

SERUM PROGESTERONE AND ESTRADIOL-17 β PROFILES IN NILI RAVI BUFFALOES (*BUBALUS BUBALIS*) WITH AND WITHOUT RETENTION OF FETAL MEMBRANES

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ABSTRACT

Serum progesterone and estradiol-17 β levels were estimated in Nili Ravi buffaloes (n=190) with and without fetal membranes retention in three agro-ecological zones of Punjab. The results showed that serum progesterone concentration was significantly higher (P<0.05) in buffaloes with retention of fetal membranes (RFM) compared to buffaloes without retention of fetal membranes (NRFM). The comparison amongst the three agro-ecological zones revealed that the mean serum estradiol-17- β level in buffaloes with RFM in the northern irrigated zone was significantly lower (P<0.05) compared to those in the southern irrigated zone and the arid zone, whereas the latter two zones did not differ (P>0.05) significantly from each other.

Key words: Retention of fetal membranes, buffaloes, progesterone, estradiol 17- β , agro-ecological zones.

INTRODUCTION

Economical milk production is a function of better production ability and reproductive efficiency alongwith cost effective feeding and management. The productive and reproductive performance of the buffalo is negatively influenced by the calving related reproductive disorders, especially retention of fetal membranes (El-Wishy, 2007). The incidence of retention of fetal membranes and genital prolapse is high in the buffalo compared to cattle (Arthur *et al.*, 1989; Laven and Peters, 1996). Samad *et al.* (1987) reported the highest incidence of genital prolapse (42.9%), followed by retention of fetal membranes (23.2%) and dystocia (20.7%) among the reproductive disorders in the riverine buffaloes.

Most buffaloes usually expel the fetal membranes within 8 hours following parturition. Retention of fetal membranes for 12 hours or more after parturition indicates abnormal condition which is one of the most important calving related disorders affecting economics of the farmer and the herd health (Laven and Peters, 1996). The incidence of retention of fetal membranes is increased by abortion, premature birth, dystocia, hypocalcemia, twin birth, high environmental temperature, old age of the female, induction of parturition, placentitis and nutritional disturbances (Han and Kim, 2005).

Steroids are fundamental in pregnancy maintenance and parturition, and are related to regulation of prostaglandin synthesis. Prostaglandin E₂ (PGE₂) production is stimulated by progesterone (Wooding *et al.*, 1996), and estrogens function to increase the prostaglandin F₂ (PGF₂) levels in the uterus (Rasmussen *et al.*, 1996). Progesterone levels are higher (Matton *et al.*, 1987), while estrogen levels are lower

(Thomas *et al.*, 1992; Kankofer *et al.*, 1996) than normal in cows with placental retention.

Information on the postpartum endocrinology in buffaloes is limited (Prakash *et al.*, 2005), especially in buffaloes with calving disorders like retention of fetal membranes (Mishra and Parkash, 2005). Therefore, the present study was planned to determine serum progesterone and estradiol 17- β concentrations in buffaloes affected with retention of fetal membranes (RFM) in three agro-ecological zones of Punjab, Pakistan viz. Southern irrigated, Northern irrigated and arid zones.

MATERIALS AND METHODS

Animals and sample collection

A total of 190 buffaloes of different parities with RFM and without RFM (NRFM) were selected from three different agro-ecological zones of Punjab province, Pakistan. The number of buffaloes with RFM located at Southern irrigated zone, Northern irrigated zone and Arid zone were 15, 10 and 15, respectively. Fifty NRFM buffaloes from each zone were taken as control. The buffaloes which failed to expel their afterbirth within 12 hours were referred as RFM, while those expelling the membranes within 12 hours were referred as control (NRFM). Blood samples were collected aseptically from jugular vein between 12 to 24 h after calving for hormonal assay (progesterone and estradiol-17- β), serum was separated and stored at -20°C.

Determination of hormone concentration

Progesterone concentrations in blood serum were determined through solid phase competitive ELISA by using commercially available kit (Bio Check, Inc. USA,

Lot. RN-28387). The sensitivity of the progesterone ELISA assay was 0.3 ng/ml, intra-assay precision was less than 7.1 % and interassay precision was less than 12.6%.

Estradiol 17- β concentrations in blood serum were determined through ELISA by using commercially available kit (Bio Check, Inc. USA, Lot. RN-27637). The sensitivity of the estradiol ELISA assay was 10 pg/ml, intra-assay precision was less than 24.1% and interassay precision was less than 26.7%.

The collected data was analyzed statistically through analysis of variance, using completely randomized design. Significant means were compared using Duncan's Multiple Range (DMR) test (Steel and Torrie, 1990).

RESULTS

Progesterone

The mean (\pm SE) serum progesterone levels of the buffaloes with and without RFM for each zone are depicted in Table 1. The NRFM buffaloes had significantly lower ($P < 0.05$) mean serum progesterone concentration compared with the buffaloes suffering from retention of fetal membrane in the southern irrigated zone. A similar trend was recorded in the northern irrigated zone and the arid zone. The comparison amongst the agro-ecological zones revealed that in RFM buffaloes the level in buffaloes of northern irrigated zone was significantly lower ($P < 0.05$) compared with those in the southern irrigated zone and the arid zone, whereas the difference between latter two zones was non significant. In NRFM buffaloes, no difference was seen among animals of the three zones.

Estradiol 17- β

The mean (\pm SE) serum estradiol-17- β levels in buffaloes suffering from retention of fetal membranes (RFM) and their healthy controls (NRFM) for each zone are shown in Table 2. Serum estradiol 17- β concentrations in NRFM buffaloes did not differ from RFM buffaloes in southern irrigated zone. However, in other two zones, the level of estradiol-17- β in control buffaloes was significantly higher ($P < 0.05$) compared with buffaloes suffering from retention of fetal membranes. The comparison amongst the three agro-

ecological zones revealed that the mean serum estradiol-17- β level in the buffaloes affected with retention of fetal membranes in the northern irrigated zone was significantly lower ($P < 0.05$) compared to the southern irrigated zones and the arid zone, whereas the latter two zones did not differ from each other. In NRFM buffaloes, serum estradiol levels in arid zone were higher ($P < 0.05$) than southern irrigated or northern irrigated zone, the difference between the latter two zones was non significant.

DISCUSSION

Significantly lower estradiol 17- β concentrations were recorded in buffaloes affected with retention of fetal membranes compared with controls in northern irrigated and arid zones in this study. A low estradiol 17- β concentration at calving in cows with retention of fetal membranes was also observed in different studies (Kankofer *et al.*, 1996; Wischral *et al.*, 2001b; Farzaneh *et al.*, 2006). The estradiol 17- β levels observed in this study are similar to those reported by Shah *et al.* (2007). Certain enzymes and hormones are responsible for the contraction of uterus in the normal expulsion process and for histological changes in fetal villi and maternal crypts (Shah *et al.*, 2007). Lower estrogen concentrations may cause reduced synthesis of PGF_{2 α} (Wischral *et al.*, 2001a). Shah *et al.* (2007) discussed stress as a factor resulting in increased amount of cortisol which might have increased the concentration of estradiol 17- β , leading to immediate initiation of calving process, while the placentomes are immature resulting in retained placenta.

This study indicates that concentrations of progesterone and estradiol 17- β vary between buffaloes with and without retention of fetal membranes which is indicative of possible role of these hormones in incidence of this disorder. Moreover, variation in serum concentrations of hormones in different agro-ecological zones may be due to different factors such as environmental temperature and humidity, malnutrition and management differences which vary among different agro-ecological zones may be responsible for the variation in hormonal profile and, thus, affecting the incidence of the problem.

Table 1: Mean (\pm SE) serum progesterone levels (ng/ml) in RFM and NRFM buffaloes maintained in three agro-ecological zones of Punjab, Pakistan

Condition of buffalo	Agro-ecological zones		
	Southern irrigated	Northern irrigated	Arid
Retention of fetal membrane (RFM)	0.75 \pm 0.02 ^{aA} (n=15)	0.56 \pm 0.04 ^{bA} (n=10)	0.69 \pm 0.02 ^{aA} (n=15)
No retention of fetal membrane (NRFM)	0.22 \pm 0.01 ^{aB} (n=50)	0.23 \pm 0.01 ^{aB} (n=50)	0.19 \pm 0.02 ^{aB} (n=50)

Values with different superscripts in the same row (small letters) and in the same column (capital letters) differ significantly ($P < 0.05$).

Table 2; Mean (\pm SE) serum estradiol 17- β levels (pg/ml) in RFM and NRFM buffaloes maintained in three agro-ecological zones of Punjab, Pakistan

Condition of buffalo	Agro-ecological zone		
	Southern irrigated	Northern irrigated	Arid
Retention of fetal membrane (RFM)	33.32 \pm 2.17 ^{aA} (n=15)	22.34 \pm 0.82 ^{bB} (n=10)	35.00 \pm 0.66 ^{aB} (n=15)
No retention of fetal membrane (NRFM)	35.88 \pm 0.71 ^{bA} (n=50)	34.59 \pm 0.33 ^{bA} (n=50)	41.87 \pm 0.67 ^{aA} (n=50)

Values with different superscripts in the same row (small letters) and in the same column (capital letters) differ significantly ($P < 0.05$).

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