Impact of Gasoline Vapor Inhalation on Anxiety in Male Rats

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Abstract—Studies show that there is association between air pollution and enhanced anxiety in industrialized areas. The main aim of this study was to determine the effects of gasoline vapor inhalation on anxiety in male rats. In our study male Wistar rats were randomly divided into control, 1 h, 2h, and 3h gasoline vapor groups 5 rats in each. The experiments were repeated for 3 times with a week interval. Anxiety level was measured in animals using elevated plus maze. Data were statistically analyzed and compared between groups using ANOVA. The results indicated that anxiety level was increased in rats inhaling the gasoline vapor for 3 hours compared to control rats. Our findings show that gasoline vapor inhalation can enhance anxiety level.

Index Terms— Gasoline vapor, Anxiety, 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]. Gasoline-induced neurotoxic effects were attributable to gasoline sniffing which has become an increasingly rising phenomenon in the poor societies as a means for cheap mood alteration [3]. Organolead compounds in leaded gasoline usually result in permanent neurological deficits [4], [5]. Ethylene glycol is another gasoline constituent which can produce central nervous system depression [6]. The effects of gasoline exposure on intelligence, memory and mental and psychoneurotic conditions have been reported in previous studies [7], [8]. Headache, fatigue, loss of memory, and dizziness were the common signs observed in subjects that have been exposed to gasoline vapor [9], [10]. This study was designed to evaluate the effects of gasoline vapour inhalation on anxiety in male rats.

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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. Elevated plus-maze test

We used an elevated plus-maze to determine the anxiety level in animals exposed to gasoline vapor. The apparatus, constructed from black Plexiglas, consisted of two open arms, two enclosed arms and a central platform. The maze was elevated 70 cm above the floor. After exposing the animals to gasoline vapor, animals were placed at the center of the maze, facing one of the enclosed arms. During the 5-min test period, the time that each mouse spent on dark platform, open platform and middle of the maze was accurately recorded [11]. After the test, the maze was carefully cleaned with 10% ethanol solution.

C. Protocol of Study

Male Wistar rats were randomly divided into control animals, and rats that received gasoline vapor for 1 hour, for 2 hours and for 3 hours. Gasoline vapor receiving rats were placed in elevated plus maze after exposing to gasoline vapor. Control rats also were placed in the maze as same as other animals. The test was performed for 300 sec for each rat and was repeated twice at 5-day interval. High levels of anxiety was measured by increased length of time for the animal to emerge into the lighted portion of the apparatus.

All animal experiments were carried out in accordance with the guidelines of Institutional Animal Ethics Committee.

D. 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>Group</th>
<th>Time in open area (sec)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>44.90±5.29</td>
<td>-</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1 h)</td>
<td>38.50±5.56</td>
<td>NS</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2 h)</td>
<td>33.23±3.11</td>
<td>NS</td>
</tr>
<tr>
<td>Gasoline Vapor Receiving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3 h)</td>
<td>62.11±5.57</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

The data are indicated as mean ± SEM. P values are expressed in comparison with control group. N.S. represents non significant difference.

IV. DISCUSSION

Our findings indicate that there was no significant difference in mean time in open area that rats spent in groups receiving gasoline vapor for 1 or 2 hours compared with control rats. The mean time in open area that rats spent in the group receiving gasoline vapor for 3 hours was significantly higher compared with control rats (P<0.05).

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REFERENCES