

## **Progesterone Secretion During the Estrous Cycle in Garole Ewes (*Ovis aries*)**

DIPYAMAN SENGUPTA\*, SIDDHARTHA BASU AND DEBASIS MAZUMDAR

*Department of Veterinary Gynaecology & Obstetrics, West Bengal University of Animal & Fishery Sciences  
 Belgachia, Kolkata 700037, India*

*E-mail : dipyamansenguptal@gmail.com*

*\*Correspondence*

### **Abstract**

We studied the functional activity of corpus luteum in Garole ewes (n=6) during the estrous cycle. Blood progesterone concentration has been measured during the estrous cycle to assess the functional activity of corpus luteum. In Garole ewes the average length of estrous cycle was found to be  $15.87 \pm 0.75$  days. Garole ewes have subtle estrous symptoms that was detected by advancement of ram and ewes standing to be mounted. The average progesterone concentration at estrous has been found to be  $0.27 \pm 0.02$  ng/ml. In this breed the corpus luteum starts secreting progesterone from day 3 ( $0.4 \pm 0.05$  ng/ml) onwards. There is significant rise in progesterone concentration from day 3 to day 9 and on day 11 being the maximum ( $5.7 \pm 0.29$  ng/ml). From day 14 onwards there is sharp and significant fall in progesterone concentration with ewes returning to heat on day 17. Thus, day 14 is the day of onset of luteolysis in this breed.

**Key words :** Garole ewes, Estrous cycle, Corpus luteum, Progesterone.

Estrous cycle in domestic animals is divided into pro-estrous, estrous, met-estrous and di-estrous phase. However, the length of estrus cycle in ruminants is largely under the control of life span of corpus luteum i.e. the diestrous phase. Progesterone secreted by the corpus luteum is the main gonadal hormone during the diestrous phase that exerts negative feedback on hypothalamus and pituitary to suppress the release of GnRH and FSH/LH respectively. Moreover high level of progesterone early in the estrous cycle is vital for successful conception (1). A detailed study of progesterone concentration on each day of estrous cycle in Garole ewes has therefore been conducted to determine the day when CL starts secreting progesterone, progesterone secretion reaches its peak and the day of onset of luteolysis.

### **Methods**

A total of 6 adult, normal cycling (estrous cycle length of approximately 14 to 16 days) and non-mated Garole ewes of about 2 years of age and approximately 12 to 15 kg body weight were used for conducting the experiments. All ewes were estrous synchronized by two PGF<sub>2α</sub> (lutalyse 10 mg/ewe i.m.) treat-

ments 9 days apart before the experiments. All animals used for the present investigation were kept under uniform standard of managemental practices including the schedule of nutrition.

Starting from the day of estrous (day 0) blood samples were taken on each day until the ewes were observed in heat. Heat was detected by a vasectomized ram. After separation of serum the samples were stored at -20C until use. Progesterone concentration was assayed in duplicate by Enzyme-Linked ImmunoSorbent Assay (ELISA) by using ELISA kit (Lilac Medicare) following the manufacture's protocol.

*Statistical Analysis.* The change in progesterone concentration with day was analyzed by regression analysis (2). The progesterone concentration of ewes on two different day of estrous cycle was compared by paired *-t* test.

### **Results and Discussion**

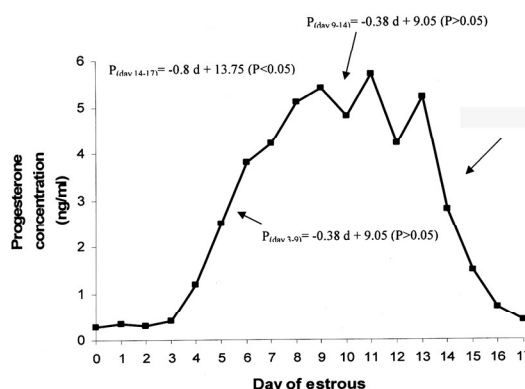
Garole ewes had an average estrous cycle length of  $15.87 \pm 0.75$  days. The estrous behavior of the females was inconspicuous in this breed. The only detectable symptom was advancement of male and the ewes standing to be mounted. The progesterone con-

centration on the day of estrous averaged  $0.27 \pm 0.02$  ng/ml. However, it has been reported that in Malpura ewes the progesterone concentration on the day of estrous was  $1.17 \pm 0.36$  ng/ml (3). In Dorset Horn Malin and Malin ewes the mean progesterone concentration during the follicular phase of estrous cycle was reported to be 0.19 and 0.26 ng/ml in respectively (4).

Regression analysis showed that the change in progesterone concentration was non-significant between day 0 and day 3 of estrous cycle, however there was significant ( $P < 0.01$ ) rise in progesterone concentration between day 3 and day 4 (Fig. 1). Thus in the Garole ewes, the secretory activity of corpus luteum starts from day 3 ( $0.4 \pm 0.05$  ng/ml) to day 4 ( $1.2 \pm 0.21$  ng/ml) of the estrous cycle and first four days can be taken as met-estrous in this breed (Fig. 1). From day 4 to day 9 there was significant ( $P < 0.01$ ) rise in progesterone concentration indicating rapid rise in secretory activity of the corpus luteum but thereafter from day 9 to day 14 the change in progesterone concentration with non-significant. Similar results have been observed in Malpura ewes (5) where there was sharp rise in progesterone concentration on days 4, 8 and 12 and then declined on day 16.

The maximum progesterone concentration of  $5.7 \pm 0.29$  ng/ml was found on day 11 of estrus cycle. This differed from the observed peak progesterone concentration of 2.94 ng/ml during the luteal phase in Dorset Horn Malin and Malin ewes (4). This might be due to higher ovulation rate in Garole ewes as this is the only know Indian breed to possess high fecundity *fec B* gene (6). During day 8 to day 14 of estrous cycle we find a zig-zag rise and fall of progesterone concentration that might be due to pulsatile nature of release of progesterone by the corpus luteum. However, from day 14 there was significant ( $P < 0.05$ ) and progressive fall in progesterone concentration on each day until the ewes were detected in heat by day 17. Thus, day 14 can be considered to be the day of onset of luteolysis in this breed. Since luteolysis is mediated by uterine  $\text{PGF}_{2\alpha}$  it can be conferred that in Garole ewes the uterine  $\text{PGF}_{2\alpha}$  pulses are released close to day 14 that results in luteolysis.

Moreover, we observed that the ewes started showing pro-estrous signs with advancement of male once the progesterone concentration fell below 1 ng/ml. Since the male is able to detect estrogen in



**Figure 1.** Progesterone secretion by Garole ewes (n=6) during the estrous cycle.

the urine of female approaching estrous early, it might be that lowering of progesterone level below 1 ng/ml resulted in onset of folliculogenesis. Thus progesterone concentration above 1 ng/ml is necessary in Garole ewes for suppressing the activity hypothalamus and pituitary gland and preventing the animals to come to heat.

Thus from this study it can be concluded that Garole ewes start secreting progesterone by day 3 to day 4 that reaches peak by day 9 indicating maximum growth of corpus luteum. Thereafter during days 9 to 14 the progesterone secreted by the corpus luteum remains at a steady rate with daily variations in progesterone secretion. Day 14 can be considered the day of onset of luteolysis in this breed as from this day there is sharp fall in progesterone concentration until the ewes were detected in heat.

## References

1. Mann G. E., M. D. Fray and G. E. Lamming. 2006. Effects of time of progesterone supplementation on embryo development and interferon-t production in the cow. *Vet J.* 171 : 500—503.
2. Anonymous. 1997. SPSS 7.5 copyright 1997 by SPSS Inc., USA Base 7.5 Application guide.
3. Naqvi S. M. K., G. K. Pandey, Q. Sheikh, K. K. Gautam, A. Joshi and J. P. Mittal. 2002. Plasma progesterone levels during estrous cycle in Malpura ewes. *Ind. J. Small Rum.* 8 : 28.
4. Musaddin K. H., H. S. Tan, M. Y. M. Khushry and I. Jasm. 1996. Resumption of postpartum ovarian activity in Malin, Dorset Horn Malin and Long Tail ewes. *Mardi Res. J.* 24 : 31.

5. Tarakhede R. C., J. D. Honmode and M. S. Kudu. 2002. Seasonal variations in estradiol-17 $\beta$  and progesterone level during oestrus cycle in malpura ewes. *Ind. J. Anim. Sci.* 72 : 296.
6. Land R. B. and D. W. Robinson. 1985. *Genetics of reproduction in sheep*. Butterworths, UK.