Vet. Med. J., Giza 40, No. 1, 63-76 (1992)

FURTHER STUDIES ON VITAMIN E AND SELENIUM IN BUFFALO-CALVES IN EGYPT V- EFFECT OF PARENTRAL ADMINISTRATION OF SELENIUM AND VITAMIN E- SELENIUM PREPRATIONS ON BLOOD SELENIUM LEVELS IN BUFFALO-CALVES IN EGYPT

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(Received: 30.11.1991)

INTRODUCTION

Selenium has been considered as an essential trace-element since Schwarz and Foltz (1957), demonstrated that it was the effective components of factor-3 in preventing liver degeneration in rats. Soon after, it was shown to prevent NMD in calves (Muth et al. 1958) and in lambs (Hogue, 1958).

The importance of an adequate vitamin E and selenium intake for preventing NMD-WMD in calves up to 6 months of age is well recognized by Jenkins and Hidiroglou, 1972) and by El-Neweehy, (1982) in buffalo-calves in Egypt. On the other hand Jenkins et al.(1974), reported that, the incidence of NMD in calves and lambs was related to selenium status of their dams and was reduced by maternal selenium and vitamin E supplementation.

Administration of selenium in combination with vitamin E to pregnant dams almost completely prevents NMD-WMD in calves (Hidiroglou et al.,1965) and lambs (Hogue et al. 1972).

Calf serum selenium at birth reflected the maternal treatment, being higher in calves from cow fed 5 mg selenium daily starting 90 days prepartum than in those from unsupplemented cow (Perry et al. 1978). Treatment of pregnant cows or calves at birth with selenium and vitamin E in combination prevent MD (Nils Lannek 1973).

Therefore, this work was planned to study effect of administration of selenium and vitamin E selenium prepration directly to suckling buffalo-calves or indirectly through their pregnant dams on blood selenium levels.

MATERIAL AND METHODS

A total number of 85 suckling buffalo-calves were divided into two groups:

The first one consisted of 10 apparently healthy calves, nearly of approximately the same age and weight and belonging to El-Marg farm of Egyptian company of meat and milk.

The second group contained 75 apparently healthy calves belonged to Mehallet Mousa Farm of Animal Production Research Institute. These were divided into 5 subgroups each of 15 animals. The first one included, untreated calves from non-treated dams and used as control.Calves of the second subgroup were untreated animals born from selenium treated dams during pregnancy (two I/M injections of 5 ml selenium solution, each ml contains 1 mg selenium as sodium selenite, with 5 days intervals at the 8th and 9th month of pregnancy). Simillarly the third subgroup was untreated calves from E-selenium treated dams (2 I/M injections of 10 ml injacome E-senium, each ml contains 150 mg vitamin E as DL-O tocopherol acetate and 0.5 mg selenium as sodium selenite pentahydrate, with 5 days intervals during 8th and 9th month of pregnancy.

The fourth subgroup calves were from non-treated dams which received single I/M dose of 3 ml selenium solution at 5 days of age.

Simillarly calves of also non-treated dams were given 6 ml E-selenium preparation, in single dose comprising the fifth sub-group. Heparinized blood samples were collected from all aobve mentioned calves soon after birth before drug administration beside at various time intervals in both groups as shown in Tables (1, 2). These samples were used for determination of whole blood selenium level according to the method of Olson (1969), in Hoffman La Roche Ltd laboratories. The detection limit of this method is approximately 15 ng Se/gm substance. Statistical analysis was performed according to Steel and Torrie (1960).

RESULTS AND DISCUSSION

The results obtained are shown in Tables (1, 2) and represented graphically in Figs. (1, 2). Studying effect of selenium and E-selenium administration on whole blood selenium level at short intervals, Table (1) showed that although significant increase occurred in its level in both directly treated groups, which begin 3 hours after administration and reached its maximum level (572.14±147.20 ng/ml) after 24 hours in selenium treated group. Yet its level declined gradually and reached to nearly preinjection level (62.36±33.4 mg/ml) after one week in selenium treated calves. On the other hand, a gradual significant increase in blood selenium level in E-selenium directly treated calves, reached to a highest level (462.605± 74.362) ng/ml) one week after administration.

On studying effect of selenium and E-selenium administration when given indirectly to dams and directly to calves on blood selenium level but at long term,Table (2) showed that its level behave simillarly as that of short intervals. Although calves of selenium treated

Table (1): Effect of selenium and E-selenium I/M administration on blood selenium levels (ng/ml) in suckling buffalo-calves at shrot intervals (Group I).

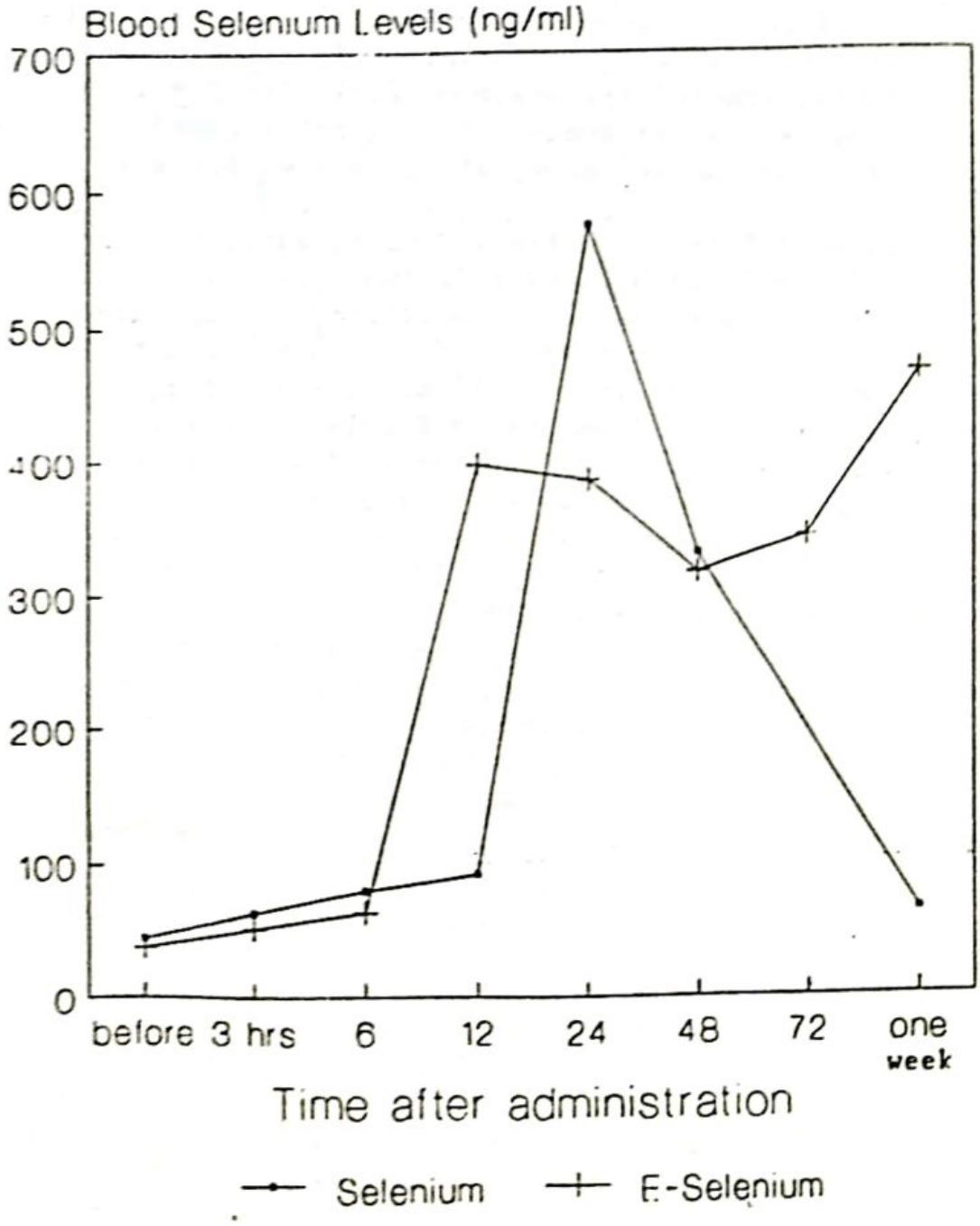
Time of sampling	No. of calves	Blood Se level (ng/ml) in Se treated calves	No. of calves	Blood Se level (ng/ml) in E-Se treated calves
A. Before administration	5	44.035± 15.056	5	37.3210± 14.462
B. After Administration:				
3 hours	5	62.550± 7.208**	5	50.7730± 7.867**
6 hours	5	78.314± 13.906***	5	61.9070± 7.897**
12 hours	5	91.567± 36.776***	5	393.2320± 71.200***
24 hours	5	572.148±147.201***	5	380.4820±111.905***
48 hours	5	325.145±147.868***	5	311.2008± 56.072***
72 hours	5	--	5	337.9680± 87.867***
1 week	5	62.360± 33.403*	5	462.6050± 74.362***

* P<0.05

** P<0.01

*** P<0.001

Fig. (1): Effect of selenium and E-selenium administration on blood selenium levels (ng/ml) in suckling buffalo-calves at short intervals.



dams were born with very high blood selenium level (260.98±141.284 ng/ml), which began to decline gradually with progression of age to reach simillar level as that of control group at 75 days of age. Simillar gradual increase occurred in selenium directly treated calves, reached its maximum level (147.32±21.38 ng/ml) 60 days after administration but dropped to below that of control group at 75 days of age also.

In calves of E-selenium treated dams, although born with relatively high blood selenium level (112.81± 22.28 ng/ml), a gradual but small increase occurred in its level with progresson of age to reach a highest level (104.31±11.48 ng/ml) at 75 days of age. Blood selenium level behave in E-selenium directly treated calves simillarly to those of E-selenium treated dam as showed in Table (2) and Fig. (2). These findings go side to those reported by Hogue et al. (1962), in lambs. Mac et al. (1963), Nelson et al. (1964), Wright and Bell (1964), who attributed continous increase in blood selnium level in E-selenium treated groups to suggestion that α tocopherol may increase transfer of selenium across the cell membrane. Hidiroglou et al. (1965), mentioned that when a complex of selenium and vitamin E was administrated to pregnant dams, the prophylactic effect was remarkable and some improvement was also noted when only selenium was injected. Hidiroglou et al. , (1965); Nachev et al. (1965), Hidiroglou et al. (1969), found that blood selenium level decreased from birth in all calves but calves from dams injected I/M during last month of gestation with E-selenium prepration had relatively higher blood selenium level for the first 16 weeks of life than control. Scott, (1970); Whanger, (1970); Ganther, (1971); Jenkins et al. (1971), Hidiroglou et al. (1972), indicated that lambs requirment for selenium was reduced with adequete vitamin E, while Jenkins et al. (1974); Allen et al. (1975); Kovac & Verzgula (1978) and Perry et al. ,(1978), reported that calf serum selenium at birth reflected maternal treatment, being higher in calves from dams

Table (2): Effect of Se and E-Se I/M administration of dams and calves on blood selenium levels (ng/ml) at long intervals in suckling buffalo-calves (Group II).

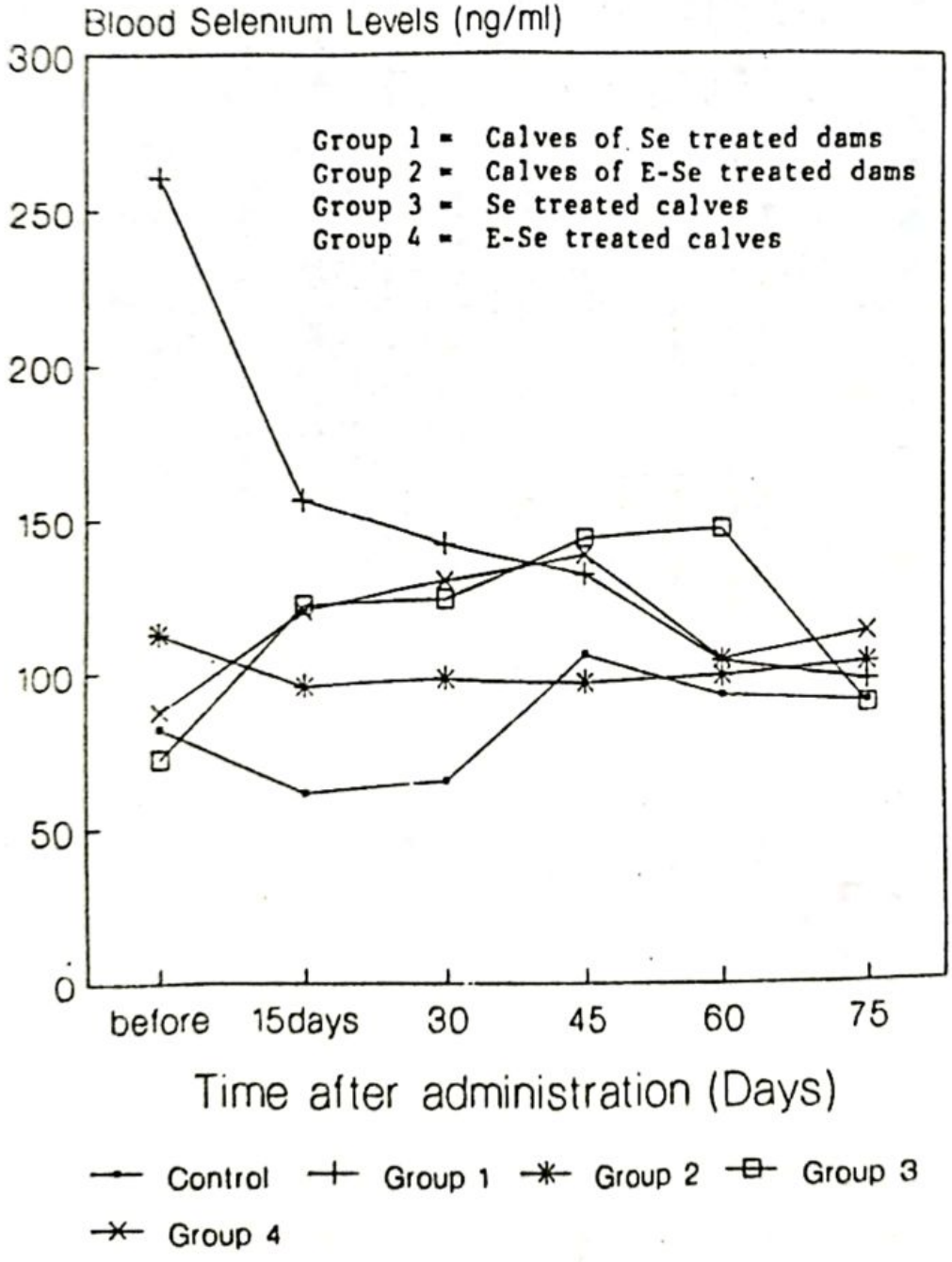
Time of sampling	Different subgroups of calves	No. of calves	Control calves from untreated dams subgroup (1)	Calves from Se treated dams Subgroup (2)	Calves from E-Se treated dams Subgroup (3)	Se treated calves from untreated dams Subgroup (4)	E-Se treated calves from untreated dams Subgroup (5)
Before administration		15	81.787±18,36	260.98±141.284 ***	112.81±22.28 ***	71.91±16.28	87.45±14.48
15 days after birth		15	61.382±12.46 ***	156.26± 16.412 **	95.63±11.84 ***	121.50±21.55 ***	119.90±19.98
30 days after birth		15	65.740±15.86 ***	141.87± 62.927 **	98.83± 8.64 ***	123.78±55.76 ***	129.73±36.26
45 days after birth		15	106.587±20.76 ***	131.94± 46.640	97.74± 0.36 **	143.89±33.68 ***	138.18±28.18
60 days after birth		15	93.097±13.26	104.37± 18.113	99.42± 8.40	147.32±21.38	104.82± 8.84 ***
75 days after birth		15	91.330± 8.78	98.35± 25.217	104.13±11.48	90.19± 6.68	113.96±13.84

* P<0.05

** P<0.01

*** P<0.001

Fig. (2): Effect of Se and E-Se administration indirectly to dams and directly to calves on blood selenium levels (ng/ml) at long intervals in sucling buffalo-calves.



fed selenium daily starting 60 days prepartum than in those from unsupplemented cows. Close similler results were obtained by Perry et al. (1971); Nils Lannek (1973); Linklater et al. (1977) and Van Fleet (1980).

MdDowell (1989), gave a clear attribution to the persisted gradual increase occurred in blood selenium level in E-selenium directly treated calves and those indirectly treated calves through their dams as compared with selenium treated groups where vitamin E is known to reduce the selenium requirement in at least two ways. First by maintaining body selenium in an active form or preventing loss from the body. Second, by preventing destruction of membrane lipids within the membrane, theroby, inhibiting the production of hydroperoxides and reducing the amount of glutathione peroxidase formed in the cell.

Very high and relativelly high blood selenium level in calves of selenium and E-selenium treated dams respectively may be attributed to the fact that selenium passes through placenta efficiently as reported by McConnell et al. (1971); Shearer & Hadjimarkos (1973); Johnson et al. (1974); Salantiu (1975) and Perry et al. (1978).

From the results of the present study it could be generally concluded that although significant increase occurred in blood selenium level after both selenium and E-selenium administration directly to two groups of calves yet it declines to reach the preinjection level in the first when compared with the second group, where gradual but continous increase occurred in its level, which reached to a highest level, one week after administration. Calves of selenium treated dams were born with very high blood selenium level, reltively high level occurred in calves of E-selenium treated animal. Although its level decline gradually with progressions of age in the first group, reached to nearly similler level to that of control, it increases gradually and reached to its highest level, both at 75

days of age in both groups respectively. Blood selenium level behave simillerly when calves were given selenium and E-selenium directly 5 days after birth and followed biochemically at long interval till weaning.

SUMMARY

A significant increase, occurred in blood selenium level, 3 hours after selenium I/M administration, and reached its highest level 24 hours later. Then began to decline gradually and reached to nearly its preinjection level one week after administration.

Similler pattern occurred in blood selenium level in the first 24 hours after E-selenium I/M administration but its level raised gradually to its highest peak, one week after administration.

Studying effect of selenium and E-selenium administration on blood selenium levels at long intervals when given by I/M route indirectly to pregnant buffaloes and directly to calves, revealed that its level behave simillarly as when studied at short intervals.

Although calves from selenium treated dams were born with significantly very high blood selenium level, this level decline gradually with progression of age and appoached that of control calves, 75 days of age. Gradual increase in its level occurred in selenium treated calves but decline to below that of control group, at a similler age. On the other hand and dissmillarly, calves from E-selenium treated dams were born with relatively high blood selenium level, gradual small increase occurred in its level with pronounced elevation on its level at 75 days of age. Similler behaviour occurred in E-selenium treated calves.

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