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Factors Affecting Calving Difficulty

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INTRODUCTION

Calf deaths resulting from difficult calving (dystocia) cause a major reduction in the net calf crop and income realized by beef producers. Based on 1993 projected figures, a 5% increase in animals available for sale in the U.S. could potentially increase gross receipts by over $1.5 billion annually. These same projection figures also suggest that losses attributed to calf deaths from dystocia alone exceed $750 million annually. Identifying ways to decrease dystocia and the accompanying calf deaths is the subject of this paper.

IMPORTANT FACTORS

Dystocia is affected by two categories of factors: (1) those attributed to the dam, and (2) those attributed to the calf (Table 1). Research conducted at Miles City has shown that precalving weight and pelvic area of the dam and sex and birth weight of the calf were the most important factors contributing to dystocia. All of these were statistically significant, and Table 1 shows the relative importance of the four factors. Note calf birth weight ranked first. This means that any effort to control dystocia <u>must</u> include controlling calf birth weight. The precalving weight of the dam also had a negative effect on dystocia indicating that heavier (larger) dams had less dystocia. This means that growing the heifer adequately during the 2 years prior to calving is another important aspect of managing dystocia. Replacement heifers that are not fed and managed properly will be lighter (smaller) at calving and may experience more dystocia.

TABLE 1. RELATIVE IMPORTANCE OF FACTORS AFFECTING DYSTOCIA IN FIRST-CALF 2-YR-OLD HEIFERS

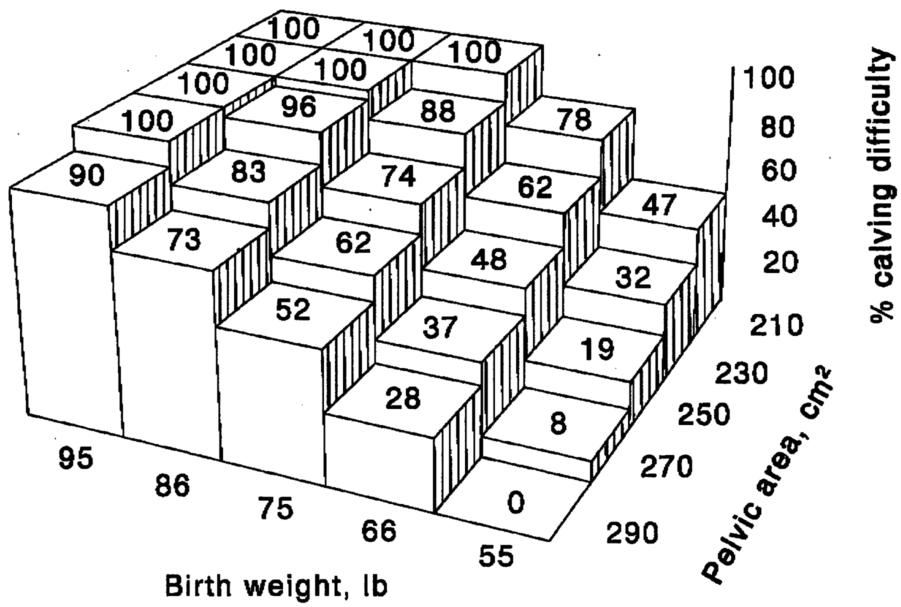
Factor[a]	Significance	Relative importance rating
Dam precalving weight	P<.05	1.10
Dam precalving pelvic area	P<.05	1.16
Calf sex	P<.05	1.00
Calf birth weight	P<.01	3.05

[a]All factors had a negative (desirable) influence on dystocia. See text for discussion.

Calf sex was also important. The research indicated that heifer calves were associated with fewer calving problems than were bull calves. However, since calf sex is determined at conception, we are not able to do much about this problem unless sex control can be achieved. This is not an impossible scenario since procedures for sexing semen and(or) embryos appear promising. Production of only female calves from first-calf heifers would potentially reduce dystocia.

Precalving pelvic area of the dam also had a significant negative effect on dystocia meaning that dams with larger pelvic areas experienced fewer dystocia problems. This relationship is shown graphically in Figure 1.

Figure 1. Relationships among pelvic area, calf birth weight and percent calving difficulty.



As pelvic areas became larger, the incidence of dystocia was less in all birth weight classes. This is an important relationship and suggests that in the short-term we could reduce dystocia problems by culling heifers with small pelvic areas. But let's also consider the long-term effects before we draw far-reaching conclusions.

First, our data, and that of other scientists, show the following: (1) larger heifers produce calves with higher birth weight and, recall, high calf birth weight is the most important factor causing dystocia; (2) larger heifers have larger pelvic areas; but (3) heifers with larger pelvic areas produce calves with higher birth weights. This seemingly circular relationship must also be evaluated in light of data showing the genetic correlations between heifer size and birth weight and heifer size and pelvic area are relatively large and positive. These facts are of critical importance when we consider selecting breeding males and females for larger pelvic areas. Our studies show that larger pelvic size of the dam is associated with larger dimensions of the entire

skeleton (Table 2). Pelvic height, width and area are skeletal growth traits, and there is little likelihood that selection for these traits will result in an increase in pelvic size only. The result will be larger total skeletal size, i.e., an increase in frame score. In addition, pelvic area of the dam at 231 days of gestation and at calving were positively associated with all skeletal traits plus placental and skeletal size of the calf (Tables 2 and 3). These results mean that increased skeletal size of the dam will be transmitted to the calf resulting in higher birth weights. Therefore, producers must be aware of what will probably accompany selection for pelvic areas. We have calculated that a 10-cm^2 increase in pelvic area per generation would be accompanied by a .02 decrease in calving difficulty score and a 2-lb. increase in calf birth weight. The effect on dystocia score is desirable. However, there is a real possibility that the accompanying increase in calf birth weight would eventually cancel any gains realized from increases in pelvic area.

TABLE 2. RESIDUAL CORRELATIONS BETWEEN DAM PELVIC AREA AT 231 DAYS OF GESTATION AND CARCASS AND FETAL TRAITS

	r values
Dam pelvic area and:	
Live weight	.60**
Hot carcass weight	.43**
Carcass length	.41**
Shank length	.38**
H-bone length	.40**
Rear leg length	.33*
Rib lean weight	.26†
L. dorsi weight	.29†
Fetal:	.46**
Placentome weight	.42**
Avg. placentome weight	.37*
Cannon circumference	

† P<.10; * P<.05; ** P<.01.

TABLE 3. RESIDUAL CORRELATIONS BETWEEN DAM SIZE AND CALF DIMENSIONS

	Dam precalving	
	Body weight	Pelvic area
Precalving pelvic area	.58**	--
Calf: Birth weight	.40**	.35**
Head width	.31**	.16
Head circumference	.44**	.30**
Heart girth	.30**	.22**
Hip width	.35**	.41**
Body length	.35**	.34**
Leg length	.27**	.35**
Thigh width	.29**	.25**

** P<.01.

This is also important since much interest has developed in using pelvic areas to predict calving problems. In our hands, using pelvic area alone has been of minor value in predicting dystocia, the reason being that we cannot accurately predict individual calf birth weight. There are two prediction outcomes that must be considered: (1) identifying heifers that will not experience dystocia; (2) identifying heifers that will experience dystocia. We have been slightly more successful (+10%) in predicting heifers that will not experience dystocia than heifers that will experience dystocia.

Other scientists have more recently developed computer models that are of higher accuracy in predicting dystocia. These models include cow age, external body dimensions, pelvic measurements and estimated calf birth weight. We need to watch these developments carefully since the field of computer modeling is very dynamic and will likely lead to valuable breakthroughs in decision making. However, at the present time, the best methods of managing dystocia are: (1) raising the replacement heifer on a management plan that allows maximum rates of fertility and skeletal growth; (2) controlling calf birth weight through wise sire selection; (3) not underfeeding or overfeeding the pregnant heifer during gestation. Let's discuss these factors in more detail.

Table 4 shows a summary of a Miles City study of feed effects on puberty, reproduction and dystocia in Hereford-Angus crossbred heifers. Note that the winter rate of gain had marked effects on pregnancy rate. However, there were interesting effects on precalving pelvic area and incidence of dystocia. Since the heifers were all treated alike following the winter diet treatments, the calving data shows an important carryover effect of the dietary level. Development of heifers on the low feed level was retarded, and they had smaller pelvic areas at calving and a higher incidence of dystocia.

TABLE 4. EFFECTS OF POSTWEANING DIET ON REPRODUCTION, PELVIC AREA AND DYSTOCIA IN HEIFERS

	Winter diet group[a]	
Data	Low	High
Number of heifers	30	59
Daily gain - winter (lb./day)	0.6	1.3
Daily gain - summer (lb./day)	1.3	1.0
October pregnancy (%)	50	86
Calving data		
Precalving pelvic area (cm^2)	240	252
Dystocia (%)	46	36

[a]Fed first winter period from weaning to breeding as yearlings.

Point 2 (controlling calf birth weight through wise sire selection) is in regard to sire effects on birth weight and dystocia. When EPDs (expected progeny differences) are available, average birth weight can be predicted with reasonable accuracy. Table 5 shows results of a Miles City study where we selected Angus bulls for moderate or high birth weight based solely on EPDs. Note that birth weight and dystocia percentages ranked as predicted. The study also demonstrated the well-known relationships between prenatal and postnatal growth. The gestation lengths were essentially the same between the two sires so differences in birth weights resulted from different growth rates of the fetus while in the uterus. This same ranking for growth rate continued after the calf was born resulting in differences in weaning weight and carcass weight and value.

TABLE 5. PRODUCTION OF SIRES SELECTED ON BIRTH WEIGHT EPD'S[a]

	Sire birth weight EPD	
	Moderate	High
No. calves	53	74
Gestation length (days)	282.6	282.5
Calf birth weight (lbs.)	68	85
Dystocia (%)	13	61
Calf losses (%)	5	8
Calf wean weight (lbs.)	397	419
Carcass data[b]		
Weight (lbs.)	576	674
% choice	90	68
Value/carcass ($)	536	627

[a]Data from first-calf heifers only.
[b]Feedlot data on steers only.

Thus, producers must make a decision as to how much growth rate they are willing to sacrifice to manage dystocia or how much dystocia they are willing to accept to maintain maximum growth. Use of EPDs can be of great value when available. When EPDs are not available, then birth weight of the potential sire can be evaluated as this gives a fair method of predicting and ranking birth weights. Sires can also be ranked by using an index (Index = adjusted yearling weight - 3.2 X birth weight). The yearling weight must be adjusted for age of dam. Research has shown that use of this index will result in increased postnatal growth rate and, at the same time, reduce expected increases in calf birth weight by about 55%.

Genetic aspects of dystocia. Genetic influences on dystocia have been studied by numerous scientists. Heritability values for either direct or maternal effects have been variable ranging from 0 to .5 so an average of approximately .25 may be a fair estimate. This indicates that some progress in reducing dystocia could be realized through selection. But possibly more important than the exact value is that this is evidence for genetic influence. This fact should not be ignored when planning a breeding and culling program. Are heifers that experience severe dystocia good cull candidates?

There is another factor that should be considered when evaluating genetic influences. Direct effects on calving ease are the effects that are attributable to the genetic makeup of the calf and consist mainly of effects associated with birth weight and gestation length. Maternal effects are attributed to the genetic makeup of the cow and include dam size, pelvic dimensions, gestation length and differences in uterine environment. It is a common practice to select sires on the basis of direct EPD values. This certainly is not incorrect. But the genetic correlation between direct and maternal calving ease is negative. This means that sires that produce light birth weight calves and low calving difficulty will tend to sire daughters that have more difficulty at calving. Sires need to be evaluated on more than the direct EPD, and you should consider the daughters of these bulls as second choice candidates for replacements.

Assuming that our calculation of .25 is an accurate estimate of the true heritability for calving ease, we can see that .75, or three times more variation is due to environmental influences.

ENVIRONMENTAL EFFECTS

Point number 3 (nutrition for the pregnant heifer) is in regard to their gestation diet. I have reviewed seven studies summarizing research in the U.S. and Australia (Table 6) that were specifically designed to study effects of gestation feed level. Feeding was for as long as 150 days or as short as 45 days before calving. Low and high feed levels were variable, but animals on the low diets lost weight, and those on high diets gained weight during the precalving feeding period. The values represent averages of various traits from the seven studies. Problems can be encountered when summaries like this are made, but the results were very consistent.

TABLE 6. EFFECTS OF GESTATION FEED LEVEL ON CALVING AND SUBSEQUENT REPRODUCTION[a]

	Gestation diet of dam	
Items	Low	High[b]
Calf birth weight (lbs.)	63	69
Dystocia (%)	35	28
Calf survival (%)		
At birth	93	91
Weaning	58	85
Scours (%):		
Incidence	52	33
Mortality	19	0
Dam traits:		
Estrus begin of breed. season (%)	48	69
Pregnancy (%)	65	75
Precalving pelvic area (cm^2)[c]	256	271

[a]Averages from seven studies; cows and heifers combined.
[b]Diet level fed from up to 150 days precalving; low and high, animals lost or gained weight precalving, respectively.
[c]First-calf heifers only.

In general, birth weight was increased, but the effect on incidence of dystocia was slightly in favor of high gestation diets. Calf survival at birth did not differ but there was a 27 percentage point advantage in survival at weaning in calves from dams on high precalving diets. The major reason for this survival difference was due to a much higher incidence and death rate from scours in calves from low-fed dams.

There was also marked carryover effects of the gestation diet on rebreeding of the dam. Breeding seasons ranged from 45 to 120 days duration. High feed levels resulted in more cows showing estrus by the beginning of the breeding season (+21%) and higher pregnancy rates (+10%). Precalving pelvic areas were determined in four of the studies, and there was a consistent positive effect (+15 cm^2) in favor of high feed levels. A word of caution--these results do not mean that animals should be overfed during gestation. If they are and they become fat, the results will be drastically different. When the birth canal becomes filled with fat, more dystocia and calf deaths will occur.

Dystocia studies conducted to date have examined many factors perceived to relate to both incidence or severity of dystocia. Specific factors studied include breed of dam, breed of sire, gestation feed levels, age of dam, shape, size, and pelvic area of the dam, calf shape, size, and sex, gestation length, etc. By examining the R^2 values (coefficient of determination) of dystocia studies in the literature you discover a very important point. Calculation of the unweighted average of 11 R^2 values results in a value of .37. Assuming this average is a

reasonable estimate of the actual R^2 value, approximately 63% (1.00 - .37 = .63) of the variation in dystocia has not been explained through analyses of these studies. We are conducting research to give a better insight into this unexplained variation. Four of these studies will be discussed today: effects of exercise during gestation, duration of labor, maternal effects on fetal growth and endocrine relationships with dystocia.

Exercise during gestation. We conducted a study to determine if the incidence or severity of dystocia could be affected by exercise of the pregnant dam during the last 90 days of pregnancy. Dams were Angus-Hereford crossbreds that had been bred to a single Charolais bull. Ninety days prior to the predicted calving date, dams were randomly assigned within age group to forced exercise (FE) or restricted exercise (RE) groups. FE dams remained on range and were fed 1 mile from the water source in the pasture. RE dams were placed in feedlots measuring 95'x 190' with 22 to 29 females assigned per lot. Each lot contained a waterer and an open-faced shed which offered some protection from severe weather. Heifers were lotted separately from cows. RE dams were maintained on a feed level with a calculated TDN content of 10.6 lb per head daily. The diet was 2.4 lb grain mix (80% barley, 20% soybean meal) plus 17 lb average quality alfalfa hay. Feed for FE dams was the same hay and grain as the RE dams, but fed in amounts necessary to obtain weight changes similar to those observed in the RE dams. FE dams were transferred to the lots for calving on a weekly basis on day 260 to 267 with the transfer date dependent on the individual predicted calving date.

All dams were calved in feed lots and were under 24 hr daily observation by experienced herdsmen. The necessity for obstetrical assistance was based on their judgment. If both the dam and calf exhibited normal vigor and health after calving, they were moved to pasture within 72 hr post calving. All pairs were held on the same pastures throughout the remainder of the study. Postpartum intervals were determined and dams were bred by AI in a 45 day breeding season from June 15 to July 30. Results are summarized in Table 7.

TABLE 7. EFFECTS OF GESTATION EXERCISE

Group	No. animals	Body weights (lb)		Daily wt change (lb)	Calf birth wt (lb)	Calving difficulty		Estrus by begin breeding (%)	Breeding/ conception	Fall pregnancy (%)
		Initial	Pre-calving			Incidence (%)	Score			
Restricted exercise	54	903	933	.37**	72	27	1.5	76	1.17	76
Forced exercise	57	896	891	-.07	70	22	1.4	71	1.44**	91*

* P<.05; ** P<.01.

FE dams required 31% more feed than RE dams during gestation (P<.01). This clearly shows that feed requirements of range beef animals are much greater than that of animals held under feedlot conditions. Exercise during gestation had no significant effect on calving difficulty

incidence or severity, but the effect on subsequent reproduction is of interest. Exercise had no significant effect on the percentage of dams that were observed in estrus by the beginning of the breeding season, but FE dams required more services per conception and had a 15 percentage point higher pregnancy rate than did RE dams. The increase in services per conception was due to an increase in estrous cycles less than 9 days in length (17% vs 5%, FE vs RE, respectively, $P<.05$). These results are somewhat similar to results in dairy cattle where forced exercise during gestation resulted in improved reproduction, but is in contrast to the dairy data which reported an improvement in calving ease.

Duration of labor. Numerous studies have shown that dystocia has a major effect on calf survival. Work at Miles City has shown dystocia to be the leading cause of calf deaths at parturition. In addition, work at several laboratories, including Miles City, has shown that dams that experience difficult calving have a lower pregnancy rate than dams that do not experience problems at calving. Another critical aspect is the question of when should obstetrical assistance be given? Data show clearly that if assistance is given too late, the calf and possibly the dam may be lost. But if assistance is given too early, the birth canal of the dam may not be fully dilated and assistance can result in severe damage to the birth canal of the dam and injury to the calf.

Parturition (calving) is divided into three stages: I- initial contractions of the uterus that position the calf for delivery; II- abdominal press (labor) resulting in delivery of the calf through the birth canal of the dam; III- shedding of the placental membranes. Stage II is the stage we are probably most familiar with and is the stage where dystocia problems occur and must be dealt with. The ability to diagnose obstetrical problems and provide the correct obstetrical assistance are extremely important parts of management decisions and actions at calving time.

We have conducted two studies to determine the effects of prolonged or short labor and what effect giving obstetrical assistance early or late in stage II of parturition might have on calf survival or rebreeding of the dam. Females assigned to receive assistance late in stage II (LA) remained in labor until the calf was born or it appeared to experienced herdsmen that a live calf could not be born without assistance. Dams assigned to the early assistance group (EA) were given obstetrical assistance when the cervix and birth canal of the dam were fully dilated. Full dilation was assumed after the dam was determined to be in stage II and fetal membranes or calf feet were visible protruding from the vulva. Stage of labor and need for assistance were based on observation of the parturient females a maximum of every 30 minutes throughout the 6 week calving season. Each calf was given a vigor score within 1 hour after birth (1= normal, 2= weak, 3= born dead or died within 1 hour after birth). Results are shown in Table 8.

TABLE 8. EFFECTS OF DURATION OF LABOR AND OBSTETRICAL ASSISTANCE[a]

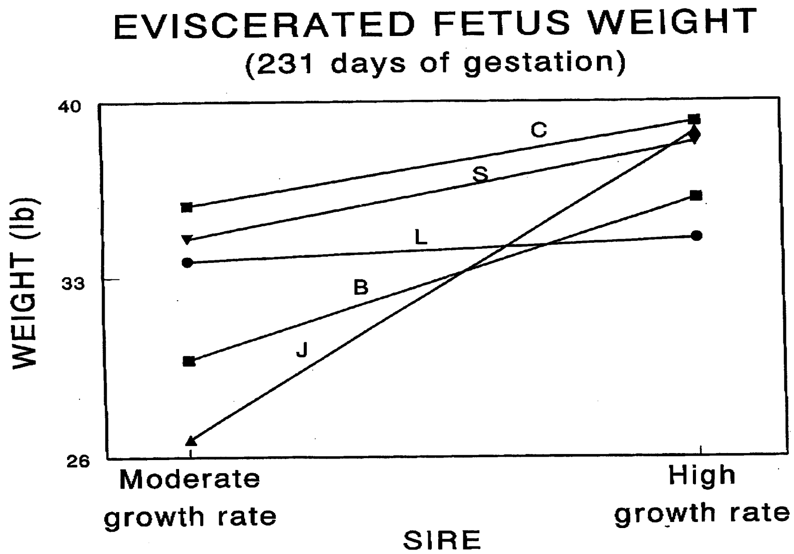
Group	No. animals	Calving difficulty: Incidence (%)	Calving difficulty: Score	Calf vigor score	Postpartum interval (days)	% in heat begin breeding	Services/ conception	Oct preg (%)	Calf data[b]: Daily gain birth to wean (lb)	Calf data[b]: Wean wt (lb)
Prolonged-late ass't	115	13	1.2	1.1	51	82	1.24	78	1.63	387
Short -early ass't	118	83**	2.3**	1.2	49	91†	1.15	92*	1.74†	422

[a]Data from two studies.
[b]Data from one study.
† P<.10; *P<.05; ** P<.01.

As would be expected, early assistance resulted in significant increases in both incidence and severity of calving difficulty. But effects of this assistance are of interest. Dams given early assistance had a slight reduction in postpartum interval, more dams in heat by the beginning of the breeding season (P=.07), a trend toward fewer services/conception, and a 14 point increase in October pregnancy percentage (P<.05). Additionally, calves from dams given early assistance had similar vigor scores at birth (P>.25), but gained more rapidly from birth to weaning (P=.09). Thus, prolonged labor can affect not only calf survival, but can have negative effects on rebreeding of the dam and growth of the calf.

Maternal effects on fetal growth. Data presented earlier indicated calf birth weight is the most important causative factor associated with dystocia. Calf birth weight is the end result of genetic growth potential of the calf responding to the maternal uterine environment during gestation. We have been conducting studies on the interaction between fetal growth potential and the maternal environment differences among different breeds of dams. Forty-six first-calf F_1 heifers sired by Brahman, Charolais, Jersey, Longhorn or Shorthorn sires were mated to one of two Angus sires selected to produce high or moderate fetal growth. Dams were slaughtered at 231 days of gestation and conceptus data obtained. Eviscerated fetus weight data are summarized in Figure 2.

Figure 2. Fetal genotype X maternal uterine environment effects.



Key: C, S, L, B, J = Charolais, Shorthorn, Longhorn, Brahman, and Jersey F_1 dams.

Weights shown in Figure 2 demonstrate a significant fetal genotype x maternal uterine environment interaction. In all cases fetuses sired by the high-growth sire were heaviest. However, the increase in fetus weight from the moderate to the high growth sire was not the same in all maternal environments. The increase was approximately the same in the Charolais, Shorthorn and Brahman uterine environments, but the change was markedly different in the Jersey uterine environment. Also, the increase in weight of the high growth fetuses in the Brahman uterine environment was similar to the Charolais and Shorthorn, but at a reduced level. We interpret these results to indicate that some maternal uterine environments can suppress fetal growth while others appear to compliment it. This finding is important because it helps us understand why there are accuracy differences among EPD results between herds, i.e., why some producers experience severe calving difficulty with some sires while other producers can use the same sires and have relatively few problems. The maternal uterine environment in cows in some herds may be similar to that found in Jersey F_1 dams while others maybe similar to that found in Brahman or Longhorn F_1 dams.

Dystocia and hormones. Parturition is under control of many complex changes in hormone concentrations and interactions. We have studied some of these and found some relationships of interest. Estrogen is the hormone responsible for bringing the cow into estrus. Progesterone suppresses estrus and is responsible for maintaining pregnancy. These two hormones play major roles in parturition. Estrogen acts on the uterus to increase sensitivity to oxytocin resulting in greater strength of uterine contractions. Circulating estrogen concentrations in the dam increase just prior to parturition. Progesterone concentrations in the dam decline prior to calving. The direct and interacting effects of these hormones (and others such as relaxin)

result in dilation of the cervix, relaxation of the pelvic ligaments and expansion of the birth canal. We have studied prepartum changes in these hormones in daily blood samples obtained from the dam for up to 3 weeks before calving. Results are shown in Figures 3 and 4 and indicate changes in estrogen and progesterone differed in dams that did or did not experience dystocia.

Figure 3. Day pre-calving calving difficulty score (CD) subplot regressions for serum estradiol. Orthogonal contrasts of CD1 vs CD2 + CD3 (P<.01) and CD2 vs CD3 (P=.01). Calving difficulty was scored from 1 (no difficulty) to 4 (extreme difficulty or cesarean section).

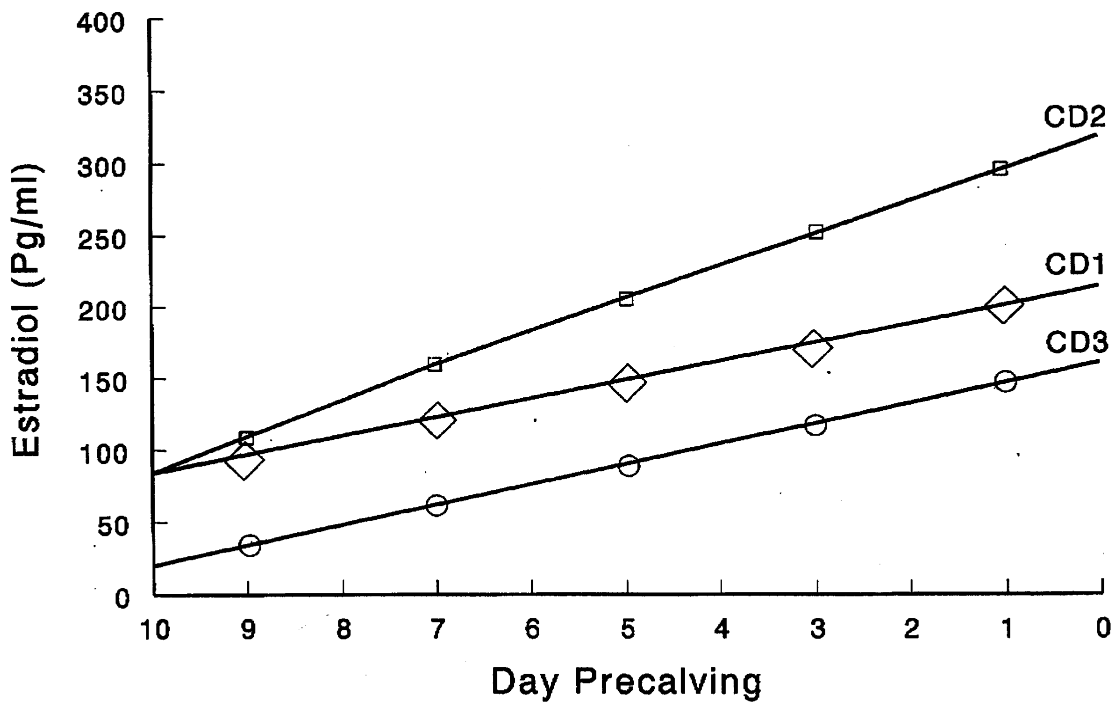
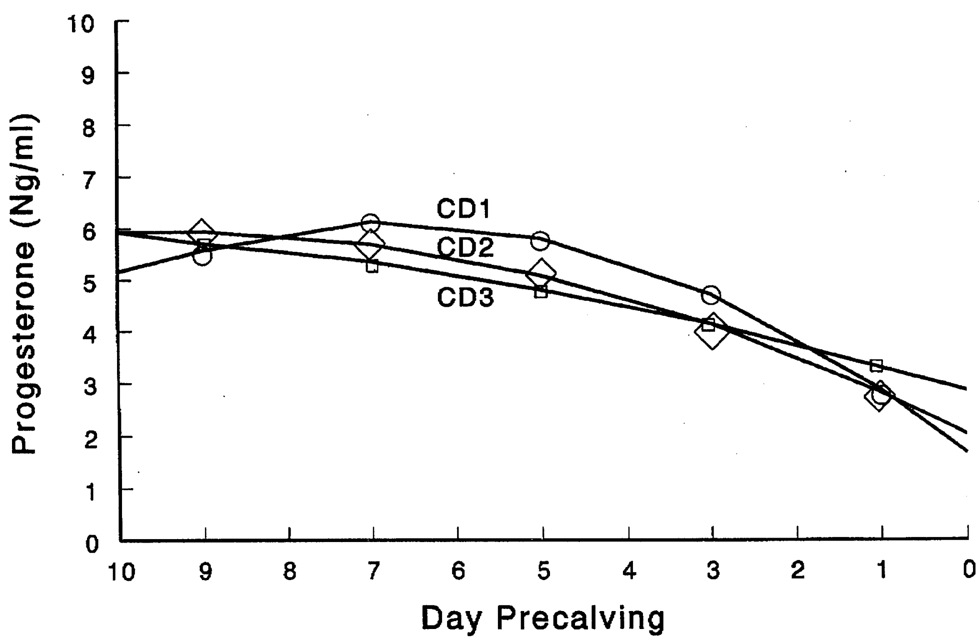


Figure 4. Day pre-calving x calving difficulty score (CD) subplot regressions for serum progesterone. Orthogonal contrasts of CD1 vs CD2 + CD3 (P=.02) and CD2 vs CD3 (P>.10). Calving difficulty was scored from 1 (no difficulty) to 4 (extreme difficulty or cesarean section).



In another project we studied the effect of porcine relaxin on prepartum changes in the dam and dystocia. We were unable to detect any effects of relaxin treatment, but found interesting changes in the dam prior to calving.

Results are shown in Figure 5. Changes in pelvic area from day 6 precalving to 2 days post calving were significant, a result of actions of hormones discussed above. The breed difference between the F_1 Hereford and F_1 Brahman were significant, as were differences between dams gestating male or female calves. This is in agreement with our earlier discussion since we also found a significant difference in prepartum estradiol concentration changes in dams gestating male or female calves (Figure 6). We have recently reported interesting differences in testosterone concentrations at 231 days of gestation in dams gestating male or female fetuses. Results are summarized in Table 9. The differences among breeds of dam were significant, the sire difference approached significance and the difference due to calf sex was highly significant. Since dystocia problems are greater in calvings with male births we believe these hormone changes may well be related to the sex difference in dystocia incidence and severity. The results printed in Figures 3-6 and Table 9 lead us to the conclusion that there is an endocrine aspect to dystocia.

Just what role this may play in managing dystocia remains to be established. As we continue our research we are encouraged that we are gaining information that will help explain part of the 63% of unidentified variation in dystocia discussed above.

Figure 5. Changes in pelvic area from 6 d prepartum through 2 d postpartum.

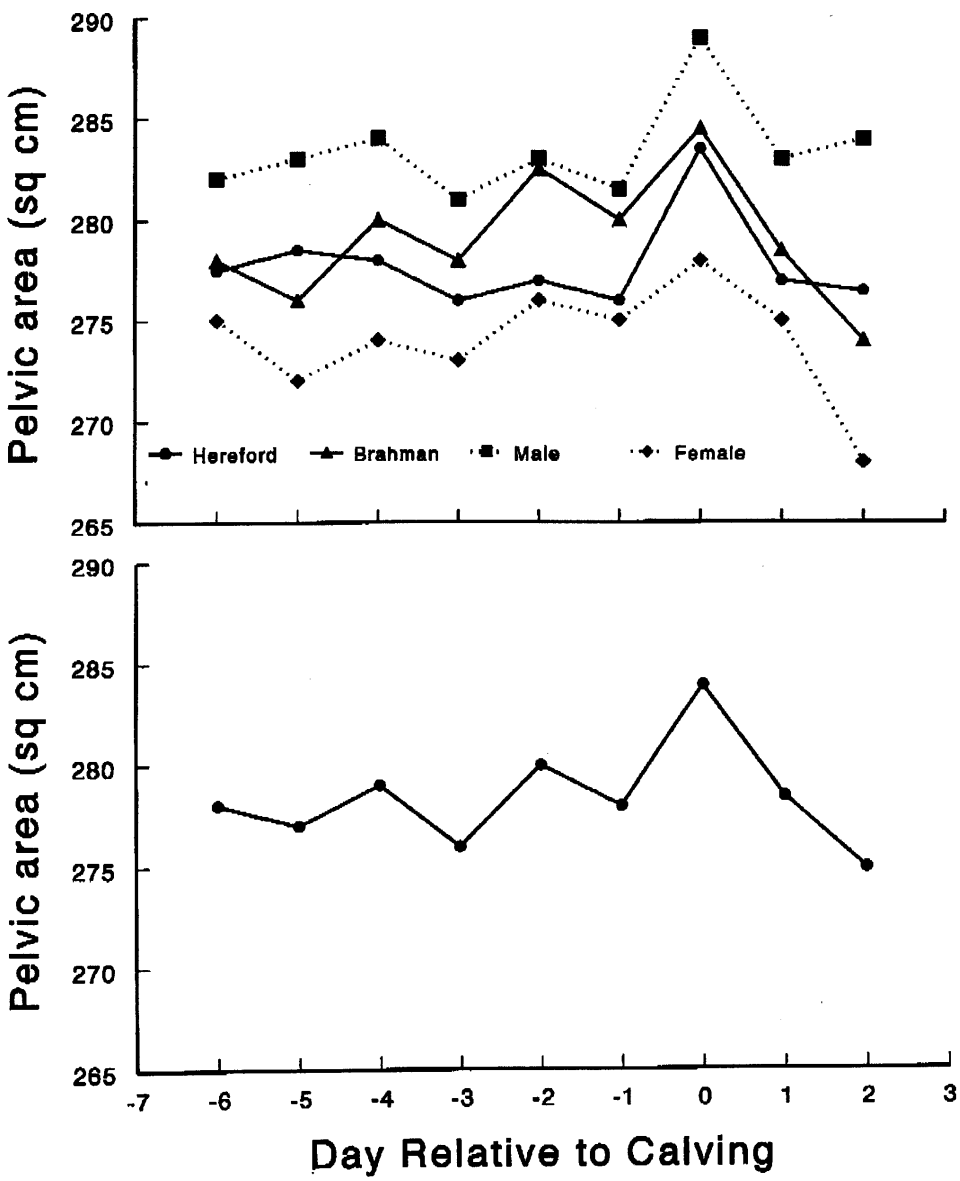


Figure 6. Day pre-calving calf sex (male vs female; P=.04) subplot regressions for serum estradiol.

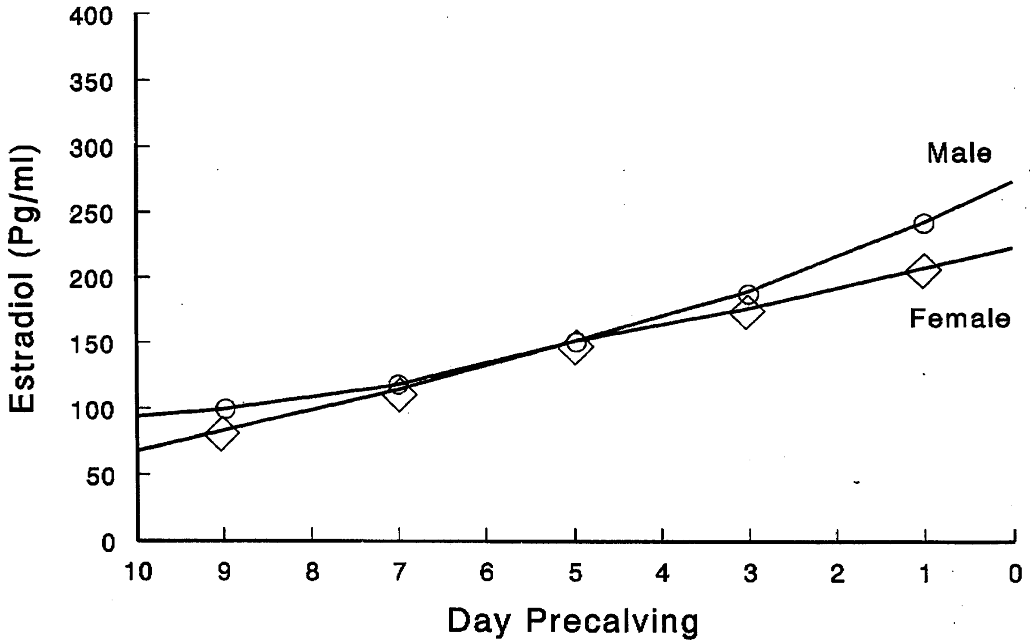


TABLE 9. SERUM HORMONE CONCENTRATIONS IN DAMS AT 231 D GESTATION

Item	No. Samples	Blood hormone concentrations		
		Estradiol 17β (pg/ml)	Progesterone (ng/ml)	Testosterone (pg/ml)
Breed F_1 dam*				
Brahman	24	11	7	109
Charolais	32	13	7	64
Jersey	28	10	8	52
Longhorn	56	13	8	94
Shorthorn	44	11	7	58
Sire growth potential				
Moderate	88	12	7	64
High	96	12	8	87†
Calf sex				
Female	72	11	8	52
Male	112	13	7	99**

† P=.08; *P<.05; ** P<.01.

SUMMARY

High calf birth weights are the main cause of dystocia. Pelvic area of the dam must be large enough to accommodate the calf. Selection for large pelvic areas in bulls and heifers will potentially result in increased size of the entire skeleton of the dam and increased calf birth weights. Low feed levels during the last one-third of pregnancy will not result in predictable effects on dystocia but will be detrimental to all aspects of rebreeding of the dam. Significant fetal genotype x maternal uterine environment effects have been shown. This resulted from some maternal environments not allowing the fetus to express its genetic growth potential in utero while other maternal environments appeared to complement it. Exercise during gestation had no effect on dystocia, but did result in an increase in feed requirements and a 15 percentage point increase in subsequent pregnancy rate of the dam. Prolonged labor (stage II of parturition) has a negative effect on calf survival and creating short labor by giving correct obstetrical assistance resulted in a 14 percentage point increase in subsequent pregnancy rate of the dam. Evidence is clear that there is an endocrine aspect to dystocia. Dams gestating male calves have higher serum testosterone concentrations than dams gestating females. These studies are helping us understand the factors that do or do not affect dystocia.