Jung-Hee Jang, J Psychiatry 2018, Volume: 21
DOI: 10.4172/2378-5756-C5-048

Attenuation of learning and memory impairments in aged mice model of Alzheimer's disease by mild stress

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Stress is regarded as one of the critical risk factors for neurodegenerative disorders leading to learning and memory deficits. However, recently a possibility of mild level of stress to enhance cognitive functions has been reported by several researchers, whereas its underlying molecular mechanisms are not clearly verified. In this study, we have investigated the effect of mild restraint stress (MRS) for 28 days (3 hours/day) against the learning and memory impairments in aged C57BL/6 mice by conducting diverse behavior tests and molecular analyses. MRS improved mean escape latency, the time taken to find the platform during training trials in Morris water-maze test. In addition, the neuropathological markers for Alzheimer's disease (AD) such as accumulation of β-amyloid peptide and hyperphosphorylation of Tau protein were mitigated by MRS. MRS effectively decreased ratio of pro-apoptotic BAX to anti-apoptotic Bcl-2, the representative proteins determining apoptotic cell death. To further elucidate the neuroprotective mechanism of MRS, we have examined the molecules involved in the oxidative stress and inflammation. MRS attenuated the lipid peroxidation and protein oxidation through up-regulation of antioxidant enzymes via activating NF-E2-related factor two and ameliorated the pro-inflammatory responses by inhibiting the expression of cytokines in aged mice. Taken together, these findings suggest that MRS may exhibit beneficial effects for the improvement of learning and memory functions during neurodegenerative process by suppressing neuropathological markers of AD and oxidative stress as well as inflammatory responses.

Biography

Jung-Hee Jang has completed her BS in 1998, MS in 2000 and PhD in 2005 from College of Pharmacy, Seoul National University, Korea. She served as Postdoc in College of Pharmacy, Seoul National University, Korea from 2005 to 2006 and worked as Full-time Lecturer/Assistant Prof. in College of Oriental Medicine, Daegu Haany University from 2006 to 2011. She was an Exchange Scholar in Taub Institute for Research on Alzheimer's disease and the Aging Brain, Columbia University Medical Center, USA (2007/2008) and Exchange Scholar in School of Medicine, Nagasaki University, Japan (2009). From 2011 to present, she is working as Assistant Prof./Associate Prof. at School of Medicine, Keimyung University, Korea.

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