EFFECT OF ENVIRONMENT ON QUALITY OF MEAT IN ALEXANDRIA GOVERNATE

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ABSTRACT

Meat sold in open markets consumed by many peoples. Special attention was focused on the determination of selected heavy metals in meat samples. For assessing environmental contamination, thirty meat samples of three varieties (Minced meat, meat slices, and sausage) were purchased from different open markets in Alexandria province. The samples were analyzed for the estimation of Fe, Cu, Pb and Cr using atomic absorption spectrophotometer. The results for minced meat were Fe (950.2 ppm), Cu (73.7 ppm) and Pb (3.8 ppm), for meat slices were Fe (838.3 ppm), Cu (72.3 ppm) and Pb (0.86 ppm), and for sausage were Fe (102.7 ppm), Cu (9.6 ppm) and Pb (2.95 ppm). A significant correlation was found between Fe and Pb in the three products. The concentrations of these elements were above the allowable international limits for human food. Chromium was undetectable in the three products.

Key words: Environmental pollution, heavy metals, and meat samples

INTRODUCTION

The environmental pollution is a matter of great concern worldwide, and consequently contamination of food chain is getting increasingly important in view of its role in human health and nutrition. There are numerous types of environmental pollution, which constitute a potential threat to human health **(Heidelberger, 1975)**.

The primary sources of these pollutants are garbage s, trash, and raw sewages, chemical effluents of the industries and emission of irritant and harmful gases from various sources. These pollutants emerge from rapid population growth, massive urbanization and extensive urbanization and extensive industrialization throughout the world **(Raja et al., 1996)**.

Meat is a food material, which is composed of mainly proteins, fat and some important essential elements. Contamination is transferred to animals via direct exposure, polluted water and

crops grown on irrigateted sewage water. Another important reason for causing contamination of meat is the deposition of contaminants from vehicle emission and from dirty slaughter places, and selling meat in the open market and even on roadside.

The contaminated food and water are sources of illness in human body. Among various pollutants in the environment, heavy metals are directly related to health diseases in humans. Although it is difficult to classify trace metals into essential and toxic groups, yet it is well known fact that an essential metal becomes toxic at sufficiently high intakes **(Khurshid and Qureashi, 1984)**.

Lead may enter the atmosphere during mining, smelting, refining, also automobile gasoline contains tetra-ethyl lead as knock inhibitor that is burned enters the atmosphere and manufacturing processes and by the use of lead containing products. Lead intake occurs from the consumption of fruit juices, food stored in lead lined containers, cosmetics, cigarettes.. **(Benneth, 1981)**. Lead is able to cross the placenta as early as the 12th-14th week of gestation. Cord blood concentrations of lead are generally equivalent to that of the mother, or just a bit lower. Lead is not easily excreted, so it will continue to accumulate in fetal tissues throughout gestation, mostly accumulating in fetal brain. **(Schardein, 1998)**.

Excess lead can cause serious damage to the brain, kidneys, nervous system and red blood cells. Young children, infants and fetuses are particularly vulnerable to lead poisoning. US environmental protection agency (EPA) says that lead may be implicated in causing leukemia **(Anonymous, 2002)**.

High concentration of copper oxide may result from welding operations. The corrosion of copper containing alloys in pipe feting may add measurable amount of copper into the water. Copper content of normal human adult is 50-120 mg, but above 15mg causes nausea, vomiting, diarrhea and intestinal pain. Copper deficiency results in anemia and the congenital inability to exerete copper resulting in aecumulation and Wilson, S disease **(Greenwood and Earnshaw, 1986)**.

Iron deficiency is seen in premenopausal women, adult men should not use iron supplements, because high tissue level of iron correlate with increased risk of myoeardial infection **(Harvey and Champe, 1994)**.

The present work was done to estimate the level of iron, copper, lead and chromium in three meat varieties (Mineed meat, meat slices, and sausage) purehased from local markets and different spots in Alexandria provinee .

MATERIALS AND METHODS

Sample collection and preparation:

Ten different samples from each meat variety (mineed beef, meat slices and sausage) were collected from various shops in different markets. All samples were taken to the lab in plastic bags. For metal analysis wet digestion of metal samples was done using the method of **Holak (1980)**.

Instrumentation:

The atomic absorption speetrophotometer (Thermoelimental, type. Solaar 54/2001. NC. 9423-400-30042, Ser. No. GE 710728) was employed in analysis of samples. Air /acetylene were used as fuel. Three such determinations were taken as the observed value. The absorption signals of the samples were evaluated after subtracting the mean value of the blank.

Standards:

Certified AAS stock standards of Pb, Cu and Fe containing 1000 mg/dm3 were obtained from Merck Company, for calibration curve. The standers were prepared by proper dilution of stock stander solution in 6n HCL.

Working standard solution:

Pb, Cu and Fe standards containing 1-100 ppm were prepared and from stoek standard solutions.

Blank solution:

Blank solutions were prepared and treated exactly in the same way as the samples except the metal ion concentration. The absorption signals of sample solution were evaluated by subtracting the mean value of blank from the signals of the sample.

Statistical analysis:

The results were evaluated by ANOVA, pair wise comparisons test and person correlation **(Clark and Cooke, 1983)**.

Results and discussion:

The present work was done to estimate the concentration of iron, copper, lead and chromium in minced meat, meat slices and sausage sold in some public open markets in Alexandria.

Iron was the major element in the samples; minced meat had the highest concentration followed by meat slices and finally sausage (Fig. 1). The mean concentrations of iron in the three products were significantly different from each other s. The low significant concentration of iron in sausage ($p<0.0001$) may be attributed to the nature of the product, which is usually made of

small ratio of beef meat and offal s with high ratio of bulking materials. But the significant increase of iron in minced meat ($p<0.005$) than in slices was inexplicable. Since, minced meat was prepared from meat contain 20% fat. (Egyptian standards, No.1694/1991) which usually lower in iron concentration.

The concentration of iron in meat slices was high according to that reported by **Lawrie, 1981** for ox lean meat (21 ppm). Also, the values of minced meat and sausage were higher than the amount stated by RAD safe for man (12-15 mg/day).

Copper was the second element with high in the tested samples minced meat had the greatest concentration followed by meat slices. And sausage (Fig.2). The mean difference between minced and meat slices was not significantly different however, the concentration of element was higher in minced than slices. On the other hand, sausage had significant low copper concentration ($p<0.0001$) when compared with mince or slices meat.

In general the concentrations of copper were high according to permissible limits of copper in beef mince (0.2 mg/100 g), meat slices of topside, rump steak, and silverside (0.1, 0.2 and 0.3 mg/100g, respectively) and beef sausage (0.2 mg/ 100g) **(McCance and Widdowson, 1991)**.

Lead concentration measured in mineed meat showed the highest concentration followed by sausage and meat sliees came later (Fig.3). The difference between mean concentration of lead in case of minced meat and sausage was not significant, but was significantly high between minced and slices ($p<0.001$) or sausage and slices ($p<0.0003$). According to the European commission regulation (No 466/2001), lead in the meat of bovine animals should not exceed the maximum level (0.1mg/kg wet weight). So, tested products overcame the allowable lead concentration in human food.

A significant correlation was found between iron and lead in meat slices ($p<0.01$), minced meat ($p<0.05$) and sausage ($p<0.05$) (Figs 4, 5 and 6). While non-significant negative correlations were calculated either between copper and iron or lead in minced meat, meat slices and sausage.

Chromium was un detectable in meat slices, minced meat and sausages.

Finally we can concluded that the major part of contamination of tested products may be related to red color stains which usually which usually added to these products to make them attractive to the consumer. On the other hand, lead contamination may be also, duc to automobile exhaust contain leaded gas and particulate lead.

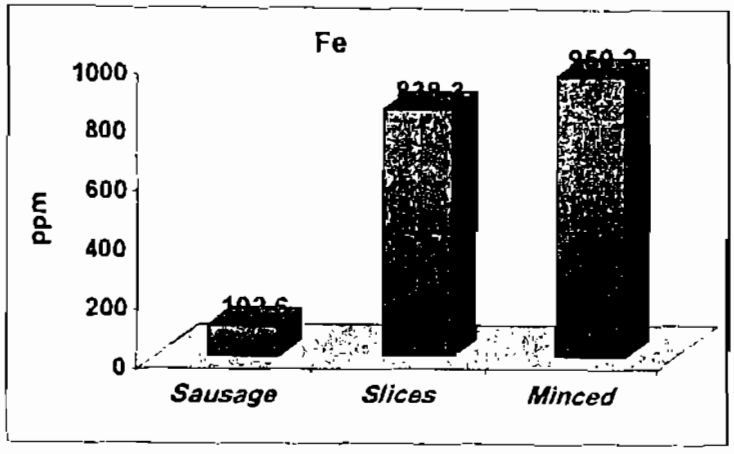

Fig (1) Concentration of iron in meat product.

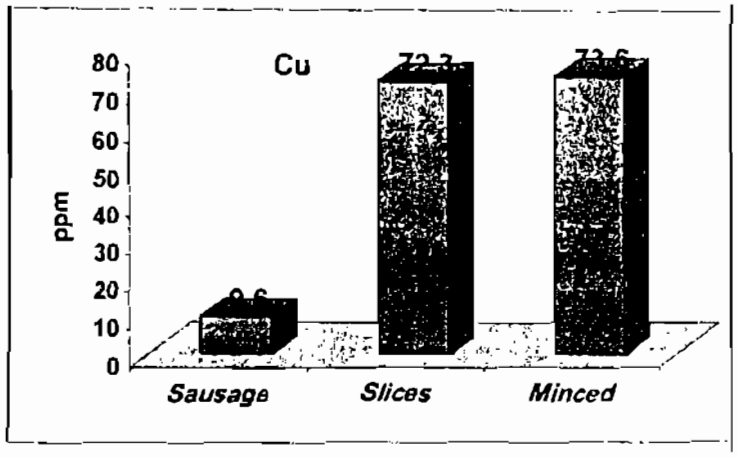

Fig (2) Concentration of copper in meat product.

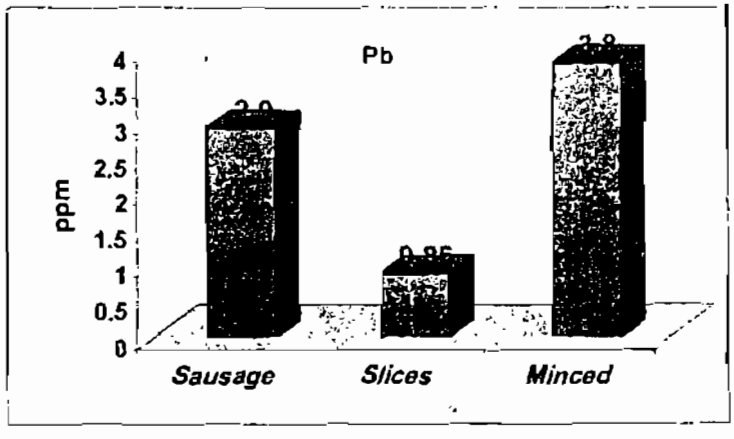

Fig (3) Concentration of Lead in meat product.

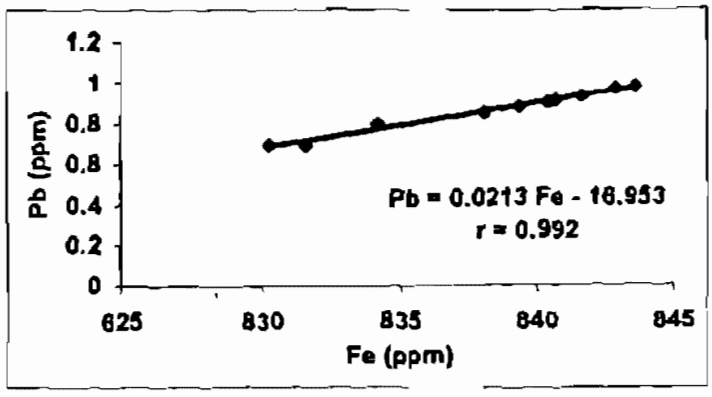

Fig (4) Correlation between Fe and Pb in meat slices.

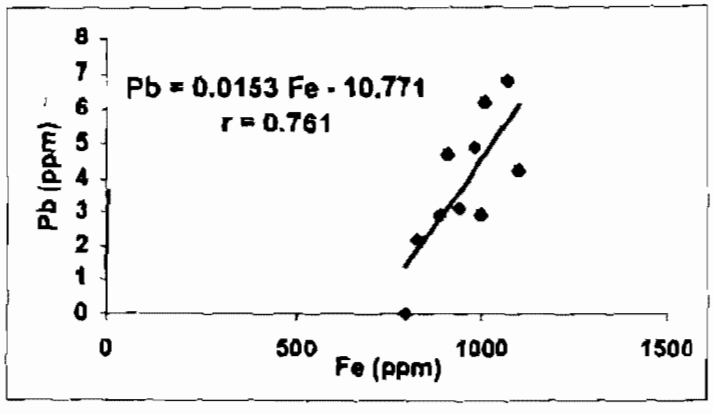

Fig (5) Correlation between Fe and Pb in minced meat.

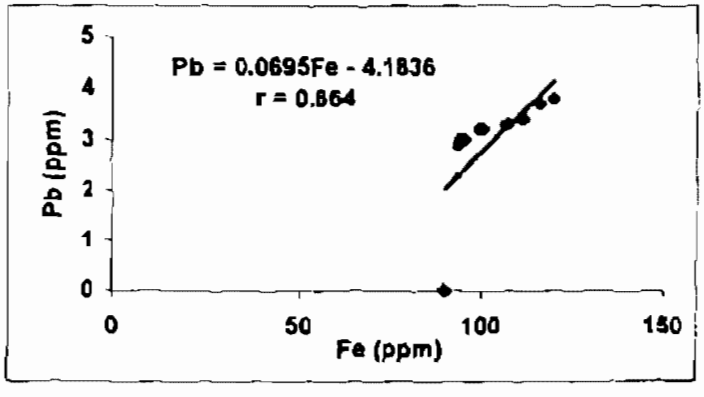

Fig (6) Correlation between Fe and Pb in sausage.

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الملخص العربى

التـأثيـر البيئى على اللحـوم فى محافظـة الإسـكندريـة

المشتركون فى البحث

محمـد أحمـد عبدالله و وليـم بطـرس هابيـل

كلية الطب البيطرى - جامعة المنصورة

يتم عرض بعض اللحوم المجهزة للطهى (مفرومة وقطع) وكذلك السجق مباشرة فى الأسواق الشعبية بمحافظة الإسكندرية وغالباً ماتكون تلك الأسواق بالقرب من الطريق العام مما يجعلها عرضى للعديد من مصادو التلوث منها عوادم السيارات والأتربة التصاعدة العام مما يجعلها عرضى للعديد من مصادو التلوث منها عوادم السيارات والأتربة المتصاعدة من النشاط السكانى فى تلك المناطق، تم شراء عدد عشرة عينات من كل صنف ومن أسواق مختلفة، وتم تجهيز العينات لتقدير العناصر الآتية : الحديد والنحاس والرصاص والكروم وذلك باستخدام جهاز الامتصاص الذرى، أسفرت النتائج عن وجود أعلى نسبة من الحديد (٢ر٩٥٠ جزء فى المليون)) والنحاس (٧ر٧٣ جزء فى المليون) باللحم المفروم يليه شرائح اللحم تحتوى على ٣ر٨٣٨ جزء فى المليون من الحديد و ٦ر٩ جزء فى المليون من النحاس، أما عنصر الرصاص فقد كان أعلى تركيز له باللحم المفروم (١ر٣ جزء فى المليون) والسجق (٩٥ر٢ جزء فى المليون) وأقل تركيز بشرائح اللحم (٨٦ر٠ جزء فى المليون) وقد وجد إرتباط بين عنصرى الحديد والرصاص فى كل من الأصناف الثلاثة وبشكل عام تعتبر تلك القياسات أعلى من تلك المسموح بها دولياً فى غذاء الإنسان، أما عنصر الكروم فلم يستدل عليه فى تلك العينات.