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Effect on Pregnancy Rate of a Previously Used Progesterone-Releasing Device and Fixed Time Artificial Insemination in Brahman Cows

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Abstract: With the objective to evaluate the efficiency of the Controlled Intravaginal Devices Releasing (CIDR) new and reutilized until a 4th occasion and their effect on the pregnancy rate were studied 594 Brahman multiparous cows with their calves with 468.4±33.9 kg of body weight and with a minimum of 90 days postpartum and Fixed Time Artificial Insemination (FTAI) under humid tropical conditions. The cows were randomly assigned to one out to 8 treatments where the CIDR1A was new and anestrous cows; CIDR1C: new and cyclic cows; CIDR2A: Second use and anestrous cows; CIDR2C: Second and cyclic cows; CIDR3A: Third use and anoestrus cows CIDR3C: Third use and cyclic cows; CIDR4A: Fourth use and anestrous cows; CIDR4C: Fourth use and cyclic cows in the following way T1 (n = 116): CIDR1A+estradiol benzoate (E)+D-Cloprostenol+eCG+AI at detected estrus; T2 (n = 34): CIDR1C+E+D-Cloprostenol+AI at detected estrus; T3 (n = 53): CIDR2A+E+D-cloprostenol+eCG+Fixed Time Artificial Insemination (FTAI); T4 (n = 62): CIDR2C+E+D-Cloprostenol+FTAI; T5 (n = 33): CIDR3A+E+D-Cloprostenol+eCG+FTAI; T6 (n = 67): CIDR3C+E+D-Cloprostenol+FTAI; T7 (n = 41): CIDR4A+E+D-Cloprostenol+eCG+FTAI and T8 (n = 188): CIDR4C+E+D-Cloprostenol+FTAI. The pregnancy rate was different among treatments being 35.3, 61.7, 30.1, 64.5, 21.2, 82.0, 41.4 and 48.9% for T1-T8, respectively. In conclusion, the use of new or reutilized CIDR up to a 4th time plus artificial insemination at fixed time in Brahman cows represents an alternative to synchronize estrus and ovulation to improve gestation percentages.

Key words: CIDR, prostaglandins, pregnancy rate, synchronize estrus, gestation, Brahman

INTRODUCTION

In order to improve the reproductive response in beef cattle females, different techniques have been developed that allow to reinitiate the postpartum ovarian activity within a relatively shorter time than that given by traditional management, nevertheless, the associated high costs does not allow to use them. The use of natural progesterone and progestagens improves ovulation regardless the endocrine environment at the treatment time. To synchronize estrus, it is desirable that females show ovulation in synchrony which would make easy to use artificial insemination at fixed time. There are some evidences that progesterone and estradiol benzoate concentrates estrus clusters during estrus synchronization programs in bovine cattle (Vogg *et al*., 2004). In the same way, when eCG is applied at the intrauterine devices removal or subcutaneous implants, synchrony is significantly improved and synchronized estrus are clustered more efficiently without affecting estrus percentage or fertility however, fertility is significantly higher in estrus animals than in acyclic animals. The investigation to evaluate new CIDR has been mentioned by different researchers (Rathbone *et al*., 2002; Mapletoft *et al*., 2003). In the last years, different researchers have published investigations with intravaginal devices reused in bovine cattle and ovine.

The intravaginal devices can be reused because the hormonal amount in them is given by grams and the amount that the cows need to be able to show estrus is in nanograms from this form the questioning arises from which the residual concentration of the progestin in the

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CIDR is able to induce estrus synchronization with similar rate of gestation when this one is used by second or more occasions. Because of these reasons, the objective of this study was to evaluate the repetitive use of intravaginal devices up to a 4th time with and without eCG and its effect on pregnancy rates in Brahman cows.

MATERIALS AND METHODS

The present study was carried out in the Finca Perseverancia San Jose which is located in Tonala county, Mexico. It is located between 15°51'35''N and 93°29'40''W and the average altitude is 30 m above sea level. The climate is warm-humid with a rainy season during summer and a drought season from February-June when the pasture consumption decreases significantly. A total of 594 multiparous Brahman cows with their calves and average weight of 468.4±33.9 kg were used for this study. Transrectal palpation was done at day 90 postpartum and in this moment cows were assigned like cyclic or acyclic.

Cows were inseminated 12 h after the detection of the estrus in T1 and T2. Females from T3-T8 were artificially inseminated at fixed time 30 h after the 2nd injection of estradiol benzoate and/or eCG with frozen semen of tested fertility from different bulls. Artificial inseminations were made by the same technician. Pregnancy was determined 50 days post insemination by rectal examination. Cows were individually identified with ear tags and treated against ecto and endo-parasites as well as vaccinated against clostridiasis, anthrax, pasteurellosis, rabies and brucellosis. Cows were under continuous lactation and their calves remained with them until weaning. The corporal condition index ranged 3-4 in a 1-5 scale where one represents an emaciated cow and five represents an obese cow (Edmonson *et al*., 1989). Cows grazed freely on stargrass (*Cynodon plectostachyus*) and Jaragua grass (*Hyparrhenia rufa*) pasturelands.

A randomly unbalanced design with eight treatments and different number of replications was used. Each replication was represented by a cow and her calf in a factorial arrangement 2×4 where factors were cyclic and acyclic cows. The cows were randomly assigned to one out to 8 treatments where the CIDR1A was: new and anestrous cows; CIDR1C: new and cyclic cows; CIDR2A: Second use and anestrous cows; CIDR2C: Second and cyclic cows; CIDR3A: Third use and anoestrus cows; CIDR3C: Third use and cyclic cows; CIDR4A: Fourth use and anestrous cows; CIDR4C: Fourth use and cyclic cows, in the following way: T1 (n = 116): CIDR1A+estradiol benzoate (E)+D-Cloprostenol+eCG+AI at detected estrus; T2 (n = 34): CIDR1C+E+D-Cloprostenol+AI at detected estrus; T3 (n = 53): CIDR2A+E+D-Cloprostenol+eCG+Fixed Time Artificial Insemination (FTAI); T4 (n = 62): CIDR2C+E+D-Cloprostenol+FTAI; T5 (n = 33): CIDR3A+E+D-Cloprostenol+eCG+FTAI; T6 (n = 67): CIDR3C+E+D-Cloprostenol+FTAI; T7 (n = 41): CIDR4A+E+D-Cloprostenol+ eCG+FTAI and T8 (n = 188): CIDR4C+E+D-Cloprostenol+FTAI. Data were analyzed through, the free distribution χ^2 non-parametric test.

RESULTS AND DISCUSSION

The estrus percentages showed after CIDR removals were 61.2 and 79.4% for T1 and T2, respectively. The mean interval from CIDR withdrawal to onset of estrus was 44.6±15.6 and 42.2±12.1 h for the T1 and T2 treatments, respectively. None of these differences were significant as shown in Table 1. The estrus response and distribution of T1 and T2 groups are shown in Fig. 1. The pregnancy rates at day 50 following estrus synchronization in overall of experimental groups are shown in Table 2. These results are similar to those reported by Diaz registered 70% of estrus when synchronizing Brahman cows through natural progesterone and estradiol benzoate in tropical

Table 1: Response of acyclic and cyclic Brahman cows to estrus synchronization with CIDR used for first time plus estradiol benzoate, D-cloprostenol, equine chorionic gonadotrophin and artificial insemination at detected estrus

	Treatments[1]	
Results	T1	T2
Estrus (%)	61.2	79.4
Onset of estrus (h)	44.6±15.6	42.2±12.1

[1] T1 (n = 116): CIDR1A+estradiol benzoate (E)+D-Cloprostenol+eCG+AI at detected estrus; T2 (n = 34): CIDR1C+E+D-Cloprostenol+AI at detected estrus

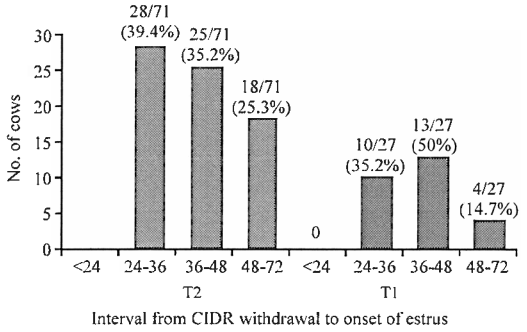

Fig. 1: Distribution of the onset of estrus after synchronization in Brahman cows. T1 (n = 116): CIDR1A+estradiol benzoate (E)+D-Cloprostenol +eCG+AI at detected estrus; T2 (n = 34): CIDR1C+E+D-Cloprostenol+AI at detected estrus

Table 2: Pregnancy rate of cows synchronized at estrus with CIDR reused up to a fourth time with and without eCG

Treatment group1	Cows (n)	Pregnant	Pregnancy rate (%)
CIDR1A	116	41	35.3[a]
CIDR1C	34	21	61.7[b]
CIDR2A	53	16	30.1[bc]
CIDR2C	62	40	64.5[c]
CIDR3A	33	7	21.2[cd]
CIDR3C	67	55	82.0[d]
CIDR4A	41	17	41.4[d]
CIDR4C	188	92	48.9[d]

[1] T1 (n = 116): CIDR1A+estradiol benzoate (E)+D-Cloprostenol+eCG+AI at detected estrus; T2 (n = 34): CIDR1C+E+D-Cloprostenol+AI at detected estrus; T3 (n = 53): CIDR2A+E+D-Cloprostenol+eCG+Fixed Time Artificial Insemination (FTAI); T4 (n = 62): CIDR2C+E+D-Cloprostenol +FTAI; T5 (n = 33): CIDR3A+E+D-Cloprostenol+eCG+FTAI; T6 (n = 67): CIDR3C+E+D-Cloprostenol+FTAI; T7 (n = 41): CIDR4A+E+D-Cloprostenol+eCG+FTAI and T8 (n = 188): CIDR4C+E+D-Cloprostenol+ FTAI

conditions. These results coincide with results published by different researchers (Penny *et al*., 2000; Lucy *et al*., 2001) they observed that by administrating progesterone plus estradiol benzoate and eCG, estrus is synchronized and ovulation is induced. By using eCG in anestrous cows ovulation are induced allowing to inseminate cows without estrus symptoms or anestrous cows and getting good conception indexes.

Contrarily, the inductions of estrus with estradiol benzoate not always induce ovulation. Estrus expression is a critical factor in conventional artificial insemination programs (Vogg *et al*., 2004) nevertheless in this study FTAI was used to avoid low pregnancy percentages owing to estrus detection potential failure. This study found that Brahman cows had an average pregnancy percentage of 48.1% at synchronized estrus being of 35.3, 61.7, 30.1, 64.5, 21.2, 82.0, 41.4 and 48.9% from T1-T8, respectively there were differences ($p<0.05$) among treatments (Table 2). As can be observed in the results, cyclic cows showed a better reproductive response than anestrous cows being 64.2% the pregnancy percent for cyclic cows and 32% for the anestrous cows.

The obtained pregnancy percentage in all groups falls within the range cited by other studies (35.1-71.4%; Perez-Hernandez *et al*., 2002). Similarly, it coincides with other studies carried out in tropical regions even though it was realized during the rainy season which implies a higher forage quality and availability. However, it has been reported that the presence of males affects the resumption of postpartum ovarian activity in *Bos indicus* cattle. Because in tropical regions seasons are not well defined, sometimes it is impossible to differentiate among them however, it is important to point out that in the study area there are two well defined seasons (rainy and drought) which could potentially affect the cycles depending on forage availability. These results are better than those reported by Solorzano who used CIDR 2 times and found pregnancy percentages of 42.1, 37.1 and 36.1% with new, first and second use CIDR correspondingly. In the same way, Larocca obtained 64% of pregnancy using Norgestomet+E+Delprostenate+eCG and AI 12 h after estrus detection in Holstein cows under tropical conditions in Costa Rica. Other researchers obtained 51% of pregnancies when using subcutaneous implants of norgestomet combined with eCG; this result is lower than results of T6 where we used CIDR+E+D-Cloprostenol+ eCG+FTAI.

These results confirm findings reported by Yavas and Walton (2000) they affirm that by using progestagens to induce the first postpartum ovulation, a corpus luteum is produced with normal duration in response to the combined injection of eCG causing a fertile estrus. Similarly, paludo infer that the first dominant follicles detected during the third postpartum week ovulate in response to hormonal treatments and they can be used as precursors for reestablishing from postpartum anestrous. According to Cavestany this study reaffirms that cows have greater opportunity of being pregnant if they had a normal estrus cycle before. In the Brahman race as well as in other zebu races, the postpartum ovarian activity resumption is the most important factor into the partum-conception interval.

This variable determines the profitability of bovine livestock exploitations. Perez-Hernandez *et al*. (2002) mentioned that suckling is a very important factor involved in the delayed ovarian activity resumption because it affects the interval partum-first ovulation in cows. In the interval partum-conception it is necessary to consider those factors affecting the herd fertility like semen quality, AI technique, embryo mortality and the AI time related to ovulation (Lucy *et al*., 1992).

The corporal condition has a significant effect on the reproductive response in artificially inseminated females. Corporal condition of the cows of this study was 3 in a one to five scale where one was extremely skinny cows and 5 represented obese cows. In a other study heifers with good corporal condition had a larger pregnancy percentage (79.1%) compared with those heifers with poor corporal condition (36.4%). In other study, a similar effect was found in acyclic lactating and in poor physical conditions cows where only 26% of them got pregnant. Moreover, a physiological mechanism avoiding cows getting pregnant if they loss >25-30% of their weight during the postpartum period had been considered as a factor limiting the reproductive efficiency in postpartum cows (Oliver and Richardson, 1976). Under these considerations, one of the factors that have contributed largely too little diffusion of AI is the deficiency in estrus detection particularly in zebu cows.

CONCLUSION

The use of new or reutilized CIDR up to a 4th time plus fixed time artificial insemination in Brahman cows represents an alternative to synchronize estrus and ovulation to improve gestation percentages under tropical conditions of Mexico.

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