

# Evaluation of a New or Once-used CIDR and Two Different Prostaglandin F<sub>2α</sub> Treatments to Synchronize Suckled *Bos indicus* × *Bos taurus* Cows

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Suckled *Bos indicus* × *Bos taurus* cows achieved similar pregnancy rates when synchronized with CIDR inserts and two PGF<sub>2α</sub> types. Greater synchronized pregnancy rates were observed with a 3 d estrous detection and clean-up timed artificial insemination compared to a 5 d estrous detection following PGF<sub>2α</sub>. Days from calving had a strong influence on response to synchronization protocol.

## Summary

Multiparous suckled *Bos indicus* × *Bos taurus* cows were used in two experiments to evaluate the Select Synch and Select Synch + timed artificial insemination (TAI) synchronization protocols combined with a controlled intravaginal progesterone device (CIDR). Both experiments were conducted as 2 × 2 factorial designs with the main effects being CIDR type (new vs once-used) and PGF<sub>2α</sub> type (cloprostenol sodium vs dinoprost tromethamine). Cows in both experiments received GnRH and either a new CIDR or once-used CIDR on d 0, followed by CIDR removal and either cloprostenol sodium or dinoprost tromethamine on d 7. In Exp. 1, estrus was detected for 5 d following PGF<sub>2α</sub> and cows were AI 8 to 12 h after observed in estrus. In Exp. 2, estrus was detected for 3 d following PGF<sub>2α</sub> and cows were AI 8 to 12 h after observed in estrus. Cows not exhibiting estrus by 72 h after PGF<sub>2α</sub> were timed-AI between 76 to 80 h and received GnRH. In Exp. 1, estrous response, conception, and synchronized pregnancy rates were similar ( $P>0.05$ ) for both new and once-used CIDR, as well as cloprostenol sodium and dinoprost tromethamine. Interval from PGF<sub>2α</sub> to onset of estrus influenced ( $P<0.05$ ) conception rates. Cows displaying estrus ≤ 84 h after PGF<sub>2α</sub> had greater ( $P<0.05$ ) conception rates compared to

cows exhibiting estrus ≥ 96 h after PGF<sub>2α</sub>. In Exp. 2, estrous response, conception, timed-AI, and synchronized pregnancy rates were similar ( $P>0.05$ ) for new and once-used CIDR, as well as cloprostenol sodium and dinoprost tromethamine. In both experiments, estrous response, conception, and pregnancy rates increased ( $P<0.05$ ) as days from calving increased. In summary, CIDR (new vs once-used) and PGF<sub>2α</sub> (cloprostenol sodium vs dinoprost tromethamine) types resulted in similar responses when used in the Select Synch protocol and the response to synchronization treatment increased as days from calving increased in suckled *Bos indicus* × *Bos taurus* cows.

## Introduction

Estrous synchronization allows for more cows to display estrus and ovulate over a period of several days. This allows for either a reduction of daily estrous detection over a 21 d estrous cycle to 1 to 5 d, or elimination of estrous detection and insemination of all cows at a pre-determined time known as timed-AI. A frequently used and effective synchronization protocol in *Bos taurus* cattle is administration of GnRH followed 7 d later with PGF<sub>2α</sub>. However, a common problem with the GnRH + PGF<sub>2α</sub>

protocol is that some cattle express estrus several days before PGF<sub>2α</sub>, which requires additional estrous detection. This problem can be eliminated with addition of a progestogen between the GnRH and PGF<sub>2α</sub> treatments. An added benefit of the progestogen is that it can induce estrous cycles in some anestrus cows. Limited research has been conducted using the GnRH + PGF<sub>2α</sub> protocols in *Bos indicus* × *Bos taurus* cattle either with or without a progestogen and that research was met with limited success. The reason(s) for the less than acceptable results are unclear, but may be due to a decreased synchronized estrous response, which may be influenced by decreased luteolytic actions of PGF<sub>2α</sub>.

Several studies have reported similar responses in *Bos taurus* cattle synchronized with synchronization systems that compared cloprostenol sodium to dinoprost tromethamine, but limited work has been done in *Bos indicus* × *Bos taurus* cows.

The CIDR is an effective synchronization agent that induces estrus in some anestrus cattle. A new CIDR (1.9 g progesterone) maintains circulating progesterone concentrations > 1 ng/mL for at least 15 d after insertion, suggesting that a CIDR could be used for two consecutive 7 d treatments and still suppress estrus. Furthermore, autoclaving a once-used CIDR brings more progesterone to the surface making more available for absorption in the vagina, as well as decreasing the possibility of disease transmission. Re-use of the CIDR could help producers decrease the cost of synchronizing cattle, but it must be accomplished without a reduction in AI pregnancy rates. Evaluation of a once-used CIDR has not been conducted in suckled *Bos indicus* × *Bos taurus* cows.

Therefore, the objectives of these experiments were to evaluate the effectiveness of a new CIDR compared to a once-used CIDR and cloprostenol sodium compared to dinoprost tromethamine in two GnRH + PGF<sub>2α</sub>

synchronization protocols in suckled *Bos indicus* × *Bos taurus* cows.

### Materials and Methods

Two experiments were conducted from January to March during two successive years at the Bar L Ranch in Marianna, FL. In Experiment 1, multiparous, suckled *Bos indicus* × *Bos taurus* cows (n = 284) were used. Mean (± SD) cow age was 5.7 ± 1.9 yr, days postpartum (DPP) was 58.0 ± 12.5 d, body weight (BW) was 1098 ± 106 lbs, and body condition score was 5.2 ± 0.5 (BCS: 1 = emaciated, 9 = obese). The percentage of *Bos indicus* breeding ranged from approximately 10 to 38% with the remainder being *Bos taurus* breeding. The experiment was a 2 × 2 factorial design. At the start of the experiment (d 0), cows were equally distributed by DPP and cow age to one of two progesterone treatments, which included a new CIDR (1.38 g; Eazi-Breed™ CIDR®, Pfizer Animal Health) and a once-used CIDR (new CIDR used once and autoclaved before the second use). All cows received GnRH (100 µg i.m.; Fertagyl®, Intervet) at CIDR insertion and BCS were recorded. On d 7, CIDR were removed and cows within each CIDR treatment were equally distributed by DPP, BCS, and cow age to receive either cloprostenol sodium (cloprostenol; 500 µg i.m.; Estrumate®, Schering-Plough Veterinary Corp.) or dinoprost tromethamine (dinoprost; 25 mg i.m.; Prostagmate®, Agrilabs). All cows received an EstroTECT™ estrous detection patch (EstroTECT™, Rockway, Inc.) at CIDR removal to aid in estrous detection.

Estrus was visually detected three times daily at 0700, 1200, and 1700 h for 5 d following PGF<sub>2α</sub>. Estrus was defined as a cow standing to be mounted by another cow and/or a half to full red EstroTECT™ patch. Cows were AI 8 to 12 h after observed in estrus. Frozen-thawed semen from a single sire of known fertility was used and cows were inseminated by two AI technicians. Seven d after the last cow was inseminated, bulls were placed with cows. Pregnancy was diagnosed approximately 55 d after AI using a real-time B-mode ultrasonography machine

(Aloka 500V, Corometrics Medical Systems) with a 5.0 MHz transducer. Because there was a 7-d period where cows were neither inseminated nor exposed to bulls, differences in fetal size were used to determine whether a pregnancy resulted from the synchronized breeding or clean-up bull.

In Experiment 2, multiparous suckled *Bos indicus* × *Bos taurus* cows (n = 259) were used. Mean (± SD) cow age was 6.9 ± 1.9 yr, DPP was 48.5 ± 12.8 d, and BCS was 5.1 ± 0.5. The experiment was a 2 × 2 factorial design and animals were assigned to the same synchronization treatments as Experiment 1. Estrus was detected for 72 h following PGF<sub>2α</sub> as described in Experiment 1. Cows were AI 8 to 12 h after observed in estrus. All cows that had not displayed estrus by 73 h after PGF<sub>2α</sub> were timed-AI and received GnRH between 76 and 80 h after PGF<sub>2α</sub>. Cows were inseminated by a single AI technician with frozen-thawed semen from five sires that were pre-assigned to cows before AI by the co-operating producer. Seven days after the last cow was inseminated, bulls were placed with cows and pregnancy was diagnosed as described in Experiment 1. The GENMOD procedure of SAS (SAS Inst. Inc.) was used for the statistical analysis. The main effects of CIDR and PGF<sub>2α</sub> treatments, and CIDR × PGF<sub>2α</sub> were evaluated for estrous response, conception, synchronized pregnancy, and thirty-day pregnancy rates. Cow age, DPP, BCS, and interval from PGF<sub>2α</sub> to the onset of estrus were included as covariates. When covariates were significant (P < 0.05), they were treated as independent variables.

## Results

In Experiment 1, estrous response, conception rate, and synchronized pregnancy rates were similar (P>0.05) for main effects of CIDR and PGF<sub>2α</sub> treatments, as well as the simple treatment effects (Table 1). Thirty-day pregnancy rates were similar (P>0.05) for the new (78.0%) compared to the once-used (79.4%) CIDR treatment and for the cloprostenol (77.3%) compared to the dinoprost

(80.1%) treatment.

Days post partum effected (P<0.05) estrous response, conception, and synchronized pregnancy rates (Table 2). Cows that were long (≥ 70 d) postpartum had a greater (P<0.05) estrous response compared to cows that were short (≤ 50 d) and medium (50 to 69 d) postpartum, which were similar (P>0.05). Conception rates were similar (P>0.05) for cows that were medium and long postpartum, both of which were greater (P<0.05) compared to short postpartum cows. Synchronized pregnancy rates were greater (P<0.05) for cows that were long postpartum compared to short and medium postpartum cows, which were different (P<0.05) from each other. Thirty-day pregnancy rates were greater (P<0.05) for cows that were medium (79.1%) and long (87.8%) postpartum compared to cows that were short (71.6%) postpartum. Cows that were medium and short postpartum had similar (P>0.05) thirty-day pregnancy rates.

No cows were detected in estrus until 48 h after PGF<sub>2α</sub> for any of the four treatments. The mean interval from PGF<sub>2α</sub> to onset of estrus (64.4 ± 16.0 h) was not influenced (P>0.05) by main or simple treatment effects. Interestingly, there was an effect (P < 0.01) of interval from PGF<sub>2α</sub> to onset of estrus on conception rate (Figure 1). Cows which displayed estrus 48, 60, 72, and 84 h after PGF<sub>2α</sub> had similar (P>0.05) conception rates, but cows which displayed estrus at 48, 60, and 72 h had greater (P<0.05) conception rates compared to cows that displayed estrus 96 h after PGF<sub>2α</sub>. Cows that displayed estrus at 84 h had similar (P>0.05) conception rates compared to cows which displayed estrus at 96 h. Cow age and BCS did not affect (P>0.05) estrous response, conception rate, synchronized pregnancy, or 30-d pregnancy rates when included as covariates for main and simple treatment effects.

In Experiment 2, estrous response, conception rate, timed-AI pregnancy, and synchronized pregnancy rates were similar (P>0.05) for main

effects of CIDR and PGF<sub>2α</sub> treatments (Table 3). Thirty-day pregnancy rates were similar ( $P>0.05$ ) for the new (83.2%) compared to the once-used (76.9%) CIDR treatment and for the cloprostenol (76.7%) compared to the dinoprost (83.3%) treatment.

The CIDR treatment tended ( $P=0.10$ ) to influence conception rate as 14.1% more cows that received a new CIDR became pregnant compared to cows that received a once-used CIDR (Table 3). The interval from PGF<sub>2α</sub> to onset of estrus was not ( $P>0.05$ ) affected by treatment, with a mean interval of  $58.6 \pm 10.3$  h across the four treatments. Interval from PGF<sub>2α</sub> to onset of estrus did not ( $P>0.05$ ) effect conception rates. Conception rates for cows that exhibited estrus 48, 60 and 72 h after PGF<sub>2α</sub> were 61.8 (n=55), 57.6 (n=33), and 60.0% (n=40), respectively.

Days postpartum affected ( $P<0.05$ ) estrous response, conception rate, timed-AI pregnancy, and synchronized pregnancy rates (Table 4). Estrous response was greater ( $P<0.05$ ) for long ( $\geq 60$  d) compared to short ( $< 40$  d) and medium (40 to 59 d) postpartum cows, which were similar ( $P>0.05$ ) to each other. Conception and timed-AI pregnancy rates were greater ( $P<0.05$ ) for long compared to short postpartum cows, but were similar ( $P>0.05$ ) to medium postpartum cows. Short postpartum cows had similar ( $P>0.05$ ) conception and timed-AI pregnancy rates compared to medium postpartum cows. Synchronized pregnancy rates were greater ( $P<0.05$ ) for long postpartum cows compared to medium and short postpartum cows ( $P<0.05$ ) while the medium postpartum cows had greater ( $P<0.05$ ) synchronized pregnancy rates compared to the short postpartum cows. Thirty-

day pregnancy rate was greater ( $P<0.05$ ) for long (94.5%) postpartum cows compared to short (70.3%) and medium (76.9%) postpartum cows, which were similar ( $P>0.05$ ) to each other. Body condition score did not ( $P>0.05$ ) affect estrous response, timed-AI pregnancy, or synchronized pregnancy rates, but did affect conception and 30-d pregnancy rates when included as a covariate for the main and simple treatment effects. Cows with a BCS  $\geq 5$  (64.5%) tended ( $P=0.10$ ) to have a greater conception rate compared to cows with a BCS  $< 5$  (48.6%). Cows with a BCS  $\geq 5$  (84.3%) had a greater ( $P<0.05$ ) 30-d pregnancy rate compared to cows with a BCS  $< 5$  (68.6%). Cow age did not affect ( $P>0.05$ ) estrous response, conception rate, timed-AI pregnancy, synchronized pregnancy, or 30-d pregnancy rates when included as a covariate for main and simple treatment effects.

In conclusion, synchronized pregnancy rates were similar between cloprostenol sodium and dinoprost tromethamine treatments in Select Synch + CIDR protocols. The decreased estrous response of the Select Synch + CIDR protocol compromises the protocols overall effectiveness, but synchronized pregnancy rates are improved with addition of a timed-AI after 3 d of estrous detection. The overall effectiveness of Select Synch protocols are significantly influenced by days postpartum at the start of treatment and producers need to pay particular attention to when synchronization protocols are implemented in relation to calving in suckled *Bos indicus*  $\times$  *Bos taurus* cattle.

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**Table 1.** Main treatment effects for estrous response, conception rate, and synchronized pregnancy rate of suckled *Bos indicus* × *Bos taurus* cows synchronized with controlled intravaginal progesterone-releasing device (CIDR; new vs once-used) and prostaglandin F<sub>2α</sub> [(cloprostenol sodium (cloprostenol) vs dinoprost tromethamine (dinoprost)] treatments (Experiment 1).<sup>a</sup>

Variable	Estrous response, % (n) <sup>b</sup>	Conception rate, % (n) <sup>c</sup>	Synchronized pregnancy rate, % (n) <sup>d</sup>
Main effects			
New CIDR	70.9 (141)	45.0 (100)	31.9 (141)
Once-used CIDR	66.0 (141)	50.5 (93)	33.3 (141)
P-value	P > 0.05	P > 0.05	P > 0.05
Cloprostenol	68.8 (141)	48.5 (97)	33.3 (141)
Dinoprost	68.1 (141)	46.9 (96)	31.9 (141)
P-value	P > 0.05	P > 0.05	P > 0.05

<sup>a</sup>All cows received GnRH (100 µg) at the initiation of either a 7 d new or once-used CIDR. Cows received either cloprostenol sodium (500 µg) or dinoprost tromethamine (25 mg) at CIDR removal. Estrus was detected for 5 d and cows that exhibited estrus were inseminated 8 to 12 h later.

<sup>b</sup> Percentage of cows displaying estrus 5 d after prostaglandin F<sub>2α</sub> of total treated.

<sup>c</sup> Percentage of cows pregnant to AI of the total that exhibited estrus and were AI.

<sup>d</sup> Percentage of cows pregnant during the synchronized breeding of the total treated.

**Table 2.** Effect of days postpartum (DPP) at the initiation of controlled intravaginal progesterone-releasing device (CIDR) and prostaglandin F<sub>2α</sub> treatments on estrous response, conception rate, and synchronized pregnancy rates of suckled *Bos indicus* × *Bos taurus* cows (Experiment 1).<sup>a</sup>

DPP	Estrous response, % (n) <sup>b</sup>	Conception rate, % (n) <sup>c</sup>	Synchronized pregnancy rate, % (n) <sup>d</sup>
≤ 50	57.8 (109) <sup>e</sup>	27.0 (63) <sup>e</sup>	15.6 (109) <sup>e</sup>
51-69	64.8 (91) <sup>e</sup>	49.2 (59) <sup>f</sup>	31.9 (91) <sup>f</sup>
≥ 70	86.6 (82) <sup>f</sup>	64.8 (71) <sup>f</sup>	56.1 (82) <sup>g</sup>

<sup>a</sup> All cows received GnRH (100 µg) at the initiation of either a 7 d new or once-used CIDR. Cows received either cloprostenol sodium (500 µg) or dinoprost tromethamine (25 mg) at CIDR removal. Estrus was detected for 5 d and cows that exhibited estrus were inseminated 8 to 12 h later.

<sup>b</sup> Percentage of cows displaying estrus 5 d after prostaglandin F<sub>2α</sub> of total treated.

<sup>c</sup> Percentage of cows pregnant to AI of the total that exhibited estrus and were AI.

<sup>d</sup> Percentage of cows pregnant during the synchronized breeding of the total treated.

<sup>e,f,g</sup> Means without a common superscript within a column differ (P<0.05)

**Table 3.** Main treatment effects for estrous response, conception rate, timed-AI pregnancy rate, and synchronized pregnancy rate of suckled *Bos indicus* × *Bos taurus* cows synchronized with controlled intravaginal progesterone-releasing device (CIDR; new vs once-used) and prostaglandin F<sub>2α</sub> [(cloprostenol sodium (cloprostenol) vs dinoprost tromethamine - (dinoprost)] treatments (Experiment 2).<sup>a</sup>

Variable	Estrous response, % (n) <sup>b</sup>	Conception rate, % (n) <sup>c</sup>	Timed-AI pregnancy rate, % (n) <sup>d</sup>	Synchronized pregnancy rate, % (n) <sup>e</sup>
Main effects				
New CIDR	51.2 (125)	67.2 (64)	32.8 (61)	50.4 (125)
Once-used CIDR	49.2 (130)	53.1 (64)	31.8 (66)	42.3 (130)
P-value	P > 0.05	P = 0.10	P > 0.05	P > 0.05
Prostaglandin F <sub>2α</sub>				
Cloprostenol	53.5 (129)	59.4 (69)	28.3 (60)	45.0 (129)
Dinoprost	46.8 (126)	61.0 (59)	35.8 (67)	47.6 (126)
P-value	P > 0.05	P > 0.05	P > 0.05	P > 0.05

<sup>a</sup>All cows received GnRH (100 µg) at the initiation of either a 7 d new or once-used CIDR. Cows received either cloprostenol sodium (500 µg) or dinoprost tromethamine (25 mg) at CIDR removal. Estrus was detected for 3 d and cows exhibiting estrus were AI 8 to 12 h later. Cows not displaying estrus were timed-AI and received GnRH 76 to 80 h after prostaglandin F<sub>2α</sub>.

<sup>b</sup> Percentage of cows displaying estrus 5 d after prostaglandin F<sub>2α</sub> of total treated.

<sup>c</sup> Percentage of cows pregnant to AI of the total that exhibited estrus and were AI.

<sup>d</sup> Percentage of cows pregnant to timed-AI of the total that were timed-AI.

<sup>e</sup> Percentage of cows pregnant during the synchronized breeding of the total treated.

**Table 4.** Effect of days postpartum (DPP) at the initiation of controlled intravaginal progesterone-releasing device (CIDR) treatments and prostaglandin F<sub>2α</sub> treatments on estrous response, conception rate, and pregnancy rates of suckled *Bos indicus* × *Bos taurus* cows (Experiment 2).<sup>a</sup>

DPP	Estrous Response, % (n) <sup>b</sup>	Conception rate %, (n) <sup>c</sup>	Timed-AI pregnancy rate %, (n) <sup>d</sup>	Synchronized pregnancy rate, % (n) <sup>e</sup>
< 40	39.2 (74) <sup>f</sup>	44.8 (29) <sup>f</sup>	20.0 (45) <sup>f</sup>	29.7 (74) <sup>f</sup>
40-59	45.4 (108) <sup>f</sup>	57.1 (49) <sup>f,g</sup>	33.9 (59) <sup>f,g</sup>	44.4 (108) <sup>g</sup>
≥ 60	68.5 (73) <sup>g</sup>	72.0 (50) <sup>g</sup>	52.2 (23) <sup>g</sup>	65.8 (73) <sup>h</sup>

<sup>a</sup>All cows received GnRH (100 µg) at the initiation of either a 7 d new or once-used CIDR. Cows received either cloprostenol sodium (500 µg) or dinoprost tromethamine (25 mg) at CIDR removal. Estrus was detected for 3 d and cows exhibiting estrus were AI 8 to 12 h later. Cows not displaying estrus were timed-AI and received GnRH 76 to 80 h after prostaglandin F<sub>2α</sub>.

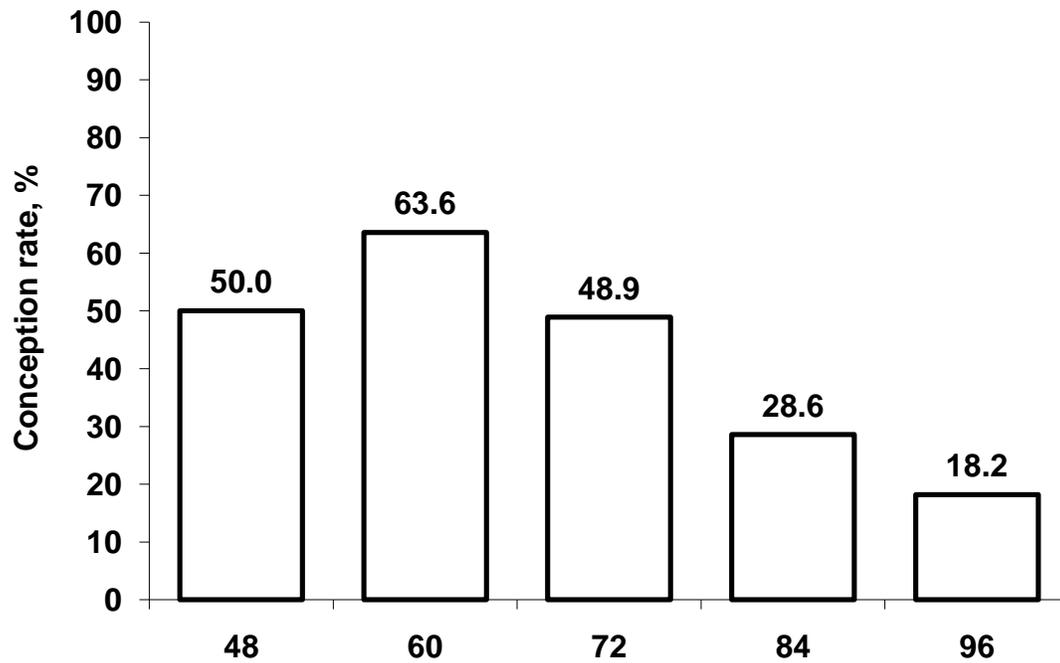
<sup>b</sup> Percentage of cows displaying estrus 3 d after prostaglandin F<sub>2α</sub> of total treated.

<sup>c</sup> Percentage of cows pregnant to AI of the total that exhibited estrus and were AI.

<sup>d</sup> Percentage of cows pregnant to timed-AI of the total that were timed-AI.

<sup>e</sup> Percentage of cows pregnant during the synchronized breeding of the total treated.

<sup>f,g,h</sup> Means without a common superscript within a column differ (P<0.05).



**Figure 1.** Effect of interval from PGF<sub>2α</sub> to the onset of estrus on conception rates in suckled *Bos indicus* × *Bos taurus* cows synchronized with controlled intravaginal progesterone-releasing device (CIDR) and prostaglandin F<sub>2α</sub> treatments. Means between columns without a common letter differ (P<0.05). Numbers in parenthesis indicate the number of cows inseminated within each category (Experiment 1).

