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EFFECT OF VITAMIN E AND ZINC SUPPLEMENTATION ON IMMUNE SYSTEM OF BUFFALO CALVES

By

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INTRODUCTION

Only a few years back, the important role of dietary factors in modulating immune responses has only been studied in a systematic manner. The immune system can be considered as a good evaluation of the resistance and health status of animals. Many nutrients regulate lymphoid cellular activity and both deficiency and excess can produce adverse functional consequences.

Specific nutrient imbalances vary in the ability to influence the immune response and the mechanism underlying the immunological abnormalities. Extensive research is required to define the optimum level and the interactions between nutrients. The importance of this particular point emerges from the fact that it could raise the health and defense performance of the animal and improve the outcome of the vaccination programs. It has been demonstrated that vitamin E could improve the immune responses in many animal species, especially in deficient animals (1, 2 and 3). Moreover, most studies agreed on the fact that vitamin E deficiency suppresses the lymphocyte response to different mitogens in a variety of species (4,5 and 6). In contrast, the results have been variable, when the effect of dietary supplementation with vitamin E in various quantities in excess of established requirements on lymphocyte response to different mitogens has been studied by several other authors in different species (7, 8, 9, 10 and 11).

Among the specific nutrient, zinc deficiency has been shown in several studies to cause suppression of cell mediated immunity especially lymphocyte blastogenesis to Phytohaemagglutinin (PHA) (12 & 13) and thymic atrophy (14). Because the thymus is important in immunological competence, this effect of zinc has received considerable research attention (15). vitamin E or zinc deficiencies have all been found to have a profound adverse effect on the immune system of numerous species, whereas, supplementation with vitamin E or zinc have had contradictory effects depending on the nutrient concentration, immune function and species (11).

The aim of this study is to investigate the effect of vitamin E and/or zinc supplementation on the cell-mediated immunity of the buffalo-calves.

MATERIAL AND METHODS

Twenty five yearling buffalo calves of both sexs were housed at Bahteem farm.

Experimental Design:- Buffalo calves were alloted into five groups, five animals per group as follows:-

- Control group: no vitamin E or zinc.
- Vitamin E orally supplemented group: 1500 IU of dl-α- tocopherol (Rhone-Poulenc, France) per animal at weekly interval.
- Zinc orally supplemented group: 5.46g zinc (Zinc oxide form) per animal at weekly interval.
- Vitamin E and zinc orally supplemented group: 1500 IU of dl-α-tocopherol and 5.46 g. zinc per animal at weekly interval.
- Vitamin E injected group: 800 IU of dl-α-tocopherol (Mfg Anthony products, Arcada)

intramuscullarly every other week started in the 9th week of the experiment.

The animals were on trial for 18 weeks.

Feeding: Feed consisted of a concentrated mixture (2.5 kg) and berseem hay ad-libitum to meet the nutrient requirements of ruminants in developing countries (16).

- Chemical Analysis of Feedstuffs used (%)

	C.P.	Zinc
Concentrate mixture	16.6	0.0021
Berseem hay	11.4	0.0015

- Heparinized and non heparinized blood samples were collected twice, one at 10 weeks after starting the trial and the second at the end of the experimental period. Lymphocyte blastogenesis test was assayed using the heparinized blood samples (17) with some modifications using PHA. Serum zinc analysis was performed using Atomic Absorption Spectrophotometer "SP 1900 Pye Unicam".

RESULTS AND DISCUSSION

The role of vitamin E and/or zinc supplementation on the blastogenic response of peripheral blood lymphocytes of buffalo-calves was investigated.

The chemical analysis of the used feedstuffs revealed 16.6, 11.4 C.P., and 0.0021, 0.0015 zinc (in percent) for concentrate mixture and berseem hay respectively. The blood analysis showed that serum zinc was markedly elevated in the supplemented groups throughout the study. It was increased from 0.0726, 0.0748 and 0.0778 to 0.1198, 0.1022 and 0.1228 ug % zinc for vitamin E injected, oral zinc and vitamin E and zinc supplemented group respectively Mean while, the results obtained (Table 1) showed that vitamin E and/or zinc enhanced the immune parameters of the buffalo calves by significant ($P < 0.05$) increased lymphocyte response to PHA mitogen. Our finding are in agreement with other studies (7, 10, 11). At the sametime, the lymphocyte response to PHA mitogen was improved by oral vitamin E, which could not be achieved in Holstein and crossbred calves (9).

From the present study one can notice that the diet offered to the yearling buffalo-calves could not supply the animals with enough amount of zinc, which consequently lower the lymphocyte response to PHA mitogen (12 & 13).

CONCLUSION

As this is the first study to report on the effect of nutrients on the immune response of buffalo, one can safely conclude that among the factors which must be considered when attempting to determine

Table (1): Effect of vitamin E injection, vitamin E and/or zinc oral supplementation on the Blastogenic response of peripheral blood lymphocytes (as measured by stimulation Index SI) of buffalo calves using PHA mitogen.

Period of time	Vit. E Inj.	Vit. E oral	Zinc oral	E & zinc oral	Control
10th week	$1.62 \pm .189^{a}$	$2.18 \pm .396^{b}$	$2.14 \pm .288^{b}$	$2.5 \pm .374^{b}$	$1.40 \pm .264^{a}$
18th week	$2.57 \pm .330^{b}$	$2.70 \pm .200^{b}$	$2.53 \pm .305^{b}$	$2.55 \pm .264^{b}$	$1.50 \pm .40^{a}$

Values in the same row with different superscripts vary singificantly at $P < 0.05$.

the possible effects a nutrient may have on the immune response are the optimun level of nutrients required for this unique animal.

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REFERENCES

1- Tengerdy, R.P., and C.F. Nockels (1975): Poult. Sci., 54, 1292.
2- Sheffy, B.E. and A.J. Wiliams (1980): 11th Seminar for the feed Industry, Nippon Roche K.K., Tokyo, Japan.
3- Mohamed, F.F. and O.E. Mohamed (1989): 70th Ann. Meet. Cong. Res. Workers in Animal Diseases. Chicago, IL, U.S.A.
4- Sheffy, B.E. and R.D. Schultz (1978): Cornell Vet. 68, 89-93.
5- Langweiler, M., R.D. Schultz and B.E. Sheffy (1981): Am. J. Vet. Res., 42, 10: 1681-1685.
6- Lessard, M. (1988): Ph. D. Thesis, Univ. Laval, Quebec, Canada.
7- Reddy, P.G., J.L. Morrill, H.C. Minocha and J.S. Stevenson (1987b): J. Dairy Sci., 70: 993-999.
8- Cipriano, J.E., J.L. Morrill and N.V. Anderson (1982): J. Dairy Sci. 65: 2357-2365.
9- Abdellatif, H., D.M. Shaefer, J. Jensen, O.E. Mohamed and R.D. Schultz (1990): 71st Ann. Meet. of the cong. Res. Wrokers in Animal Disease, Chicago IL, U.S.A.
10- Abdellatif, H., O.E. Mohamed and K.D. Schultz (1993): VII World conference on Animal Prod. Edmonton, Alberta, Canada.
11- Mohamed, F.F., O.E. Mohamed, J. Jensen and R.D. Schultz (1990): 71st Ann. Meet. Cong. Res. Workers in Animal Diseases. Chicago, IL, U.S.A.
12- Allen, J.I., Kay, N.E. and McClain, C.J. (1981): Annals of Internal Medicine, 95: 154-157.
13- Flynn (1984): J. Nutr., 114: 2034-2042.
14- Golden, M.H., B.E. Golden, P.S. Harland and A.A. Jackson (1978): Lancet, June: 1226.
15- Cohen, J.J. and R.C. Duke (1984): J. Immunol., 132, 38.
16- Kearl, L.C. (1982): "Daily Nutrient Requirements of Buffaloes" UTAH State University Logan, UTAH USA.
17- Schultz, R.D. and Adams, L. (1984): Vet. Clin. North. Am., 8: 721-754..