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Some Trace-Elements Profile in the Liver of Camels, Cattle, Sheep and Goats

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Abstract: Hepatic concentrations of Copper (Cu), Zinc (Zn), Iron (Fe) and Cobalt (Co) of dromedary camels were determined and compared with those of cattle, sheep and goats. Hepatic Cu concentration was significantly higher in camels than cattle, sheep and goats. Liver concentrations of Zn and Co which obtained from cattle, sheep and goats were lower than the range recorded for ruminants. In camels, hepatic Zn and Co values were lower in concentration than those other ruminants. High Fe content of camels' liver was recorded.

Key words: Trace elements, camel, sheep, goats, cattle

INTRODUCTION

Sudan is rich in natural resources especially in animal wealth. Livestock in Sudan represents one of the largest and most species diverse populations in the African and Arab region. Within the animal resource sector, the largest component is the estimated 133,640,000 heads of camels, cattle, sheep and goats (MARF, 2003).

To assess trace mineral levels on a regional basis, a study was conducted to determine some microminerals status in the liver of livestock in Eastern region of Sudan. Trace elements are generally included in enzymes molecules, for example, copper in cytochrome oxidase, alkaline phosphatase, cystyloxidase, DNA and RNA polymerase and dehydrogenases, vitamins (cobalt in vitamin B12) and metalloprotein (iron in haemoglobin and myoglobin). More than 20 different enzymes are known to be either zinc metalloenzymes or to require zinc for activation.

Liver contents are good indicator of trace-elements status of camels and small ruminants. The aim of this study was to assess trace mineral levels on a regional basis and to evaluate some of micromineral status in the liver of livestock in Eastern region, Sudan (Table 1).

Table 1: Livestock estimate (Head)

Camel	3,503,000
Cattle	39,667,000
Sheep	48,440,000
Goats	42,030,000

[1]Source: Ministry of Animal Resources and Fisheries (2003)

MATERIALS AND METHODS

Collection of liver samples: Visits were paid to Kassala slaughterhouse, Eastern region of Sudan. A total of one thousand and three hundred liver samples were collected from camels, cattle, sheep and goats. To avoid contamination, first use stainless surgical blades were used to obtain liver samples. The samples were transferred into clean sterile containers and immediately frozen at-20°C until analyzed.

Analysis of liver samples: Liver samples were digested in a mixture of 2:1:0.5 nitric acid (HNO_3, 65%, perchloric acid ($HCLO_4$, 60%) and sulphuric acid (H_2SO_4, 97%). The samples were further diluted and aspirated into an atomic absorption spectrophotometer (Shimadzu, Model 6601). Iron, Cu and Zn concentration were determined using atomic absorption with a Perkin-Elmer model 306. Liver Co was determined on a Perkin-Elmer model 503 with an HGA 2100 graphite furnace.

RESULTS

Liver concentrations of Cu, Zn, Fe and Co were examined in camels, cattle, sheep and goats. Hepatic Cu concentration was higher in camels than cattle, sheep and goats.

Liver concentrations of Zn and Co obtained from cattle, sheep and goats were lower than the range recorded for ruminants.

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In camels, hepatic Zn and Co values were lower than those small ruminants.

High Fe content of camels' liver was recorded. However, the differences in liver concentrations of Zn, Fe and Co, between the three species, were not statistically significant.

DISCUSSION

In the present study, the mean hepatic concentrations of Cu, Zn, Fe and Co found in camels agree with previous reports (Tartour, 1975, 1969; AbuDamir *et al*., 1983; Wensvoort, 1992). Liver concentrations of Cu, Zn, Fe and Co obtained from cattle, sheep and goats fall within the lower range recorded for ruminants[4] .With the exception of Cu, no significant differences were found in hepatic trace elements between camels and cattle, sheep or goats. Cu concentration in camel liver was found to be higher because the camels graze more forage trees which are generally richer in copper and this will lead to accumulation of Cu in the liver[3]. As for other ruminants, hepatic Zn and Co are generally low in camels compared to other trace-elements according to different authors (AbuDamir *et al*., 1983; Wensvoort, 1992). Higher hepatic Fe was recorded in camels in the Sudan (Tartour, 1969). In natural conditions, iron deficiency is not observed in ruminants (Underwood, 1977) (Table 2).

Table 2: Concentrations of Cu, Zn, Fe and Co in camels, cattle, sheep and goats (Mean±SE)

Parameter	Camel	Cattle	Sheep	Goats
Cu (ppm)	103±12.3	88.±9.8	65.5±8.1	54.6±4.1
Zn (ppm)	34.7±1.02.	85±6.1	139.4±7.9a	141.0±3.3
Fe (ppm)	560.0±38	180±20.5	229.14±15.6a	211.4±10.1
Co (ppm)	2.2±0.01	0.5±0.001	0.7±0.02	0.4±0.0.1

CONCLUSION

The trace minerals status of livestock in different regions of Sudan needs to be studied. Liver as a tissue reflects trace elements status more accurately than blood. Studies should be done to document the status of trace elements in animals at slaughter to monitor the possible risk of livestock trace element poisoning/deficiency by documenting the highest/lowest levels of minerals detected in animal tissue.

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