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Some Micro Mineral Profile in the Serum of Female Camels as Affected by the Physiological State

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Abstract: Thirty-two female camels were utilized in this study while living in their natural habitat (low rain Savannah). Copper (Cu) and zinc (Zn) profile were examined in young, pregnant and lactating camels with different yields. The data analysis revealed that, serum values of both Cu and Zn were within the normal range, although Zn concentration decreased significantly in fourth gestation. Changes in Cu concentrations due to physiological states were not detected. However, at the minimum range serum Cu level tended to increase with advancement of age. Medium milk yielder showed the highest Cu levels at both minimum and maximum ranges. Zn means serum concentration increased significantly with advancement of age but dropped significantly during fourth gestation (10-11 years old). No significant differences could be detected in Zn values among camels with different yields.

Key words: Female camel, micro minerals, physiological state

INTRODUCTION

The one-humped dromedary is the only type of camel in Africa. In Sudan camels are found mainly in arid and semi-arid parts north of latitude 13° N where rainfall is less than 350 mm (Darrag, 1989). Sudan maintains the second camel population in the world, the estimated number is about 3 millions (Salih, 1988). Most tribal groups breed distinctive types of camels; well-known among these are the Arabian type which are the Anafi and Bashareen valued for their racing and riding capacities in addition to the large whitish Lahaween which gives high meat yields (Manson and Maule, 1960). Females are bred for the first time at the age of four to five years, producing their first calves one year later. In dry years, when forage is scarce, maturity is delayed which are frequently regarded as the great drawbacks of camel. There are two main breeding peaks: The main one occurs immediately after rainy season, lasting from July to September and the other occurring in December to January where camels' milk constitutes the main diet of nomads (Kholer *et al.*, 1992). Little information concerning trace elements changes following different physiological states in camels' serum are available. Thus the present study was initiated with the aim to investigate Cu and Zn profile in female camels following different physiological states.

MATERIALS AND METHODS

Site: The present study was conducted in Butana area of Sudan, a geographical zone which lies approximately between latitude 14-16° N and longitude 33-36° E. The area is bounded by Atbara River to the east, River Nile to the west and Blue Nile to the south and southwest. Rainfall is moderate to low (400-250 mm). Vegetation is of the semi-desert grassland mainly *Aristida funiculata* on clay in the north and an area of rich Savannah on cracking clay, alternating with grass areas to the south (Abu-Sin, 1970).

Animals: This study utilized camels in their natural habitat during the winter season (maximum temperature 30°C and minimum 19°C). The Rashaida pastoralist, one of the main camel herders and well-known camel exporter to Saudi Arabia, come to settle with their camels near a small village (Hage Abd Allah) east of El Damar city (350 kilometer north to the capital Khartoum). Large mechanized cultivation of sorghum has started in the Butana region since 1960. Camels are the only domestic animal that could exploit this precarious ecological niche, which has been artificially created by mechanized agriculture. Sorghum stalks appear to be a nutritionally adequate type of fodder, thus ensuring a degree of security for the pastoral system during wintertime. The type of camel used in this study was the Rashaida type, a sturdy camel with superior drought resistance.

Blood sampling: A total of thirty two sera were collected from camels at different physiological states as follows:

- Young camels (2-3 years old).
- Pregnant camels in their first gestation and within three months to parturition (4-5 years old).

- Pregnant camels in their second gestation and within three months to parturition (6-7 years old).
- Pregnant camels in their third gestation and within three month to parturition (8-9 years old).
- Pregnant camels in their fourth gestation and within three months to parturition (10-12 years old).
- High milk yielder.
- Medium milk yielder.
- Low milk yielder.

Copper (Cu) and zinc (Zn) levels in the serum were analyzed by an atomic absorption (Model 2380, Perkin-Elmer) as described by Vanloon, (1980).

Statistical analysis: For the purpose of this study, randomized complete block design was used as a sampling technique, using the analysis of variance procedure (ANOVA) to test the overall significance of the model. Mean separations were examined by Duncan's multiple range test to detect statistical significance between the different groups with different physiological status (Little and Hills, 1978).

RESULTS

Copper (Cu) and Zinc (Zn) serum levels

Young and pregnant animals: Cu serum values seemed not to be affected significantly in response to different physiological states. However, at the minimum range, third and fourth gestations tended to have higher Cu levels. Generally all Cu values were within the normal range (Table 1). Zn serum level was found to be significantly affected by the physiological state of the animal. There was a significant ($P<0.01$) increase through young animals to first or second pregnancy and third pregnancy. Animals in their fourth pregnancy showed a significant ($P<0.01$) decrease in their Zn serum levels compared to all other groups.

High, medium and low yielder: The type of milk yielder (high, medium or low) did not seem to affect both serum Cu and Zn concentrations (Table 2). All values were within the normal range. However, there was a tendency for Cu level to increase in the medium yielder while that of Zn tended to decrease.

When comparing Cu and Zn concentrations in the serum of all female camels under study (Table 1 and 2), no significant changes were obtained in response to different physiological states. With Zn, however, except for fourth calving, pregnant animals had significantly ($P<0.01$) higher levels than lactating or young animals.

DISCUSSION

The serum copper concentration in camels observed in this study were within the range obtained in camels raised under nomadic conditions at different locations of south western parts of Sudan which were 59±1.98 μg/100 ml (Nuba Mountains), 70±1.14 μg/100 ml (Darfur) and 67±1.37 μg/100 ml Egyptian camels (77-212 μg/100 ml) and sheep (60 μg/100 ml) (Espinosa *et al.*, 1982).

In this study there was a slight tendency for Cu serum level to increase with age. However, other studies found a significant increase in plasma Cu with age in cattle (Wiener *et al.*, 1980). Furthermore, it has been found that net requirement for Cu during late pregnancy was reflected on the daily requirement of Cu that increased by approximately 70% of the maintenance requirement (Pryor, 1964). Cu concentration did not change significantly among high, medium or low yielders, which would reflect

Table 1: The concentrations (μg/100 ml) of copper (Cu) and zinc (Zn) in the serum of young and pregnant camels at different gestations

	Cu			Zn		
Physiological status	Minimum	Maximum	Mean±SD	Minimum	Maximum	Mean±SD
Young camels	46	92	75±1.91	26	31	30±0.21^{A}
First gestation	46	92	69±1.62	46	56	52±0.41^{B}
Second gestation	46	69	58±1.15	51	62	59±0.47^{B}
Third gestation	69	92	81±1.15	41	51	46±0.50^{C}
Fourth gestation	69	92	75±0.99	15	21	20±0.20^{D}

Values within the same row bearing different superscripts vary significantly at $P>0.01$

Table 2: The concentrations (μg/100 ml) of copper (Cu) and zinc (Zn) in the serum of lactating camels with different yields

	Cu			Zn		
Type of yield	Minimum	Maximum	Mean±SD	Minimum	Maximum	Mean±SD
High yielder	69	92	86±0.99	31	51	49±0.40
Medium yielder	92	115	103±1.15	41	46	45±0.20
Low yielder	69	92	81±1.15	46	51	47±0.20

that the element level in the serum was not affected by the genetic make-up of the animal. The values for Cu obtained in pregnant camels were similar to those obtained in pregnant llamas (Junge and Thornburg, 1989).

The mean value of Zn serum concentration for young camels at 6-7 years old (59±0.47 μg/100 ml) were the same as those quoted (135±4.1 μg/100 ml) for female Egyptian camel at the same age (Moty *et al.,* 1968) but lower than those quoted for llamas (30 μg/100 ml) (Espinosa *et al.,* 1982). The increase in serum level with age could be attributed to the high Zn-binding enzymes necessary for growth and development. Enzymes such as carbonic anhydrase necessary for the growth of germinal and somatic cells (Underwood, 1977) and carbonic peptidases necessary for bone formation (Virgil and Melvin, 1970) require the presence of Zn as enzyme activator. It could be concluded that, under the prevailing natural grazing conditions, camels could optimally utilize trace minerals usually available in the pasture to meet their requirements for the different physiological states.

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