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Short Communication

CONSEQUENCE OF VITAMIN E AND SELENIUM ADMINISTRATION DURING TRANSITION PERIOD ON SERUM GLUTATHIONE PEROXIDASE LEVEL OF SURTI BUFFALOES

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SUMMARY

The present was carried out on twenty Surti buffaloes during their transient period. The animals were divided into two equal groups (n=10). Treatment group animals were treated with Inj. Vitamin E and selenium on day 60th, 45th, 30th and 15th day pre partum and on day 15th and 30th post-partum and Control group animals were given Inj. Normal Saline as placebo treatment intramuscular. Blood samples were collected before injection to be given, on the day of calving as well as 45 and 60 days postpartum. The mean serum Glutathione Peroxidase (GPx) level was non-significantly higher at 60th day and significantly lower at 45th day, 30th day and 15th day pre partum, on the day of calving and 15th day, 30th day, 45th day and non-significantly lower at 60th day post-partum in treatment group as compared to control group. Increased activity of glutathione peroxidase is considered indicative for oxidative stress and lower level of GPx in the treatment group as compared to control group was probably due to vitamin E and Se treatment in that group. GPx activity was found to be increased in buffaloes towards parturition indicating more oxidative stress at the time of parturition.

Keywords: Glutathione peroxidase, Selenium, Surti buffalo, Transition period, Vitamin E

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The transition or periparturient period, from 3 weeks before to 3 weeks after parturition, is a stressful time for dairy cows (Drackley, 1999). An imbalance between increased production of Reactive Oxygen Species (ROS) and reduced availability of antioxidant defenses near the time of parturition increases oxidative stress and may contribute to periparturient disorders in dairy cows (Gitto *et al*., 2002). A number of vitamins and trace minerals are involved in the antioxidant defense system and deficiency of any of these nutrients may depress immunity in transition dairy cattle. Vitamin E is an important antioxidant that has been shown to play an important role in immuno- responsiveness and health in dairy cows (Weiss and Spears, 2006). In cattle, selenium deficiency can have economically significant impacts such as reduced fertility, placental retentions, and the incidence of mastitis and metritis (Spears and Weiss, 2008). In the immune system, selenium plays a role in the formation and the activity of helper T, cytotoxic T and Natural killer (NK) cells (Petrie *et al*., 1989).

In Vitamin-E and Selenium deficiency condition, free radicals accumulate and not only damage cell membranes, but also disrupt several processes linked to the synthesis of steroids (Seagerson and Libby, 1982) and prostaglandins (Harrison and Conrad, 1984). Several metalloenzymes such as Superoxide Dismutase (Cu, Zn, and Mn containing), Glutathione Peroxidase (Se bearing) and Glutathione Reductase (GR) are critical in protecting the internal cellular constituents from oxidative damage (Weiss, 2006). Glutathione reductase works in conjugation with glutathione peroxidase (GPx) and regenerates the reduced form of low molecular weight thiol, i.e. Glutathione (Griffith, 1999). Very little work has been conducted on effect of vitamin E and selenium on serum GPx level during periparturient period especially in Surti buffaloes,therefore the present study was planned.

The present research work was undertaken on twenty (20) Surti buffaloes during their transient period i.e. two months before their expected date of calving to two months after parturition, dividing into Treatment (n=10) and Control (n=10) groups, at Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat over a period of twelve months from May, 2014 to April, 2015. The animals were fed green fodder, hay and compounded concentrate, as per the standard feeding schedule followed on the farm. The animals had free access to drinking water. The animals were also washed and sprinkled with water twice daily to reduce heat stress. The treatment protocol is given in Table 1.

Blood samples were collected from all those selected animals aseptically by jugular vein puncture in serum clotting vaccutainer. Serum was separated and stored in 4.5 ml plastic storage at –20 °C in deep freezer until analysis. Serum GPx was determined by using a commercial kit (BioVision Research Product, Catalog #K762-100).

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Table 1

Treatment regimen of the experiment

Groups	Treatment Schedule / Protocol (n=10)	Dose & Route	Blood collection schedule
Treatment Group	Inj. Vitamin E and Selenium (E-CARE Se*) Injected on day 60, 45, 30 and 15 pre partum and day 15, 30 post-partum.	10 ml I/M	On day 60, 45, 30, 15 prepartum, on the day of parturition and 15, 30, 45 and 60 day post-partum
Control Group	Inj. Normal saline was Injected on day 60, 45, 30 and 15 before expected date of parturition and after parturition on day 15, 30.	10 ml Normal saline, I/M	

The tests of significance for pregnant vs. non-pregnant in treatment vs. control groups were made by Standard Student's paired't' test. The fortnight-wise variation within the group was tested by using completely randomized design as well as the mean differences between and within the groups were tested using Duncan's New Multiple Range Test (DNMRT) at 1 and 5 per cent level of significance.

The mean serum glutathione peroxidase level in treatment versus control group was found non-significantly higher at 60th day and significantly ($p<0.05$ and $p<0.01$) lower at 45th day, 30th day and 15th day before parturition and it was significantly ($p<0.01$ and $p<0.05$) lower as 116.486 ± 3.060 vs. 128.116 ± 2.895 mU/ml on the day of calving and 15th day, 30th day, 45th day and non-significantly lower at 60th day after parturition (Table 2).

The overall pre and post-partum mean serum glutathione peroxidase values in the treatment group were found non-significantly lower as compared to control group.

The serum glutathione peroxidase levels in treatment and control groups found non-significantly higher at 60th day prepartum than that of 60th day postpartum; 45th day prepartum than that of 45th day postpartum. However, it was non-significantly lower at 30th day prepartum than that of 30th day postpartum and non-significantly higher at 15th day prepartum than that of 15th day postpartum in treatment and control groups.

The mean serum glutathione peroxidase level was found to increase significantly ($p<0.05$) from 60th day to 45th day, 30th day and 15th day prepartum and on the day of calving and thereafter significantly ($p<0.05$) decreased at 15th day, 30th day, 45th day and 60th day postpartum in both treatment and control groups.

Glutathione peroxidase activity was found significantly ($p<0.05$) increased from 60th day prepartum to the day of calving and then to the lowest level at 60th day

Table 2

Mean serum Glutathione Peroxidase (GPx) levels (mU/ml) at different fortnightly intervals peripartum in antioxidant treated and control groups of Surti buffaloes (Mean±SEM)

		Glutathione Peroxidase (GPx) mU/ml		
Peripartum Phases	Days	Treatment (n=10)	Control (n=10)	't'-Value
Prepartum	60	52.230 ± 0.351^{ab}	51.594 ± 0.234^{a}	1.506
	45	57.355 ± 0.661^{yc}	60.030 ± 0.763^{xb}	2.650*
	30	63.287 ± 1.440^{yd}	69.267 ± 1.491^{xc}	2.886**
	15	73.682 ± 1.705^{ye}	79.548 ± 1.432^{xd}	2.634*
	Overall	61.639 ± 1.397	65.110 ± 1.751	1.550
Day of Parturition	0	116.486 ± 3.060^{yf}	128.116 ± 2.895^{xe}	2.761**
Postpartum	15	73.370 ± 1.260^{ye}	79.285 ± 1.369^{xd}	3.178**
	30	63.876 ± 2.060^{yd}	70.278 ± 1.674^{xc}	2.412*
	45	$56.290\pm0.788y^{bc}$	59.718 ± 0.822^{xb}	3.011*
	60	50.059 ± 0.484^{a}	50.826 ± 0.288^{a}	1.363
	Overall	60.899 ± 1.526	65.027 ± 1.807	1.745
Overall	't'-Value	0.358	0.033	—
	P-Value	0.722	0.974	—
	Pooled	67.404 ± 2.079	72.074 ± 2.396	1.472

Means bearing different superscripts (a,b,c) within a column (between phase intervals) differ significantly ($p<0.05$), while means bearing different subscripts (x,y,z) within a row (between the groups) differ significantly ($p<0.01$ & $p<0.05$).

postpartum in treatment and control groups of Surti buffaloes, respectively. In concurrence with the present findings, Maurya *et al*. (2014) found significantly ($p<0.05$) higher plasma glutathione peroxidase activity in control and vitamin E and zinc supplemented cows on the day of calving as compared to 60th days pre- and post-partum levels. Similarly, Bernabucci *et al*. (2002) reported an increase in blood GPx level in prepartum cows with peaks around calving possibly as a homeostatic control.

Pathan *et al.* (2009) observed an increase in the level of GPx with the advancement of pregnancy in Surti buffaloes. Sordillo *et al*. (2007) found GPx activity significantly ($p<0.05$) higher on 21 day after calving compared to 21 day before calving. Increased activity of glutathione peroxidase is considered indicative for oxidative stress and significantly ($p<0.05$) lower level of GPx in the treatment group as compared to control group in the present study from 45th day prepartum to 45th day postpartum might be the effect of vitamin E and Se treatment in that group.

In the present study, higher GPx activity was observed in the control group as compared to vitamin E and Se supplemented group and the level was found increased from 60th day to the day of parturition in both the groups, whereas, Tanha *et al*. (2011) recorded GPx level significantly higher on 7th and 14th day before calving in glutamine supplemented group compared to control group of cows, however, the level increased from 21st days before to the day of parturition in both the groups; Wullepit *et al*. (2012) reported that plasma GPx activity was non-significantly affected at the time of parturition but showed a clear trend to be higher after calving with a peak at 2 weeks postpartum in HF cows.

The mean plasma glutathione peroxidase activity of control and treatment group was significantly ($p<0.05$) higher on the day of calving as compared to 60th day before calving. It was significantly ($p<0.01$) higher in control group on the day of calving as compared to treatment group of buffaloes and it might be due to cope up with more stress as compared to vitamin E and Se treated group. After parturition its activity started decreasing up to 60th day of lactation in control and treatment group.

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