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Effect of Injecting with Dexamethasone and Progestagen-PMSG on Reproduction and Rearing of Lambs in Semi-Intensive Conditions

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Abstract: The aim of the present study was to evaluate the effect of different doses dexamethasone and progestagen-PMSG on fertility and prolificacy in Kivircik ewes during the breeding season. For the experiment, 100 ewes were divided into four groups, with 25 females in each group. Groups were fluorgestone acetate (FGA, 30 mg), administered via intravaginal sponges. Experimental groups 2, 3 and 4 mL dexamethasone injection were given 72 h before mating season. The fertility rates control, 2, 3 and 4 mL were 88.0, 92.0, 100.0 and 100.0%, respectively ($p<0.05$). The prolificacy rates for the same groups were 122.7, 130.4, 144.0 and 156.0%, respectively ($p<0.01$). The injections dexamethasone significantly increased lamb birth weight and daily weight gain for 60 days ($p<0.05$).

Key words: Sheep, progestagen, PMSG, dexamethasone

INTRODUCTION

Glucocorticoids have been found to inhibit reproductive function in most domestic species studied but, in the ewe, preliminary reports suggest that glucocorticoids may have little or no effect. The stress-induced release of glucocorticoids is known to inhibit the immune (Sapolsky *et al*., 2000), reproductive (Liptrap, 1993) and endocrine (Vighio and Liptrap, 1990) systems. In particular, glucocorticoids have recently been reported to stimulate leptin secretion in humans (Janssen *et al*., 1998). However, glucocorticoid effects on these systems in ewe are not well defined. Endogenous and exogenous glucocorticoids may modulate androgen biosynthesis, libido and fertility.

Estrous synchronization is a valuable management tool that has been successfully employed to enhance reproductive efficiency, particularly in ruminants (Kusina *et al*., 2000). In small ruminants, estrous synchronization is achieved either by reducing the length of the luteal phase of the estrous cycle with prostaglandin F2α or by extending the cycle artificially with exogenous progesterone or more potent progestagens (Jainudeen *et al*., 2000; Kusina *et al*., 2000). Progestagens or natural progesterone have been used to synchronize estrus in different forms, such as implants, impregnated sponges or controlled integral drug release device (Menegatos *et al*., 2003).

The majority of sheep breeds perform different reproduction activities depending on season changes, latitude/longitude, the length of the photoperiod and other factors. Therefore, estrous synchronization in ewes is important in the improvement of reproductive efficiencies and management processes (Gordon, 1997).

The aim of the present investigation was to evaluate the effects of the synthetic glucocorticoid dexamethasone and progestagen-PMSG on reproduction and lambs rearing in treated ewes.

MATERIALS AND METHODS

This study was conducted at the Application and Research Farm of the College of Agriculture, Uludag University, Bursa. The experiment was carried out during autumn breeding season (August-October). One hundred of Kivircik breed, aged 2-3 years and 50-55 kg body weight were used during the breeding season. The experiment ewes divided into four groups, each consisting of 25 animals. The investigation covered also lambs born of those dams. Groups 1, 2, 3 and 4 were synchronized using 30 mg FGA (fluorogestone acetate) intra vaginal sponges for 14 days, plus 500 IU PMSG administered subcutaneously at sponge withdrawal. Furthermore the experimental groups (2, 3, 4) 2, 3 and 4 mL dexamethasone injection were given 72 h before the mating season (Table 1).

The ewes from all groups were kept in the same shed and constituted one flock grazing. The nutrition was based on local feeds: meadow hay, fodder beets, feed supplement (oats, wheat bran, sunflower meal and

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Table 1: Group treatment in experiment

Groups	Injection	Dose
1 (Control)	Sponge + PMSG	500 IU
2	Sponge + PMSG	500 IU
	Dexamethasone	2 mL
3	Sponge + PMSG	500 IU
	Dexamethasone	3 mL
4	Sponge + PMSG	500 IU
	Dexamethasone	4 mL

limestone), pasture herbage and trace-mineralized salt. Animals were routinely drenched against flukes and roundworms and vaccinated for pasteurellosis and clostridia infections. Ewes were exposed to 10 fertile Kivircik rams during the 30 days breeding seasons in October and November. Ewes lambed indoors and animal weights were recorded at lambing. The lambs were fed only milk from the ewe.

The differences between groups in reproduction performance were estimated using the model below (Harvey, 1990).

$$Y_{ij} = \mu + a_i + e_{ij}$$

Where:

μ = The overall mean
a_i = Effect of ith group
e_{ij} = The random error

The significance of differences between groups was verified using contrast method.

Mean body weight of lambs and their mean body live weight gains from birth to 60 day of life was calculated by least-squares analysis of variance by difference according to Harvey (1990):

$$Y_{ijklm} = \mu + a_i + b_j + c_k + e_{ijklm}$$

Where:

μ = The overall mean
a_i = The effect of ith group (i = 1-4)
b_j = The effect of jth type of birth and rearing (j = 1.1, 2.1, 2.2)
c_k = The effect of kth sex (k = 1, 2)
e_{ijkl} = The random error

RESULTS AND DISCUSSION

The doses of dexamethasone applied in this experiment did not result in miscarriages, still birth. Comparing the results of the onset of behavioral estrous in the mating season, one may notice that ewes from the dexamethasone injected groups demonstrated estrous symptoms earlier than the control groups. In groups, 3 and 4 fertility (100%, $p<0.05$) were significantly higher than in the control group and group 2 (88 and 92%, respectively) (Table 2). This indicates that dexamethasone treatment had a significant influence on the fertility in ewes. The mean prolificacy was high in all groups and varied from 112.7 to 156.0% (Table 2). In groups 3 and 4 prolificacy (144 and 156%, $p<0.01$) were significantly higher than in the control group and group 2 (122.7 and 130.4%). The proportion of ewes showing estrous at 48 h was 93.70%. Basaran and Askin (1995) using 40 mg FGA reported that in the breeding season estrous proportion was 90.10%, which is similar to our results. The efficacy of progestagen treatments to synchronise estrous in sheep has been documented (Gordon, 1997). In cyclic ewes, dexamethasone treatment at rates of up to 2 mg day^{-1} did not affect the natural or pregnant mare serum gonadotrophin-stimulated ovulation rate, or the timing and incidence of behavioural estrous (Phillips and Clarke, 1990).

Table 2: Reproductive performances (%)

Reproductive performance	Group 1 (Control)	Group 2	Group 3	Group 4
Fertility[1]	88.0[b]	92.0[b]	100.0[a]	100.0[a]
Prolificacy[2]	122.7[d]	130.4[d]	144.0[c]	156.0[c]

[1]: Percentage of ewes lambing, [2]: Number of lambs born of lambing×100, [a,b]: Means with different letter(s) are significantly different ($p<0.05$) from each other, [c,d]: Means with different letter(s) are significantly different ($p<0.01$) from each other

Table 3: The performance of lambs up to day 60 of life

Items	Group 1	Group 2	Group 3	Group 4
No. of lambs born	27.00	30.00	36.00	39.00
Lamb live weight at birth*				
LSM[a] (kg)	3.70[b]	3.90[b]	4.20[a]	4.40[a]
Se[b]	0.14	0.18	0.21	0.20
No. of lambs reared to 60 days	24.00	29.00	34.00	38.00
Lamb live weight at day 60*				
LSM (kg)	19.60[b]	19.90[b]	21.40[a]	20.30[b]
SE	0.62	0.59	0.80	0.77
Daily live weight gain for 60 days*				
LSM (g)	271.20[b]	272.50[b]	293.60[a]	273.00[b]
SE	7.92	8.03	9.47	8.40

[a]: Least-square means, [b]: Standard error of LSM, *: Values with different superscripts (column vise) are significantly different (a:b = $p<0.05$)

The data presented in Table 3 show that treated 2-3-year-old ewes, 25 per group, expressed higher numbers of lambs reared to 60 days of age than control ewes, producing 29, 34 and 38 lambs, respectively, in groups 2-4. The body weight on day 60 (21.4 kg) and daily live weight gains during first 60 days (293.6 g) were significantly ($p<0.01$) higher than the other groups.

The administration of dexamethasone doses and sponge+PMSG had significant effects on the fertility, prolificacy and the number of lambs born and reared to 60 days in ewes. The significant effect of dexamethasone injection on reproductive performance and rearing of lambs was observed in group 3 and 4.

Phillips and Clarke (1990) reported that dexamethasone did not significantly modify reproductive function in the ewe, a finding that is in contrast to that found in other domestic species. Dexamethasone dramatically increased plasma glucose and insulin levels without affecting plasma gonadotropin levels or growth of the dominant follicle. Thus, short-term increases in systemic levels of glucocorticoids have little direct impact of follicular function but may have a negative impact on luteal function in dairy cattle (Maciel *et al*., 2001).

In the present study, dexamethasone was capable of significantly altering the reproductive performances of ewes that had been primed with progestagen-PMSG. This was the first comprehensive study on the effects of dexamethasone on reproductive function of ewes.

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