J. Agric. Sci. Mansoura Univ., 30 (12): 7413 - 7424, 2005

INFLUENCE OF SELENIUM AND VITAMIN E ADMINISTRATION OF LATE PREGNANCY BUFFALO COWS ON MATERNAL TRANSFER OF SELENIUM AND IMMUNOGLOBULINS TO THEIR CALVES

Abd El-Hady, M. A. A.*; R. W. Raghib and G. H. Metry***

*** Animal Production Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.**

****Animal Reproduction Research Institute, Agriculture Research Center, El-Haram, Giza, Egypt.**

ABSTRACT

The present study was conducted to evaluate the effect of maternal intramuscular administration of selenium (Se) and vitamin E (Vit.E) on transfer of Se and immunoglobulins from buffalo cows to their offspring. Fourteen dried-off buffalo cows (60 days prepartum) were used. They were randomly assigned into two experimental groups. The first group (Control, n=6) was not treated and the second group (Treated, n=8) was injected intramuscularly with 0.05 mg of Se (as sodium selenite) plus 4.5 mg of Vit.E/kg BW/week. All cows were fed a diet composed of 50% concentrate mixture, 25% berseem hay and 25% rice straw as 2.5 kg DM/100 kg BW. Plasma Se concentration of treated cows were significantly higher than control (71.7 *vs.* 52.6 ng/ml, $P<0.01$). Plasma Se concentration of calves from cows that injected with Se were higher ($P<0.1$) than of control. Selenium concentrations in colostrum from treated cows were significantly ($P<0.01$) higher than untreated cows. Average daily gain of buffalo calves was improved ($P<0.05$) significantly by Se+E injection of their dams. Plasma immunoglobulin (Ig)G, IgM and IgA concentration were significantly ($P<0.01$) higher in treated cows and their newborn calves compared to untreated cows and their offspring. However, colostral IgG, IgM and IgA were not affected significantly by Se+E injection. Neither blood measurements nor chemical composition of colostrum was affected by Se+E injection.

INTRODUCTION

Selenium (Se) has been recognized as an essential trace element for animals (Schwarz and Foltz, 1957). It is required as a metallic co-enzyme for glutathione peroxidase which acts as part of the cellular antioxidant defiance system (Rotruck *et al.*, 1973). The main effect of Se is to prevent the nutritional muscular dystrophy (NMD) in the young calves (Underwood and Suttle, 1999). Moreover, Se deficiency has long been reported to impair reproductive performance and the functions of immune system in cattle (Harrison *et al.,* 1984 and Droke and Loerch, 1989). Vitamin E is also essential to this system that is necessary to prevent cellular destruction due to hydrogen peroxide and lipid hydroperoxides (Rice and Kennedy, 1988). Selenium level in the feedstuffs in Egypt may be lower than the adequate levels set at 0.3 ppm which was recommended by NRC (2001). Van Saun (1990) and Gerloff (1992) proposed serum Se concentration of cattle less than 40, 70 and more than 70 ng/ml as indicative of deficient, marginal and adequate Se status, respectively. Plasma Se concentration of cows at dry-off period treated with Se (as bolus, mineral salts mix or i.m. injection) was increased significantly compared with untreated cows, which resulted in increase of blood Se of their nursing calves (Campbell *et al.,* 1990; Abdelrahman and Kincaid, 1995; Awadeh, *et al.,* 1998; Pavlata, *et al.,* 2003). Many researchers observed efficient Se transfer from cows to their calves through placenta and colostrum, when it was supplemented at dry-off period (Campbell *et al.,* 1990; Abdelrahman and Kincaid, 1995; Koller *et al.,* 1984 and Gunter *et al.,* 2003). Dietary deficiency of Se decreases immunoglobulin (Ig)G and IgM in plasma (Larsen, 1993). Inadequate absorption of colostral Ig or failure of passive transfer is common and increase morbidity and mortality risk (NAHMS, 1993). Swecker *et al.* (1995) showed that grazing cows supplemented with 120 mg Se/kg salt mix and parentral administered with 0.1 mg Se and 1 mg vitamin E/kg BW had higher colostral IgG concentration ($P<0.002$) than either control or those given Se+E only.

The purpose of this study was to clarify the effect of Se+E injection to buffalo cows at late pregnancy period on maternal transfer of Se and immunity through the placenta and colostrum to their newborn calves.

MATERIALS AND METHODS

The present study was conducted on Buffalo Research Station at Mahallet Mousa, belonging to Animal Production Research Institute. Fourteen buffalo cows were assigned at 60 d before the expected calving date into control (C, n=6) group which did not receive any treatment and treated group (Se+E, n=8) in which each cow was injected with 0.05 mg Se (as sodium selenite) plus 4.5 mg vitamin E/kg BW/week until parturition, then the treatment was stopped. Cows were maintained in a common exercise area with open housing and fed the same dry cow ration (Table 1); cows were fed individually on a diet composed of 50% concentrate mixture, 25% berseem hay and 25% rice straw at 2.5 kg DM/100 kg BW. Drinking water was available free choice. The neonatal calves were fed colostrum for first 3 days and then housed in individual concrete pens (140 x 120 x 106 cm) which were layered with rice straw. Each calf was fed whole buffalo milk at the rate of 10% of his birth weight of whole milk tell d 28 of age and then the milk was reduced gradually by 1% of body weight weekly until weaning at 105 days of age. Calf starter and berseem hay were available for *ad libitum* feeding. Clean water was available twice daily for calves.

Blood samples were drawn from cow's jugular vein into Vacutainer sterile interior glass tubes with adding a droplet of heparin as anticoagulant at d 60, 45, 30, 15 and 0 prepartum. Blood samples were withdrawn from the calves at d 7, 28, 56 and 84 to determine maternal transfer of Se and immunity to their calves. Blood samples were centrifuged (at 3000 r.p.m for 15 min.) to separate plasma and stored at -20°C until analysis of Se, immunity and metabolic profile.

Colostrum samples were taken at parturition twice daily for 3 days to determine the immunoglobulin contents (IgG, IgM and IgA), chemical composition and Se concentration. Chemical analysis of feedstuffs (Table 1) was determined according to A.O.A.C. (1990). Plasma samples were diluted with bidistilled water at 1:9 ratio and analyzed for Se directly using Graphite

Furnace Atomic Absorption Spectrometry (ATI Unicam Model 939, UK). Also, Se concentration was determined in colostrum and feed samples using the same procedure after wet ashing with nitric acid and H_2O_2 in microwave unit.

Plasma total protein, albumin, cholesterol and total lipids were determined colorimetrically using commercial kits of Stanbio Laboratory inc., USA according to the procedures outlined by the manufacture. Plasma AST, ALT activity and Glucose were determined using colorimetric kits (Sentinel CH., Italy). The IgG, IgM and IgA in blood plasma and colostral whey were determined using radial immunodifusion according to Hostetler *et al.* (2003). Chemical composition of colostrum was determined using Milk Scan analyzer Model 133B.

Table (1): Chemical composition (%) of the experimental feeds:

Feed	DM	Composition (on DM basis)						
		OM	CP	CF	EE	NFE	Ash	Se (ppm)
Concentrate*	89.8	94.1	15.5	18.68	6.19	53.7	5.9	0.092
Clover Hay	87.7	87.7	12.6	34.6	2.1	39.2	11.46	0.066
Rice Straw	85.1	85.1	3.9	37.02	1.2	43.0	14.9	0.033
Calf Starter**	90.15	90.5	17.2	10.49	5.7	57.1	9.52	0.072

* Composition: 30% undecorticated cotton seed meal, 35% wheat bran, 16% yellow corn, 10% rice bran, 5% vinas, 3% lime stone and 1% sodium chloride.

** Composition: Yellow corn, soybean meal (44%), lin seed cake, wheat bran, molasses, calcium carbonate and sodium chloride.

Statistical Analysis:

The data of Se concentration, blood metabolites, chemical composition of colostrum and immunoglobulins (IgG, IgM and IgA) were analyzed using the general linear models procedure (GLM) of SAS (1996) with a model that included Se+E treatment, time of sampling and their interaction. Calf birth weight, weaning weight, total gain and daily gain were analyzed using one way procedure GLM with a model that included Se+E treatment and error. The overall means were compared using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Selenium Concentration:

Plasma Se concentrations of buffalo cows are presented in Fig (1). The average plasma Se concentration in untreated cows was 52.6±3.4 ng/ml, which was raised to 71.7±3.2 ng/ml in the Se+E group with significant differences (P<0.01) between groups. Selenium concentration in blood plasma of treated cows was elevated significantly (P<0.05) up to the maximum level (96.3±8.0 ng/ml) at day 15 prepartum and then it was reduced to the minimum level (58.5±6.3 ng/ml) at parturition. Whereas, plasma Se level in untreated cows at 60 d prepartum was 49.2±7.3 ng/ml and tended to be stable during the experimental period. The main average Se concentration increased gradually (P<0.01) with time until 15^{th} d prepartum and thereafter it was declined significantly at parturition.

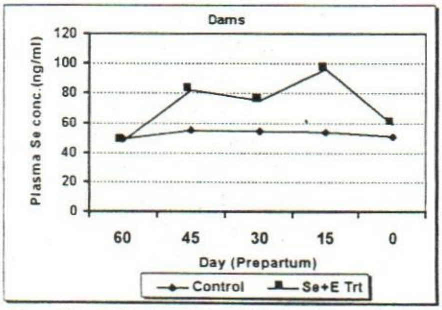

Fig. (1): Effect of Se+E injection of dried buffalo cows on their plasma Se concentration.

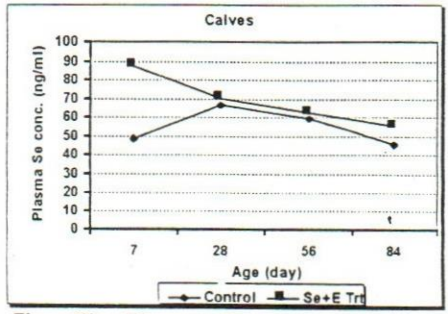

Fig. (2): Plasma Se concentration of buffalo calves as affected by Se+E injection of their dams.

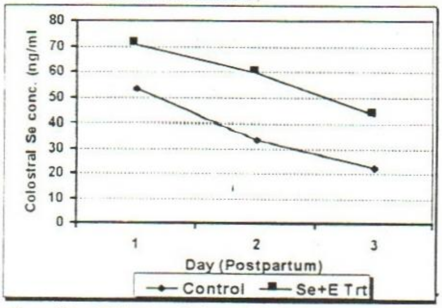

Fig. (3): Effect of Se+E injection of dried buffalo cows on their colostral Se Concentration.

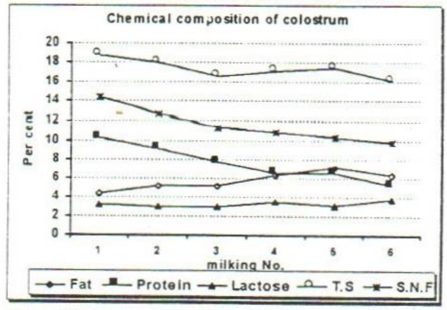

Fig. (4): Colostral chemical composition of the first 6 milking.

These findings agreed with those given by Harrison *et al.* (1984) who found that dairy cattle injected with 50 mg Se 21 d prior to calving had plasma Se concentration of approximately 60 ng/ml compared with 30 ng/ml for uninjected cows. Similar results were found by Weiss *et al.* (1990) who mentioned that the cows supplemented with 0.2 ppm Se and 70 IU vitamin E/kg DM during the dry period had increased ($P<0.05$) plasma Se concentration from 50 ng/ml (in unsupplemented group) to 100 ng/ml (in supplemented group). Maas *et al.* (1993) found that Hereford heifers injected with 0.05 mg Se/kg body weight had serum Se concentration greater ($P<0.05$) than that of the control group at times after injection. As well as, Pavlata *et al.* (2003) showed the same finding when they injected Holestein cows at dry-off period with 44 mg Se and 500 mg vitamin E, 1 or 2 time.

Plasma Se concentration in the newborn calves (Fig. 2) of untreated cows was 48.3±4.67 ng/ml in the first week of age which increased slightly at d 28 and then it was declined gradually to 45.2±3.04 ng/ml. However, in the newborn calves of administrated cows, plasma Se concentration was 87.4±17.6 ng/ml and declined gradually to the minimum level (55.3±11.6 ng/ml) but the differences among them were not significant. The average Se level in young calves of control cows was 55.4±3.35 ng/ml compared with 69.7±6.58 ng/ml in the calves of treated cows ($P<0.10$). These results agree with Abdelrahman and Kincaid (1995), who found that supplementation of cows with 3 mg Se/d elevated Se concentration in whole blood, plasma and liver of their newborn calves. Similar results were reported by Koller *et al.* (1984) with inorganic source of Se and by using organic Se sources (Pehrson *et al.*, 1989; Ortman and Pehrson, 1999 and Gunter *et al.*, 2003). Also, these researchers mentioned that blood Se concentration in calves born of cows supplemented with sodium selenite decreased as they aged. Rowntree *et al.* (2004) reported that calves born from cows receiving weekly 20 mg Se drenches had adequate plasma Se (about 70 ng/ml), whereas calves born to control cows had plasma Se concentrations approaching less than adequate Se status (about 50 ng/ml).

Selenium concentration of colostrum from Se-injected buffalo cows was significantly (P<0.01) higher than those of control cows (58.6 *vs.* 37.6 ng/ml). The colostrum had the highest Se concentration in the first day postpartum and it was linearly decreased at 2^{nd} and 3^{rd} day (Fig. 3). These results agree with Rowntree *et al.* (2004) and Stowe *et al.* (1988) who showed that Se supplementation to Holstein cows at dry-off period improved Se concentration in colostrum. Campbell *et al.* (1990) found that Se supplementation to beef cows elevated Se in colostrum from 17 to 72 ng/ml. On the other hand, Pavlata *et al.* (2003) found that colostrum Se was not affected significantly by Se injection to dry-off cows. They reported also that colostrum should not be considered a suitable medium for evaluation of Se status in cows.

Clinical observations:

It was observed only one case in control calves had a clinical symptoms of NMD. This case has walked with a stiff gait, arched back and avoids movement. It was recovered after injecting with Se and Vit. E.

Chemical composition of colostrum:

Least square means of colostral components are shown in Table (2). There were no significant differences between treated and control groups in all chemical composition of colostrum, however fat and lactose in Se+E group were slightly greater than those in control group. Protein and solids-not-fat (SNF %) declined in Se treated group compared to control but without significant differences. They decreased significantly (P<0.01) by advancing milking intervals, whereas fat % was elevated gradually (P>0.10; Fig. 4).

Table (2): Least square means of colostral chemical Composition of buffalo cows as affected by Se+E injection.

%	Control	Se+E Trt	SE
Fat	5.5	6.0	0.40
Protein	7.9	7.2	0.54
Lactose	3.09	3.36	0.12
SNF	11.8	11.3	0.47
T.S	17.3	17.2	0.47

Blood plasma parameters:

Total protein, albumin, globulin, glucose, total lipid, cholesterol, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in plasma of buffalo cows are presented in Table (3). There were no significant differences between treated and control groups for all parameters, however there was a trend toward greater total protein, albumin, glucose and total lipid in injected cows. Plasma albumin and glucose levels tended to be stable during the experimental course but they increased significantly (P<0.01) prior to parturition (Fig. 5 and 6). Similar results were reported by Cipriano, *et al.* (1982) and Reddy *et al.* (1985) with Holstein heifer calves with different levels of vitamin E. Also, El-Ayouty, *et al.* (2003) found that total protein, albumin, globulin and A/G ratio were not affected by the treatment of suckling buffalo calves with Se and/or vitamin E.

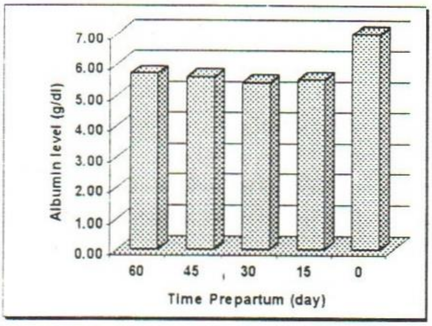

Fig. (5): Plasma albumin levels of buffalo cows at different prepartum intervals.

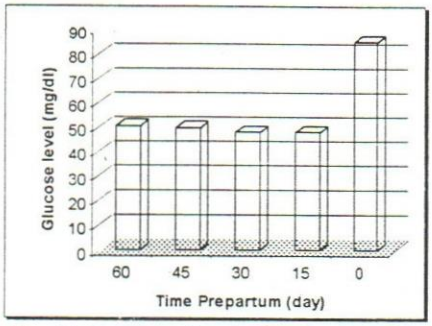

Fig. (6): Plasma glucose levels of buffalo cows at different prepartum intervals.

Table (3): Least square means of plasma metabolites of buffalo cows as affected by Se+E injection.

Parameter	Control	Se+E Trt	SE
T. Protein, g/dl	8.35	8.76	0.22
Albumin, g/dl	5.6	6.11*	0.21
Globulin, g/dl	2.73	2.90	0.28
Glucose, mg/dl	52.7	59.9*	3.47
T. Lipid, g/dl	215.9	241.7	12.9
Cholesterol, mg/dl	46.6	48.39	2.16
AST, U/l	18.78	19.54	0.86
ALT, U/l	5.97	5.59	0.28

*** The difference between control and treated cows was significant at P<0.1**

Immunoglobulins:

Least square means of plasma IgG, IgM and IgA of buffalo cows and their calves are presented in Tables (4, 5 and 6). The concentrations of plasma IgG, IgM and IgA were significantly higher (P<0.01) in treated cows compared to control group. As shown in Table (4), plasma IgG of untreated cows decreased gradually to the lowest value (1.77 g/dl) at calving. On the other hand, the treatment with Se+E increased significantly (P<0.01) plasma IgG of cows from 1.78 g/dl to 2.96 g/dl at parturition. A similar trend was observed with plasma IgM and IgA. However, plasma IgG, IgM and IgA of newborn calves (Table 6) elevated to the maximum concentration at 15 days old and thereafter their were declined (P<0.05, P>0.10 and P>0.10, respectively). Plasma Ig (IgG, IgM and IgA) concentration of calves from the treated dams was higher (P<0.01) than those from control dams (Table 5). The interaction between treatment and time tend to increase Ig concentration at d 15 and then it was declined but without significant differences.

Previously, some studies demonstrated that Se supplementation could increase serum IgG, IgM and the production of secondary antibodies to antigen (Droke and Loerch, 1989; Larsen *et al.* 1988 and Reffett *et al* $1988_{a,b}$). Awadeh *et al.* (1998) showed that the supplementation of Se in salt mixes to serum IgG, IgM of cows and their calves. Rock *et al.* (2001) found that Se supplement (as 0.3 mg/kg) of ewe increased the absorption of IgG by the newborn lamb (P<0.05). Paape and Pearson (1975) presented that plasma IgG of cows decreased significantly from 0.82 g/dl at 10 days prepartum to 0.58 g/dl at parturition, whereas plasma IgM declined slightly (0.14 *vs.* 0.12 g/dl), which is in agreement with our result specially in control buffalo cows. On the other side, Lacetera *et al.* (1996) found that the administration of 5 mg Se as sodium selenite plus 25 IU vitamin E/100 kg BW of cows did not affect plasma Ig concentration in cows or their calves.

Table (4): Least square means of plasma IgG, IgM and IgA of buffalo cows.

Plasma of Dams	Day Prepartum						SE	Overall mean		
	30		15		0					
	Cont	Trt	Cont	Trt	Cont	Trt		Cont	Trt	SE
IgG (g/dl)	1.92	1.78	1.83	2.53	1.77	2.96***	0.15	1.84	2.42***	0.09
IgM (g/dl)	0.31	0.29	0.24	0.41	0.24	0.49***	0.03	0.26	0.40***	0.02
IgA (g/dl)	0.085	0.084	0.088	0.116	0.09	0.13**	0.01	0.09	0.11***	0.01

** The difference was significant at P<0.05
*** The difference was significant at P<0.01

Table (5): Least square means of plasma IgG, IgM and IgA of buffalo calves.

Plasma of Calves	Age of Calf (day)						SE	Overall mean		
	0		15		30					
	Cont	Trt	Cont	Trt	Cont	Trt		Cont	Trt	SE
IgG (g/dl)	1.17	2.17	1.44	2.96	1.27	2.35	0.20	1.29	2.49***	0.12
IgM (g/dl)	0.19	0.28	0.18	0.26	0.17	0.27	0.02	0.18	0.27***	0.01
IgA (g/dl)	0.053	0.092	0.058	0.128	0.048	0.11	0.01	0.053	0.11***	0.01

*** The difference was significant at P<0.01

Table (6): Least square means of plasma IgG, IgM and IgA intervals of buffalo cows and their calves.

Plasma of Cows	Cows				Calves			
	Day Prepartum			SE	Age of Calves			SE
	30	15	0		0	15	30	
IgG (g/dl)	1.85^{B}	2.18^{A}	2.36^{A}	0.110	1.67^{b}	2.20^{a}	1.81^{ab}	0.140
IgM (g/dl)	0.297	0.326	0.365	0.019	0.24	0.22	0.22	0.015
IgA (g/dl)	0.084^{b}	0.102^{a}	0.112^{a}	0.006	0.07	0.093	0.079	0.008

A, B Means with differing superscripts within rows are significantly different at P<0.01
a, b Means with differing superscripts within rows are significantly different at P<0.05

Least square means of colostral Ig concentration are present in Table (7). It was found that the colostral Ig levels were not affected significantly by Se+E injection, however the treated group was slightly lower than control. This may be related to decrease total colostral protein content of treated group (7.2 *vs*. 7.9 ±0.54 %, Table 2). The overall means of Ig concentration decreased (P<0.05) gradually at intervals. These findings are in agreement with Lacetera *et al.* (1996), who use cattle, and Hayek *et al.* (1989) who use sows. On the other side, Swecker *et al.* (1995) showed that beef cows which treated with Se as parental administration of 0.1 mg of Se and 1 mg vitamin E/kg BW; 120 mg Se/kg of salt-mineral mix or both compared with no supplemented group. They found that cows given 120 mg Se/kg salt mix (Groups 2 and 3) had higher colostral IgG concentration (P<0.01) than groups 1 and 4, whereas colostral IgM did not differ among treatments. Similar findings were observed by Awadeh *et al.* (1998).

Table (7): Least square means of colostral IgG, IgM and IgA (g/dl) intervals of buffalo cows as affected by Se+E injection.

Items	IgG	IgM	IgA
Control	4.24 ± 0.30	0.73 ± 0.06	0.29 ± 0.015
Treatment	4.15 ± 0.25	0.60 ± 0.05	0.27 ± 0.012
Milking No.: 1	5.43 ± 0.45^{a}	0.75 ± 0.09^{A}	0.35 ± 0.02^{A}
2	4.80 ± 0.49^{ab}	0.93 ± 0.09^{A}	0.30 ± 0.02^{AB}
3	4.42 ± 0.45^{abc}	0.79 ± 0.09^{A}	0.30 ± 0.02^{AB}
4	3.73 ± 0.47^{bc}	0.66 ± 0.09^{AB}	0.27 ± 0.02^{B}
5	3.7 ± 0.49^{bc}	0.44 ± 0.09^{CB}	0.24 ± 0.03^{B}
6	3.10 ± 0.51^{c}	0.40 ± 0.10^{C}	0.23 ± 0.03^{B}

A,B,C Means with differing superscripts within the same column are significantly different at P<0.01

a,b,c Means with differing superscripts within the same column are significantly different at P<0.10

Growth Rate of Calves:

Least square means of birth weight, weaning weight, total gain and daily gain of buffalo calves are in Table (8). Birth weight of calves nursing buffalo cows injected with Se+E was higher than those from control group but without significant differences (38.0 *vs.* 35.8 kg). However, weaning weight, total gain and daily gain were greater (P<0.05) for calves from treated group than those from untreated. Lacetera *et al.* (1996); Awadeh *et al.*, (1998) and Gunter *et al.*, (2003) did not find any significant differences of growth rate (daily gain and/or total gain) between calves nursing cows administered or supplemented with Se and calves nursing control cows.

Table (8): Least square means of growth rate of buffalo calves as affected by Se+E injection to their dams.

	Control	Se+E Trt	SE
Birth Weight, kg	35.8	38.0	2.19
Weaning Weight, kg	76.0	87.7***	2.44
Total gain, kg	40.2	49.7**	2.33
Daily gain, kg	0.412	0.507**	0.023

**** The difference between treated and control group is significant at P<0.05**

***** The difference treated and control group is significant at P<0.01**

Conclusion:

It is concluded that Se+E administration (0.05 mg Se plus 4.5 mg Vitamin E/kg BW/week) to buffalo cows at dry-off period maintained adequate concentration of Se in plasma of cows and increased its content in colostrum. Calves of the treated cows have adequate plasma Se concentration during the first month of age, which resulted in prevention of NMD. The treatment increased plasma Ig of cows and their calves. Daily gain of calves was improved by the treatment of their dams at late gestation period.

REFRENCES

Abdelrahman, M. M., and Kincaid, R. L. (1995). Effect of selenium supplementation of cows on maternal transfer of selenium to fetal and newborn calves. J. Dairy Sci. 78: 625-630.

A.O.A.C. (1990). Association of Official Analytical Chemists. Official Methods of Analysis. 13th ed., Washington, D.C. USA.

Awadeh, F. T.; Kincaid, R. L. and Johnson, K.A. (1998). Effect of level and source of dietary selenium on concentrations of thyroid hormones and immunoglobulins in beef cows and calves. J. Anim. Sci. 76:1204-1215.

Campbell, D. T.; Mass, J.; Weber, D. W.; Hedstrom, O. R.; Norman, B. B. (1990). Safety and efficacy of two sustained-release intrareticular selenium supplements and the associated placental and colostral transfer of selenium in beef cattle. Am. J. Vet. Res., 51: 813-817.

Castellan, D. M.; Maas, J. P.; Gardner, I. A.; Oltjen, J. W. and Sween, M. L. (1999). Growth of suckling beef calves in response to parental administration of selenium and the effect of dietary protein provided to their dams. J. Am. Vet. Med. Assoc. 214: 816–821.

Cipriano, J. E.; Morrill, J. L. and Anderson, N. V. (1982). Effect of dietary vitamin E on immune responses of calves. J. Dairy Sci., 65: 2357(abstract).

Droke, E. A., and Loerch, S. C. (1989). Effects of parenteral selenium and vitamin E on performance, health and humoral immune response of steers new to the feedlot environment. J. Anim. Sci. 67: 1350-1359.

Duncan, D. B. (1955). Multiple range and multiple F-test. Biometrics, 11:1-42.

El-Ayouty, S. A.; Metry, G. H.; Gabr, A. A.; Abd El-Hady, M. A. A. and Khattab, R. M. (2003). Studies on selenium status of suckling buffalo calves: I- Effect of selenium and/or vitamin E administration on growth performance, plasma selenium concentrations, enzyme activities and the prevention of white muscle disease. Egyptian J. Anim. Prod., 40: 1-13.

Gerloff, B. J. (1992). Effect of selenium supplementation on dairy cattle. J. Anim. Sci.,70: 3934-3940.

Gunter, S. A.; Beck, P. A. and Phillips, J. K. (2003). Effects of supplementary selenium source on the performance and blood measurements in beef cows and their calves. J. Anim. Sci., 81: 856-864.

Harrison, J. H.; Hancock, D. D. and Conrad, H. R. (1984). Vitamin E and selenium for reproduction of the dairy cow. J. Dairy Sci. 67:123-132.

Hayek, M. G.; Mitchell, G. E.; Harmon, R. J.; Stahly, T. S.; Cromwell, G. L.; Tucker, R. E. and Barker, K. B. (1989). Porcine immunoglobulin transfer after prepartum treatment with selenium or vitamin E. J. Anim. Sci., 67: 1299-1306.

Hidiroglou, M., and Jenkins, K. J. (1975). Effect of selenium and vitamin E, and copper administrations on weight gains of beef cattle raised in a selenium-deficient area. Can. J. Anim. Sci. 55: 307–313.

Hostetler, D.; Vicki, L. D.; Tyler, J.; Julie Holle and Steevens, B. (2003). Immunoglobulin G concentrations in temporal fractions of first milking colostrum in dairy cows. J. App. Res. Vet. Med., 1: 45-48.

Koller, L. D., Whitbeck, G. A. and South, P. J. (1984). Transplacental transfer and colostral concentrations of selenium in beef cattle. Am. J. Vet. Res. 45: 2507–2510.

Lacetera, N.; Bernabucci, U.; Ronchi, B. and Nardone, A. (1996). Effects of selenium and vitamin E administration during a late stage of pregnancy on colostrum and milk production in dairy cows, and on passive immunity and growth of their offspring. Am. J. Vet. Res., 57: 1776-1780.

Larsen, H. J. 1993. Relation between selenium and immunity. Norw. J. Agric. Sci. Suppl. 11:105-119.

Larsen, H. J.; Moksnes, K. and Overnes, G. (1988). Influence of selenium on antibody production in sheep. Res. Vet. Sci., 45: 4-10.

Maas, J.; Peauroi, J. R.; Tonjes, T.; Karlonas, J.; Galey, F. D. and Han, B. (1993). Intramuscular selenium administration in selenium-deficient cattle. J. Vet. Int. Med. 7: 342-348.

NAHMS. (1993). Dairy herd management practices focusing on preweaned heifers. USDA: APHIS:VS, Fort Collins, CO.

NRC. (2001). Nutrient Requirements of Dairy Cattle. National Academy Press, Washington, DC.

Ortman, K. and Pehrson, B. (1999). Effect of selenate as a feed supplement to dairy cows in comparison to selenite and selenium yeast. J. Anim. Sci. 77: 3365-3370.

Paape, M. J. and Pearson, R. E. (1975). Phagocytosis and immunoglobulins during lactation. J. Dairy Sci. 58: 1242-1243.

Pavlata, L.; Prasek, J.; Pechova, A. and Haloun, T. (2003). Selenium metabolism in cattle: Maternal transfer of selenium to newborn calves at different selenium concentration in dams. Acta Vet. Brno. 72: 639-646.

Pehrson, B.; Knutsson, M. and Gyllensward, M. (1989). Glutathione peroxidase activity in heifers fed diets supplemented with organic and inorganic selenium compounds. Swed. J. Agric. Res. 19: 53-56.

Reddy, P. G.; Morrill, J. L.; Frey, R. A.; Morrill, M. B.; Minocha, H. C.; Galitzer, S. J. and Dayton, A. D. (1985). Effect of supplemental vitamin E on the performance and metabolic profiles of dairy calves. J. Dairy Sci., 68: 2259-2266.

Reffett, J. K.; Spears, J. W. and Brown, T. T. Jr. (1988_a). Effect of dietary selenium on the primary and secondary immune response in calves challenged with infectious bovine rhinotracheitis virus. J. Nutr., 118: 229-235.

Reffett, J. K.; Spears, J. W. and Brown, T. T. Jr. (1988_b). Effect of dietary selenium and vitamin E on the primary and secondary immune response in lambs challenged with parainfluenza virus. J. Anim. Sci., 66: 1520-1528.

Rice, D. A. and Kennedy, S. (1988). Vitamin E and free radical formation: Possible implications for animal nutrition. In Haresign and Cole editors of Recent Advances in Animal Nutrition, 3: 39-57.

Rock, M. J. Kincaid, R. L. and Carstens, G. E. (2001). Effects of prenatal source and level of dietary selenium on passive immunity and thermometabolism of newborn lambs. Small Ruminant Research 40: 129-138.

Rotruck, J. T.; Pope, A. L.; Ganther, H. E.; Swanson, A.; Hafeman, D. and Hoekstra, W. G. (1973). Selenium: biological role as a component of glutathione peroxidase. Scince, USA 179: 588-590.

Rowntree, J. E.; Hill, G. M.; Hawkins, D. R.; Link, J. E.; Rincker, M. J.; Bednar, G. W. and Kreft, R. A. (2004). Effect of Se on selenoprotein activity and thyroid hormone metabolism in beef and dairy cows and calves. J. Anim. Sci., 82: 2995-3005.

SAS (1996). SAS User's Guide, SAS (Statistical Analysis System) Institute, Cary, NC.

Schwarz, K. and Foltz, C. M. (1957).Selenium as an integral part of factor 3 against dietary necrotic liver degeneration. J. Amer. Chem. Soc., 79: 3292-3293.

Spears, J. W.; Harvey, R. W. and Segerson, E.C. (1986). Effects of marginal selenium deficiency and winter protein supplementation on growth, reproduction and selenium status of beef cattle. J. Anim Sci., 63: 586-594.

Stowe, H. D., Thomas, J. W.; Johnson, T.; Marteniuk, J. V.; Morrow, D. A. and Ullrey, D. E. (1988). Responses of dairy cattle to long-term and short-term supplementation with oral selenium and vitamin E. J. Dairy Sci. 71: 1830-1839.

Swecker, W. S.; Thatcher, Jr.; Eversole, C. D.; Blodgett, D. E. and Schurig, D. J. (1995). Effect of selenium supplementation on colostral IgG concentration in cows grazing selenium-deficient pastures and on postsuckle serum IgG concentration in their calves. Am. J. Vet. Res., 56: 450-453.

Underwood, E. J. and Suttle, N. F. (1999). Mineral Nutrition of Livestock. (3rd edition). CABI publishing, UK, 421-475.

Van Saun, R. J. (1990). Rational approach to selenium supplementation essential. Feedstuffs, 15: 15.

Weiss, W. P.; Todhunter, D. A.; Hogan, J. S. and Smith, K. L. (1990). Effect of duration of supplementation of selenium and vitamin E on periparturient dairy cows. J. Dairy Sci. 73: 3187-3194.

تأثيرالحقن بالسيلينيوم وفيتامبن E للجاموس أثناء الفترة الأخيرة من الحمل على انتقال السيلينيوم والأجسام المناعية من الأمهات الى أبنائها

ماجـد عبدالهادى عبدالعزيز عبدالهادى* - رضا وهيب راغب - جميل حبيب مترى***

*** معهد بحوث الانتاج الحيوانى - مركز البحوث الزراعية - الدقى - الجيزة - مصر.**

****معهد بحوث التناسليات الحيوانية - مركز البحوث الزراعية - الهرم- الجيزة - مصر.**

أجريت هذه الدراسة لتقييم تأثير حقن السيلينيوم وفيتامين E لأمهات الجاموس فى الفترة الأخيرة من الحمل على انتقال السيلينيوم والأجسام المناعية من الأمهات الى أبنائها. تم اختيار ١٤ جاموسة من مختلف المواسم الإنتاجية وفى مرحلة الحمل المتأخر (٦٠ يوما قبل الولادة) ووزعت عشوائيا الى مجموعتين، الأولى (مجموعة المقارنة - ٦ حيوانات) لم تكن تعامل بشئ. ، أما الثانية (مجموعة المعاملة - ٨ حيوانات) كانت تحقن فى العضل بمعدل ٠,٠٥ مجم سيلينيوم (فى صورة صديوم سيلينيت) مع ٤,٥ مجم فيتامين E / كجم وزن جسم / أسبوع وكانت جميع الحيوانات تغذى يوميا على ٥٠% عليقة مركزة ، ٢٥% دريس برسيم، ٢٥% قش أرز وذلك بمعدل ٢,٥ كجم مادة جافة / ١٠٠كجم وزن جسم.

وقد أدت المعاملة الى زيادة تركيز السيلينيوم فى بلازما دم الأمهات التى كانت تحقن بالسيلينيوم وفيتامين E زيادة معنوية (P<0.01) بالمقارنة بالأمهات التى لم تحقن (٧١,٧ مقارنة ب ٥٢,٦ نانوجرام/مل) . كذلك فان مستوى السيلينيوم فى أبناء الأمهات المعاملة كان أعلى معنويا (P<0.10)بالمقارنة بأبناء الأمهات الغير معاملة. وكان تركيز السيلينيوم فى السرسوب الناتج من الأمهات المعاملة أعلى معنويا من ذلك الناتج عن الأمهات الغير معاملة (P<0.01).

وقد تحسن معدل الزيادة الوزنية اليومية لأبناء الحيوانات المعاملة (P<0.05). وقد أدت معاملة الأمهات الى زيادة معنوية (P<0.01) فى تركيز الأجسام المناعية (IgG, IgM and IgA) فى بلازما دم الأمهات وكذلك فى بلازما دم أبنائها بالمقارنة بتلك التى لم يتم معاملتها وأبنائها على التوالى. فى حين لم يكن هناك تأثيرا معنويا للمعاملة على تركيز الأجسام المناعية فى السرسوب الناتج. كما لم يكن هناك تاثيراً معنويا للمعاملة على قياسات الدم المختلفة (البروتين الكلى ، الألبيومين ، الجلوبيولين ، الجلوكوز ، الكوليستيرول ، الدهون الكلية وانزيمات الكبد ALT & AST) وكذلك على التركيب الكيماوى للسرسوب.

نستخلص من هذه الدراسة أن حقن أمهات الجاموس فى الفترة الأخيرة من الحمل بالسيلينيوم وفيتامين E قد أدى الى زيادة مستويات السيلينيوم والأجسام المناعية فى دم الأمهات وكذلك فى دم أبنائها مما أدى الى تحسين الحالة الصحية للأبناء والوقاية من الإصابة بمرض العضلة البيضاء فى الفترة الأولى من العمر، كما أدى الى تحسين معدلات نمو الأبناء.