Protective effect of Centella asiatica against D-galactose and aluminium chloride induced rats: behavioral and ultrastructural approaches

ABSTRACT

Background: Alzheimer's disease (AD) is a neurodegenerative disorder and the commonest cause of dementia among the aged people. D-galactose (D-gal) is a senescence agent, while aluminium is a known neurotoxin linked to pathogenesis of AD. The combined administration of rats with d-gal and aluminium chloride (AlCl3) is considered to be an easy and a cheap method to obtain an animal model of AD. The plant Centella asiatica (CA) is reported to exert neuroprotective effects both in vitro and in vivo. Therefore, this study explored the protective effects of CA on cognition and brain ultrastructure in d-gal and AlCl3 induced rats. Materials and methods: Rats were exposed to d-gal 60 mg/kg/b.wt/day + AlCl3 200 mg/kg/b.wt/day and CA (200, 400 and 800 mg/kg/b.wt/day) and 1 mg/kg/b.wt/day of donepezil for 70 days. Different cognitive paradigms viz. T maze spontaneous alternation, modified elevated plus maze and novel object recognition test, were used to evaluate full lesions of the hippocampus, spatial learning and memory and non-spatial learning and memory respectively. Nissl's staining was used to determine the survival of hippocampus CA1 pyramidal cells, while transmission electron microscopy was used to check the ultrastructural changes. Results: The results revealed that d-gal and AlCl3 could significantly impair behavior and cognitive functions, besides causing damage to the hippocampal CA1 pyramidal neurons in rats. In addition, it also caused ultrastructural morphological alterations in rat hippocampus. Conversely, co-administration o;f CA, irrespective of the dosage used, alleviated the cognitive impairments and pathological changes in the rats comparable to donepezil. Conclusion: In conclusion the results suggest that CA could protect cognitive impairments and morphological alterations caused by d-gal and AlCl3 toxicity in rats. Biochemical and molecular studies are ongoing to elucidate the probable pharmacodynamics of CA.

Keyword: Centella asiatica; Cognitive impairment; Alzheimer's disease; Morphological alterations and Hippocampus