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Effect of oxytocin and prostaglandins on conception rate at the time of artificial insemination of repeat breeder cows during estrus synchronization

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Abstract

A double PGF_{2α} injection protocol alone or along with oxytocin or PGF_{2α} at the time of artificial insemination also did not significantly enhance the fertility of repeat breeder cows.

Keywords: PGF_{2α}, oxytocin, artificial insemination, repeat breeder cows

Introduction

Repeat breeding (RB), defined as cows failure to conceive from 3 or more regularly spaced services in the absence of detectable abnormalities, is a costly problem for the dairy producer [1]. Repeat breeding is one of the major reproductive problem affecting reproductive efficiency and economy of milk production in cross bred dairy cows. Early embryonic mortality and fertilization failure are two major causes for repeat breeding syndrome in cows [2]. The suggested maternal factors involved in repeat breeding syndrome in cow include the maternal age [3], genetic factor [4], uterine infection [5], hormonal dysfunctions [6], inadequate follicular growth [7] and inadequate nutrition [8]. The bull factors suggested as a possible cause of repeat breeding syndrome include bull fertility and semen quality [9]. The environmental and management factors influencing repeat breeding syndrome include the lactational stress, size of the livestock, milk yield or calving season [10]. Other managerial factors correlated to the incidence of repeat breeding syndrome include calving difficulty [11], estrus detection [6], hygiene at artificial insemination and parturition [12], improper site of deposition of semen in the female genital tract [13], time of deposition [14] and heat stress [15].

Prostaglandin F_{2α} (PGF_{2α}) and its analogues are widely used as a luteolytic agent for the treatment of uterine conditions in dairy cattle reproduction. Consequently, a double protocol in which PGF_{2α} given at a 7, 11 or 14 d interval was developed so that cows at a stage in the estrous cycle other than diestrus would have a functional corpus luteum when they received the second PGF_{2α} dose [16, 17]. Following the second injection of PGF_{2α}, the animals were inseminated either during detected estrus [18] or at a fixed time which is usually between 72 to 80 h [19]. The fixed time artificial insemination was generally carried out between 72 to 80 h as most animals treated were likely to have a synchronized estrus. The use of endogenous PGF_{2α} have been shown as an essential part of ovulation process [20], known to increase of uterine and oviductal contractility [21] which affects the sperm transport. There are few studies focused on the effect of PGF_{2α} administration at the time of AI on pregnancy rate [22, 20].

Oxytocin is used to increase conception rate by improving the sperm transport in the female reproductive tract of several species [23, 24]. Clitoral massage which probably releases oxytocin following artificial insemination increased pregnancy in beef cows but not in beef heifers or dairy cows [25]. But in another study, it had hardly any effect on pregnancy in cows [26].

Materials and Methods

This study was conducted on dairy cows maintained by the farmers in and around Shivamogga, Karnataka. The repeat breeder cows with body condition score of 2.5 to 3.5, maintained on scientifically balanced ration were selected for the trail.

Twelve repeat breeding cows were randomly subjected to double PGF_{2α} protocol using PGF_{2α}-PGF_{2α} injection regimen with intramuscular injection of 25 mg Dinoprost tromethamine (day1), 25 mg of Dinoprost tromethamine (day11) and timed artificial insemination after 80 h (day14) were attempted.

Twelve repeat breeding cows in addition to double PGF_{2α} protocol received a single intramuscular injection of 50 units oxytocin prior to artificial insemination, which was carried out 80 h after second injection of PGF_{2α}.

Twelve repeat breeding cows in addition to double PGF_{2α} protocol received an intrauterine infusion of 0.5 mg Dinoprost tromethamine diluted with 0.5 ml of sterile physiological saline immediately after artificial insemination which was carried out 80 h after second injection of PGF_{2α}.

The data generated in the present study were subjected to one way ANOVA and Chi square test to determine the efficacy of various treatment protocols used for the enhancement of conception rate in repeat breeding cows as per the procedure described by [27].

***Oxytocin Injection (Syntocinon®):** Each 1ml solution contains 10 international unit Oxytocin or 10 USP oxytocin. Presentation- 5 IU/ml, Novartis®.

****Dinoprost Tromethamine injection (Lutalyse®):** Each ml contains Dinoprost Tromethamine equivalent to 5 mg Dinoprost -5 mg / ml, 10 ml vials. Pfizer Animal health India Limited.

Results and Discussion

The double PGF_{2α} injection regimen with fixed time artificial insemination in repeat breeding cows did not significantly improve the conception rate as compared to animals which did not receive any treatment (41.66 % vs. 33.33 %) (Table 1; $P>0.05$). Several researcher have similarly reported that the conception rate following insemination during PGF_{2α} induced

estrus in repeat breeding cows did not enhance the fertility of the treated animals [28, 29, 30].

Timed insemination with double PGF_{2α} as followed in the present study has also been reported to consistently yield the conception rate lower than with breeding after estrus detection [31, 32, 33]. Differences in follicular development at the time of CL regression following PGF_{2α} therapy has been stated to result in varying times to estrus and ovulation [34], possibly contributing to a lower conception rate due to asynchrony between the time of AI and ovulation.

The conception rate was recorded as 33.33 and 41.66 per cent respectively for animals receiving oxytocin and intrauterine PGF_{2α} infusion during double PGF_{2α} induced estrus (Table 1). The conception rate recorded was not significant to the control group (Table 1; $P>0.05$).

The results of the present study clearly demonstrated that administration of uterotonic drugs during PGF_{2α} induced estrus did not significantly improve the conception rate of repeat breeding cows. They also showed that PGF_{2α} administered at the time of fixed timed insemination had no effect on conception rate in cows with acceptable reproductive performance [22].

This result may also suggest that suboptimal uterine and tubal contraction which delays the transport of spermatozoa may not be a significant cause of repeat breeding syndrome. The observations found that repeated insemination during spontaneous estrus of repeat breeding cows improves conception rate suggesting that the low conception rate in a significant number of repeat breeding cows may be associated by an asynchrony of the time of artificial insemination in relation to the time of ovulation.

Table 1: Conception rate in estrus synchronized repeat breeder cows

Treatment protocol	No. of RBCs treated	No. of RBCs conceived	Conception rate (%)
Double PGF _{2α} regimen + FTAI	12	5	41.66 ^a
Double PGF _{2α} regimen + (oxytocin I.M + FTAI)	12	4	33.33 ^a
Double PGF _{2α} regimen + (PGF _{2α} I.U + FTAI)	12	5	41.66 ^a
Spontaneous estrus	12	4	33.33 ^a

I.M: Intramuscular; I.U: Intrauterine; RBS: repeat breeding cows

*Conception rates bearing same superscripts are statistically did not different ($P<0.05$)

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