Approaches to Decreasing Dystocia in the Primiparous Beef Heifer EPD's or the Pelvimeter, You Make the Choice

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Introduction

High rates of dystocia in primiparous beef heifers are responsible for significant economic loss to United States beef cattle producers.[1,2,3] Losses due to dystocia result from increased calf and cow mortality, increased labor and veterinary costs, and subsequent decreased reproductive performance of the dam.[3,4,5,6,7] One study showed that primiparous two- and three-year-olds were responsible for over 40% of the herd calf mortality and that dystocia was the single largest cause of calf death in the first 96 hours postpartum.[8] The study also showed that the fall pregnancy rate was 7% lower in cows that had lost calves compared with those that had not.[8]

Another research group conducted a more detailed study of the effects of dystocia on rebreeding performance.[9] In cows that had experienced dystocia, these researchers found a 14% reduction in the number of cows in estrus during a 45- day artificial insemination breeding season. They also found a 16% reduction in both the artificial insemination conception rate and the overall conception rate (natural service and artificial insemination) among cows that had experienced dystocia.

The most important cause of this dystocia is disproportion in size between the fetus and the birth canal of the dam.[9,10,11,12] Selection of beef cattle for rapid growth rates resulting in higher weaning and yearling weights has resulted in the production of heavier calves at birth. This result has occurred because of the documented high genetic correlation between these growth characteristics and the weight of calves at birth.[1,13]

Beef cattle producers would benefit financially if they could select sires for replacement-heifer matings that would combine desirable growth characteristics and birth weights compatible with easy parturition. Llewelyn *et. al.* and Nelson and Beavers reported that decreasing birth weights through use of an alternate breed type was successful in decreasing dystocia rates.[14,15] Tong *et. al.* and Cundiff *et. al.* reported on the genetic control of birth weight and calving ease and suggested that selection could be utilized to reduce calving difficulty within the same breed type.[13,16]

Primiparous cattle experience a higher degree of dystocia than do multiparous cows due to their smaller size at calving and the fact that soft tissues of the birth canal have never been stretched.[9,13] Technology is available to decrease the incidence of dystocia in heifers.[13,16] Bulls that sire calves with below-average birth weights and above-average weaning and yearling weights have been identified.[7,16] Estimated Progeny Difference (EPD) is the construct that has been created to quantify measurable characteristics for genetic difference. EPD calculation utilizes a statistical technology to compare sires within a breed. A sire with an EPD of 0 for birth weight would be expected to sire offspring with an average birthweight of 4 pounds less than a sire with an EPD for birthweight of +4 pounds. EPD values are associated with an accuracy estimate which is an attempt to predict the certainty that the true EPD value will fall within a certain range.[13]

Since a relatively small number of calving-ease sires with high accuracies have been identified, artificial insemination provides a means by which heifers may be bred to proven calving-ease sires. The time, labor and handling difficulty of inseminating virgin heifers can be minimized by using estrous synchronization procedures.

The pre-breeding measurement of pelvic area in heifers has been reported to be a useful management procedure and, when coupled with culling, is capable of decreasing the risk of dystocia.[14,18,19,20] Dissenting reports have also been published.[12,21,22] Pelvic area:calf birth weight ratios are reported to be useful in predicting the maximum size calf that a heifer may be expected to deliver with a low risk of dystocia.[18,19]

We carried out two studies to evaluate two approaches to reducing the incidence of dystocia in beef replacement heifers.[23,24] The first of these was to breed heifers to sires that have been shown to produce offspring with low birth weights. The second approach involved measuring the pelvic area of heifers prior to breeding and calculating a predicted deliverable pounds (PDP) statistic and evaluating its utility in predicting calving difficulty.

Study 1

Materials and Methods

Five commercial beef cow-calf producers in Southwest Virginia were identified as cooperators. Heifers 12 to 16 months of age (n=374) had been developed in each herd and served as trial animals. All heifers were crossbreeds with a mix of British (Angus and Hereford) and Continental European (Simmental, Charolais, Gelbvieh) breeding. Prior to breeding, all heifers were weighed, visually scored for frame and condition, and measured for pelvic area. Heifers in Herds 2, 3, and 4 were synchronized using norgestomet and estradiol valerate (Syncro-Mate-B®: Sanofi Animal Health Inc., Overland Park, KS). Heifers in herds 1 and 5 were synchronized with melengestrol acetate (MGA®: the Upjohn Company, Kalamazoo, MI) and prostaglandin F2 (Lutalyse®: The Upjohn Company, Kalamazoo, MI). The MGA®/Lutalyse® procedure involved feeding 0.5 mg MGA®/animal/day for 14 days. Seventeen days after the end of MGA® feeding, Lutalyse® (25 mg) was injected intramuscularly. Heifers were then bred approximately 12 hours after detection of estrus by artificial insemination, except in Herd 3 where all heifers were time-inseminated at 50 to 52 hours after implant removal.

Heifers were inseminated with semen from British-breed (Red Angus, Angus or Polled Hereford) sires selected for calving-ease (CE sires) based on low (<+1.0 pounds) birth weight expected progeny difference (EPD) and high accuracy (>0.85) where possible. Table 1 lists the CE sires and their corresponding EPD's and accuracies for birth weight, weaning weight and yearling weight. Natural service clean-up bulls were used in a 45- to 60-day breeding season and are designated as CU sires. CU sires were Angus sires except in Herd 1 where Polled Hereford sires were utilized. CU sires were selected by the management of the individual herds without consultation by study personnel. Some CU sires (Herds 1 and 3) had been selected with calving-ease as an important selection criterion.

Table 1. Expected Progeny Differences (EPD) and Accuracies (Acc.) for Traits of Calving Ease Sires Used for Artificial Insemination.

Sire No.	Sire Breed	Herd No.(s)	Birth Wt. EPD	Acc.	Weaning Wt. EPD	Acc.	Yearling Wt. EPD	Acc.
1	Angus	1,2,4,5	-1.2 lbs	.95	+25.0 lb	.94	+48 lbs.	.89
2	Angus	3	-2.6 lbs	.83	+15.0 lb	.82	+1.0 lbs.	.76
3	Red Angus	1	-1.9 lbs	.42	+15.2 lb	.34	+27.9 lbs	.30
4	Polled Hereford	1	-1.9 lbs	.85	+8.2 lb	.80	+2.4 lbs.	.59

Pre-breeding pelvic area (PA) measurements were taken on heifers in all herds by a single operator using the Rice Pelvimeter (Lane Manufacturing, Denver, CO). These were utilized in calculating the size of Predicted Deliverable calf in Pounds (PDP). The following formula was used: PDP = PA in cm^2/age, weight factor. The formula employed has been described by Deutscher.[18,19] To determine PDP for heifers with a PA measured at 12 to 13 mo. of age, pelvic area is divided by a factor of 2.0 for heifers weighing 227 - 271 kg; 2.1 for heifers weighing 272 - 316 kg; 2.2 for heifers weighing 317 - 361 kg; 2.3 for heifers weighing 362 - 407 kg; and 2.4 for heifers weighing 408 to 454 kg prior to breeding.

During the subsequent calving season, data was collected for calving-ease score according to guidelines recommended by the Beef Improvement Federation.[25] Scoring was as follows: 1 = no difficulty, no assistance; 2 = minor difficulty, some assistance; 3 = major difficulty, usually mechanical assistance; 4 = cesarean section or other surgery; 5 = abnormal presentation. Determination of calving score was made by farm personnel following a training discussion of what represents major or minor difficulty. Personnel agreed to intervene after one hour of active labor resulted in no progress towards delivery or when it was apparent that a problem existed. Scores of 1 through 4 were used in the analysis of calving data.

Data was also collected for birth weight, date of calving, and calf survival. Data was collected on 271 of the 320 replacement heifers that became pregnant during the calving season; attrition resulting from abortions, death losses, identity losses and the sales of some individuals. Sales were not based on pelvic area, heifer weight or other factors judged to affect dystocia levels. Birth weights were adjusted for differences in sex. This was accomplished by multiplying birth weights of heifer calves by 1.05.[25] Most male calves were castrated at some time between birth and 90 days of age. At weaning, calves were weighed and graded. Weaning weights were adjusted for age to 205 days and for sex to a steer basis. The following factors were used for these adjustments: heifers = 1.05, steers = 1.00, bulls = 0.95.[25]

Chi-square analysis was utilized to assess differences in conception rates to artificial insemination and pregnancy rates at the end of the breeding season between herds. Tables were evaluated using the Yates correction. Data for calving scores, weaning weights and PDP's were evaluated using analysis of variance. T-tests were used to test differences between sire groups and PDP groups.

Results

Table 2 summarizes the characteristics of the heifers at breeding and the success of the breeding programs. Average pre-breeding weights for the heifers within herds ranged from 634 lbs to 757 lbs. Conception rates after estrous synchronization and a single artificial insemination service ranged from a high of 56% to a low

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of 41%. Chi-square analysis indicated significant differences in AI pregnancy rate among herds (Chi square = 6.26; P<0.01). Following artificial insemination and clean-up with natural service, pregnancy rates across herds averaged 85.6% with a range of 70% to 94%. Chi-square analysis again indicated significant differences among herds (Chi-square = 39.1; P<0.01).

Table 2. Characteristics of Heifers at Breeding and Success of Artificial Insemination (AI) and Clean-Up Sire Breeding Programs.

	Herd Number					Across Herd Mean
	1	2	3	4	5	
Avg. weight at breeding (lbs)	748	634	755	757	656	724
Avg. frame score	5.5	4.9	4.8	5.6	5.6	5.4
% pregnant to A.I.	52[a]	53[a]	56[a]	52[a]	41[b]	50.7
% pregnant after A.I. & clean-up	89[a]	80[a]	88[a]	94[a]	70[b]	85.6

[a,b] Values with different superscripts within rows are different P < 0.05.

Data collected at calving and weaning in each herd are summarized in Table 3. Collection of calf birth weights was not consistent in Herd 5 so birth weight data is not summarized for this herd. There was a trend toward lower calving-ease scores for CE bulls vs CU bulls in all herds but Herd 1. Across-herd means for calving-ease scores were lower for CE sires (P<0.05). Calf birth weights tended to be lower for CE sires in Herd 2,3, and 4 and similar in Herd 1. When data was pooled, across-herd means for birth weights were lower for calves sired by CE vs CU (P<0.05). In Herds 2, 3, and 5, a tendency towards a decrease in calf death loss at calving was documented for calves sired by CE bulls. Only in Herd 1 did CE-sired calves experience a greater death loss than CU-sired calves. In all other herds, there was a tendency toward a death loss advantage to CE-sired calves and the average across all herds was 3.1% death loss for CE-sired calves vs 7.7% death loss for CU-sired calves.

Table 3. Birth and Weaning Data for Heifers Bred to Calving-Ease Sires (CE), Versus Clean-Up (CU) Sires

	Herd Number										Across Herd Mean	
	1		2		3		4		5			
	CE	CU	CE	CU	CE	CU	CE	CU	CE	CU	CE	CU
No. calvings	80	35	14	9	12	30	27	21	26	17	159	112
Avg. calving ease scores	1.10	1.06	1.36[a]	1.78[b]	1.50	1.43	1.14[a]	1.38[b]	1.19[a]	1.41[b]	1.25[a]	1.41[b]
Calf birth weight (lbs) (steer basis)	68.0	69.1	70.4	79.4	77.0	81.0	69.5	82.5	--	–	71.3[a]	78.1[b]
Adj. birth weight ratios	97	100	93	106	98	105	91	109	--	--	94.8	105.0
% calf death loss	5.0	0.0	7.0	10.0	0.0	6.7	3.7	4.2	0	17.6	3.1	7.7
205-day weaning weights(lbs)	455[a]	429[b]	499[a]	519[a]	524[a]	493[b]	493[a]	486[a]	460[a]	493[a]	486[a]	484[a]
Expected Lbs 205-day weight/calving heifer	433	429	464	466	524[a]	460[b]	475	466	460[a]	407[b]	471[a]	447[b]

Calving-Ease Scores: 1=unassisted, 2=easy pull, 3=difficult pull, 4=Caesarian section

[a,b] Values between herd pairs within the same row with different superscripts are different P < 0.05.

In Herds 1 and 3, 205-day weaning weights adjusted for sex to a steer basis were heavier for calves with CE sires (26 lbs and 31 lbs respectively; P<0.05). In other herds and when data was pooled across all herds, adjusted weaning weights for CE- sired calves were not significantly different than those sired by CU bulls.

The 205-day weaning weight per heifer calving was determined by multiplying the proportion of calves surviving birth by the 205-day adjusted weaning weight. In Herds 3 and 5, and across all herds, there was an advantage for heifers which conceived to CE bulls over heifers conceiving to CU bulls (P<0.05).

Tables 4, 5 and 6 summarize the calving-ease scores for heifers based on their Predicted Deliverable Pounds (PDP)[1] of calf as derived from pelvic measurements. Because of the failure to obtain weights on some calves and because deliveries with a calving-ease score of 5 were not included, pelvic- area and calf-weight data was only available on 248 calvings. Heifers delivering calves with a birth weight greater than their PDP had a significantly higher rate of dystocia as evidenced by a mean calving-ease score of 1.82 (Table 4). Heifers delivering calves smaller than their PDP had lower calving-ease scores, but there was no difference in the mean score for deliveries of calves with birth weights 0 to 10 , 10 to 20, or more than 20 pounds less than PDP. The birth weights of calves delivered with a calving-ease score of 1 (no assistance) were an average of 14 pounds less than the PDP of their dam (Table 5). Conversely, those calves born with difficulty (scores of 2 and 3) had an average birth weight that was greater than the dam's PDP.

Table 4. Numbers of Heifers and Mean Calving-Ease Scores When Calf Birth Weight was consigned to Predicted Deliverable Pound (PDP) Groups

	Predicted Deliverable Pounds Group			
	1	2	3	4
Birth weight relative to PDP	50 lbs greater than to equal	1 to 10 lbs less	11 to 20 lbs less	21 lbs or more less
No. of heifers	51	57	68	72
Calving-ease score	1.82[a]	1.23[b]	1.07[b]	1.11[b]

[a,b] Values within row with different superscripts are different P < 0.01.

[1]Pounds rather than metric kilograms is utilized in the discussion of pelvic area measurement because factors have been reported elsewhere in pounds and are utilized and understood throughout the industry by this convention.

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Table 5. Mean deviation in Predicted Deliverable Pounds of Calf (PDP) from Actual Birth Weight for Each Calving-Ease Score Category.

	Calving-Ease Score[a]		
	1	2	3
No. of heifers	202	24	22
Actual calf birth weight relative to PDP (lbs)	-14.2[b]	0.4[c]	4.4[c]

[a]Calving-Ease Scores: 1=unassisted, 2=easy pull, 3=difficult pull, 4=Caesarian section. No deliveries with a calving-ease score of 4 were recorded.
[b,c]Values with different superscripts within rows are different P < 0.01.

Table 6. Percent Dystocia and mean Calving-Ease Score Within 10 Pound Predicted Deliverable Pounds of Calf Categories.

	Predicted Deliverable Pounds of Calf					
	50-59	60-69	70-79	80-89	90-99	> 100
No. Heifers	1	8	44	112	66	40
% Dystocia	100[a]	37.5[a]	13.6[a]	20.5[a]	19.7[a]	17.5[a]
Calf Birth Weightb,c,d	85[c]	79.0±4.4[c]	69.5±1.9[c]	72.6±1.1[c]	75.1±1.6[c]	75.7±1.6[c]
Mean Calving-Ease Score	3.0[e]	1.38[e]	1.25[e]	1.26[e]	1.28[e]	1.26[e]

Calving-Ease Scores: 1=unassisted, 2=easy pull, 3=difficult pull, 4=Caesarian section
[a] Numbers within a row with like superscripts are similar P > 0.05. Chi-square= 6.9
[b] Mean ± standard error
[c,e] Numbers within rows with like superscripts are similar P > 0.05.
[d] Based on birth-weight data from 251 deliveries

Study 2

Study 2 had a similar design to study one with a few differences. Again, five beef producers in southwestern Virginia were enlisted in this study of 407 heifers. Heifer characteristics were similar. All heifers in Herds 1, 2, 3, and 4, and half of the heifers in Herd 5 were synchronized using norgestomet implants and estradiol valerate-norgestomet injections. The remaining heifers in Herd 5 were synchronized with melengestrol acetate and prostaglandin $F2\alpha$.

Heifers were weighed and their pelvic areas measured at the initiation of estrous synchronization treatment. The predicted deliverable pounds (PDP) value was calculated as above.

Heifers in Herds 1, 2, and 3 were randomly placed into two groups for breeding. Sixty percent of the heifers in each herd were assigned to be artificially inseminated once by the Angus sire and then exposed to natural-service cleanup bulls for the remainder of the breeding season. The other 40% of the heifers were assigned to be bred exclusively to the natural-service bulls beginning at synchronized estrus. Heifers in Herd 4 were artificially inseminated with the Angus semen, and then exposed to cleanup bulls. In Herd 5, heifers were artificially inseminated with either the Angus or the Red Angus semen, and then exposed to cleanup bulls. Artificial insemination in all herds was performed about 12 hours after heifers were observed in estrus. Accurate records of artificial insemination dates for each heifer allowed the sire to be determined with reasonable accuracy based on calving dates. Angus bulls were used for natural service in Herds 2, 3, and 4. Polled Herefords were used in Herd 5. Both Polled Herefords and Angus were used in Herd 1. Natural-service sires in all herds were selected by the producers for possible calving-ease traits based on visual appraisal, low-accuracy EPD information, or both. The breeding season lasted about 60 days in all herds.

Table 6 depicts calving difficulty for six PDP categories divided by 10 lb. differences. Chi-square analysis of percent dystocia in each category revealed no differences among categories (Chi-square = 8.0, P= 0.16). Mean calving-ease scores were also not different for PDP categories.

Two calving-ease sires, one Angus and one Red Angus, were used for artificial insemination. the EPD for birth weight, weaning weight, and yearling weight are listed for these bulls (Table 7). These calving-ease sires were selected on the basis of low birthweight EPD (<+1.0 lb).

Table 7. Expected Progeny Differences (EPD) for Birth Weight, Weaning Weight, and Yearling Weight of Sires Used for Artificial Insemination.*

	Herd	Birth Weight		Weaning Weight		Yearling Weight	
Sire Breed	Number	EPD (lb)	Accuracy**	EPD (lb)	Accuracy	EPD (lb)	Accuracy
Angus	1-5	-0.8	0.97	+26	0.96	+50	0.94
Red Angus	5	-1.9	0.59	+16.2	0.56	+28.1	0.51

*Adapted from American Angus Association Sire Evaluation Report. Angus J. (Suppl.) 14(8):9-123; 1993 and Sire Evaluation of Proven Active Sires. 1993 Sire Evaluation and Membership Directory. Red Angus Association of America, Denton, Texas, 1993; pp 8-34.
**As the accuracy approaches 1.0, there is greater confidence that the value will not change as additional data are accumulated.

At parturition, calving-ease scores were assigned as in study 1 and the birth weights of all calves recorded. Dystocia was defined as a calving-ease score of 2 or greater. Birth weights were adjusted for calf sex. Calf mortality was recorded at birth and up to two weeks postpartum. Gestational length was calculated as the number of days between breeding date and calving date for all heifers conceiving at the synchronized estrus, including those bred only by natural service.

Heifers were assumed to have conceived at synchronized estrus if they calved within 283 + 7 days of synchronized estrus. Calves were weighed at weaning. Weight differences at weaning due to calf sex and age were corrected by adjusting weaning weights to a steer basis and to 205 days of age.

Statistical analyses were performed using a personal computer software package. Mean gestational lengths, sex- adjusted birth weights, and adjusted 205-day weights were compared using one-way analysis of variance. Sire group (natural service or artificial insemination) was the only source of variation included in the model *(Table 8)*.

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Table 8. Gestational Lengths, Sex-adjusted Birth Weights, Incidence of Dystocia, and Adjusted 205-day Weights of Calves for Various Sire Groups.

	Artificial Insemination			
	Angus	Red Angus	Combined	Natural Service
Herd number	15	5	15	15
Gestational length (days; mean ± SEM)	280 ±0.73	281 ±0.55	281 ±0.45a	284 ±0.67b
Number of calves	49	67	116	35
Sex adjusted birth weight (Ib, mean ±SEM)	74.8 ± 1.7	65.8 ± 1.1	69.6 ±1.0c	76.0 ±1.0d
Number of calves	46	64	110	164
Number experiencing dystocia	9 (18%)	2 (3%)	11 (9%)e	45 (27%)f
Number of calves	50	69	119	169
Adjusted 205 day weight (lb, mean ± SEM)	498 ±12.5	409 ±7.8	438 + 8.09g	451 ±7 4h
Number of calves	31	62	93	124

ab Within this row, mean values with a different superscript letter are statistically different (p=0.0001).
c,d Within this row, mean values with a different superscript letter are statistically different (p<0.0001).
e,fWithin this row, mean values with a different superscript letter are statistically different (chi squared=12.4, p=0.0004).
g,h Within this row, mean values with a different superscript letter are statistically similar (p=0.24).
Sex-adjusted birth weights were also compared between PDP categories (<80 lb, 80 to 89 lb, and >89 lb) using one-way analysis of variance with PDP category as the source of variation *(Table 9).*

Discussion

The estrous synchronization and artificial insemination programs applied to these groups of heifers were successful in achieving an across-herd mean pregnancy rate of 50.7% in study 1. The mean pregnancy rate achieved by the end of the full breeding season (45 to 60 days) was 85.6%. This pregnancy rate indicates that most heifers had reached the critical minimum weight for breeding recommended by Mossman and others.[26,27]

Use of calving-ease AI sires based on low birth-weight EPD accomplished the objective of reducing dystocia in both studies. The across-herd mean for birth weight,calving-ease scores and dystocia rates were significantly lower for CE vs CU sires. In study 1, Herds 1 and 3, where CU bulls had been selected for low calf birth weight, birth weights of calves from CU and CE sires were similar. In the two other herds where birth weights were recorded in study 1, birth weights of calves sired by CE sires were 4.5 kg and 6.5 kg lower than birth weights for calves sired by CU bulls.

Table 9. Mean Sex-adjusted Birth Weights and Incidence of Dystocia Associated with Predicted Deliverable Pounds.

PDP (lb)	Heifers (no.)	Sex adjusted Birth Weight (Ib)	Heifers Experiencing Dystocia (no.)*
>89	87	76.4 ±1 4a	17b (19.5%)
80	135	72.8 ±1 2a	26b (19.3%)
<80	75	74.8 + 1.6a	20b (26.7%)

*Dystocia was defined as a calving ease score >1.0. a b Mean values with the same superscript letter are statistically similar (p=0.28). Percentages experiencing dystocia in each category are statistically similar (chi squared=1.79, p=0.41).

The rates of dystocia in each PDP category *(Table 10)* and in each birth weight deviation from PDP category *(Table 11)* were also compared using chi-squared analyses. Mean birth weight deviations from PDP values were calculated for each calvingease score group. These mean deviations were compared using one-way analysis of variance with calving-ease score as the source of variation in the model *(Table 11).*

Table 10. Incidence of Dystocia for Birth Weight Deviationfrom Predicted Deliverable Pounds (PDP).

Birth Weight Deviation from PDP (lb)	Heifers (no.)	Heifers Experiencing Dyustocia (no.)*
<20	120	13 (10.8%)[a]
20 to 11	78	15 (19.2%)[a]
10 to 0	47	10 (21.3%)[a]
>0	55	24(43.6%)[a]

*Dystocia was defined as a calving ease score >1.0. a ~ Within this column, percentages with a different superscript letter are statistically different (chi squared=24.9, p<0.0001).

Table 11. Mean Birth Weight Deviation from Predicted Deliverable Pounds (PDP) According to Calving-ease Score.

Caving-ease Score	Heifers (no.)	Deviation (lb)
1	222	-15.3 ± 0 9[a]
2	12	3 7 ± 3.9[b]
3	46	-2.2 ± 2.4[b]
4	2	+29 ± 6.0[c]

[a,b,c] Mean values with a different supercript letter are statistically different (p<0.05).

Data for calf survival at birth and at two weeks postpartum between artificial insemination and natural-service groups were compared using chi-squared analyses *(Table 12).*

Table 12. Calf Survival at Birth and Two Weeks Post partum for Various Sire Groups.

	Artificial Insemination			
	Angus	Red Angus	Combined	Natural Service
Number of calvings	49	67	116	175
Herd number 1	5	5	15	15
Number of calves surviving				
At birth	47(95.9%)	66(98.5%)	113(97.4%)[a]	158(90.3%)[b]
Two weeks postpartum	45 (98.8%)	66 (98.5%)	111 (95.7%)[c]	152 (86.9%)[d]

[a,b] Within this row, values with a different superscript letter are statistically different (chi squared=4.48 p=0.03). c,d Within this row, values with a different superscript letter are statistically different (chi squared=5.28 p=0.02).

Many authors have reported the importance of calf birth weight as a determinant of dystocia incidence. Our report demonstrates that selection within a breed type may be successfully used to decrease calf birth weight and calving difficulty. In these herds low dystocia incidence was

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achieved using Angus, Red Angus or Polled Hereford sires rather than resorting to smaller breeds to achieve low birth weights.

Calves sired by CE sires showed a trend towards decreased death loss(across herd means of 3.1% for CE sires versus 7.7% for CU sires) in study 1 and a significant decerease in death loss in study 2. This is explained by the decrease in the incidence of dystocia. Calf survival rates are decreased by dystocia.[2,13,28]

Overall, there was no difference in 205-day adjusted weaning weights for CE vs CU sires in either study. In study 1, Herds 1 and 3, which utilized CU bulls selected for calving ease, the adjusted weaning weights of calves sired by CE bulls were 12 kg and 14 kg greater, respectively, than those sired by CU bulls. In Herds 2 and 5, CU bulls produced calves that tended to be heavier at weaning but they experienced greater calving difficulty. In Herd 4, CE sires produced smaller calves at birth that had 205-day weights that were similar to those of CU-sired calves. In a report by Nelson *et. al,* the use of Angus sires compared to Charolais sires resulted in lower birth weights and less calving difficulty for Angus sires, but lower calf growth as well.[15] In our trial we demonstrate different phenomena depending on current practices in the herd. If natural-service sires are already in place that produce calves with small birth weights (Herds 1 and 3, for example), then the use of CE sires that have demonstrated calving ease but desirable growth characteristics resulted in greater calf growth with similar calf birth weight. In herds where natural-service sires which produced large birth weights and higher levels of dystocia were utilized, CE sires decreased calf birth weights while keeping growth rates similar.

The numbers of heifers calving and the average calving-ease scores broken into four predicted deliverable pound groups (Table 4) demonstrate that deliveries where birth weights were greater than PDP are associated with a higher degree of calving difficulty. Likewise, when data is examined from the point of view of calving-ease score groupings (Table 5), deliveries that occurred without assistance (Score 1) were associated with birth weight that was lower than the PDP (-14.2 lbs). These findings agree with reports from other authors.[18,20] Table 6 demonstrate another aspect of our data. When dystocia rates and mean calving-ease scores are examined in relation to PDP categories, no differences between categories were seen. Only a trend towards greater dystocia associated with very small PDP was seen and this is based on very few deliveries. In this sense, our findings would concur with those of Van Donkersgoed *et. al.*[22] in that culling heifers below a certain set PDP or even below the mean would not have been effective in reducing the rate of dystocia. **Our conclusion is that, while heifers with larger PDP based on pelvic area experienced lower rates of dystocia, knowledge of the pelvic area alone is less effective in predicting and reducing dystocia than is the selection of sires to reduce calf birth weight.**

Summary

Birth weight is the single greatest factor influencing dystocia. Using bulls for artificial insemination that are known to sire calves with low birth weigms allows control of calf birth weight without sacrificing growth or weaning weight. Estrous synchronization and artificial insemination with proven calving-ease sires is more effective than pelvic area measurement as a single management practice to reduce dystocia. The pelvic area data documents that heifers which attempt to deliver a calf with a birth weight greater than PDP derived from pelvic area measurement are at increased risk of dystocia. The effectiveness of pelvic measurement in predicting dystocia and hence being used as a culling tool to reduce dystocia is, however, limited. Culling of a small percentage of heifers with very small pelves may be a reasonable management practice. A rationally applied program of artificial insemination in conjunction with pelvic area measurement may be the most effective means of reducing or eliminating dystocia in virgin beef heifers.

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AABP - SFT Joint Meetings

The Twenty-Eighth Annual Meeting of the AABP
was held in conjunction with the
Annual Conference of the Society For Theriogenology.
Due to the success of the venture,
joint meetings will be held in
Montreal, 1997 and Nashville, 1999.

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