

CHARACTERIZATION OF ENDOCRINE EVENTS AT OESTRUS IN DWARF GOAT (*CAPRA HIRCUS*)

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ABSTRACT

This study was conducted to characterize the profiles of LH, estradiol and progesterone hormones during oestrus in Dwarf goats. Five does were synchronized into oestrus with 2 intramuscular injections of PGF_{2α} at an interval of 10 days. Blood samples were drawn at 8 h intervals from 0 to 77 h after second injection and hormones were estimated by radioimmunoassay (RIA). One of the does did not show oestrus. In two goats, LH rises were observed from hours 25-45 and attained peak levels at h-70 after second PGF₂ injection. In two other does the rise in LH was significantly earlier and reached peak levels at 24-30 h. The concentration of LH ranged between 7.5 and 30 ng/ml (mean 19 ng/ml). The estradiol peaks in does were noticed at the same time as that of the LH. Estradiol concentrations varied between 9 and 16 pg/ml (mean 12 pg/ml). The progesterone remained at basal levels (0.1-0.2 ng/ml) throughout the oestrus in all animals. These results indicate that the estradiol and LH rises have temporal relationship with each other, rising almost at the same time and LH fall was earlier than estradiol.

Key words: Oestrus, goat, progesterone, estradiol, LH.

INTRODUCTION

The Dwarf (Teddy) is one of the popular breeds of goat reared in Pakistan. It is an early maturing non-seasonal breeder having high reproductive efficiency (Prasad, 1979; Khanum *et al.*, 2000). It has high prolificacy with 3 kiddings in two years (Srivastava *et al.*, 1968; Khan *et al.*, 1982). However, its milk production is poor and often insufficient to sustain adequate kid growth. The average body weight of adult males at one year of age is 22.98 ± 2.96 kg, whereas females of the same age weigh 13.91 ± 1.54 kg (NIAB Farm Data, 1992). In Pakistan, where this breed plays an important role in the economy of the country, its reproductive physiology has not been well understood.

Oestrus is a short phase of reproductive cycle in does, which involves some important events leading to ovulation. This phase can be manipulated to synchronize does in to a uniform group to prepare batch of kids, avoiding the severity of extreme seasons. Measurement of the concentrations of hormones associated with reproductive function and their temporal interrelationship can aid in the evaluation of reproductive status of does. The pre-ovulatory LH peak in the goat that occurs near the oestrus is preceded by a rise in the concentration of estradiol, 1 or 2 days before oestrus (Rawlings and Cook, 1993; Okada *et al.*, 1996).

The coordination of all these phenomena is necessary for getting high fertility rates.

These aspects of reproductive physiology of Dwarf goat have not been thoroughly studied in Pakistan. The purpose of this research was to study the hormonal profiles and their temporal interrelationship during oestrus period in Dwarf goats.

MATERIALS AND METHODS

Five Dwarf does, approximately one year of age and 12 to 14 kg weight, were selected at Biosaline Research Station, Lahore, Pakistan. Animals were allowed free grazing. The study was performed in October, 2003. The experimental animals were given two intramuscular injections (0.5 ml each) of Estrumate (Cloprostenol; a synthetic analogue of PGF_{2α} at 125 ug/ml) at an interval of 10 days. The time of second injection was taken as 0 hour. After second injection an intact buck was introduced in the herd for oestrus detection. Blood sampling from the jugular vein of does was carried out from 0 to 77 h after second injection with an interval of 8 hours. Serum was separated by centrifugation (2000 rpm, 15 min) and frozen in plastic capped tubes at -20°C until analysis.

The serum progesterone and estradiol concentrations were determined by solid-phase radioimmunoassay (RIA) kits (coat-A-count progesterone and estradiol; Diagnostic Products

Corporation, 5700 West 96th Street, Los Angeles, CA 90045). The sensitivity of the assays for progesterone and estradiol were 0.015 ng/ml and 0.69 pg/ml, respectively.

LH was assayed by a double-antibody RIA method (Kanai and Ischikawa, 1988). For this assay NIDDK-ovine LH was used for radiiodination and standard preparation, rabbit anti-ovine LH serum as the first antibody, and goat anti-rabbit gammaglobulin as the second antibody. The sensitivity of the assay was 0.1 ng/ml. The intra-assay and inter-assay coefficients of variation were 6.77 and 0.12%, respectively.

RESULTS AND DISCUSSION

In the present study, in two goats, LH rises were observed from 25-45 h and LH attained peak levels at h-70 after second PGF_{2α} injection (Fig. 1A and B). While in other two goats LH reached peak levels at 24-30 h after second PGF_{2α} injection (Fig. 1C and D). The peak concentrations of LH ranged between 7.5 and

30 ng/ml (mean 19 ng/ml). However, one doe did not show oestrus.

These results conform to those of some earlier findings on characterization of endocrine events during oestrus in goat. Medan *et al.* (2004) reported oestrus at 55.2 ± 2.3 h and LH surge occurred at 62.8 ± 1.4 h after PGF_{2α} injection in goats. In another study with Canary goats (Gonzalez-Valle *et al.*, 1998), the total interval from progesterone sponge withdrawal to LH peak has been reported as 77.5 ± 0.9 h and its peak level averaged 44 ± 5.3 ng/ml.

Estradiol peak was observed at h-70 in two does in which LH peak was also observed at h-70 after second PGF_{2α} injection (Fig. 1A and B). In 2 other does, estradiol was found to have peak levels at h-24 and 30. Estradiol peak concentrations varied between 9 and 16 pg/ml (mean 12 pg/ml). The LH and estradiol rises were found to have intimate temporal relationship with each other, rising almost at the same time. However, the LH fall was earlier than the estradiol fall in two animals (Fig. 1A and D), whereas in two other goats fall in LH

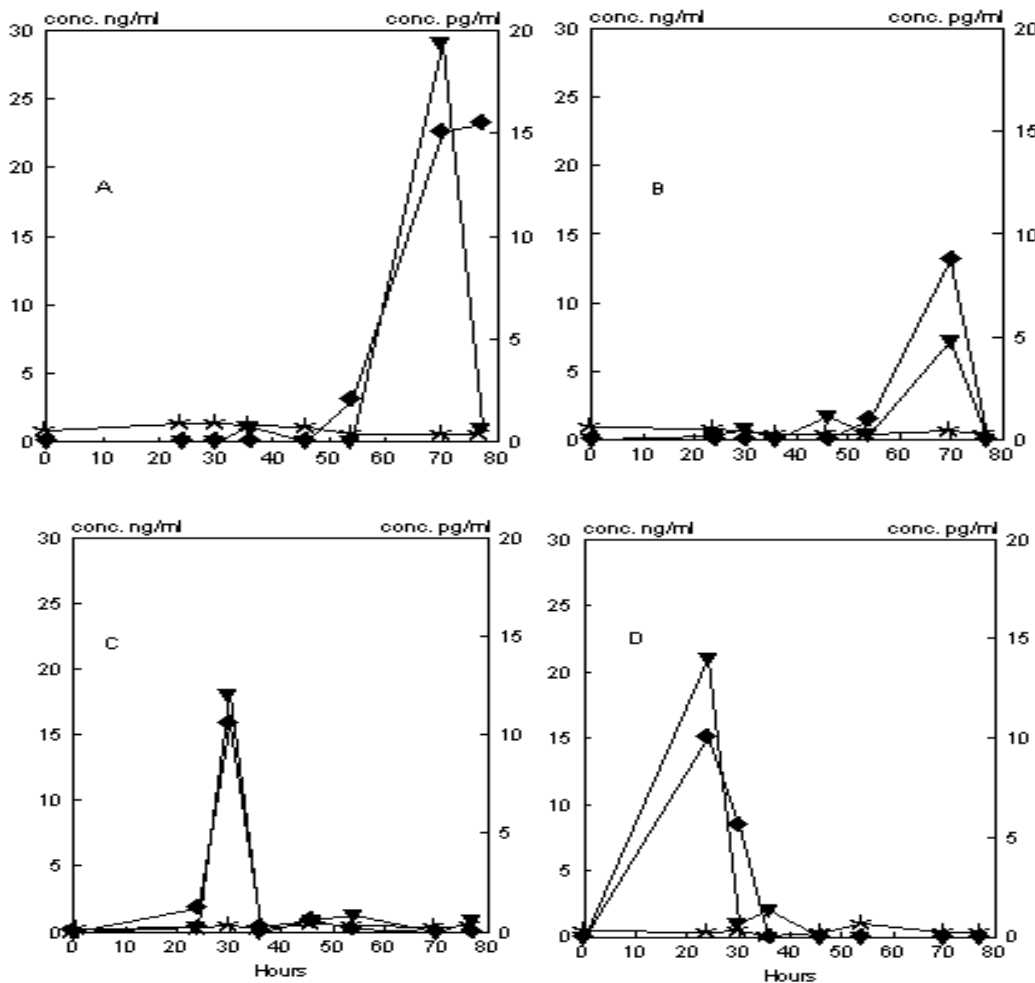


Fig. 1: Serum profile of LH (▼; ng/ml), progesterone (*; ng/ml) and estradiol (◆; pg/ml) in four Dwarf goats (A, B, C and D) during oestrus period

and estradiol was at the same time (Fig. 1B and C).

The estradiol levels during oestrus phase of other does and sheep were found comparable to the levels in Dwarf goats. Blaszczyk *et al.* (2004) has reported plasma estradiol levels in goats during induced estrus as 15.3 ± 5.0 pg/ml in autumn and 12.3 ± 3.8 pg/ml in spring. The sequence of changes in the estradiol level and its temporal relationship with LH as observed in this study is almost similar to that observed in Finn-Merino ewes (Campbell *et al.*, 1990).

The progesterone concentrations remained at basal levels of 0.1-0.2 ng/ml throughout the oestrus, as observed by others (Zarkawi, 2000; Khadiga *et al.*, 2005). The fall in basal level of progesterone was found coincident with the increase in estradiol level. This was in agreement with the Pant *et al.* (1977), who reported that the decline in the concentration of progesterone 12 hours before oestrus was coincided with the increased estradiol concentration. Tanaka *et al.* (1995) suggested that after luteolysis, GnRH pulse generation becomes fully potentiated to induce the final follicular development and to stimulate estradiol secretion, which eventually provokes the induction of the preovulatory LH surge and hence ovulation.

It was concluded that LH and estradiol peaks have remarkable temporal relationship at oestrus in Dwarf goat, rising almost at the same time, while progesterone remains at basal level. However, due to pulsatile secretion pattern and short duration of LH peak observed in conjunction with ovulation in most domestic species, the frequency of sampling requires to be in the order of 10 minutes to ensure detection of all the pulses (IAEA Technical Report Series No. 233, 1984). So it was felt that frequent sampling is required to substantiate these results.

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