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DETECTION OF SOME HEAVY METAL RESIDUES IN SOME CAMEL'S MEAT PRODUCTS

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SUMMARY

Lead, cadmium and copper residues were determined in each of 15 samples of camel's luncheon and frozen sausage, collected from different supermarkets in Cairo, Giza and Zagazig Cities. The residues of these heavy metals were detected by using Atomic Absorption Spectrophotometer. The obtained results revealed that the mean values ± S.E. of lead, cadmium and copper (p.p.m) in camel's luncheon were 0.138 ±0.008, 0.055 ±0.004 and 3.662 ±0.221; respectively, while in frozen sausage, such residues were 0.133± 0.008, 0.058 ±0.004 and 3.789 ±0.189 p.p.m; respectively. The present results were compared to the permissible limits of FAO/WHO (1972), WHO (1972) and Egyptian Organization for Standardization and Quality Control "E.O.S.Q.C." (1993). Public health importance and the hazardous toxic effects of these heavy metals as well as the suggestive recommendations to minimize the pollution with heavy metals were discussed.

INTRODUCTION

Heavy metals and their salts constitute the most widely distributed group of highly toxic and long retained pollutants. They are commonly found in effluents discharging from metal processing factories. Mining products, chemical and sewage sludge effluents have high levels of heavy metals that might cause potential pollution to fresh water resources (Dean and Suess, 1985; Khalaf-Allah, 1998). Heavy metals in soil and water may enter the food chain through the biologic cycle which include bioconcentration by plants and animals (El-Shorbagy, 2004).

Lead is a toxic substance which accumulates in the body from old house paints. Lead arsenate contains large quantities of lead and acts as a possible sources of lead for both man and animal. Chronic lead poisoning is particularly characterized by anemia, liver dysfunction, muscular pain, lead nephropathy and neuropathy. Its potential carcinogenic nature has also been shown by Zawurska and Medras (1988) and Goldfrank et al. (1990).

Cadmium is also a toxic element for human being. It is virtually absent from the human body at birth. It is accumulated with age in body tissues and causes renal failure (Gracey and Collins, 19992). Cadmium had a significant role in the incidence of some diseases as diabetes mellitus (Merali and Singhal, 1977), chronic renal failure (Friberg, 1984), human hypertension and anemia in all species (Watanabe and Murayame, 1974 and Nishiyama et al., 1986), reproductive toxicity and bone defects (Noroderg, 1995).Air pollution with cadmium from industrial sources (manufacturing of plastics, solder alloys, nickel cadmium batteries, photo cells and rubber tires) may be transmitted to man through contaminated vegetables used as food stuffs or through food of animal origin (Carstensen and Poulsen, 1974). The International Agency for Research on Cancer (IARC) in (1993) classified cadmium and cadmium compound as class "1" human carcinogens in (1993). Uptake through food and digestion is regarded as the most significant source of cadmium for the general population (WHO, 1989).

Copper is widely distributed in nature and also present in food. It is important in formation of erythrocytes, development of bone, C.N.S and connective tissues. Acute exposure to copper causes hypotension and haemolytic anemia but chronic exposure to copper causes jaundice in human (Gossel and Bricker, 1990).

The purpose of this study was carried out to determine the levels of lead, cadmium and copper residues in either of camel's luncheon and frozen sausage which collected from different supermarkets located in Cairo, Giza and Zagazig Cities.

MATERIALS AND METHODS

A total of 30 samples, 15 each of camel luncheon and frozen sausage were collected from different supermarkets in Cairo, Giza and Zagazig Cities. The weight of each sample ranged from 100-150 g. The samples were kept in polyethelene bags and then frozen stored at - 20°C until examined. The collected samples were prepared and digested according to the technique recommended by Khan et al . (1995) as follows: One gram of each sample was macerated in screw capped tube by sharp scalpel. Ten ml of digestion mixture consists of 7 parts of ultrapure concentrated nitric acid (HNO_3) and 3 parts of perchloric acid ($HClO_4$) were add-

ed to the sample. The tubes were tightly closed and the contents were vigorously shaked and allowed to stand overnight at room temperature, then heated until evaporated (at 95°C). The residues were redissolved in 10 ml of 1 N HNO_3. The solutions were filtered through Whatman no. 41 filter paper and analyzed for the presence of lead, cadmium and copper residues by using Atomic Absorption Spectrophotometer (UNICAM 696) under the following conditions:

Metal / Conditions	Lead	Cadmium	Copper
Method	Normal segmented curve fit	Normal segmented curve fit	Normal segmented curve fit
Measurment time	4.0 second	4.0 second	4.0 second
Lamb current/m. am	15	8	5
Wave length (nm)	217	228.8	324.8
Technique	Flame	Flame	Flame
Flame Type	Air /Acetylene	Air /Acetylene	Air /Acetylene
Air/I	30	30	30
Acetylene/I	20	20	20
Fuel Flow (L/Min)	1.1	1.2	1.1

N.B: The estimation of such heavy metals in each examined sample was in p.p.m on the basis of wet weight sample.

Statistical analysis:

The obtained results were statistically analyzed according to the method of Selvin (1996).

RESULTS AND DISCUSSION

Heavy metals make up one of the most important groups of pollutants, so it is necessary to monitor the levels of heavy metals residues which may be avoidably present in luncheon and frozen sausage of camels meat.

Lead (Pb): The obtained results in table (1) and (2) revealed that the mean values of lead in luncheon and frozen sausage of camels samples were 0.138 ±0.008 and 0.133 ±0.008 p.p.m; respectively.

Table (1): Heavy metal residues (p.p.m) in camel's luncheon.

Metal	Min.	Max.	$\overline{X}$	S.D	± S.E.
Lead (Pb)	0.089	0.182	0.138	0.032	0.008
Cadmium (Cd)	0.035	0.089	0.055	0.017	0.004
Copper (Cu)	2.461	5.971	3.662	0.857	0.221

N.B: No. of examined samples = 15.

p.p.m: Part per million.

Min. Minimum value.

Max.: Maximum value.

$\overline{X}$: Mean values

S. D : Standard Deviation.

± S. E. : Standard Error.

The obtained findings of lead residues in table (1) and (2) were within the permissible limits which intended by WHO (1972), Casarett and Doull (1975) and E.O.S.Q.C. (1993) in table (3). The present data of lead in table (1) and (2) were agreed with those reported by Amodio-Cocchieri and Fiore (1987) in sheep muscles and Shehata et al. (1999); El-Sharkawy (2000) in camel's meat. On the other hand high lead findings were recorded by Youssef et al. (1994) in buffalo muscles; Daoud et al. (1998) in cattle and sheep muscles; Lopez-alanse et al. (2000) in cattle muscles and El-Shorbagy (2004) in muscles of camels.. Low lead values in camels were detected by Diab (1995). Low lead levels in the present data might be attributed to the collection of meat from slaughtered camels subjected to low environmental pollution with lead. On the other hand, the presence of high levels of lead by some authors may be due to collection of samples from animals subjected to high environmental pollution and to the accumulative effect of such metal in tissues. This held the view reported by Doganoc (1996).

Table (2): Heavy metal residues (p.p.m) in frozen sausage of camels.

Metal	Min.	Max.	$\overline{X}$	S.D	± S.E.
Lead (Pb)	0.075	0.185	0.133	0.032	0.008
Cadmium (Cd)	0.038	0.091	0.058	0.015	0.004
Copper (Cu)	2.187	5.192	3.789	0.733	0.189

N.B: No. of examined samples = 15.

p.p.m: Part per million.

Min. Minimum value.

Max.: Maximum value.

$\overline{X}$: Mean values

S. D : Standard Deviation.

± S. E. : Standard Error.

Cadmium (Cd): The results illustrated in table (1) and table (2) showed that the mean values of cadmium residues in either camel luncheon and frozen sausage were 0.055 ± 0.004 and 0.058 ±0.004 p.p.m; respectively. The obtained data were within the limits of FAO/WHO (1972); Casarett and Doull (1975) and E.O.S.Q.C. (1993) in table (3). High levels of cadmium were recorded by Daoud et al. (1998) in muscles of cattles and sheep; Sallam and Morshdy (2000) and El-Shorbagy (2004) in muscles of camels. The high values of cadmium may be attributed to the grazing of animals in polluted pasture with cadmium from industrial sources. The actual extent of absorption depends on a number of dietary factors such as the intake of protein, calcium, vitamin D and other trace metals. Following absorption, cadmium is transported and bound to certain proteins of the plasma and red blood cells to other sites throughout the body. However, the metabolism of the cadmium was antagonized with the copper and iron leading to anemia. This agrees with that reported by Underwood (1977). Low values in muscles of camels were detected by Diab (1995).

Copper (Cu): The results recorded in table (1) and (2) showed that the mean values of copper residues were 3.662 ±0.221 and 3.789 ±0.189 p.p.m; respectively. The obtained data were within the permissible limits of Casarett and Doull (1975) and E.O.S.Q.C. (1993) in table (3). High values of copper in camels meat were detected by Diab (1995). On the other hand low values were

recorded by Daoud et al. (1998) in muscles of cattle and sheep.

The variation of such metal concentrations between the presented results and those reported by many other authors was referred to the differences of the degree of pollution among the different localities in which the animals were raised.

Therefore, the preventive measures intended for minimizing the pollution of raw meat with such metals are of significant concern, including:

1- Minimizing the use of phosphates and sludge for land fertilization as possible.

2- Periodical examination should be done for meat, meat products and their content for heavy metals should be evaluated according to the international guide lines as a fruitful advise to delay environmental contamination.

Table (3): Recommended levels of heavy metals in food.

References	Heavy metals		
	Lead (Pb)	Cadmium (Cd)	Copper (Cu)
Casarett and Doull (1975)	Human daily intake 0.3 mg	Human daily intake 0.018 - 0.20 mg	Human daily intake 3.2 mg
E.O.S.Q.C. (1993)	Human weekly intake 0.05 mg/Kg body weight. 0.5 mg/Kg in frozen sausage and luncheon of camels	Human weekly intake 0.0067 - 0.0083 mg/Kg body weight	Daily intake 0.05 - 0.5 mg/Kg body weight 15 mg/Kg in frozen sausage
FAO/WHO (1972)	———	Not exceed 0.04 - 0.05 mg/Kg in food	———
WHO (1972)	Human weekly intake 3 mg/ person or 0.05 mg/Kg body weight	———	———

E.O.S.Q.C.: Egyptian Organization for Standardization and Quality Control.

FAO: Food and Agriculture Organization.

WHO: World Health Organization.

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تقرير بقايا بعض المعادن الثقيلة فى بعض منتجات لحوم الجمال

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تم تقدير بقايا عنصر الرصاص والكادميوم والنحاس فى ١٥ عينة من لانشون اللحم الجملى وفى ١٥ عينة من سجق اللحم الجملى المجمد الذين تم تجميعهم من السوبر ماركت المختلفة المتواجدة فى مدينة القاهرة والجيزة والزقازيق. وقد تم تقدير بقايا هذه المعادن بإستخدام جهاز إمتصاص الطيف الذرى.

وقد أظهرت النتائج أن القيم المتوسطة لعنصر الرصاص والكادميوم والنحاس فى عينات لانشون اللحم الجملى كانت ٠.١٣٨ ± ٠.٠٠٠٨ ، ٠.٠٥٥ ± ٠.٠٠٤ و ٣.٦٦٢ ± ٠٠.٢٢١ ٠.٢٢١ جزء فى المليون على التوالى بينما فى سجق اللحم الجملى المجمد كانت ٠.١٣٣ ± ٠.٠٠٨ ، ٠.٠٥٨ ± ٠.٠٠٤ و ٣.٧٨٩ ٠.١٨٩ جزء فى المليون على التوالى وقد تم مقارنة النتائج بالمواصفات القياسية لمنظمة الأغذية والزراعة/منظمة الصحة العالمية (١٩٧٢) ، منظمة الصحة العالمية (١٩٧٢) والهيئة المصرية العامة للتوحيد القياسى وجودة الإنتاج (١٩٩٣) وقد تم مناقشة الأهمية الصحية والتأثيرات السامة لهذه المعادن الثقيلة وكيفية الحد من التلوث لهذه المعادن التى تضر صحة المستهلكين.