Indian Journal of Animal Sciences **94** (2): 185–187, February 2024/Short communication
https://doi.org/10.56093/ijans.v94.i2.133736

Effect of dietary supplementation of Vitamin E on the resumption of cyclic ovarian activity in Murrah buffaloes

BHABESH MILI[1]✉ and SUJATA PANDITA[2]

Central Agricultural University, Jalukie, Peren, Nagaland 797 110 India

Received: 24 February 2023; Accepted: 4 December 2023

Keywords: Buffaloes, Progesterone, Postpartum, Vitamin E

The periparturient period around parturition in dairy cattle is characterized by negative energy balance, alteration of metabolic (Mili *et al.* 2014), and hormones of the somatotropic axis, i.e. GH-insulin-IGF-1-glucose signalling pathway (Mili *et al.* 2015a) for energy homeostasis, along with several immune suppression events, both innate and acquired defence mechanisms (Mili *et al.* 2015b). Hence, the inability of dairy cows to cope with these physiological events during the periparturient period leads to postpartum infectious and delayed resumption of postpartum luteal activity, folliculogenesis, and steroidogenesis in the ovarian follicles, especially in tropical climatic conditions. Thereby production performance of the dairy animal is seriously affected in terms of economic loss to farmers. Vitamin E acts as an antioxidant in the body that scavenges and reduces the presence of free radicalss nevertheles; the role of these antioxidants to the postpartum ovarian activities has not been studied adequately in buffaloes. Plasma progesterone (P_4) has been widely used to describe an ovarian activity, pregnancy status, and the time of artificial insemination (Adriaens *et al.* 2017), for enhancing fertility in dairy herds (Bruinjé *et al.* 2017). Peripheral P_4concentration acts as a Navigator™ system for reproductive management in the herd include monitoring of resumption of postpartum corpus luteum (CL) activity and estrus, apart from detection of pregnancy status (Bruinjé *et al.* 2017). Therefore, this study was aimed at assessing the effect of dietary supplementation of vitamin E on the resumption of cyclic ovarian activity in periparturient Murrah buffaloes through plasma P_4 hormones profile.

The present experiment was conducted from September 2011 till May 2012 at ICAR-National Dairy Research Institute, Karnal, Haryana. A total of twelve (n=12) Murrah buffaloes were selected from the ICAR-National Dairy research Institute herd for experimentation. All these buffaloes were maintained under general managemental practices as followed for the herd. These buffaloes were randomly divided into control group 1 and treatment group 2, consisting of 6 animals each. Feeding was done as per Kearl's (1982) standards based on changes in fortnightly body weight to group 1 (control feed). Group 2 buffaloes were supplemented with 2,000 IU α-tocopheryl acetate/day/head from 56 days prepartum to 21 days postpartum in addition to the control feed. The feed grade DL α-tocopheryl acetate was weighed accurately and mixed with concentrate for feeding. The water was provided *ad lib.* to all the experimental buffaloes. Blood sample (15 mL) from each buffalo was drawn in sterile heparinised vacutainer tube +21, +28, +35, +42, +49, +56 days after calving. Immediately after collection, the blood was transported to the laboratory in an icebox for further processing. The heparinized tubes were centrifuged at 3,000 rpm or 1008 g for 15 min and stored at –20°C until the analysis of progesterone concentrations. Plasma progesterone was estimated by a direct RIA as per the method described by Kamboj and Prakash (1993). The anti-progesterone serum (bspNR#2) was highly specific for progesterone (Prakash and Madam 2001). The sensitivity of the assay was 4 pg/tube, which corresponded to a plasma concentration of 0.2 ng/mL.The data were statistically analyzed using analysis of variance (ANOVA*)* with variables as treatments, and periods (day) by SAS software considering $P<0.05$ as the level of significance.

Plasma progesterone profiles of buffaloes with or without supplementation of vitamin E with individual buffaloes P_4 profile are presented in Fig.1. The individual animals' progesterone levels are presented in Table 1. Plasma P_4 levels were significantly higher in control group on 21st day and non-significantly higher on 49th day, while on all other days, the supplemented group had numerically higher P_4 levels but statistically non-significant. The overall P_4 profile of each buffalo was indicative of some ovarian activity; especially an active corpus luteum phase in the ovaries was evident from day 28 postpartum in supplemented group and day 42 in the control group. To the best of our knowledge, this is the first report of Murrah buffaloes being dietary supplemented with vitamin E, and

Present address: [1]College of Veterinary Sciences and Animal Husbandary, Central Agricultural University, Jalukie, Peren, Nagaland. [2]ICAR-National Dairy Research Institute, Karnal, Haryana. ✉Corresponding author email: bhabamili@gmail.com

Table 1. Postpartum progesterone profiles of buffaloes with or without supplementation of vitamin E

Group	Buffalo no.	Day postpartum					
		21	28	35	42	49	56
Control	470	0.43	1.96	0.22	0.44	2.22	0.31
	5766	2.69	1.25	1.85	0.27	2.30	2.45
	5809	7.31	2.73	0.26	0.26	2.66	4.05
	5354	0.28	0.20	0.38	2.93	0.20	2.90
	5308	0.23	0.20	2.53	2.91	5.31	2.21
	451	0.25	1.91	1.43	0.28	0.29	0.25
Mean± SEM		1.10±0.40	0.80±0.42	1.05±0.50	1.58±1.00	2.40±0.33	1.80±0.42
Treatment	5780	2.29	2.96	3.06	7.31	2.38	3.45
	5507	2.41	0.28	0.23	0.27	2.60	3.08
	5042	1.00	0.85	0.77	0.96	0.88	0.89
	436	0.20	0.28	2.05	2.50	2.89	2.28
	485	0.22	2.01	1.34	2.21	0.20	0.31
	420	0.23	2.28	3.30	0.38	2.02	1.90
Mean± SEM		0.94±0.46	1.68±0.33	1.95±0.39	2.17±0.51	2.04±0.75	2.15±0.44

quantifying the plasma P_4 profile to accesses the postpartum ovarian activities. Recent results are in agreement with previous reports on cows (Derar *et al.* 2011, Ali *et al.* 2017). Ali *et al*. (2017) reported elevated plasma P_4 levels (≤0.05) 7, 21, and 35 days after calving in vitamin E supplemented cows but didn't reveal any effect of the ovarian cyclic activities. Another study revealed that the antioxidants except for ascorbic acid, increases at the time of estrus and but they have not affected the resumption of postpartum ovarian activities in cows (Derar *et al.* 2011).

The plasma P_4 levels were >1.0 ng/mL from 28 days onwards in vitamin E supplemented groups against the 35 days in a control group, which indicated that vitamin E supplemented animals had an active luteal phase in the ovaries earlier than control, though statistically not significant. It might be due to failure to develop the normal size of CL following first ovulation after calving. The onset of the decline in plasma P_4 concentrations is variable, depending upon the time of regression of CL since CL is the only source of P_4 in cycling buffalo (Mondal *et al.* 2007). Also, there are reports indicating that the CL from the first ovulation after calving fail to develop to the normal size and had a shorter lifespan than CL of normal estrus cycles in cows (Willam and Roy 1981), with an average of 8.5±0.2

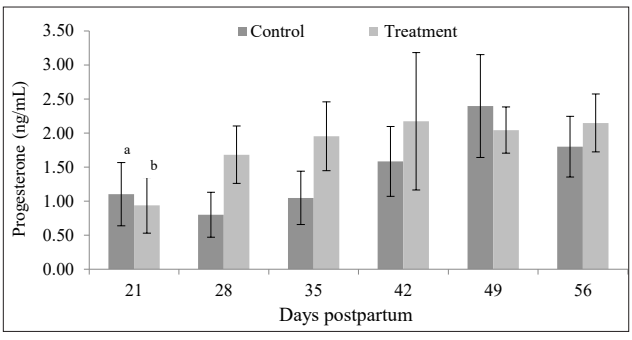

Fig. 1. Plasma progesterone concentration (Mean±SEM) during postpartum period in buffaloes with or without vitamin E supplementation. Superscripts (a, b) in the mean values indicates significant differences at P<0.05.

days luteal phases between first and second ovulation (Derar *et al.* 2011). The plasma P_4 levels > 1.0 ng/mL indicated the active CL in the ovaries. Peripheral P_4 concentrations concentration ≤0.4 ng/mL indicated the estrus phase or very early of the estrus cycle, whereas plasma P_4levels of 0.4-1.0 ng/mL indicated the early luteal phase and >1.0 ng/mL indicated the luteal phase in buffaloes (Mirmahmoudi and Prakash 2012) before declining to basal levels at the onset of next oestrus in buffaloes.

Based on the present study, it can be concluded that the dietary supplementation of vitamin E @2,000 IU day/ head during the peripartum period has no effect on the resumption of cyclic ovarian activity/steroidogenesis.

SUMMARY

The postpartum anestrus and silent estrus are the challenging cause for low reproductive efficiency in buffaloes especially in tropical climate conditions. This study was aimed at assessing the effect of dietary supplementation of vitamin E on the resumption of cyclic ovarian activity in periparturient Murrah buffaloes through plasma progesterone (P_4) hormone profiles. The Murrah buffaloes (n=12) were selected during their late gestation based on the expected date of calving that fall between November and February, from ICAR-National Dairy Research Institute livestock herd and were divided randomly into two groups (n=6). Buffaloes of group I were given only the control diet, while group II was supplemented with 2000 IU/day/head vitamin E along with control feed. Blood samples were collected from each buffalo at weekly intervals from day +21 to +56 after calving. Plasma P_4 was estimated by direct radioimmunoassay (RIA). The results revealed that plasma P_4 levels were statistically non-significant between groups except on day 21. However, the overall P_4 profile of each buffalo indicated ovarian activity; from day 28 postpartum in supplemented group and day 42 in the control group. From the experiment, it could

be inferred that the dietary supplementation of vitamin E has no effect on the resumption of cyclic ovarian activity/ steroidogenesis.

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