SDSU Extension

BEEF

Chapter 30

Managing Reproduction in Replacement Heifers

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Introduction

Heifers need to calve by 24 months of age to achieve maximum life-time productivity (Patterson et al., 1992), and heifers that lose a pregnancy or conceive late in the breeding season are likely to not have enough time to rebreed during a defined breeding season. In addition, heifers that calve early with their first calf have more time to resume normal estrous cycles by the start of the subsequent breeding season. Therefore, early calving heifers are more likely to breed back as two year olds and continue to calve early in the calving season. This is important to overall profitability since heifers that calved during the first 21 days of the age of the calving season had increased longevity in the cow herd compared to heifers that calved in the second 21 day period, or later (Cushman et al., 2013). Average longevity for South Dakota heifers that calved in the 1st or later period was 5.1 ± 0.1 and 3.9 ± 0.1 years, respectively. Furthermore, analysis of 3700 calves at the USDA-Meat Animal Research Center indicated that for each day of age after the beginning of the breeding season that a calf is born 2.4 pounds of weaning weight is lost (personnel communication R. Cushman).

Principles of heifer development:

The goal of a heifer development program is to select replacement heifers that will calve early in the calving season. Breeding heifers 2 to 3 weeks before the cows is a commonly used strategy for accomplishing this goal. In this section of the paper we discuss several best management practices that apply to heifer development.

Heifer development begins at weaning:

Heifer development begins with heifers that are structurally sound and that did not receive growth promoting implants before 30 days of age. There is strong evidence that administering growth promoting implants to heifer calves within 30 days of birth will decrease pregnancy rates. This is due to impairment of normal uterine development and function by the hormones in the implants. Selecting the older and heavier heifers at weaning will reduce the feed cost associated with attaining the designated target weight at breeding.

Key Points

- Heifers that lose a pregnancy or conceive late in the breeding season are likely to not have enough time to rebreed during a defined breeding season.
- The goal of a heifer development program is to select replacement heifers that will calve early in the calving season.
- Both heifers and cows should receive vaccination at least 30 days before breeding season.
- Timing of puberty is dependent on both age and weight.

Importance of a prebreeding examination of heifers:

Performing a prebreeding examination 4 to 6 weeks before the breeding season is an important management tool in heifer development. The exam should include administration of prebreeding vaccines and your veterinarian should perform a reproductive tract score on your heifers.

Use of reproductive tract scores to predict cyclicity:

A reproductive tract score (RTS) is a subjective measurement of the sexual maturity of a heifer that is normally performed by a veterinarian approximately 4 to 6 weeks before the breeding season. A minimum of 50% of your heifers should have a reproductive tract score of ≥ 4, regardless of whether you plan to use natural service or AI. The score is obtained by palpation per rectum and is based on the degree of uterine development and ovarian status (size of dominant follicle and presence or absence of a CL). Each heifer is assigned a score of 1 to 5 (1 = immature; 5 = presence of a corpus luteum) with a RTS of 1 referring to a prepubertal heifer, 2 or 3 referring to a peripubertal heifer (transitional stage), and 4 or 5 referring to a pubertal (cycling) heifer. The uterine and ovarian dimensions of heifers for each of the reproductive tract scores (RTS) are described in Table 1. An advantage of implementing a progestin-based (i.e. CIDR or MGA) estrus synchronization protocol is that you will be able to induce estrus and ovulation in the heifers with a reproductive tract score 3.

Administration of prebreeding vaccines:

Reproductive diseases, including bovine viral diarrhea (BVD), vibriosis, leptospirosis, and infectious bovine rhinotracheitis (IBR), can induce abortion in cattle and decrease profitability (Daly 2007ab). Consequently, a prebreeding vaccination program in combination with careful attention to biosecurity practices and reducing stress/disease transmission within a herd should be included in a herd health program. A common question is "When should I administer prebreeding vaccines in relative to the start of the breeding season?" The answer to this questions depends on how quickly immunity will be established following vaccination and whether or not the vaccine itself will adversely affect reproductive performance and (or) the response to an estrus synchronization protocol (Daly, 2007b). In regards to the first issue, there is a lag time between vaccination and the establishment of immunity that will depend upon factors such as: 1) whether or not the animals were previously vaccinated, and 2) the type of vaccine – modified live (MLV) or killed vaccine. In general, animals that were previously vaccinated will respond more quickly than animals that are naive to the vaccine and the immune response is normally more rapid to MLV compared to killed vaccine.

Injection of naïve heifers with the IBR virus (wild type and modified live) around the time of breeding can result in ovarian lesions (particularly within the corpus luteum; Van Der Maaten and Miller 1985; Smith et al., 1990) and decreased conception rates (Chiang et al., 1990; Miller 1991). Several studies report that vaccinating naive heifers with MLV around time of breeding decreased pregnancy success (Miller et al., 1989; Chiang et al., 1990; Miller 1991, Perry et al., 2013). Furthermore, when heifers were vaccinated intravenously with MLV the day after breeding, necrotic lesions were found in the CL and ovaries 9 to 14 days after vaccination and heifers with severe luteal damage had decreased concentrations of progesterone (Van Der Maaten

Table 1: Description of uterine and ovarian measurements for different reproductive tract scores (RTS).

RTS	Uterine horns (diameter, mm)	Ovarian length (mm)	Ovarian height (mm)	Ovarian width (mm)	Ovarian structures
1	Immature, < 20 mm, no tone	15	10	8	No palpable follicles
2	20-25 mm no tone	18	12	10	8 mm follicles
3	20-25 mm slight tone	22	15	10	8-10 mm follicles
4	30 mm good tone	30	16	12	> 10 mm follicles, CL possible
5	> 30 mm	> 32	20	15	CL present

et al., 1985). However, if prebreeding vaccinations (e.g. IBR) are administered a minimum of 30 days before the breeding season, the likelihood of decreased pregnancy rates is minimized. General recommendations for prebreeding vaccinations include the following: 1) Replacement heifers should be vaccinated before and at weaning. The immune response of an individual heifer to a single vaccination is not known; therefore, heifers should receive an initial vaccination followed by a booster when dictated by the vaccination protocol, 2) Both heifers and cows should receive a booster vaccination approximately 30 to 60 days before breeding. If it is absolutely necessary to give a modified live vaccine less than 30 days prior to breeding, the vaccine should be administered as soon as possible and only to animals that were vaccinated both before and at weaning, or a better option might be to utilize a killed vaccine at this point in time. Animals that have not previously been vaccinated (naïve animals) should not be vaccinated near the time of breeding. For additional information on reproductive diseases and the timing of prebreeding vaccines the reader is referred to Daly (2007a,b).

Importance of target weight at breeding:

Timing of puberty is dependent on both age and weight and varies among breeds (Wiltbank et al., 1966; Short and Bellows, 1971; Varner et al., 1977). Therefore, the concept of developing heifers to a specific target weight (i.e., usually 60 to 65% of mature weight) has become a common management practice, recognizing that target weights will vary across breed (Freetly and Cundiff, 1998). Recent studies proposed that the target weight may be reduced to 50 to 55% of mature weight prior to the breeding season. Fewer crossbred heifers that were developed to 53% of mature weight were cycling prior to the start of the breeding season compared with heifers developed to 58% of mature weight, but the percent pregnant in a 45 day breeding season was similar between treatments (Funston and Deutscher, 2004). When heifers were developed to 55% compared with 65% of mature weight, there was no difference between groups in percentage of pubertal heifers at 12 months of age or yearling pregnancy rates after an 80-day breeding season (Patterson et al., 1991). However, more heifers developed to 65% of mature weight were pregnant during the first 45 days of the breeding season compared with heifers developed to 55% of mature weight (Patterson et al., 1989). There also tended to be a difference in postpartum interval with heifers developed to 55% of mature weight taking longer to reinitiate postpartum estrous cycles after calving compared with heifers developed to 65% of mature weight (Patterson et al., 1991). When crossbred heifers were developed to 50% of mature weight 15.7% fewer heifers conceived during the first 30 days of the breeding season compared with heifers developed to 55% of mature weight (Creighton et al., 2005). This is consistent with a recent study that reported that across several breeds, heifers were 55 to 60% of mature weight when puberty was attained (Freetly et al., 2011). In summary, a target weight of 50 to 55% can work provided you start with more heifers than you require and you provide sufficient post breeding nutrition for the heifers to attain 85% of their mature body weight at calving. Finally, utilizing a progestin-based estrus synchronization protocol can be helpful in increasing the proportion of heifers that conceive early when feeding to a target weight of 50 to 55% compared to 60 to 65%.

Summary

At weaning, select heifers that are structurally sound, older, heavier, and have not received growth promoting implants within 30 days of birth. Select an appropriate target weight that you want each heifer to achieve by the start of the breeding season and feed accordingly. Four to six weeks before the start of breeding, administer prebreeding vaccinations and have your veterinarian assign a reproductive tract score to each heifer. You want greater than 50% of your heifers to have a reproductive tract score of ≥ 4. Begin the breeding season 2 to 3 weeks before the cows and use sires selected for calving ease. In addition, consider implementing estrus synchronization and fixed-time AI to increase the proportion of heifers that conceive on the first day of breeding to sires with highly accurate EPDs for calving ease. At pregnancy diagnosis, select heifers that conceive within the first 30 days of the breeding season. Continue to develop the pregnant heifers such that they achieve 85% of their mature body weight at calving.

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