Comparison of Use of Two Modified Select Synch Protocols with Timed Artificial Insemination in Bos indicus-influenced Females

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Story in Brief

In each of 2 years (year 1: n = 60; year 2: n = 82), multiparous Bos indicus-influenced (at least 3/8 Brahman, predominantly Beefmaster breeding) females were synchronized using either 1) a 100 µg injection of gonadotropin releasing hormone (GnRH; G) or 2) a 1 mg injection of estradiol 17β (E) at insertion of a controlled internal drug release device (CIDR). In both treatment groups, CIDRs were removed after 7 d and a 25 mg injection of prostaglandin (PGF2α; PGF) was administered. All females were observed for estrus and artificially inseminated (AI) following the AM/PM rule. Any female who had not exhibited estrus was given a 100 µg injection of GnRH and inseminated approximately 84 h after PGF administration. Overall AI pregnancy rates in year 1 were 40%, with the E group having 46% pregnancy rates and the G group having 30%. In year 2, overall AI pregnancy rate was 42% with the E group having 50% AI pregnancy rates and the G group having 34.88%. The second injection of GnRH in either treatment group resulted in 7 additional AI calves in year 1 and 12 additional calves in year 2. These results imply that additional GnRH injection to facilitate follicular wave turnover has use in increasing AI conception rates.

Introduction

Widespread use of estrous synchronization and artificial insemination (AI) is not common in the beef cattle industry; however, progressive producers may employ these tools to maximize production of genetically superior calves. The use of timed artificial insemination programs has become more desirable, both from a cattle handling perspective and a labor cost standpoint. Producers want to produce as many superior calves as possible, but most of them do not have the time or resources to perform adequate estrous detection. In the southern United States, Bos indicus-type females are extremely common due to their adaptability to hot, humid environments; however, these females often do not exhibit favorable responses to timed artificial insemination programs. The objective of this study was to determine if acceptable pregnancy rates could be attained using a combination of heat detection and insemination with a timed insemination protocol in Bos indicus females.

Experimental Procedures

In mid-December in each of 2 years, fall-calving, multiparous lactating (at least 45 d postpartum) females at the Southeast Research and Extension Center in Monticello were randomly allocated to 1 of 2 treatment groups: 1) 100 µg injection of gonadotropin releasing hormone (GnRH) (Cystorelin7, Meriel Limited, Duluth, Ga.) at insertion of a controlled internal drug release device (CIDR) followed by a prostaglandin F2α (PGF; ProstaMate, Agri-Laboratories Ltd, St. Joseph, Mo.; G) injection 7 d later at CIDR removal or 2) a 1 mg injection of estradiol 17β (Med-Shop Pharmacy, Longview, Texas; E) at CIDR insertion followed by a PGF injection 7 d later at CIDR removal. Estrous detection was performed for 90 min each morning and evening (0630 to 0800 and 1530 to 1700) by observation. Females who exhibited estrus were inseminated following the AM/PM rule by a single insemination technician. Insemination took place between 9 and 14 h after observation of standing estrus. All females who had not exhibited standing estrus were subjected to timed AI (TAI) and a second 100 µg GnRH injection approximately 84 h after PGF administration (Figure 1). High quality Beefmaster semen was used for all cows. After being inseminated, females were placed with Angus bulls that had passed a standard breeding soundness exam for a 60 d breeding season. Females were palpated per rectum for pregnancy approximately 100 d after bulls were removed. At birth, paternity of each calf was determined using visual appraisal (presence of horns, head shape, presentation of Bos indicus characteristics) to distinguish between Beefmaster and Angus sired calves.

Number of calves resulting from treatment groups was expressed as percentage of calf crop, then converted using an arcsine transformation so that data could be adjusted to a normal distribution, and analyzed using PROC GLM of SAS (SAS Inst., Inc., Cary, N.C.). Length of gestation for AI calves was analyzed for comparison among treatment groups using the PROC GLM.

Results and Discussion

Overall responses to each treatment for entire experiment are presented in Table 1. No treatment differences were seen in either year of this trial ($P > 0.10$). It was interesting to note that females who received E17β at CIDR insertion showed numerically higher conception rates to artificial insemination in both years. Overall pregnancy rates to artificial insemination were low compared to previous studies on Bos taurus females (Lamb et al., 2001), but were similar to studies using females of similar genotype (Saldarriaga et al., 2007). Researchers have demonstrated acceptable TAI concep-
tion rates using several protocols and length of time following PGF administration to insemination (Patterson et al., 2003). Again, most research of this type has been performed on Bos taurus cattle that often exhibit markedly different responses to exogenous hormone treatments when compared to Bos indicus females. While it has been argued that Bos indicus females have an inherent disadvantage in fertility compared to Bos taurus females, many authors have refuted this argument (Saldarriaga et al., 2007). This trial also demonstrated favorable overall conception rates (86.67% in year 1 and 85.54% in year 2) even though the cattle were bred in the winter months, which do not typically show optimal conception rates for Bos indicus cattle. Figure 2 shows number of calves produced through AI and natural service by females synchronized in year 1 and 2.

Although no treatment differences were observed in length of gestation for females conceiving to artificial insemination in either year of the experiment ($P > 0.10$), females in the G treatment group exhibited numerically shorter length of gestation. In year 1, the E treatment group averaged 285.6 days of gestation and the G treatment group averaged 282.1 days of gestation. The same pattern was observed in year 2, with the E treatment group averaging 283.8 days of gestation and the G treatment group averaging 280.5 days of gestation.

To maximize the number of AI calves realized, this trial incorporated both estrous detection and a timed insemination program. Use of these programs may also be desirable to producers who only have a finite amount of time to dedicate to estrous detection. Figure 3 illustrates additional calves realized by incorporating an additional GnRH injection at the time of insemination. Larson et al. (2006) found that this type of strategy demonstrated increased AI pregnancy rates from 9 to 11% in suckled Bos taurus females, maximizing the producers’ benefit from this synchronization and AI program. Ultimately, it is up to the individual producer to determine if the additional cost of a second GnRH administration to a large group of females will yield enough benefits to be economically feasible.

### Implications

While Bos indicus-influenced females do not seem to respond favorably to timed artificial insemination protocols, a need exists to devise synchronization strategies maximizing producer benefits. Using a combination of estrous detection and AI with a timed insemination program numerically increased AI conception rates, allowing realization of profits from superior calves.

### Literature Cited


### Table 1: Summary of treatment responses*

<table>
<thead>
<tr>
<th>Item</th>
<th>Year 1</th>
<th>Year 2</th>
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<tbody>
<tr>
<td></td>
<td>E17β</td>
<td>GnRH</td>
</tr>
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<td>Females in treatment group</td>
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<tr>
<td>Females observed in estrus</td>
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</tr>
<tr>
<td>Females receiving 2nd GnRH injection</td>
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<td>16</td>
</tr>
<tr>
<td>Calves conceived from AI on observed estrus</td>
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<td>7</td>
</tr>
<tr>
<td>Calves conceived from TAI and GnRH injection</td>
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<td>3</td>
</tr>
</tbody>
</table>

*GnRH = 100 µg injection of gonadotropin releasing hormone; E17β = 1 mg injection of E17β; AI = artificial insemination; TAI = timed artificial insemination. No differences were observed between treatments in either year ($P > 0.10$).

**Fig. 1. Experimental Design B 1 mg injection of estradiol 17β (E) or 100 µg injection of gonadotropin releasing hormone (GnRH) at insertion of a controlled internal drug release device (CIDR). PGF = prostaglandin F2α; AI = artificial insemination; TAI = timed artificial insemination.
Fig. 2. Number of calves produced via artificial insemination (AI) and natural service (After being inseminated, females were placed with Angus bulls who had passed a standard breeding soundness exam for a 60 d breeding season; NS) by treatment for year 1 and year 2 (E and G). E = 1 mg injection of estradiol17β and G = 100 µg injection of gonadotropin releasing hormone (GnRH).

Fig. 3: Comparison of calves conceived via artificial insemination (AI) by females bred on observed heat or timed AI (2nd injection of gonadotropin releasing hormone; 2nd GnRH) for year 1 and year 2 (E and G). E = 1 mg injection of estradiol17β and G = 100 µg injection of GnRH.