin groups on twice-daily milking and thrice-daily milking for 7 days *post partum* (Experiment 2A).

	Weeks Post Calving					
	1		8		20	
	2 yr	Mature	2 yr	Mature	2 yr	Mature
3 × daily	72.6	122.4	775.2	1 172.7	1 691.1	2 571.9
2 × daily	77.2	106.9	822.3	1 105.6	1 769.5	2 471.9
Difference						
3 × - 2 ×	-4.6	15.5**	-47.1	67.1*	-78.4	100.0*
SE of Dif.	±7.39	±4.7	±37.3	±23.6	±59.5	±37.6

TABLE 3

Average milk production (litres) at 1, 8 and 20 weeks post calving for identical-twin groups on twice-daily and thrice-daily milking for 8 weeks post partum (Experiment 2B).

	Weeks Post Calving					
	1		8		20	
	2 yr	Mature	2 yr	Mature	2 yr	Mature
3 × daily	85.3	125.7	974.9	1 236.0	2 122.9	2 662.5
2 × daily	80.3	112.9	916.0	1 169.0	2 058.5	2 629.5
Difference						
3 × - 2 ×	5.0	12.8*	58.9	67.0†	64.4	33.0
SE of Dif.	±5.59	±5.23	±39.5	±37.0	±71.6	±67.0

† $P < 0.10$.

This advantage had diminished to 2.2% in milk and 2.7% in milkfat by 20 weeks post calving.

Twin-set members assigned to the treatment group of Experiment 2B showed a production response of 9.4% in milk and 12.2% in milkfat over the first week of treatment. However, at the conclusion of the 8-week treatment period the average production advantage for the group milked thrice daily was 6.0%

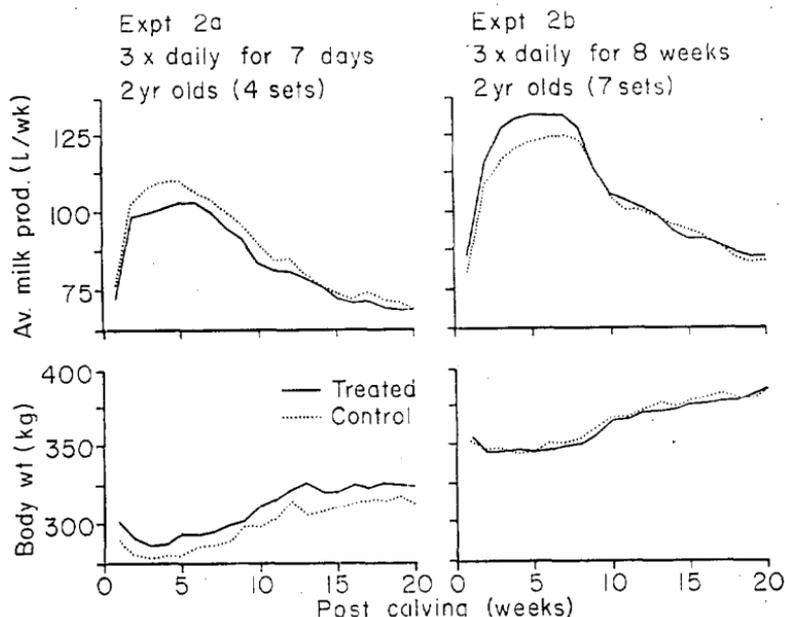


FIG. 1: Average milk production and body weights for twin groups of 1st lactation cows in Experiments 2A and 2B, for 20 weeks post calving.

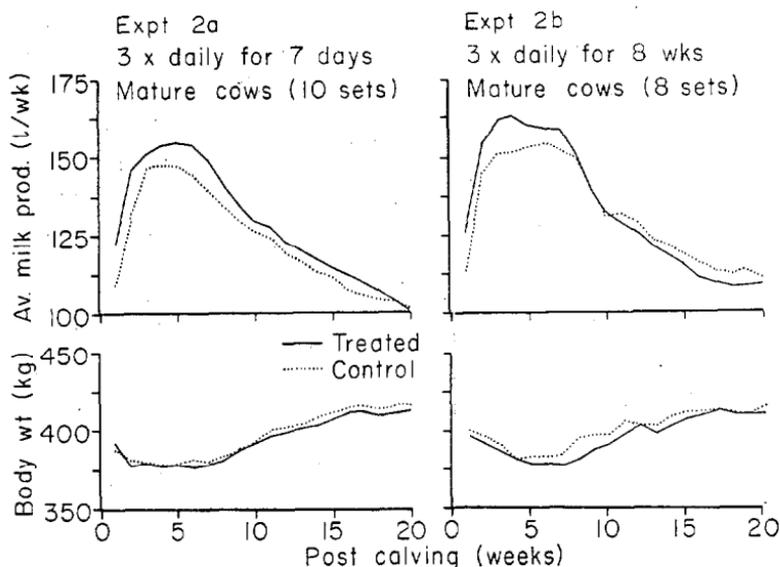


FIG. 2: Average milk production and body weights for twin groups of mature cows in Experiments 2A and 2B for 20 weeks post calving.

in milk and 6.6% in milkfat. This had further declined to 2.0% in milk and 1.1% in milkfat by 20 weeks post calving.

A substantial age effect was noted in both experiments in that cows of 3 years or older responded at a higher level (14.6% in milk for Experiment 2A and 11.4% in milk for Experiment 2B) than primiparous heifers (-5% in milk for Experiment 2A and 6.2% in milk for Experiment 2B) over the first 7 days of lactation. However, in Experiment 2A there were only four first-lactation twin sets.

Body Weight

The body-weight changes of treatment and control groups for the first 20 weeks of lactation are shown in Figs. 1 and 2.

Two-year-old control animals of Experiment 2A were 12 kg lighter than their treatment twin mates when weighed 1 week post calving, and this difference persisted through lactation. There were only four twins sets in this age group.

The body-weight curves of mature cows (3 years and older) of Experiment 2A and 2-year-old cows of Experiment 2B showed

very similar mean body weights for both treatment and control groups. Mature treatment cows of Experiment 2B lost an average of 10 kg of liveweight over the 8-week treatment period in comparison with their control twin mates. These cows recovered this lost body weight over the following 9-week period, mean body-weight values for treatment and control groups being 413.9 and 414.4 kg, respectively, at 17 weeks post calving.

DISCUSSION

The overall production gains at 20 weeks were quite small. This suggests that the increased milking frequency did not significantly increase the production gains achieved by the management techniques employed in Experiment 1. However, there is some evidence, particularly in the case of the mature cows of Experiment 2B, that the increased milking frequency led to real increases in milk production which could not be sustained by the feed intake. As a result, the cows lost body weight, which was made up later in lactation at the expense of production. It could be speculated that if the production gains resulting from increased milking frequency in early lactation were matched by high dry-matter supplementary feed, the body-weight losses could be avoided, and the increased peak production might then carry over into later lactation. The production gains from the 1 week of thrice-daily milking are interesting as they indicate a substantial carryover effect. If this could be maintained later into lactation it could represent a worthwhile gain from a relatively small labour input.

The major gain, however, can be achieved by the early lactation management techniques employed in the first experiment. If the 54% of dairy farmers currently using the "single-suckling once-daily milking" regime were to change to twice-daily milking with or without the use of multiple suckling of bobby calves, the gain in total production at present-day prices would be worth \$16 million annually. This is surely a worthwhile objective.

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