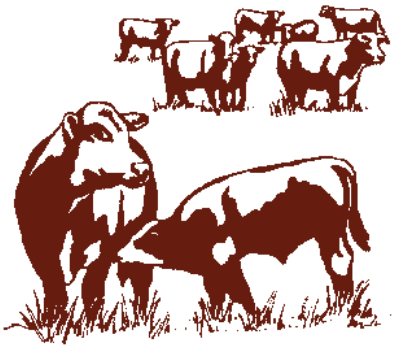

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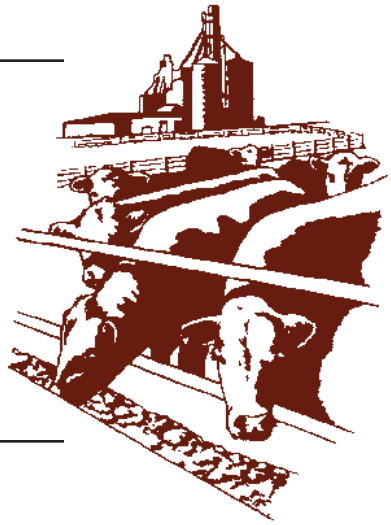

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Management of First-Calf Heifers

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Successfully calving out and then rebreeding a set of first-calf heifers presents one of the greatest challenges to cow-calf producers. The physical and nutritional stresses associated with parturition, lactation and continuing her own growth, create a real challenge for the two-year-old cow. Calving difficulties, weak calves, calf death loss and scours are all potential pitfalls that can be avoided or reduced with proper management and nutrition. But, perhaps the biggest stumbling block with first-calf heifers is getting them rebred in a timely fashion. Data from South Dakota herds enrolled in the Cow Herd Appraisal Performance Software (CHAPS) program shows a tendency for heifers to calve on time as two-year-olds, calve late as three-year-olds and then be open in the fall when they wean their second calf. Five years of culling data from the North Dakota CHAPS program supports this tendency as the highest percentage of cows culled for reproductive failure were three-year-olds. The two- and three-year-old cows accounted for nearly one third of all the open cows culled. Therefore, not only getting first-calf heifers rebred, but also getting them bred early in the season are of great importance to the long term success of the breeding program.

Pre-calving Nutrition and Management

Successful management and rebreeding of first-calf heifers is partially dependent on having them bred early as yearling replacement heifers. Research has shown that first-calf heifers have a longer postpartum interval (the time from calving to first estrus) than cows. Heifers that calve late as two-year-olds are difficult to keep in the herd and even if you do get them rebred every year they will usually calve late in the season and thus wean younger, lighter weight calves. Producers should either start the breeding season for yearling heifers two-three weeks ahead of the cow herd or simply shorten the breeding season on the yearlings to help assure an early calving group of first-calf heifers. If purchasing replacement heifers, buy only heifers that are due to calve early in your calving season.

Table 1. Effect of Pre-calving Energy Level on Performance of First-calf Heifers

Energy Level	HIGH	LOW
Birth Weight, lb.	67	63
% Calving Difficulty	27	28
% Calves Alive at Birth	97	90
% Heifers Cycling 40 Days After Calving	41	26
% Heifers Cycling by Start of Breeding Season	74	56
% Heifers Cycling by End of Breeding Season	100	93
Weaning Weight of Calves, lb.	353	325

Corah, et al., J. Anim. Sci. 41:819, 1975.

Proper pre-calving nutrition is essential. Table 1 shows the results of a Wyoming study comparing the performance of two groups of first-calf heifers fed differing levels of energy for 100 days prior to calving. One group (HIGH) received 100 percent of the NRC requirement for TDN (energy) while the other group (LOW) received only 65 percent of their NRC requirement for

TDN. LOW energy reduced birth weights by approximately 5 pound., however the percentage of cows with calving difficulty was not decreased and the calf survivability was lower with LOW energy. HIGH energy resulted in a more rapid return to estrus and a higher percentage of cows cycling at both the beginning and end of the breeding season.

Research from Colorado State University helps explain the Wyoming results. When heifers were developed to calve in adequate body condition score (BCS = 5 or 6 on a 9-point scale) calves were quicker to stand following calving and they also had higher serum immunoglobulin concentrations than calves from heifers developed on lower energy and calving in BCS 3 or 4 (Table 2). Several researchers have also demonstrated a strong relationship between BCS at calving and subsequent reproductive performance. In a recent Louisiana study (Table 2), heifers that calved in BCS 6 or 7 had higher pregnancy rates and a shorter interval from calving to pregnancy than heifers in BCS 4 or 5. These and other data would indicate a target BCS of 6 for first-calf heifers at calving. If heifers are thinner than this, weak calves and poor rebreeding performance become potential problems; if their BCS are higher than this, increased calving difficulties could occur.

The Colorado researchers also demonstrated that protein intake during gestation affects colostrum production and the activity of the calves at birth. Restricting protein to 55 percent of the NRC requirement resulted in lower colostrum production, lower heat production in the newborn calf and a longer interval from calving to when the calves first stood. Other research at the University of Idaho has related restricted protein intake to an increase in weak calf syndrome in newborn calves.

Table 2. Effect of Body Condition Score at Calving on Colostrum, Interval from Calving to Standing and Reproductive Performance of First-calf Heifers

	Body Condition Score				
	3	4	5	6	7
Interval from Calving to Standing, min[a]	60	64	43	35	-
Colostrum Production, ml[a]	1525	1112	1411	-	-
Calf Serum IgG1, md/dl[a]	1998	2179	2310	2349	-
Calf Serum IgM, mg/dl[a]	146	157	193	304	-
Pregnancy Rate, %[b]	-	65	71	87	91
Days to Pregnancy[b]	-	92	82	74	76

[a] *Odde, Food Anim. Practice 4:501, 1988.*
[b] *DeRouen, et al., J. Anim. Sci. 72:1119, 1994.*

Avoiding Calving Difficulty

Survey information from the National Animal Health Monitoring System (NAHMS) indicates that 17.8 percent of all beef first-calf heifers require some type of calving assistance. Of these, 9.4 percent are reported as easy pulls, 7.4 percent as hard pulls and 0.4 percent as Cesarean sections. Calving difficulty in first-calf heifers delays return to estrus, lowers pregnancy rates, increases cow and calf death losses and dramatically increases costs of production. Odde (1988) has also shown that calving difficulty affects calf vigor and serum immunoglobulin concentration (Table 3). As calving difficulty scores (1=no assistance, 2=easy pull, 3=hard pull) increased the calf serum immunoglobulin concentrations decreased and the interval from calving to the calf standing was increased. They also found that cows that calved without assistance more readily accepted their calves. Odde concluded that reducing calving difficulty may have an indirect effect on increasing calf survival, independent of the direct effect of calving difficulty on direct calf losses.

Sire selection and proper development of replacement heifers are the keys to reducing calving difficulty. It should be noted though that with improvements in estrus synchronization techniques the technology is available to AI the majority of all replacement heifers to progeny proven, calving ease bulls.

Replacement heifer development extends well beyond the time of getting the yearlings bred. At calving a first-calf heifer should weigh approximately 85 percent of her mature weight potential. For example a heifer that you predict will grow into a 1200 pound. mature cow should weigh 1020 pound. when she calves. This translates into an average daily gain of around one pound per day from breeding to calving plus the weight of the fetus and membranes. Obviously, a potential drawback to this target weight method of heifer development is accurately predicting mature weights. There is a general tendency to underestimate mature weights especially on larger framed cows. Your cull cow weight receipts or simply weighing a group of cows with similar genetics can give you a good estimate of the mature weights in your herd.

Proper heifer development can also be monitored via body condition scores. As discussed earlier a BCS of 6 at calving is optimum. A BCS is equivalent to approximately 60 pound. of body weight. By monitoring BCS on bred heifers throughout gestation you can make the necessary adjustments to achieve the target BCS at calving.

Reducing dietary energy prior to calving is not an effective method for controlling calving difficulty.

Table 3. Effect of Calving Difficulty Score on Calf Serum Immunoglobulin Concentration and the Interval From Calving to Standing.

	Calving Difficulty Score		
	1	2	3
Interval from Calving to Standing, min	40	51	84
Calf Serum IgG_1, mg/dl	2401	2191	1918
Calf Serum IgM, mg/dl	195	173	136

Odde, Food Anim. Practice 4:501, 1988

Researchers at the U.S. Meat Animal Research Center (MARC) fed Angus and Hereford two-year-old heifers 10.8, 13.7 or 17.0 pounds. of TDN per head per day for 90 days prior to calving. Although birth weights increased as energy increased, the low energy group experienced the most calving difficulty. This is in agreement with the Wyoming data previously discussed in Table 1.

Dietary protein levels during gestation are also a consideration. In a Miles City, Montana study bred heifers were fed either 86 percent or 145 percent of the NRC crude protein requirement for the 82 days prior to calving. Heifers on the high protein diet gained more weight and calved in higher condition scores; however, they also had significantly heavier calves at birth and experienced more calving difficulty. Other research trials though have not shown a consistent response to high protein gestation diets. Pre-calving protein levels should be kept near NRC recommendations, as low levels can result in weak calves and high levels are costly and may present some risk of heavier birth weights and increased dystocia.

Forced exercise during late gestation has been shown to improve calving ease in confined dairy heifers. However, a recent report from the Miles City research station (J. Anim. Sci. 72:1667, 1994) indicated no advantage to forced exercise on the calving ease of first-calf beef heifers maintained in typical beef environments.

Providing timely assistance to heifers that do experience calving difficulty is a key to improving rebreeding performance. In another Miles City project (J. Anim. Sci. 59:1, 1984) heifers were divided into SHORT (assistance provided when membranes or feet were visible) or PROLONGED (labor progressed until calf was born or assistance was required) duration labor groups. The SHORT duration group had higher percentages of first-calf heifers cycling at the start of the breeding season (87 vs. 70 percent) and pregnant in the fall (88 vs. 69 percent). The average length of Stage II parturition (time from the first abdominal press to when the calf was born) in the PROLONGED group was 54 minutes. In contrast, NAHMS data indicates that 45 percent of producers let a heifer labor for three or more hours before providing assistance. More frequent observation of heifers and earlier intervention with extended labor appear to be justified.

Post-calving Nutrition and Management

Separating first-calf heifers from the mature cow herd can help in improving their reproductive performance. Not only will the mature cows dominate heifers at the feed bunk, but one must also realize that the lactating first-calf heifer is a unique individual. As shown in Table 4, a 1000 pound heifer has similar daily requirements for energy (TDN) and crude protein as her counterpart 1200 pound mature cow of similar milking ability. However, the dry matter intake for the heifer is approximately 10 percent lower than the cow's. Therefore producers need to provide a higher quality diet for their lactating first-calf heifers than for their lactating cows. If the heifers and cows are run together as a single management group, either the heifers will be under-fed or the cows over-fed. Either scenario will result in decreased efficiency due either to decreased performance in the heifers or additional costs for the cows.

Table 4. Comparison of Feed Requirements of Mature Cow and First-calf Heifer.

	Cow	Heifer
Weight	1200	1000
TDN, lb.	12.8	12.9
CP, lb.	2.1	2.1
Intake	23.0	20.8
% TDN	55.7	62.0
% CP	9.1	10.1

NRC, 1984, Average milk production.

Heifers should be monitored for changes in BCS from calving through breeding to assure that they are in a positive plane of nutrition. This is true even after turnout onto lush pastures as first-calf heifers may have problems consuming enough of the lush, wet forage to meet their dry matter and energy requirements. If the heifers start to lose condition, additional energy and other ration adjustments may be necessary.

Kansas researchers fed lactating first-calf heifers at either 100 or 150 percent of their NRC requirements for crude protein with supplements of either low rumen escape or bypass potential (L) or high rumen escape (H) potential (Table 5). Average daily gains of both cows and calves were higher for cows receiving the higher level of protein. Neither the amount nor the source of the supplemental protein significantly affected the milk yield or

conception rates in this study. This study would suggest that NRC potentially under estimates crude protein requirements for first-calf heifers or that we can easily under estimate the milk production potential of heifers, especially those selected for improved maternal traits.

Continue to monitor BCS of first-calf heifers even after the breeding season. Preventing excessive body weight losses during late lactation can reduce winter feed costs and help to prevent reproductive failures as three-year-olds. The impact of crude protein supplementation during late lactation and/or early weaning in spring calving cows was demonstrated in a Montana study (Table 6). When calves were weaned in December at 8-9 months of age, non-supplemented cows lost approximately two pounds for each pound that their calves gained. If the late weaned cows were supplemented with three quarters of a pound of crude protein, they were essentially able to maintain their weight and body condition. Early weaned cows maintained their weight and condition without supplementation, while early weaned, supplemented cows gained both weight and condition. These results were not duplicated when this trial was repeated in subsequent years indicating a weaning date by year interaction. In years when first-calf heifers are losing weight and BCS, or pasture conditions are becoming poor during late lactation, strongly consider early weaning and or supplementation to prevent loss of valuable body energy reserves.

Table 5. Effect of Amount and Source of Protein on Performance of Lactating, First-calf Heifers

	100-L	100-H	150-L	150-H
ADG of Cow, lb.	.62	.55	.68	1.06
ADG of Calves, lb.	1.30	1.36	1.45	1.50
Milk Yield, lb./day	10.4	11.4	11.2	13.0
Conception, %	56	80	90	80

Rusche, et al., J. Anim. Sci. 71:557, 1993.

Summary

- First-calf heifers are a unique management group in a cow-calf operation. They are highly susceptible to calving and reproductive failure unless properly fed and managed.
- Restricting energy prior to calving might reduce birth weights, however it has also been shown to cause increased calving difficulty, poor calf vigor, decreased calf survivability and reduced conception rates.
- A BCS of 6 at calving appears to be optimum for first calf heifers to achieve successful calving and reproductive performance. BCS is an excellent tool for monitoring nutritional status and for making decisions regarding changes in the nutrition and management of first-calf heifers.

Table 6. The Effect of Weaning Date and Protein Supplementation on Cow and Calf Performance

	Weaning Date			
	September 19		December 11	
Crude Protein, lb./day	0.0	.75	0.0	.75
	Cow and Calf Performance			
Cow Weight Change (Sept-Dec), lb.	-23	80	-130	-25
Cow Condition Change	0.1	1.3	-1.4	-0.6
Weaning Weight, lb.	445	445	507	536

Short, et al., Factors Affecting Calf Crop, pp. 176-186, 1993.

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