

COMPARATIVE STUDY OF THERAPIES IN REPEAT BREEDER DAIRY COWS FOR FERTILITY AUGMENTATION

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ABSTRACT

The study was designed to evaluate the effect of gonadotropin-releasing hormone (GnRH), human chorionic gonadotropin (hCG), Dextrose 5% and Control Internal Drug Release (CIDR) on conception rate in repeat breeding dairy cows. Repeat breeder cows aged 3-6 years (n=60), lactating and negative to white side test and negative to haemoprotozoan infections were randomly divided into six groups: Group 1 (CIDR 5-9 days Post AI intravaginally), Group 2 (CIDR 5-13 days Post AI intravaginally), Group 3 (GnRH at 20 µg IM), Group 4 (hCG at 1500 IU IM), Group 5 (Dextrose 5% IV) and Group 6 (Control). All the treatments were given on 5th day post-breeding in Group 1-4 and in Group 5 on day of AI. The conception rate on day 60 in Group 1, Group 2, Group 3, Group 4, Group 5 and Group 6 was 30, 60, 20, 70, 20 and 10%, respectively. Treating repeat breeder dairy cows with hCG is effective in increasing conception rate.

Keywords: CIDR, Gonadotropin-releasing hormone, Human chorionic gonadotropin, Repeat breeder

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In dairy sector, repeat breeding (RB) is a major cause of economic losses due to poor reproductive performance. GnRH injection causes a predictable release of a luteotrophic hormone and a significant increase in serum progesterone. GnRH on day 5th or 11th and day 11 to 14 after artificial insemination increased serum concentrations of progesterone and caused a tendency toward higher pregnancy rates (Willard *et al.*, 2003). Human chorionic gonadotropin (hCG) has a potent luteinizing hormone (LH)-like effect in cattle which extends the life span of the corpus luteum (CL) and increases progesterone synthesis, induces ovulation throughout the estrous cycle, promotes the formation of accessory corpora lutea when applied in the early luteal phase and modifies follicular wave dynamics increasing the frequency of three-wave dominant follicular cycles. Treatment with hCG or GnRH to induce ovulation of a first wave dominant follicle on day 5 of the estrous cycle successfully increased concentrations of progesterone during mid-luteal phase in lactating dairy cows (Kumar and Purohit, 2017). Dextrose monohydrate is sterile intravenous solution for fluid replenishment. Intravenous administration of Dextrose solution provides source of water and glucose giving cow fluid and energy. Also reduces the stress on dairy cows at the time of AI.

Hormonal therapies on day 5 post insemination increase the plasma progesterone concentration and conception rates in repeat breeding dairy cattle with hCG treatment being the best (Kumar and Purohit, 2017). Additional approach for improvement of embryonic survival life in repeat breeder dairy animals is direct application of progesterone. Progesterone Releasing Intravaginal Devices (PRID), Controlled Internal Drug

Release (CIDR) and progesterone base ear implants are commercially available (Shams-Esfanabadi and Shirazi, 2006). These are several strategies have been used to increase progesterone concentration after breeding for improved embryo survival.

Despite the embryotrophic effects of increased progesterone concentrations, administration of P4 during met-estrus or early diestrus may compromise the CL development, as P4 acts by inhibiting LH secretion and, consequently, luteal cell differentiation. In addition, early P4 supplementation (1-3 Days post-oestrus) may lead to earlier luteolysis and result in shortened estrous cycles in cattle (O'Hara *et al.*, 2014).

MATERIAL AND METHOD

The study was conducted on 60 repeat breeder dairy cows aged 3-6 years at individual owner place, private dairy farm near and around Nagpur Tehsil from December 2017 to May 2018. All animals were thoroughly examined per-rectally to rule out any anatomical defect of genitalia and ovarian abnormalities. Cows included in the study were in lactation phase having lactation yield between 2000 and 2500 litres, negative to white side test, negative to haemoprotozoan infection and had more than three unsuccessful inseminations within the current lactation.

Cows were inseminated at normal estrus with AM-PM rule. The selected dairy animals were randomly divided into six groups (each group containing 10 animals): Group 1 (CIDR 5-9 days Post AI intravaginally), Group 2 (CIDR 5-13 days Post AI intravaginally), Group 3 (GnRH at 20 µg IM), Group 4 (hCG at 1500 IU IM), Group 5 (Dextrose 5% intravenous 2 Liters) and Group 6 (Control). The treatments

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were given on 5th day post breeding in Group 1-4 and in Group 5 on day of AI.

RESULTS AND DISCUSSION

In Group-I, CIDR @ 1.38 gm intra vaginal device was inserted on 5th day of post AI and removed on 9th day. Out of 10 animals, 03 (30.00 %) were pregnant while in control group 01 cows (10.00 %) was found to be pregnant (Table 1). Therapy of progesterone supplementation initiated at the time of between days 4 and 5 i.e. on onset of the postovulatory rise has proved beneficial than used later to increases in pregnancy rate (Mann and Lamming, 2001). The degree of embryo development and interferon-tau secretion is also associated with both the timing of the postovulatory progesterone rise and the concentration to which progesterone rises. Supplementation of progesterone is beneficial in cows of lower fertility below 45% but not in cows with higher fertility. Benefit of progesterone supplementation on fertility of cows required exogenous progesterone supplementation to start between Day 3 to 7 and the appropriate reproductive status like lower fertility, natural estrus of the treated cows (Yan *et al.*, 2016). Use of PRID post AI not improves pregnancy rates, despite the fact that serum progesterone concentrations were higher in treatment groups with higher level of serum progesterone (Ergene, 2011).

In Group-II the animals were treated with CIDR @ 1.38 gm intra vaginal device on 5th day of post AI and removed on 13th day (Table 1). Out of 10 animals, 06 (60.00%) were pregnant. These results are comparable with Khoramian *et al.* (2012) and Mehni *et al.* (2012) recorded as 56.00% pregnancy rate in repeat-breeder dairy cows. Use of PRID or CIDR in repeat breeder cows between days 4-11 after AI and resulted as lower pregnancy rate (Mellado *et al.*, 2012), which results are lowest than the present study. The lowest results might be due to high milk yields, change in feeding pattern, lactational length, altered temperature and humidity. In development of early embryo, progesterone plays a very critical role whereas Kendall *et al.* (2009) who reported the incidence and treatment of inadequate postovulatory progesterone concentrations in repeat breeder cows and noted that treatment with an intravaginal progesterone device for 7 days starting from day 5 or 6 did not improve pregnancy rate.

In Group-III, the animals were administered with injection GnRH @ 20 µg IM on 5th day of post AI. Out of 10 dairy cows, 02 cows (20.00%) were pregnant (Table 1). Similar findings were recorded by Prabakaran *et al.* (2009) when treated with the 10 µg of Buserelin Acetate IM on 5th day of post insemination and conception rate reported as 23.07%. Dirandeh *et al.* (2014) injected GnRH on day 6 after insemination on fertility of dairy cows during warm season and noted as 22.00% conception rate. More *et al.* (2012) who mentioned conception rate as 62.50% in Deoni

cows by administered inj. GnRH @ 10 mcg on 5th day of artificial insemination. Higher conception rate by use of GnRH on 5th day, it might be due to maintaining the pregnancy and formation of accessory corpus luteum (Pandey *et al.*, 2016).

In Group IV, dairy cows were treated with hCG @1500 IU intramuscular on 5th day of post AI. Out of 10 animals, 07 cows (70.00%) were pregnant (Table 1). These findings are similar with Pandey *et al.* (2016). Funston *et al.* (2005) evaluated effect of administration of hCG after artificial insemination on concentrations of progesterone and recorded conception rates as 62% in beef heifers. Use of Human chorionic gonadotropin as activity similar to LH, and after binding to LH receptors, causes small luteal cells to increase progesterone synthesis. The effect of post-AI hCG treatment on 4th day of oestrus cycle on embryonic mortality in dairy cattle reported conception rate of 42% (Tefera *et al.*, 2001). The effect of hCG administration five days after insemination on the first service conception rate of anestrous dairy cows and found no difference in first service conception rates (46.3%) between the control (Hanlon *et al.*, 2005). Use of 3,300 IU of hCG (Chorulon) once between 4 and 9 days after AI reported conception rate 33.6%. This might be due to the failure of formation of accessory CL and due to insufficiency of LH (Stevenson *et al.*, 2007). The hCG has a longer half-life and produces a direct effect on the ovary, hCG instead of GnRH should be considered in fixed timed artificial insemination protocols targeted at subfertile cows (De Rensis *et al.*, 2010).

In Group V, repeat breeder dairy cows were treated with Intravenous Dextrose 5% on day of AI. Out of 10 animals, 02 cows (20.00 %) were pregnant (Table 1). On scanning of literature, none of literature is available on use of Intravenous Dextrose 5% on day of AI. However, the present study supported by Hunter (1977) who mentioned the conception rate in cows at mating period can be improved the by raising the blood glucose and phosphorus level. reported that the effects of glucose infusion on serum concentrations of insulin and progesterone in non lactating dairy cows were dependent on cow nutritional status Vieira *et al.* (2010). Furthermore, Machado *et al.* (2014) reported that with the use of intrauterine infusion of 200 mL of 50% dextrose solution as a treatment for clinical endometritis (CE) had a strong statistical tendency to decrease CE cure rate, did not improve first-service conception rate and early embryonic mortality, and did not decrease calving-to-conception interval.

CONCLUSION

Injection hCG 1500 IU on day 5th of AI considered as best treatment in noninfectious repeat breeder dairy cows. Direct progesterone supplementation for a short period not improve conception rate while for a long period

Table 1. The conception rates in Dairy Cows by USG on day 45th after AI

Groups	Treatment	No of cow inseminated	No of Cows conceived	Conception rate (%)
Group-I	CIDR @ 1.38 gm intravaginal device on 5 th day of post AI and removed on 9 th day	10	3	30
Group- II	CIDR @ 1.38 gm intravaginal device on 5 th day of post AI and removed on 13 th day	10	6	60
Group-III	Inj. GnRH @ 20 µg intramuscularly on 5 th day of post AI	10	2	20
Group-IV	Inj. hCG @ 1500 IU intramuscularly on 5 th day of post AI	10	7	70
Group-V	Intravenous Dextrose 5% (2 liters) on day of AI	10	2	20
Group-VI	Control	10	1	10
Total		60	21	35%

comparatively improve conception rate. However, intravenous Dextrose 5% on the day AI and Inj. GnRH on day 5th of AI were not improves the conception rate.

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