

## ESTIMATION OF SOME METALS IN WORKER OF DYES INDUSTRIES

Rafah Kh. Ahmed

University of Baghdad, College of Science for Women.

### Abstract

This study involve in an estimation of some metals in sera of workers in one of the dyes industries in Baghdad city, the content of blood serum from lead, copper and zinc were analyzed in twenty two sera samples of workers using the Atomic Absorption Spectroscopy (AAS) instrument type (AAS VARID 6 Analytik Jena AG), also, twenty two sera samples were used as a control cases in this study .It was found that the zinc concentrations were decreased in the sera of workers who worked in the dyes industry compared to control cases, but increased in the levels of both two elements lead and copper in the sera of workers compared with the control cases.

**Key words :** Estimation, metals, workers, Dyes Industry.

### Introduction

Toxic metals, are individual metals and metal compounds that negatively affect people's health. Some toxic, many of these metals are necessary to support life. However, in larger amounts, they become toxic. They may build up in biological systems and become a significant health hazard.

The metals, which include copper (Cu), zinc (Zn), lead (Pb), are common trace constituents in the earth crust. Their concentrations in the ambient environment have increased dramatically since the Industrial Revolution, as have lead and copper since Roman times. Many of these metals play an essential role in human physiology. For example, the enzymes that synthesize DNA and RNA contain zinc ions, and cobalt is an integral part of coenzyme B<sub>12</sub> and vitamin B<sub>12</sub>. It is possible to be deficient in these metals, or to have an optimal or a damaging or lethal intake<sup>1, 2, 3</sup>.

It was found that Zinc ions are protective against free-radical injury; it is known to have specific role in the nucleus of cells, where it stabilizes native RNA polymerase and its essential function of at least two of the chromatin proteins involved in transcription. The recommended dietary allowanced (RDA) for zinc in adults is 15mg/day. High-protein foods, such as meat, fish and dairy products, are good sources of zinc<sup>4</sup>. Copper also appears to have many important functional roles in the body that is apparently related, among others, to

the maintenance of immune function, bon, health and haemostasis<sup>5</sup>. Copper plays an important role in iron metabolism. A copper deficiency shows similar symptoms to those of Fe- deficiency anemia<sup>6</sup>.

About lead; Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.<sup>7</sup>

The occupational exposure to lead is one of the most prevalent over exposures. Industries with high potential exposures include construction work, most smelter operations, radiator repair shops, and firing ranges<sup>4</sup>.

### Material and method

**1-Chemicals:** The entire chemicals used were obtained from the following companies:

| No. | Chemicals      | Formula compound           | Mr. (g/mole) | Conc. %               |
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| 2.  | Copper Nitrate | $\text{Cu}(\text{NO}_3)_2$ | 187.56       | 1000 $\mu\text{g/ml}$ |
| 5.  | Lead Nitrate   | $\text{Pb}(\text{NO}_3)_2$ | 331.22       | 1000 $\mu\text{g/ml}$ |
| 6.  | Zinc Nitrate   | $\text{Zn}(\text{NO}_3)_2$ | 189.32       | 1000 $\mu\text{g/ml}$ |

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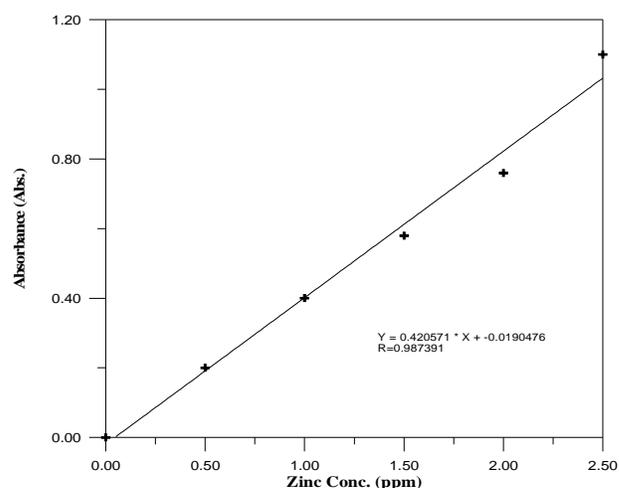
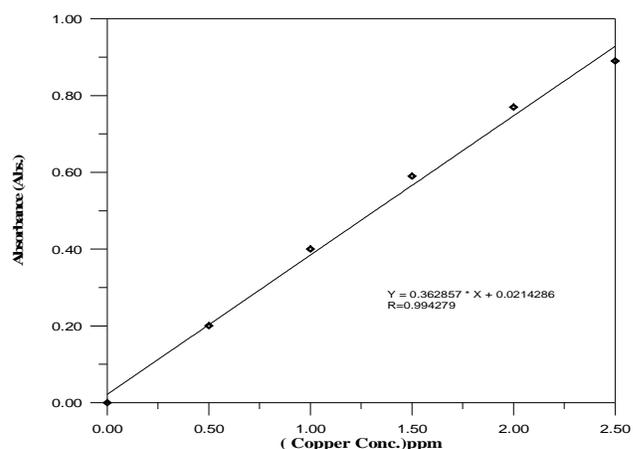
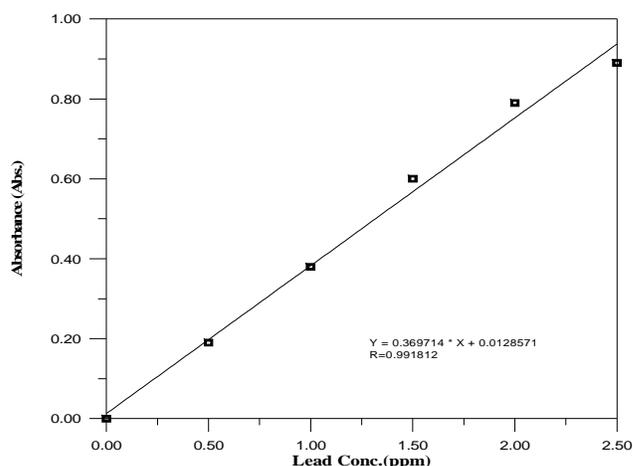
Twenty two blood samples of workers who worked in one of the dyes industries in Baghdad and other twenty two blood samples as a control cases were collected (5 ml of blood was collected from the vein of workers and controls), and then centrifuged to separate the sera samples and stored in the refrigerator until sent it for analysis.

## 3-Analysis

Using the Flameless Atomic Absorption Spectrometer type (AAS VARID 6 Analytik Jena AG); the blood sera samples were analyzed to detect their containing from the elements under our study (copper, lead and zinc).

Copper (Cu), Lead (Pb) and Zinc (Zn) standard solutions covering the concentration range (0.5-2.5)  $\mu\text{g/ml}$  were prepared by the dilution of the standard solutions (1000  $\mu\text{g/ml}$ ) for each, with metal free water (deionized water) and stored in tightly closed polyethylene bottles.

Using the range of concentrations (0.5-2.5 ppm) of such elements under our study, elements were analyzed. Fig. (1).



**Fig.(1) : Calibration curve for the (AAS) determination of (a)-Lead, (b)-copper, (c)-zinc in sera samples.**

## Results and discussion

Samples are collected from workers whose aged range between 15 and 52 years with occupational duration range 10 to 30 years ,all of them residents of Baghdad city ,half of them

are married and the other half are single. The concentrations of the elements under our study was measured in sera of workers in the dyes industry using the Flameless Atomic Absorption Spectrometer instrument, under the standard curve of such element

#### a- Concentrations of copper:

The concentrations of copper in the sera samples of workers and control cases were show in Table (1).

**Table (1)**

**Copper concentrations in sera of workers and control cases.**

| Age(year)       | Copper concentrations (ppm) |              |               |              |
|-----------------|-----------------------------|--------------|---------------|--------------|
|                 | workers                     |              | Control cases |              |
|                 | Range                       | Mean average | Range         | Mean average |
| 15-29(10 cases) | 1.210-1.271                 | 1.240        | 1.021-1.141   | 1.081        |
| 30-44(8 cases)  | 1.310-1.331                 | 1.320        | 1.213-1.292   | 1.252        |
| 45-58(4 cases)  | 1.353-1.462                 | 1.407        | 1.281-1.370   | 1.325        |
| Mean value      | 1.322                       |              | 1.219         |              |

In general the sera copper concentrations in both workers and the control cases was with in the normal value and the rare increasing in the concentrations in the sera of workers compared with the control cases was not significant.

#### b- Concentrations of lead:

Table (2) shows the comparison between the concentrations of lead in workers and the control cases.

**Table (2)**

**Lead concentrations in sera of workers and control cases.**

| Age(year)       | Lead concentrations (ppm) |              |               |              |
|-----------------|---------------------------|--------------|---------------|--------------|
|                 | workers                   |              | Control cases |              |
|                 | Range                     | Mean average | Range         | Mean average |
| 15-29(10 cases) | 1.101-1.210               | 1.155        | 0.301-0.313   | 0.307        |
| 30-44(8 cases)  | 1.431-1.491               | 1.461        | 0.367-0.402   | 0.385        |
| 45-58(4 cases)  | 1.880-2.011               | 1.945        | 0.485-0.503   | 0.494        |
| Mean value      | 1.520                     |              | 0.395         |              |

The comparison between the sera lead concentrations in workers and control cases shows significantly high in the sera lead of workers in the industry under our study compared with the control cases , this result was expected; because the workers used the dyes containing lead as a compound, so, the workers in aged 45-58 yeas who have been large occupational duration suffered from pre-lead poisoning and have a side effect of lead poisoning such as stomach pain.

#### c- Concentration of zinc:

Zinc concentrations relation with copper concentration ,it was found that in some cases who suffered from increasing in sera zinc the copper is decreased that mean if the concentration of copper decreased ;zinc levels in the same sera samples was increased . Table (3).

**Table (3)**  
**Zinc concentrations in sera of workers and control cases.**

| Age(year)       | Zinc concentrations (ppm) |              |               |              |
|-----------------|---------------------------|--------------|---------------|--------------|
|                 | workers                   |              | Control cases |              |
|                 | Range                     | Mean average | Range         | Mean average |
| 15-29(10 cases) | 0.541-0.664               | 0.602        | 0.990-1.120   | 1.055        |
| 30-44(8 cases)  | 0.435-0.511               | 0.473        | 1.132-1.215   | 1.173        |
| 45-58(4 cases)  | 0.400-0.431               | 0.415        | 1.240-1.879   | 1.559        |
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Table (3) appeared that the zinc concentrations in sera of workers was within the normal value (0.5-1.5 ppm) and near the results of that control cases, except the workers who aged, these cases suffered from zinc deficiency that explained the zinc may be accumulated in the tissue and that caused the deficiency in serum blood zinc, from the history of these cases, it was found that they suffered from allergy and some of these cases has difficulty in wound healing which is the side effect of zinc deficiency<sup>8</sup>.

Zinc deficiencies in human being with neoplastic and inflammatory disease (arthritis, lupus erythematosus) have been attributed to anorexia, starvation, loss of zinc from catabolized tissue, and increased urinary excretion of zinc subsequent to its mobilization by interleukin-1.

This polypeptide hormone, released by granulocytes, mediates a redistribution of body zinc during the acute phase reaction, which results in increased hepatic zinc sequestration and urinary excretion of zinc

Zinc deficiency is often associated with sickle cell anemia<sup>9</sup>.

#### **The comparison among the three under study elements concentrations in sera of workers:**

The comparison among the three under study elements concentrations in sera of workers appeared by Table (4), Fig. (2).

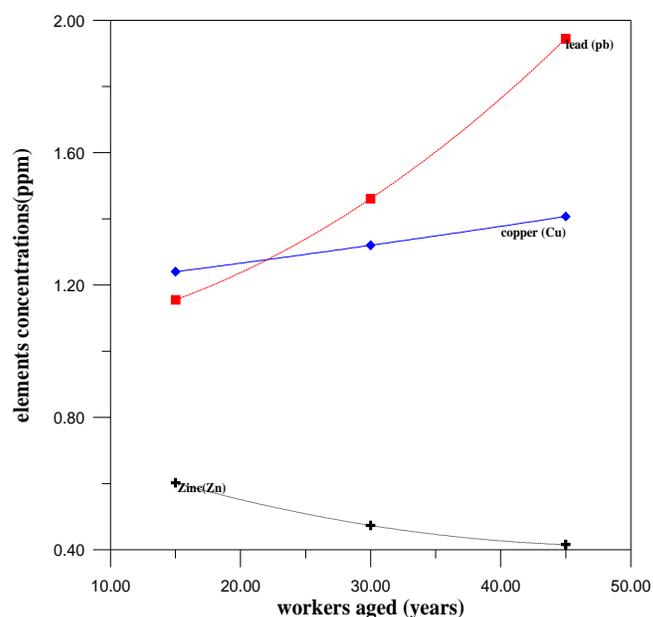
**Table [4]**  
**The comparison among elements concentrations in sera of workers**

| Age(year)      | Elements concentrations in sera of workers (ppm) |                              |                                |
|----------------|--|------------------------------|--------------------------------|
|                | Copper(Cu)<br>N.V:(0.5-1.5µg/ml)                 | Lead(Pb)<br>N.V:(0.5-1µg/ml) | Zinc(Zn)<br>N.V:(0.5-1.5µg/ml) |
|                | 15-29 (10 cases)                                 | 1.240                        | 1.155                          |
| 30-44(8 cases) | 1.320  | 1.461                        | 0.473                          |
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This Table (4) appeared that in general the concentrations of the three elements are not very high or very low compared with the control cases and the normal value in sera samples.

It was also found contrary relationship between copper and zinc concentrations in the serum blood samples<sup>10</sup>.



**Fig. (2) : The comparison among elements concentrations in sera of workers.**

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في امصال العمال مقارنة بامصال الاشخاص موضع السيطرة.

## الخلاصة

تتضمن هذه الدراسة تقدير بعض العناصر في امصال العاملين في احد معامل الاصبغ في مدينة بغداد، محتوى مصل الدم من العناصر الرصاص ، النحاس والارصين تم تحليله في اثنان وعشرين نموذج مصل باستخدام جهاز الامتصاص الذري الغير لهبي نوع (AAS VARID 6 Analytik Jena AG) . كذلك استخدم اثنان وعشرين نموذج مصل لاشخاص خارجيين كنماذج سيطرة .  
وجد ان تراكيز عنصر الارصين منخفضة في امصال العمال في مصنع الاصبغ مقارنة بالاشخاص نماذج السيطرة، لكن زيادة في مستويات كل من عنصري الرصاص والنحاس

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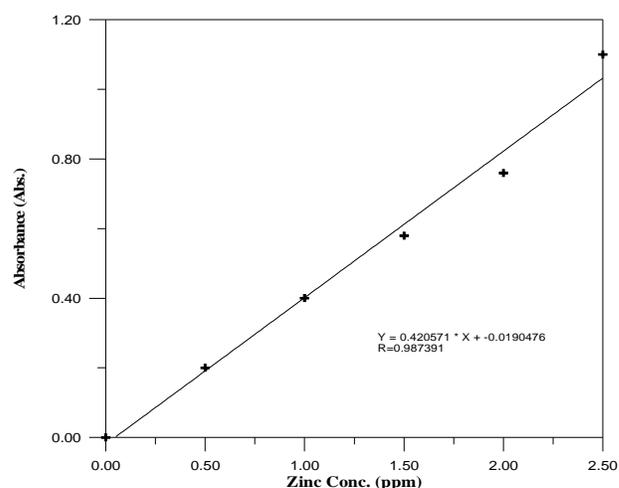
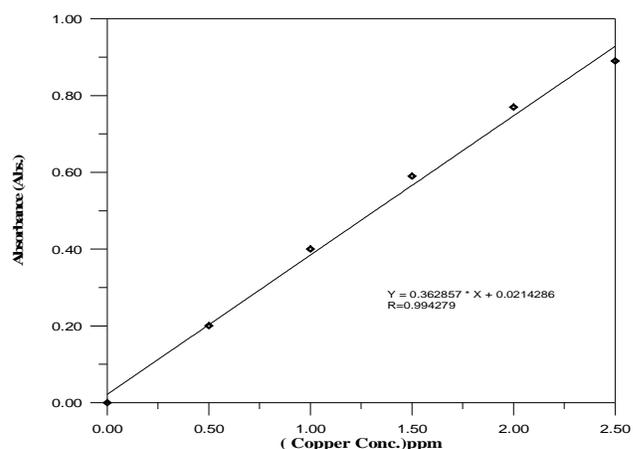
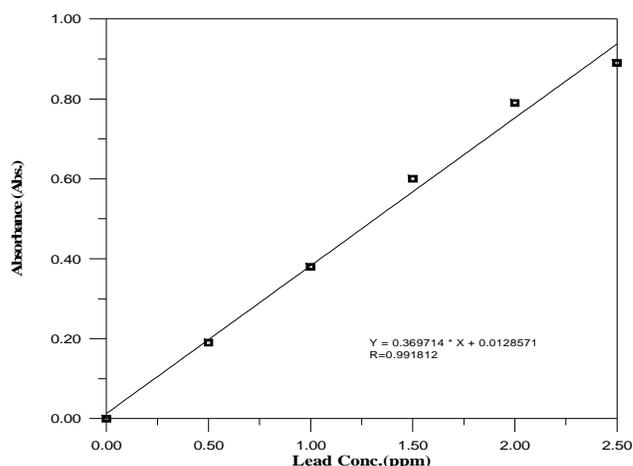
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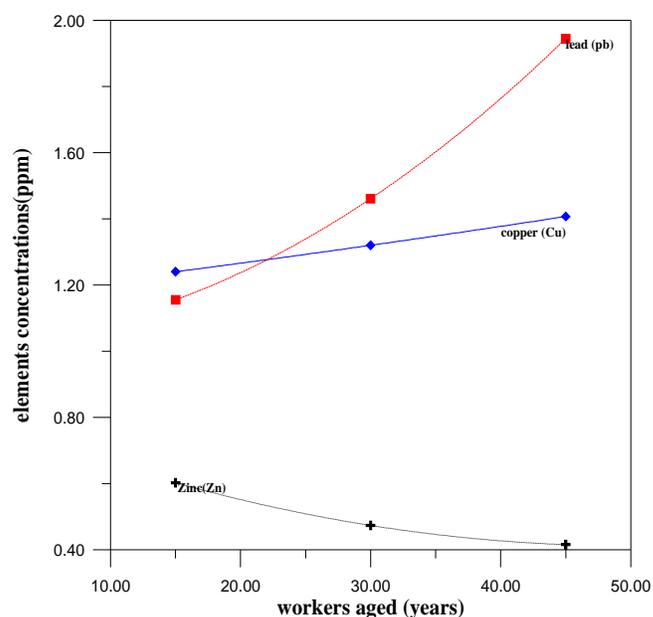
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