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Effects and mechanisms of 2.5T terahertz radiation exposure on testis injury in mice

[HTML] (19) PDF (89)

MA Qinlong,LIN Min,GAO Peng,YANG Lingling,LU Yonghui,ZHANG Yanwen,YU Zhengping,CHEN Chunhai.Effects and mechanisms of 2.5T terahertz radiation exposure on testis injury in mice[J].J Amry Med Univ (J Third Mil Med Univ),2024,46(19):2197-2207.DOI:10.16016/j.2097-0927.202311151

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《J Amry Med Univ (J Third Mil Med Univ)》 [ISSN: 1000-5404/CN: 51-1095/R] **Volume:** 46 **Issue:** 19 **Page:** 2197-2207 **Publish Date:** 2024-10-15

Title:

Effects and mechanisms of 2.5T terahertz radiation exposure on testis injury in mice

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Keywords:

terahertz ; testis ; inflammatory response ; sperm function ; RNA-seq

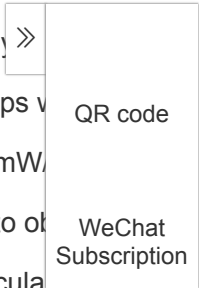
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DOI:

10.16016/j.2097-0927.202311151

Abstract:

ObjectiveTo investigate the effects of terahertz (THz) radiation on mouse testicular tissue and its potential molecular mechanisms. MethodsA total of 125 male C57BL/6J mice (6~8 weeks old) were randomly divided into control group and low-, medium- and high-radiation power groups. The mice of the latter 3 groups were exposed to THz radiation at a frequency of 2.5 T, with an average power density of 38, 115, or 318 mW/cm² for 5 or 10 min. The detection time was immediately or 24 h after exposure. HE staining was used to observe pathological damage. ELISA was employed to detect the expression of inflammatory factors in testicular tissue. RNA-seq was utilized to detect the global changes of gene expression. The differentially expressed genes (DEGs) were screened and bioinformatics was used to cluster them. The screened genes were further



analyzed with RT-qPCR to determine the time-dependent and dose-dependent relationships of the expression with THz exposure. Finally, sperm quality was evaluated morphologically using a microscope. ResultsThree doses of THz radiation exposure did not cause significant pathological damages to mouse testicular tissue. TNF- α expression was increased immediately after exposure at average power density of 115 mW/cm² (P<0.01), and the expression of IL-1 β and TNF- α were both increased when the dose reached 318 mW/cm² (P<0.01). However, all the 3 factors returned to normal levels in 24 h after exposure. RNA-seq results showed that THz radiation exposure caused abnormal expression of 56 genes. Cluster analysis indicated that these DEGs were mainly enriched in immune and inflammatory responses, enzyme activity, sperm development and capacitation functions. Then for 5 selected key genes, Crisp1, Adam7, Ltf, Rnase9, and Bsph1, the expression of Crisp1 and Rnase9 was decreased immediately after exposure to 115 mW/cm² THz radiation, the dose of 318 mW/cm² resulted in obvious changes in the expression of the 5 genes (P<0.05), and their expression returned to normal levels in 24 h after exposure. Morphological observation displayed that exposure to all the 3 doses of THz had no influence on sperm quality. ConclusionTHz radiation exposure causes temporary inflammatory response in testicular tissue and abnormal expression of sperm functions-related genes. However, these changes return to normal 24 h after exposure, and additionally, do not impair sperm quality.

References:

Memo:

Journal Information

Editor-in-chief: BIAN Xiuwu
Managing Director: NI Bing
ISSN: 2097-0927(used: 1000-5404)
CN: 50-1223/R (used: 50-1126/R)
Postal Distributing Code: 78-91

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