INTEGRATED REPRODUCTIVE MANAGEMENT

Part IV. The First-Calf Heifer

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A greater proportion of first-calf heifers is culled because of rebreeding failures than any other age class of beef females. The most critical period in the sequence of reproductive events occurring in a cow's life is between first calving and the second breeding. The primary cause of reproductive failure during this period is nutritional stress.

Nutritional stress is more clearly seen in young animals because heifers have not reached their mature size. The requirements of reproduction and lactation added to maintenance and growth can tremendously drain often already depleted body reserves. When this stress occurs, the animal's body responds by prioritizing how available nutrients will be utilized. Reproduction will always be at the bottom of the priority list and will be the first economically important function to suffer from severe stress. To maximize reproduction, nutritional stress must be minimized. The stresses facing the first-calf heifer can be positively influenced, if not totally alleviated, by proper management.

Plan for the interval between calving and first estrus when breeding heifers for the first time. It is mandatory that this be considered prior to turning bulls out. Because of nutritional stress, first-calf heifers are often slow in resuming estrous cycles after calving. Therefore, a lower percentage of heifers become pregnant early in the breeding season (Table 1). Research data has demonstrated that the average length of interval from calving to first estrus is 49 days in older cows and 67 days in young cows suckling calves. A management procedure for synchronizing the calving season of first-calf heifers with the older cows is to turn the bulls in with virgin heifers approximately 20 days in advance of the mature cow herd. A negative aspect of this procedure is a longer calving season and higher winter feed costs. On the positive side, however, more time can be spent with the heifers during calving, their calves will weigh more at weaning and the heifers will be getting an earlier start on their productive lives. Many of the reproductive problems experienced by heifers are the result of long intervals from calving to first heat. First-calf heifers that calve late will likely calve late the rest of their lives or miss at least one pregnancy.

Table 1. Cows in Heat Early in the Breeding Season.

Calving Time In 20 Day Increments	Avg. No. Days Calving to Start of Breeding Season	In Heat First 20 Days of Breeding Season (May 1 to May 20)	
		Cow 5 years or older	2- and 3-year-old cows
		%	%
Feb. 10 to March 1 (first 20 days of calving)	70	95	79
March 2 to March 21 (second 20 days of calving)	50	88	64
March 22 to April 10 (third 20 days of calving)	30	70	32
April 11 to May 1 (fourth 20 days of calving)	10	29	10

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Alternate managerial practices for first-calf heifers that might be considered are (1) starting the breeding season 20 days earlier than the cow herd; (2) breeding for only 45 days; (3) synchronizing estrus and (4) exposing 50-70 percent more heifers for breeding than are needed and selecting replacements from heifers that become pregnant early in the breeding season.

Nutrition

The first consideration of any nutritional program should be to maintain the desired nutritional level while minimizing cost. The nutrient requirements for pregnant yearling heifers are as follows (Table 2).

In years of average precipitation and proper stocking rates, pasture will provide the nutrients required by pregnant heifers. Overstocking and drought will affect weaning weights, calf crop percentage and feed costs. In a Montana study, weaning weights during a year of reduced rainfall were 67 pounds less than average years. Considering all producing-age females, first-calf heifers were the first to suffer reproductive failures in drought years. Yearling heifers had conception rates of 87 percent, but two-year-olds nursing their first calf had a 28 percent conception rate.

Heifers must continue development during pregnancy to ensure that they calve properly, milk well and rebreed quickly after calving. A two-year-old heifer should weigh about 85 percent of her mature weight at first calving. If the average mature weight for a breed is between 1050 and 1100 pounds, yearling heifers should weigh between 900 and 950 pounds at calving. If the heifers weighed 700 pounds at breeding, they will need to gain 200 to 250 pounds during the gestation period, which is approximately 280 days. Bred heifers should gain between .75 and 1.0 pounds per day from breeding to calving. When pasture quality is good, heifers may reach the target weight coming off fall pasture. Heifers then need only to maintain their weight until calving. If this weight has not been reached, feed levels will have to be increased to attain the desired weight. It is important to provide enough feed without getting the heifers too fat at calving time.

Replacement heifers and thin cows should be fed in a separate group from the main cow herd; they are not as aggressive because of their smaller size. The entire cow herd would have to be overfed to ensure that thin cows and heifers receive enough feed to meet their nutritional requirements if all were fed together. Research data indicate heifers wintered with mature cows are slower to return to heat after calving and have a lower percentage calf crop than when fed separately.

After calving, heifers need more energy and protein than mature cows to meet their requirements for milk production and body growth (Table 6). Heifers require about 75 percent more energy after calving than before calving to meet these needs. The ration should also contain 10 percent crude protein. Failure to supply sufficient energy after calving will result in delayed return to heat and failure to rebreed in the normal breeding season.

Young cows should gain 100 to 150 pounds after weaning their first calf and calving again as a three-year-old.

Calving Difficulty

Calf losses are usually higher in cows calving for the first time than in older cows. Research con-

Table 2. Nutrient Requirements for Pregnant Yearling Heifers (Last 3-4 Months of Pregnancy).

Average Weight	Daily Gain	Dry Matter Consumption	Minimum Roughage (%)	Protein (%)	Total (lbs)	(%)	TDN (lbs)	Ca (%)	P (%)
	0.9	14.5	100	8.8	1.28	52	7.7	.23	.23
716	1.3	18.7	100	8.8	1.65	52	9.9	.21	.21
	1.8	20.7	85-100	9.0	1.87	58	12.3	.23	.21
	0.9	15.2	100	8.8	1.34	52	8.1	.22	.22
772	1.3	19.6	100	8.8	1.72	52	10.3	.21	.21
	1.8	22.0	85-100	8.8	1.94	58	12.9	.22	.21
	0.9	15.9	100	8.7	1.39	52	8.4	.21	.21
827	1.3	20.5	100	8.7	1.79	52	10.8	.20	.20
	1.8	24.2	85-100	8.7	2.12	55	13.5	.20	.20
	0.9	16.5	100	8.7	1.43	52	8.7	.21	.21
882	1.3	21.4	100	8.7	1.85	52	11.3	.20	.20
	1.8	25.6	85-100	8.7	2.23	55	14.0	.19	.19
	0.9	17.2	100	8.8	1.52	52	9.0	.20	.20
937	1.3	22.3	100	8.7	1.94	52	11.7	.19	.19
	1.8	26.7	85-100	8.7	2.31	55	14.6	.18	.18

ducted at the Range Experiment Station, Miles City, Montana, reported 10 percent of the calves born to first-calf heifers were lost compared to a 2 to 4 percent loss in older cows.

The primary cause of calving difficulty is a calf which is too big to readily pass through the birth canal (pelvic opening). Studies have shown the size of the pelvic opening in two-year-old heifers is small compared to that in older cows. Only 4 percent of two-year-old heifers had a pelvic opening over 230 sq. cm. while only 17 percent of the three-year-old and none of the older cows had a pelvic opening smaller than 230 sq. cm. Consequently, when the birth weight of the calves of two-year-old cows is high, calving difficulties occur.

Attempts have been made to decrease birth weight by lowering the dam's energy intake. There is no doubt that calving problems are increased in heifers which are fat. However, this is not because of increased birth weight of the calf. Research trials have shown the losses at birth in heifers receiving high energy rations were the result of a pelvic opening reduced in size because of fat deposition. **Available data indicates serious consequences can result from trying to starve calving difficulty out of a heifer.**

Several studies indicate nutritional level prior to calving can alter calf birth weight but not enough to consistently reduce calving problems. When the gestation feed level is decreased, there are dramatic increases in the time required for heifers to rebreed. Fewer females become pregnant than heifers on a higher level of nutrition (Table 2 and 3).

There is a balance between having heifers either too thin or too fat at calving. Fat heifers increase the incidence of calving difficulty and thin heifers will have postpartum breeding failures.

A more fruitful approach in decreasing birth weights is to breed heifers to bulls that will sire calves with light birth weights. Birth weight can be highly influenced by selection since it is estimated to be 40 percent heritable. It becomes mandatory to know the bull's birth weight to effectively estimate birth weights of his progeny. For example, assume a bull has a birth weight of 100 lbs. and the average birth weight in the producer's herd was 70 lbs. In terms of pounds, what would be the influence of this bull's birth weight on the average birth weight of his progeny? The difference in the birth weights is 30 lbs. (100 lbs.-70 lbs. = 30 lbs). This difference is 40 percent heritable (30 lbs. × .40 = 12 lbs.) and would account for 12 lbs. However, the bull is only providing one-half of the genetic information toward the make-up of the new individual, so this value must be divided by 2 (12 lbs ÷ 2 = 6 lbs). This bull would be estimated to increase the average birth weight by 6 lbs per calf. The extent by which this will influence calving difficulty will depend on size and conformation of the heifers. However, research data suggest a 2 percent increase in calving difficulty for every 1 pound increase in birth weight. Many producers use the management approach of breeding their first-calf heifers to bulls of a smaller framed breed in the hope of reducing calving difficulty. A word of caution — indiscriminate crossbreeding will not necessarily reduce calving problems (Table 4).

In this study, bulls causing calving difficulty tended to sire calves which had greater birth weights. Heifers bred to different bulls showed distinct differences in calving difficulty. Forty-four percent of the heifers bred to Angus sire 602 experienced calving difficulties, while only 13 percent of the heifers bred to the sire 609 experienced claving difficulty. Bulls which will sire calves of light birth weights can be found. This type of bull cannot be determined solely by visual selection techniques but must be chosen on the basis of performance records.

Normally a young, light bull should be used on heifers. This reduces risk of injury to the heifers at breeding, as the heifer must support less weight than if she were bred by a mature, heavy bull.

SUMMARY

Reproductive failure in first-calf heifers is an all too common occurrence. The primary cause of failure is nutritional stress. Nutritional stress is greater in first-calf heifers because they have not reached their mature size. The maintenance and growth demands plus the added requirements of reproduction and lactation can often exceed the nutrient intake of these heifers. When this situation occurs, the animal's body responds by prioritizing how available nutrients will be utilized, and

Table 3. Nutrient Requirements of Lactating Heifers (3-4 Months After Calving)

Average Weight (lbs)	Minimum Dry Matter Consumption (lbs)	Roughage (%)	Total Protein (%)	Total Protein (lbs)	TDN (%)	TDN (lbs)	Ca (%)	P (%)
772	22.4	100	10.9	2.45	55	12.8	.44	.39
882	23.8	100	10.9	2.58	55	13.5	.42	.38
992	24.9	100	10.9	2.71	55	14.1	.40	.37
1102	26.0	100	10.9	2.84	55	14.8	.39	.36
1213	27.3	100	10.9	2.98	55	15.4	.37	.35
1323	28.4	100	10.9	3.11	55	16.1	.36	.34
1433	29.5	100	10.9	3.22	55	16.8	.35	.33

reproduction falls at the bottom of the priority list. Proper attention to nutritional and other management details can mean the difference between a pregnant or an open heifer.

Table 4. Effects of Age, Gestation Feed, Sire and Sex of Calf on Gestation Length, Dystocia, and Calf Birth Weight.

Main effects	No. of calves	Gestation length, days	Dystocia score*	Birth weight, lbs.
Age of dam				
Heifer	48	282.0	2.7	75
Cow	54	283.0	1.6	84
Gestation feed				
Low	51	283.0	2.3	80
High	51	282.1	2.0	79
Size of calf				
Moderate birth weight	58	281.4	2.1	76
High birth weight	44	283.7*	2.2	82
Calf sex				
Male	47	283.2	2.4	84
Female	55	281.8	1.9	75

*Dystocia Scores
1 = unassisted
2 = assisted (&light pull)
3 = difficult pull
4 = extreme difficulty or cesarean

(Bellows et al., J.A.S. 1982)

Table 5. Effects of Age, Gestation Feed, Sire and Sex on Postpartum Reproductive Performance.

Main effects	No. head	Day of year of first estrus	Postpartum interval, days	Estrus by begin breeding season, %	October pregnancy, %
Age of dam					
Heifer	47	181.8	88.9	31.6	64.1
Cow	52	154.1	59.1	90.6	82.2
Gestation feed					
Low	49	174.3	79.5	54.7	66.8
High	50	161.6	68.5	67.5	79.4
Sire of calf					
Moderate birth weight	55	168.2	77.0	56.8	72.8
High birth weight	44	167.7	70.9	65.4	73.5
Sex of calf					
Male	47	171.5	77.8	60.2	62.7
Female	52	164.4	70.1	62.0	83.6

(Bellows et al., J.A.S. 1982)

Table 6. Effect of Sire on Calving Difficulty in Two-year-old Heifers (1964).

	Angus Sires				Hereford Sires			
	602	609	610	611	702	705	750	753
Number of Calves Born	30	30	29	25	29	34	35	22
Birth Weight (lb)	68	64	62	70	69	68	71	66
Cows Experiencing Calving Difficulty (%)	44	13	20	36	31	40	23	18
Cows Experiencing Calving Difficulty in Which Calf Was Presented Abnormally (%)	3	3	7	4	3	8	3	9
Cows Experiencing Calving Difficulty in Which Calf Was Presented Normally								
Total (%)	41	10	13	32	28	32	20	4
Very Difficult Birth (%)	7	0	0	8	7	3	0	0
Pullers Needed (%)	27	10	10	24	21	29	17	4
Slightly Difficult (%)	7	0	3	0	0	0	3	0
Live Calves at 24 Hours (%)	87	100	93	96	96	100	94	100

(Wiltbank, 1971.)

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