

# HEALTH STATUS OF AN OCCUPATIONALLY EXPOSED TO LEAD WORKERS GROUP FROM A CAR BATTERY FACTORY

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**Keywords:** lead, occupational health, safety, workers

**Abstract:** In the car battery technology production the occupational exposure to lead continues to be an important cause of morbidity. Monitoring the work environment and health status are efficient means within an integrated health and safety occupational strategy.

**Cuvinte cheie:** plumb, sănătate, siguranță ocupațională, lucrători

**Rezumat:** În tehnologia fabricării de acumulatori auto expunerea profesională la plumb continuă să fie una din cauzele de îmbolnavire. Monitorizarea mediului de muncă concomitent cu evaluarea stării de sănătate a personalului expus la plumb sunt măsuri eficiente în cadrul unei strategii integrate de sănătate și siguranță ocupațională.

## INTRODUCTION

The occupational risk on health of activities carried out in a lead contaminated environment depends on several factors, such as working conditions, length of exposure, smoking habits and alcohol consumption, and also varies with the particulate matter quantities, airborne lead particles' size and solubility of lead compounds (5). In lead-acid batteries manufacturing technology, the use of inorganic lead and/or lead oxides poses a risk of cardiovascular, kidney, musculoskeletal or systemic toxic effects to exposed workers, due to inhalation of compounds from the industrial environment (6). Improving occupational safety and health is important, both to reduce the suffering of workers and in ensuring business success and economical development (3).

## WORKING HYPOTHESIS

A cross-sectional study was carried out among a group of workers exposed to lead in an automotive batteries factory, in order to evaluate the influence of lead exposure on their health status.

## MATERIAL AND METHOD

The study was performed on a total group of 255 workers divided into 3 groups: 165 subjects with continuous exposure to lead 55 subjects with intermittent exposure to lead and 35 subjects without occupational exposure to lead. In order to evaluate the health status, comprehensive physical exams off all bodily systems, as well as biochemical investigations were performed.

Blood pressure and heart rate were determined for each subject, electrocardiograms were performed, as well as blood lead levels (PbB) and urinary  $\Delta$ ALA levels; PbBs were measured by stripped anodic voltammetry method and  $\Delta$ ALA was computed by AAS.

The quantification of clinical and biological effects of exposure to lead was performed using Microsoft Excel Version 5.0, data being analyzed by summary statistics tests (mean, median, standard deviation, and frequencies).

## RESULTS AND DISCUSSIONS

When comparing the biochemical data, mean PbB values (Table 1) and urinary  $\Delta$ ALA values (Table 2) were approximately twice as high in those exposed than in the lead unexposed subjects. Identified differences in PbB and urinary-ALA values between groups were statistically significant; still, the average values remain within biologically acceptable limits. Taken separately, 44 subjects (17.74%) with exceeding PbB values and 26 subjects (11.11%) with greater than normal urinary  $\Delta$ -ALA values were found. (3,4,5). Corroborating these data with the incidence of lead poisoning suggestive clinical manifestations, we observe that **asthenia-vegetative**, digestive and pseudo-rheumatism syndromes are present in a significantly lower percentage than the percentage of pathological PbBs (Fig. 1).

**Table no. 1. PbB - Mean values in automotive batteries industrial unit workers**

PbBs	Mean	Standard deviation	Exceeded MAC: >40 $\mu$ g/dL (%)
continuous exposure to lead	30.47	10.32	20.61
intermittent exposure to lead	25.52	12.09	18.52
without exposure to lead	16.82	8.00	0.00

**Table no.2 Urinary D-ALA - mean values in automotive batteries factory workers**

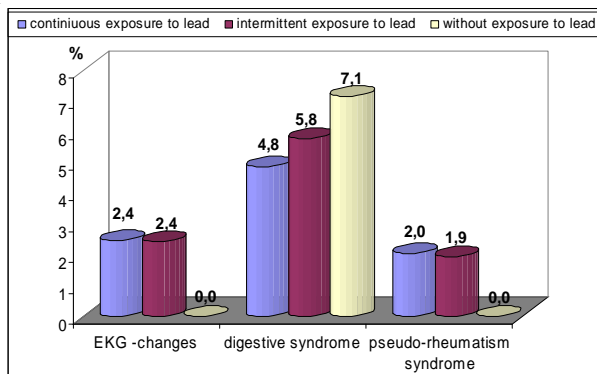
Urinary $\Delta$ -ALA	Mean	Standard deviation	Exceeded MAC: >10mg/L (%)
continuous exposure to lead	6.50	8.40	13.04
intermittent exposure to lead	5.57	4.15	9.80
without exposure to lead	3.52	1.50	0.00

EKG changes were detected in four subjects with continuous exposure (2.44%) and two subjects (2.42%) with

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intermittent exposure. Digestive syndrome (minor) was present in eight subjects (4.84%) of those continuously exposed to lead as well as in 3 (5.76%) intermittently exposed to lead subjects, and in two (7.14%) of not exposed to lead workers. The pseudo-rheumatism syndrome was identified in four individuals (2.4%) from continuous exposure to lead group and in two persons (1.92%) from the intermittent exposure to lead group (figure 1).

Figure no. 1. Pathological aspects in the lead-acid batteries plant workers



In addition, the comparative analysis of systolic and diastolic blood pressure did not show an excessive percentage of hypertension, a disease usually regarded by medical literature as a genuine professional ailment in relation to lead exposure (6). The blood pressure average/mean was within the normal limits for both the diastolic (figure 2) and the systolic values (figure 3), while the percentage of subjects with increased blood pressure or with EKG changes did not exceed the incidence of these morbidities in general population (3).

Figure no. 2. Systolic blood pressure – mean values

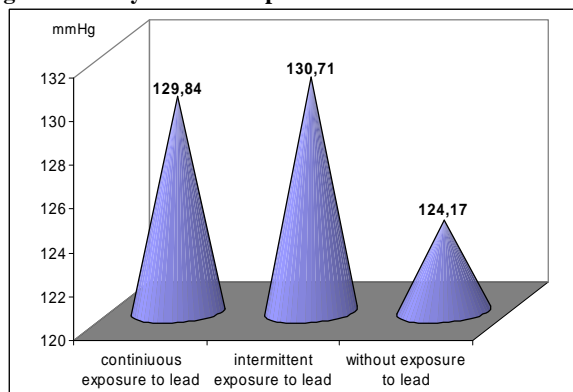
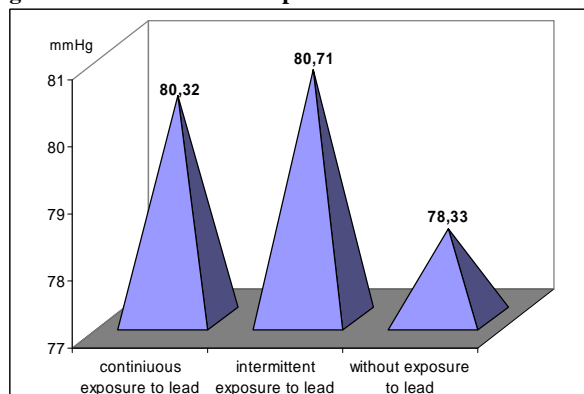


Figure no. 3. Diastolic blood pressure – mean values



CONCLUSIONS

- The results of this study showed that PbB and urinary-ALA mean values were approximately two times higher in exposed workers compared to unexposed subjects.
- The blood pressure average/mean was within normal limits for both diastolic and systolic values; the percentage of subjects with increased blood pressure or with electrocardiographic changes did not surpass figures encountered in the general population.
- In the investigated group of subjects, asthenia-vegetative, digestive and pseudo-rheumatism syndromes are present only in low percentages.
- This investigation has not verified any major health disorder in relation to occupational exposure to lead.

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