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EFFECT OF HIGH DOSE OF SELENIUM ON SOME BLOOD PARAMETERS OF BALADI RABBITS

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Abstract

It is necessary to regulate and examine the used Se physiological dose in Baladi rabbit practice. Selenium injection at low dose 0.1 mg/kg body weight had significantly increased serum sodium and phosphorus in both sexes. Only sodium of males of 0.2 mg injected group increased and this dose released more alkaline phosphatase in both sexes. Liver carotenoids significantly increased with 0.1 mg injected group in both sexes, and glycogen reserves decreased significantly with 0.2 mg.

INTRODUCTION

The nutritional essentiality of selenium has been demonstrated for numerous species of animals. This element has been shown to be a constituent of the enzyme glutathione peroxidase which is involved in the disposal of peroxides in tissues. Buescher *et al.* (1960), McConnell and Levy (1962), Cousins and Cairney (1961) and Aikowa and David (1969) found that significant increase in Na content of brain as well as of bone, liver, lung, skin, spleen, stomach and testes of Se-deficient rabbits was noticed. Potassium levels were decreased in bone and kidneys of these rabbits but elevated in the lage intestine.

So, the present study investigates the effect of selenium when given in high dose on some physiological parameters of Baladi rabbits.

MATERIALS AND METHODS

The rabbits were divided into 3 groups (16, 16 and 12) but were caged separately. The first and second groups were injected intramuscularly with sodium selenite 0.1 or 0.2 mg/kg body weight, twice weekly for 3 weeks. The third group was left as a control group. After 3 weeks of treatment, rabbits were slaughtered and blood samples and livers were collected for the following analysis. Serum was used for inorganic phosphorus and alkaline phosphatase estimation according to Urbach technique (1934) which was modified by Raabe (1951) as described by Klichling and Freiburg (1951). Magnesium was spectrophotometrically estimated after Neill and Nelly (1956). Calcium was determined by the method of Bett and Fraser (1959) using calcein as indicator. Plasma sodium and potassium were measured by clinical flamephotometer 410 C according to the method of Oser (1979).

Fresh liver tissue was taken for carotenoids and vitamin A estimation according to Beadle and Zscheile (1942) and Zechmeister and Polgar (1942) as cited in Oser (1979). Live glycogen content was determined by the anthrone method described by Carroll *et al.* (1956).

RESULTS AND DISCUSSION

The influence of the injections of selenium intramuscularly on some blood parameters are presented in Tables 1 & 2 and those of the liver in Table 3.

Table 1 shows a significant increase in sodium ions and Na/K ratio of 0.1 group. This could be due to the fact that selenium was associated with the plasma proteins. From the plasma proteins, Se enters within all the tissues, including bones,

hair and the red blood cells and leukocytes. These results were confirmed by Buescher *et al.* (1960), McConnell and Levy (1962), Cousins and Cairney (1961) and Aikowa and David (1969) who found that significant increase in Na content of brain as well as of bone, liver, lung, skin, spleen, stomach and testes of Se deficient rabbits. Potassium levels were decreased in bone and kidneys of these rabbits but elevated in the large intestine.

Decreasing of Na in 0.2 mg group may be due to damage in kidney function which lead to increase in alkaline phosphatase enzyme in the same groups.

Table 2 shows insignificant decrease in serum Ca in both injected groups, and a significant increase in inorganic phosphorus than control group. Eva and Emily (1992) found that rabbits injected with selenium grew significantly faster after the first week only and consumed significantly more diet than controls. These results are supported by Ahmed *et al.* (1988), who found that 5 mg/kg/day of sodium selenite, cause increase in inorganic phosphate, and decrease in Ca, while doses of 1, 0.5, 0.25 mg/kg/day were non-toxic to goats. Magnesium ions were decreased insignificantly in both groups than control. However, there was a significant increase in Ca/Mg ratio due to the decrease in Mg and was associated with a significant increase in Alk-phos. activity. The decrease of Mg ions would have caused increasing of parathyroid hormones secretion which cause release of inorganic phosphorus from bone. Baumann and Sprinson (1939) fed rabbits on diet high in P and relatively low in calcium developed hypertrophy and hyperplasia of parathyroids and maintained markedly increased serum levels of parathyroid hormone for up to 2.5 years. Alkaline phosphatase increased in both male and female (0.2 mg) injected group, while it is decreased in (0.1 mg) injected group. This also agrees with the findings obtained by Mathien and Smith (1961) who found increase in serum alk. phosphatase in rabbits injected with 0.2 mg sod. selenite.

Table 3 shows decrease in carotenoids but significant in glycogen content in both injected groups than control. However, that was not signficant in males with 0.2 and both sexes with 0.1 mg. Vitamin A decrease which was non-significant produced glycogenolysis process. The liver vit. A formation from carotenoids entered blood binding plasma protein and was transported to cells for metabolic activities and biochemical changes that occurred as a result of 0.2 mg Se injection.

Selenium has not been demonstrated to be nutritionally essential for the rabbits, the author does not prefer high doses (0.2 mg) for rabbits and furhter studies

Table 1. Effect of Selenium on Sodium and Potassium balance in rabbits serum.

Item m.eq./L	Sex (no.)	Injected selenium (mg/k body weight) (0.0) 12	(0.1) 16	(0.2) 16
Sodium	o	142.22±4.60^a	160.61+3.30^b	113.00±2.50^b
	♀	124.41±2.40^a	142.00+3.50^b	123.41±4.60^a
Potasium	o	6.74±0.48^a	6.52+0.31^a	6.12±0.23^a
	♀	6.66±0.29^a	6.50+0.21^a	6.22±0.44^a
Sod./Pot. ratio	o	21.52±1.39^a	24.80+1.21^b	18.60±0.64^a
	♀	18.18±0.50^a	21.88+0.36^b	20.17±1.32^a

- Means in the same horizontal row with the same letter are not significantly different.

m.eq. / L: milliequivalent/ Liter

( ) : no. of animals

± : Standard error

Table 2. Serum Calcium, Inorganic Phosphorus, Magnesium and Alkaline Phosphatase of rabbits serum.

Item m.eq./L	Sex (no.)	Injected selenium (mg/k body weight) (0.0) 12	(0.1) 16	(0.2) 16
Calcium	o	17.60±0.60[a]	15.91±1.70[a]	15.36±1.00[a]
	o	13.75±0.84[a]	16.12±1.90[a]	14.56±1.67[a]
Phosphorus	o	6.17±0.33[a]	8.39±0.51[b]	7.80±0.25[b]
	o	6.56±0.45[a]	7.69±0.24[b]	9.42±1.02[b]
Ca x P	o	108.37±5.50[a]	111.72±4.70[a]	118.72±10.96[a]
	o	89.66+6.90[a]	118.12±24.5[a]	115.60±13.8[a]
Mg	o	2.56±0.17[a]	2.10±0.15[a]	1.53±0.09[a]
	o	2.28±0.06[a]	1.89±0.20[a]	1.64±0.08[a]
Ca/Mg	o	6.99±0.55[a]	7.60±0.61[a]	10.31±1.10[b]
	o	6.08±0.49[a]	8.73±1.07[b]	8.77±0.60[b]
Akl. Phos	o	2.19±0.50[a]	1.55±0.30a	3.36±0.15[b]
	o	1.46±0.25 [a]	1.35±0.29a	

- Means in the same horizontal row with the same letter are not significantly different.

( ) : no. of animals

± : Standard error

Table 3. Effect of Selenium injection on Carotenoids , vitamin A and Glycogen of rabbits liver.

Item m.eq./L	Sex (no.)	Injected selenium (mg/k body weight)		
		(0.0) 12	(0.1) 16	(0.2) 16
Carotenoids	o	0.31+0.02a	0.25+0.01b	0.22+0.04a
µg/g F.T.	o	0.33+0.01a	0.22+0.02b	0.21+0.02b
Vit. A	o	57.30+8.80a	44.80+2.70a	50.20+4.80a
µg/g F.T	o	53.30+3.10a	50.20+4.20a	56.20+1.80a
Glycogen	o	45.67+4.60a	39.71+0.46a	34.80+0.82b
mg/g F.T	o	53.70+3.70a	44.84+2.06a	38.21+2.96

- Means in the same horizontal row with the same letter are not significantly different.

F.T. : Fresh tissue.

( ) : no. of animals

± : Standard error

are needed to determine the significiant role of less than 0.1 mg Se/kg in rabbit nutrition. Cheeke and Whanger (1976) have found that rabbit tissues do have glutathione peroxidase activity with levels comparable to or higher than those of rat tissues, while Jenkins *et al.* (1970) found that a low selenium hay that induced nutritional muscular dystrophy in lambs and calves from dams fed the hay did not produce any deficiency signs when fed to young rabbits.

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تأثير الجرعة العالية من عنصر السيلينيوم على بعض المعايير فى الارانب البلدى

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تمت دراسة تأثير حقن عنصر السيلينيوم بجرعات عالية على تمثيل بعض العناصر الغذائية فى الأرانب البلدية. وتبين أن الجرعة الصغيرة (٠,١ ملجم) أدت إلى زيادة فى الصوديوم والفوسفور بسيرم الذكور والاناث والكاروتينات بالكبد. أما الجرعة الكبيرة (٠,٢ ملجم) فتبين أنها أدت الى زيادة فى إنزيم الفوسفاتيز القلوى بسيرم الذكور والإناث وزيادة الصوديوم بسيرم الذكور فقط ، بينما المختزنات من الجليكوجين قد إنخفضت.

وعلى هذا يعتبر عنصر السيلينيوم بالجرعة الكبيرة لا يفضل إستخدامها للأرانب.