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Factors Affecting the Plasma Contents of Retinol and Alpha Tocopherol in Camels (*Camelus dromedarius*)

H.E. Mohamed
Department of Animal Sciences, Faculty of Agricultural Sciences,
Tshwane University of Science and Technology, Private Bag X680 Pretoria 0001, South Africa

Abstract: The purpose of the study was to investigate normal baseline levels of retinal and alpha tocopherol in clinically healthy camels (*Camelus dromedarius*), kept under natural grazing conditions. A total of 275 Arabi camels of both sexes were sampled over a one-year field survey at Butana area, central Sudan. The overall mean concentration of retinal was 479.5±69.4 ng L^{-1}, whereas alpha tocopherol was 2.1±0.4 mg L^{-1}. Sex showed insignificant effect of vitamin levels. However, season exerted a significant effect; the rainy season (July-October) showed the highest level 493.5±80.3 ng L^{-1} and 2.3±0.5 mg L^{-1} for retinal and alpha tocopherol, respectively. The corresponding figures for the dry season (January-May) were 400.3±70.0 ng L^{-1} and 1.4±0.4 mg L^{-1}, respectively. Age influences vitamin levels with adult having higher status.

Key words: Alpha tocopherol, camel, retinol

INTRODUCTION

Retinol functions in support of visual, reproductive performance, differentiation and growth of epithelial cells and impotence[1,2]. Vitamin E, fat-soluble antioxidants playing crucial roles in the cellular defence system, is protecting cell from lipid peroxidation and oxidative stress. As camels are surviving in harsh environmental habitat, the increase in demand of antioxidant is expected to be higher[1]. The requirement of these vitamins and minerals may be substantially increased to meet various immune and metabolic stressors such as workload, scarcity of water, race of disease[3]. Assessment of retinal[4,5] and alpha tocopherol[6-9] in camels kept under natural grazing conditions received little attention. Hence, the objective of the current experimentation was to assess

MATERIALS AND METHODS

Animals and feeding: The study was conducted in Butana area, central Sudan. A total of 275 apparently healthy Arabi camels (*Camelus dromedarius*) from both sexes were used in this study. The camels were ear-tagged and followed on a monthly basis. The camels were grazing from pasture containing *Acacia mellifera*, *Acacia nilotica*, *Blepharis perisca*, *Arisitda funiculata.*

Sample collections and analysis: Blood samples were collected from the jugular vein into heparinized tubes. Plasma was removed and frozen at-70°C until analysis. 1-mL of plasma (2 replicates for each animal) was added to ethanol in ratio 1:1. The mixture then vortexed and 2 mL of hexane were added. The mixture was then centrifuged at 9000 g for 5°C for 10 mins. From the top layer, 1 mL was then transferred into another test tube. Plasma retinal and alpha tocopherol concentrations were determined using isocratic High Performance Liquid Chromatography (HPLC) with fluorescent detection[10].

Statistical analysis: Three-way analysis of variance (ANOVA) was used to determine the effects of age, sex and season on the plasma levels of retinal and alpha tocopherol. Data are presented as means±SE. The level of significance was detected at $p<0.05$.

RESULTS AND DISCUSSIONS

Based upon information collected from 275 camels over a one-year field survey, the normal plasma retinal and alpha tocopherol concentrations were 479.5±69.4 ng L^{-1} and 2.1±0.4 mg L^{-1}, respectively. As shown in Table 1, age influences the plasma contents of both vitamins, adult having a higher status. However, sex did not exert an effect (Table 2). The highest status of the vitamin in relation to season was recoded from July-October (Table 3).

This is the first study to report both plasma retinal and alpha tocopherol status in camels browsing under natural vegetation. The highest plasma retinal and alpha tocopherol in camels were obtained during (July-October). For most part, this is the only time of the year when camels can consume feed containing high levels of naturally occurring vitamins. Similar trends were observed in llama[8] and horse[11] and sheep[12]. Interaction of location

Table 1: The effects of age[a] on plasma retinol and alpha tocopherol concentrations of Sudanese camels (*Camelus dromedarius*)

Age/number of camels	Retinol (ng L^{-1})	α-tocopherol (mg L^{-1})
> 6 (33)	461.8±72.0	2.2±0.9
6-12 (41)	463.4±69.1	1.5±0.1
> 12-24 (67)	482.5±70.0	1.7±0.2
24-72 (71)	493.6±66.5	1.9±0.3
> 72 (63)	499.7±71.0	2.3±0.8
Probability	< 0.0001	< 0.0001

[a]Across all categories pertaining to sex and season Values are expressed as means±SE

Table 2: The effects of sex[a] on plasma retinal and α-tocopherol concentrations of Sudanese camels (*Camelus dromedarius*)

Sex/number of camels	Retinol (ng L^{-1})	α-tocopherol (mg L^{-1})
Female (133)	479.4±63.5	2.01±0.6
Male (142)	466.8±76.4	1.99±0.4
Probability	< 0.08	< 0.05

[a]Across all categories pertaining to sex and season Values are expressed as means±SE

Table 3: The effects of season[a] on plasma retinal and alpha tocopherol concentrations of Sudanese camels (*Camelus dromedarius*)

Sex/number of camels	Retinol (ng L^{-1})	α-tocopherol (mg L^{-1})
Rainy season (113)	493.5±80.3	2.3±0.5
Dry season (162)	400.3±60.0	1.4±0.4
Probability	< 0.0001	< 0.05

[a]Across all categories pertaining to age and season Values are expressed as means±SE

and date was highly significant for both vitamins A and E in plasma[13].

The present investigation revealed an insignificant effect of gender on retinal and alpha tocopherol plasma levels. This agreed with the data reported for camels[4], sheep[12] and horses[14]. However sex related differences were obtained in mice[15] and rat[16].

The study indicated that age influences retinal and alpha tocopherol plasma levels. Ben Said[7] showed that vitamin A is lower in <5 years old dromedary and vitamin E lower in >10 years old. However, llamas showed insignificant effect of age on these vitamins[9]. It was made clear that a decrease in the capacity of some antioxidant factors may be compensated by an increase in the concentrations of other factors[17].

Plasma alpha tocopherol levels reported in this study are higher than previous figures obtained in Saudi Arabia[6], United Arab Emirates[3,5] and India[18]. The availability of green pasture in the present investigation may account for this variation. However, on the same area in 1992, it was indicated that vitamin A deficiency did occur in camels during the dry season[4]. The present author indicated few cases of vitamin A deficiency (night blindness) during the dry season and those animals were not sampled.

In summary, the current investigation indicated seasonal variability of retinal and alpha tocopherol. Dry season (April-June) is a period of poor pastures quality in term of carotenoids; hence high risk of counteracting deficiencies is expected.

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