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Synchronization of estrus in beef heifers using either melengesterol acetate (MGA)/prostaglandin or MGA/Select Synch

R.N. Funston[a,*], R.P. Ansotegui[a], R.J. Lipsey[b], T.W. Geary[c]

[a]*Montana State University, Bozeman, MT, USA*
[b]*American Simmental Association, Bozeman, MT, USA*
[c]*Fort Keogh Livestock and Range Research Laboratory, ARS, USDA, Miles City, MT, USA*

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Abstract

The objective of this study was to evaluate synchronization, conception, and pregnancy rates of yearling beef heifers synchronized with either the Select Synch protocol preceded by 7 days of MGA feeding (MGA/Select Synch) or the traditional MGA/PGF protocol. Heifers in the MGA/Select Synch group ($n = 402$) were fed MGA (0.5 mg/day/head) for 7 days, received an injection of GnRH (100 μg) the day following the last MGA feeding and an injection of PGF (25 mg) 7 days after GnRH. Heifers in the MGA/PGF group ($n = 394$) received MGA (0.5 mg/day/head) for 14 days, followed by an injection of PGF (25 mg) 17 days later. Synchronization rates tended ($P = 0.08$) to be higher for the MGA/Select Synch (82%) compared to the MGA/PGF (77%)-treated heifers. Conception and pregnancy rates to AI were similar ($P > 0.10$), 57 and 46% for the MGA/Select Synch heifers and 61 and 47% for the MGA/PGF heifers, respectively. Mean estrous response (h) was earlier ($P < 0.05$) for the MGA/Select Synch versus MGA/PGF treatment, 56 versus 61 h post-PGF treatment, respectively. In summary, short-term (7 days) MGA feeding preceding the Select Synch protocol produced similar synchronization, conception, and pregnancy rates as the traditional MGA/PGF protocol.

Keywords: Estrous synchronization; GnRH; Melengesterol acetate; Heifers

1. Introduction

The melengesterol acetate/prostaglandin (MGA/PGF) method of estrous synchronization has proven to be very successful in synchronizing estrus in beef heifers [1,2]. One

* Corresponding author. Present address: 243 Fort Keogh Road, Miles City, MT 59301, USA. Tel.: +1-406-232-8223; fax: +1-406-232-8209.
E-mail address: rick@larrl.ars.usda.gov (R.N. Funston).

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disadvantage to the MGA/PGF protocol is that MGA must be fed for 14 days followed 17–19 days later with an injection of PGF [1–4]. In some situations, especially when cattle are grazing, it is difficult to ensure uniform consumption of MGA. A shorter synchronization protocol with the success of the MGA/PGF program would be advantageous for synchronization of beef heifers. New synchronization programs using GnRH show promise for multiparous beef cows and possibly heifers; however, previous reports [5–7] have indicated a lower synchronization and pregnancy rate among heifers synchronized with the Select Synch protocol (GnRH followed by PGF 7 days later) compared to the MGA/PGF protocol. Another disadvantage of the Select Synch protocol is that, depending on the stage of the cycle an animal is in, not all animals will respond to GnRH. If the GnRH injection fails to luteinize a follicle in animals that were going to show estrus naturally around the time of the PGF injection, the treatment fails to prevent those animals from displaying estrus, and early estrus occurs [8]. We hypothesized that short-term feeding of MGA immediately before the Select Synch protocol would improve heifer response to the GnRH injection and help prevent early estrus, thereby, increasing the success of the program similar to the MGA/PGF protocol with a shorter application time.

2. Materials and methods

Crossbred yearling beef heifers ($n = 796$) from one location were randomly assigned to synchronization treatment and AI sire. Heifers were fed a total mixed corn-silage-based diet in a feedlot. Heifers were divided into two synchronization groups of approximately 400 head, both treatments were represented within each synchronization group. Therefore, there were four pens of approximately 200 heifers per pen (two synchronization groups with each treatment represented within synchronization group). Synchronization treatments included the traditional MGA/PGF synchronization protocol (Fig. 1) in which heifers received MGA (0.5 mg/day/head) for 14 days followed 17 days later by an i.m. injection of PGF (25 mg) or a modification of the Select Synch protocol (Fig. 1) in which MGA (0.5 mg/day/head) was fed for 7 days followed by an i.m. injection of GnRH

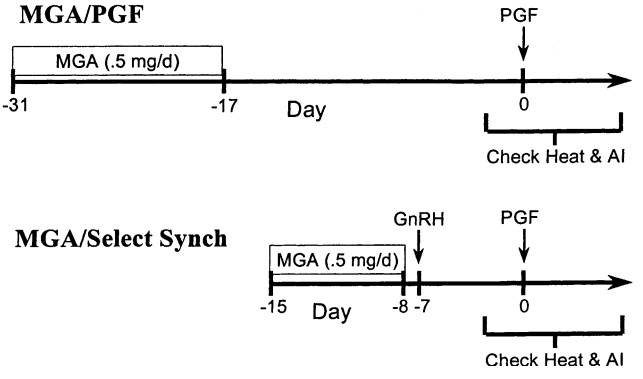

Fig. 1. Illustration of the MGA/PGF and MGA/Select Synch protocols.

(100 μg) 1 day after the last MGA feeding and an injection of PGF (25 mg) 7 days after GnRH. Administration of either GnRH or PGF occurred at approximately 0900 h on the day of injection. Heifers in the second synchronization group was administered prostaglandin 4 days after the first to facilitate estrous detection and AI. All heifers were observed for estrus continuously during daylight hours, beginning 1 day before through 5 days after PGF treatment (Day 0). Because one-half of the heifers within each treatment were synchronized 4 days after the first group, estrous detection data was collected an additional 4 days before PGF in the second group of heifers (Days −5–5) and an additional 4 days after PGF on the first group of heifers (Days −1–9). Heifers were bred in the morning and afternoon approximately 12 h after observed estrus. Heifer weights and body condition scores were recorded at the time of insemination. Clean-up bulls were turned in with heifers 7 days after the last AI. Transrectal ultrasonography was used to determine pregnancy status approximately 42 days after AI. Conception rate was defined as the percentage of artificially inseminated heifers that conceived to AI. Pregnancy rate was defined as the percent of heifers submitted to the synchronization treatment that conceived to AI.

Differences in synchronization, conception and pregnancy rates, time of estrus (h), and synchronization rates by day of synchronization period were determined using GLM procedures of SAS [9]. Included in the model were treatment, synchronization period, and the interaction of treatment and synchronization period. The main effects of sire and technician were also tested in the conception and pregnancy analysis.

3. Results

Mean body condition scores and weights at time of breeding were similar ($P > 0.10$) for the MGA/PGF and MGA/Select Synch heifers and were 6.4 and 6.3, and 380 and 375 kg, respectively. Only heifers that were detected in estrus between Days −1 and 5 were considered to have exhibited a synchronized estrus. Six percent of MGA/PGF-treated heifers and 4% of MGA/Select Synch-treated heifers were detected in estrus and bred either before Day −1 (second synchronization group) or after Day 5 (first synchronization group). Estrus response tended ($P = 0.08$) to be higher for MGA/Select Synch (82%) when compared to MGA/PGF heifers (77%). Conception and pregnancy rates were similar ($P > 0.10$) between treatments (Fig. 2).

Synchronization rate tended ($P = 0.09$) to be higher for heifers synchronized in the second group (77% versus 82% for heifers in the first and second groups, respectively). The mean interval from PGF to estrus was shorter ($P < 0.05$) for heifers in the second group (55 versus 61 h for second and first group, respectively). The first synchronization group had a higher conception rate than the second ($P < 0.05$; 64 versus 54% for first and second group, respectively). Pregnancy rate was not affected ($P > 0.10$) by which group the heifers were synchronized in. The treatment by synchronization group interaction was not significant ($P > 0.10$) for synchronization, conception, or pregnancy rates. The peak interval to estrus for both groups was 2 days following PGF. Neither sire nor technician affected ($P > 0.10$) conception or pregnancy rates.

Fig. 3 illustrates the estrous response by day of synchronization relative to PGF (Day 0). The peak interval to estrus for both treatments was Day 2 following PGF. However, there

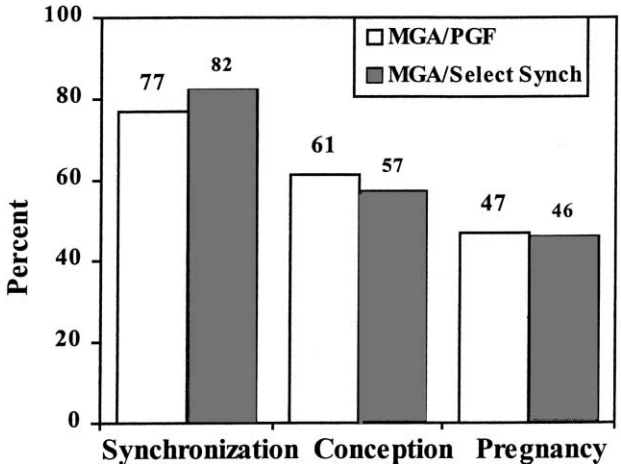

Fig. 2. Synchronization, conception, and pregnancy rates ($P > 0.05$) of heifers for each synchronization treatment (see Fig. 1).

were more ($P < 0.05$) MGA/Select Synch-treated heifers in estrus on Day 1 (11% versus 5%) and more MGA/PGF-treated heifers in estrus on Day 3 (30% versus 21%). There were no other differences ($P > 0.10$) in estrous response by treatment on any other days during the synchronization period.

Fig. 4 illustrates the cumulative estrus response of synchronized heifers by day of synchronization relative to PGF. Cumulative estrus response was greater ($P < 0.05$) for

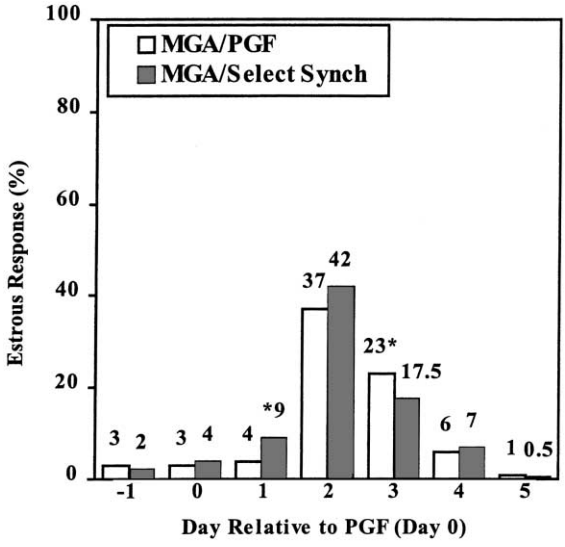

Fig. 3. Estrous response of heifers by day of synchronization relative to PGF (Day 0). Differences ($P < 0.05$) between treatments (see Fig. 1) are indicated by asterisks.

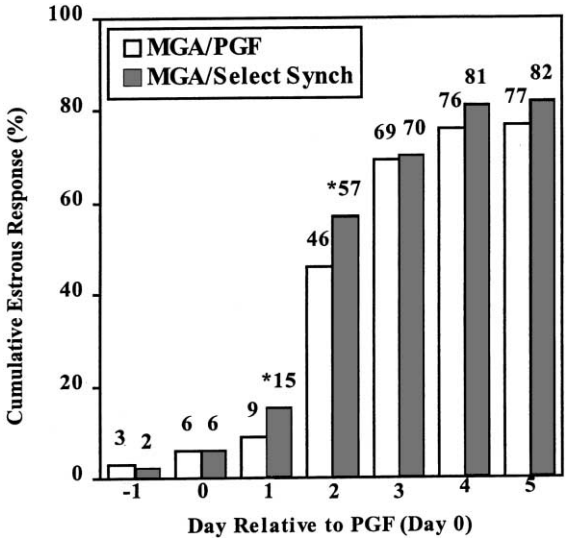

Fig. 4. Cumulative estrous response of heifers by day of synchronization relative to PGF (Day 0). Differences ($P < 0.05$) between treatments (see Fig. 1) are indicated by asterisks.

heifers that received the MGA/Select Synch protocol on Days 1 and 2 than for the MGA/PGF heifers. Mean estrous response (h) was earlier ($P < 0.05$) for the MGA/Select Synch versus MGA/PGF treatment, 56 h versus 61 h post-PGF treatment, respectively.

4. Discussion

Estrous synchronization programs must be inexpensive, easy to administer, and have a high rate of success before producers will adopt them. Recent advances using GnRH show promise in increasing the success and application of estrous synchronization because of ease of administration and short duration of treatment. However, others [5,6] have suggested that GnRH-based protocols are more successful in cows and generally not recommended in virgin heifers, which are the major classes of beef animals synchronized. The MGA/PGF protocol has been one of the most widely adapted and successful programs for estrous synchronization in beef heifers. The major disadvantage in this protocol is that it is a 31–33 days protocol and animals must ingest MGA on a daily basis. A major advantage in the MGA/PGF protocol is that MGA will induce puberty in some heifers. The initial estrus after feeding MGA for 14 days is sub-fertile, however, shorter term (<10 days) administration of progestogens did not reduce conception rates [6]. Short-term (8 days) treatment with MGA has been demonstrated to stimulate pulsatile LH secretion, accelerate follicular growth, and enhance the onset of puberty in beef heifers [10]. In the present study, we were not able to measure the attainment or induction of puberty, however, short-term (7 days) feeding of MGA provided similar estrous response and pregnancy rates when compared to the traditional MGA/PGF protocol. To our knowledge, this is the first report of

combining short-term MGA feeding with a GnRH protocol. Other researchers [11,12] have used longer term MGA feeding (12–14 days) preceding the Select Synch protocol and reported an earlier and more concentrated estrous response compared to MGA/PGF. Findings in the present study were similar with 7 days MGA administration immediately preceding the Select Synch protocol.

It is not clearly understood why the second synchronization group had a higher synchronization and lower conception rate than the first. It is possible that the increased estrus activity or pheromones from the first group had a stimulatory effect on estrus response of the second group but that this estrus was less fertile.

Feeding MGA 7 days before the Select Synch protocol provided equal synchronization and pregnancy rates as the traditional MGA/PGF protocol in beef heifers. This program does require handling the animals one additional time to administer GnRH and is more expensive than the MGA/GnRH protocol, however, this may be a viable synchronization program for producers who want a shorter synchronization program or a program that requires less days of feeding MGA than the traditional MGA/PGF program.

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