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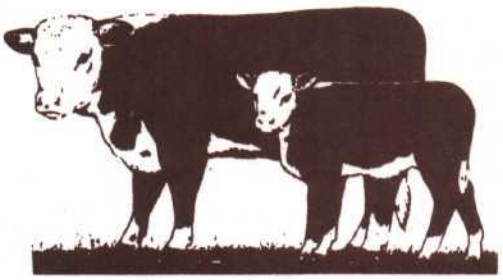

MICHIGAN BEEF PRODUCTION

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Calving Difficulty in Beef Cattle: A Review

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Calving difficulty can increase calf losses, cow mortality, veterinary and labor costs, as well as delay return to estrus, and lower conception rates. In two studies at the U.S. Meat Animal Research Center (MARC), Clay Center, Nebraska, calf losses within 24 hours of birth averaged 4% for those born with little or no assistance compared to 16% for those requiring assistance. Percent calf mortality increased by a 0.35% per pound increase in birth weight. In a Hereford herd at the Miles City, Montana Experiment Station, 57% of all calf losses were reported to be due to dystocia (calving difficulty).

Researchers at MARC noted that the percentage of cows detected in estrus during a 45-day A.I. period was 14% lower in those requiring assistance than in those calving with no difficulty. Conception to A.I. was 6% lower in cows experiencing dystocia than in those with no dystocia. Pregnancy rate after the entire breeding season (70 days) was 16% lower in cows which had been assisted (85 vs. 69%). At Miles City, pregnancy rate among cows that had caesarean deliveries was 26.6% lower (52.4 vs. 79.0%) than the herd average.

Factors Affecting Dystocia

Calving difficulty is influenced by many factors, including: 1) age of dam; 2) calf's birth weight; 3) sex of calf; 4) dam's pelvic area; 5) dam's body size; 6) gestation length; 7) breed of sire; 8) breed of dam; 9) sire's genotype; 10) dam's genotype; 11) nutrition of dam; 12) condition of dam; 13) shape of calf; 14) position or presentation of fetus; 15) geographic regions; 16) other unknown factors. Several of these factors are inter-related in a complex manner. For example, larger cows of larger breeds have larger pelvic areas which would be an aid to calving. However, larger cows of larger breeds have proportionately bigger calves, which tends to offset the advantage of a larger pelvic area.

Table 1. Effect of Dam's Age on Calving Difficulty.

Dam's Age	RESEARCH STATION	
	MARC[a]	CSU[b]
	Percent Calving Difficulty	
2 yr.	54	30
3 yr.	16	11
4 yr.	7	7
5 and over	5	3

[a] Smith *et al.*, (1976).
[b] Brinks *et al.*, (1973).

Age of Dam

Table 1 is a summary of calving data from MARC and Colorado State University (CSU), relating age of dam to calving difficulty. These data illustrate that age of dam has a profound effect on the incidence of dystocia. First-calf, 2-year-old heifers represent the greatest source of trouble to the beef herd owner. Difficulty in 2-year-olds is three to four times as high as in 3-year-olds, and 3-year-olds have about twice as much difficulty as 4-year-olds. By the time a cow reaches 4 to 5 years of age, dystocia problems are minimal. Calving difficulty in MARC Hereford and Angus cows was higher than in CSU Hereford cows, presumably because the former tended to be mated to larger exotic sires, whereas the latter were mated only to Hereford sires.

Calf's Birth Weight

Table 2 is taken from a study by Bellows and coworkers at Miles City, correlating calving difficulty with several traits in 2-year-old Hereford and Angus heifers. A perfect correlation would be 1.0; anything over .40 was highly significant; .18 to .40, significant; less than .18, non-significant. Birth weight of the calf was the trait most highly correlated with calving difficulty, followed by sex of calf. Pelvic area, gestation length and cow weight had considerably less influence.

Bellows, as well as other researchers, have since demonstrated that the influence of gestation length and sex of calf on dystocia are generally not direct,

Table 2. Effect of Various Traits on Dystocia in Hereford and Angus Heifers.[a]

Trait	BREED OF COW	
	Hereford	Angus
	Correlation with Dystocia	
Calf's birth weight	.54	.48
Calf's sex	—.47	—.26
Pelvic area, pre-calving	—.18	—.22
Gestation length	.25	.10
Cow wt., pre-calving	—.01	—.20

[a] Bellows *et al.*, (1971).

but indirect, through their effect on increasing calf size. As gestation length increases, birth weight increases 0.3 - 0.8 lb. per day of gestation. As birth weight increases, percent assisted births increases 0.7 - 2.0% per pound of birth weight. Compared to heifer calves, bull calves have 1 to 2 days longer gestation length, weigh 5 to 10 lbs. more at birth, and exhibit a 10 to 40% higher assistance rate. Several researchers have reported that calves requiring assistance weigh 5 to 7 lbs. more than those born without assistance. Research has also shown that the impact of birth weight on dystocia is greater in 2-year-old cows and that as cows become older birth weight assumes less significance.

Shape of Calf

Many cattlemen believe that differences in a newborn calf's shape can have an important effect on ease of delivery. For example, a slender, lighter-muscled, finer-boned calf should theoretically be born more easily than a thicker, heavier-muscled, coarse-boned calf of the same weight. However, researchers at MARC (Laster, 1974), were unable to find any calf shape measurements significantly correlated with calving ease, even though they believe that such relationships probably exist. Some interesting data from Germany (Graser, 1981) showed a relatively high correlation (0.62) between chest girth at 330 days of age in Simmental sires and the calving difficulty of their subsequent progeny. In France, Abdallah (1971) reported that the calf's body length and rump width were significantly correlated with calving difficulty in 2-year-old cows. Foulley *et al.* (1976) reported that selection of French beef breeds based on muscle development and growth rate early in life has led to an increase in birth weight and calving difficulty.

Breed of Sire

Table 3 summarizes MARC data on calves sired by various breeds of bulls and out of Hereford and Angus dams that were 4 years of age or older. Calving difficulty ranged from 3 to 20% and birth weights from 68 to 90 lbs. Note that sires available in some of the newer breeds may have been rather limited when this study was conducted (1970-76). Therefore, the data may not be altogether representative of these same breeds today.

Table 3. Breed of Sire Effects on Calving Difficulty and Birth Weight (Cundiff et al. 1980).[a]

Breed of sire	Calving Difficulty (percent)	Birth Weight (lb.)
Hereford and Angus	2.9	78.7
Jersey	2.9	68.6
Red Poll	3.7	78.7
Tarentaise	6.0	82.7
Sahiwal	6.2	83.8
Pinzgauer	6.3	86.4
Gelbvieh	8.0	86.0
Brown Swiss	8.4	85.6
Limousin	9.4	85.8
Brahman	10.0	90.2
Chianina	11.0	89.3
South Devon	11.9	83.1
Simmental	14.9	88.9
Charolais	18.4	90.6
Maine Anjou	20.4	90.6
Overall average	8.3	83.5

[a] Calves were out of Hereford and Angus cows, 4 yrs. old and over.

Breed of Dam

Breed of dam effects are presented in Table 4, which is a summary of three cycles of the germ plasm study at MARC. In all cases, the cows were F_1 half blood cows out of Hereford and Angus dams. In general, most of the breeds of F_1 cows did not differ greatly from the Hereford x Angus crosses, which were used as controls in each cycle. However, the Jersey, Brahman and Sahiwal (a Zebu breed) F_1 cows experienced a somewhat lower incidence of dystocia than the other crosses.

Oklahoma researchers (Belcher and Frahm, 1979) reported that 2-year-old F_1 dairy x beef cross cows experienced only 21% calving difficulty compared to 37% for F_1 beef x beef cross cows. They suggested that dairy crossbreds may have a biological advantage over beef crossbreds, such as less fat, less muscling or a more flexible pelvic area.

Nutrition and Condition of Dam

Many cattlemen believe reducing dietary energy during late pregnancy will decrease fetal size resulting in improved calving ease, while increasing energy may increase fetal size leading to a higher incidence of dystocia. However, research in recent years does not support this view. Laster (1974) fed three levels of energy (10.8, 13.7 or 17.0 lb. TDN/head/day) to Hereford and Angus 2-year-old cows for 90 days prior to calving. Results are summarized in Table 5. Increasing the level of dietary energy resulted in increased birth weights but not increased dystocia; in

Table 4. Calving Difficulty in F_1 Cows (Cundiff et al., 1981).

Breed of cow	Calving Difficulty (percent)
Cycle I (2- through 8-yr-olds)	
Hereford–Angus–X	10
Jersey–X	4
Limousin–X	9
South Devon–X	12
Simmental–X	14
Charolais–X	12
Cycle II (2- through 7-yr-olds)	
Hereford–Angus–X	17
Red Poll–X	19
Brown Swiss–X	11
Gelbvieh–X	15
Maine Anjou–X	15
Chianina–X	11
Cyile III (2- through 5-yr-olds)	
Hereford–Angus–X	19
Tarentaise–X	14
Pinzgauer–X	19
Sahiwal–X	4
Brahman–X	3

fact, the incidence of calving difficulty was lower in the medium and high energy groups than in the low energy group. At Miles City, Bellows and Short (1978) fed two levels of energy (7.5 or 13.9 lb. TDN/head/day) to Hereford x Angus crossbred 2-year-old cows for 90 days before calving. Table 6 shows that cows fed low energy weighed less, carried less condition (fat), had lighter calves at birth, but no less dystocia than those receiving a high energy ration.

Over-feeding cows to the point of obesity has been shown to increase the incidence of dystocia. Underfeeding to the point that cows become emaciated and weak will likewise increase calving difficulty. Depending upon body size, stage of pregnancy and climatic conditions, weaned heifer calves require 8-12 lbs. of TDN daily; pregnant coming 2-year-old heifers, 9-13 lb. TDN; and mature pregnant cows, 8-12 lb. TDN.

Recent research at Miles City suggests that overfeeding of protein during the last 3 months of gestation may lead to increased birth weights and dystocia. Crossbred 2-year-old cows were fed rations containing either 86% or 145% of the NRC (National Research Council) crude protein requirement. Cows fed the 145% level had heavier calves (84 vs. 73 lb.) and a higher percentage of calving difficulty (58 vs. 42%). These results must be considered preliminary. Producers should not be encouraged to under-feed protein because this could result in so-called "weak calf syndrome."

The time of day the cow herd is fed during calving season has recently been shown to influence when calves are born. The data indicate that cows fed at night are more apt to calve during daylight hours when they can be observed closely. Gus Konefal, a Hereford breeder in Manitoba, was the first to recommend this feeding system. Consequently, it has been called the "Konefal Method" of daytime calving. The Konefal Method involves feeding twice daily, once at 11:00 a.m. to 12 noon and again at 9:30 to 10:00 p.m. This regime starts about 1 month before the first calf is born and continues throughout the calving season. By following this feeding program, Konefal reported that 75% of his cows calved between 7:00 a.m. and 7:00 p.m. Similar results were obtained in a trial at Iowa State University (Brackelsberg and Strohbehn, 1981).

Table 5. Effect of Pre-Calving Energy Level on Birth Weight and Dystocia in 2-Year-Old Cows (Laster, 1974).

Energy Level	Birth Wt., lb.	Dystocia (percent)
Low (10.8 lb. TDN)	58.0	26
Medium (13.7 lb. TDN)	61.5	17
High (17.0 lb. TDN)	63.9	18

Table 6. Two Levels of Pre-Calving Energy for 2-Year-Old Cows (Bellows and Short, 1978).

Energy Level	Pre-calving Cow Wt., lb.	Pre-calving Condition Score	Calf Birth Wt., lb.	Dystocia (percent)
Low (7.5 lb. TDN)	725	6.4	58.6	40
High (13.9 lb. TDN)	811	10.6	62.8	36

Implanting With Zeranol

Recent research has suggested that implanting open heifers with the growth stimulant, zeranol (Ralgro), can increase pelvic area and could theoretically reduce the incidence of dystocia. Staigmiller *et al.* (1978) did find that implanting increased pelvic size, but that it also reduced conception rate during the breeding season (78% vs. 63%). Anthony *et al.* (1981) implanted pregnant heifers with zeranol and reported increased pelvic area in one trial but no increase in a second trial. Ironically, calving ease was adversely affected by zeranol treatment in their first trial but was improved in the second. A negative aspect of their results was the observation that 10 to 20% of the implanted heifers aborted in Trial 2. Based upon the results of these and other experiments, implanting with zeranol cannot be recommended for replacement heifers. It is, however, an excellent growth stimulant for non-replacement cattle.

Geographic Area

Research has demonstrated there is less calving difficulty in the southern part of the U.S. than in

the Midwest or West. Hereford and Angus cows, four months pregnant, were transported from MARC in Nebraska to LSU in Louisiana (Humes, 1974). A comparable group was kept at MARC. Both groups had been bred to the same five Chianina sires. Calves born in Nebraska weighed 92 lb. and had an assistance rate of 10%. In contrast, their mates born in Louisiana averaged 69 lb. at birth with an assistance rate of only 2%. A portion, but by no means all, of these differences could probably be accounted for by the fact that Louisiana calves were born in the fall whereas Nebraska calves were dropped in the spring.

Similar results were observed when Hereford cows of comparable genetic make-up were moved from Miles City, Montana, to Brooksville, Florida, and vice versa (Burns *et al.*, 1979). Ten years after this switch was made, birth weights in the Montana herd that had been moved to Florida had declined from 81 lb. to 64 lb. Conversely, birth weights in the Florida herd that had been moved to Montana had increased from 66 lb. to 77 lb.

Problems in Presentation and Delivery of the Fetus

Most calves are presented frontwards (anterior) with the nose resting on the front legs. The following situations are among the more common ones that can lead to calving problems: 1) oversize fetus, resulting in shoulder lock or hip lock; 2) backwards (posterior) presentation; 3) buttocks or breech birth; 4) elbow lock; 5) one or both legs back; 6) head deviated to either side; 7) twins. Whether a veterinarian should be called for assistance depends upon the experience of the producer.

Not only is knowing *how* to give assistance important, but so is knowing *when* to help. For years, the general recommendation was to intervene if the cow labors 2 or 3 hours without making progress or if the water sac is observed and delivery is not complete within 2 hours. Recent research at Miles City suggests that assistance should be given earlier, as soon as fetal membranes or calf's feet are visible. They found the average cow labors for 50 minutes. For every 10 minutes increase in duration of labor, the interval from calving to first estrus was lengthened by 2 days and pregnancy rate was decreased by 6%. They caution, however, that the operator should be certain the cervix is fully dilated before pulling on the calf. Also, the posture of the fetus must be normal; for example, if either of the legs or head are back, they should be corrected before assistance is given. It is also very important that the operator's hands, arms and equipment be disinfected before entering the cow. Furthermore, it is important to apply liberal quantities of lubricant soap to the operator, and to the fetus and birth canal.

Coping With Calving Difficulty

Some producers can tolerate more calving difficulty than others because they have the time, expertise, and other resources needed to ensure a high rate of calf survival. New producers with limited experience who work off the farm and spend little time with their cattle need to put a higher priority on ease of calving. Furthermore, large extensive range operations cannot tolerate as much calving difficulty as smaller, more intensively managed herds.

Dystocia can be attacked from two standpoints — management and genetics. Management considerations have been alluded to. In summary, they are: 1) know the cow's nutrient requirements and do not underfeed nor overfeed her; 2) give first-calf, 2-year-old heifers extra attention during calving season; 3) know how and when to give assistance and when to call the veterinarian.

From a genetic standpoint, most of the emphasis has been placed on birth weight because research has shown it is the single most important factor associated with calving difficulty, especially in 2-year-old cows where a 1 lb. increase in birth weight results in a 2% increase in dystocia (Burfening *et al.*, 1978). However, increases in birth weight are not all bad because the genetic correlations between it and components of post-calving growth are quite high, as shown in Table 7. This means that selection for increased growth rate tends to result in higher birth weights. Table 7 also lists the heritability estimates of various growth traits. All are relatively high, which means that selection for growth in beef cattle can be quite effective.

Embarking on a crash program of selection for low birth weights could lead to a decline in weaning and yearling weights which seems ill-advised. In recent years, most breeds have developed sire summaries of bulls used in A.I. service. These summaries show exceptional bulls that sire progeny with breed average or lower birth weights and well above average post-calving growth. These are the kind of bulls that can be of real help in controlling calving difficulty without sacrificing growth. For example, out of 170 Simmental

Table 7. Heritabilities of Growth Traits and Their Genetic Correlations With Birth Weight (Petty and Cartwright, 1966).

Trait	Heritability (percent)	Genetic Correlation with Birth Wt.
Birth weight	44	—
Weaning weight	32	.58
Yearling weight	58	.61
18-month weight	50	.60
Gain, birth to weaning	31	.38
Feedlot gain	52	.54
Mature weight	84	.68

reference sires (those with 300 or more progeny) in 1981, 30 had above average progeny ratios for both calving ease and yearling weight. Out of 673 sires listed in the 1981 Angus Sire Evaluation Report, 59 had below average birth weights but were above average on weaning weight, yearling weight and maternal breeding value.

Field records on Simmental cattle have shown there is little or no relationship between how a sire's calves are born and the way his daughters subsequently calve. In other words, just because you select an easy-calving A.I. sire, there is no reason to believe that his daughters will calve any more easily than daughters of hard-calving sires. However, daughter's first-calf calving ease is a moderately heritable trait (about 25%) that can be selected for. Values for this trait are listed in the sire summaries of several breed associations.

When purchasing a young bull for natural service, one should check the bull's birth weight, if available. If it is breed average or lower, he is apt to sire calves that deliver easily and could be considered a candidate for use on heifers. When selecting a bull to use on small-type British breed heifers, it is generally recommended that they not be mated to large exotic breed bulls, but rather to British breed bulls with low birth weights. Four-year-old cows and older can likely be mated to bulls of the same breed which are one standard deviation (about 12 lb.) over breed average in birth weight without encountering serious calving problems.

When checking the birth weight of a bull, consider the age of his dam when he was dropped because younger cows give birth to lighter calves. Ideally, birth weights should be adjusted to a 5- to 10-year-old dam equivalent as follows: 2-year-old dams, add 8 lbs.; 3-year-olds, add 5 lbs.; 4-year-olds, add 2 lbs.; 5- to 10-year-olds, add none; 11-year-olds and over, add 3 lbs. These are standard adjustments used by BIF (Beef Improvement Federation); some breeds have their own adjustments. Average birth weights used by various U.S. beef breed associations are listed in Table 8.

Even though growthier heifers tend to have bigger calves at birth, it still pays to select larger heifers as replacements because their pelvic size is apt to be proportionately greater than smaller heifers. Furthermore, their calves will grow faster because the heritability of growth traits is relatively high, as shown in Table 7. Selecting the older heifers in a calf crop should likewise lead to less dystocia because they will be larger when their first calves are born.

Table 8. Breed Standard Birth Weights Used in Performance Testing Programs.

Breed	Sex of Calf	
	Females	Males
Angus	65	75
Charolais	85	85
Chianina	80	80
Hereford	70	75
Polled Hereford	70	75
Limousin	75	80
Maine Anjou	84	90
Shorthorn	70	70
Simmental	83	91

Summary

The complex nature of calving difficulty is summarized in Figure 1.

In conclusion, research has shown the following practices to aid in alleviating calving problems:

(1) Mate yearling heifers to low-risk bulls:
   (a) Proven A.I. sires whose progeny calve easily.
   (b) Unproven bulls whose own birth weights were low.

(2) Feed pregnant females adequately; do not underfeed nor overfeed.

(3) Using the Konefal Method may cause more cows to calve in daytime when they can be observed closely.

(4) Give first-calf 2-year-old heifers extra attention at calving time.

(5) Know when and how to give assistance and when to consult a veterinarian.

(6) Within a herd, select replacements from among the larger (older and growthier) heifers.

(7) For long-term progress in a herd, select A.I. sires having above average breeding values for daughters' first-calf calving ease.

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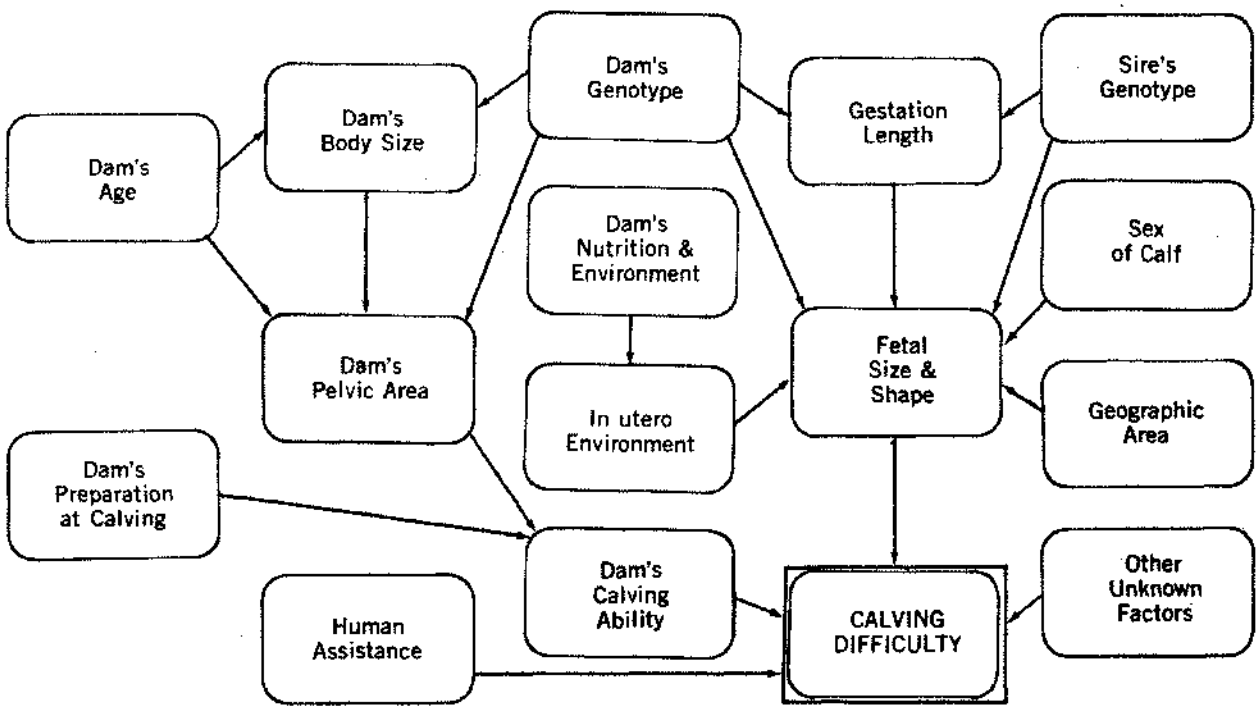

Figure 1. Factors affecting calving difficulty.

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