



> Noise Health. Mar-Apr 2017;19(87):79-83. doi: 10.4103/nah.NAH_39_16.

The Effects of Low-Frequency Noise on Rats: Evidence of Chromosomal Aberrations in the Bone Marrow Cells and the Release of Low-Molecular-Weight DNA in the Blood Plasma

Irina N Vasilyeva ¹, Vladimir G Bespalov ¹, Alexander L Semenov ¹, Denis A Baranenko ², Valery N Zinkin ³

Affiliations + expand

PMID: 29192617 PMCID: PMC5437756 DOI: 10.4103/nah.NAH_39_16

Free PMC article

Abstract

Objectives: Evaluation of the effect of low-frequency noise (LFN) on the frequency of chromosomal aberrations in the bone marrow cells and on the content of low-molecular-weight DNA (lmwDNA) in the blood plasma of rats.

Materials and methods: A total of 96 male Wistar rats were exposed to either single (17 min session) or multiple (17 min session repeated five times a week for 13 weeks) LFN, with the maximum range below 250 Hz and the sound pressure levels (SPLs) at 120 and 150 dB, respectively. The rats in the control groups were not subjected to any impact. The frequency of chromosomal aberrations in the bone marrow cells and the levels of lmwDNA in the blood plasma were measured afterwards.

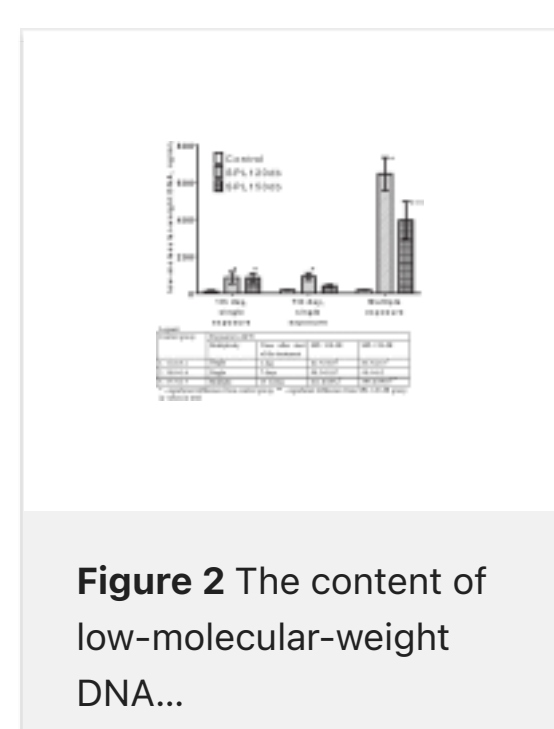
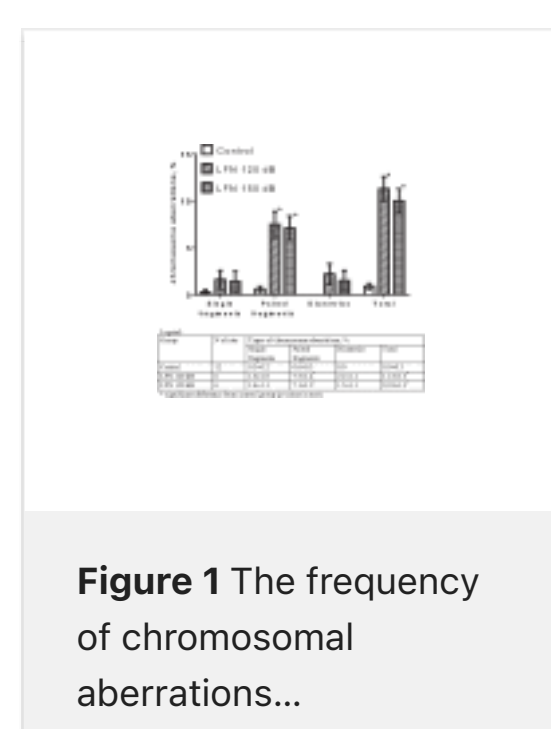
Results: It has been detected that a single LFN exposure with either corresponding SPLs had a significant increase in the frequency of chromosomal aberrations (more than 10-fold) compared to the controls (0.9 ± 0.3%) and resulted in the appearance of dicentric chromosomes in the aberration spectrum, both of which are evident for the occurrence of deoxyribonucleic acid double strand breaks triggered by the exposure. Furthermore, the lmwDNA levels in the blood plasma measured the following day after a single LFN exposure were significantly higher (7.7- and 7.6-fold, respectively) than that in the control group (11.0 ± 5.4 ng/ml), and such levels were maintained higher (4.8- and 2.1-fold, respectively) in the week after a single LFN exposure for the SPL of 120 and 150 dB, respectively, compared to the control group (18.8 ± 1.6 ng/ml). Similar results were obtained from the group with multiple LFN exposures (36.4- and 22.4-fold, respectively) compared to the control (17.7 ± 1.7 ng/ml) and suggest the enhancement of cellular apoptosis as a result of the LFN impact.

Conclusion: Presumably, the LFN may have possible mutagenic effects and cause massive cell death.

Conflict of interest statement

There are no conflicts of interest.

Figures



Similar articles

[\[Low-frequency noise as a hazard increasing occurrence of chromosomal aberrations and promoting cell death.\]](#).

Vasil'eva IN, Bespalov VG, Zhikin VN. Med Tr Prom Ekol. 2017;(3):22-26. PMID: 30351790 Russian.

[Comparative Analysis of Harmful Physical Factors Effect on the Cell Genome.](#)

Vasilyeva IN, Zinkin VN, Bespalov VG. Adv Exp Med Biol. 2016;924:79-84. doi: 10.1007/978-3-319-42044-8_15. PMID: 27753023

[Noise-induced duodenal lesions: a light and electron microscopy study of the lesions of the rat duodenal mucosa exposed to low frequency noise.](#)

Fonseca J, Martins dos Santos J, Oliveira P, Laranjeira N, Castelo Branco NA. Clin Res Hepatol Gastroenterol. 2012 Feb;36(1):72-7. doi: 10.1016/j.clinre.2011.10.002. Epub 2011 Nov 21. PMID: 22104641

[Low-frequency noise effects on the parotid gland of the Wistar rat.](#)

Oliveira PM, Pereira da Mata AD, Martins dos Santos JA, da Silva Marques DN, Branco NC, Silveira JM, Correia da Fonseca JC. Oral Dis. 2007 Sep;13(5):468-73. doi: 10.1111/j.1601-0825.2006.01322.x. PMID: 17714349

[Respiratory pathology in vibroacoustic disease: 25 years of research.](#)

Branco NA, Ferreira JR, Alves-Pereira M. Rev Port Pneumol. 2007 Jan-Feb;13(1):129-35. doi: 10.1016/s2173-5115(07)70326-3. PMID: 17315094 Review.

[See all similar articles](#)

Cited by 2 articles

[The Immune System Can Hear Noise.](#)

Zhang A, Zou T, Guo D, Wang Q, Shen Y, Hu H, Ye B, Xiang M. Front Immunol. 2021 Feb 18;11:619189. doi: 10.3389/fimmu.2020.619189. eCollection 2020. PMID: 33679706 Free PMC article. Review.

[Cell-Free DNA Plasma Levels Differ in Age-Specific Pattern in Healthy Rats and Castrates with Testosterone-Induced Benign Prostatic Hyperplasia.](#)

Vasilyeva IN, Bespalov VG, Von JD, Semenov AL, Tochilnikov GV, Romanov VA, Alvosky IK, Baranenko DA. Int J Genomics. 2019 Jun 2;2019:8173630. doi: 10.1155/2019/8173630. eCollection 2019. PMID: 31281830 Free PMC article.

References

- Leventhall HG. Low frequency noise and annoyance. Noise Health. 2004;6:59-72. - [PubMed](#)
- Persson Way K. Effects of low frequency noise on sleep. Noise Health. 2004;6:87-91. - [PubMed](#)
- Schmidt JH, Klokker M. Health effects related to wind turbine noise exposure: A systematic review. PLoS One. 2014;9:e114183. - [PMC](#) - [PubMed](#)
- Schust M. Effects of low frequency noise up to 100 Hz. Noise Health. 2004;6:73-85. - [PubMed](#)
- Harrison RV. On the biological plausibility of wind turbine syndrome. Int J Environ Health Res. 2015;25:463-8. - [PubMed](#)

Show all 17 references

MeSH terms

- > Animals
- > Bone Marrow Cells / pathology*
- > Chromosome Aberrations*
- > DNA / blood*
- > Male
- > Molecular Weight
- > Noise / adverse effects*
- > Rats
- > Rats, Wistar

Substances

- > DNA

Related information

MedGen
PubChem Compound (MeSH Keyword)

LinkOut - more resources

Full Text Sources
[Europe PubMed Central](#)
[PubMed Central](#)

Medical
[MedlinePlus Health Information](#)

Miscellaneous
[NCI CPTAC Assay Portal](#)

FULL TEXT LINKS



ACTIONS

Cite

Favorites

SHARE



PAGE NAVIGATION

< Title & authors

Abstract

Conflict of interest statement

Figures

Similar articles

Cited by

References

MeSH terms

Substances

Related information

LinkOut - more resources

