

Effects of Noise Stress on Liver Function

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Abstract- Increased noise pollution in surrounding environment is the most important risk factor for human health in the age of technology. The aim of this study was to investigate the effects of noise stress on liver function through assessment of serum level change in enzymes of SGPT and SGOT in male rats. In this laboratory-experimental study, the male Wistar rats were divided into control, exposed to noise stress for 1h, 3h, and 6h/day. After 8 weeks, blood samples were obtained using cardiac puncture method and after serum preparation, levels of enzymes of SGPT and SGOT were measured using spectrophotometry method, and the data were statistically analyzed using ANOVA. The results indicated that serum level of SGPT significantly decreased in all experimental groups compared with control animals ($P < 0.001$). Serum level of SGOT in all experimental groups did not change compared with the control group. The findings of this study show that the exposure to noise stress can influence liver function.

Index Terms- Noise stress, SGOT, SGPT, Rat

I. INTRODUCTION

NOISE is the most important source of environmental annoyance resulting in various psychological and physiological problems in human beings. According to the Environmental Expert Council of Germany, severe annoyance persistent over prolonged periods of time is to be regarded as causing distress [1]-[4]. The studies show that in contrary to high sound level, low sound level of environmental noise is not considered to be a potential danger to health [5],[6]. Noise pollution also is biological stressor leading to various negative health effects [7]. There are evidences showing that noise stress can influence cardiovascular and endocrine system [8].

Aspartate aminotransferase (AST or SGOT) and alanine aminotransferase (ALT or SGPT) are two of the several enzymes that are measured as part of the liver function tests so as to assess the functioning of the liver [9]. SGOT has both a cytoplasmic isoenzyme as well as a mitochondrial isoenzyme which mainly is found in liver cells[10].

The purpose of the present study was to determine effects of noise pollution on liver function in male rats.

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II. MATERIAL AND METHODS

A. Animals

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 ± 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. Care was taken to examine the animals for general pathological symptoms. Food was withheld for 12-14h before death. This study was performed according to ethical guidelines relating to working with laboratory animals.

B. Protocol of Study

Male Wistar rats were randomly divided into control animals, and rats exposed to noise pollution for 1h/day, 3h/day, and 6h/day. For induction of noise pollution, recorded traffic noise was used. After 8 weeks, the animals were killed and blood samples were obtained using cardiac puncture method. Serum SGOT and SGPT levels were measured using spectrophotometry method. All animal experiments were carried out in accordance with the guidelines of Institutional Animal Ethics Committee.

C. Statistical Analysis

Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using Fisher's least significant for the exact P values and significant differences are noted in the results. Differences with $P < 0.05$ were considered significant

III. RESULTS

Figures I and II show serum levels of SGOT and SGPT in male rats.

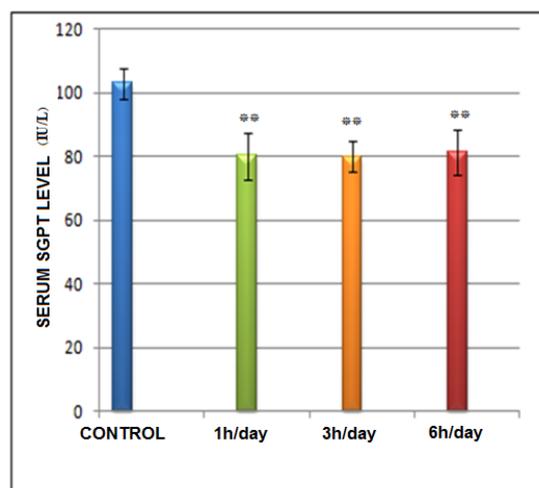


Fig 1 The serum SGPT level in control and rats exposed to noise stress for 1h/day, 3h/day, and 6h/day. ** indicates significant difference compared to control group.

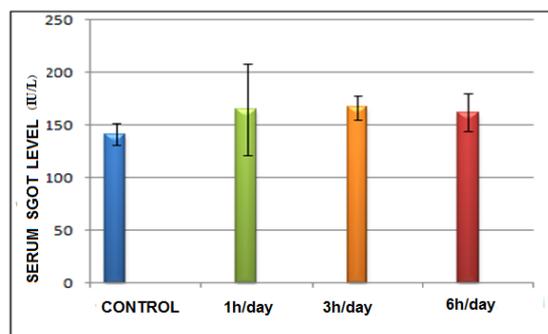


Fig 2 The serum SGOT level in control and rats exposed to noise pollution for 1h/day, 3h/day, and 6h/day.

Our results showed that serum SGPT levels decreased in rats exposed noise stress compared to control rats ($P < 0.05$). Serum SGOT levels did not change in rats exposed to noise stress for 1h/day, 3h/day and 6h/day compared to control animals.

IV. DISCUSSION

Our study indicated that noise stress results in reduced serum SGPT levels; however, serum SGOT levels did not significantly change. The natural environment is composed of various potentially hostile stressors. It is a basic requirement of life that the cells of an organism must be maintained within closely defined physiological limits [11],[12]. Physical stressors such as noise generate highly reactive oxygen species overwhelm the endogenous antioxidant defense of the body and damage cellular macro molecular structures [13], [14].

Serum SGPT and SGOT levels reflect the liver function such that increasing or decreasing of serum levels of SGPT and SGOT is occurred in liver disorders [15]. However, and in line with our findings, there are reports showing that some types of stressors do not influence serum levels of SGOT [16].

Since noise stress affects on oxidative balance in cells and free radical forming [17], it is suggested that in our study noise stress might influence liver cells functions by acting on oxidative balance resulting in decreased serum levels of SGPT.

V. CONCLUSION

We have shown that exposure to noise stress can bring about decreased serum SGPT levels showing damaging effects of noise stress on liver function.

ACKNOWLEDGMENT

We appreciate all who helped us to exert the present study.

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