Estradiol Benzoate Administered in Combination with an Intravaginal Progesterone-Releasing Device (CIDR¹) Results in Follicular Turnover in Crossbred Cattle of Bos indicus Breeding²

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Estradiol benzoate administration at the start of a 7-d CIDR effectively initiated follicle turnover and tended to increase pregnancy rates to timed-AI compared with no estradiol benzoate at CIDR insertion in crossbred Bos indicus cattle.

Summary

Crossbred lactating, postpartum cows (n=29) of Bos indicus breeding were used to determine the effectiveness of estradiol benzoate to initiate follicle turnover when administered at the start of treatment with a 7-d intravaginal progesterone -releasing device (CIDR). All cows received a CIDR with an injection of prostaglandin F2a (Lutalyse) at CIDR removal. At CIDR insertion, half of the cows received 2 mg of estradiol benzoate while the remainder did not. Within the estradiol benzoate and no-estradiol benzoate treated groups, cows were timed-AI and injected with gonadotropin releasing hormone (GnRH - Cystorelin) at either 48 or 60 h after CIDR removal. Follicle turnover was determined by ultrasonography. Estradiol benzoate treatment initiated follicle turnover in all (n=12) cows with a follicle > 10 mm. Cows treated with estradiol benzoate tended to have greater pregnancy rates (64.2 %) than cows not treated with estradiol benzoate (33.3%).

Introduction

The utilization of artificial insemination (AI) in the beef cattle industry is becoming a more widely used production practice. However, with timed-AI, or breeding by appointment, producers must utilize an effective estrus and/or ovulation control system that provides consistent results. Administration of progesterone-like compounds (progestagens) to cattle have long been used to prevent cattle from exhibiting estrus. However, long term use (> 10 d) of progestagens results in development of a large follicle that remains on the ovary for an extended period of time compared with what is typically observed during the normal estrous cycle. The large follicle, known as persistent follicle, ovulates after removal of the progestagen, but fertility of the subsequent breeding is decreased due to compromised development of the developing embryo. Furthermore, short term (< 7 d) progestagen treatments can result in ovulation of aged oocytes, which may also be of decreased fertility. Consequently, to prevent ovulation and fertilization of either a persistent follicle, or an aged oocyte, the follicle must be regressed either during or at the beginning a progestagen treatment so that a new follicle is recruited, selected, and ovulated at the estrus following withdrawal of the progestagen treatment. The objective of this study was to determine the effectiveness of estradiol benzoate in combination with a 7-d progesterone treatment to initiate follicle turnover and to synchronize follicle development for a timed-AI in crossbred, lactating cows of Bos indicus breeding.

Procedure

Crossbred, lactating, postpartum cows of Bos indicus breeding (n=29) were allotted to one of four treatments by cycling status, days post-partum, and body condition score (1= emaciated; 5= moderate; 9= very fat). On the first day of the experiment, D 0, all cows received a 7-d CIDR (EAZI-BREEDTCIDRr, InterAg, Hamilton, NZ) and were injected with 5 mL of prostaglandin F2a (Lutalyse; Pharmacia & Upjohn, Kalamazoo, MI) at CIDR removal. Additionally, half of the cows were injected with 2 mL of estradiol benzoate (1 mg/mL; CIDROL, InterAg, Hamilton, NZ) at CIDR insertion.
and half were not. Cows were timed-AI and simultaneously injected with 2 mL of GnRH (Cystorelin, Merial Limited Athens, GA) at either 48 or 60 h after CIDR removal. Therefore, four AI treatments were represented in the study. Half of the cows received estradiol benzoate at insertion of the CIDR and half did not, and within each of these groups, cows were timed-AI at either 48 or 60 h after CIDR removal. Estrus was detected using the HeatWatchr estrus detection system. Follicular development was determined using transrectal ultrasonography. On D 0 of the experiment ovaries were ultrasounded every other day until CIDR removal and then every day until ovulation. This allowed the researchers to determine if the estradiol benzoate caused the early regression of follicles, known as follicular turnover. Approximately 30 d after timed-AI, pregnancy was diagnosed with ultrasonography.

Results

Estradiol benzoate administered on D 0 of the CIDR treatment initiated follicle turnover in all cows that had follicles greater than 10 mm when the CIDR was inserted (Table 1). Of the cows that did not receive estradiol benzoate, only 7 of 15 cows had follicle turnover during the duration of the CIDR. This is follicle turnover that occurs naturally in the follicular cycle of the cow. Therefore, the injection of estradiol benzoate at the start of a 7-d CIDR treatment can effectively initiate follicle turnover in cattle of Bos indicus breeding. Only 35.7 % of all animals in the experiment exhibited estrus during the period from CIDR withdrawal to timed-AI. Therefore, it appears that estrus expression is compromised when cows are AI and simultaneously injected with GnRH at 48 or 60 h after CIDR removal.

Because there were no significant differences in pregnancy rates between cows that were AI at 48 vs. 60 h after CIDR removal the data were combined. Cattle treated with estradiol benzoate tended to have greater (P < .09) AI pregnancy rates than cattle not treated with estradiol benzoate (64.3 vs. 33.3%; respectively). When the data were analyzed by cows that had follicle turnover, regardless of whether the follicular turnover was natural or induced by estradiol benzoate, AI pregnancy rates was numerically greater for animals that had follicle turnover (10/19 = 52.6%) compared to follicles that failed to turnover (4/10 = 40.0%) during CIDR treatment.

In conclusion, estradiol benzoate administered at the time of CIDR insertion is an effective method of initiating follicle turnover and may result in increased pregnancy rates in crossbred cattle of Bos indicus breeding.

Table 1. Follicle turnover and follicle size at AI in cattle treated with estradiol benzoate at the time of CIDR insertion (Includes follicles that were > 10 mm at CIDR insertion)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Follicle turnover (%)</th>
<th>Size of follicles that turned over at AI (mm)</th>
<th>Size of follicles that failed to turnover at AI (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIDR/PG – 48</td>
<td>7</td>
<td>4/7 = 57.1</td>
<td>11.0</td>
<td>12.0</td>
</tr>
<tr>
<td>CIDR/PG – 60</td>
<td>8</td>
<td>3/8 = 37.5</td>
<td>12.6</td>
<td>12.0</td>
</tr>
<tr>
<td>EB+ CIDR/PG – 48</td>
<td>8</td>
<td>8/8=100</td>
<td>10.3</td>
<td>-</td>
</tr>
<tr>
<td>EB+ CIDR/PG – 48</td>
<td>6</td>
<td>4/4=100</td>
<td>11.3</td>
<td>-</td>
</tr>
</tbody>
</table>

1The CIDR has yet to be approved for use as an estrous synchronization agent by the Food and Drug Administration (FDA) in the United States.

2The authors would like to thank InterAg, Hamilton New Zealand for donation of the CIDR and estradiol benzoate; Pharmacia Upjohn for donation of the Lutalyse and Merial limited for donation of the Cystorelin. The authors would also like to thank Dr. Bryan Reiling and his Cow-Calf Management class for their assistance in conducting this project.

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