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STUDIES ON SOME HEAVY METALS IN CAMEL'S OFFAL AND ITS RELATION TO PUBLIC HEALTH

(With 2 Tables and 3 Figures)

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دراسات عن بعض العناصر الثقيلة والنادرة في أسقاط الجمال وعلاقتها بالصحة العامة

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تم جمع ٤٥ عينة من أسقاط الجمال من مجزر الجيزة وحللت لتقدير وتحديد تركيز بقايا الرصاص ,الزئبق ,النحاس ,الخارصين والمنجنيز. تم تحليل العينات بعد تجفيفها واستخراج الدهون منها وقياسها باستخدام جهاز الإمتصاص الذرى. خلصت النتائج إلى أن معدلات وجود بقايا الرصاص ,الزئبق ,النحاس ,الخارصين والمنجنيز في أسقاط الجمال المصرية قليلة جدا بالمقارنة بالحدود المسموح بها في المواصفات القياسية المصرية.

SUMMARY

A total of 45 offal samples from slaughtered camels were collected from Giza slaughter house and analyzed to detect and determine the concentration of lead, mercury, copper, zinc and manganese. These were computed from an ethereal dry extracted samples and data compiled by atomic adsorption technique. Levels monitored for lead, mercury, copper, zinc and manganese have elucidated that the residual amounts in Egyptian camel's offal are very low as compared with the permissible limits according to the Egyptian Organization of Standardization and Quality Control (EOS).

Key words: *Heavy metales, camel's offal.*

INTRODUCTION

Camels belong to the family Camelidae and genera Camelus and Lama (Mugerwa, 1981). Dromedary camels constitute about 91% and are concentrated mainly in the Arab world, particularly in the African Arabian countries. In addition the ability of the Arabian camels to

withstand the hot and harsh environmental conditions is not matched by any other red meat animal species.

In spite of its potential, the contribution of camel meat to the per capita meat consumption in the Arab world is not impressive. This can be attributed to the fact that camel meat and offal are the least studies type and are wrongly believed to be the lower nutritive value and quality than other types of red meat.

Pollution has a harmful effect all over the world; nowadays the acute problems are posed as due to environmental pollution with persistent chemical and in particular by some trace elements (mercury, lead, copper, zinc, and manganese) and recently determined in the natural environment, in flora, food and in a variety of food stuffs. Accumulation of toxic metals (Pb, Hg, and Cu) in meat or offal occurs at doses which produce no overt ill effects in the animal. The effects are subclinical, in contrast to the clinical effects seen in cases of obvious poisoning.

Several dietary factors affect the level of the lead that can be stored in bone because bone formation is lower at time of low calcium intake, however a significant amount of lead may be released from the bone because of bone resorption, iron deficiency also affects lead absorption from the gastrointestinal tract (Takayuki and Leonard, 1993).

Toxic compounds of mercury accumulate mainly in the liver; the alkyl mercuries are more slowly metabolized and more evenly distributed in the body tissues (Underwood, 1977). Mercury caused redness of lips, throat and tongue, loss of teeth, swelling and redness of the skin with pink-red fingertips. It affects the nervous system causing irritability. (Mert, 1987).

The importance of copper in human and animal nutrition is well known. Copper pesticides used for orchard and vegetables result in animal poisoning while grazing, pathology occurs when high copper concentrations are in animal feed or when feed stuffs have normal copper content but are low in molybdenum or sulfates (Koh and Judson, 1986).

Zinc and manganese are considered as essential trace elements, which are involved in enzymatic functions, protein synthesis and carbohydrate metabolism, Zinc and manganese are necessary for normal growth and development in mammals and birds. Human dwarfism and lack of sexual development have been related to zinc deficiency (Halsted *et al.*, 1974).

The aim of the current study was to throw light upon the concentration of lead, mercury, copper, zinc and manganese in camel's offal at Giza governorate.

MATERIALS and METHODS

45 samples of camel's offal were collected at random from El-Moneb abattoir (fifteen each of liver, kidney and spleen). These samples were confirmed wholesome and fit for human consumption from the official stamps. 100 gram from each sample was collected in previously bid-stalled water washed glass jars and was carried an in icebox to the laboratory. Chopping and mincing of samples were done in glass petri dishes. Samples were dried in a hot air oven at 100°C for 2 hours, cooled and extracted with ether. One gram from ether-extracted dry matter was ashed at 550°C and the ash was dissolved in 0.05 N Hcl and filled up to 10 ml volume with bi-distilled water.

Lead, mercury, copper, zinc and manganese were estimated according to the methods of analysis of the Association of Official Analytical Chemists (1990) using the atomic spectrophotometric method on the ethereally dry material. The precautions and specifications for apparatus, reagents and working standard solutions were followed. Blank, standard and unknown solutions used in estimations were treated with the same way. The flame Atomic Absorption Spectrometer, FMD3, Carl Zeiss was operated as follows:

	Lead	Mercury	Copper	Zinc	Manganese
Hollow cathode Lamp (nm)	283.3	253.7	324.8	213.9	279.5
Slit width (nm)	0.8	0.5	0.7	0.7	0.2
Support gas	Air	Air	Air	Air	Air
Fuel gas	Acetylene	Acetylene	Acetylene	Acetylene	Acetylene

RESULTS

Table 1: Residual amounts of Mercury (Hg) ppb in analyzed camel tissue samples.

Organ	Min	Max	Mean ± SE
Liver	7.351	26.169	14.00 ±2.4
Kidney	7.925	18.275	11.93±1.6
Spleen	4.834	7.772	5.72±0.72

Table 2: Concentration of Lead, copper, zinc and manganese (µg/g) in analyzed camel's tissue samples.

Elements / Tissues	Lead			Copper			Zinc			Manganese		
	Min	Max	Mean ± SE	Min	Max	Mean ± SE	Min	Max	Mean ± SE	Min	Max	Mean ± SE
Liver	0.52	0.81	0.65 ±0.28	15.43	22.985	19.231 ±1.1	22.0	37.0	33.00 ±7.1	0.45	4.48	3.27 ± 0.19
Kidney	0.27	0.53	0.41 ± 0.2	22.924	36.465	32.148 ±0.86	35.0	46.0	39.2 ± 6.2	0.54	2.69	1.95 ± 0.26
Spleen	0.10	0.33	0.20 ±0.054	0.436	3.723	2.391 ±0.18	43.0	49.0	45.492 ± 5.1	1.79	3.54	3.13 ± 0.57

Fig 1: Residual amounts of Hg (ppb) in analyzed camel tissue samples

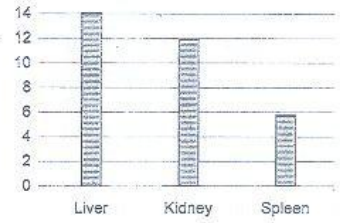


Fig 2: Concentration of Pb (µg/g) in analyzed camel's tissue samples

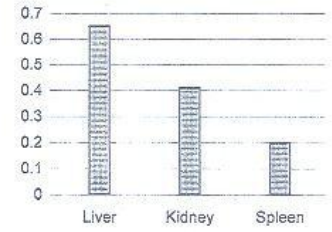
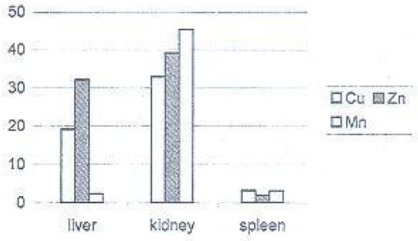


Fig 3: Concentration of Cu, Zn and Mn (µg/g) in analyzed camel's tissue samples.



DISCUSSION

The present study was carried out to determine lead (Pb) and Mercury (Hg) as toxic elements, copper (Cu), zinc (Zn) and manganese (Mn) as essential elements in liver kidney and spleen of camels slaughtered in El-Monibe slaughter house. The obtained results can be assessed in the evaluation of these elements in meat and also human diet.

The statistical analysis results for mercury were recorded in Table (1) while that for lead, copper zinc and manganese in camel's liver, kidney and spleen were presented in Table (2).

Liver samples of camel carcasses had the highest mean value of lead (Pb) (0.65±0.28µg/g dry weight) residual amounts while spleen samples had the lowest mean value (0.20±0.054 µg/g dry weight).

These results were lower than that reported by El- Dayem (2000) in liver, kidney and spleen who recorded 1.748, 1.365 and 1.103 µg/g wet weight respectively whereas the corresponding values reported by Soliman (2002) in liver, kidney and spleen were 1.12, 1.05 and 1.00 µg/g wet weight respectively. Nearly similar results were reported in liver by Diab et al. (2000), (0.52±1.27 µg/g wet weight).

The average concentrations of lead in the examined samples were nearly the same or lower than the permissible limits recommended by ESO (1991) and FAO/WHO (1992).

Negligible amounts of mercury (Hg) were determined in samples by part per billion (ppb). The results were lower than that obtained by Diab et al. (2000), ESO (1991) and FAO/WHO (1992).

Copper (Cu) is an essential trace element for man and animals. In addition to its role in promoting hematopoiesis, it is also required for normal biological activity for many enzymes. Concentration of copper in tissues differs greatly in their susceptibility to variation in the dietary copper intakes. Excess amount of copper in food gives rise to outbreaks of copper poisoning (Doyle and Spaulding (1978).

As illustrated in Table (2) the mean values of copper concentration in camel's liver, kidney and spleen were 19.231±1.1, 32.148±0.86 and 2.391±0.18µg/g dry weight respectively.

The highest copper concentration was detected in the kidney followed by liver then spleen. El-Dayem (2000) showed residual amount of copper in liver and kidney of camel (15.75±0.841, 10.13±0.343 wet weight) respectively which seemed to be lower than the obtained results and similar results in the examined spleen (2.38±0.161 µg/g wet weight)

Zinc (Zn) is an essential element for human as being involved in protein synthesis and as constituent of many metaloenzymes.

Relatively low toxicity of zinc coupled with efficient haemostatic control mechanisms make chronic zinc toxicity from dietary sources as an unlikely hazard to man.

Zinc concentration in liver, kidney and spleen of camel were 33±7.1, 39.2±6.2 and 45.49±5.1µg/g dry weight respectively. The highest mean value presented in spleen samples. The results were lower than the result recorded by El-Dayem (2000).

Salisbury *et al.* (1991) reviewed that the action level of copper in animal tissue set by Agriculture Food Safety Division Of Canadian Ministry Of Agriculture was 150 µg/g wet weight and 100µg/g wet weight for zinc.

The essentiality of manganese (Mn) in animal nutrition was demonstrated in 1931, shortly after it was shown that manganese deficiency caused a disease in chickens called perosis (Kemmere *et al.*, 1931). Manganese deficiency has an effect on manganese metaloenzymes and metal-enzyme complexes (Leach, 1973). Concentrations of manganese in the present study were 3.27±0.19, 1.95±0.26 and 3.13±0.57-µg/g dry weight of liver, kidney and spleen respectively.

There is no available references on manganese level in liver, kidney and spleen of camel. Casarett and Doull (1975) reviewed that the human daily intake of manganese was 5 mg.

In conclusion, liver, kidney and spleen of camel had lower concentrations of toxic metal (lead and mercury) than the permissible limits of ESO (1991) and FAO\WHO (1992) and had sufficient amount of essential element like copper, zinc and manganese.

In view of the above and its unique adaptability to the harsh environment condition, the value of the Arabian camel as a source of meat should not be under estimated.

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