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Induction of synchronized estrus in dairy goats with different gonadotrophins[1]

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Abstract

The objective of this study was to evaluate the efficiency of two gonadotrophins in induction of estrus in dairy goats. A total of 47 dairy goats were randomly divided according to breed into two treatments (T1 and T2). In both treatments, goats received intravaginal sponges containing 60 mg medroxy-progesterone acetate for six days and subvulvar administration of 22.5 μg of d-cloprostenol at the time of sponge insertion. In T1 (n=23) and T2 (n=24), animals received intramuscular administration of 200 IU and 250 IU of eCG and hCG, respectively. After sponge removal, goats were monitored twice daily (06:00 a.m. and 18:00 p.m.) with bucks. Animals were bred at the start of estrus and at each 12 hours interval until the end of estrus. Pregnancy was checked by ultrasonography 63 days after breeding. Percentage of animals in estrus did not differ (P>0.05) between T1 (95.6%) and T2 (78.3%). There was no effect (P>0.05) of treatment on interval from sponge removal to the start of estrus (IE) and duration of estrus (DE). The average IE was 48.0 ± 9.4h and 46.2 ± 8.4h for eCG and hCG, respectively. The average DE was 20.7 ± 11.9h and 18.8 ± 9.0h for eCG and hCG, respectively. Pregnancy rate did not differ (P>0.05) between eCG (77.3%) and hCG (61.1%). Results of this study showed that estrus can be efficiently induced in female goats outside the breeding season with both eCG and hCG.

Key words: eCG, goat; hCG, progestagen; reproductive performance.

Introduction

Goats are typical polyestrous seasonal breeders in Brazilian southeast region. To overcome this phenomenon and become reproduction possible anytime, assisted reproduction techniques must be employed. In this field, estrous induction presents variable efficient protocols, most of them using equine chorionic gonadotrophin (eCG) as an inductor of ovarian follicular activity and estrus (Gordon, 1997). Nevertheless, eCG is as peptide hormone that functions as an immunogen displaying immune response. In successive administrations, antibodies synthesized against eCG can interfere in its function and diminish the efficiency of estrous induction. Then, other hormones like human chorionic gonadotrophin (hCG) should be tested as a substitute of eCG. The alternate use of different hormones can minimize immune attack and maintain good estrous induction rate in goat.

The objective of this study was to check the efficiency of hCG in estrous induction and pregnancy rate in goats during the non breeding season.

Material and Methods

Location

This study was carried out from October to November of 2003 in Coronel Pacheco, Minas Gerais, southeast region of Brazil. The research unit is located at 435 m altitude and 21º35''S and 43º15''W latitude and longitude, respectively. This area has an average annual precipitation and temperature of 1581 mm^3 and 21ºC, respectively.

Experimental animals

A total of 47 dairy goats (Toggenburg, Saanen and Alpine) of various physiological status (nulliparous, non-lactating and lactating) were used. The animals had body condition score (BCS, 1 to 5 variation) evaluated by palpation of the lumbar and sternal regions on day of estrus. Average body weight was 43.1 ± 8.9 and 44.1 ± 9.4 kg in T1 and T2 respectively. Average BCS was 3.6 ± 0.9 and 3.5 ± 0.8 in T1 and T2 respectively. The animals were kept on suspended pens and fed twice a day corn silage and concentrate ration to attend nutritional demands. Water and mineral salt were permanently available.

Design of experiment

Goats were shared according to breed and physiological status to two treatments. In both treatments, goats received intravaginal sponges containing 60 mg medroxy progesterone acetate (Estroforte®, Umuarama–

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PR, Brasil) for six days and intra-vulvo-submucosal administration of 22.5 μg of d-cloprostenol (d-cloprostenol; Prolise®, ARSA S.R.L., Buenos Aires, Argentina) at the time of sponge insertion. Sponges were always inserted and removed from 10:00 to 12:00 hours. In T1 (n=23) and T2 (n=24), animals received intramuscular administration of 200 IU and 250 IU of equine chorionic gonadotrophin (eCG; Novormon® 5.000, Syntex S.A., Indústria Bioquímica e Farmacêutica, Buenos Aires, Argentina) and human chorionic gonadotrophin (hCG; Vetecor®, Laboratórios Calier do Brasil Ltda, São Paulo, Brasil), respectively, 24 hours before sponge removal. After sponge removal, animals were monitored twice daily (06:00h and 18:00h) by means of a surgically prepared male (teaser by penis translocation). The estrous signs observed were: searching for the male, restlessness, vocalization, frequent urination, tailing, contraction, hiperemia and edema of the vulva, vaginal mucous discharge and immobility on mounting, which is a characteristic considered as the onset of estrus. Animals were bred at the start of estrus and at each 12 hour interval until the end of estrus.

Pregnancy detection and parturition

All females were evaluated by transrectal ultra-sonography with a 5 MHz probe after 35 and 70 days after breeding for early pregnancy detection and confirmation, respectively. After parturition, number, sex and weight of fetuses and gestation period were recorded.

Variables and statistical analysis

The following parameters were recorded:

- Percentage of animals in estrus: number of females in estrus / number of total females X 100;
- interval to estrus: time from sponge removal and first mounting acceptance;
- duration of estrus: time from first to last mounting acceptances;
- number of services per goat mated;
- pregnancy rate: number of pregnant females / number of mated females X 100;

Statistical analysis comprised one way analysis of variance for testing differences in variables studied between treatments. Parametric variables were analyzed by SNK test processed by the SAEG- Statistical Analysis System (Ribeiro Júnior, 2001). Non-parametric variables were evaluated by the qui-square test (Ayres *et al*., 2000). Statistical analysis was performed using all tests for statistical significance at the 95% confidence interval**.**

Results

Estrous response

The percentage of animals in estrus, interval from sponge removal to onset of estrus and duration of estrus did not differ (P>0.05) between eCG-treated and hCG-treated goats. There is neither effect (P>0.05) of parity or breed on parameters measured nor interaction of parity or breed with treatments (P>0.05). A negative correlation (-0.28) was detected (P<0.05) between interval to estrus and duration of estrus. Both treatments had similar number of services (Table 1).

Table 1. Percentage of animals in estrus (%), interval to estrus, duration of estrus (hours), number of services and pregnancy rate (%) from dairy goats which estrus was induced by progestagem and cloprostenol plus equine chorionic gonadotrophin (eCG) or human chorionic gonadotrophin (hCG). Except for the percentage data, all other data are expressed as mean ± SD.

	eCG	hCG	Total
Animals in estrus (%)	95.7 (22/23)	75.0 (18/24)	85.1 (40/47)
Interval to estrus (h)	48.0 ± 9.4	46.2 ± 8.4	47.2 ± 8.9
Duration of estrus (h)	20.7 ± 11.9	18.8 ± 9.0	19.8 ± 10.6
Number of services	1.5 ± 0.5	1.5 ± 0.5	1.5 ± 0.5
Pregnancy rate (%)	77.3 (17/22)	61.1 (11/18)	70.0 (28/40)

Pregnancy

The pregnancy and kidding rates did not differ (P>0.05) between treatments (Tab. 1). The overall pregnancy rate was 70.0 % (28/40).

Discussion

Since estrus response did not differ between treatments, eCG as well as hCG can be efficiently used as gonadotrophin for induction of estrus in goats outside the breeding season. It is in agreement with Machado and Simplício (2001), which reported the effectiveness of the use of 60 mg MAP sponges for 10 days plus 300 IU hCG and 100 μg cloprostenol 48 hours before sponge removal.

The average interval to estrus for eCG (48.0 ± 9.4 h) and hCG (46.2 ± 8.4 h) was similar to other studies reported (Baril *et al*., 1993; Ahmed *et al*., 1998). However, duration of estrus for eCG (20.7 h) and hCG

(18.8) was inferior to earlier studies reporting duration of estrus superior to 30 h (Ahmed *et al*., 1998). In the present study, unlike others, cloprostenol was administered concomitantly with sponge insertion. It allows earlier luteolyses of any corpora lutea or terminates possible luteal activity. In another study, Fonseca (2002) showed that luteal activity in goats, measured by plasma progesterone, declines differently among animals throughout the progestagen treatment (nine days) until no detection levels one day after cloprostenol administration. The combination effects of progesterone or progestagen and cloprostenol administered on the day of intravaginal devise insertion promoted emergence of a new ovarian follicular wave around four days after devise insertion (Maffili, 2004). Possibly, earlier cloprostenol administration can promote more synchrony in goats, culminating in reduction of estrus duration. Reasons for that fact are not known but Fonseca (2002) showed that duration of estrus was inferior after second (16 h) than the first (32 h) cloprostenol administration 10 days apart in nulliparous dairy goats.

Recently, Bartlewski *et al*. (2004) reported no effects of MAP on tonic secretion of LH/FSH or follicular wave emergence in anoestrous ewes. However, the same study revealed that GnRH-stimulated LH discharge was attenuated in ewes that received MAP-impregnated sponges for 14 days and were treated intermediately after sponge removal. So, it is presumed that LH content in MAP-treated animals can be inferior to those not treated. On the other hand, earlier luteolysis, evoked by cloprostenol administration in the present study, can remove the inhibitory effect of endogenous progesterone on LH release. Both depletory effects of MAP and earlier cloprostenol administration on LH can reflect in less LH for final follicular development and ovulation. This possibly can decrease the level of circulating estrogens (Ginther et al., 1996), which culminates in short estrous duration. Posterior studies, including LH and estradiol measurement and different times for the cloprostenol administration can elucidate this question.

The negative correlation between interval to estrus and duration of estrus observed in the present study was previously reported by Fonseca (2002). This phenomenon are similar to interval from weaning to estrus and duration of estrus well accepted in swine (Soede and Kemp, 1995; Weitze, 1995). It means that when applying artificial insemination in fixed time in induced estrus in goats, interval to estrus should be considered.

Pregnancy rate did not differ (P>0.05) between eCG (77.3%) and hCG (61.1%). Similar results were reported by Machado and Simplício (2001). The overall pregnancy rate (70 %) found in the present study can be considered elevated. It is important to note that sponge insertion and removal was done between 1000 and 1200 p.m. It is in agreement with Cortell *et al.* (1988), which reported significant superior pregnancy rate for goats that had insertion and removal of sponges in this time period compared with other times during the day.

Finally, repeated induction of estrus during the year or life of goat increased active immunization against eCG, which decreased the efficiency of ovarian stimulation out of breeding (Baril et al., 1992). The proven efficiency use of alternative hormones to induce estrus can be a valuable tool in estrous induction in goats. Thus, goats not responding to eCG can be induced by hCG. Additionally, because the imprecision of superovulatory response in goats, recipient goats had induction of estrus successively, which can evoke immune response against gonadotrophin used, decreasing the efficiency of whole process. The alternated use of gonadotrophins can overcome this problem, maintaining the efficiency of induction of estrus.

In conclusion, results of this study indicate that estrus can be efficiently induced in female goats outside the breeding season. Although eCG is the most common hormone used to this objective, hCG can be considered to substitute eCG without significant decrease in the efficiency of the whole process. Many routes and doses of eCG were tested in goats (Gordon, 1996). So, other studies that include variation in doses of hCG should be investigated.

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