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Screening herds for cows with a history of twin calving

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ABSTRACT

Dairy and beef cows ($n=349$) which had calved at least two sets of twins were identified in farmers' herds in 1982-85. Their calving performance is summarised here, and an experimental herd was founded from a sample of them. The calvings of 11 high twinning-rate dairy herds identified from this publicity are also summarised. Repeat-twinning cows were from factory-supply dairy herds (66%), town-supply dairy herds (10%), beef herds (21%) and house cows (2%). The twin calving rate in factory-supply survey herds with Friesians was 2.6%, greater than the national average. There were, on average, 2.44 twin or triplet sets per cow. Of all the multiple births, 1.3% were triplet sets. Data on sex ratios of calves from the twinning cows suggested that probably all their twins were the result of multiple ovulations. Perinatal calf survival rates averaged 86%, with 80% of sets having both calves surviving; 21% of twin calvings were associated with a retained placenta, and 18% of twin calvings were assisted. Mean ages of cows at first and later twin calvings were also summarised. The 11 'elite' herds averaged a 4.1% twin calving rate (21 000 records), with 16% of cows calving at least one set of twins. Subsequent twin calving frequencies were summarised. The 69 foundation experimental cows averaged 2.39 twin sets and a 50% twin calving rate/year at purchase, and subsequently (1983-89) a twin calving rate of 10.3% (18 sets/174 calvings) compared with controls at 0.8% (1/121).

Keywords Cattle, twin calving, repeatability, calf survival, assisted calvings, retained placenta.

INTRODUCTION

It is well known that increasing twin calving rates should increase the biological efficiency of beef cattle production (Dickerson, 1978). However, the net increase will depend on any side effects of twin calving such as lower calf survival and greater dystocia (Cady and Van Vleck, 1978).

Prolific cows were sought from the New Zealand beef and dairy industries for a long-term Ruakura breeding project. This paper reports the calving data from questionnaire replies completed by herd owners, along with additional data from 11 selected dairy herds with a high twinning rate. The twin calving rates (for the years before and after purchase) of the 69 cows included in the experiment are also reported.

MATERIALS AND METHODS

Questionnaire Data

Questionnaire replies from the owners of 349 cows, each of which had produced at least 2 sets of twins or

higher order births, were obtained in 1982-85. The information obtained was:

- Farming type (beef herd, factory- or town-supply dairy herd or house cow)
- Herd twin calving rate
- Identification of cow, sire and dam of cow, year of birth and breed
- Years of twin calvings, and for each twin calving year:
- Sexes of calves and perinatal survival status
- Calving assistance or not (inductions or abortions also noted)
- Placenta retained or not
- Calving date, and calving dates in the previous and subsequent year.

Data from 11 Selected Herds

Eleven selected herds with high twin calving rates (average 4.1%), identified from the above questionnaires, were studied further. They comprised 9 Holstein-Friesian and 2 Milking Shorthorn pedigree

TABLE 1 Performance history of cows with at least two sets of twins.

Character	Herd type ^a				
	Factory supply	Town supply	Beef	All cows	Purchased cows
Number of cows	232	34	75	349	69
Number of twin sets per cow	2.40	2.53	2.51	2.44	2.39
Herd-of-origin twin calving rate, %	2.67	4.21	3.70	3.03	2.46
Age : when 1st set born, yr	5.0	4.0	4.4	4.8	3.9
: when 2nd set born, yr	6.8	5.9	6.1	6.6	5.4
: interval, 1st to 2nd, yr	1.8	1.9	1.7	1.8	1.5
% with 2 sets by age 6 yr	50	62	64	55	74
Estimated no. of matings/cow ^b	6.5	5.6	5.1	6.1	4.8
Cow twin calving rate/yr	0.37	0.45	0.49	0.40	0.50
Placenta retained ^c	24	24	11	21	16
Calving assistance ^c	22	26	5	18	14
Calf survival among twins ^d , %	85	79	88	86	84

^a Excludes house cows; ^b Assumes age at 1st calving = 2.0 yr (factory-supply cows), 2.75 yr (beef), 2.2 yr (town-supply); average = 2.18 yr. Numbers of mating years are up to the last twin set recorded; ^c % of twin calvings; ^d Perinatal survival.

herds. Their twin calving rate was about 4 times the national average in dairy herds of c 1% (New Zealand Dairy Board, 1961). In total, data were obtained for 141 herd-years of calving from 4269 cows and 21000 calving records. The herd twin calving rate (number of twin calvings per cow calved) was obtained for each herd each year and the pedigree of all twin-calving cows was established. The frequency distribution of cows producing 1 to 5 sets of twins was then derived.

Purchased Cows

From the 349 cows identified in the questionnaire, 69 were subsequently purchased for a Ruakura twin-breeding experiment: 35 in 1982/83, 23 in 1983/84 and 11 in 1984/85. Their calving records before purchase were summarised as for the remainder of the 349 cows. After purchase, their calving records were also summarised, alongside 41 contemporary control cows, balanced as far as possible for breed and age.

RESULTS

Questionnaire Data

From 349 cows, 232 (66%) were from factory-supply dairy herds, 34 (10%) from town-supply dairy herds, 75 (21%) from beef herds and the remaining 8 (2%) were house cows. Of the factory-supply cows, 127 (55%) were Holstein-Friesian or Friesian-cross, 44 (19%) were Jersey or Jersey-cross and a large number, 59 (25%), were Ayrshire or Milking Shorthorns, with 2 (1%) other dairy crosses. Among the town-supply cows, 30 (88%) were Holstein-Friesians. Among the cows from beef herds, 41 (55%) were Angus, Hereford or traditional beef breed crosses, 18 (24%) were exotic or exotic crosses (mainly Charolais and Simmental), and there were 16 (21%) cows of dairy breeds or crosses. Overall, 206 (59%) cows were from herds north of Taupo, 103 (30%) from other North Island herds and 40 (11%) from South Island herds. For the 69 purchased cows, 71% came from factory-supply herds, 23% from beef herds and 3% each from town-supply herds and house cows.

TABLE 2 Herds with data selected by different methods: twin calving rate and frequency of cows^a with repeated twin calvings.

Twin data	From	11 selected	<u>Experimental cows</u>	
	questionnaire	herds	Before ^b	After ^c
No. of cows with >1 twin set	349	138		69
Herd-of-origin twin calving rate, %	3.0	4.1		2.5
No. (and %) with				
3 twin calvings	77(22)	21(15)	13(19)	23(33)
4 twin calvings	16(5)	6(4)	4(6)	8(12)
<u>5+ twin calvings</u>	<u>13(4)^d</u>	<u>1(1)</u>	<u>2(3)</u>	<u>2(3)</u>
3+ twin calvings	106(30)	28(20)	19(28)	33(48)

^a Selected as having produced at least 2 twin sets; ^b Records before the time of purchase; ^c Including experimental calvings in 1983-89;

^d 11 with 5 each, 1 with 7 and 1 with 9 sets.

Calving performance is shown in Table 1, for all cows and for selected subgroups. The average numbers of twin sets from each group were similar, averaging 2.44 sets overall. Herd-of-origin twin calving rates, however, varied according to herd type. Selecting Friesian herds only, the twin calving rate was 2.6% in factory-supply herds, but 1.7 times higher than this (4.4%) in town-supply herds. The value in beef herds was made up of a mean of 5.4% contributed by exotic or exotic-cross herds, with 3.2% for other beef herds. Adjusting for ascertainment would reduce these herd means by about 0.4 percentage points.

Age of cow at first twin birth averaged 4.8 yr. The value in town-supply herds was lower, presumably because their mean herd twin calving rate was higher. The interval between first and second twin sets averaged 1.8 yr (and 1.6 yr for subsequent sets), with 55% of cows calving two sets of twins by 6 years of age. Overall, 54 and 26% of cows produced their second set of twins one or two years respectively after the first set. All these age or interval parameters were lowest in the purchased cows, reflecting the selection differential applied before purchase.

Using the estimated number of mating years per cow up to the last twin set recorded (Table 1), and the mean of 2.44 twin sets per cow-year, the twin calving rate per cow was calculated as 0.40, ranging from 0.37 sets/cow-yr in factory-supply herds to 0.49 in beef herds and 0.50 for purchased cows.

Overall, 21% of cows retained the placenta after a twin calving, and 18% of cows were given assistance during a twin calving. There were lower mean values in beef herds, presumably reflecting the lesser degree of supervision available. For calving assistance, the 5 (0.8%) reported abortions and 16 (2.7%) inductions were excluded from the averages above.

There were 11 (1.3% of all multiples) sets of triplets recorded. Excluding these, calf sex combinations at birth were known for 772 twin sets as follows: 178(23.1%) male-male, 227(29.4%) female-female and 367(47.5%) male-female, which did not differ significantly from a 1:1 distribution of like-sex versus unlike-sex pairs. Thus, the cows reported in this questionnaire were probably all multiple ovulators, rather than producers of identical twin sets. Overall, 723 (46.8%) were male calves and more, 821 (53.2%), were females ($P < 0.05$).

There were significant differences in perinatal calf survival according to calf sex ($P < 0.01$), with 85.8% of calves surviving overall. Both calves survived in 80.1% of pairs, there were 11.4% where one of the pair survived and 8.5% where neither survived; 91.2% survived among female-female pairs, 86.2% among female-male pairs and 83.0% among male-male pairs. Additionally, there was a 53.6% survival rate for 28 pairs where sexes were not known or not reported.

Intercalving Intervals

The intercalving interval (CI) after a twin calving averaged 377 days (n=281 records), excluding abortions and induced calvings. Using data from factory supply herds only, CIs immediately before a twin calving averaged 375 and 369 days, depending on whether the preceding calving was a single or prior twin calving, respectively. This apparent 6-day reduction due to pregnancy status was not significant.

Data from 11 Selected Herds and from Purchased Cows

From 681 cows (16%) that produced at least one set of twins, 138 (20%) of them produced at least one further set. The subsequent repetition of twin calving ability is shown in Table 2. The corresponding data from cows in the questionnaire or from experimental cows before purchase are also shown. From 20 to 30% of twice-twinning cows produced at least a third twin set, with 4 to 6% producing 4 sets and 1 to 4% producing 5 or more sets.

The 69 purchased cows with a history of 2.39 calf sets each, or 0.50 calf sets per mating (Table 1), subsequently produced 18 more sets (10.3% twin calving rate) from 174 calvings during the calving years 1983-1989. Their average age on arrival in the experiment in 1982/83 to 1984/85 was already 7.4 years, and the lifetime twin calving rate then fell from 0.50 to 0.33 by 1989. Nevertheless, by retaining these cows to greater ages, the number producing at least 3 twin sets rose from 28 to 48% of all those purchased. Contemporary control cows over the same experimental period produced only 1 twin set from 121 calvings (0.8% twins).

DISCUSSION

Questionnaire Data

There was a higher twin calving rate in town-supply than factory-supply herds. Most of the former herds had predominantly autumn calvings, which is thought to lead to a higher twin calving rate, consistent with American data from a twin selection herd (Gregory *et al.*, 1990a), calved partly in spring (6% twins) and

partly in autumn (13% twins).

High twin calving rates of the Charolais and Simmental breeds are well known in Europe (e.g. Frebling *et al.*, 1982). In New Zealand, all pedigree herds averaged twin calving rates of 1.7% (Charolais) and 2.1% (Simmental) in 1983, compared with all other beef breeds on Beefplan (mainly Angus and Hereford) at 0.7% (C.A. Morris, unpublished data)

Overseas data on rates of placenta retention, calving assistance and twin calves surviving at birth were +19%, +12% and 82% (Gregory *et al.*, 1990b), similar to the values found here of 21, 18 and 86%, respectively. Cady and Van Vleck (1978) found a perinatal calf survival rate of 78%. Gregory *et al.* (1990b) found a difference of 7 days between the gestation length of a single or twin pregnancy, very similar to the CI contrast here of 6 days following a single or twin pregnancy.

Data from 11 Selected Herds and from Purchased Cows

The frequency of randomly sampled cows with a second set of twins averaged only 10%, according to the review by Morris (1984), compared with 30% in the selected cows and 20% in the selected sample of herds in this study.

The subsequent twin calving rate of 10.3% after purchase was to be expected from a single-record repeatability of about 0.06 (Morris and Day, 1986). For comparison, the actual repeatability estimate (Gregory *et al.*, 1990a) from purchased foundation cows was 0.08, but it was 0.16 for cows born and reared within one location.

Comparing records of the foundation cows at purchase (7.4 years of age) and in old age at disposal (10 years) pointed to a difficulty in finding an early phenotypic selection criterion. Mean values for possible criteria at 7.4 or 10 years respectively were: number of twin sets per cow, 2.39 and 2.65; percent with more than 2 sets, 28 and 48; but estimated twin calving rate per cow-yr, 0.50 and 0.33.

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