Effects of Noise Pollution on Sex Hormone Levels in Rats

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ABSTRACT

To investigate the effect of noise pollution on serum sex hormone levels in rats. Choose 40 Wistar rats were randomly divided into control group (normal), experimental group (further divided into 30, 60 and 80 dB three groups), each group 10 animals, stimulated for 30 min once a day, continually stimulated for consecutive 20 days. On the 21th day of experiment, the serum sex hormone levels were determined by enzyme-linked immunosorbent assay (ELISA). The results showed that the serum E2 and FSH levels were increased by 51.68%, 69.28%, 81.28% and 22.76%, 49.43%, 87.64%, respectively, LH and PRL levels were increased by 16.31%, 34.79%, 75.24% and 16.51%, 36.04%, 60.55% compared with the control group; the serum T level was decreased by 9.12%, 20.06%, 68.39%, respectively. The results showed the noise pollution can significantly affect the serum sex hormone levels in rats.

INTRODUCTION

Noise is a source of original environmental pressure and is one of the most widespread sources of environmental pollution. Ministry of environmental protection announced the national regional city day average acoustic environmental quality of 54.1 dB (A), road traffic noise day average of 67.0 dB (A), the traffic trunk line on both sides of the area of noise pollution is still severe at night. The

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World Health Organization reports that more than one billion teenagers and young people are exposed to noise caused by noise every year[1]. Follicle stimulating hormone (FSH), luteinizing hormone (LH), prolactin (PRL), estrogen (E2), and testosterone (T) are the main sex hormones in the body and animals. Under normal physiological conditions, the hypothalamus gonadotropin releasing hormone (GnRH), stimulate the secretion of pituitary generated follicle stimulating hormone (FSH) and luteinizing hormone (LH), promote the sex gland, adrenal gland to secrete testosterone and estrogen. Therefore, the determination of hormone levels such as blood follicle stimulating hormone (FSH) and luteinizing hormone (LH) is of great value in determining the etiology and lesion location of sex hormone disorders. In order to explore the effect of noise pollution on human health of auditory, refer to the law of the People's Republic of China on the prevention and control of environmental noise pollution of urban regional environmental noise standard[2], choose strength for 30, 60, 80 dB, the frequency of 350 Hz noise stimulate Wistar rats, detection analysis of noise pollution on Wistar rats with hemorrhagic hormone levels, the effects of noise pollution for prevention and control and provides some references for the clinical treatment of infertility infertility.

MATERIALS AND METHODS

Experimental Materials

EXPERIMENTAL ANIMALS

SPF level Wistar rats, 180~190 g, 6 weeks old, male and female. From the scientific research laboratory center of gansu university of traditional Chinese medicine [SCXK (gan) 2015-0001], the experiment was conducted in the SPF level laboratory of gansu university of political science and law [SYXK (gan) 2015-0006]. All the operations of this experiment are in accordance with the regulations of the People's Republic of China on the administration of experimental animals, and the humane care for experimental animals is given in accordance with the 3R principle (the approval number of the ethics committee: gzf-2017-006).

REAGENTS AND INSTRUMENTS

Estrogen(E2), follicle stimulating hormone (FSH), luteinizing hormone (LH), prolactin (PRL), testosterone (T) detection kits, bought in Shanghai biological technology development co., LTD; UFX 7103 AAW audio signal generator, Shanghai electronic teaching instrument factory; TES-1352S low frequency sound meter, taishi electronic industry co., LTD; MK3- enzyme marker, Shanghai instrument co., LTD; Noise stimulus box (self-made[3]).
Intensity of the Experimental Method

The Wistar rats were divided into 4 groups with 10 animals in each group. Control group: normal feeding, no noise stimulation; Experimental group (30, 60, 80 dB). The animals in the experimental group were given corresponding noise stimulation at 15:30-18:30, each time for 30 min, and once a day, a total of 20 d. On 21th day of the experiment, with ether anesthesia and painless surgery, the blood was extracted from the heart, blood centrifuge 2000 r/min for 15 min, and the absorbance (A) was determined by E2, FSH, LH, PRL and T kit. On E2, FSH, LH, PRL, T standard liquid concentration as the abscissa, absorbance (A) as the ordinate do standard curve and the standard curve of the linear regression equation is: E2 standard curve of the linear regression equation is: Y=1.0×10-3x+1.37×10-2, R2 = 0.9973; FSH standard curve of the linear regression equation is: Y =1.4×10-3x+3.9×10-3, R2 = 0.9904; LH standard curve of the linear regression equation is: Y=1.27×10-2x+9.1×10-3, R2=0.9953; PRL standard curve of the linear regression equation is: Y=1.5×10-3 x+5.27×10-2, R2 =0.9949. The blood absorbance value of each group was substituted into the linear regression equation, and E2, FSH, LH, PRL and T levels were calculated.

Statistical Analysis

The experimental data were statistically processed with SPSS 17.0 software. Differences between groups using single factor analysis of variance, using the mean plus or minus standard deviation (±s), noise pollution of rat blood level of E2, FSH, LH, PRL, T the influence degree of the expressed as a percentage, with P<0.05 for the difference was statistically significant.

EXPERIMENTAL RESULTS

Wistar rats Were given 30, 60, 80 dB noise testing and stimulate 20 d, estrogen (E2) levels in the blood of rats than in the control group increased by 51.68%, 51.68% and 69.28%, respectively, have significant difference (P<0.01); The follicle stimulating hormone (FSH) increased by 22.76%, 49.43% and 87.64% respectively, and the difference was significant (P<0.01). Luteinizing hormone (LH) level increased 16.31%, 34.79% and 75.24% respectively, and prolactin (PRL) level increased 16.51%, 36.04% and 60.55%, respectively, testosterone (T) level than the control group was reduced by 9.12%, 20.06% and 9.12% respectively. (figure 1).

DISCUSSION

Noise is a kind of natural pollutant, which has harmful effects on human physiology and psycho -logy. The results show that the noise pollution is not only
directly damage the auditory organs[4], and stimulate the signal through the auditory system cause the hypothalamus-pituitary-adrenal axis excited[5], the adrenal glands secrete hormones in the body increases [6], heart rate increases, blood pressure rises, leading to cardiovascular damage [7], memory loss, attention deficit disorder, and other mental syndrome[8]. At the same time, noise pollution can also cause the inhibition of hypothalamic-pituitary-gonad axis, which can decrease male gonadal function[9], women estrogen abnormal secretion[10]. Noise pollution makes experimental rat testis and epididymis, seminal vesicle gland weight were significantly lower, and the number of sperm movement ability markedly reduced[11], the main reason is because of the noise pollution promoted the process of cell apoptosis, inhibit the occurrence of the sperm dynamics[12], make sperm and agglutination of sperm death increases[13], the male hormones (testosterone) level significantly lower[9]. When increased serum level of follicle-stimulating hormone (FSH), can cause amenorrhea, decreased sexual function; Luteinizing hormone (LH) is on the high side, and ovarian dysfunction causes the imbalance of estrogen level to affect the development of follicles, which can lead to ovulatory disorders affecting pregnancy. In this paper, the results of the study showed that giving different intensity noise stimulation in rats, the rat blood estrogen (E2), follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin (PRL) levels were higher than the control group, testosterone (T) was lower than the control group. These hormones levels change, it plays an important role in the pathogenesis of infertility[14]. The experimental results show that the national regional city day sound environment quality level security is far more than human tolerance limit.

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CONCLUSIONS

This study is the first to provide the first literature on the effects of noise pollution on blood hormone levels. As an environmental pollution source, noise stimulation can cause hypothalamic-pituitary-gonadal axis suppression, which causes abnormal secretion of sex hormones and hypogonadism in men. The experimental results show that the quality of acoustic environment in urban diurnal region is far higher than that of human body.

REFERENCES