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Effects of progesterone in synchronization of estrus and fertility in Shal ewes in nonproductive season

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ABSTRACT

Synchronization of estrus let to insemination and husbandry as a work plan proportionate with other require activities that reduces estrus diagnosis time consuming conduct and reproductive season. About 80 Shal ewes 2-4 years old that all have had calving last year and lactate lambs were divided into four groups of 20 lambs per treatment (three treatment groups and one control group) and they were examined. They were inoculated with CIDR in three groups in May (anestrous season). CIDRs were remained in vagina of the treatment groups ewes for 10, 12 and 14 days and then they were removed. All experiment groups were fertilized with a healthy and fertile ram. Twenty four hours after CIDR withdrawal, the half of the ewes was injected 100 mg GnRH-IV. Occurrence of estrus in the control group was 12 and in experimental groups was 70, 90 and 80 percent, respectively. Estrus incidence in the groups treated with CIDR showed significant difference compared to control group ($p<0.01$) but there was no significant differences in incidence of estrus in experimental groups ($P\geq0.05$). The pregnancy rate in experimental groups ewes that was received GnRH compare to control group was significantly higher ($P<0.05$). It was concluded that the occurrence of estrus using CIDR in non- reproductive season for 10, 12 and 14 days was associated with the onset of good estrus and use of GnRH has good effect on fertility in treatment groups.

Keywords: CIDR, estrus induction, Shal sheep

INTRODUCTION

Ewes are capable of responding to manipulation in reproductive activities due to seasonal mating and multiple ovulations. The relatively short gestation interval (5-months) compared to cows permit them to calving twice a year [3].

Luteal or follicular estrous cycle phases manipulation is required for the estrous synchronization at most domestic animals and in sheep due to length of luteal phase that provides more opportunities for involvement in the reproductive cycle of animals in this stage. Estrus synchronization allows the handling of the animals insemination into a work program, in accordance with requirements of planning other activities that reduces time-consuming task of estrus and shortens reproduction season and the animals can be grouped in appropriate delivery models [1].

The use of intra vaginal natural or synthetic progesterone compounds along with gonodtropin for mating of ewes was first described by Robinson [12]. Then it was widely used in commercial and research herds [11].

One of the policies by which progesterone is slowly absorbed into mucosal tissues is a vaginal suppository such as application of CIDR. This method has been employed in New Zeeland and other countries on sheep [6]. CIDR is made of elastic silicon containing natural progesterone with nylon string and there is no purulent discharge in this method relative to using sponge [2].

According to researchers, CIDR should remain in the vagina between 10 to 14 days that it confirmed with the length of the luteal phase of the natural estrous cycle [1]. Martin studies et al (1980) concluded that the ram effect causes to secretion of GnRH and then LH, FSH and ovulation. In Perry Alp El De France ewe inactive cycles are increased temporarily in the spring. If the ram is in herd estrus behavior is stimulated in ewes. Therefore, in these races, there are two reproductive season coexist and also in the summer when the ewes are given LH. Follicles are grown and secrete estradiol [8].

MATERIALS AND METHODS

This experiment was conducted in Zanjan province. Eighty 2-4 years old Shal ewes with at least one non-breeding season of calving were studied. These ewes had parturition 40 days before experiment and they had lamb and they were in lactating period. The studied sheep were kept in field and they were pastured in spring and summer in day and returned to field at night. Nutrition in the field was done by dry alfalfa with water. EAZI-BREED CIDR manufactured in Canada in packages of 20 each containing 300 mg of progesterone. GnRH (Intervet, Gonadoroline, Netherlands) was used as other consumed hormone. Eighty Shal ewes were randomly divided into three experimental groups and one control group. The CIDR was inserted into the vagina of ewes of experiment groups.

All the herds of sheep were kept together under study. In order to facilitate the registration of this study, treatment groups were separated into 1, 2 and 3 groups and retention time of CIDR in vagina was 10, 12 and 14 days, respectively. CIDR retention period has elapsed after each treatment group, separated from the main herd and the CIDR was removed . The treatment and control groups (20 ewes per group) were divided into four subgroups (5 ewes per subgroup) and each subgroup was randomly mated with a healthy and fertile ram. After one week of the aforementioned period, the groups were released into the herd in order to live the lambs with their mothers. Signs of estrus were recorded by direct and continuous observation. The occurrence of estrus and pregnancy rates in the three treatment groups and the control group were studied. After detection of estrous ewes in all three treatment groups, in each group, half of them was injected intramuscularly Gondotropine 1cc IM (100 mg). In order to recognize pregnancy, all ewes were studied through the abdominal wall in a month by a portable ultrasound machine with external probe SSD 210 DXll-Aloka made in Japan. Statistical analysis was carried out by Chi-square test in SAS programs.

RESULTS AND DISCUSSION

The induction and estrus synchronization and statistical results of them in the experiment group and the control group was demonstrated in tables 1 and 2. Of twenty ewes in control group two ewes were estrous and pregnant and according to results of this research it seems that this pedigree could have active reproductive cycle without using hormone in attendance of ram that it needs to more research in this field. According to the results there was a significant difference between estrous incident in control group and treatment groups ($p<0.01$) that indicates the effectiveness of CIDR induction and synchronization of estrous in Shal ewes in non reproduction season. The presence of rams during the transition from seasonal estrus to reproductive season causes to estrus and ovulation in ewes. These results are consistent with the results of Rosa and Bryant (2003) and Tournadre et al., (2002) [13, 14].
CIDR was inserted and removed easily from vagina. Nothing was missing from the CIDR and smell or evidence of infection and discharges was not observed. The results are constant to the results of Harma et al (1986), Welch et al (1984) and Carlson et al (1989) [2, 4, 16].

After CIDR removal, treatment groups were exposed to rams. Estrus was begun within 24 hours and most estrous was observed 30 hours after CIDR removal. Robertson (1980) and MacNatty and colleagues (1988) reported the highest frequency of estrus approximately 36 hours after treatment with progesterone-PMSG and ovulation is about 27.4 hours after the onset of estrus that it is consistent with our results [7, 8].

Table 1: Results of estrus induction and synchronization in control group and treatment group

	Control G.	Experimental G.		
		1	2	3
Estrous No (% in Each group)	2 (12%)[*a]	15 (70%)[b]	19 (90%)[b]	17 (80%)[b]
Anestrous No (% in Each group)	18 (90%)	5 (25%)	1 (5%)	3 (15%)

**Similar letters are non- significant*

Table 2: Estrus induction and synchronization analysis of variance in control group and treatment group

	Control G.	Experimental G.
Total Estrous No.	2	51
Total Anestrous No	18	9

The best occurrence of estrus was observed in groups 1, 2 and 3 with 70, 90 and 80%, respectively with no significant difference ($p \geq 0.05$) among the three groups. Insignificant incidence of estrus in the treated group is due to the luteal phase lasts about 12-14 days (2-3 days-met-estrus, 10-12 days di-estrus) [8]. Therefore, it can be artificially induced in this phase to have imitated estrus synchronization. CIDR remains in vagina in this period and induces uniform estrous synchronization in treatment group. Results of estrus occurrence is consistent with Crosby et al (1988) and Tritschler et al. (1991) results. Their percentage of estrus was in the order of 93-95 percent [3, 15] and MacDonald and Crawley (1978) demonstrated that 14 days of treatment with progesterone CIDR has an effect similar to the effect of medroxy progesterone acetate foam during seasonal reproduction [5]. Ainsworth and Downey (1986) showed that treatment with 12 or 14 day CIDR is a good replacement for FGA foam for ewes that consistent with the results [1].

Pregnancy diagnosis results are summarized in Table 3. The results showed a significant relationship between the incidence of pregnancy in treatment group treated with GnRH and controls group ($P \leq 0.05$). Based on these results, injection of 100 micrograms GnRH causes the emergence of a significant difference between the incidences of pregnancy in groups treated with GnRH and untreated group ($P \leq 0.05$).

Injection of GnRH by increasing LH and FSH secretion and release of an egg increases pregnancy.

Table 3: Pregnancy outcomes in different treatment and control groups

Groups	Control G.	Experimental G.					
		1		2		3	
		With GnRH	Without GnRH	With GnRH	Without GnRH	With GnRH	Without GnRH
Estrous No	2	7	8	10	9	9	8
Pregnant No (%)	0	2(28)	0(0)	1(10)	0(0)	0(0)	0(0)
Total Estrous No	17/20[b]	15/20[b]		19/20[b]		17/20[b]	

Intravenous and subcutaneous administration of GnRH increases the pre-ovulation LH in estrous cycle. Use of GnRH 24 h after CIDR removal accelerated the onset of ovulation [7, 9].

Gonadotropin receptors are developed by influence of the local concentration of steroid hormones. Estradiol increases sensitivity of granulose cells to FSH (estrogen and FSH) increase the sensitivity of LH receptors to FSH [11]. The injection of GnRH and accompaniment the herd with ram by increasing the gonadotropin hormones induce ovulation [8, 10].

CONCLUSION

The overall results of this research can be identified: 1) The use of a progesterone compounds as CIDR affects on estrous cycle in the treatment groups, especially in Group 2 had a positive effect. 2) Application of GnRH in the treatment groups offers good results in increasing fertility percentage that needs to more studies. 3) According to the results obtained from this study the better retention time of CIDR in the vagina of ewes is 12 days. 4) Use of rams together with anestrous ewes influences on occurrence of estrus and fertility.

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