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Effect of Vitamin C on Trace Minerals Profiles during Pre and Post Cesarean Section in Dystocia Affected Water Buffaloes (*Bubalus bubalis*)

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ABSTRACT

Trace minerals like copper, iron, zinc and manganese have been described as non-enzymatic component of endogenous antioxidants. Vitamin C role as an antioxidant is well documented in literature and treatment with vitamin C reduced plasma cortisol in buffaloes. Endogenous trace minerals plasma variations were assessed following vitamin C administration in buffaloes.

Key words: *Trace minerals, Vitamin C and buffaloes.*

INTRODUCTION

The trace elements which are required by buffaloes includes cobalt (Co), copper (Cu), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se) and zinc (Zn)[1]. Trace minerals like Fe, Mn, Cu and Zn have been described as non-enzymatic component of endogenous antioxidants which provides efficient mechanisms to prevent damage to cells and tissues by oxidants[2]. Imbalance and deficiency of single or combined trace elements can induce reproductive failure in ruminants[3]. Elevated plasma cortisol levels can reflect quantitative value of stress during parturition in buffaloes and Sathya *et al.*[4] reported increased plasma cortisol values in dystocia groups than normal calving buffaloes on calving day. Vitamin C role as an antioxidant is well documented in literature and treatment with vitamin C reduced plasma cortisol by 52.14% in dystocia affected buffaloes in comparison to untreated group[5]. Trace minerals copper, iron, zinc and manganese were found to be increased in dystocia affected buffaloes after obstetrical maneuvering due to removal of stress associated with dystocia[6].

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Therefore, the present study was undertaken with an objective to assess endogenous trace mineral status (copper, iron, zinc and manganese) and modulation of their concentration following vitamin C administration.

MATERIAL AND METHODS

Twenty buffaloes were divided into two groups (dystocia control and dystocia treatment group). Each group was comprised of ten dystocia affected buffaloes subjected to caesarean section. All the animals received routine supportive therapy consisting of parentral antibiotics, dexamethasone, fluid therapy, haemostatic, vitamin B complex, anti-histaminic, Mifex, NSAIDS and intrauterine antiseptics post-delivery of the foetus. The buffaloes of dystocia treatment group were additionally given vitamin C 30 ml (CMAC; containing ascorbic acid 250mg/ml, Macnor Life sciences Pvt. Ltd.) intravenously prior to caesarean and then at 24 hour interval post caesarean. Jugular venous blood samples were collected in heparinised vials prior to caesarean and 2, 24 and 48 hours after caesarean.

Trace minerals were determined by adding 1 ml of plasma to 10 ml of diacid mixture of nitric and perchloric acid (4:1) in digestion flasks and kept overnight to allow slow digestion. Next day, all the samples were digested at simmering heat in a digestion chamber. After drying, the flasks were cooled and the volume was made up to 25 ml with deionised triple glass distilled water. Trace minerals in the acid digest were estimated by voltametery analysis (797VA Computrace, Metrohm Switzerland). Standard solutions were prepared from fresh stock standards supplied by Sigma, USA for calibration.

Statistical analysis

The data were expressed as mean ± standard error (±SE). The data was analyzed statistically using Duncan Multiple Range test[7]. Probability values of less than0.05 ($P<0.05$) were considered to be statistically significant.

RESULTS AND DISCUSSION

The results of plasma copper, iron, zinc and manganese in dystocia control and treatment groups are presented in Table 1. The mean values of estimated trace minerals did not register any significant changes at different intervals in the both groups. However, a progressive decreasing trend was observed up to 48 hours with a non significantly reduction in the plasma copper level by 30.61% in treatment group which was higher as compared to the reduction of 9.46% in control group at 48 hours intervals post caesarean from the base value. This could have been because of progressive decrease in oxidative stress and stress from 2 to 48 hours interval post caesarean from the base value in vitamin C treated group. A non significant increase was observed in iron concentration (3.63%) in treatment group where as it was decreased in control group (4.31%) at 48 hours intervals post caesarean from the base value. Direct comparisons cannot be made due to lack of such type of study but the range of iron concentration is in accordance with Singh *et al*.[6] who have reported increased iron concentration after obstetrical maneuvering in dystocia affected buffaloes. No significant difference was observed in plasma manganese levels at any interval in both the groups. There is no parallel report in the available literature to confirm or repute our findings but range of manganese is in agreement with Singh *et al*.[6]. The concentration of zinc at 48 hours interval was significantly ($p < 0.05$) higher in comparison to values at 0, 2 and 24 hours in treatment group. The decrease in the lipid peroxidation following supplementation with vitamin c, as evidenced by 13.5% reduction in MDA at 48 hour intervals post caesarean, could have increased zinc concentration[5]. Such data have to be considered with in context of antioxidant cellular burden where the balance that exists among antioxidant is given as supplement[8]. Lack of such studies hampers comparison but Singh *et al*.[6] have also reported increased zinc concentration after obstetrical maneuvering in dystocia affected buffaloes.

Table 1: Plasma trace mineral levels in dystocia control and treatment group

Minerals (µg/dl)	Control Group				Treatment Group			
	0 hr.	2 hrs.	24 hrs.	48 hrs.	0 hr.	2 hrs.	24 hrs.	48 hrs.
Copper	128.63 ± 21.96	113.84 ± 14.82	135.84 ± 23.28	116.46 ±12.56	134.95 ± 27.19	131.17 ± 21.67	115.16 ± 25.54	93.64 ± 21.19
Iron	311.13 ± 21.10	288.70 ± 22.34	304.28 ± 17.75	297.70 ± 19.55	309.03 ± 23.06	301.84 ± 17.66	316.65 ± 14.25	320.27 ± 27.07
Manganese	55.38 ± 6.28	70.07 ± 12.77	58.94 ± 7.41	66.46 ± 12.38	59.73 ± 11.64	64.62 ± 13.60	67.73 ± 10.83	48.98 ± 10.59
Zinc	144.42 ± 19.52	131.89 ± 15.44	129.13 ± 19.12	139.84 ± 21.27	150.61 ± 9.28[a]	138.11 ± 14.87[a]	145.63 ± 13.01[a]	189.74 ± 14.89[b]

Values with different superscripts (a, b) differ significantly ($p<0.05$) with in row of a group.

CONCLUSION

The mean plasma concentration of copper, iron, zinc and manganese did not vary significantly at any time interval following vitamin C administration however; further research is warranted involving large sample size.

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