Management of Young Cows for Maximum Reproductive Performance

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Reproduction is the main factor limiting production efficiency of beef cattle (Dickerson, 1970). Forty years ago, failure to conceive or early embryonic death accounted for the largest loss in calf crop potential (Wiltbank et al., 1961). More recently, Bellows and Short (1994) reported that the greatest production loss in the cow-calf segment of the beef industry results from cows not being pregnant at the end of the breeding season. Have we made any progress in improving reproductive efficiency among beef cows?

Today, the most common reproductive problem that both purebred and commercial beef producers encounter is getting first calf heifers rebred. This is a common problem because we are trying to rebreed a cow that has not yet reached her mature weight and is often faced with the task of consuming enough energy to satisfy needs for growth, lactation, and maintenance when generally only poor quality forage is available (Laster et al., 1973). In most operations, pregnancy rate of either the two or three-year old cows is the lowest in the herd. Economically, the two-year old cow is generally the most expensive/valuable animal on the ranch because of the dollars invested in her and because she has not yet returned any income to the operation. Because of the estimated $950 involved in developing each replacement heifer and carrying her through until calving, producers cannot afford for these cows to fall out of the herd because of reproductive failure as two-year olds. Put another way, producers can easily justify additional expenses to ensure these females rebreed rather than having to develop another replacement heifer.

Over the past 40 years, numerous studies have been conducted to identify the problems and improve the rebreeding efficiency of first calf heifers. While older cows require 40 to 60 days to recover from calving and overcoming a negative energy balance before they begin having regular estrous cycles and can be rebred, 2- and 3-year old cows may require 70 to 90 days. This interval from calving until the re-initiation of estrous cycles is often referred to as a cow s postpartum anestrous interval or more commonly, postpartum interval (PPI). The longer PPI and delayed re-breeding attributable to the negative energy balance of young cows after calving has been magnified by genetic selection for increased productivity. When genetic potential of the female is out of synch with the production environment, delayed reproduction is one of the first phenotypic indicators of that asynchrony. This phenomenon has been observed, on an across-breed basis, where Angus-Hereford females had 10% greater pregnancy rate than Simmental-Hereford females and 66% of Angus-Hereford females versus 38% of Simmental-Hereford females remained in the breeding herd at 7 years of age (MacNeil et al., 1994). The keys to increasing pregnancy rate among young cows especially are to shorten the PPI to increase the number of opportunities a cow has to conceive during a defined breeding season and to increase the fertility of cows early during the breeding season (Wiltbank et al., 1961). Improved re-breeding efficiency can be achieved through additional inputs in feed resources and labor, management alternatives, or selection to reduce nutrient requirements of cows.

A part of the reason that producers are advised to breed heifers to calve 3 weeks ahead of the cow herd is to provide additional time to overcome the longer PPI before the start of the subsequent breeding season. While this works well in theory, it can backfire. Cows calving earlier in the spring have longer PPI due to true seasonal effects related to changes in light

(Hansen and Hauser, 1984). In addition, calving heifers ahead of the cowherd generally means calving earlier in the spring and a longer interval until when green grass is available. If sufficient nutrients are not provided to heifers with newborn calves, they can actually be further behind (still in a negative energy balance) at the start of the breeding season. Thus, it is essential to provide these females with the best resources available and can be afforded. It is difficult if not impossible to provide sufficient feed to cows after calving to avoid the negative energy balance, so we need to prepare them for this period by allowing them to develop energy stores before calving and ensure they are in adequate body condition at calving (Houghton et al., 1990; Short et al., 1990). Adequate body condition means a body condition score of 5 to 6 (moderate) at calving. In general prepartum nutrition (especially the last 50 to 60 days before calving) is the primary controller of length of the PPI, while postpartum nutrition primarily affects fertility (Bellows and Short, 1978; Henricks and Rone, 1986; Randel, 1990). However, cows on a low plane of nutrition postcalving will also have a longer PPI. A summary of 5 studies suggests that feeding ionophores such as Bovatec¤ or Rumensin¤ after calving increases feed costs less than two cents per day, but shortens the PPI in cows by an average of 18 days provided adequate energy is available.

If producers are unable or choose not to calve heifers ahead of the cowherd, then it is essential that heifers calve early in the calving season. That means heifers must be adequately developed to be cycling at the beginning of the breeding season. The old rule of thumb that heifers should be 65% of mature weight at the beginning of the breeding season still stands. The biggest difference is that producers translate this into meaning 650 —700 lbs, which was adequate when we were kids and mature cow weights were 1,000 — 1,100 lbs. Mature cows in today s herds often weigh 1,250 lbs or more, meaning heifers should be at least 800 lbs at the onset of breeding. Synchronization of estrus (even with natural service) should be considered in every heifer development program to increase the percentage of heifers calving early. Developing more heifers than are needed as replacements and retaining only those that conceive early, during the first 25 days of the breeding season, may increase rebreeding pregnancy rates. A simple and cheap method of synchronizing heifers for natural service is to feed MGA in pellets to heifers for 14 days, and turn in the bulls two weeks after the last feeding of MGA (Patterson et al., 1990).

Identification of early pregnancies among heifers may require earlier pregnancy diagnosis than producers are accustomed to and may require pregnancy diagnosis with ultrasound to improve accuracy of fetal aging. Heifers that calve late as two-year olds, often fail to rebreed or calve later as three-year olds and may fail to conceive as three-year olds (Lesmeister et al., 1972). In most herds, a replacement female will not pay for herself until she has weaned her 4th calf as a five-year old.

Dystocia is more common among first calf heifers and increases the PPI and delays rebreeding (Brinks et al., 1973; Laster et al., 1973; Bellows and Short 1978). One of the reasons artificial insemination has become so popular among heifers is the ability to avoid dystocia by breeding heifers to calving ease proven sires. In a survival analysis of 1,382 CGC (1/2 Red Angus, 1/4 Charolais, 1/4 Tarentaise) females, Rogers et al. (2003) reported that heifers experiencing dystocia were at 35% greater risk of being culled, primarily due to subsequent reproductive failure, than herd mates that calved without assistance. When calving assistance is needed, earlier assistance greatly decreased the interval from calving to the subsequent pregnancy. After a heifer has spent 1.5 hours in stage II labor (hooves visible), every 30-minute delay in providing assistance resulted in a 6 day longer interval to pregnancy (R. A. Bellows, personal communication).

Exposing first calf heifers to either sterile bulls or androgenized cows following calving helps re-initiate estrous cycles (Zalesky et al., 1984; Burns and Spitzer, 1992). Researchers have demonstrated that a bull pheromone is involved, that approximately 30 days of bull exposure is required, and that the return to cyclicity is quicker if exposure is initiated 55 days after calving (Joshi, 2002). When bull exposure began at either 15 or 35 days after calving, the return to cyclicity was delayed compared to bull exposure begun at day 55 after calving, but well ahead of first calf heifer not exposed to bulls. Most studies have utilized bull or androgenized cow to heifer ratios of 1:20 to produce this effect.

Estrous cycles can be induced in cows after calving with hormones used for synchronization. Most cows have a short estrous cycle or may ovulate without expressing estrus just before they begin having regular estrous cycles. This short cycle produces progesterone for 5 to 8 days that helps synchronize hormonal control of the cow s estrous cycle. We can mimic this short cycle by administering progesterone to anestrous cows in the form of a CIDR inserted into the vagina, which releases progesterone until it is removed 7 days later. When we administered CIDRs to early postpartum cows last year, estrous cycles were initiated in 90% of cows and almost 60% were in estrus within 4 days after it was removed. Cows were not bred at this estrus, so we don t know anything about the fertility of this estrus. In this same study, neither a normal dose nor a high dose of MGA induced estrous cycles. Another hormone, referred to as GnRH, can also be used to induce estrous cycles following calving. An injection of GnRH initiates a short estrous cycle in anestrous cows by eventually causing release of progesterone for 5 to 7 days. The estrous cycle following this short estrous cycle is generally very fertile. With either of the hormonal induction methods, heifers need to be at least 30 days since calving before any benefit will be achieved.

Over the years, we ve learned that the demand lactation places on a cow represent the single greatest factor affecting the postpartum anestrous interval. As indicated earlier, this is especially true for first calf heifers, as they are still diverting energy for growth as well as lactation. Short-term (48-hour) calf removal helps induce release of GnRH within a cow and helps induce estrous cycles (Smith et al., 1979). This is very effective in anestrous cows, but is less effective in anestrous two-year olds, perhaps due to the depth of anestrus (Geary et al., 2001). However, **early and permanent weaning holds more promise for improving reproductive efficiency in first calf heifers than probably all of the other methods combined.** Early weaning has received considerable attention within the last few years, particularly because of regional areas of drought and low grain prices. While each operation may define early weaning differently, if it is to impact reproduction, then it must occur before the end of the breeding season and preferably before the beginning of the breeding season. As one might expect, early weaning completely eliminates the energy that was needed for lactation, so now the cow can divert extra energy to reproduction. Several studies have been reported in which early-weaned two-year olds experienced dramatic increases in pregnancy rates and/or increases in the percentage of calves born early the subsequent year (Table 1). Depending on how early your heifers calve, this may mean weaning calves that are less than 60 days old. Calves that are 40 days old can outperform suckled calves as long as a highly palatable ration that is dense in energy is provided. Rations for early weaned calves should be designed to provide at least 2.7 lb/d gain and contain at least 50 to 70% concentrates (wheat middlings / corn / barley mixtures have worked best) and 30 to 50% grass hay (alfalfa hay is not recommended).

Table 1. Benefits observed in three herds that compared reproductive performance of cows whose calves were weaned early or at approximately 200 days of age.

Early vs normal weaning	2-yr olds	3-yr olds	Mature cows
Study 1. Weaned 8 d before a 42-d breeding season.[a]			
Increased pregnancy rate	26%	16%	8%
Study 2. Calves weaned at 50 d of age.[b]			
Increased pregnancy rate	38%		19%
Increased cow weight at normal weaning	87 lbs		80 lbs
Study 3. Calves weaned at 56 d of age.[a]			
Increase calving first 30 d of subsequent year	35%		

[a]Adapted from Management of early weaned calves NebGuide G83-655.
[b]Adapted from Early weaning for the beef herd OSU Extension Facts No.3264.

While early weaning seems like a rather drastic measure, if facilities, labor, and cheap feed resources are available, the benefits to first calf heifers may have lasting effects. Getting these young cows to conceive and calve early as 3-year olds may mean longer and greater lifetime productivity. In the past few years, grain prices have been low enough that early weaning has been profitable through increased weight gains alone. Remember when grain prices are higher, that each two-year old that successfully rebreeds translates into a $950 savings in heifer replacement cost.

In the past 40 years, researchers have investigated and developed several methods of improving the rebreeding performance of 2- and 3-year old cows. However, producer adoption of these methods has not occurred at a very rapid pace. While it is possible to use combinations of the methods below to improve rebreeding performance, the overall benefit of each one may not be additive. In summary, the following methods may improve the rebreeding performance of young beef cows.

- Develop heifers to 65% of mature weight at breeding
- Synchronize heifers to conceive early during a short breeding season
- Artificially inseminate heifers with semen from calving ease proven sires
- Provide additional energy during the last 50 days of gestation so that heifers calve at a minimum body condition score of 5
- Provide early calving assistance when intervention is needed
- Provide young cows with the best feed resources available after calving
- Provide ionophores to cows after calving to improve utilization of feed
- Expose young cows to sterile bulls or androgenized cows during the last 30 days before the start of breeding
- Induce/synchronize estrous cycles in young cows even with natural service
- Consider early weaning during drought and cheap feed availability

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