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INVESTIGATION ON SERUM TRACE ELEMENT STATUS (COPPER; IRON AND ZINC) IN IRAQI CAMELS *(CAMELUS DROMEDARIES)*

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Abstract

This is the first study aimed to assess levels of some serum micronutrients in camels (Camelus dromedarius) clinically healthy in central Iraq. Fifty nine (59) camels with both sexes were categorized as two age groups. The first group composed of ninety camels (19) were in the age group of (3-4) years, While the second group included fourteen (40) were in the age group 5-8 years. Blood samples had been collected from all experimental camels. Spectrophotometry used for measurement the Copper concentrations in the blood; Iron and Zink. The consequences revealed that generally Cu; Fe and Zn were in the physiological range in all experimental camels. There were no statistical difference ($p>0.05$) in mean serum concentrations of Cu; Fe and Zn between male and female, whereas mean serum concentrations of Cu and Zn were increased significantly ($p>0.05$) in the age group (3-4) years compared to age group (5-8) years. As for Fe its mean serum concentrations were not significantly affected by age interval. The normal values of Cu; Fe and Zn in blood serum had been reported and all values were within the physiological range informed in other studies may be due to an adequate supply of this micronutrient; same management and environmental condition of camel husbandry. Our results may be applied to fix the base level of micro-minerals in Iraqi camels.

Key words : Iraqi camels, Serum traces element, Copper, Iron and Zink.

Introduction

Camel is considered as ruminant animal that is well adapted to the harsh environment of the desert and it is multi-purpose animal that used for, racing, transportation and providing good source of milk, meat and wool (Kamal, 2008; Meiloud *et al.*, 2011). Naturally, camels are needed minerals like all the members of animals and plant kingdom for efficient performance and their survival. Macro- and micro minerals are essential inorganic substances for maintaining the normal function living status and in domestic animals (Sharma *et al.*, 2006; Soetan *et al.*, 2010). Macro elements such as phosphorus, calcium, magnesium sulfur, chlorine, sodium and potassium are essential components structural of the skeleton and their lack the body structures weaken. The majority of these elements have more than one function like the involvement in acid-base balance, while many are contained in the enzyme system (Church and Pond, 1988).

On the other hand, micronutrient such as selenium, cobalt, copper, iron and zinc are involved in many physiological activities and are also known as integral components of some enzymes, such as, copper in alkaline phosphatase, cytochrome oxidase, RNA Polymerase and DNA, Dehydrogenases and Cystyloxidase, selenium in Gluthione Peroxidase and manganese in pyruvate carboxylase. Some are involved in metalloprotein (iron in myoglobin and hemoglobin), hormones (Iodine in thyroid hormones) and vitamins (cobalt in vitamin B12) (Deen *et al.*, 2004). Commonly, these played a crucial physiological processes role related to health, the growth of the most organs, reproduction, and they provide the adequate function of the endocrine and immune systems. The inadequate nutrition, particularly mineral deficiency lead to suboptimal reproductive efficiency and low production

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in livestock, in addition the performance of the animal, such as immunity depressed and reproduction, reduced milk yield, mastitis in high incidence, and lameness degree increased because of laminitis, may be results due to mineral deficiency in dairy animals (Dobrzañski *et al.*, 2005; Nocek *et al.*, 2006). Moreover, a wide variety of metabolic defects and pathological changes happened due to the deficiency of these elements (Deen *et al.*, 2004; Hamzah and Hasso, 2019).

In the camels, clinical deficiencies of mineral had been reported (Faye *et al.*, 1992, Faye and Bengoumi, 1994), due to the camels versatile nature, the incidence and importance of mineral deficiencies tend to be underestimated because deficiencies in sub-clinical forms might go not observed for long periods (Badiei *et al.*, 2006). However, there are no available data in published literature regarding serum levels of copper (Cu), iron (Fe) and zinc (Zn) in camels in our country. So, this study was designed to provide data for the normal level of trace elements in the blood serum of Iraqi dromedary camels in both sexes within two age intervals.

Materials and Methods

Animals

The present study was ranged from November 2018 to March 2019. A total of fifty nine (59) clinically healthy camels were chosen from four different regions of central Iraq, both sexes and within different age. The experimental animals were categorized as two age groups. The first group composed of ninety camels (19) were in the age (3-4) years. While the second group included fourteen (40) were in the age (5-8) years. Blood samples (10 ml) were taken from the jugular vein by using disposable sterile syringes and vacutainer tubes, Upon sampling, blood underwent spontaneous coagulation at room temperature. Then, we separate the serum by centrifugation 3000 cycles per minute for five minutes and then store the serum at -20 C until it is examined according to Butrimovitz and Purdy (1977), zinc, Iron and copper were determined.

Biochemical analysis

The concentrations of copper, zinc, and iron were measured by atomic absorption spectrophotometry (Shimadzu, Model 6601).

Statistical analysis

1. Data were presented as mean ± standard error (SEM). Significant differences between genders and age interval were evaluated by independent-samples T-test. P=0.05 was designed as significance. (Schiefer, 1980).

Results

Table 1 presented the mean ± SEM concentrations of (Cu, Fe and Zn) in the serum of male involved in this study as (92.76 ± 4.86); (106.04 ± 2.39); and (92.47 ± 3.46) μg/100ml, respectively. That indicated no statistically significant values for the concentration of (Cu, Fe and Zn) in serum of female which were (88.84 ± 2.79); (116.21± 5.02); and (85.28 ± 3.34) μg/100ml, respectively.

In table 2, the assessment of micronutrients level in serum as Cu (109.63 ± 2.76); Fe (107.15 ± 2.32) and Zn (105.47 ± 2.73) in the age group (3-4 years) were increased significantly than in age group (5-8 years) as copper (77.65 ± 2.60) and Zink (82.85 ± 2.12). On the other hands, the mean ± SEM concentrations of Fe in the serum of age group (3-4years); (5-8years) were (106.04 ± 2.39) and (116.21± 5.02) μg/100ml, respectively. That revealed no significant alteration in Iron concentration between the two age groups. .

Discussion

Trace elements such as zinc, iron, manganese, copper, selenium, cobalt, chromium and iodine, though required in minute quantities (less than 100 mg/kg dry matter), are needed for immunity and health maintaining, in addition they are impacting in production, reproduction and growth. These trace element performance by way of co-factors of enzymes, which are important for animal immunity (Yatoo, *et al.*, 2013)

Copper

Cu wanted for normal red blood cell formation. Furthermore, it is essential for normal activity of many enzymes, including such important ones as lysyl oxidase, superoxide dismutase, cytochrome-c oxidase, and ceruloplasmin and tyrosinase. These enzymes are important in detoxication of superoxide radicals, the elastin and collagen structural integrity, iron transport, pigmentation and energy metabolism. (Ward 1996; Mullis *et al.*, 2003). In our investigation the mean serum concentrations of Copper for camels were in the normal physiological range in the ruminant according to Faye *et al*. (2008) who established the normal Cu levels in ruminant was (70-120 μg/100ml) and (70-140 μg/100ml) according to (Damir *et al.*, 2008). May be due to the nature of the feed intake that containing a good level of Cu and providing an optimal supply of this trace element in the both sexes of camels tested and owing to the fact that generally the forage trees richer in copper and it considered the main source of grazing for camels. (Faye *et al.*, 1986; Tartour, 1966).

Table 1: Mean ± SEM. Concentration of trace element level (Cu,Fe and Zn) in the serum of Iraqi camels according to gender.

Parameters			Total sample No. and %	Gender
Zinc	Iron	Copper		
92.47 ± 3.46A	106.04 ± 2.39A	92.76 ± 4.86A	21(35.59)	Male
88.84 ± 2.79A	116.21± 5.02A	85.28 ± 3.34A	38(64.4)	Female
0.797	1.827	1.296		T test
0.429	0.073	0.200		P value

Similar letters refer to the non-significant difference at P<0.05.

Table 2: Mean ± SEM. Concentrations of serum trace element levels (Cu, Fe and Zn) in Iraqi camels according to age interval.

Parameters			Total sample No. and %	Age interval
Zinc	Iron	Copper		
105.47 ± 2.73A	107.15 ± 2.32A	109.63 ± 2.76A	19(32.2)	3-4 years
82.85 ± 2.12B	115.17± 4.84A	77.65 ± 2.60B	40(67.79)	5-8 years
6.252	1.493	8.410		T test
0	0.141	0		P value

Similar letters refer to the non-significant difference at P<0.05.
Different letters refer to the significant difference at P P<0.05.

However, the results of data obtained in this study showed no statistical difference (p>0.05) in mean serum concentration of Cu between male and female, and that was in agreement with Abdala (1988); Bengouni *et al*. (1995); Zia-ur-Rahman *et al*. (2007) who observed no sex effect on Cu level. At the same time the results registered a higher concentration of Cu in age group (3-4years) compared to value of age group (5-8 years) that is in accordance to Mohamed and Hussien (1999) who explained a wide range of serum mineral value which had been attributed to many factors such as age, breed, sampling and analytical procedure.

Iron

Iron is an essential for animals because of its major role in haemoglobin synthesis process and transport of (O_2) in the blood and myoglobin in skeletal muscles. In electron transportation it acts as an essential part of cytochromes and Fe-dependent proteins. (Spears, 2003; Theil, 2004; Nocek *et al.,* 2006).

In the current study, the mean concentration of Fe was higher than studies by (Nazifi and Maleki, 1998; Osman and Al-Busadah, 2003; Abdalmula *et al.,* 2018). With no statistical significance (p>0.05) between values obtained from male and female, suggesting no sex effect on an Iron level that in agreement with (Badiei *et al.,* 2006; Hamzah and Hasso, 2019), who noted no difference due to sex had been founded in serum concentrations of micronutrients. Moreover, according to age interval there was no significant alteration in serum Fe levels and that is in difference with (Faye *et al.,* 2008; Eltahir *et al.,* 2010) who reported a highest Fe level for older camels over than (8 years) compared to (3-7) years of age.

Zinc

Zinc has been implicated in conditions such as dwarfism and poor sexual development and in other metabolic processes, including maintenance of the integrity of the male gorads and of the brain, the skin, the eye and the bones. (Faye *et al.,* 1986). Over 70 enzymes in mammals need Zn in their installation. These enzymes are involved in metabolism of protein, carbohydrate, nucleic acid and lipid. (Miller, 1970; Olson *et al.,* 1999; Ballantine *et al.,* 2002; Kellogg *et al.,* 2004).

In this work serum Zn levels in experimental camels were within the physiological range of (70 – 120 µg/100 ml) (Abdel-Moty, *et al.,* 1968; El Tohamy *et al.,* 1986; Faye *et al.,* 1986), showed no significance (p>0.05) in values between male and female. That was in agreement with EL-Tohamy *et al*., (1986) who founded no variation has been observed among the sex, although the decrease in zinc levels significantly was recorded in the she camel in the third trimester of pregnancy, due to an active transfer to the fetus in the gestation at the last part.

However, significantly higher (p) values for Zn were found in 3-4 years of age, compared to 5-8 years of age, suggesting that Zn level is decreased in older animals may be because of increasing body need for Zn in development of the body, and the immunodeficiency system due to exposure to infectious diseases and stress factors, that was in accordance to literature information which offered the important role of Zn for the immune system function, normal development, gene expression and cell membrane stability (Kellogg *et al.,* 2004).

Conclusions

By this study the normal values of some trace element in blood serum have documented in Iraqi camels. All values were within the physiological range reported in other studies that due to an adequate supply of this micronutrient; same management and environmental condition of camels husbandry. According to sex there were no statistical difference (p>0.05) in mean serum concentrations of Cu; Fe and Zn whereas mean serum concentrations of Cu and Zn were significantly increased (p>0.05) in the age group (3-4) years compared to age group (5-8) years. Our findings may be useful to fix the micro-minerals basal level of Iraqi camels.

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