Vet. Med. J., Giza. Vol. 45, No. 2. (1997):219-224.

# MONITORING OF SOME POLLUTANT HEAVY METALS IN MEAT PRODUCTS IN CAIRO ZONE.

SAMIA EL-ZEINI, M. E. GEORGY, and OMAIMA, M. DIAB.

Animal Health Research Institute, Dokki, Cairo, Egypt.

## SUMMARY

Fifty meat product samples were collected from the local market of Cairo zone representing, canned luncheon, plastic paked luncheon, fresh sausage, canned sausage and hot dog. They were examined as wet matter for copper, lead and cadmium. Copper was determined spectrophotometrically, while lead and cadmium were determined by atomic absorption spectrophotometry technique. The levels of these elements were recorded in 20 gm of each by - product. It was concluded that these are wholesome food commodity without fear from heavy metal pollution concering these elements.

## INTRODUCTION

Litretures concerning Egyptian levels of some heavy metals in meat products are not much. In this respect (Cantarow and Schepartz, 1967) have stated that copper and other essential elements have well - defined physiological functions, directly as activators of certain enzymes or indirectly as essential components of vitamins or hormones.

The concentration of these toxic elements (Lead and Cadmium) in body tissues depends mainly on the dietary concentration, absorption of the element; conentration of other tissue elements and homeostatic control mechanism of the body for the element (Underwood, 1977). Environmental pollution with persistant chemical and particular by some heavy metals as copper, lead, and cadmium is not uncommon. Most of these biogenic minerals are more readily available to human from animal tissues than any other food sources (Marchello, et al., 1984). Industrial residues, fertilizers and fungicides are the main sources of pollution by heavy metals which are transfrred to plants and animals and consequently to meat and meat products (Omaima, 1995). These toxic elements, cadmium and lead are generally regarded as accidental contaminants. However, their interactive and cummulative nature make them highly dangerous even if they are consumed in low concentration for relatively longer periods (Doyle and Spaulding, 1977) causing various health problems.

Various levels of heavy metals have been recorded in meat and meat products allover the world. Lead and cadmium concentrations were ranging 0. ) - 0.3 mg /Kg and 0.01 - 0.04 mg /Kg in cann d meat products respectively (Oddi and Maggi, 1986). Copper and cadmium levels were 0.051 , 0.062 / 106 and 0.47 , 0.37 / 106 in sausage respectively (Chiang, et al., 1983). FAO / WHO ( 972) reported that, average intake should not ex d 0.04 - 0.05 mg /Kg cadmium; 3.2 , 0.3 / mg d y of copper and lead respectively.

Level pt were recorded as 306.53 - 987.68 ; 0.10 - 9 and 0.003 - 0.012 of copper, lead and c m in meat respectively in ug / loog D. M. (O ma, 1995). Copper also interacts with cadmium and lead (Klander and Petering, 1975). Hypocupremia occurs in number of diseased conditions in man. The cause in these cases is not a dietary deficiency of copper. It can be related to a defect in ceruloplasmin synthesis, poor absorption, excessive excretion, or some other disturbance associated with the disease, or from low protein intakes. (Underwood, 1971). Lead was found to be in the forms of, sulfide, phosphates, and chromates (Bailar, et al., 1965). The toxic lead compounds are used in many industrial processes such as lead paint, lead gasoline and lead arsenate containing significant quantities of lead. They are possible sources of lead intake for both man and animal. Contamination of air by lead (petrol) 5 - 10% of it is absorbed from the gastrointstinal tract in adults but this amount may be higher in children. Lead poisoning symptoms are anaemia; heptic, renal and neurological sequelae, abdominal peripheral and motor neurone, defici (Stewert, et al. 1995).

Cadmium accumulates in the body, especial kidney and liver, over many years becaus body has no homeostatic mechanism to cadmium at a constant safe level. He cadmium is a cummulative poisonous ele (Miller, 1971). The aim of this work is to esti the level of copper, lead and cadmium in s Egyptian meat products.

## MATERIAL AND METHODS

*** Meat product Samples:**

Five duplicate meat products as canned lunche plastic packed luncheon, fresh sausage, can sausage and hot dog were collected from Ca market. Copper, lead, and cadmium in each these samples were determined. Ashing of samples was carried out according to A. O. A. (1984). Samples were prepared for estimation copper, lead and cadmium. The chemicals us were of highest grade of purity and solutions we made with deionized water.

***Copper determination:**

Copper was determined spectrophotometricall according to Georgy (1980).

| Metal | Wave length nm. | Support gas (air) / L | Fuel gas acetylene /L | Lamp current/ mAmp. |
|---|---|---|---|---|
| Lead | 217 | 4.5 | 0.95 | 15 |
| Cadmium | 228.8 | 4.5 | 0.95 | 10 |

***Determination of lead and cadmium:**

The atomic absorption spectrophotometry techinque was applied according to Jackson (1970). Perkin Elmer / 100 B Atomic Absorption Spectrophotometer was used with the following conditions.

## RESULTS and DISCUSSION

The levels of copper, lead and cadmium in canned luncheon, plastic packed luncheon, fresh sausage, canned sausage and hot dog were recorded as wet material in table1. Copper, lead, and cadmium in canned luncheon were 0.7 to 1, 3 to 9, and 0.0 to 0.58 ug / g. respectively. In plastic packed luncheon copper level was 0.0, but lead and cadmium levels ranged from 0.14 to 3, and 0.72 to 7.6 ug / g. respectively. In fresh sausage, copper was 0.05 to 0.6, lead ranged from 1.6 to 6, while cadmium was 0.0 to 0.72 ug / g. In canned sausage the recorded, copper level ranged from 0.1 to 0.5, lead from 4.6 to 10.6 and cadmium from 0.28 to 0.44 ug / g. In hot dog copper level was 1.2 to 2.45, while lead was 1.2 to 4.6 and cadmium level was 0.0 to 0.44.

The present results showed marked variation in levels of copper, lead and cadmium among different meat products. Higher copper level was recorded in hot dog (2.45 ug / g. W. M.) and the lower level was redcorded in fresh sausage (0.05 ug / g. W. M.). The higher lead level was recorded in canned sausage (10.6 ug / g. W. M.). but the lower level was in hot dog (1.2 ug / g. W. M.). In cadmium the higher level was recorded (0.72μ g / g. W. M.) in fresh sausage and the lower level (0.0) in hot dog, fresh sausage and canned luncheon. In the present results copper levels in canned luncheon, plastic packed luncheon, fresh sausage, canned sausage, and hot dog, were greatly lower than those reported by, Schlettwein et al., (1971) and Falandyez and Iorenc (1991) in cattle muscle as, 2-6.9 P. P. M. and 0.9 P. P. M. respectively in wet matter. The recorded levels of lead in this work were higher than those reported by Penumorthy, et al., (1980)

who recorded 0.16 - 0.34 ug / g. in wet mater. In 1989 Cibulka, et al., reported that the levels were 0.007-0.038 ug / g. Daily intake 0.3 mg of lead by Casarett and Doull, (1975), 0.05 mg / kg b. w. weekly intake of lead was recorded by the World Health Organization (1977). The achieved results showed that cadmium levels were 0.001 ug / g. It differ from those reported by Schlettwein, et al., (1971) and Jorhem, et al., (1991), as in wet matter cattle muscle. These variations in the levels of the obtained results in this work a to the variation of the production technique utensils used in the processing of these products. On other hand it may be due t additives for these meat products. Theref could be concluded that consumption of 20 g the mentioned meat products do not lead t pollutant of the examined heavy metals co lead and cadmium.

Table 1 : Copper, lead and cadmium levels in canned luncheon, plastic packed luncheon, fresh sausage, canned sausage, and hot dog ug/g. W. M. (Mean ± SD, N= 10) .

| Element / Sample | Mean | | |
|---|---|---|---|
| | Copper | Lead | Cadmium |
| Canned luncheon | 0.84 ± 0.12 | 4.84 ± 2.46 | 0.315 ± 0.23 |
| Plastic backed luncheon | 0.00 ± 0.00 | 5.16 ± 1.73 | 0.312 ± 0.24 |
| Fresh sausage | 0.238 ± 0.21 | 3.68 ± 1.98 | 0.575 ± 0.37 |
| Canned sausage | 0.238 ± 0.16 | 0.38 ± 0.15 | 0.333 ± 0.09 |
| Hot dog | 1.744 ± 0.56 | 2.68 ± 1.35 | 0.285 ± 0.12 |

Table 2 : Copper, lead and cadmium levels in meat products, as compared with the maximum tolerance level of human consumption in mg/ 20 g. wet material .

| Element / Sample | Mean | | |
|---|---|---|---|
| | Copper | Lead | Cadmium |
| Canned luncheon | 0.0168 | 0.0968 | 0.0063 |
| Plastic backed luncheon | 0.00 | 0.1032 | 0.0062 |
| Fresh sausage | 0.0048 | 0.0736 | 0.0115 |
| Canned sausage | 0.0048 | 0.0076 | 0.0067 |
| Hot dog | 0.0349 | 0.0536 | 0.0057 |
| Daily intake * | 3.2 | 0.300 | 0.018 - 0.20 |

* Casarett and Doull (1975) .

## REFERENCES


A. O. A. C. (1984): Official Methods of Analysis, 14th. Ed. association of official analytical chemists, Washington Dc.

Bailar, J. C., Moeuer, T. and Kleinberg (1965): University chemistry D. c. Heath and co., Boston, M. A.

Cantarow, A. and B. Schepartz (1967): Biochemistry 4th. Ed. P. 640. W. B. Saunder Co., Philadelphia, PA.

Casarett, L. J. and Doull, J. (1975): Toxicollogy The Basic Science Of Poisons. Collier. Macmillon Canada, LTD. Toronto, Bailliere Tindall, London.

Chiang and Orozco (1983): "Estimation of copper, cadmium and lead in sausages and edible pastes from the V Region of Chile". Revistachilena-de-Nutricion. 11: 3, 31.

Cibulka, J.; Miholova, D.; Pisa, J; Sova, Z.; Mader, P.; Jandurova, S.; Szakova, J. and Pytloun, J. (1989): Natural levels of lead, cadmium and mercury in tissues and hair of new born calves from different areas of Czechoslovakia. Science of the total Environ.; 84, 101.

Doyle, J. J. and Spaulding, J. E. (1977): Toxic and essential trace elements in meat a review". J. Anim. Sci., 47, (2) 398.

FAO / WHO (1972): 16th joint expert committee on food additives, evaluation of mercury, lead, cadmium and the food additives amaranth, diethyl pyrocarbonate and acetyle gallate, WHO food additives Ser. No. 4.

Falandyez, J. and Lorence - Biala, H. (1991): Metals in muscle tissue, liver and kidney of slaughter animals from the Northern region of Poland. Bromatol. Chem. Tosykol, 22, 19.

Georgy, M. E.;, (1980): Application of some micro analytical methods to the determination of some elements in their biological reservoirs and their influence on the health of Egyptian farm animals Ph. D. theis, Fac. Sci, Cairo, Univ.

Jackson, M. L. (1970): Soil Chemical Analysis. Prentice Hall, India.

Jorhem - L; Slorach - S; Sundstrom - B; and Ohlin - B. (1991): Lead, cadmium, arsenic and mercury in meat, liver and kidney of Swedish pigs and cattle in 1984 - 1988. Food Additives and Contaminants 8, 201.

Klander, D. S. and Petering, H. G. (1975): Protective value of dietary copper and iron against some toxic effects of lead in rats. Environ. Health perspect. 12.

Miller, W. J. (1971): Cadmium nutrition and metabolism in ruminants: Relationship to concentrations in tissues and products feedstuffs, July 17, p. 24.

Marchello, M. J.; Slanger, W. D.; and Milme, D. B. (1984): Macro and micro minerals from selected muscles of pork. J. food Sci.; 5, 1375.

Oddi, - P; Maggi, - E. (1986): Lead, cadmium and chromium in canned meat products. Archirio - Veterinario - Italiano. 37: 2, 77.

Omaima, M. A. Diab (1995): Chemical constituents of beef, buffaloe and camels meat. Ph. D. Vet., theis, Faculty of Vet. Med. Cairo, Univ. Egypt.

Peunmarthy, L.; Oehme. F. W. and Hayes, R. H. (1980): Lead, cadmium and mercury tissue residues in healthy swine, cattle, dogs and horses from the midwestern United States. Arch. Environ. Contam. Toxicol., 9, 193.

Schlettwein - Gsell, D. Und Mommsen - Straub, S. (1971): Ubersicht: Spurenelemente in lebensmitteln. VI. Kupfer, Internat. Zin Vit. Ern. Forshung, 41, 554.

Standish, J. F.; Ammerman, C. B.; Simpson, C. F., Neal F. C. and Palmer, A. Z. (1969): Influence of graded levels of diatary iron as ferrous sulfate on performance and tissue mineral composition of steers J. An. Sci. 29, 496.

Stewert, J. S.; Churchill, U. L.; Edinburgh, L. M. (1995): Clinical Biochemistry. Edinburgh London Madrid Melbourne New York and Tokyo, First published.

Underwood, E. J. (1977): Trace elements in human and animal nutrition 4th. Ed. Academic press - New York.

World Health Organization (1977): Environmental Health Criteria: 3 lead W. H. O. Geneva.