Control of Estrus and Ovulation in Beef Heifers

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KEYWORDS

• Beef heifer • Estrous synchronization • Reproductive management
• Artificial insemination

KEY POINTS

- Estrous synchronization and artificial insemination contribute to a total heifer development program by concentrating the breeding and resulting calving periods.
- Artificial insemination provides the opportunity to breed heifers to bulls selected for low birth weight or high calving-ease expected progeny difference with high accuracy, a practice that minimizes the incidence and severity of calving difficulty and decreases calf loss that results from dystocia.
- Protocols are now available that facilitate fixed-time artificial insemination without the need to detect estrus.
- Many of the protocols reviewed in this article include the use of progestins. Progestins are used effectively to synchronize estrus in heifers that are pubertal, but may also be used to facilitate the induction of puberty in prepubertal or peripubertal heifers.

INTRODUCTION

Estrous synchronization and artificial insemination (AI) remain the most important and widely applicable reproductive biotechnologies available for cattle.[1] Although hormonal treatment of heifers and cows to synchronize estrous cycles has been a commercial reality now for more than 30 years, beef producers have been slow to adopt this management practice. Perhaps this is because of past failures, which resulted when heifers that were placed on estrous synchronization treatments failed to reach

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puberty. In addition, early estrous synchronization programs failed to manage follicular waves, resulting in more days in the synchronized period, which ultimately precluded fixed-time artificial insemination (FTAI) with acceptable pregnancy rates. The development of convenient and economical protocols to synchronize estrus and ovulation to facilitate use of FTAI with resulting high fertility should result in increased adoption of these important management practices.[2] Research has focused on the development of methods that effectively synchronize estrus in replacement beef heifers by decreasing the period of time over which estrous detection is required, thus facilitating the use of FTAI. Although tools are now available for beef producers to successfully use these procedures, transfer of the technology must assume a high priority. Transfer of such technology to beef producers in the United States will require an increase in technical support to facilitate successful use and adoption of these procedures.[3] Veterinarians should position themselves to play a key role in this process.

Improving traits of major economic importance in beef cattle can be accomplished most rapidly through selection of genetically superior sires and widespread use of AI. Procedures that facilitate synchronization of estrus in estrous-cycling heifers and induction of an ovulatory estrus in peripubertal heifers will increase reproductive rates and expedite genetic progress. Estrous synchronization can be an effective means of increasing the proportion of females that become pregnant early in the breeding period, resulting in shorter calving seasons and more uniform calf crops.[4] Females that conceived to a synchronized estrus calved earlier in the calving season, and weaned calves that were on average 13 days older and 21 lb (9.5 kg) heavier than calves from nonsynchronized females.[5]

Effective estrous synchronization programs offer the following advantages: (1) heifers are in estrus at a predicted time that facilitates AI, embryo transfer, or other assisted reproductive techniques; (2) the time required to detect estrus is reduced, thus decreasing labor expense associated with estrous detection; (3) heifers will conceive earlier during the breeding period; (4) AI becomes more practical; and (5) calves will be older and heavier at weaning.

The inability to predict time of estrus for individual heifers in a group often makes it impractical to use AI because of the labor required for detection of estrus. Available procedures to control the estrous cycle of heifers can improve reproductive rates and speed up genetic progress. These procedures include synchronization of estrus in estrous-cycling females, and induction of estrus accompanied by ovulation in heifers that have not yet reached puberty.

The following protocols and terms will be referred to throughout this article.

Protocols for AI performed on the basis of detected estrus:

PG: Prostaglandin $F_2\alpha$ (PG; Lutalyse, Estrumate, ProstaMate, InSynch, estroPLAN).

MGA-PG: Melengestrol acetate (MGA; 0.5 mg/h/d) is fed for a period of 14 days with PG administered 17 to 19 days after MGA withdrawal.

GnRH-PG (Select Synch): Gonadotropin-releasing hormone injection (GnRH; Cystorelin, Factrel, Fertagyl, OvaCyst) followed in 7 days with an injection of PG.

MGA-GnRH-PG (MGA Select): MGA is fed for 14 days, GnRH is administered 12 days after MGA withdrawal, and PG is administered 7 days after GnRH.

CIDR Select: A controlled internal drug release (CIDR) device is inserted on day 0 and removed on day 14, GnRH is administered on day 23, and PG is administered on day 30.

14-day CIDR-PG: CIDRs are inserted on day 0 and removed on day 14. PG is administered on day 30.