

## Centella asiatica protects d-Galactose/AlCl<sub>3</sub> mediated alzheimers disease-like rats via PP2A/GSK-3 $\beta$ signaling pathway in their hippocampus

### ABSTRACT

Alzheimer's disease (AD) is a progressive neurodegenerative disorder more prevalent among the elderly population. AD is characterised clinically by a progressive decline in cognitive functions and pathologically by the presence of neurofibrillary tangles (NFTs), deposition of beta-amyloid (A $\beta$ ) plaque and synaptic dysfunction in the brain. Centella asiatica (CA) is a valuable herb being used widely in African, Ayurvedic, and Chinese traditional medicine to reverse cognitive impairment and to enhance cognitive functions. This study aimed to evaluate the effectiveness of CA in preventing d-galactose/aluminium chloride (d-gal/AlCl<sub>3</sub>) induced AD-like pathologies and the underlying mechanisms of action were further investigated for the first time. Results showed that co-administration of CA to d-gal/AlCl<sub>3</sub> induced AD-like rat models significantly increased the levels of protein phosphatase 2 (PP2A) and decreased the levels of glycogen synthase kinase-3 beta (GSK-3 $\beta$ ). It was further observed that, CA increased the expression of mRNA of Bcl-2, while there was minimal effect on the expression of caspase 3 mRNA. The results also showed that, CA prevented morphological aberrations in the cornu ammonis 3 (CA 3) sub-region of the rat's hippocampus. The results clearly demonstrated for the first time that CA could alleviate d-gal/AlCl<sub>3</sub> induced AD-like pathologies in rats via inhibition of hyperphosphorylated tau (P-tau) bio-synthetic proteins, anti-apoptosis and maintenance of cytoarchitecture.

**Keyword:** Alzheimer's disease; Centella asiatica; Hippocampus; Protein phosphatase 2; Glycogen synthase kinase 3; B-cell lymphoma 2