NUTRITION AND MANAGEMENT PROGRAMS FOR HEIFERS

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INTRODUCTION

Effective replacement heifer development is a critical segment of the integrated management program in an efficient beef cow production system. The main objective should be to develop an adequate number of heifers to a point where they reach puberty and are cycling regularly at the start of the breeding season. However, many associated considerations in a successful development program will be discussed. In addition, one might consider the first-calf heifer as part of replacement heifer development until she breeds back and weans her first calf. Indeed, she should continue to be managed separately as she has increased nutritional demands through this period.

The replacement heifer represents the future profitability and genetic improvement of the cow herd. Assuming a restricted breeding season and a somewhat static weaning date each year, age of calf at weaning has a large impact on pounds of calf weaned. This is particularly important if calves are sold at weaning. Therefore, it is important to the production unit that heifers conceive early in the first breeding season. Researchers have concluded that heifers that conceive the earliest are reproductively more efficient and have greater lifetime production potential (Lesmeister et al., 1973).

The development of replacement heifers can be divided into four phases:

. Preweaning
. Weaning to breeding
. Breeding to calving
. Calving to rebreeding

PREWEANING

Since puberty is influenced by age, weight and breed, it is important to consider available nutritional resources and the environment in the development of heifers.

During the phase prior to weaning, we largely depend on the dam to nurture and care for the replacement heifer. However, the influence of several management practices should be discussed as they relate to the management system. Producers are encouraged to identify all calves at birth so that birth dates are known, records can be kept and subsequent culling of the cow herd can be more efficient. In addition, producers should work with a local veterinarian to develop a specific vaccination program that offers protection against disease problems for that particular locale.

Selecting early born replacement heifers that weigh at least 450 to 600 lb. at weaning, depending upon breed and frame size, is the first step. However, it is important that this weight be true muscle growth without a substantial amount of fat. Research has shown that feeding a high-energy creep feed to suckling heifers of British breeding will hinder their subsequent milking ability because of fat deposition in the developing udder (Hixon et al., 1982). However, a summary of similar data collected on large-frame heifers containing European breeding, showed no effect of creep feeding on subsequent maternal performance (Friedrich et al., 1975). Thus, creep feeding of replacement heifers, when economically feasible, should depend on the breeding and growth potential of the calves. Likewise, use of limit (1-2 lbs/day) fed creep rations would not be expected to impact future productivity.

The use of growth promoting implants in suckling calves is a highly profitable practice used by cow/calf operators to increase weaning weights. Implants currently cleared for use in suckling heifers are zeranol (Ralgro: Brac/International Minerals) and progesterone/estradiol benzoate (Synovex C: Syntex). However, Synovex C is the only implant cleared for use in potential replacement females and should not be used in calves less than 45 days of age. Some studies have shown that implanted heifers have larger pelvic areas at a year of age (Deutscher, 1991). However, where heifers were followed to calving, no consistent affect on calving difficulty has been noted. Therefore, with the data presently available it appears that the advantage in pelvic area may be lost by the time the heifer calves. An excellent summary of implant effect on heifer pregnancy rates by Deutscher (1991) summarizing the trials that used Ralgro implants showed:

1. Implanting between 1 and 9 months of age showed no adverse effects of subsequent reproduction, normally. In 21 trials involving a single Ralgro implant, 47% showed a positive effect, 29% no effect, and 24% a negative effect.
2. Implanting **at or near** birth lowers pregnancy rates. In a four trial summary with one Ralgro implant, pregnancy rates were 35% lower.
3. Multiple implants are more likely to lower pregnancy rates than single implants. In a 12 trial summary involving multiple implanting with Ralgro, 50% showed a negative effect while 50% showed either a positive or no effect.
4. **Don't** implant bull calves intended for use as herd sires.

WEANING TO BREEDING

In selecting potential replacements, it is normally advisable to keep a number in excess of those actually needed as replacements to allow for further culling as yearlings and after breeding. Keeping only heifers that conceive in a short breeding season (21 - 45 days) is an ideal way to enhance cow herd fertility and shorten the calving season. The number in excess should be determined by available feed resources and associated costs. An excess of from 10 to 50% may be feasible depending on these associated factors. The merits of using artificial insemination on these yearling heifers as a means of reducing calving difficulty, improving first calf weaning weights and creating future replacement females out of first calf heifers should be considered by more producers. The new MGA/PG synchronization system developed by Colorado State University further makes A.I. usage more practical.

Once the female is selected at weaning, she needs to be grown and adequately developed prior to breeding. Replacement heifers need to weigh approximately 65 to 70% of their mature weight in order to consistently breed as yearlings. Therefore, the key to a successful heifer development program from this point is to wean heifers that are adequate in weight and, coupled with a good nutrition program, can reach a weight that is 65 - 70% of the mature cows of similar genetics, prior to the breeding season. Depending on weaning weight and the time available prior to breeding, heifers may have to gain 1 to 1.5 lb. per day from weaning to breeding. Usually, this means the average British breed heifer will need to gain approximately 200 lb. in order to weigh the 600 to 650 lbs. necessary to begin cycling. With the larger-frame European breeds and crosses, a target breeding weight of 700 to 800 pounds is usually necessary.

If variability exists in the heifers weight, dividing the heifers into a light half and heavy half and feeding accordingly will help reach the target weight. This will allow all of the heifers to more efficiently reach their estimated breeding weight prior to the breeding season.

Recent research has illustrated that the degree of development from weaning to breeding influences not only when heifers cycle as yearlings, but also their subsequent productivity and rebreeding rate after they calve as 2-year-olds. Research at Purdue and Kansas State (Tables 1 and 2, respectively), indicates the impact of inadequate growth and development during this phase on subsequent calving ease, rebreeding and calf growth.

Ionophores, such as Rumensin and Bovatec, have a place in heifer development programs. Research indicates that heifers receiving 200 mg of Rumensin daily gained more weight than controls fed high roughage diets even though the Rumensin-fed heifers received 10% less feed. Age of puberty was decreased slightly in the Rumensin-fed group with the difference being greater in heavier heifers (Staigmiller and Mosely, 1981).

It should be emphasized that replacement heifers need to be fed separately from the rest of the herd. Because of their stage of growth and their higher nutritional demands, they cannot compete with the rest of the cow herd nor efficiently utilize poor quality forages to meet their nutrient requirements. Because of different objectives, they should also be fed separately from their steer counterparts if they are to satisfactorily breed as yearlings.

Another management strategy that producers may consider, especially if they have problems getting their heifers to cycle (reach puberty) is exposing them to altered (sterile) bulls during this developing period. In a two year Nebraska study, half of 159 heifers were exposed to a bull and half were non-exposed. The bull-exposed heifers reached puberty 40 days earlier with 50.5% pregnant the first 21 days as compared to 16.5% of the non-exposed heifers (Roberson et al., 1991).

Producers are encouraged to breed their replacement heifers starting 3-4 weeks prior to the time they start breeding the rest of the cow herd. Since first-calf heifers typically have a 2-3 week longer postpartum period than older females, due to the fact that they are still growing and also lactating, this allows them one extra estrous period to start cycling and therefore be in synchrony with the rest of the cow herd for her second parturition. The 3 to 4 weeks additional age on the calves at weaning also adds pounds. It is important, however, for heifers to have initiated cycling prior to the start of the breeding season since the first behavioral estrus of a heifer can be subfertile.

If it is impossible for a producer to breed his replacements earlier than the rest of the cow herd, then he should limit the heifers' breeding season to 21 to 45 days. This emphasizes reproductive efficiency and assures the retaining of fertile replacement females that conceive promptly. It will also force the heifers into a short calving season so that the producer can give them more attention.

BREEDING UNTIL CALVING

The final step in the profitable management of the replacement heifer is to assure her adequate growth and development from breeding until she calves as a two-year-old at about 85% of her mature weight. During this time, the bred heifer should gain .75-1 lb per day, or approximately 250 to 300 lb. Thus, British breeds and British breed crosses should go into the calving season weighing 850-950 lbs., with larger frame breeds and crosses weighing approximately 950-1000 lbs. It is important to remember that the majority (approximately 60-70%) of fetal growth occurs during the last trimester of gestation. Therefore, adequate nutrition, especially energy and protein, is essential for proper development of the fetus and preparation of the heifer for calving and lactation.

Research has consistently shown that inadequate nutrition prior to parturition results in lighter, weaker calves at birth without any decrease in calving difficulty. In addition, it has

resulted in increased calf sickness and mortality, lower milk production, a longer postpartum interval to first estrus and poorer overall reproductive performance.

Table 3 shows the major nutrient requirements of replacement heifers from weaning through calving and rebreeding. This information can be used as a guide for feeding these females. However, environment can substantially influence the heifers' needs. Therefore, monitoring body condition and weight should be used to modify the feeding program as needed.

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Table 1. Effect of First Winter Nutrition on Subsequent Performance of Heifers (Lemenager et al., 1980)

Item	Lb of Grain Per Head Fed Daily in Addition to Low-Quality Fescue Hay Fed ad libitum		
	0.0	**3.0**	**6.0**
Number of heifers	112	113	112
Initial fall weight, lb	496	502	493
Daily gain - winter, lb	0.07	0.50	0.80
Breeding weight, lb	506	577	613
Percent conceiving as yearlings	69.2	73.9	83.5
Subsequent production:			
Percent rebreeding after first calf	67.3	75.4	87.1
Weaning weight - first calf, lb	405	433	443

Table 2. Effect of Heifer Nutritional Development on Subsequent Performance (Patterson et al., 1987).

Percent of Mature Weight at Breeding as Yearling	Number	Pre-Breeding **Weight**	Calving **Weight**	Calf Birth Weight	Calving Difficulty	**Percent Calf Death Loss**	**Fall Pregnancy Rate Percent**
55	60	600	834	70.9	52.3	6.2	85.0
65	61	683	897	73.3	28.8	4.5	93.4

Table 3. Major Nutritional Requirements of Replacement and First-Calf Heifers[a]

Body Weight[b]	Daily Gain[c]	Daily DM Intake[d]	Crude Protein % of DM	Crude Protein lb/day	TDN[e] % of DM	TDN[e] lb/day	Calcium % of DM	Phos-phorus % of DM	Vitamin A IU/Day
Replacement Heifers:									
400	1.5	10.2	11.8	1.2	68	6.9	0.45	0.24	10,000
500	1.5	12.1	10.7	1.3	68	8.2	0.38	0.22	12,000
600	1.2	13.6	9.6	1.3	65	8.8	0.30	0.21	14,000
700	1.2	15.3	9.2	1.4	65	9.9	0.20	0.20	16,000
Bred Yearling Heifers - Last Third of Pregnancy:									
700	1.0	15.3	8.5	1.3	56	8.5	0.27	0.20	19,000
800	1.0	16.8	8.4	1.4	55	9.2	0.27	0.20	21,000
900	1.0	18.3	8.3	1.5	54	9.9	0.26	0.20	23,000
Two Year-Old Heifers - Average (10 lb/day) Milking, Calving Through Rebreeding:									
750	0.5	16.7	11.0	1.8	64	10.8	0.34	0.24	30,000
850	0.5	18.4	10.6	1.9	63	11.6	0.33	0.23	33,000
950	0.5	20.0	10.2	2.0	62	12.5	0.31	0.23	35,000

Trace mineralized salt should be provided either free choice in a mineral supplement, or mixed into the ration at 0.3% of the DM to all cattle.

[a] Adapted from National Research Council, "Nutrient Requirements of Beef Cattle," 1984.
[b] Average body weight during feeding period.
[c] Approximately 0.8 lb gain/day during the last third of pregnancy is made up of fetal growth.
[d] Minimum DM intake required to provide needed amounts (lb/day) of protein and TDN based on the dietary concentrations (percent of DM) reported in this table. If intake is above or below this level, nutrient concentrations can be adjusted accordingly.
[e] The energy (TDN) levels reported are sufficient in relatively mild climates. As a general rule, the amount of TDN should be increased by 1% for each 1F decrease in the windchill temperature below 30F for cattle with dry, winter hair or below 55F for wet or summer hair coats.