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Evaluation of the Effect of GnRH Administration Within 3 h After Onset of Estrous on Conception Rate in Dairy Cows

[1]N. Shams-Esfandabadi, [1]A. Shirazi and [2]M. Bonyadian
[1]Department of Clinical Sciences, [2]Department of Food Quality Control and Epidemiology,
Faculty of Veterinary Medicine, Shahrekord University, P.O. Box 115, Sharekord, Iran

Abstract: Various hormonal treatments have been used in attempts to improve pregnancy rate. In cattle GnRH or GnRH agonists were used at first or later AI and at times ranging from 6 h before to 5, 6, 11, 14, or 15 days after AI. The objective of this study was to evaluation the effect of administration of GnRH within 3 h after estrous observation on conception rate in dairy cows. Within 3 h after standing estrous cows in treatment group (n = 42) received an i.m. injection 5 mL of GnRH (gonadorelin, Aburaihan, Iran, Each mL contains: 5 μg luliberin A). Controls cows (n = 42) did not received any treatment. The study population was stratified by parity, milk yield production, days in milk and number of AI. Pregnancy rate between GnRH treated and control cows were 28.57 and 38.09%, respectively. There was no significant differences between two groups ($p<0.05$).

Key words: GnRH, estrous, conception rate, cows

INTRODUCTION

Reproductive efficiency in dairy cattle has declined over the last several years and in considerably lower than desired (Lucy, 2001; Washburn *et al*., 2002; De Vries and Risco, 2005; Howard *et al*., 2005). Decreased reproductive efficience is due to many factors (Hermans *et al*., 1987; Nebel and Jobst, 1998; Bulter, 2000; Lucy, 2001). One of these factors that contributing to low pregnancy rates is embryonic loss (Lamming *et al*., 1989; Chebel *et al*., 2004; Santos *et al*., 2004). Although fertilization rate in cattle are reported to be greater than 90% (Diskin and Sreenan, 1980), the majority of embryonic mortality (70-80% of the total loss) occurs between day 8 and 16 after insemination (Sreenan *et al*., 2000). Maintenance of pregnancy, in part, is dependent on secretion of progesterone during early pregnancy. Luteal deficiency during the first 3 weeks of pregnancy has been hypothesized as a cause of pregnancy failure (Henricks *et al*., 1970; Bulter *et al*., 1996; Mann and Lamming, 2001; Santos *et al*., 2004). Many factor including nutrition (Gombes and Hansel, 1973), heat stress (Wilson *et al*., 1998; Wolfenson *et al*., 2002), genetics (Lucy, 2001) and rate of steroid metabolism in high producing cows (Wiltbank *et al*., 2000; Sartori *et al*., 2002), have an impact on progesterone level during early pregnancy. Regardless of the cause of low progesterone during early embryonic development, it appears that a suboptimal progesterone level may contribute to low fertility in dairy cows (Howard *et al*., 2005). The administration of GnRH during the estrous cycle results in LH release (Chenault, 1990) and can cause ovulation or luteinization of large follicles present in the ovary, synchronize the recruitment of a new follicular wave (Thatcher *et al*., 1989) and synchronize follicle development waves (Wolfenson *et al*., 1994). Further, there is no apparent detrimental effect of GnRH on the responsiveness of GnRH-induced corpora lutea or spontaneous corpora lutea to prostaglandin (Twagiramungu *et al*., 1995). These benefits explain the extensive use of GnRH for both ovulation synchronization protocols and the treatment of ovarian disorders (Yaniz *et al*., 2004; Lopez-Gatius *et al*., 2006).

GnRH have been used extensively as treatment at or near insemination, on the assumption that such treatment might improve luteal function early in the estrus cycle and thus avoid some of the early embryonic mortality (during the first 7 to 8 days), or losses that might be associated with misiming of embryonic development in relation to maternal recognition of pregnancy (Chenault, 1990).

Improvement of conception fallowing GnRH treatment during estrous has been attributed to the prevention of ovulation failure or to reduced variation in the interval to ovulation (Coulson *et al*., 1980; Nakao *et al*., 1984; Kaim *et al*., 2003). It has also been

Corresponding Author: N. Shams-Esfandabadi, Department of clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, P.O. Box 115, Sharekord, Iran Tel/Fax: +98 381 4424427

suggested that GnRH-induced increase in progesterone concentration during the subsequent estrous cycle may have an effect on conception rate; this was found in some studies (Lee *et al*., 1985; Mee *et al*., 1993; Ullah *et al*., 1996) but not in others (Lucy and Stevenson, 1986; Ryan *et al*., 1994).

The effect of increasing endogenous progesterone, using luteotropic hormones, on pregnancy rate has also been inconsistent. However, the research on the effect of GnRh at or near estrous, on fertility is limited and the results have been inconsistent.

The objective of this study was to determine the effect of administration of exogenous GnRH within 3 h after onset of estrous on conception rate in lactating dairy cows.

MATERIALS AND METHODS

The study was carried out in a large commercial dairy herd, 600 Holstein in milk, located in suburbs of Esfahan province during a period from February to Marc 2006. 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 parity of cows in this herd ranged between one and seven. The animals were kept in a free stall barn with concrete floor. The cows, on the basis of their milk yield production, were fed a total mixed ration. The herd was under veterinary health care throughout the year. All cows were routinely checked and treated for health disorders, 4 week after calving. Two person observed animals 24 h per day, for estrous detection, with an emphasis on two time of each day, at evening (just before dusk) and at morning (just after sun rise). Within 3 h following the manifestation of the first sings of standing estrous, cows in treatment group (n = 42) received an i.m. injection of 5 mL of GnRH (gonadorelin, Aburaihan, Iran, Each mL contains: 5 μg luliberin A). The doses of GnRH used in this study were the doses recommended by the above-mentioned company for improvement of fertility. Cows in control group (n = 42) received no treatment. Cows were inseminated at estrous by on farm technician. Animals were alternately assigned to control and treatment groups. Cows entered the study matched by parity, milk yield production, days in milk and number of AI. Cows that were detected in estrous after day 18 were reinseminated and recorded as non pregnant (open) to the prior AI. The uteri of cows not observed in estrus were palpated per rectum 45-50 days after insemination to determine pregnancy status. The differences in pregnancy proportion between treated and control cows were analyzed by using Chi-Square and Fisher tests.

RESULTS

The results of this study were shown in Table 1. In total 84 cows entered in study. Of 42 cows in treatment group, 12 cows and of 42 cows in control group 16 cows were pregnant at rectal examination. Unstratified analysis showed no effect of GnRH administered within 3 h after onset of estrous on pregnancy proportion ($p<0.05$). The effect of this treatment on pregnancy outcome was statistically indifferent among lactation, milk yield production, days in milk and number of AI.

Table 1: The effect of GnRH administered to cows within 3 h after onset of estrus on conception rate, matched by parity, milk yield production, days in milk and No. of AI

		Cows (n = 84)			
		Control (n = 42)		Treatment (n = 42)	
Variable	Level	No. of pregnant (%)	No. of open (%)	No. of pregnant (%)	No. of open (%)
	1	4 (40)	6 (60)	5 (41.66)	7 (58.33)
Parity	2	5 (31.25)	11 (68.75)	4 (33.33)	8 (66.66)
	3+	7 (43.75)	9 (56.25)	3 (16.66)	15 (83.33)
	<34	5 (38.46)	8 (61.53)	3 (21.42)	11 (78.57)
Milk yield (kg)	34-42	4 (36.36)	7 (63.63)	8 (44.44)	10 (55.55)
	>42	7 (38.88)	11 (61.11)	1 (10)	9 (90)
	<80	6 (37.5)	10 (62.5)	6 (42.85)	8 (57.14)
Days in milk	80-160	6 (35.29)	11 (64.7)	4 (21.05)	15 (78.94)
	>160	4 (44.44)	5 (55.55)	2 (22.22)	7 (77.77)
	1	6 (40)	9 (60)	4 (28.57)	10 (71.42)
No. of AI	2-3	6 (35.29)	11 (64.7)	5 (31.25)	11 (68.75)
	3+	4 (40)	6 (60)	3 (25)	9 (75)
Total No. of cows	84	16 (38.09)	26 (61.90)	12 (28.57)	30 (71.42)

DISCUSSION

The objective of this study was to determine whether administration of GnRH within 3 h after onset of estrous would increase the proportion of inseminated cows diagnosed pregnant at 45-50 days after insemination.

The results of this study showed that the treatment of dairy cows with GnRH 3 h after onset of estrous did not improved their conception rate. The results of this study are in agreement with the finding of Lewis *et al*. (1990) and Chenault (1990). Based upon the data presented and reviewed by them, one can not conclude that this treatment is routinely valuable. Mee *et al*. (1990) reported that GnRH administered early in estrous had no effect on conception rate of dairy cows. The results of this study are contrast to the finding of Kaim *et al*. (2003). Their study showed that, treatment with GnRH increased conception in primiparous cows, during summer, in cows with lower body condition. In a study, GnRH administered at detection of estrous increased conception in dairy cows in the summer, when conception rate was very low (Ullah *et al*., 1996).

When cows and heifers were treated with GnRH at first or later AI at times ranging from 6 h to 6 day after AI, the differences in pregnancy rates in treated and in control cattle ranged from -10 to +25 percentage point (Lewis *et al*., 1990). In the present study the differences in pregnancy rate between treated and control groups were 4 percentage point. A major determining factor for conception rate in the cow herd is postpartum interval at breeding (days in milk), other factor have been addressed, most recently by Chebel *et al*. (2004). These factors include heat stress, number of the insemination, milk production, incidences of calving difficulty, retained placenta, mastitis, post parturient disease, method of synchronization of estrous and timing of insemination. In the present study, days in milk, No. of the insemination, milk production and parity did not affect the pregnancy rate in two groups. These results are agreement with the findings of Chebel *et al*. (2004).

Several authors have found that premature ovulation of follicles led to reduced ability of fertilized, cleaved oocytes to develop to the blastocyst stage, as well as delayed or inadequate luteal function or premature luteal regression (Inskeep, 2002). Smaller follicular diameter has been shown to affect conception rate in several study (Perry *et al*., 2002, 2003). Concentrations of progesterone rose at a slower rate in cows with smaller follicles at induced ovulation than in cows with larger follicles. Thus embryos might have been expected to be less advanced (Garrett *et al*., 1988) and to produce less interferon tau (Kerbler *et al*., 1997; Mann *et al*., 1999). In the cows that ovulated small follicles. Day (2003) arrayed data from studies of effects of follicular diameter, according to the duration of proestrus. As mean duration of proestrus increased, conception rate increased. Thus follicular maturity may be the important variable and diameter may not reflect maturity as effectively as duration of proestrus. In addition, luteal function was lower on days 8 through 14 in cows with normal luteal life span, when proestrus was shortened by earlier preovulatory treatment with GnRH.

Overall, one must conclude that fertility can be compromised by either immature or over mature follicles/oocytes. The follicles/oocytes ovulated at natural estrous; appear to be of more optimum age and size than those ovulations are induced prematurely with GnRH.

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