BIRTH WEIGHTS OF DAIRY, BEEF AND DAIRY-BEEF CALVES

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SUMMARY

The birth weights of 708 calves born in 1966 to identical twin and unrelated dams in two trials are presented.

On the average, pure-bred Friesian bull calves weighed 38.5 kg, which was 13 kg heavier than pure-bred Jersey, and 7.8 kg heavier than Aberdeen Angus bull calves.

The mean sex corrected birth weight of Charolais x Jersey calves born to identical twin dams was 34.7 kg; this was 6.5 kg heavier than Friesian x Jersey calves and 1.1 kg heavier than Hereford x Jersey calves, with a similar ranking order of birth weights for calves of these three crosses born to unrelated dams.

LITTLE INFORMATION exists on the birth weights of cattle in New Zealand. The first importation into New Zealand, in 1965, of semen from Charolais bulls for use in beef production research programmes provided an opportunity to record details of calving performance of different breeds and crosses of cattle.

This communication offers estimates of the birth weights of dairy, beef and dairy-beef calves born in 1966; detailed records of calving performance will be published elsewhere at a later date.

MATERIAL AND METHODS

The data originate from two series of experiments, namely, Ruakura trials and farm trials. Table 1 records the number of single-born, live calves involved in this analysis, categorized by breeding and sex within each series.

RUAKURA TRIALS

Three cross-breds—Charolais x Jersey (C x J), Hereford x Jersey (H x J) and Friesian x Jersey (F x J)—and three purebreds—Aberdeen Angus (AA x AA), Friesian (F x F) and Jersey (J x J)—were represented, with the sire breed shown first.

Cross-bred calves were derived from identical twin Jersey dams, splitting the pairs between two of the three sire

breeds at the time of insemination. Dams were held on three separate dairy units at Ruakura.

Pure-bred calves originated from unrelated dams; the AA x AA from either the beef herd at Whatawhata Hill Country Research Station or a smaller herd at Ruakura, the J x J from dairy cows at Ruakura dairy units, and the F x F from one large commercial dairy herd located near Hamilton.

All calves were identified and weighed within 12 hr of birth.

TABLE 1: NUMBER OF CALVES REPRESENTED

Breed or Cross	Sex	Number of Calves			
		Ruakura Trials		Farm Trials	Total
		Identical Twin Dams	Unrelated Dams	Unrelated Dams	
C x J	M	19	—	63	82
	F	11	—	54	65
					147
H x J	M	16	—	89	105
	F	22	—	72	94
					199
F x J	M	29	—	87	116
	F	17	—	54	71
					187
AA x AA	M	—	35	—	35
	F	—	26	—	26
					61
F x F	M	—	54	—	54
	F	—	—	—	—
					54
J x J	M	—	39	—	39
	F	—	21	—	21
					60
Total	M	64	128	239	431
	F	50	47	180	277
	Total	114	175	419	708

Farm Trials

Data from three crossbreds (C x J, H x J and F x J), born to unrelated dams, have been used in this analysis. Calves were born on 22 co-operating dairy farms located within 40 miles radius of Ruakura. Identification and weighing of the calves at birth were undertaken by each farmer.

Ages of Dams

In both the Ruakura and farm trials, only calves of second or later parity were involved, the dams therefore being 3 years old or more at calving.

Sires-within-Breeds

AA x AA cows were naturally mated. All other cows in both series were artifically bred. The numbers of bulls representing each sire breed are recorded in Table 2.

Table 2: Number of Bulls Used

Sire Breed	Number of Bulls		
	Ruakura Trials	Farm Trials	Combined
Jersey	6	7	10
Friesian	22	22	27
Charolais	7	7	8
Hereford	7	7	7
A. Angus[1]	6	—	6

[1]Natural mating.

Some bulls were employed in both trials; other bulls were represented in one or other series. Similarly, semen from 17 Friesian bulls was used for inseminating both Friesian and Jersey cows, whilst semen from another 10 Friesian bulls was used only for one or other of these maternal breeds.

Biometrical Procedures

In these preliminary examinations, analyses of variance and covariance were used for all data, employing calf sex as a discontinuous covariate. For calves born to identical twin dams, the variance was apportioned be-

tween and within twin sets, thus eliminating age of cow and dairy of origin as sources of variation. For calves born to unrelated dams, the variation between breeds and crosses has been compared with that within breeds.

RESULTS

Cross-bred Calves

Mean birth weights and differences of cross-bred calves born to identical twin dams in the Ruakura trials and to unrelated dams in the farm trials are given in Table 3.

TABLE 3: MEAN BIRTH WEIGHTS OF CALVES BORN TO IDENTICAL TWIN DAMS (RUAKURA TRALS) AND UNRELATED DAMS (FARM TRIALS)

Cross	Ruakura Trials	Farm Trials
	Mean Birth Weights (kg)	
Charolais x Jersey (C x J)	34.7	32.8
Fricsian x Jersey (F x J)	29.3	30.4
Hereford x Jersey (H x J)	28.2	27.9
	Mean Differences ± S.E.	
(C x J)—(H x J)	6.5 ± 1.0***	4.9 ± 0.5***
(C x J)—(F x J)	5.4 ± 0.9***	2.4 ± 0.6***
(F x J)—(H x J)	1.1 ± 0.8	2.5 ± 0.5***

Birth weights adjusted for sex by covariance:
Ruakura trials, Male-female = 3.7 ± 0.9***
Farm trials, Male-female = 2.2 ± 0.5***
*** = $P < 0.001$

In both series, C x J calves were significantly heavier than either H x J or F x J calves, the differences between these crosses being greater in Ruakura trials than farm trials. F x J calves were heavier than H x J calves at birth in both series, but the mean difference was smaller and not significant for the contemporary half-sibs in the Ruakura trials.

Bull calves were significantly heavier than heifers at birth in both series, the difference due to sex being a little greater in the Ruakura than farm trials.

The standard errors of the mean differences indicate slightly greater variation in the farm than Ruakura trials, as might be expected, although greater numbers of animals were involved in the farm trials.

PURE-BREEDS

Table 4 shows the mean birth weights and differences of the three pure-breeds involved in the Ruakura trials.

TABLE 4: MEAN BIRTH WEIGHTS OF CALVES BORN TO UNRELATED DAMS IN RUAKURA TRIALS

Breed	Mean Birth Weights (kg) Male	Female
Friesian x Friesian (F x F)	38.5	—
Jersey x Jersey (J x J)	25.5	23.7
A. Angus x A. Angus (AA x AA)	30.7	29.6

Breed	Mean Differences ± S.E. Male	Female	Combined[1]
(F x F)—(J x J)	.... 13.0 ± 0.8***	—	—
(F x F)—(AA x AA)	.... 7.8 ± 0.9***	—	—
(AA x AA)—(J x J)	.... 5.2 ± 0.9***	5.9 ± 1.2***	5.5 ± 0.7***

[1]Adjusted for sex effect by covariance.
Male-female = 1.5 ± 0.7*.
*** = $P < 0.001$ * = $P < 0.05$.

Friesian bull calves at birth were substantially heavier than Jersey and Aberdeen Angus bull calves and the latter were heavier than the Jersey.

The adjustment for the sex effect favoured bull calves but the difference was small in comparison with the cross-bred calves.

DISCUSSION

These birth weights, and the variance estimates associated with them, must be regarded with due caution. Several additional sources of variation, such as those shown important in recent British (Anon., 1966) and other studies (reviewed Turton, 1964), need examination as further data are collected. Indeed, a complete comparison of different breeds and crosses will require particular attention to the variation between the breeds relative to that between sires-within-breeds. These results are, however, indicative of the effects attributable to the particular samples of sires used for each breed.

The results also focus attention on the substantial differences existing between breeds and crosses in the

important productive parameter of birth weight. Clearly, the J x J commences life under severe penalty from the point of view of beef production, whilst the F x F, on the other hand, possesses a distinct advantage. The traditional beef breed represented here, the AA x AA, lags considerably behind the F x F in birth weight and thus has a greater leeway to make up after birth in order to achieve the same weight at the same age.

Comparison of the cross-bred calves with the purebred J x J reveals the increase in birth weight resulting from the use of heavier sire breeds in a dairy-beef production programme. The use of Charolais semen on Jersey cows lifted the mean birth weight by nearly 40% over the J x J, to a level approaching the F x F. The increased birth weight resulting from use of Hereford semen was, by comparison, very small. Turton (1964), reviewing British studies, cites values of 39.2 kg and 37.0 kg for C x J bull and heifer birth weights, respectively.

Of real interest is that the birth weight of F x J crossbreds exceeded the H x J birth weight, and approximately equalled the AA x AA. In view of the marked increase occurring in the national use of Friesian semen, and the fact that F x J crossbred progeny can be directed to dairy or beef purposes, this result assumes great importance.

In a large body of data from a Hereford breeding herd, Koch and Clarke (1955a, b) found that genetic, maternal and environmental components of variation in birth weight were important and substantial with a heritability of 0.42 for birth weight. Evidence of heterosis in birth weight of cattle crosses among European breeds has not been clearly established (reviewed Mason, 1966), birth weights conforming generally to mid-parent inheritance. Without heterosis, smaller dams appear to depress birth weight of cross-bred offspring more than larger dams enhance it (Donald, *et al.*, 1962), the mean of reciprocal crosses falling below mid-parent, when inheritance is additive, but only by about 3% even when one parent is double the other, as in South Devon x Dexter crosses (Joubert and Hammond, 1958).

In these present experimental results, the F x J birthweight falls midway between the F x F and J x J after making allowance for the sex effect. The C x J birth weight lies nearer the birth weight of 25.5 kg recorded for J x J

than the 51.6 kg reported for pure-bred Charolais bull calves out of mature cows (Anon., 1959).

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