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Effects of Supplementation of Repeat-Breeder Dairy Cows with CIDR from 5-19 Post-Insemination on Pregnancy Rate

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Abstract: Early embryonic mortality, indicated by cows returning to estrus before 24 day after insemination, and late embryonic mortality with cows returning to estrus after 24 days post insemination, contributes to repeat-breeding in dairy cows. The objective of this study was to evaluation the effect of post-insemination supplementation with CIDR (controlled internal drug release) for 14 days on pregnancy rate in repeat-breeders dairy cows. On day 5 after insemination, treated cows (n = 60) received a CIDR, which was removed on Day 19. Control cows (n = 54) did not receive any treatment. The study population was stratified by parity, days in milk and yield of milk production. Pregnancy rate between CIDR treated and control cows were 46.6 and 37%, respectively. There was no significant differences between two groups $p<0.05$.

Key words: CIDR, repeat-breeder, post-insemination, cow

INTRODUCTION

In cycling cows, several studies have shown that cows which have lower progesterone concentration during the subsequent diestrous have a lower conception rate. These findings have lead to the investigation of the effects of supplementing diestrous progesterone levels after insemination. Such studies have produced conflicting results, with some reporting no effects on conception rate and others reporting an increase in conception rate (Hanlon *et al*., 2005a; Lamming *et al*., 1989; Mann *et al*., 1999).

One approach to improving embryonic survival in cattle has been the direct supplementation with progesterone. There are several progesterone preparations commercially available such as Repositol, Progesterone Releasing Intravaginal Devices (PRID), Controlled Internal Drug Release (CIDR) devices and Synchro-Mate B ear implants. Progesterone treatment seems to increase fertility in herd with low fertility (Robinson *et al*., 1989; Van Cleef *et al*., 1991).

Cows that do not become pregnant by the third breeding are commonly referred to as repeat-breeder cows. Several factors have been identified as causes of repeat-breeders, including estrus detection errors, inflammation or anatomical impediments in the female reproductive tract and embryonic mortality (Barr, 1975; Pursley *et al*., 1998; Villarroel *et al*., 2004; Wiltbank *et al*., 1955).

In the cow embryonic period of gestation extends from conception to the end of the differentiation stage (about 42 days) and the fetal periods from day 42 to parturition. The role of progesterone in embryonic loss in the early stages, between the first and third week, has been extensively explored (Ball, 1997; Lopez-Gatius *et al*., 2004; Vanroose *et al*., 2000).

Low systemic progesterone concentrations on day 5 post-ovulation or delay in normal rise in progesterone between days 4 and 5 post-ovulation have been associated with reduced pregnancy rates (Larson *et al*., 1997; Shelton *et al*., 1990; Strong *et al*., 2005).

Cases of embryonic mortality have been exhaustively reviewed by Ayalon (1978) and include lethal genotypes, infectious disease, nutritional deficiencies and luteal insufficiency. The corpus luteum, which produces significant concentration of circulating progesterone by approximately 4 days post-insemination, has an essential role in maintaining pregnancy (Villarroel *et al*., 2004).

On the basis of positive association between early post-insemination progesterone supplementation and the maintenance of pregnancy, we hypothesized that sub-optimal progesterone concentrations during the late embryo and early fetal period may act to compromise conceptus development in repeat-breeder cows and supporting the pregnancy up to the time of maternal recognition, by CIDR might increase pregnancy rate in repeat-breeder cows.

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The aim of the present study was to evaluate the effect of the post-insemination supplementation with CIDR on pregnancy rate in repeat-breeder Holstein cows.

MATERIALS AND METHODS

This study was conducted in a large commercial dairy herd, 600 Holstein in milk, located in suburbs of Esfahan province during a period from April to June 2005. Cows included in the study were in their first to fifth lactation, and had three to six unsuccessful inseminations within the current lactation (repeat-breeders). Cows were milked three times a day at 0600, 1400 and 2100. Milk yield per cow was recorded monthly. The rolling, 305 day herd average of the farm was 9000 kg of milk. The animals were kept in a free stall barn with concrete floor. Cows were inseminated at estrous by on farm technician prior to group allocation. Cows entered the study on day 5 After Insemination (AI), matched by parity, production and days in milk and then were alternately assigned to control (n = 54) and treatment (n = 60) groups. Treatment group cows received a progesterone releasing device (CIDR: Controlled internal drug release, 1.9 g progesterone; Inter Ag, Hamilton NZ). This device is designed to allow for sustained release of progesterone. The CIDRs were removed on Day 19 of the cycle, 14 days after insemination. Cattle in the control group received no treatment. Cows that were detected in estrous after day 18 were reinseminated and recorded as non pregnant (open) to the prior AI. The uterus of cow not observed in estrous was palpated per rectum 45-50 days after insemination to determine pregnancy status. The differences in pregnancy proportion between CIDR-treated cows and control cows were analyzed by using Chi-Square method.

RESULTS

The results of this study were shown in Table 1. In total 114 cows entered in the study. Of 60 cows in the CIDR-treated group, 28 cows and of 54 cows in the control group, 20 cows were pregnant at rectal examination. Unstratified analysis showed no effect of CIDR supplementation on pregnancy proportions ($p<0.05$). The effect of progesterone supplementation on pregnancy outcome was statistically indifferent among lactations, days in milk and productions.

DISCUSSION

The objective of this study was to determine whether supplemental progesterone would increase the proportion of inseminated repeats-breeder cows diagnosed pregnant at 45-50 days after insemination. Any treatment which delays regression of the corpus luteum may allow conceptus additional time to develop prevent the secretions of PGF2α (Villarroel *et al*., 2004).

However, while some studies have shown a positive association between progesterone and embryo survival rate in cattle (Ahmad *et al*., 1996), others have not recorded any such association (Ayalon, 1978; Linares, 1981).

The treatment of repeat-breeder cows with CIDR from 5-19 days after insemination did not improved their conception rate. The results of this study are in agreement with the findings of Villarroel *et al*. (2004). Who treated repeat-breeder cows with PRID(progesterone releasing intravaginal device). That study showed that in overall PRID had no effect on proportion of pregnancy in repeat-breeder cows. Days in milk (days post partum), milk production, and parity did not affect pregnancy rate in two groups. These results are agreement with the findings of Starbuck *et al*. (2004), who evaluated factor affecting retention of early pregnancy in dairy cattle. In similar study, no improvement in first service conception rate was obtained in anovulatory anestrous dairy cows when PRID were used to supplement diestrous P4 concentration for 7 day, starting 5 day after insemination (Hanlon *et al*., 2005b).

The results of this study are in contrast to the findings of other studies that have shown improvement in conception rate when CIDR or PRID is used after

Table 1: Distribution of cows by studying variables and outcome (n = 114), for evaluation of the effect of progesterone supplementation in repeat-breeder Holstein cows after insemination

		Cows			
		CIDR group (n = 60)		Control group (n = 54)	
Variable	Level	No. of pregnant (%)	No. of open (%)	No. of pregnant (%)	No. of open (%)
Parity	1	6(75)	2(25)	13(65)	7(35)
	2	14(44)	18(56)	10(37)	17(63)
	3+	8(40)	12(60)	3(43)	4(57)
Milk production (kg)	<29	4(29)	10(71)	7(29)	17(71)
	29-35	12(37)	20(63)	9(47)	10(53)
	>35	8(57)	6(43)	7(64)	4(36)
Days in milk	110-155	10(36)	18(64)	6(26)	17(74)
	156-190	14(64)	8(36)	10(53)	9(47)
	191-300	4(40)	6(60)	5(41)	7(59)
Total No. of cows	60	28(46.6)	32(53.6)	20(37)	34(63)

insemination in cows (Rensis, 1999; Robinson *et al*., 1989). Insertion of an intravaginal progesterone device (CIDR-B) 6-8 days but not after mid-cycle post-insemination increased pregnancy rate to first insemination (Bartolome *et al*., 2005; Macmillan *et al*., 1993). In this study in which a CIDR containing progesterone was inserted for 6 or 12 days starting on days 5 to 7, a significantly higher pregnancy rate was achieved than in untreated cattle (Macmillan *et al*., 1991). It is accepted that progesterone plays a major role in controlling the maternal secretion of nutrients, growth factor and immunosuppressive agents required for successful embryo/fetal development and pregnancy recognition (Ford, 1985; Lopez-Gatius *et al*., 2004; Spencer *et al*., 2002).

Based on the results of Strong *et al*. (2005), that showing that low and high concentration of progesterone were both associated with a low embryo survival rate, it is not surprising that many of studies failed to detect significant differences in pregnancy rate between treatment and control groups. Clearly if progesterone supplementation was to be effectively used to increase embryo survival, it would have to be in a targeted fashion rather than blanket treatment of all cows (Mann *et al*., 1999; Strong *et al*., 2005).

In conclusion further study is needed to determine the role of post-insemination progesterone supplementation on conception rates in repeat-breeder cows.

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