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Effect of PGF₂α Administration and Subsequent eCG Treatments on the Reproductive Performance in Mature Raieni Goats during the Breeding Season

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ABSTRACT

Reproductive management has an important role in animal production; therefore, the objective of this study was to determine the effect of different dosages of equine chronic gonadotropin (eCG) on reproductive performance of mature Raieni goats during the breeding season. One hundred Raieni goats (42±2.5 kg) were randomly allocated to five groups to receive different dosages of eCG; (0 IU as control group; and other treated groups received 350, 450, 550 and 650 IU of eCG respectively). The interval to onset of estrus was detected by using five aproned bucks. Oestrus was induced by prostaglandin and occurred 24 to 48 h after the second injection. The results showed the estrus incidence rates were not significantly different between groups ($p>0.05$). The pregnancy rates were 90, 90, 95, 100 and 85% in treatments and control group, respectively, with the pregnancy rate in 550 and 650 IU groups being significantly higher than the other groups ($p<0.05$). Twinning rates were higher in treated goats (55, 58 and 65%) than in controls (36%, $p<0.05$). The results of the present study show that eCG treatments increase the twinning rate in Iranian Raieni goats.

Key words: Estrus synchronization, twinning rate, reproductive performance, raieni goats, pregnancy rate

INTRODUCTION

The increased demand for milk and meat from goat production has resulted in an increased interest in consistent methods for estrus synchronization in goats. Producers can use this technology with high efficacy to manage reproduction (Whitley and Jackson, 2004). There are many strategies that can induce and control the activation of ovaries in goats with the objective of increasing pregnancy rates. Recently, the combination of PGF₂α with eCG at the time of insert withdrawal, has been widely used (Husein *et al.*, 2005). Many techniques have been applied to increase the reproductive characteristics in small ruminants, consisting of sheep and goats, to augment the proportion of super ovulations and consequently raise lambing proportion (Akoz *et al.*, 2006). Many factors may affect the efficacy of synchronization consisting season, male contact, type and age of the animal (Pierson *et al.*, 2001, 2003). Researchers developed a new short-procedure which could be used in small ruminants instead of conventional progesterone method

(Menchaca and Rubianes, 2004). This protocol uses a short progestin exposure associated with a PGF₂α injection at the beginning of the treatment. A higher pregnancy rate was achieved when this short-term procedure was applied in goats (Menchaca and Rubianes, 2007). The hormone eCG has been extensively applied in sheep and goats to encourage ovulation. Nevertheless, the results of eCG and Follicle Stimulating Hormone (FSH) on stimulation of ovaries are inconsistent in practice, although it may have a positive impact on follicular development (De Roover *et al.*, 2005). The Raieni goat is one of the important native breeds in the southeast of Iran, where climate and food sources are not ideal for livestock. It also presents a good carcass conformation and stands out as being very fertile, precocious and resistant to gastrointestinal parasites, as well as producing valuable Kashmir hair. The main objective of this experiment was to study the effects of different dosage of eCG treatments on reproductive traits in Raieni goats during the breeding season.

MATERIALS AND METHODS

A completely randomized design experiment was conducted at the Raieni Goat Breeding Station in Bofit city in Kerman province in Iran (latitude 92°17'N, longitude 56°36'E, altitude 2250 m) during the breeding season from September to February 2009. The average ambient temperature during the experiment was 25 to 30°C. A total of 100 mature Raieni goats were used. The animals were submitted to examination for general clinical condition, sanitary and reproductive health. Goats weighed (42±2.5 kg) with a standard body condition score between 3 and 3.5 on a scale of 1 to 5. They grazed on native pastures and received additional barley at 150-180 g/head/day. Does were randomly divided into five groups (20 does each). After synchronization with two injections of PG (500 µg D-cloprostenol, Ciosin, Schering-Plough, São Paulo), given 13 days apart, on the mating day 20 goats in first group (0 IU) were kept as controls and other treated goats were injected intramuscularly with different dosage of eCG (350 IU, 450 IU, 550 IU and 650 IU, respectively). The interval to onset of estrus was detected by the use of 5 aproned bucks at the time of mating.

Statistical analysis: The percentage of animals exhibiting behavioral estrus, the interval to onset of estrus, pregnancy and twinning rate were recorded. Data were analyzed, using the Chi-squared procedures of statistical analysis system (SAS, 2008) the means were compared using χ^2 -test. Differences were considered significant at a level of $p < 0.05$.

RESULTS AND DISCUSSION

In this experiment, the goats treated with eCG following PG injections showed estrus signs during 24-48 h after the second injection of PG. The mean intervals from second injection of PG to onset of estrus were 35.3, 33.6, 28.5 and 27.7 h in the 350 IU, 450 IU, 550 IU and 650 IU treatment groups, respectively and 35.6 h in control group. The mean onset of estrus in the 550 and 650 IU eCG groups was significantly sooner than the other groups (Fig. 1). Estrus incidence rates were not different between the control group and treatment groups ($p > 0.05$; Table 1). The results of the present study showed that the eCG treatment shortened the mean time to onset of oestrus in groups which were treated with 550 and 650 IU eCG (Fig. 1). This result is in agreement with those of Ali (2007), Kridli and Al-Khetib (2006), Oliveira *et al.* (2001) and Cardwell *et al.* (1998). This effect can be attributed to the act of eCG on follicular growth (Kridli and Al-Khetib, 2006). The main action of eCG is similar to follicle stimulating hormone (FSH) which can reduce the duration between progesterone elimination and incidence of estrus. Wildeus (2000) stated that the reduced

Table 1: Effects of eCG treatment on estrus, pregnancy and twinning rate in Raieni goats (n = 20/group)

Groups	Pregnancy rate (%)	Estrus incidence rate (%)	Twinning rate (%)
Control	85 (17/20)	85 ^a (17/20)	36 ^a (6/17)
350 IU	90 (18/20)	85 ^a (17/20)	44 ^a (8/18)
450 IU	90 (18/20)	90 ^a (18/20)	55 ^b (10/18)
550 IU	95 (19/20)	95 ^b (19/20)	58 ^b (11/19)
650 IU	100 (20/20)	100 ^b (20/20)	65 ^b (13/20)

Mean with different letters are significantly different (p<0.05)

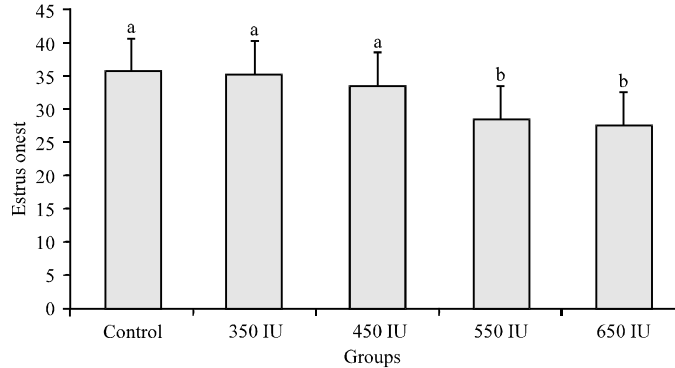


Fig. 1: Time to the onset of estrus from second injection of PG in goats treated with different doses of eCG. Mean with different letters are significantly different (p<0.05)

interval to estrus in ewes treated with pregnant mare serum gonadotropin (PMSG) could be a consequence of a faster follicular development, which in turn is caused by a greater production of estrogen. Estrus incidence was significantly higher in goats received 550 and 650 IU eCG than other groups the control group and treatment groups. With high dosage of eCG, a higher estrus response has been reported in Pelibuey ewes treated with intravaginal sponges and 250 IU of PMSG (Macias-Cruz *et al.*, 2009) or 500 IU of PMSG (Avendano-Reyes *et al.*, 2006). In contrast with this and with our result, Husein and Kridli (2002) reported that eCG administration can elevate the estrus incidence rate. The corresponding values for pregnancy rates were 90, 90, 95, 100 and 85% in treatments groups and control group, respectively, with the pregnancy rate being significantly in 550 and 650 IU eCG treatment group than other groups (p<0.05; Table 1). The pregnancy rate was significantly higher in the 550 and 650 IU eCG treatment groups than the control group (p<0.05; Table 1). Luther *et al.* (2007) showed that progestagen treatment in combination with PMSG enhanced pregnancy rate in artificially inseminated ewes, possibly due to a greater number of ovulations per ewe. Chao *et al.* (2008) reported similar trends and Fonseca *et al.* (2005) reported that pregnancy rate did not differ (p>0.05) between eCG (77.3%) and human chorionic gonadotropin (hCG) (61.1%). The mean twinning rate in treatments groups and the control group were 44, 55, 58, 65 and 36%, respectively, (p<0.05; Table 1).

Twinning rate was higher in 550 and 650 IU eCG treatment groups than the control group (p<0.05). Several studies have shown that PMSG application increases the percentage of multiple lambing in sheep as a consequence of an increase in ovulation rate (Ali, 2007; Ince and Karaca, 2009). The administration of different doses of eCG increased the mean number of large follicles and the ovulation rate (Moakhar *et al.*, 2010). There are several possibilities, namely an increased rate of entry of follicles into the >2 mm size category, the prevention of the occurrence of natural atresia or the reversal of the atretic process (Bister *et al.*, 1999; Mandiki *et al.*, 2000).

This indicates that the administration of eCG led to an increase in follicular and luteal blood flow (Honnens *et al.*, 2009). The increase in luteal blood flow could be attributable to the luteotropic effect of the gonadotropin administered. Barrett *et al.* (2004) observed that higher PMSG doses increase ovulation rate in ewes by recruiting small ovarian follicles, raising the growth rate of antral follicles and altering ratios of follicles size classes. The Leutinizing Hormone (LH) component in the preparation causes luteinization of premature follicles, desensitization of LH receptors, premature ovulation and drastically decreases the superovulatory response (Herrler *et al.*, 1991). Kridli and Al-Khetib (2006) reported similar prolificacy (1.0 lamb/lambing ewes) but different percentage of multiple lambing (40% versus 0%) between Awassi ewes receiving 600 and 0 IU of PMSG. Zeleke *et al.* (2005) working with Dorper ewes, observed similar lambing rates of 1.5 and 1.4 lambs per ewe in animals either not treated with PMSG or treated with 300 IU, respectively. However, it has been observed that estrus behavior, fertility and ewe productivity may vary in response to PMSG dose (Barrett *et al.*, 2004; Ince and Karaca, 2009) and time of PMSG application (Zeleke *et al.*, 2005; Ali, 2007).

CONCLUSION

The results of the present study demonstrated an improvement in pregnancy and twinning rate in Raieni goats treated with 550 IU eCG or 650 IU eCG after synchronization with two PG injections 13 days apart. This demonstrates the potential to improve reproductive indices during the breeding season.

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