Breed differences in birth weights, calving difficulty, and mortality of Holstein, Jersey, and crossbred calves in a pasture-based dairy system.

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Introduction

One of the objectives in the crossbreeding system established at the Center for Environmental Farming Systems (CEFS) by Dr. Ben McDaniel was to evaluate calving ease and calf survivability among the various pure breeds, reciprocal crosses, and backcrosses in a planned criss-cross 2- breed mating system. Both calving ease and calf survival are traits of economic importance in that heifers or cows that experience difficult calvings often have associated problems leading to lower production and fertility and possibly even death of both the cow and the calf. Loss of calves at or near calving is an immediate economic loss of the value of the calf and potentially an additional cost in terms of fewer replacement animals for maintaining or expanding the herd.

Materials and Methods

Data on birth weights, calving ease, and calf mortality were collected for 451 calvings during the 2003 to 2005 calving seasons at CEFS. Calving difficulty scores were based on a 5-point scale where 1 is an unassisted, easy calving and 5 is an extremely difficult calving requiring substantial assistance and possibly surgical intervention. Calf mortality includes abortions recorded after mid-gestation, stillborn calves, and calves that did not survive past 24-h after parturition.

Data were examined with respect to parity of the dam (1st parity vs. all others), breed of sire (Holstein-H or Jersey-J), breed of dam (H, J, or various crossbred combinations-X), sex of calf (M or F), and interactions among these variables. All cows were managed similarly during late gestation to remove any effects of previous treatment regimens or feeding programs and these were not considered in the analyses.

Results

Of the 451 calvings recorded, there were just 6 sets of twins (1.3%) including 5 sets of pure Holsteins and one set from a crossbred cow (¾ Jersey twins from a J x H cow). All of these twins either aborted or were dead at birth except for one male/female pair of pure Holstein calves. Only 1 set of twins was from a first parity cow. Twinning rate among Holstein dams was 2.6 % whereas only one crossbred dam (0.7 %) and no Jersey dams had twins.

Birth weights (Table 1) differed significantly ($P < 0.001$) by breed of dam (H = 74, J= 60, X = 66; Standard Error = ± 1 lb.), breed of sire (H= 72, J = 61; S.E. = ± 0.8 lb.), parity of the cow (1 = 65, ≥ 2 = 69, S.E. = ± 0.9 lb.), and sex of the calf (M = 69, F = 64; S.E.= ± 0.8 lb.). Mean birth weights were ≤ 75 lbs for all combinations of breed, parity, and gender with three exceptions: 1) male Holstein calves from Holstein sires and dams in either first parity (82, S.E. = ± 3 lb.) or 2) second and later parities (83, S.E. = ± 2 lb.) or in male calves born to 2+ parity crossbred cows mated to Holstein sires (78, S.E. = ± 2 lb.).

Calving difficulty scores (Table 1) tended to differ significantly by dam breed (H = 1.3, J = 1.1, and X = 1.1 ± 0.5, P = 0.06) but sire breed was not significant (P = 0.11). The relationship between parity and calving ease was evident (P < 0.01), with higher calving difficulty scores for first parity dams than for more mature dams (1.27 vs. 1.06, S.E. = ± 0.04). Male calves had higher scores than heifer calves across all breed groups (1.22 vs. 1.1, S.E. = ± 0.05, P < 0.05).

However, there were significant interactions between calf sex and parity (P < 0.05), calf sex and sire breed (P < 0.05), and calf sex by parity by sire breed (P < 0.05). The interaction of calf sex with parity was such that male calves from first parity dams had higher calving difficulty scores than other calf sex and parity combinations (1.39 vs. 1.1, S.E. = ± 0.07). Similarly, the interaction of calf sex with sire breed can be explained in that male calves sired by Holstein sires had higher scores than for female calves from Holstein sires or for calves of either sex from Jersey sires (1.35 vs. 1.1, S.E. = ± 0.06).

The 3-way interaction of calf sex, parity, and sire breed had highest calving difficulty scores (1.6, S.E. = ± 0.1) for male calves from Holstein sires and first parity dams. Use of Jersey sires on first parity dams resulted in intermediate scores for male (1.17, S.E. = ± 0.1) or female (1.24, S.E. = ± 0.11) calves whereas all other combinations of sire breed, calf sex, and dam parity had very low calving difficulty scores averaging between 1 and 1.1.

The overall **mortality rate** through 24 hours after birth based on a total of 456 calves was 9.4 %. That figure includes abortions, twins that died, other stillbirths, etc. Holsteins dams had significantly higher scores than crossbred dams (H vs. X, P = 0.01) for (H= 13.3 %, J = 10.2 %, X = 3.5%, S.E. = ± 2.9). Some of the mortality losses associated with Holstein dams was related to the higher losses observed among the 5 sets of twins in that breed (8 of 10 calves failed to survive). %). Differences due to sex of calf were significant (M = 13.7 %, F = 4.4 %, S.E. = ± 2.8 %, P < 0.01), Table 1.

Also the 3-way interaction of breed of dam with calf sex and dam parity differed (P < 0.05) primarily because of higher mortality rates among male calves born to either first (18.8, S.E. = ± 5.0 %) or later parity (20.0, S.E = ± 3.1 %) Holstein dams or for male calves born to first parity Jersey dams (29.4, S.E. = ± 6.9 %). Least-squares means for mortality of heifer calves from first parity Holsteins was 10 .0 (S.E. = ± 6.4 %) and for male calves from crossbred cows at second or later parities was 8.1 (S.E. = ± 4.1 %). Other combinations of calf sex, dam parity, and dam breed had calf mortality rates under 6 %.

Conclusions

Additional data from another calving year will be added before a more complete analysis is undertaken. Addition of another year should increase the confidence of the results and interpretations. However, there are interesting trends within these data. Within the pasture-based system as managed at CEFS, overall calf mortality was 9.4 % and calving difficulty and calf mortality were related to parity, sex of the calf, and breed. Higher birth weights for calves from Holstein sires may account for some of the issues associated with calving difficulty and failure to survive calving, particularly in first parity cows. In contrast, calf losses among pure Jersey calves or Jersey heifers having Holstein-sired calves may not be as clearly related to higher birth weights although the numbers of those observations is relatively low. In any case, it appears that some crossbred combinations may have some advantages over the pure breeds in calf survival through calving.

Table 1. Least-squares means for birth weight, calving ease score, and mortality within 24h by breed, parity, and sex. Number of observations is included in parenthesis after birth weights.

Sire x Dam breeds	1st Parity						
	H x H	J x H	H x J	J x J	H x X	J x X	Range of Std. Errors
Birth Weight-lbs[1]							1.5 to 4.3
Sex M	82 (17)	72 (15)	63 (7)	49 (10)	67 (16)	63 (11)	
Sex F	73 (13)	68 (7)	59 (7)	50 (10)	71 (14)	58 (11)	
Calving Difficulty[2]							0.09 to 0.22
Sex M	1.9	1.4	1.6	1.0	1.4	1.1	
Sex F	1.2	1.0	1.0	1.2	1.0	1.4	
% Mortality <24h[3]							6 to 11 %
Sex M	24	13	29	30	0	0	
Sex F	8	14	0	0	8	0	

Sire x Dam breeds	2+ Parity						
	H x H	J x H	H x J	J x J	H x X	J x X	Range of Std. Errors
Birth Weight-lbs[1]							1.5 to 4.3
Sex M	83 (54)	75 (31)	75 (13)	59 (23)	78 (24)	62 (25)	
Sex F	75 (39)	68 (25)	67 (18)	52 (16)	71 (28)	62 (22)	
Calving Difficulty[2]							0.09 to 0.22
Sex M	1.3	1.1	1.0	1.0	1.0	1.0	
Sex F	1.2	1.1	1.0	1.0	1.0	1.0	
% Mortality <24h[3]							5 to 11 %
Sex M	22	16	0	9	8	8	
Sex F	8	0	0	13	0	5	

[1] Significant differences for birth weight include effects of dam breed; sire breed; parity; and calf sex ($P < 0.001$).

[2] Significant differences for calving difficulty scores (5-point scale) include effects of parity; calf sex; sire breed*calf sex; parity*calf sex; sire breed*parity*calf sex ($P < 0.05$); and dam breed ($P = 0.06$).

[3] Mortality includes calves born dead, those that died within 24-h, and abortions after 5 months of gestation. Significant differences for mortality include effects of dam breed; dam breed*calf sex; and dam breed*parity*calf sex ($P < 0.05$).