Dept. of Forensic Med. and Toxicology,
Fac. Vet. Med., Assiut Univ., Assiut, EGYPT.

# LEAD AND CADMIUM LEVELS IN SOME READY-TO-EAT MEAT PRODUCTS (SHAWERMA AND HAMBURGER) AT ASSIUT CITY

(With 3 Tables)

By

**A. A. Sharkawy and Amal A. M.**
Animal Health Institute, Assiut, EGYPT

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## مستويات الرصاص والكادمبوم فى بعض منتجات اللحوم الجاهزة للأكل ( الشاورمة والهامبورجر)فى اسيوط

*أحمد عبدالباقى شرقاوى ، أمال أحمد محمد*

في هذه الدراسة تم جمع ثلاثون عينة من منتجات اللحوم الجاهزة للأكل (الشاورمة والهامبورجر، بواقع خمسة عشر عينة لكل منهما) من مطاعم مختلفة فى مدينة أسيوط لتحديد مستويات الرصاص والكادميوم بها. وقد أوضحت النتائج أن: (١) تركيز الرصاص (جزء فى المليون) كان ٠,٠٧٢ (بمعدل يتراوح من ١٨٠و إلى ٠,١٠٤) فى الشاورمة، ٠,٠٥٠ (بمعدل يتراوح من ١٤٠و إلى ٠,٠٩٠) فى الهامبورجر. (٢) تركيز الكادميوم (جزء فى المليون) كان ٠,٠٦٧ (بمعدل يتراوح من ١٠٠و إلى ٠,٠٩٨) فى الشاورمة ، ٠,٠٤٩ (بمعدل يتراوح من ٠٠٦و إلى ٠,٠٨٥) فى الهامبورجر. من هذه الدراسة وضح جليا أن جميع العينات التي تم فحصها بها تلوث بالرصاص والكادميوم (متفاوتا فى درجته) وأن استهلاك هذه المنتجات (الشاورمة والهامبورجر) قد يؤدى الى مشاكل صحية إذا تم أكلها لمدة طويلة بصفة مستمرة. لذلك فإن مصادر التلوث بالرصاص والكادميوم لمنتجات اللحوم الجاهزة للأكل يجب تجنبها أو تقليلها والتحكم فيها

## SUMMARY

In this study, thirty random samples of ready-to-eat meat products (shawerma and hamburger, 15 of each) were used and collected from different restaurants in Assiut City to determine their lead and cadmium levels. The results revealed that: (1) Lead levels (ppm) were 0.072 (ranged from 0.018 to 0.104) in shawerma and 0.050 (ranged from 0.014 to 0.090) in hamburger. (2) Cadmium levels (ppm) were 0.067 (ranged from 0.010 to 0.098) in shawerma and 0.049 (ranged from 0.006 to 0.085) in hamburger. From this study, it is clear that all examined samples showed low contamination with lead and cadmium. The consumption of such meat products regularly even in a small amounts for long time may result in health troubles. So the sources of contamination by lead and cadmium to these products must be avoided or at least minimized and controlled.

*Key words: Shawerma- hamburger- lead- cadmium.*

## INTRODUCTION

Because of agricultural and industrial practices, a redistribution of heavy metals in the air, water and soil ultimately appears in the food chain as they are accumulated in plants and animals (Doyle and Spaulding, 1978). Heavy metals are persistent type of pollutants and can not be destroyed by heat treatment, so that their persistence enhances their potential to reach and affect the human being (Levensen and Barnard, 1988).

Lead is one of the most toxic metals that has probably plagued humans since early civilization. The major sources of lead-contamination are wastes from leaded gasolines, pesticides manufacturing, combustion of coal, incineration of refuse and leaded paints (Pagenkopf and Neuman, 1974). Transport and distribution of lead from stationary or mobile sources into the air over areas of high traffic density falls out and may reach to human food (WHO, 1977).

The distribution of lead in the environment is a major health hazard and intoxication with lead may occur as pandemics in humans (Needleman, 1980). Lead intoxication is known to occur as a consequence of various forms of exposure. A more general environmental distribution of lead, e.g. contamination of drinking water, food or air to cause chronic exposure (EPA, 1986). Lead intoxication can also occur due to a more short-term exposure from specific sources, e.g. ingestion of leaded-paint chips or inhalation of lead-contaminated dust (ATSDR, 1988).

Through the years considerable amounts of Pb have been mobilized into the environment. Industrial smelters, discarded batteries, burning of garbage and old paint wood are the main sources of environmental Pb. The Pb derived from petrol additives contributes not only to the intake through inhalation but also to the intake through ingestion as a result of fallout from vehicle exhaust on nearby food crops (WHO, 1972). Lead is recognized as a known neurotoxicant and of a major public health concern which causes both acute and chronic intoxication (Gossel and Bricker, 1990). It is known to cause encephalopathy in children (Carl, 1991). The provisional weekly intake of lead in food must not exceed than 0.05 ppm as recommended by FAO/WHO (1989). However, Carl (1991) postulated that the acceptable limits ranged from 0.05-0.2 ppm.

The toxicity of lead could results in anemia, abdominal colic, liver dysfunction, renal damage, peripheral neuropathy in adults, CNS disorders in the form of permanent brain damage in children and in case of extreme lead poisoning, convulsion followed by coma and death might occurred, moreover lead had a biological half life of about 27 years in human bones (Shibamoto and Bjeldanes, 1993).

Cadmium, a toxic heavy metal, has a number of industrial applications, such as metal plating, pigments, batteries, and plastics. However, for most people the primary source of cadmium exposure is food (WHO, 1992), since food materials tend to take up and retain cadmium. Cadmium is not known to have any beneficial effects, but can cause a broad spectrum of toxicological and biochemical dysfunctions (Theocharis *et al.*, 1994; Funakoshi *et al.*, 1995).

Shawerma and hamburger belong to the category of ready-to-eat meat products which do not undergo further preparation or cooking. In recent years, these products became a popular food article in Egypt and the rate of its consumption is continuously increased (Morshdy *et al.*, 1986).

The aim of the present study is to determine the concentration of lead and cadmium in these ready-to-eat meat products, shawerma and hamburger collected from restaurants in Assiut City.

## MATERIALS and METHODS

**Collection of samples:**

Thirty random samples of ready-to-eat meat products (shawerma and hamburger) 15 each, were collected from different restaurants in Assiut City to determine their lead and cadmium concentrations.

**Digestion of samples:**

Five gram from each sample was digested by using a mixture of nitric and perchloric acids (Khan *et al.*, 1995).

**Estimation of metals:**

Lead and cadmium were determined by using atomic absorption spectrophotometer (GBC 906 AA) according to Agemain *et al.* (1980).

# RESULTS

The obtained results in this study are summarized in Tables 1, 2 and 3.

**Table 1:** Lead levels (ppm) in examined ready-to-eat shawerma and hamburger collected from Assiut City.

| Examined material | Number of samples | Minimum level | Maximum level | Mean ± S.E.M. |
|---|---|---|---|---|
| Shawerma | 15 | 0.018 | 0.104 | 0.072 ± 0.006 |
| Hamburger | 15 | 0.014 | 0.090 | 0.050 ± 0.005 |

**Table 2:** Cadmium levels (ppm) in examined ready-to-eat shawerma and hamburger collected from Assiut City.

| Examined material | Number of samples | Minimum level | Maximum level | Mean ± S.E.M. |
|---|---|---|---|---|
| Shawerma | 15 | 0.010 | 0.098 | 0.067 ± 0.006 |
| Hamburger | 15 | 0.006 | 0.085 | 0.049 ± 0.007 |

**Table 3:** The number and percentage of examined shawerma and hamburger samples that exceeding the international permissible limit (IPL) for both lead and cadmium.

| Element | Product | Number of examined samples | Number of samples containing higher than IPL | % of these samples |
|---|---|---|---|---|
| Lead | Shawerma | 15 | 12 | 80 |
| | Hamburger | 15 | 8 | 53.33 |
| Cadmium | Shawerma | 15 | 11 | 73.33 |
| | Hamburger | 15 | 9 | 60 |

# DISCUSSION

The ready-to-eat meat products are usually manufactures and sold outside the supermarkets and restaurants, that make it liable for lead and cadmium contamination especially by lead through exhausts of leaded gasoline at areas of high traffic density at squares and stations.

In the present study, the obtained results (Table 1) revealed that lead levels were 0.072 ppm and 0.050 ppm in shawerma and hamburger respectively. These results are nearly similar to that obtained by Fatin (1998) who found lead level of 0.078 ppm in shawerma and 0.061 ppm in hamburger and Falandysz and Lorence (1991) who found the mean value of lead in fresh beef was 0.080 ppm. Our obtained results are higher than that recorded by Morshdy *et al.* (2000) they found that lead level in shawerma was 0.037 ppm at Zagazig city. The lead levels recorded in examined shawerma samples exceeded the permissible limits of WHO (1984) which mentioned that lead level should not more than 0.05 ppm, but lead level in hamburger samples was within this limit. In comparison with the permissible limits (0.1 ppm) recommended by Egyptian Standard (1993), lead levels in examined shawerma and hamburger samples were lower than this limit.

Table 3 indicated that 80% and 53.33% of the examined shawerma and hamburger samples containing lead concentration higher than the international permissible limit (0.05 ppm), and 73.33% and 60% of these investigated samples containing cadmium levels higher than the international permissible limit (0.05 ppm).

Chronic lead poisoning is characterized by neurological defects, renal tubular dysfunction and anemia. Damage of CNS is a marked feature especially in children (Underwood, 1977). In men, lead affects the male gametes resulting in sperm abnormalities and decreased sexual desire as well as sterility (Needleman and Landrigan, 1981). In Women, lead poisoning is associated with abnormal ovarian cycles and menstrual disorders in addition to spontaneous abortion (Needleman *et al.*, 1984).

The obtained results (Table 2) revealed that the mean cadmium level was 0.067 ppm and 0.049 ppm in shawerma and hamburger respectively. This cadmium level in shawerma was lower than that reported by Fatin (1998) who found that the mean level of cadmium in shawerma was 0.092 ppm. But the cadmium level in hamburger is nearly similar.

The current results were nearly similar to those reported by Mussman (1975) in USA, Ruttner and Jarce (1979) in Austria and Youssef (1994) in Egypt who found that the average cadmium level in imported frozen meat samples was 0.073 ppm. While higher results were recorded by Solly *et al.* (1981) in New Zealand and Boulis (1993) in Egypt.

The mean cadmium levels of examined hamburger samples appeared to be within the permissible limits stipulated WHO (1984) which mentioned that the content of cadmium should not exceed 0.05 ppm while the average cadmium content of examined shawerma exceeded such limit. On the other hand, The Egyptian Standard (1993) recommended that the concentration of cadmium should not exceed 0.1 ppm. So the obtained results in this study (Table 2) for cadmium levels in shawerma and hamburger indicated that the mean value of cadmium of examined samples are within these permissible limits.

Cadmium contaminating air from industrial sources may be transmitted to man through contaminated foodstuff (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).

Finally, the results obtained in the present study reflect a different variations in their levels of lead and cadmium and this may be attributed to the age of animals from which the meat obtained for preparing these meat meals and the pasture on which these animals reared. So these results allow to recommend that the sources of contamination of human diets with lead and cadmium should be avoided, minimized or reduced through many ways such use of high technology in preparing these foods, avoid exposure to leaded gasoline, high education courses for food handlers and consumers and good quality diets must be admitted to consumers (such diets containing high protein, vitamins, calcium and iron to decrease the absorption of lead and cadmium).

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