Selenium levels in clinically healthy Iraqi stray cats in Baghdad city

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Summery

The aim of this study was to measure the selenium level in the stray cats of both sexes. Blood samples were collected from forty four male and female stray cats from different places in Baghdad city for the estimation of selenium level. The results showed that the lowest value was 1.646 µmol/L (0.13 µg/ml (ppm)) and the highest value was 3.798 µmol/L (0.3 µg/ml (ppm)) with a mean value ± Standard Error of 2.526 µmol/L ± 0.091 (0.1995 µg/ml (ppm)± 0.007). The range in males and females was 1.646 - 3.798 µmol/L (0.13 - 0.3 µg/ml (ppm)) and 2.405 - 3.798 µmol/L (0.19 - 0.3 µg/ml (ppm)), respectively with a mean 2.45 µmol/L ± 0.108 (0.194 µg/ml (ppm)± 0.009) and 2.785 µmol/L ± 0.137 (0.22 µg/ml (ppm)± 0.011) for males and females respectively .There were no significant differences between sexes under level (P≤ 0.05). The selenium concentration in blood of local Iraqi cats was within the international lowest limit of these ranges.

Keywords: Selenium, Blood, Cat.

Introduction

The name selenium was identified in Stockholm in 1817 (1). Selenium is a trace mineral that the body uses to produce glutathione peroxidase (GPx) which is one of the components of the body's antioxidant defense mechanisms. In human and animals it works with vitamin E to protect cell membranes from damage caused by dangerous naturally occurring substances known as free radicals (2). It is essential to take adequate selenium for thyroid gland and immune normal functions. Selenium is considered as a main part of selenoenzymes like thyroxine reductase, GPx, thyroid hormone deiodinase and other (3). When selenium is combined with Vit. E in the diet it will help to enhance the immune parameters (4). The role of supplementation of selenium alone or with combination of Vit. E in cats diet and its effect on immune function is investigated by (5). The previous study found no effect of selenium on the immune system in healthy cats. In other species, the suppressing effect on the immune response is reported as a result of selenium deficiency (6). There are very few studies dealing with feline requirement to selenium (7). It is reported that 0.3mg/kg dry matter (DM) is the minimum selenium requirement for cats based on studies of other animal species (8). There is no data for the toxicity or deficiency levels in cats (7), in kittens selenium deficiency leads to decrease in hair growth rate, no obvious effect appeared with increasing the dose of selenium intake (9). Unlike other species feline can tolerate selenium levels much higher than others (7 and 10), by lowering storage of selenium in liver and increasing excess selenium clearance with urine (11). Hyperparathyroidism did not alter selenium metabolism in cats as it did in other species (12). Also chronic kidney diseases did not change selenium concentration in serum (13). In Iraq, the normal selenium levels of most healthy and non-healthy animals have not been measured. In healthy male awassi lambs it is 0.48 – 0.52 µmol/L (1). The mean value in healthy awassi ewes is 0.47µmol/L± 0.3 (14). Thus selenium is measured only in sheep in Iraq, Therefore the aim of this investigation was to measure the selenium level in other animals starting with feline species.

Materials and Methods

Forty four clinically healthy mature Iraqi stray cats, (thirty four males and ten females) were used. The age of cats ranged from more than one year to about 15 years old (age was estimated by teeth), weight ranged from 2kg to 5.6 kg in males and 2kg to 4.2 Kg in females, Body temperature, heart rate, breathing rate were within the normal ranges. Cats were captured in sealed cages containing small amount of food. The cats were sedated by allowing them to halothane gas inspiration.

After sedation, 5ml of blood was collected from the Jugular vein. The blood was allowed to clot, serum was separated and stored in Eppendorf tubes (1ml) at -20°C till use. Selenium was measured using flameless atomic absorption according to (15). The results were in old units µg/ml (ppm) then converted to Standard International (SI) units µmol/L by equation [(µg/ml) x 12.66 = µmol/L] (16). The data were analyzed by computer to find the range , mean and standard error, and for the significant difference between groups of males and females results were calculated by t value at the level (P≤0.05) (17).

Results and Discussion

Cats showed higher selenium concentration in blood as compared to other species (18). The cats had 50-70% selenium concentration in serum higher than dogs fed diets containing the same amount of selenium, and as compared to other species have five folds of selenium concentration higher in serum (19). The all over of this investigation showed the lowest and highest levels as mentioned in (Table, 1). Taking into consideration the sex, the ranges of selenium levels in both sexes are shown in (Table, 2).

Table, 1: The mean and range of serum selenium concentration in cats.

Total 44 cats	Serum selenium concentration	
	µmol/L	µg/ml (ppm)
Mean	2.526	0.1995
SE ±	0.091	0.007
Max	3.798	0.3
Min	1.646	0.13

Table, 2: The mean and range of serum selenium concentration in males and females cats.

34 male 10 female	Serum selenium concentration		Serum selenium concentration	
	µmol/L Males	µmol/L Females	µg/ml (ppm) Males	µg/ml (ppm) Females
Mean	2.45	2.785	0.194	0.22
SE ±	0.108	0.137	0.009	0.011
Max	3.798	3.798	0.3	0.3
Min	1.646	2.405	0.13	0.19

***There is no significant differences between males and females at the level (P≤ 0.05)**

The mean value of serum selenium concentration in our result was 2.526 µmol/L ± 0.091 (0.1995 µg/ml (ppm) ± 0.007) of the overall measurement is close to that mentioned by (20) which is (2.05 µmol/L) in west Ukraine, while the same researcher (20) mentioned another mean value of (6.16 µmol/L) but in another place (Pomerania) and it was disagree with our result. In New Zealand it is mentioned by (11) that the mean value of selenium in groups of cats were between (6.3 -7.0 µmol/L) which were close to the value of (6.16 µmol/L) in Pomerania (20). Moreover, (13) used 15 cats as control group, the mean of serum selenium concentration was 0.473 µg/ml ± 0.066 (5.99 µmol/L) and was above the maximum data of our result. In another study (3), 19 healthy cats, their mean was 0.415 µg/ml ± 0.091 (5.25 µmol/L) and it was in cats suffering from chronic kidney disease 0.426 µg/ml ± 0.042 (5.39 µmol/L) in both results value was higher than the maximum range of our result. Such differences between our results and that of other places could be attributed to the diet of the cats or may be due to the environmental condition like hot weather of Iraq.

World reference ranges (19) extended from 2.785 to 58.36 µmol/L (0.22 – 4.61 µg/ml (ppm), when compared to our data showing maximum selenium concentrations in serum of local Iraqi cats. Our maximum results were within the limits of universal normal ranges, but the minimum results of our study were slightly under the lowest limit of the world reference ranges. In this investigation it did not detect great differences between sexes, so did the researcher (20) in his survey. The serum selenium concentration in local Iraqi cats ranged from 1.646-3.798 µmol/L (0.13 - 0.3 µg/ml (ppm) in males and 2.405-3.798 µmol/L (0.19-0.3 µg/ml (ppm) in females with a mean value ±_Standard Error 2.45 µmol/L± 0.108 (0.194 µg/ml (ppm) ±0.009) and 2.785 µmol/L ±0.137 (0.22 µg/ml (ppm) ±0.011) in males and females respectively. Selenium in good and bad health need more investigation and study and will show differences from place to place.

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مستويات السلينيوم في القطط العراقية السليمة سريرياً السائبة في مدينة بغداد

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الخلاصة

إن الهدف من هذه الدراسة قياس مستوى السلينيوم في القطط السائبة لكلا الجنسين. جمعت أربع وأربعون عينة دم من ذكور وإناث قطط عراقية سائبة في مدينة بغداد لقياس مستوى عنصر السلينيوم. وأظهرت النتائج بأن أقل مستوى للسلينيوم كان 1.646 مايكرو مول/لتر (0.13 مايكروغرام /مل لتر (جزء من المليون)) وان أعلى مستوى كان 3.798 مايكرو مول/لتر (0.3 مايكروغرام/ مل لتر(جزء من المليون)) وبمتوسط ± الخطأ القياسي 2.526 مايكرو مول/لتر ±0.091 (0.1995 مايكروغرام/ مل لتر (جزء من المليون) ±0.007). وإنّ المدى لمجاميع الذكور والإناث كانت 1.646 - 3.798 مايكرو مول/ لتر (0.13 – 0.3 مايكروغرام/ مل لتر (جزء من المليون)) و 2.405 - 3.798 مايكرو مول/ لتر (0.19 - 0.3 مايكروغرام / مل لتر (جزء من المليون)) على التوالي وبمتوسطات 2.45 مايكرو مول/ لتر ±0.108 (0.194 مايكروغرام/ مل لتر (جزء من المليون) ±0.009) و 2.785 مايكرو مول/ لتر±0.137 (0.22 مايكروغرام/ مل لتر (جزء من المليون) ±0.011) للذكور والإناث على التوالي، ولم تظهر أية فروق معنوية مابين تلك المجاميع تحت مستوى ($P\leq0.05$). نستنتج من هذه الدراسة أن تركيز السيلينيوم في دم القطط المحلية العراقية كان ضمن الحدود الدنيا للمديات العالمية.

الكلمات المفتاحية: سيلينيوم، دم، قطط.