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Milk production and production worth of anoestrous dairy cows compared with their cycling herd mates

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ABSTRACT

The primary aim of this study was to determine whether the milk production and production worth (PW) of anoestrous (AA) cows differed from that of their cycling (CYC) herd mates. In addition, a pilot survey was carried out to examine between herd factors, which may influence the percentage of cows diagnosed anoestrous.

Individual production records were collated from 7786 cows in 26 herds, in which AA cows were identified following veterinary examination seven days before the planned start of mating. Milk production and PW did not differ between AA and CYC cows, after adjusting for herd, age and days in milk ($p>0.05$).

The percentage of cows diagnosed AA varied from 13.4% to 51.5% among herds. Completed questionnaires were obtained from 19 herd owners regarding management factors in these herds. Stocking rates were higher in herds with a low percentage of anoestrous cows (<30%AA) compared with those with a high percentage (≥30%AA; $p=0.05$), but level of supplementary feeding was higher in herds with a low level of anoestrous ($p=0.01$).

It is concluded that milk production and PW do not differ between AA and CYC cows. Nutritional supplementation after calving may influence the percentage of a herd still anoestrus before the start of mating.

Keywords: Dairy cows; anoestrus; production; fertility.

INTRODUCTION

The prevalence of postpartum anoestrus is significantly related to age of cow and interval from calving, however, there is no relationship with breeding worth of cows (Rhodes *et al.,* 1998). A number of studies carried out in the USA and UK have demonstrated a negative effect of increasing milk yield on reproductive performance. High producing cows have increased intervals to first detected oestrus and intervals from calving to conception, compared to average or low producing cows (Harrison *et al*., 1990; Hageman *et al*., 1991; Dhaliwal *et al*., 1996). In New Zealand there has been a trend for average milk production to increase, with annualmilkfat production per cow increasing from 110 kg in 1950/51 to 165 kg in 1997/98 (Anon, 1998). Production worth (PW) is an index which reflects the ability of a cow to convert feed into profit over her lifetime, based on her production and liveweight. The PW of Holstein-Friesian cows born between 1984 and 1997 has increased from $0 to $55 (Anon, 1998). There is also a perception that there has been an increase in the prevalence of anoestrus associated with increasing milk production. The primary aim of the current study was to determine whether the milk production and PW of anoestrous (AA) cows differed from that of their cycling (CYC) herd mates when measured at the herd test nearest to the herd's planned start of mating (PSM). Also, as there is a high degree of variation between herds in the prevalence of postpartum anoestrus (Rhodes *et al.*, 1998), a pilot survey was carried out to explore the between herd factors which may influence the percentage of the herd diagnosed anoestrous before the start of mating. The results of that survey are presented here.

MATERIALS AND METHODS

Individual production records were collated from 7786 cows in 26 spring calving herds in the Waikato region, following herd tests conducted between 37 days before and 34 days after the PSM. Anoestrous cows were defined as animals which had not been detected in oestrus and had no detectable corpus luteum following veterinary examination, seven days before the PSM. Animals with a detectable corpus luteum were included with cows which had been detected in oestrus and were assumed to have ovulated without expression of oestrus. Cows which had calved less than 21 days before veterinary examination were excluded from the analysis. Data from 5723 CYC and 2063 AA animals were used in the analysis. The effect of reproductive status (AA *vs.* CYC) on daily milk volume, milk solids production and PW was examined using analysis of variance, with age class (2 yr. old, 3 yr. old or >3 yr. old) and herd included in the model, and interval from calving to herd test as a covariate.

A questionnaire was sent to all herd-owners participating in the above study asking them about herd structure, farm management and their level of education. Responses were obtained from 19 herd owners. Herds were retrospectively categorised into Low anoestrous (<30%) or High anoestrous groups (≥30%), as determined by the percentage of the herd diagnosed anoestrous. Supplemental energy intake was calculated by assuming that maize silage has a metabolisable energy of 10.5 MJ/kg DM, grass silage 9.0 MJ/kg DM and hay 8.0 MJ/kg DM. Differences between High and Low groups were examined using analysis of variance for continuous variables and χ^2 analysis for dichotomous variables, with Fisher's exact test being used when cell sizes of less than five were present.

RESULTS

Mean (± SEM) herd size was 304 ± 20 cows, ranging from 165 to 713 cows. Within herd the percentage of cows diagnosed AA varied from 13.4% to 51.5%.

Milk solids production and PW did not differ between AA and CYC cows (p>0.1). Adjusted milk volume for CYC and AA cows was 18.8 ± 0.5 and 19.0 ± 0.5 litres/day, respectively (p=0.08). There was a significant herd by age class interaction influencing milk yield, milk solids production and PW (p<0.001), but there was no interaction between reproductive status and herd or age class for any variable (p>0.1).

There was no difference between herds with Low or High rates of anoestrus in their farm area, farm management or herd age structure (Table 1). Herd owners did not differ in the number of years spent in dairying (16.3 ± 2.0 vs. 19.7± 3.5 for Low and High herds, respectively, p=0.38), nor in the percentage that had a tertiary qualification (58.3% vs. 42.9% for Low and High herds, respectively; p=0.43). There was a tendancy for a greater proportion of Low herds to be fed maize silage as a supplement after calving (p=0.17) and the supplemental energy fed in these herds was significantly greater than in High herds (p=0.01, Table 2, Figure 1). Stocking rates were significantly higher in Low herds than in High herds (p=0.05, Table 2).

TABLE 1: Farm management and herd structure in herds with <30% (Low) or ≥30% (High) percentage of cows diagnosed anoestrous before the start of mating.

	Percentage anoestrus		
	Low	High	p*
Effective farm area (ha)	110.0 ± 12.4	109.7 ± 7.8	0.99
2 yr. old cows in herd (%)	19.0 ± 0.7	20.4 ± 1.0	0.24
3 yr. old cows in herd (%)	17.0 ± 0.9	16.1 ± 2.5	0.52
Friesians in herd (%)	68.3 ± 7.1	71.2 ± 10.5	0.82
Condition score at calving	4.7 ± 0.2	4.8 ± 0.3	0.2
Condition score at mating	4.2 ± 0.2	4.3 ± 0.3	0.49
Cows in herd induced (%)	10.7 ± 3.1	10.5 ± 1.7	0.95
Pre-mating heats recorded for individual cows	66.7%	85.7%	0.37

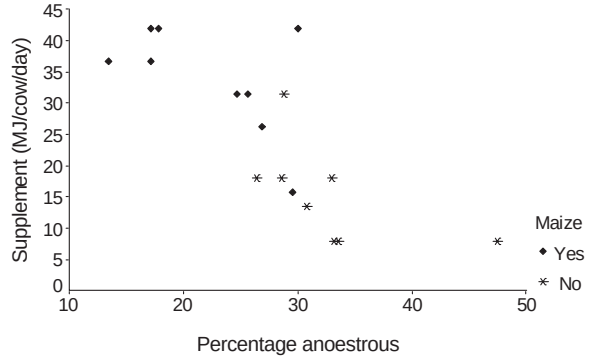
*Significance of difference between groups.

TABLE 2: Feeding management in herds with <30% (Low) or ≥30% (High) percentage of cows diagnosed anoestrous before the start of mating.

	Percentage anoestrus		
	Low	High	p*
Farm walked weekly	66.7%	42.9%	0.30
Interval from excess pasture to PSM (days)	14.8 ± 4.3	16.4 ± 2.5	0.80
Stocking rate (cows/ha)	3.1 ± 0.1	2.8 ± 0.05	0.05
Supplement fed after calving	83.3%	100%	0.39
Maize silage fed after calving	63.6%	28.6%	0.17
Supplemental energy intake (MJ/cow/day)	31.4 ± 2.7	16.2 ± 4.6	0.01

*Significance of difference between groups.

FIGURE 1: Relationship between energy intake in supplementary feed and the percentage of the herd diagnosed anoestrous, for herds feeding maize silage or another supplement.



DISCUSSION

No significant difference was found in milk solids production, milk volume or PW between cows which were diagnosed AA before the start of mating compared to CYC cows. This study included herd production records from nearly 8000 cows in 26 commercial herds. These findings are in contrast with those of overseas studies in which increased intervals to first detected oestrus were observed in higher producing cows (Harrison *et al.*, 1990; Hageman *et al.*, 1991). However, milk production by New Zealand cows is still significantly lower than that observed in the USA or Europe, with daily yields of milkfat averaging 0.73 kg compared with 1.0 kg in the UK (Veerkamp *et al.*, 1995; Anon 1998). Obviously environmental factors are the main determinants of milk production and also influence duration of the postpartum anoestrus interval. Level of nutrition is the main factor limiting production in New Zealand and is also likely to be the main determinant of the prevalence of anoestrus in herds. Interval to first oestrus after calving is significantly related to condition score at calving and dry matter intake after calving (Grainger *et al.*, 1982; McDougall *et al.*, 1995).

The preliminary survey of herds with low or high levels of anoestrous also indicated that nutritional factors were of importance. Although numbers of herds included were small, herds with less than 30% of cows anoestrous seven days before the PSM had fed supplements with a significantly greater energy content after calving compared to herds with more than 29% of cows anoestrous. There was also a tendency for a greater proportion of Low herds to have used maize silage as a supplement. Interestingly, stocking rates were significantly higher in the Low than the High herds. This suggests that these herd owners were making better utilisation of the available pasture, or that the increased use of supplementary feeding was compensating for lower pasture intakes.

The age or breed structure of the herd did not appear to influence the proportion of anoestrous cows. There was no difference between Low and High herds in the percentage of young cows (2 or 3 year old) or in the percentage of Friesians in the herd. Previous studies have shown that younger cows have a longer interval from calving to first oestrus and that Friesians have a longer interval than Jerseys (Macmillan and Clayton 1980; McDougall *et al.*, 1995). The results of this initial survey indicate that nutritional and management factors play a more important role in the level of anoestrus within a herd than do genotype or age structure of the herd. Further investigation of the role of pre-mating supplementary feeding in shortening the post-

partum anoestrus interval should be a priority for future trials.

In conclusion, milk yield, milk solids production and PW did not differ between cows diagnosed anoestrous before the start of mating compared to cows which had resumed oestrous cycles. A preliminary survey explored between herd factors influencing the proportion of cows still anoestrous before mating. Results of this survey suggested that herds with a low level of anoestrus fed a higher level of supplementary energy to cows following calving compared to herds with a high level of anoestrus.

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