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Reproductive Performance and Synchronization of Estrus in Brown Swiss and Holstein Cows and Heifers Using $PGF_{2\alpha}$

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Abstract: The objective was to compare the reproductive performances of Brown Swiss and Holstein cows and heifers synchronized for estrus using prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$). Primiparous and multiparous cows (45 to 75 days postpartum; Holstein n = 17, Brown Swiss n=36) and nulliparous heifers (22 to 24 months; Holstein n = 7, Brown Swiss n=12) were injected $PGF_{2\alpha}$ given 11 days apart. Artificial insemination (AI) was carried out 12 h after estrus was detected following the first $PGF_{2\alpha}$ injection while timed artificial insemination (TAI) was done 72h after second $PGF_{2\alpha}$injection without detecting estrus. The estrus rate at first injection was not different between two breeds. However, the estrus detection rate was relatively greater for Brown Swiss (61.1%) than for Holstein (50.8%). Conception rates followed first $PGF_{2\alpha}$injection were found higher in Holstein (51.6%) than Brown Swiss (14%). Conception rate in TAI was found low in both breeds (Holstein: 7%; Brown Swiss: 10%). In conclusion, TAI 72h after second $PGF_{2\alpha}$ injection was not effective management of AI in cows and heifers without estrus detection.

Key words: $PGF_{2\alpha}$, TAI, Holstein, Brown Swiss

Introduction

Estrus synchronization has become a routine reproductive management tool for dairy producers. Reproductive performance has decreased over the last 25 yr on dairy farms and the lack of estrus detection or inaccurate detection are major reasons for increased numbers of days open for the average cow. Estrus synchronization methods that control both the function of the corpus luteum and the development of follicles with viable oocytes are critical to efficacy.

Estrus synchronization programs used in dairy cattle mainly involve the use of the luteolytic agents prostaglandin or their analogues. Prostaglandin is able to synchronize estrus by inducing the regression of the corpus luteum. Because prostaglandin is only effective in diestrus cows, a double prostaglandin protocol applied 11 to 14 days apart seems to be capable of bringing most cows to estrus. Treatments aimed at synchronizing estrus or inducing ovulation allow for the effective management of timed AI in lactating dairy cows, without the need for detecting estrus. Most estrus synchronization protocols are mainly based on the use of the luteolytic agents, prostaglandins or their synthetic analogues.

The objectives of this experiment were to investigate reproductive performance of Holstein and Brown Swiss dairy cows and heifers treated with $PGF_{2\alpha}$11 days interval in March and to compare conception rates (CR) in AI 12 h after visual estrus detection with TAI 72h after $PGF_{2\alpha}$injection without observing estrus.

Materials and Methods

Primiparous and multiparous cows (45 to 75 days postpartum; Holstein n = 17, Brown Swiss n=36) and nulliparous heifers (22 to 24 months; Holstein n = 7, Brown Swiss n=12) reared in the Experimental Farm of Atatürk University. in eastern Turkey are included in this study. Animals received 526 µg cloprostenol sodium (Estrumate, 2 ml), im on Day 0 and inseminated 12h after the observed estrus. Estrus was checked twice daily after first $PGF_{2\alpha}$injection. If estrus was not observed the cows and heifers received a second injection (526 µg cloprostenol sodium) of PGF2 alpha on Day 11. Timed AI was performed 72 h after second injection without observing estrus. All cows were 45 to 75 d postpartum. Data were analyzed by analysis of variance and means were tested by Duncan multiple range test.

Results and Discussion

The overall percentage of cows and heifers detected in estrus after first $PGF_{2\alpha}$injection was not influenced by breed and parity. More ($p>0.05$) Brown swiss (61.1%) than Holstein (50.8%) cows and heifers (Brown Swiss:54.6%; Holstein:42.9%) were detected in estrus during the synchronized insemination (Table 1). More ($p>0.05$) cow (63.2%) than heifer (48.7%) were detected in estrus after first $PGF_{2\alpha}$ injection. Higher estrus response at first injection was obtained in Brown Swiss cows. Estrus response of Holstein (50.8%) was found lower than that of reported for Holstein (65%) by DeJarnette and Marshall (2003) and (63.3%) by Alnimer *et al.*, 2002. Aral and Colak (2004) found the estrus rate 57.7% in Brown Swiss which was similar to result obtained in this study. The reason for low estrus rate observed in Holstein could be explained by their low body condition at the time of synchronizaiton program. It was

Table 1: Reproductive performance of Holstein and Brown Swiss cows and heifers synchronized with PGF and inseminated after estrus detection or without detecting estrus after second injection of PGF

	n	Estrus Rate after first PGF injection (%)	Concption rate after AI at first PGF injection (%)	Conception Rate after TAI following second PGF injection (%)
Genotype				
Brown Swiss (BS)	48.0	61.1	14.0	10.0
Holstein	24.0	50.8	51.6	7.1
	N.S	N.S	N.S	
Parity				
Cow	53.0	63.2	49.0	7.1
Heifer	19.0	48.7	16.7	10.0
	N.S	*	N.S	
Gen.*parity				
BS-Cow	36.0	67.6	28.0^{ac}	0.0
BS- Heifer	12.0	54.6	0.0^{c}	2.0
Holstein- Cow	17.0	58.8	70.0^{ab}	14.3
Holstein-Heifer	7.0	42.9	33.3^{ac}	0.0
	N.S	*	N.S	

^{a,b,c} Means within columns, by category, comparisons not followed by the same letter are significantly different ($p<0.05$)
N.S: Not Significant *: $p<0.05$

reported that estrus synchronization programs work best on females that are cycling. A greater proportion of cows in body condition score of 5 to 6 will be cycling at the onset of the breeding season than cows with body condition score less than cows with a body condition score less than 5. Trying to increase body condition between calving and breeding is difficult, particularly in heavy milking cows. It's known from the regular data that milk production of Holstein (3050kg/lactation) is higher than Brown Swiss (2850kg/lactation) in the College of Agriculture in eastern Turkey.

Effects of genotype and parity on CR are also shown in Table 1. Conception rate (CR) to estrus detected AI was significantly ($p<0.05$) different between two breeds (Holstein:51.7%, Brown swiss: 14.0%) and higher ($p>0.05$) conception rate was obtained with cows than heifers in both breeds (Table 1). Overall conception rates obtained for Holstein was higher than 16.7% (Alnimet *et al*., 2002) and 41% (DeJarnette and Marshall, 2003) while it was found similar to those reported as 47% and 46.3% by Stevenson *et al*. (1996) and Pursley *et al*. (1997), respectively. Brown Swiss showed low reproductive performance in estrus detected AI and TAI compared to conception rate as 34.6% reported by Gwazdauskas *et al*. (1975). The highest CR (70%) was observed for Holstein cows and lowest (0%) for Brown Swiss heifers, there was significant difference in CR among genetic groups of dams. Gwazdauskas *et al*. (1975) found no significant difference in terms of CR for different genotypes of dam. They reported that the CR to be 33.80% for Ayshire, 34.60% for Brown Swiss, 37.05% for Guernsey, 35.50% for Holstein-Friesian and 48.40% for Jersey. In practices, it is difficult to find factors including environmental and management conditions those might have much more influence on fertility.

Hoque *et al*. (2003) found that Virgin heifers had higher conception rates for all services (50%) than lactating cows (34%). Our current results are disagree to their finding. Optimum time for first breeding depends on the feeding program and management system. Size is more important than age in determining when heifers should be bred. Well-fed heifers can be bred at 14 to 15 months of age and should weigh about 750 pounds (Holstein and Brown Swiss). Akbulut (1990) has reported that age at first calving is 42.3 months for Brown Swiss and 33.6 months for Holstein raised in Experimental Farm of Atatürk University. while first calving age earlier (Holstein: 31months; Brown Swiss: 36 months) in another research was conducted in the same region but under different management (Kopuzlu, 2004). Garcia-Peniche *et al*. (2005) reported that Brown Swiss are older than Holsteins at first calving (833±2.4 vs. 806±2.0 d). Holstein heifers (33.3%) were more promise over Brown Swiss in conception rates at insemination followed first PGF2 alpha injection.

TAI resulted with low conception rates both in Holstein (7.1%) and Brown Swiss (10%). Holstein cows detected in estrus at first AI achieved greater ($p<0.05$) conception rates than those receiving TAI in the absence of observed estrus. Various researchers (Lucy *et al*., 1986; Stevenson *et al*., 1987 and Archbald *et al*., 1992) reported that the conception rate after prostaglandin administration was higher for cows inseminated at detected oestrus than for those inseminated at a fixed time. Stevenson *et al*. (1987) found a 23% conception rate following a single insemination 80 hr after PGF compared with 54% for insemination 12 hr after detected estrus.

Although artificial insemination performances influenced on climatical factors (maximum temperature day after insemination, rainfall day of insemination, minimum temperature day of insemination, solar radiation day of insemination and minimum temperature day after insemination etc) were not taken account in this study, these factors had potential influence on performance rates (Gwazduskas *et al.*, 1975).

It was concluded that Holstein raised in eastern Turkey has higher reproductive performance than Brown Swiss when AI based on estrus detection is performed in late winter. As indicated in other researchs, AI should be done with estrus detection synchronization program rather than TAI. Optimum time for first breeding should be determined by taking into account of size of heifers and emphasize on better feeding program and menagement system when nulliparous heifers of both breeds are included in AI program to obtain acceptable CR.

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