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Effects of varying feeding time on diurnal calving patterns in dairy cows

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ABSTRACT

Normal calvings among 527 cows in a Ruakura Research Station herd (No. 1) were not evenly distributed throughout the 24 hours. They were most frequent in the early morning (0100 h to 0600 h, 39%) and afternoon (1300 h to 1900 h, 29%). This diurnal pattern was consistent between years. Altering feeding time from 0700 h to either 1600 h or 1900 h did not increase the frequency of daylight calvings. Feeding at 1900 h did produce 2 periods of intensive grazing each 24 h instead of only one. If a beneficial change in calving pattern is to be produced, it may be necessary to disrupt the period when most cows rest (0100 h to 0600 h) by feeding at around 0300 h.

Keywords Dairy cows; calving times; feeding times; grazing times.

INTRODUCTION

Supervision of calvings would be facilitated if most cows calved during daylight. It has been suggested that the frequency of "daylight" calving can be increased by feeding cows at night during the last month of pregnancy. Reports recommending evening feeding have been published in farming journals (Farmers Weekly, 1981; Anderson, 1983; Senft, 1983). These prompted Joe (1983) to test the recommendation in herds in his Matamata practice. He reported that late afternoon feeding (1600 h) caused 90% of cows to calve during daylight hours.

Results from studies in American Holstein dairy cows were inconsistent. Clark *et al.* (1983) reported that feeding at 1730 h in comparison to 0800 h increased daylight calvings (72% v 55%). Pennington and Albright (1983) found that 68% of cows calved during daylight irrespective of feeding time. Early morning feeding produced 55% daylight calvings whereas late afternoon feeding reduced it to 32% in 517 calvings reported by Armstrong *et al.* (1983).

No calving time studies have been made in New Zealand dairy herds; neither have time-of-feeding effects been systematically compared. Since the actual or estimated time of calving has been routinely recorded in one Ruakura herd (No. 1) for the last 6 years, and feeding times could be varied in other herds (No. 2 and No. 3), the opportunity was taken to study the effects of some selected factors on calving time.

MATERIALS AND METHODS

The normal management of cows in late pregnancy in Ruakura herds (Nos. 1, 2 and 3) involves break grazing improved ryegrass-white clover pastures so that the average intake of pasture is equivalent to 6 to

8 kg dry matter/cow/d. Pasture hay or silage is fed as a supplement on the pasture when required. Cows are given access to the daily break between 0700 and 0800 h. Most calve in July or August (No. 2) and August or September (Nos. 1 and 3).

No. 1 Dairy

Over 50 sets of monozygous twins calved in this herd each year from 1979 to 1984 (6 seasons). The pregnant cows were frequently checked throughout the day and at selected times during the night. When the completion of a calving was not observed, the time of calving was estimated from the state of the calf when first seen.

No. 2 Dairy

Cows in this herd were included in a time-of-feeding trial in 1984. They were permanently divided into 8 groups, each of 24 cows. All were high breeding index Friesians. Three groups were fed at 0700 h, 3 at 1600 h and 2 at 1900 h. The 2 experimental feeding regimes (1600 h and 1900 h) were used from 8 July, with calving expected to commence on 15 July. These feeding times were maintained until 24 August. Each group of pregnant cows was checked at 0700, 1200, 1600 and 2100 h, and each day was divided into 4 intervals between these times for recording purposes.

No. 3 Dairy

Two feeding times (0700 and 1900 h) were compared in 1983 and 1984 in the herd which comprised monozygous twins and Sahiwal cross cows. Calving times were recorded using the same procedure as in the No. 1 herd. In the second year, the 32 or 33 cows in the 2 groups were closely observed for a 48 h

period. During this time, the numbers of cows grazing, standing or lying were recorded at 10 minute intervals.

RESULTS

The time pattern of 527 normal calvings over a 6-year period in the No. 1 herd was not evenly distributed throughout the 24 h of the day. The hourly percentages ranged from 10.2% (0200 h) to 1.7% (1800 and 2300 h). Peaks in calving occurred around 0200, 0500, 1300, 1600 and 2000 h. The consistency of the calving pattern when each season's results were divided into four 6-hour periods is seen in Table 1. The greatest proportion of calvings occurred from 0030 to 0629 h in each season (Table 1). The 6-year average of 38.9% was balanced by reduced calving frequencies from 0630 to 1229 h (15.9%) and from 1830 to 0029 h (16.3%).

TABLE 1 Annual variation in the diurnal frequency of 527 normal calvings during four 6 h periods in a herd of monozygous twin dairy cows (No. 1 herd).

	% normal calvings between (h):			
	0030-0629	0630-1229	1230-1829	1830-0029
All cows	38.9	15.9	28.8	16.3
Season: 1979	35.4	17.7	22.8	24.1
1980	33.3	24.1	28.7	13.8
1981	37.0	18.5	31.5	13.0
1982	48.1	7.6	30.3	13.9
1983	36.4	11.1	32.3	20.2
1984	44.0	16.5	26.4	13.2

When cows in the No. 2 herd were fed at 0700 h, a higher proportion calved in the afternoon (1200 to 1600 h) and a lower proportion in the evening (1600 to 2100 h) than in the No. 1 herd ($P=0.05$; Table 2). The No. 3 herd had a higher proportion of night calvings (64.8%), and low proportions of morning and evening calvings (5.6% and 7.4%) ($P<0.05$; Table 2). The No. 2 pattern was consistent between the 3 groups of cows in the same season, and the No. 3 herd's pattern was consistent between seasons.

Changing the time of feeding to 1900 h significantly altered the calving pattern in the No. 2 and No. 3 herds when compared to the respective groups fed at 0700 h ($P<0.05$; Table 2); but the change in pattern differed. Feeding at 1900 h eliminated morning calving in the No. 2 herd and increased the incidence in the No. 3 herd (Table 2). Feeding at 1600 h did not alter the calving pattern in the No. 2 herd ($P<0.10$; Table 2).

During the 48 h period of observing the groups fed at either 0700 h or 1900 h in the No. 3 herd in 1984, the average proportions of time spent grazing,

TABLE 2 Frequency of calving during selected periods in 3 Ruakura herds and effects of altered feeding times.

Feed time (h)	Herd	n	% normal calvings between (h):			
			0700-1200 (morning)	1200-1600 (afternoon)	1600-2100 (evening)	2100-0700 (night)
0700	1	527	17.3	21.0	15.7	45.8
	2	43	18.6	34.9	4.7	41.9
	3	54	5.6	22.2	7.4	64.8
1900	2	26	0	38.5	11.5	50.0
	3	60	13.3	18.3	10.0	58.3
1600	2	46	10.9	32.6	4.3	52.2

standing or lying in the 0700 h group were 36%, 31% and 33% respectively, compared to 36%, 34% and 29% in the 1900 h group ($P<0.10$). Grazing patterns were different between the 2 groups. The 0700 h group had a single intensive grazing period from 0700 h to 1200 h and spent most of the night standing or lying. The 1900 h group had 2 periods of intensive grazing (1900 h to 0030 h and 0700 h to 1000 h), each followed by a period of lying.

DISCUSSION

The seasonally concentrated calving pattern in most New Zealand dairy herds often creates a severe demand on limited labour resources. This can be exacerbated if some animals require assistance with calving. Monitoring calving would be facilitated if simple management strategies could be applied to minimise the incidence of calving at night.

No consistent diurnal pattern of calving is apparent among the limited number of reports in the literature. The 2 most comprehensive studies concluded that time of calving was evenly distributed throughout the 24 h of the day in dairy (Edwards, 1979) and beef cattle (Yarney, *et al.*, 1982). This was in contrast to observations by Arthur (1961) and Dufty (1971) who reported that most calvings occurred at night; while Ewbank (1963) and Pennington and Albright (1983) found the reverse.

If time of feeding did influence the diurnal pattern of calving, then a partial degree of uniformity would be expected in New Zealand dairy herds. This is because most herds are "break" fed during the dry period, with a new break being provided during the morning. The results from the Ruakura herds did show that with feeding at 0700 h, each herd had its own consistent pattern either between years (herd 1; Table 1 and herd 3) or for groups of cows in the same year (herd No. 2). Each herd had periods of increased calving frequency during the afternoon and at night. Although the intensive grazing period which follows feeding at around 0700 h may contribute to the reduced frequency of calving for several hours, it does not

explain the reduced frequency of evening calvings (Tables 1 and 2).

Changing the feeding time can alter the calving pattern (Table 2). However, if the feeding time was to substantially increase the frequency of calving during daylight, greater emphasis may have to be placed on modifying grazing times to extend the period of reduced grazing activity during daylight. For example, feeding cows between 0200 h and 0400 h may disrupt the normal major resting time and delay the period of greatest calving frequency to coincide with sunrise. If the period of intensive grazing was completed by 1000 h, the frequency of afternoon and evening calvings may also increase. The recent development of an electronic timing device ("Gate Release" Product No G642, Gallagher Electronics Ltd) makes feeding at these otherwise awkward times a practical possibility.

The results in the Ruakura trials did not demonstrate any real advantage through feeding cows at 1600 h or 1900 h (Table 2). Nonetheless, different effects on calving patterns may occur in herds which did not have the same diurnal patterns as the cows in Ruakura herds fed at 0700 h.

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