Memory and Learning Disorders, Alters Expression of Pro-inflammatory Cytokines and Hippocampal NMDA Receptor Subunits, following Exposure to Diesel Exhaust Nano-Particles in Male Mice

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Abstract

It has been shown that sub-chronic exposure to nanoscale (<100 nm) diesel exhaust particles (DEPs) containing air pollution may lead to oxidative stress and neuroinflammation in adult male mice. In the current study, we investigated the effects of DEPs on hippocampus-dependent spatial learning and neuroinflammation and memory-related gene expression in male mice. In this study, we divided 48 adult male mice into one control group and three exposure groups. Animals were exposed to 350-400µg/m^3 DEPs for 3, 6 and 8 hours daily for 12 weeks. The elevated plus maze and Morris water maze device were used to examine anxiety and spatial learning, respectively. The mRNAs expression levels of pro-inflammatory cytokines, N-methyl-D-aspartate (NMDA) receptor subunits and glutaminase were studied in the hippocampus (HI) by real-time RT-PCR. In addition, malondialdehyde (MDA) tests were used to determine the state of oxidative stress. After 6 and 8 h of exposure to DEPs, the mRNA expression of NR2A and NR3B in IL1α, IL1β, TNFα, NMDA receptor subunits and MDA levels increased significantly ($P < 0.05$). Also, the exposed mice to DEPs for 3, 6, and 8 h showed a decreased entering to the open arms and spent less time there. As well as, 6 and 8h/day exposed mice required a longer time to reach the hidden platform. Sub-chronic exposure to DEPs affects oxidative stress, neuroinflammation and anxiety, and spatial learning and memory.

Keywords: *Nanotoxicology; Diesel exhaust particles; Learning and memory; Neuroinflammation; Hippocampus; NMDA receptor.*

Professional Biography

Dr. Mojtaba Ehsanifar has completed his PhD from Iran University of medical Sciences and now he continues his research on Air pollution and Health effects Such as effect of the Nano particular matter, PM, using in-vivo models (mouse) and health effects and focused on the molecular mechanisms involved in neurodegenerative diseases, lung diseases, and reproductive system in Kashan University of Medical Sciences. He has published more than 35 papers in reputed journals and presented in congresses. Also he has Cooperation as reviewer with reputed journals.



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