The Effects of Gasoline Vapor on Serum Alkaline Phosphatase in Male Rats

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Abstract—Studies show that there is association between gasoline vapor inhalation and human ill-health. This study was exerted to determine the effects of gasoline vapor inhalation on serum alkaline phosphatase in male rats. In our study male Wistar rats were randomly divided into control, and rats exposed to gasoline vapor for 1 h/day, 2h/day, and 3h/day. After 6 weeks blood samples were collected and serum alkaline phosphates was measured using spectrophotometry method. The results indicated that serum alkaline levels were increased in all groups of rats exposed to gasoline vapor compared to control group (P<0.05). Our findings show that gasoline vapor inhalation has a potentially impairing effect on organs such as heart or liver.

Keywords— Gasoline vapor, Alkaline phosphatase, Rat.

I. INTRODUCTION

Gasoline contains over 500 saturated or unsaturated hydrocarbons having from 3 to 12 carbon atoms. Millions of people are exposed to gasoline constituents in the course of refueling at gasoline stations [1]. Breathing fumes and evaporative and refueling emissions bring about serious toxic risks [2]. Alteration of glutathione, glutathione S-transferase and lipid peroxidation in mouse skin and extracutaneous tissues was occurred after topical application of gasoline [3]. Organolead compounds in leaded gasoline usually result in permanent neurological deficits [4], [5]. Behavioral studies in petrol pump workers indicate that gasoline vapor inhalation has adverse effects on human health [6]. It has also been shown that gasoline vapor exposure has carcinogenic effect [7]. Headache, fatigue, loss of memory, and dizziness were the common signs observed in subjects that have been exposed to gasoline vapor [8], [9]. The toxic effects of gasoline vapor also was reported in recent studies [10].

Alkaline phosphatase is a hydrolase enzyme responsible for removing phosphate groups from many types of molecules, including nucleotides, proteins, and alkaloids. As the name suggests, alkaline phosphatases are most effective in an alkaline environment. It is sometimes used synonymously as basic phosphatase [11]. Elevated alkaline phosphatase level mainly is occurred in liver [12] or heart [13] damage. Despite studies carried out to investigate the effects of gasoline vapor inhalation on human health. This study was designed to evaluate the effects of gasoline vapour inhalation on serum alkaline phosphatase level in male rats.

II. MATERIAL AND METHODS

A. Animals

Adult Wistar rats weighting 200±30g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 23±2°C and animals kept under a schedule of 12h light:12h darkness (light on at: 08: 00 a.m.) with free access to water and standard laboratory chow.

B. Protocol of Study

Male Wistar rats were randomly divided into control, and rats exposed to gasoline vapor for 1 h/day, 2h/day, and 3h/day. After 6 weeks blood samples were collected and serum alkaline phosphates was measured using spectrophotometry method. All animal experiments were carried out in accordance with the guidelines of Institutional Animal Ethics Committee.

C. Statistical Analysis

All values are presented as mean ± S.E.M. Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Differences with P<0.05 were considered significant

III. RESULTS

Table 1 shows the mean time in open area that animals spent in different groups.

<table>
<thead>
<tr>
<th>Table I</th>
<th>SERUM ALKALINE PHOSPHATASE LEVEL IN MALE RATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Alkaline phosphatase (U/L)</td>
</tr>
<tr>
<td>Control</td>
<td>424.8±5.03</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving (1 h)</td>
<td>768.4±163.6</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving (2 h)</td>
<td>741.8±135.34</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving (3 h)</td>
<td>675.2±120.37</td>
</tr>
</tbody>
</table>

The data are indicated as mean ± SEM. P values are expressed in comparison with control group.
Our findings indicate that serum alkaline levels were increased in all groups of rats exposed to gasoline vapor compared to control group (P<0.05); however, there was no significant difference between serum alkaline phosphatase level in rats exposed to gasoline vapor inhalation for 1h/day, 2h/day or 3h/day.

IV. DISCUSSION

Our study indicated that gasoline vapor inhalation results in enhanced serum alkaline phosphatase levels. In line with our finding, other research findings also indicate that breathing the evaporative and refueling emissions bring about serious toxic risks [10]. Occupational exposure to gasoline has also been associated with numerous signs of neurotoxicity [7], [8]. The impacts of gasoline exposure on Na+, K+-ATPase, superoxide dismutase, cetylcholinesterase, total protein, reduced glutathione and lipid peroxidation were established [14]. It has also been shown that unleaded gasoline has interactive effects on liver tumor promotion [15]. Since elevated serum levels of alkaline phosphatase is occurred in liver or heart damage [12], [13], the potentially adverse effects of gasoline vapor inhalation on liver or heart function or structure is suggested.

V. CONCLUSION

We have shown that exposure to gasoline vapor can bring about enhanced alkaline phosphatase level, according to potentially damaging effects of gasoline vapor inhalation on liver or heart is suggested.

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REFERENCES