

Cattle Producer's Handbook

Reproduction Section

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Rebreeding the First-Calf Heifer

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Rebreeding performance of first-calf heifers has major economic consequences. This classification of breeding animal is often the most challenging to manage for reproductive efficiency, primarily because this animal is not only subject to the stresses of calving and lactation for the first time, but she is still growing.

Inability to rebreed after delivery of the first calf is one of the primary reasons for culling in a beef cattle operation. A considerable amount of money is invested in the development of this replacement animal, and high replacement rates can greatly decrease the profitability of a beef cattle operation.

Herd Health

A sound herd health program is an essential part of any reproductive management system. Cattle are susceptible to a variety of diseases that are detrimental to reproduction (see the Animal Health section for papers on specific diseases associated with reproductive failure and abortions). Cattle producers should work closely with their veterinarian in establishing their herd health program.

A relationship exists between poor nutrition and increased incidence of herd health problems. Several vitamins and minerals are necessary for immune system function, and nutrient deficiencies in these areas can result in increased susceptibility to diseases (see papers from the Nutrition section for further information).

Breed Heifers to Calve Earlier Than the Cowherd

Even when properly developed and managed, beef heifers generally have a 20- to 30-day longer postpartum interval (interval from calving until the first fertile estrus) than older cows. The practice of breeding virgin heifers 20 to 30 days earlier than the cowherd will provide the

heifer additional time to return to estrus and rebreed with the older cows the next year. It is important to manage these heifers separately for two reasons:

1. Earlier calving will likely mean that heifers will not have pastures readily available after calving, thus additional nutrients will need to be supplied.
2. Nutrient requirements (% of ration) are higher for first-calf heifers than for mature cows (see 300, "Nutrient Requirements of Beef Cattle"). Breeding heifers early will be of no benefit if they are not properly managed after calving.

Minimize the Postpartum Interval

The period from calving until the cow conceives is critical in a cow's production cycle. Minimizing this time period is important to maximize reproductive and economic efficiency of a beef cattle operation. Cows that cycle early in the breeding season have more opportunities to become pregnant during a limited breeding season.

By keeping other factors constant, such as genetics, age of dam, and nutrition, cows conceiving early in the breeding season generally wean older and heavier calves. The length of breeding season will influence uniformity of calves and their value at weaning. Therefore, in order to have a successful, short breeding season, it is vital that cows cycle and conceive early in the breeding season.

The ability to minimize the postpartum interval is limited by uterine involution, which is the time needed for the reproductive tract to repair after calving so another pregnancy can be established. Uterine involution generally occurs within 30 days postpartum and does not generally limit the ability to cycle, however, factors such as malnutrition, disease, and calving difficulty may delay normal involution.

Table 1. Relationship of body condition score (BCS) to beef cow performance and income.

BCS ¹	Pregnancy rate (%)	Calving interval (days)	Calf ADG ² (lb/day)	Calf WW ³ (lb)	Calf price ⁴ (\$/100 lb)	\$/cow exposed ⁵
3	43	414	1.60	374	115	185
4	61	381	1.75	460	110	308
5	86	364	1.85	514	108	477
6	93	364	1.85	514	108	516

¹Average of BCS obtained at calving, breeding, and pregnancy testing.

²Average daily gain.

³Weaning weight.

⁴Average values obtained from the USDA National Market Report (June 2009).

⁵Income per calf x pregnancy rate.

Body Condition Score

Body condition is correlated with several productive and reproductive events, such as postpartum interval, services per conception, calving interval, milk production, weaning weight, calving difficulty, and calf survival. Therefore, body condition can greatly affect net income on a cow-calf operation (Table 1). Body condition at calving is one of the most important factors controlling when a beef heifer will cycle after calving (see 720, “Condition Scoring of Beef Cattle”).

Heifers should have an optimum body condition of 5 or 6 at calving through breeding to assure optimal reproductive performance (Fig. 1). Body condition score is generally a reflection of nutritional management, however, disease and parasitism can contribute to lower body condition scores even if “apparent” nutrient requirements are met.

Nutritional Management

Feeding a balanced ration to heifers in the last trimester of pregnancy through the breeding season is of critical importance (see 300 and 310, “Ration Balancing”). Nutritional demands increase greatly in late gestation

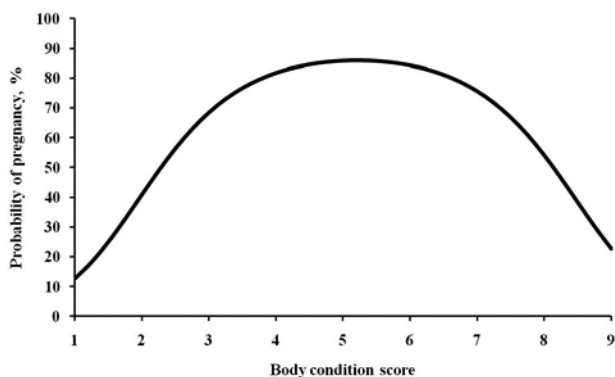


Fig. 1. Probability of beef heifers and cows to become pregnant according to body condition score evaluated at the beginning of the breeding season. Adapted from Cooke et al. (2009).

and even more in early lactation. Reproduction has low priority among partitioning of nutrients; consequently, cows in thin body condition often don’t rebreed in a timely manner or remain open after the breeding season.

Plane of nutrition during the last 50 to 60 days before calving has a profound effect on postpartum interval (Tables 2 and 3). The importance of pre- and postpartum protein and energy level on reproductive performance has been

consistently demonstrated (Table 2). Positive energy balance during postpartum is essential for prompt re-breeding of heifers that calve in thin condition (Table 4).

Several research studies have demonstrated that fat from oilseed sources fed prepartum and/or postpartum to first-calf heifers may be an alternative to increase subsequent rebreeding rates. Beef cattle do not have a fat requirement per se, but it is possible that providing this nutrient at times of high nutrient demand, such as pre- and/or postpartum, may increase reproductive efficiency.

Table 2. Effect of pre- or postpartum dietary energy or protein on pregnancy rates in cows and heifers.

Nutrient and time	Adequate	Inadequate
Energy level precalving ^a	73	60
Energy level postcalving ^b	92	66
Protein level precalving ^c	80	55
Protein level postcalving ^d	90	69

^{a,b,c,d}Combined data from 2, 4, 9, and 10 studies, respectively.

Table 3. Effects of feed level during gestation on calving and subsequent reproduction.¹

Item	Gestation diet of dam	
	Low	High ²
Calf birth weight (lb)	63	69
Dystocia (%)	35	28
Calf survival (%)		
At birth	93	91
Weaning	58	85
Scours (%)		
Incidence	52	33
Mortality	19	0
Dam traits		
Estrus (before breeding season, %)	48	69
Pregnancy (%)	65	75
Precalving pelvic area (cm ²)	256	271

¹Averages from seven studies.

²Diet level fed from up to 150 days precalving; low and high, animals lost or gained weight precalving, respectively.

Table 4. Influence of postpartum diet on body weight, body condition score (BCS), and postpartum interval (PPI).

Item	Gestation diet of dam			
	Low	Maintenance	Maintenance/ high	High
Body weight (lb)	835	822	826	821
BCS	4.27	4.26	4.18	4.10
PPI (days)	134	120	115	114
PPI weight change (lb)	12	40	70	77
PPI BCS change	-0.32	0.37	1.24	1.50

Table 5. Target weights to prevent calving difficulties in heifers.¹

Mature body weight	1,000	1,100	1,200	1,300	1,400
Weight at breeding (66% of mature weight)	660	726	792	858	924
Weight at 5-month pregnancy check (83% of mature weight)	830	913	996	1,079	1,162
Precalving weight (90% of mature weight + 100 lb from calf and pregnant uterus)	1,000	1,090	1,180	1,270	1,360
Weight after calving (90% of mature weight)	900	990	1,080	1,170	1,260

¹Adapted from Whittier et al. (2009).

Table 6. Effect of time of calving assistance on performance of heifers experiencing dystocia and their calves.

Item	Early	Late
Postpartum interval (days)	49	51
In heat at beginning of breeding season (%)	91	82
Services/conception	1.15	1.24
Fall pregnancy (%)	92	78
Calf average daily gain (lb)	1.74	1.63
Calf weaning weight (lb)	422	387

Feeding a balanced ration during the last trimester of pregnancy may also decrease calving difficulty. Heifers fed diets deficient in energy or protein during the last trimester not only experienced more calving difficulty but bred back later in the breeding season, experienced increased sickness and death rates, and also weaned lighter calves (Table 3).

Caution should be used, however, with feeding excessive amounts of nutrients before or after calving. Not only is it costly, but animals with excess body condition (more than 7) have lower reproductive performance (Fig. 1) and more calving difficulty than animals in moderate body condition (5 or 6).

Overfeeding rumen-degradable protein during the breeding season and early gestation, particularly if the rumen receives an inadequate supply of energy, may be associated with decreased fertility. This decline in fertility may result from decreased uterine pH, which has deleterious effects on embryo development. Therefore,

combination of high levels of degradable protein and low energy concentrations in early-season grasses may contribute to lower fertility of females placed on such pastures near the time of breeding.

Calving Difficulty and Time of Intervention

Research in Montana has shown that cows that experience calving difficulty will have longer postpartum intervals than cows not experiencing calving difficulty; therefore, it is important to minimize calving difficulty in your breeding herd. As a standard, the first step to avoid calving difficulty is to make sure that replacement heifers are in adequate weight at the beginning of the breeding season, during the pregnancy, and also at calving (Table 5). Further, virgin heifers should be exposed to bulls with low EPD for birth weight and/or high EPD for calving ease (see 837, “Understanding and Using Sire Summaries”).

The time of intervention, when obstetrical assistance is needed, also affects rebreeding performance. Heifers experiencing dystocia but given early assistance had reduced postpartum interval, fewer services required per conception, increased fall pregnancy rate, and heavier calves at weaning compared to heifers experiencing dystocia that received delayed assistance (Table 6). Therefore, early assistance when needed is important to assure that heifers return to estrus as soon as possible.

Another standard is heifers in stage 2 of labor (feet visible) should be provided assistance if more than 30 minutes elapses without progress, or if they have not delivered the calf within 2 hours. After 2 hours of labor, each 10-minute delay to delivery results in a 2-day longer postpartum interval.

Suckling Stimulus and Calf Removal

Suckling stimulus from the calf has a negative effect on the cow’s estrous cycle activity during the postpartum period; however, cows on a positive energy balance and in adequate body condition generally overcome this negative stimulus before the breeding season begins.

Calf removal, either temporary or permanent, can increase the number of cows that return to estrus during the breeding season. A common practice in some synchronization programs is to use 48-hour calf removal, which has been shown to induce a cycle in postpartum cows and first-calf heifers. It is important to provide a clean, dry pen with grass hay and water for calves while

separated from their dams and to make sure that pairs “mother-up” before going to pasture.

Early weaning has also been shown to benefit performance of first-calf heifers (see 747, “Time of Weaning and Cow Condition” for specific information). Several studies reported that early weaning improved body condition score, hastened return to estrus, decreased calving interval, and increased pregnancy rates of first-calf heifers. These beneficial effects can be attributed to the reduced nutritional requirements of heifers whose calves are early weaned. As they stop lactating, their nutrient requirements are reduced almost 50 percent compared to lactating heifers of similar age and body size.

One of the disadvantages of early weaning is the additional costs associated with calf feeding, although weight of early weaned calves at the time of normal weaning can be similar or greater compared to normal weaned calves. Further, the financial benefits incurred with enhanced performance of first-calf heifers can easily offset the additional expenses required by the early-weaned calf. It is certainly worth considering early weaning during periods of drought or other conditions when less forage is available for the lactating heifer.

Ionophores

Ionophores such as Bovatec[®], Rumensin[®], and Catlyst[®] have been shown to influence reproductive performance during the postpartum period. Cows and heifers fed an ionophore exhibit a shorter postpartum interval, provided that adequate energy is supplied in the ration (Table 7). This effect appears to be more evident in less intensely managed herds that generally have a moderate (60 to 85 days) or longer postpartum interval. Scientists have also demonstrated that heifers fed an ionophore reach puberty at an earlier age and lighter weight.

Induction of Estrus with Hormones

Progestin- or progesterone-containing products such as MGA[®] (melengesterol acetate) and CIDR[®] can shorten the postpartum interval provided that heifer

Table 8. Postpartum interval (PPI) of first-calf heifers exposed or not to bull presence beginning on day 15, 35, or 55 after calving.

Bull exposure	15 days		35 days		55 days	
	No	Yes	No	Yes	No	Yes
PPI (days)	88	68	86	71	84	68

¹Adapted from Berardinelli and Joshi (2005).

nutrition and body condition are adequate. Gonadotropin releasing hormone (GnRH) is another hormone used in synchronization programs (see 405, “Synchronizing Estrus in Beef Cattle”) that will induce estrus in some first-calf heifers. Nevertheless, none of these products are substitutes for good management. First-calf heifers need to be at least 40 days postpartum before these hormones can stimulate a cycle.

Bull Presence

Bull presence after calving until the start of the breeding season has been shown to cause first-calf heifers to cycle earlier. Similar results were observed if bull exposure began 15, 35, or 55 days after calving (Table 8). Heifers should be exposed to surgically altered bulls that are not capable of breeding to prevent early and undesired pregnancies. Approximately one bull per 20 heifers is required, and limited data suggest that exposure to androgenized steers or cows will produce similar results.

Summary

1. A sound herd health program is essential for optimum reproductive efficiency.
2. Breed heifers 20 to 30 days before the cowherd.
3. Make sure heifers are on a balanced ration from the last trimester of pregnancy through the next breeding season.
4. Heifers should be in optimum body condition (5 or 6) at calving and through the next breeding season.
5. Virgin heifers should be in adequate body weight at breeding, during gestation, and at calving to prevent dystocia.
5. Provide calving assistance in a timely manner when needed.
6. Use an ionophore for increased feed efficiency, coccidiosis control, and the positive effect on reproductive performance.
7. Permanent or temporary calf removal, exogenous hormones, and bull exposure are management tools that can induce a cycle in some postpartum first-calf heifers.

Several management practices can assist in shortening the postpartum interval, but none of these recommen-

Table 7. Effect of ionophore feeding on postpartum interval (PPI) in beef cows and heifers.

Study	Ionophore (PPI, days)	Control (PPI, days)	Difference (days)
1	30	42	12
2	59	69	10
3	67	72	5
4	65	86	21
5	92	138	46

dations will take the place of good management. Body condition, level of nutrition, age of cows, level of milk production, weather, disease, parasites, and other factors will affect the length of the postpartum interval. The first place to address these issues is with proper nutrition before calving and through the breeding season, which will result in optimum body weight and condition.

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