

A Comparison between Gasoline and Diesel Oil Vapor Inhalation on Anxiety in Male Rats

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Abstract: Previous studies have shown that there is association between air pollution and disturbances on normal function of various systems of body. The main aim of this study was to determine a comparison between gasoline and diesel oil vapor inhalation on anxiety in male rats. In our study male Wistar rats were randomly divided into control, 1 h, 2h, and 3h gasoline or diesel oil 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. Our findings indicate that there are anxiety level increased in animals exposed to gasoline vapor ($P < 0.001$). We have shown that exposure to gasoline can bring about enhanced anxiety level.

Keywords: Gasoline Vapor, Diesel Oil Vapor, Anxiety, Rat.

1. Introduction

Diesel oil is a fuel obtained from petroleum distillation that is used in diesel engines. One of the major sources of atmospheric soot is fumes burning diesel that produce air pollution [1]. Exposure to gasoline and mortality from kidney cancer or leukemia. In addition, other causes of death of secondary interest included multiple myeloma and heart diseases [2]. Gasoline contains benzene, known leukemia [3], [4]. Gasoline vapor inhalation can enhance anxiety level [5]. Benzene affects the blood-forming system at low levels of occupational exposure, and there is no evidence of a threshold. There is probably no safe level of exposure to benzene, and all exposures constitute some risk in a linear, if not super linear and additive fashion [6]. Headache, fatigue, loss of memory, and dizziness were the common signs observed in subjects that have been exposed to gasoline vapor [7], [8]. Stress can alter brain serotonergic and dopaminergic activity and psychiatric disorders [9]. Ethylene glycol is another gasoline constituent which can produce central nervous system depression [10]. Stress and anxiety have been implicated as contributors to many chronic diseases and to decreased quality of life, even with pharmacologic treatment [11]. This study was designed to evaluate the effects of gasoline and diesel oil vapor Inhalation on anxiety in male rats.

2. Material and Method

Adult Wistar rats weighting 200 ± 30 g were purchased and Raised in our colony from an original stock of Pasteur institute(Tehran, Iran).The temperature was at 23 ± 20 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.

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.

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 were 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.

All values are presented as mean \pm 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.

3. Results

Table I shows the mean time in closed and dark environment that animals spent in different groups. Our findings indicated that there are significant differences in mean time in closed and dark environment that rats spent in groups receiving gasoline vapor for 1, 2 or 3 hours/day compared with control rats ($P < 0.001$). Table II shows anxiety levels in control and rats exposed to diesel oil vapor. Our findings indicated that there was no significant difference in mean time in closed and dark environment that rats spent in groups receiving diesel oil vapor for 1, 2 or 3 hours/day compared with control rats.

TABLE I. The Mean Time in Close D and Dark Area in Rats Exposed To Gasoline Vapor

Groups	Time in closed and dark area	P
Control	244.60 \pm 10.63	-
Gasoline Receiving (1 h)	287.60 \pm 1.75	<0.001
Gasoline Receiving (2 h)	292 \pm 224	<0.001
Receiving Gasoline (3 h)	296.20 \pm 3.32	<0.001

All data expressed as mean and standard error (mean \pm SEM). P value represents the difference between the control and experimental groups.

TABLE II. The Mean Time in Close D and Dark Area in Rats Exposed To Diesel Oil Vapor

Groups	Time in Closed and dark environment	P
Control	236.17±4.13	-
Diesel oil Vapor Receiving (1 h)	236.33±8.65	N.S
Diesel oil Vapor Receiving (2 h)	232.50±5.65	N.S
Diesel oil Vapor Receiving (3 h)	218.67±4.99	N.S

All data expressed as mean and standard error (mean ± SEM). P value represents the difference between the control and experimental groups. NS indicates non-significant difference.

4. Discussion

Our study indicated that gasoline vapor inhalation affects on anxiety levels. In line with our finding, other research findings also indicate that exposure to gasoline brings about various disorders [2]. Exposure to diesel oil vapor has also been associated with numerous health risks [11], [12]. Gasoline is an aliphatic hydrocarbon commercial product [13]. It has been reported that the inhalation of gasoline containing aliphatic hydrocarbons results in neurotoxicity, in turn, may have behavioral consequences [14]-[16]. Enhanced anxiety following exposure to gasoline vapor may come from physiological changes happening in nervous system.

5. Conclusion

We have shown that gasoline vapor inhalation enhances anxiety level.

6. Acknowledgment

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7. References

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