Assessment Of Lead And Cadmium Residues In Some Selected Commercially Processed Meat Products

Kamal El-Dsoky
Central Laboratory, Fac.of Vet. Medicine, Zagazig University-Egypt

ABSTRACT

A total of 40 meat product samples (20 from each of Sausage and luncheon meat) , purchased from different shops and restaurants of different sanitation levels at Zagazig City, were analyzed for assessment of Lead and Cadmium residues. The results declared that the mean value of lead concentration (mg/kg wet weight) in the examined sausage samples was 0.463 ±0016 mg/kg wet. Meanwhile the mean value of lead residue in the examined luncheon samples was 0.022 ±0.001mg/kg wet weight. On the other hand, the mean value of cadmium level in the examined sausage samples was 0.063±0.003 mg/kg wet weight. Such mean value for the examined luncheon samples was 0.079±0.003 mg/kg wet weight. In comparison with **ESO**, all the analyzed sausage and luncheon samples contained lead and cadmium concentration within the recommended levels. The public health significance of such metals residues was discussed.

INTRODUCTION

Meat and meat products are important for human diet in many parts of the world because in addition as a main source of animal protein, they provide the well- known trace element contents. Concern about the effects of anthropogenic pollution on the ecosystems is growing. Heavy metals from man-made pollution sources are continually released into aquatic and terrestrial ecosystems. Contamination with heavy metals is a serious threat because of their toxicity, bioaccumulation and biomagnifications in the food *chain (1).* In recent years, much attention has been focused on the concentrations of heavy metals in fish and other foods in order to check for those hazardous to human health. *(2-5).*

The industrial and edible species have been widely investigated. For example, samples of beef, veal, pork, chicken and horse-meat were analysed for Ca, Cu, Fe, Mg, Mn, Ni, Zn, Cd and Pb *(6).* According to *(7),* there are differences in minerals in meat products. Furthermore, Mn, Cu, Zn, Fe, Cd, Hg and Pb concentrations were determined in liver, kidney and muscle meat of ducks, geese, chickens, hens, rabbits and sheep slaughtered in the northern part of Poland *(8).* Mineral and heavy metal contents of retail meat and meat products were also determined *(9).*

Sausage and luncheon is usually manufactured and sold outside the supermarkets and small restaurants that make it liable for lead and cadmium pollution by exhausts of leaded gasoline especially at areas of high traffic density like squares and near stations where such product is frequently sold. The aim of this study was to evaluate the degree of lead and cadmium pollution in Sausage and luncheon marketed at Zagazig City, Egypt to ensure their safety for human consumption.

MATERIALS AND METHODS

A total of 40 meat product samples (20 from each of Sausage and luncheon meat) were purchased from different shops and restaurants of different sanitation levels at Zagazig City. The collected samples were separately kept in nearly sterile polyethylene bags, well identified and quickly transferred to the central Laboratory, Faculty of Veterinary Medicine, and Zagazig University where they were analyzed.

Digestion was carried out *(10).* One gram of Sausage or luncheon meat samples was digested separately in 6 ml of a 42 mixture of ultrapure concentrated HNO_3: $HclO_4$ in 20-ml screw-capped tubes. The tubes were tightly closed allowed to stand overnight at room temperature, then the tubes were heated for about 3 hours in water-bath at about 80C. The resulting solutions were diluted with deionized water till 20 ml then filtered through Whatmann filter No. 41. Blank

and standard solutions were prepared and used for quality control.

Duplicate measurements on all samples using Flame Atomic Absorption Spectrophotometer (Buck Scientific Model 210 VGP) at Central Laboratory. Faculty of Veterinary Medicine, Zagazig University. The following parameters recommended by the instrumental instructions were operated for Lead and Cadmium-determination.

Lamp wave Length (nm)	Slit Width (nm)	Lamp current (ma)	Fuel Flow Rate (1/min)	Burner Hight (cm)	Detection Limit(ppm)
2170	07	12	30	8	001

RESULTS AND DISCUSSION

Cadmium (Cd) and lead (Pb) are environmental pollutants toxic to humans and animals *(11)*. Cd and Pb are non-biodegradable, and its accumulation in the environment raises agricultural and public health concerns *(12,13)*. Metal emission from smelters, industries, and automobiles can cause soil and water contamination, and contaminated soil is a major source for metal accumulation in plants. The excess transfer of metals to the food chain is thought to be controlled by a "soil-plant barrier" *(14)*. However, this barrier fails when metal concentrations reach critical limits, especially for toxic metals such as Cd and Pb *(13, 15, 16)*. The food chain is an important source of Cd and Pb accumulation, especially for plants grown on polluted soils *(17-19)*. Significant amounts of Cd and Pb can be transferred from contaminated soil to plants and grass *(16, 20, 21, 22)*, causing accumulation of these potentially toxic metals in grazing ruminants *(23- 25)*, particularly in cattle *(26-28)*.Accumulation of Cd and Pb in ruminants causes not only toxic effects in cattle *(29- 31)*, but also in humans consuming meat contaminated with toxic metals *(12, 13, 31)*.

Table 1. Lead concentration (mg/kg wet weight) in the examined meat product samples (No. =20 of each)

Meat product	Minimum	Maximum	Mean	±SE
Sausage	0.453	0.472	0.463	0.016
luncheon	0.019	0.024	0.022	0.001

Table 2. Cadmium concentration (mg/kg wet weight) in the examined meat product samples (No. =20 of each)

Meat product	Minimum	Maximum	Mean	±SE
Sausage	0.047	0.077	0.063	0.003
luncheon	0.041	0.087	0.079	0.003

From the results achieved in Table 1 it is evident that the lead concentration (mg/kg wet weight) in the examined sausage samples ranged from 0.453 to 0.472 with a mean value of 0.463 ±0016 mg/kg wet. Meanwhile the mean value of lead residue in the examined luncheon samples was 0.022 ±0.001mg/kg wet weight and ranged from 0.019 to 0.0240 mg/kg wet weight (Table 1). Nearly similar results were reported in beef meat by *(32)*, in USA, *(33)* in New Zealand, *(34)* in Greece, *(35)* . On the other hand several authors had recorded lower mean concentration of Pb in bovine meat in different countries *(36-39)*, while higher mean of Pb concentration had been reported by *(40)*. Such variation of Pb concentration might be referred to differences of age of animals *(41)* as well as the differences of degree of environmental contamination at which slaughtered cattle were fed and grown up. *(42)* concluded that Pb residues in animal tissues is

directly related to both soil and pasture content of Pb, traffic density, as well as area of mining, smelting and sewage drainage.

On the other hand, the results presented in Table 2 revealed that the cadmium level in the examined sausage samples ranged from 0.047 to 0.077 mg/kg wet weight with a mean value of 0.063±0.003 mg/kg wet weight. Such mean value for the examined luncheon samples was 0.079±0.003 mg/kg wet weight and ranged from 0.041 to 0.87 mg/kg wet weight. Nearly similar values of cadmium in the examined samples were recorded by in liver and kidney of slaughter cattle at the vicinily of regional and local sources Pb and Cd of emistion *(43)*, while lower levels were reported in Italy *(44, 45)*.On the other hand, higher levels were found by *(46, 47)*. The maximum permissible limit of recommended in Egypt *(48)* is 0.5ppm for meat and meat products, meanwhile *(49)* has set a concentration of 0.05ppm as a maximum permissible limit for cadmium in meat and meat products. In comparison, all the analyzed sausage and luncheon samples contained lead and cadmium concentration within the recommended levels

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الملخص العربى

تقييم بقايا الرصاص والكادميوم فى بعض منتجات اللحوم المصنعة تجاريا

كمال الدسوقى

المعمل المركزى- كلية الطب البيطرى- جامعة الزقازيق

تم تحليل عدد ٤٠ عينة (٢٠من كل من السجق و اللانشون جمعت من المطاعم والسوبر ماركت بمدينة الزقازيق باستخدام مقياس الامتصاص الذرى الطيفى AAS لتعين مستويات الرصاص والكادميوم بها . أوضحت النتائج ان متوسط تركيز الرصاص فى السجق كان ٠٤٦٣ ± ٠٠١٦ ميكروجرام لكل كيلوجرام. أما باللانشون فتراوحت من ٠٠١٩ الى ٠٠٢٤ بمتوسط ٠٠٢٢ + ٠٠٠١ ومن ناحية آخرى فقد وجد أن متوسط تركيز الكادميوم فى كل من السجق واللأنشون هو ٠,٠٦٣ ± ٠,٠٠٣ و ٠,٠٧٩± ٠,٠٠٣ ميكروجرام لكل كيلوجرام على التوالى.

ودلت النتائج التى تم الحصول عليها انها كانت أقل من الحد المسموح به وهو ٠٥ جزء فى المليون حسب المواصفات القياسية المصرية لهذا فأن استهلاك السجق واللانشون فى مدينة الزقازيق لا يشكل خطورة على صحة المستهلك.