

ARTIFICIAL INSEMINATION AND SYNCHRONIZATION PROGRAM USED AT THE CARRINGTON RESEARCH EXTENSION CENTER

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Introduction

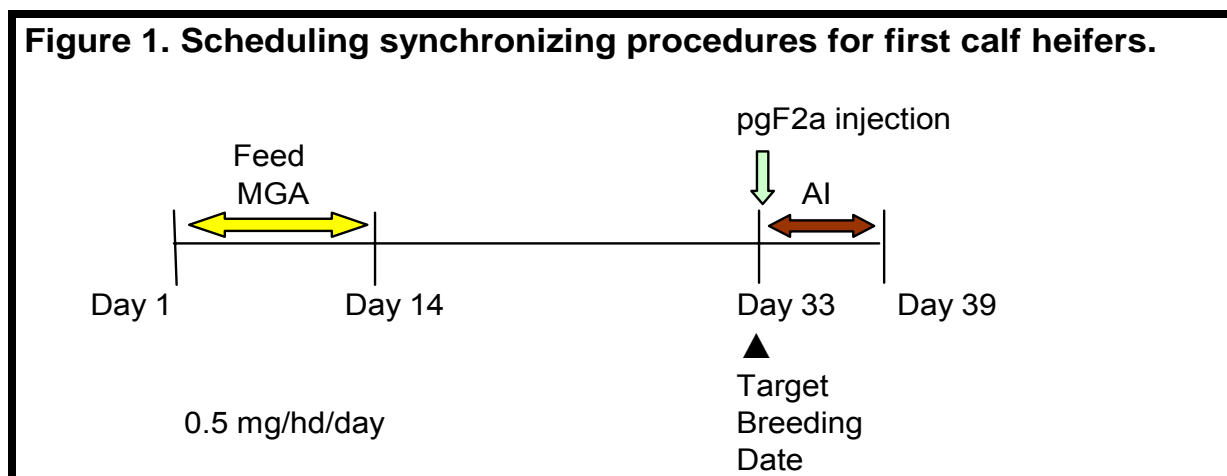
Artificial Insemination (AI) first became popular in the 1960s. The dairy industry utilized and implemented this technology at its inception, recognizing the many benefits for that industry. However, the beef industry reports only 8 to 10% of producers currently use AI in their breeding program. The North Dakota State University Carrington Research Extension Center (CREC) employed an estrus-synchronizing procedure and AI as a part of the breeding program for the beef cow research herd starting in 2003. This technology has since been used for breeding all replacement heifers. The research herd faces the same breeding challenges as commercial herds using AI in addition to the added pressures of ongoing experiments. The use of synchronizing estrus and AI has allowed for a larger pool for sire selection, increased calving ease, more uniform calf crop, shortened calving season, and reduced labor during calving season. The disadvantages are increased scheduling and cattle management, greater feeding precision, more processing animals through the chute, and recruiting a technician or becoming trained in AI. This paper discusses the breeding procedures followed by the Carrington Research Extension Center Livestock Unit and results observed.

Criteria for Artificial Insemination

Replacement heifers in a good to excellent condition score (5-6 on a 9-point scale) and at approximately 60-65% of mature weight are considered excellent prospects for synchronizing and artificial insemination. The average heifer weight for the previous three years has been 780 lbs. at an average breeding age of 14 months. All animals are fed according to NRC guidelines and cared for in compliance with NDSU Institutional Animal Care and Use Committee guidelines. Forty head of replacement heifers were selected for synchronization and artificial insemination in each of the past three years, 2003-2005.

Procedure Scheduling

Upon deciding the preferred breeding date, days were counted backwards to start MGA[®] feeding (approximately 5 weeks prior to breeding date) (Figure 1). MGA was included in a totally-mixed ration at a rate of 0.5 mg/heifer/day. Heifers were fed MGA for 14 days only. After nineteen days elapsed from the termination of MGA feeding, an injection of 5 mL prostaglandin (Lutalyse[®]) was administered intramuscularly. Lutalyse was administered on day 33 after initiation of MGA feeding. Heat detection was initiated at this time and AI conducted through day 39 based on observation of standing heat.



Technical Mode of Action

MGA[®]

Melegestrol acetate (MGA) is an orally-active progestin that will suppress heat and prevent ovulation when consumed on a daily basis (Patterson et al., 1986) at .5 mg/hd/day. The product needs to be fed in a totally-mixed ration so each animal consumes the right amount. Diets should be formulated to insure complete consumption of the feed and bunk space is adequate for all animals to eat simultaneously. Fertility of the first estrus cycle is reduced following treatment with MGA (Zimbelman et al., 1970). To maximize conception, heifers are allowed to ovulate once after removal of MGA from the ration. After the 19 days of sub-fertile ovulation and corpus luteum (CL) development, a prostaglandin injection is administered to deactivate the CL and initiate a new estrus cycle.

Lutalyse[®]

Lutalyse is a commercial sterile prostaglandin (pgF2 alpha) that naturally occurs during regression of active corpus luteum. Sixty to seventy percent of heifers should respond to the prostaglandin injection. One to five days after injection, behavioral signs of estrus should be observed with the greatest number of heifers exhibiting behavioral estrus within 72 hours.

Heat Detection

Heat Detection or observation of receptive individuals is often described as “standing heat.” Standing heat occurs when female cattle are receptive to mounting activity by bulls or other cows. Secondary observations include riding another cow, roughened or muddy tailhead due to riding, increased walking or pacing, or whitish/clear mucus discharge from vulva. Since 71% of cows show signs of heat only once per day (Selk, 2003), the CREC utilizes heat detection aides in addition to visual observations of animal behavior. Kamar Heatmount Detector[®] patches are placed on the tailhead of each heifer, using manufacturer’s recommendations and glue provided in the product kit. This patch is activated after three seconds of pressure from the brisket of a riding animal. The white capsule turns red with the release of the dye, making the triggered patch highly visible.

Accurate heat detection is essential for a successful AI program. During natural breeding, the egg is ovulated 10 to 14 hours after standing heat. This time lapse occurs to allow the sperm time to travel up the reproductive tract and accomplish fertilization at the appropriate time. To achieve maximum sperm viability, straws must be properly thawed and protected from the elements. The semen deposit from the AI straw is made near the anterior of the uterus. The greatest chance of fertilization occurs when heifers are bred 12 hours after standing heat has ended. The practice at the CREC livestock unit is “standing heat in the morning means breeding in the evening,” and visa versa.

Discussion

On a national basis, conception rates due to a single AI service, from synchronized or spontaneous estrus in beef cattle averages 50% (ranging from 40 to 60%) (Spratt 1998). If synchronized pregnancy rates are below 40%, there may be problems with semen quality or handling, inappropriate nutrition, incorrect AI technique, disease, incorrect use of the treatment compounds (Spratt 1998) or other factors. Other factors that affect success of AI can include exogenous estrogens from feed, animal disposition, feeding methods, weather, and other environmental disturbances.

Results and Discussion

Figures 2 and 3 are a graphical description of the CREC AI history, starting in the 2003 breeding season though 2006 calving season. Figure 2 shows the percentage of heifers that were bred AI and those that settled. Note the success rate for the first two years averaged approximately 70% settled of all candidate heifers. In year three, only 42% were settled of all candidate heifers. Settling rates of those heifers artificially inseminated averaged 78, 73, and 52%, respectively for each of the three years. The success rate over three years averages 68%, greater than the national average of 50%.

Figure 3 indicates the calving time from AI service, which suggests earlier calves and a shorter calving window with increased synchronization and AI success. Certainly, producers calving large numbers of heifers during the spring in North Dakota should have adequate facilities, supplies, and labor to handle the situation. Spring storms are a liability if they occur during the short calving window and barns or shelter and bedding are not available.

Figure 2. Synchronization and artificial insemination success at CREC during the past three years.

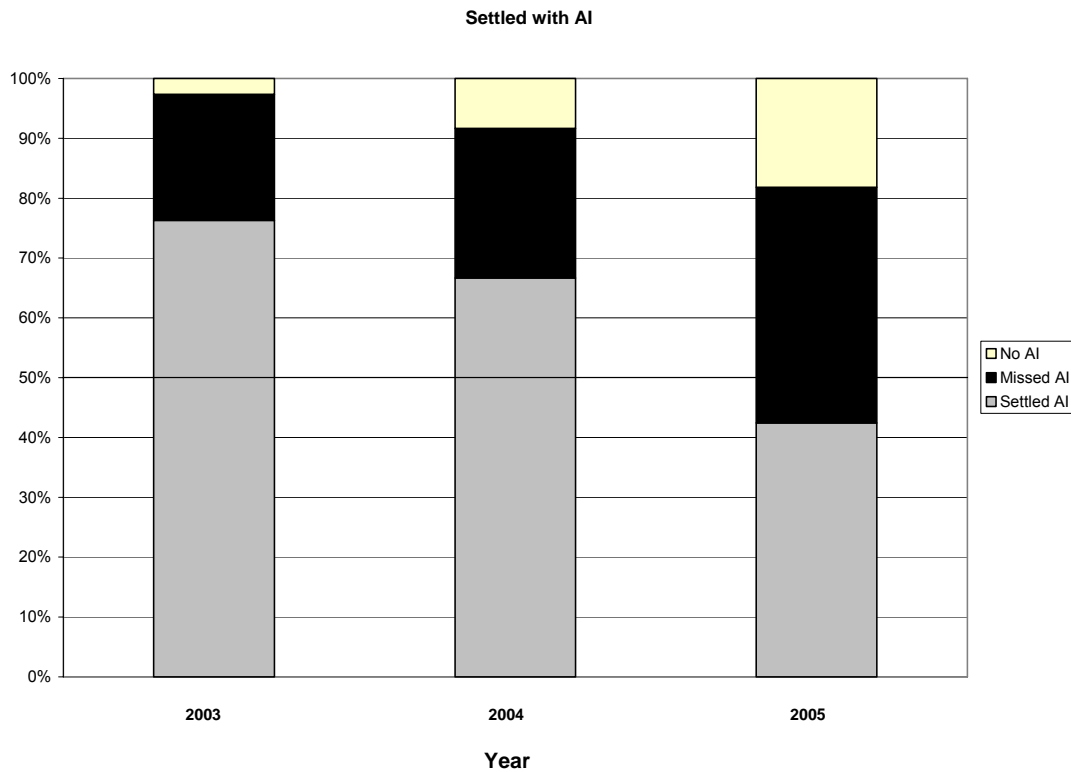
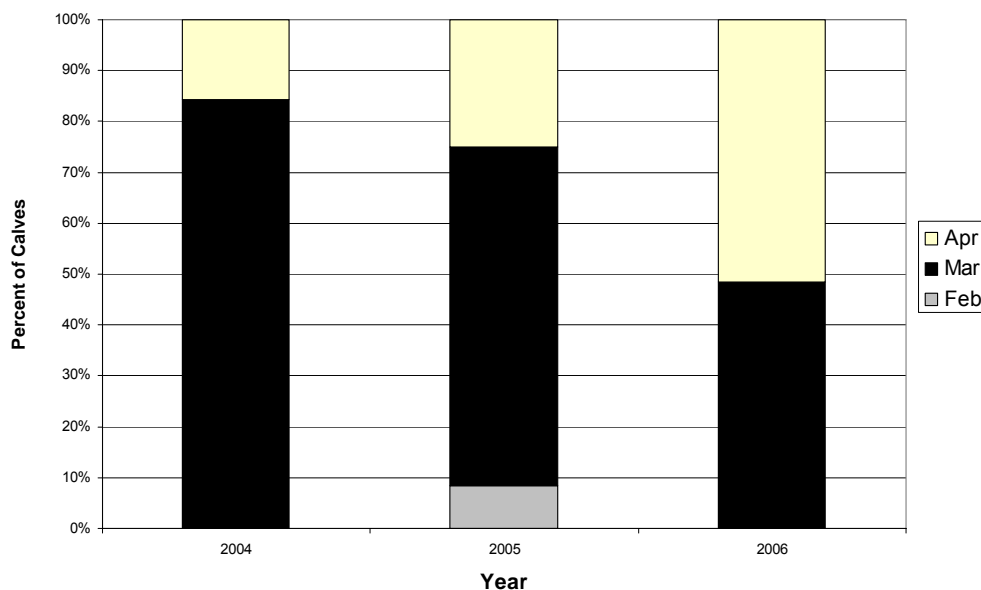


Figure 3. Calving window of synchronized and artificially inseminated heifers at CREC during the past three years.

Percent Calves Born



Implications

The above-average conception rates achieved at CREC illustrate the success possible with careful administration of the synchronizing protocol, successful heat detection, and insemination by an experienced and knowledgeable breeding technician.

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