

ESTRUS SYNCHRONIZATION WITH MEDROXYPROGESTERONE ACETATE IMPREGNATED SPONGES IN GOATS (*CAPRA HIRCUS*)

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ABSTRACT

An experiment was performed to synchronize estrus in goats by locally prepared progesterone-impregnated sponges and to determine the time of onset and duration of estrus alongwith subsequent fertility rate. The study was conducted from May to December, 2007 at NIAB (Nuclear Institute for Agriculture and Biology), Faisalabad. Polyurethane sponges were prepared with medroxyprogesterone acetate (MAP: 60 mg) and inserted intra-vaginally in a lot of 8 female postpartum goats (Beetal x Dwarf). Two goats were kept as control and were treated with sponges without MAP. Sponges were removed on 17th day of insertion and goats were examined for the signs of estrus at 6 h intervals. A buck was introduced in the herd for breeding, one day after removal of sponges. Estrus was further confirmed by determining serum estradiol levels using radioimmunoassay (RIA). All the experimental goats exhibited estrus within 21-100 h of removal of sponges, whereas one control animal also showed estrus. The average time from sponge withdrawal to the onset of estrus was 65.4 ± 24.0 h and duration of estrus was 29.8 ± 6.7 hours in experimental group. The control animal showed estrus after 22.0 h of sponge removal with estrus duration of 36 h. Estradiol concentrations in experimental lot were in the range of 2.2-15.0 pg/ml during estrus. Animals were observed for reversal towards estrus after 21 days. Only one experimental animal exhibited 2nd estrus. Pregnancy was confirmed by ultrasound after 60 days of sponge removal. The gestation period of 150.4 ± 3.4 days, a litter size of 1.3 ± 0.5 and a fertility rate of 87.5% were observed in the experimental lot. The control doe produced a male kid after 150.0 days of gestation. It is evident from this experiment that estrus can be synchronized in goats (Beetal x Dwarf) by locally prepared progesterone sponges with good fertility rate.

Key words: Progesterone sponges, estrus synchronization, estradiol, goat.

INTRODUCTION

Goat is important with reference to the preference for its meat in Pakistan. There are many breeds of goat which are seasonal breeders and have delayed puberty, a long postpartum period and kidding interval, such as Beetal goat has a kidding interval of 357 days (Acharya, 1982). Moreover, there is a large demand of goats at the time of Eid-ul-Azha in Pakistan and their prices are very high at that time due to shortage of animals. The goat meat is also very expensive year round. To overcome these problems and to move towards commercial farming, synchronization seems to be an important management tool. For a developing country like Pakistan, it is better to seek for the synchronization strategies which are cost effective and easily approachable. The synchronization of estrus in goats by medroxyprogesterone acetate (MAP) sponges has been accomplished in many advanced countries in the world (Robin *et al.*, 1994; Rathbone *et al.*, 1998). However, progesterone sponges are not commercially available in Pakistan and have not been trialed yet in our local breeds. Therefore, the present study was planned to (i) prepare MAP sponges in the laboratory and to see their effect on the induction and

synchronization of estrus in low breeding season and subsequent fertility in a mixed breed of goat (Beetal x Dwarf), and ii) to determine time from sponge removal to the onset of estrus and duration of induced estrus.

MATERIALS AND METHODS

Experimental animals

Ten adult female goats (Beetal x Dwarf) with almost similar age (1.5-2.0 years) and weight (22-25 Kg) were selected from the lot maintained at NIAB (Nuclear Institute for Agriculture and Biology) Jhang Road, Faisalabad, Pakistan on the basis of postpartum period (>2 months) during the low breeding season from May to December, 2007. Since the main objective was to confirm the functioning of the locally prepared MAP sponges, so more number of animals in the experimental group (8 does) were selected than control group (2 does). Different fodders such as *Sorghum vulgare*, *Medicago sativa* and *Sesbania aculeata* etc, were available at the farm in different seasons for free grazing. Water was provided *ad libitum*. Goats were confirmed nonpregnant by ultrasound. A buck was introduced in the herd during the experiment for breeding purpose.

Preparation of sponges

Sponges were prepared by polyurethane foam sheet according to Robinson's method (Robinson, 1965), tied with soft nylon thread and washed with ethanol. Sixty (60) mg medroxyprogesterone acetate was dissolved in 5 ml ethanol and pipetted on the sponge. Ethanol was allowed to evaporate by suspending sponges at room temperature overnight. Sponges for control animals were only pipetted with 5 ml ethanol. Next day, sponges were dusted with streptomycin.

Treatment and post-treatment monitoring

A sterilized glass applicator and a speculum were used to insert the sponge in the vagina of the animals. Sponges were left in the animals for 16 days. On 17th day, all the sponges were removed. Observation was recorded for behavior of goats toward sponges and for estrus signs thrice daily from 6:00 am to 6:00 pm till the end of behavioral signs of estrus in all goats. The time from removal of sponge to the onset of estrus and duration of estrus were also observed. Blood sampling was carried out 2 hourly during estrus period of each goat in the day time only. The serum was separated by centrifugation (2000 x g, 15 min) and frozen in plastic tubes at -20 °C until analyzed. Serum estradiol concentrations were measured by the solid-phase radioimmunoassay (RIA) using the kits (coat-A-count; Diagnostic Products Corporation, 5700 West 96th Street, Los Angeles, CA 90045, USA). The sensitivity of assay was <5.00 pg/ml with intra- and inter-assay coefficients of variation of 5.7 and 8.1%, respectively.

Breeding was natural and goats non-reversed to estrus were assumed to be pregnant. The pregnancy was further confirmed by ultrasound after 60 days of sponge removal. Observations regarding conception, gestation, parturition and litter size were recorded and data were analyzed in terms of standard deviation to the group mean.

RESULTS AND DISCUSSION

Goats felt easy with sponges and no behavioral changes were observed after sponge insertion and

removal. The retention rate of sponges was 100%. All the experimental goats exhibited estrus after removal of sponges. The time from sponge withdrawal to the onset of estrus ranged from 21 to 100 h. The duration of estrus was observed in the range of 22 to 36 h in experimental group. One of the control animals showed estrus after 22.0 h of sponge removal and showed estrus duration of 36 h (Table 1). These results are in accordance with previous studies performed on goats using commercial sponges (Greyling and Van Der Nest, 2000). In multiparous Karakul ewes, 100% estrus response has been achieved using MAP sponges with a co-treatment of eCG (Hashemi *et al.*, 2006).

The time to onset of estrus and duration are important in controlled reproduction programmes. Researchers have reported the onset of estrus within 18-96 hours following progestagen withdrawal in Saanen and Black Bengal goats (Alacam *et al.*, 1985; Ishwar and Pandey, 1990). Walker *et al.* (1989) reported a mean time from sponge withdrawal to onset of estrus of 69 h, which is closer to the value in the present study (65 h). The difference in onset timing of estrus may be due to breed difference.

The mean estrus duration of experimental lot in the present study is similar to 31.5 ± 15.0 and 31.1 ± 14.7 h reported by Greyling and Van-Der-Nest (2000) in Indigenous Feral and Boar does, respectively, synchronized with MAP sponges. In a recent study on synchronization of West African Dwarf goats by progesterone injections given for 14 days, the estrus duration averaged 31.7 ± 0.22 h (Abu *et al.*, 2008). The estrus response of one of the control females in the present trial can be contributed to other social interactions such as female-female effects which have been demonstrated in female goats kept in close contact (Restall *et al.*, 1995).

In the present trial, animals were observed for reversal towards estrus after 17-22 days. Only one experimental goat exhibited natural estrus and conceived at 2nd estrus. All the other goats conceived at the first estrus after sponge removal. A fertility rate of 87.5% was observed in experimental lot.

Table 1: Estrus response and subsequent fertility with medroxyprogesterone acetate impregnated sponges in goat (Beetal x Dwarf)

Parameters	Group	
	Control	Experimental
Total number of animals (n)	2	8
Estrus response (%)	50	100
Time from sponge removal to estrus (h)	22.0	65.4 ± 24.0
Duration of estrus (h)	36.0	29.8 ± 6.7
Estradiol conc. (pg/ml) at estrus	2.5-9.0	2.2-15.0
Fertility rate (%)	50.0	87.5
Gestation period (days)	150.0	150.4 ± 3.4
Litter size	1.0	1.3 ± 0.5

The control doe gave birth to a male kid. Fertility with intravaginal sponges varies greatly (33-100%), depending on species, breed, co-treatment, management and mating system but the treatment generally is very effective, giving acceptable conception rates (Wildeus, 2000; Hashemi *et al.*, 2006).

In the present study, estradiol concentrations were found in a higher range during behavioral estrus in experimental lot, as well as in control animal (Table 1). These high levels of estradiol further confirmed the presence of estrus phase in animals (Błaszczuk *et al.*, 2004). In dwarf goats, mean serum estradiol level during estrus has been reported to be 7.7 ± 1.7 pg/ml (Khanum *et al.*, 2008).

It is evident from the results of this study that locally prepared intravaginal sponges impregnated with MAP could serve as an efficient synchronization agent in goats, giving a high conception and fertility rate. However, further investigations in this regard on herd basis are required to further exploit the potential of these sponges.

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