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# HEAVY METALS CONTAMINATING SOME READY-TO-EAT MEAT PRODUCTS

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## SUMMARY

A total of 45 random samples of ready-to-eat shawerma, kofta and hamburger (15 of each) were collected from different restaurants in Kalyobia governorate to determine their heavy metal levels. Cadmium, lead and nickel were detected from 73.33%, 93.33% and 100% with mean values of 0.092 ± 0.078 ± 0.006 ±0.028 ppm, in shawerma samples; 60%, 46.67% and 66.67% with mean values of 0.083 ± 0.032 and 0.141 ± 0.012 ppm in kofta samples and 54.33%, 73.33% and 80% with mean values of 0.046 ± 0.005, 0.061 ± 0.004 and 0.187 ± 0.019 ppm in hamburger samples, respectively.

Sources of contamiantion of meat products with these heavy metals, their public health hazards as well as recommendations to control these contaminants were discussed.

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## INTRODUCTION

The term heavy metal as defined in chemical dictionaries includes metal of specific gravity more than four or five and this term was commonly used to denote toxic metal (Williams and Burson, 1985).

Because of agricultureal and industrial praclices, a redistribution of heavy metals in the air, water and soil ultimately appears in the food chain as they are accummulated in plants and animals (Doyle and Spaulding, 1978). However, heavy metals pose special prodblems because they usually accumulate in living organisms at successive levels and may reach high concentrations in a process called "biological magnification".

Heavy metals are persistent type of pollutants and cannot be destroyed by heat treatment, so that their persistence enhances their potenital to reach and affect the human being. (Levensen and

Barnard, 1988).

Biological interest for heavy metals has centered essentially on their properties, as highly toxic cumulative poisons for man and animals. Therefore, the current study was planned out to estimate the concentration of such heavy metals in some ready-to-eat meat products.

## MATERIAL AND METHODS

Forty five samples of ready-to-eat meat products represented by shawerma, kofta and humburger (15 of each) were collected from different restaurants in Kalyobia governorate to estimate the levels of heavy metals in such products. The collected samples were prepared and digested according to the method recommended by
et al. (1984) and Pandya et al. (1985). Five
of each sample were put in clean colorless
bottle and then dried in a hot air oven at
overnight. The dried samples were put in a
fumace (Thermolyne, 6000, Germany) at
for 32 hours until a white ash was formed.

The obtained ashes were dissolved in 1 M
acid. The concentrations of metals
determined by using Atomic Absor
Spectrophotometer Perkin Elmer, 2380, U
which was adjusted at 228.8nm for cadmium
nm for lead and 196.0 nm for nickel. The obta
results of heavy metals were recorded as
(mg/kg) on wet weight of examined meat pro
samples.

## RESULTS

Table (1):Cadmium levels in examined ready-to-eat meat product samples.

| | Positive samples | | Min | Max | Mean± S.E. |
|---|---|---|---|---|---|
| | No.* | % | | | |
| Shawerma | 11 | 73.33 | 0.017 | 0.699 | 0.092 ± 0.008 |
| kofta | 9 | 60.0 | 0.010 | 0.514 | 0.083 ± 0.006 |
| Hamburger | 8 | 53.33 | 0.007 | 0.392 | 0.046 ± 0.005 |

No.* = Number of examined samples ( 15).

Table (2): Lead levels in examined ready-to-eat meat product samples.

| | Positive samples | | Min | Max | Mean± S.E. |
|---|---|---|---|---|---|
| | No.* | % | | | |
| Shawerma | 11 | 93.33 | 0.029 | 0.325 | 0.078 ± 0.006 |
| kofta | 14 | 46.67 | 0.151 | 0.964 | 0.459 ± 0.032 |
| Hamburger | 11 | 73.33 | 0.018 | 0.253 | 0.061 ± 0.004 |

Table (3): Nickel levels in examined ready-to-eat meat product samples.

| | Positive samples | | Min | Max | Mean± S.E. |
|---|---|---|---|---|---|
| | No.* | % | | | |
| Shawerma | 15 | 100.00 | 0.057 | 0.370 | 0.206 ± 0.028 |
| kofta | 10 | 66.67 | 0.026 | 0.289 | 0.141 ± 0.012 |
| Hamburger | 12 | 80.00 | 0.041 | 0.316 | 0.187 ± 0.019 |

## DISCUSSION

Results recorded in table (1) revealed that the cadmium could be detected from 73.33%, 60% and 53.33% of the examined samples of ready-to-eat shawerma, kofta and hamburger, respectively. The concentration of cadmium varied from 0.017 to 0.699 with an average of 0.092 ± 0.08 ppm for shawerma samples, 0.010 to 0.514 with an average of 0.083 ± 0.006 ppm for kofta samples and 0.007 to 0.392 with an average of 0.046 ± 0.005 for hamburger samples.

The current results were nearly similar to those reported by Mussman (1975), Ruttner and Jarce (1979) and Youssef (1944) who found that the average cadmium level in imported frozen meat samples was 0.073 ppm. While higher results were recorded by Solley et al. (1981) and Boulis (1993).

The mean cadmium levels of examined hamburger samples appeared to be within the permissible limits stipulated by WHO (1984) which mentioned that the mean content of cadmium should not exceed 0.05 ppm while the average cadnium content of examined shawerma and kofta samples exceeded such limit. On the other hand, The Egyptian Standard (1993) recommended that the concentration of cadmium should not exceed 0.1 ppm. Accordingly, the obtained results in Table (1) indicated that all examined meat product samples agreed with these permissible limits.

Cadmium contaminating air from industrial sources may be transmitted to man through contaminated foodstuffs (Carstensen and Poulsen, 1974). Generally, cadmium is virtually absent from the human body at birth and accumulates with age in the body tissues resulting in renal failure (Gracey and Collins, 1992). However, anaemia is a common manifestation of chronic cadmium toxicity due to its metabolic antagonism to copper and iron.

Results of lead concentration in examined ready-to-eat meat product samples were recorded in Table (2). Respectivley, the lead was detected from 93.33%, 46.67% and 73.33% of examined samples of shawerma, kofta and hamburger with mean values of 0.078 ± 0.006, 0.459 ± 0.032 and 0.061 ± 0.004 ppm.

Nearly similar results were obtained by Holm (1976) and Falandysz and Lorence (1991) who found the mean value of lead in fresh be 0.08 ppm. While, higher findings were r by Youssef (1994) and Fathi et al. (199 recorded that the average of lead con corned beef was 0.730 ppm.

Concerning the lead levels, all exa ready-to-eat meat product samples excee permissible limits stated by WHO (1984) mentioned that the lead level should not b than 0.05 ppm. However, the examined samples contained lead levels abov permissible limits (0.1 ppm) recommen Egyptian standard (1993).

Chronic lead poisoning is characteriz neurological defects, renal tubular dysfu and anaemia. Damage of CNS is a marked f especially in children due to their low tolerance (Underwood, 1997). In men, lead the male gamets resulting in sperm abnorm and decreased sexual desire as well as st (Needleman and Landrigan, 1981). In w lead poisoning is associated with abn ovarian cycles and menstrual disorders in ad to spontaneous abortion (Needleman et al., 1

Table (3) indicated that 100%, 66.67% an of examined shawerma, kofta and hamb samples contained nickel, respectively. The concentrations ranged from 0.057 to 0.370 mean value of 0.206 ± 0.028 ppm for shaw samples, 0.026 to 0.289 with a mean valu 0.141 ± 0.012 ppm for kofta samples and 0.0 0.316 with a mean value of 0.187 ± 0.19 pp hamburger samples.

Nickel is a relatively non toxic element and does not constitute a serious health hazard. However, continuous oral administration of nickel may result in hand eczema (Underwood, 1977).

In general, acid foods take up nickel from the nickel vessels during cooking, but more than half the amount of ingested nickel is absorbed and excreted in the urine (Widdowson, 1992).

Finally, the results obtained in the present study allow to recommend that the sources of contamination of human diets with heavy metals should be avoided or reduced through certain ways such as production of biogas as a source of energy from human and animal wastes. Elimination of lead from gasoline in motoring the different transport means in addition to education of food handlers and consumers with health hazards and control of such pollutants . Administration of diets rich in proteins, vitamins as D and E, calcium and iron play an important role in decreasing the absorption and toxicity of such heavy metals.

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