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Short Communication

The Effects of Noise Exposure on Rat's Hematologic Parameters and Red Cell Indices

A.R. Sabahi, I. Moradi.

Abstract
Environmental pollution plays a destructive role in the daily life of industrialized communities and due to their negative impact on the society they are always under close investigation. Besides well-known pollutants substantial, all major international health organizations consider noise pollution as an important health problem.

In this study, we have used an animal model to study the effects of noise exposure on is hematological survey (CBC) and red cell indices. Forty male Winstar rats were randomized into two groups of test and control. Animals in the test group were exposed to a 20 dB unmodulated sinusoidal noise with a frequency of 1100 Hz for 120 days, while animals in the control group were kept in normal condition. By the end of the study, a blood sample was taken from each animal in both groups and a complete blood count was performed.

In animals in the test group as compared to those in the control; 1) there was significant ($p<0.001$) increase in the number of red blood cells, white blood cells, hemoglobin, and hematocrit; 2) there was significant ($p<0.001$) decrease in mean corpuscular volume (MCV), mean cell hemoglobin (MCH), and mean cell hemoglobin concentration (MCHC). It was then concluded that noise exposure affects blood cells.
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Keywords • Noise pollution • red cell • red cell indices • MCV • MCH • MCHC

Deptartment of Anatomical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

Correspondence: A.R. Sabahi, M.D.,
E-mail: abdolrezasabahi@hotmail.com

As a growing problem in industrialized communities, noise pollution has attracted a great deal of attention and development of standards and regulations related to noise exposure has been a major task for all international health organizations.

A number of retrospective studies demonstrated the stimulating effect of noise pollution on humoral and cellular components of the immune system.[1]

Most of the currently available data on noise pollution, however, are the results of retrospective studies. Therefore, we conducted this study to determine the effect of noise exposure on hematologic parameters and red cell indices in an animal model.

Forty newborn male Winstar rats were used for this study. The rats were kept under normal condition, with free access to food and water and away from noise pollution. When rats' weights reached 180 to 210 g, they were randomized into two equal groups of test and control. The rats in the test group were then exposed to a 20 dB

Table 1: Comparison between average of the determined blood parameters in the test and control groups.

	Group (Mean±SD)		
Parameter	**Test**	**Control**	**p-value**
RBC (10^{12}/l)	8.26±0.47	6.36±1.1	<0.001
WBC (10/l)	11.9±2.4	6.9±1.9	<0.01
Hemoglobin (g/dl)	15.0±0.9	13.0±2.1	<0.001
Hematocrit (%)	37.6±2.0	31.4±5.3	<0.001
MCV (fl)	47.0±1.5	51.3±3.0	<0.001
MCH (pg)	18.0±0.6	20.7±1.1	<0.001
MCHC (g/dl)	38.95±1.01	39.8±1.01	<0.001

unmodulated sinusoidal noise with a frequency of 1100 Hz for 20 minutes, three times a day. The duration of the test was 120 days, *i.e.*, a complete life span of a red blood cell (RBC). Meanwhile, the rats in the control group were kept away from noise pollution. By the end of the study, a blood sample was taken from all 40 rats and a complete blood count (CBC) was performed using an automated cell counter (Contraves–ABL 820, ABL. Co, Swiss).

The results are shown in Table 1. The RBC, and white blood cell (WBC) counts, as well as, hemoglobin and hematocrit showed a significant increase in the test group as compared to the control, while all measured RBC indices, i.e. mean corpuscular volume (MCV), mean cell hemoglobin (MCH), and mean cell hemoglobin concentration (MCHC) had a significant decrease.

Biokovi, in his study on petroleum refinery workers who were exposed to noise pollution, indicated that noise could increase the number of RBCs, hemoglobin and hematocrit.[2] This is in accord to our findings. Although, the mechanisms underlying these changes are not well understood, the increased number of WBCs observed in our study might be the result of noise-induced stimulation of the humoral and cellular components of the immune system.[1] Further studies are needed to shed light over the effect of noise on biological systems.

References

1 Sobrian SK, Vaughn VT, Ashe WK, et al: Gestational exposure to loud noise alters the development and postnatal responsiveness of humoral and cellular components of the immune system in offspring. *Environ Res 1997;***73:**227-41.

2 Boiko VI: Hygienic characteristics of working conditions and health status of workers engaged in the production of benzene and xylenes at a petroleum refinery. *Gig Tr Prof Zabol 1970;***14:** 23-5.

Erratum:

On page 24 of the previous issue (*IJMS 2002;***27(1)**), Fig. 1, should be replaced as shown below.