Comparison of conception rate following CIDR ± post insemination treatment with CIDR in repeat breeder cows

A Reshma, C Veerapandian, T Sathiamoorthy, N Arunmozhi and S Vairamuthu

Abstract
The high incidence of Repeat breeding is one of the most common problems faced by the farmers and veterinarians in India and it causes huge economic loss to the farmers. A total of 90 repeat breeder cows that were either brought to the Teaching Veterinary Clinical Complex, Veterinary College and Research Institute, Tirunelveli, or to the infertility camps at nearby villages of Tirunelveli formed the experimental animals for the present study. The repeat breeder cows were randomly and equally assigned to one of the three groups, viz. control (Group I; n=30) CIDR (Group II; n=30) and CIDR + post AI CIDR (Group III; n=30). The pregnancy status was checked 60 to 90 days post insemination by rectal palpation. The conception rate following controlled breeding with CIDR (group II) was (P<0.05) higher at 43.33 percent than untreated cows (Group I), with CIDR and post insemination treatment with CIDR (group III) was the highest at 63.33 percent than group I & II. Hence, Controlled breeding using CIDR and PGF$_2\alpha$ in combination with post insemination CIDR therapy or alone could be used to improve the conception rate in repeat breeder cows under field conditions.

Keywords: Repeat breeder, Synchronization with CIDR, Post insemination CIDR, Conception rate

1. Introduction
In India, the most common causes of infertility or reduced fertility encountered in dairy cattle under field condition were anestrus and repeat breeding. Irrespective of the management system, repeat breeding in dairy cows remained a major cause of infertility; it led to major economic losses because of reproductive wastage, culling, replacement costs, and loss of genetic gain [1]. Among various factors associated with the occurrence of repeat breeding syndrome, asynchronous hormonal interplay was a major factor causing fertilization failure and early embryonic mortality [2]. The luteal insufficiency and lower progesterone concentration were known to be causing embryonic mortality and thereby lowering the pregnancy rates [3, 4]. Thus the main cause for repeat breeding could be attributed to hormonal asynchrony around estrus [5]. Therefore present study was undertaken in the field conditions to evaluate the efficacy of CIDR protocol with fixed time insemination in repeat breeder cows for their better conception.

2. Materials and Methods
The repeat breeder cows brought to the Teaching Veterinary Clinical Complex, Veterinary College and Research Institute, Tirunelveli and infertility camps at nearby villages of Tirunelveli were used. Ninety apparently healthy crossbred cows which failed to conceive in three or more consecutive inseminations with good quality semen and with Body Condition Score (BCS) of 2.5 to 3.5 were selected and randomly assigned to one of the three groups viz. control (Group I; n=30) CIDR (Group II; n=30) and CIDR + post AI CIDR (Group III; n=30). All the selected animals were observed for one complete estrous cycle before starting the experiment. The cows in control group were inseminated twice at 24 h interval at the observed estrus. In the CIDR group, each cow received an intravaginal insert of CIDR from day 10 to day 19 of observed estrus and an intramuscular injection of prostaglandin F$_2\alpha$ 500 µg on day 18. All the cows were inseminated at 48 and 72 h after removal of CIDR. In the CIDR + post AI CIDR group each cow received CIDR, PGF$_2\alpha$ and insemination similar to CIDR group cows and in
addition a second CIDR was inserted on day 5 post insemination and removed on day 13. Blood samples were collected on the day of CIDR insertion and 48 h after in 10 animals of CIDR group. The pregnancy verification was carried out in all the animals by rectal palpation after 60 to 90 days post insemination. All the collected data were analyzed statistically by the method described by Snedecor and Cochran (1989) [6]. Duration of estrus was analyzed using two way ANOVA. Conception rate, intensity of estrus, lactation number and post calving interval on conception rate were analyzed using chi-square test.

3. Results and Discussion

The conception rate in repeat breeder cows in untreated control group was 20 percent. The conception rate following controlled breeding with CIDR (group II) was significantly \( (P<0.05) \) higher at 43.33 percent than that of the control group (Table 1). The conception rate recorded following controlled breeding in this study was in accordance with the conception rates reported by various authors \([7, 8, 9, 10]\) following controlled breeding with CIDR. A higher conception rates following controlled breeding with CIDR ranging from 50 to 82.9 percent were reported in previous studies \([11, 12, 13, 14, 15]\). The significantly higher conception rate recorded in this study following controlled breeding in repeat breeder cows could be due to the impact of fine regulation of plasma progesterone profile during preconception period \([16]\) and priming of reproductive system with adequate amount of circulating progesterone during preconception period which was favourable for the better development of ovulatory follicles that would yield a better developed CL \([17]\).

The conception rate in repeat breeder cows following controlled breeding with CIDR and post insemination treatment with CIDR (group III) was the highest at 63.33 percent. This was significantly higher \( (P<0.01) \) than that of untreated control cows and higher \( (P>0.05) \) than that of group II (Table 1 and Figure 1). Progesterone concentration and embryo survival was increased after supplementing progesterone using CIDR from days 3 to 8 post AI \([18]\). Conception rate found improved from 66.1 in untreated to 74.6 percent following CIDR insertion from 4 to 9 days after first insemination in normal cows \([19]\). PRID administration on day 12 to 21 after insemination improved the conception rate slightly from 49 to 54 percent \([20]\). The higher conception in repeat breeder cows supplemented with progesterone post AI, might be due to improved uterine environment for embryo survival and development \([21]\).

Endometrial secretions, essential for stimulating and mediating the changes in conceptus growth and differentiation throughout early pregnancy was directed by the steroid environment generated by the ovary \([22]\). Progesterone supplementation at the time of postovulatory rise (between day 4 and 5) has resulted in consistent increase in pregnancy rate \([23]\).

3.1 Body Condition Score (BCS) and conception

The mean BCS was significantly \( (P<0.01) \) higher in cows that were conceived (2.96±0.06) than in those failed to conceive (2.68±0.06) (Table 2). The BCS of dairy cow is an assessment of the proportion of body fat and an important tool in dairy cattle management \([24]\).

3.2 Duration of estrus and conception

In the present study, the mean duration of estrus in repeat breeder cows was 16.6 h and in CIDR treated cows it was 27.49 and 28.34 h in group II and III respectively (Table 3). The mean duration of estrus recorded in untreated repeat breeder cows was within the normal range but slightly lower than the duration of 22.04 h recorded by \([25]\) Ahmed et al. (2016). The mean duration of estrus following controlled breeding was more or less similar to the mean duration of 24.6±5.2 h recorded by \([26]\) Sathiamoorthy and Kathirchelvan (2010) in postpartum cows following controlled breeding with CIDR for 9 days; There was no significant \( (P>0.05) \) difference in the duration of estrus between cows conceived and those failed to conceive.

3.3 Intensity of estrus and conception

The highest conception rates of 66.66, 61.53 and 73.68 percent were recorded among the cows which exhibited intense estrus in the groups I, II and III, respectively (Table 4, Figure 3.) In all the three groups, none of the cows which exhibited weak estrus are conceived. This was in concurrence with the previous reports, most of the CIDR treated cows showed intense estrus \([7]\) Sathiamoorthy and Kathirchelvan (2010) and 63.64 percent of cows having intense estrus after treatment with CIDR \([26]\).

3.4 Lactation number and conception

Overall the percentage of conception was 68.42, 58.33, 28.57 and 15.78 in first, second, third and fourth lactation cows, respectively (Table 5). Among the different groups, animals in first and second lactation had higher conception rates when compared to the cows in third and fourth lactation with a maximum of 85.71 percent in the first lactation in the group III and a minimum of 7.69 percent in the third lactation in the group I. There was a highly significant \( (P<0.01) \) difference between the lactations. The results of this study were corroborated by the reports of other authors, the conception rates declined as the lactation progressed in cows supplemented with progesterone \([27]\). The first and second lactation repeat breeder Holstein cows were 3.26 times more likely to become pregnant when supplemented with progesterone post insemination \([4]\). However, the lactation number did not affect the pregnancy rate in cows supplemented with progesterone post AI \([28]\).

3.5 Post calving interval and conception

The overall conception rates were 64.38, 41.37 and 24.24 percent in cows with an interval of <8, 8 to 16 and >16 months after calving to the AI done in this study, respectively (Figure 2.). In all the groups the highest conception rates were recorded among cows with <8 months post calving interval and the least conception rates were recorded in cows with post calving interval of >16 months. However, no significant influence of the interval after calving on conception rate found by Kale et al. (1988) \([29]\) and Haque et al. (2015) \([30]\). A longer time interval between calving to AI increased pregnancy rates in cows \([31, 32]\). This was in contrast to the present study, this might be explained by the fact that most cows with long calving to AI interval were dry and had minimum or no suckling resulting in higher pregnancy rate.
Fig 1: Conception rate in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR) and post insemination treatment with CIDR in comparison with untreated cows.

Fig 2: Influence of interval after calving on conception rate in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR) and post insemination treatment with CIDR.

Fig 3: Intensity of estrus in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR).

Table 1: Conception rate in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR) and post insemination treatment along with CIDR application.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of cows in group</th>
<th>Conceived number</th>
<th>Failed to conceive number</th>
<th>$\chi^2$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>30</td>
<td>6</td>
<td>24</td>
<td>3.774*</td>
</tr>
<tr>
<td>Controlled breeding with CIDR</td>
<td>30</td>
<td>13</td>
<td>17</td>
<td>56.66</td>
</tr>
<tr>
<td>Controlled breeding with CIDR + post AI CIDR</td>
<td>30</td>
<td>19</td>
<td>11</td>
<td>36.66</td>
</tr>
</tbody>
</table>

*a* significant at ($P < 0.05$); ** significant at ($P < 0.01$)

Table 2: Body Condition Score and conception in repeat breeder cows treated with Controlled Internal Drug Release (CIDR)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Body Condition Score (Mean ± SE)</th>
<th>Overall</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.91 ± 0.08</td>
<td>2.71 ± 0.05</td>
<td>5.387**</td>
</tr>
<tr>
<td>Controlled breeding with CIDR</td>
<td>3.00 ± 0.08</td>
<td>2.83 ± 0.06</td>
<td></td>
</tr>
<tr>
<td>Controlled breeding with CIDR + post AI CIDR</td>
<td>2.97 ± 0.04</td>
<td>2.86 ± 0.05</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>2.96 ± 0.06</td>
<td>2.8 ± 0.05</td>
<td></td>
</tr>
</tbody>
</table>

**significant at ($P<0.01$)

Table 3: Duration of estrus (hours) in repeat breeder cows during normal cycle and following controlled breeding with Controlled Internal Drug Release (CIDR) in relation to conception.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Duration of estrus (h) (Mean ± SE)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>17.83 ± 0.80 (b)</td>
<td>16.66 ± 0.45</td>
</tr>
<tr>
<td>Controlled breeding with CIDR</td>
<td>29.69 ± 0.55 (a)</td>
<td>27.49 ± 0.36</td>
</tr>
<tr>
<td>Controlled breeding with CIDR + post AI CIDR</td>
<td>31.31 ± 0.45 (a)</td>
<td>28.34 ± 0.37</td>
</tr>
</tbody>
</table>

Subclass means with different superscripts are significantly ($P<0.01$) different from each other within column.

Table 4: Conception rate in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR) and post insemination treatment with CIDR, in relation to intensity of estrus.

<table>
<thead>
<tr>
<th>Group</th>
<th>Conception rate % (n)</th>
<th>$\chi^2$ = 24.75** significant at ($P&lt;0.01$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>33.33 (2/13)</td>
<td></td>
</tr>
<tr>
<td>Controlled breeding with CIDR</td>
<td>38.46 (5/14)</td>
<td></td>
</tr>
<tr>
<td>Controlled breeding with CIDR + post AI CIDR</td>
<td>36.66 (4/7)</td>
<td></td>
</tr>
</tbody>
</table>

Subclass means with different superscripts are significantly ($P<0.01$) different from each other within column.
4. Conclusion
It could be concluded from the present study that controlled breeding using CIDR in combination with post insemination CIDR could be used to improve the conception rate in repeat breeder cows under field conditions.

5. Acknowledgment
The authors acknowledge The Dean, Veterinary College and Research Institute, Tirunelveli, Tamil Nadu, India for support of this study.

6. References
23. Mann GE, Fray MD, Lamming GE. Effects of time of progesterone supplementation on embryo development

### Table 5: Influence of number of calving on conception rate in repeat breeder cows following controlled breeding with Controlled Internal Drug Release (CIDR) and post insemination treatment with CIDR.

<table>
<thead>
<tr>
<th>Group</th>
<th>Lactation 1</th>
<th>Lactation 2</th>
<th>Lactation 3</th>
<th>Lactation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>40.00 (2/5)</td>
<td>33.33 (2/6)</td>
<td>7.69 (1/13)</td>
<td>16.66 (1/6)</td>
</tr>
<tr>
<td>Controlled breeding with CIDR</td>
<td>71.42 (5/7)</td>
<td>57.14 (4/7)</td>
<td>42.85 (3/7)</td>
<td>11.11 (1/9)</td>
</tr>
<tr>
<td>Controlled breeding with CIDR + post AI CIDR</td>
<td>85.71 (6/7)</td>
<td>72.72 (8/11)</td>
<td>50.00 (4/8)</td>
<td>25.00 (1/4)</td>
</tr>
<tr>
<td>Overall</td>
<td>68.42 (13/19)</td>
<td>58.33 (14/24)</td>
<td>28.57 (8/28)</td>
<td>15.78 (3/19)</td>
</tr>
</tbody>
</table>

χ²=11.66** significant at (P < 0.01)


