Effects of Clinacanthus nutans leaf extract on lipopolysaccharide induced neuroinflammation in rats: a behavioral and 1 H NMR-based metabolomics study

ABSTRACT

Objective: This research revealed the biochemical outcomes of metabolic dysregulation in serum associated with physiological sickness behavior following lipopolysaccharide (LPS)-induced neuroinflammation in rats, and treatment with Clinacanthus nutans (CN). Verification of 1H NMR analysis of the CN aqueous extract proved the existence of bioactive phytochemical constituents' in extract.

Materials and methods: Twenty-five rats were subjected to unilateral stereotaxic injection of 10 µL LPS (1 mg/mL), while another ten rats were injected with phosphate-buffered saline (PBS, 10 µL) as control. Then, 29 parameters of rat behavior related to sickness were tracked by a device software (SMART 3.0.1) on days 0 and 14 of CN treatment. The acquired and accumulated data were analyzed using multivariate data analysis with the SIMCA Software package (version 13, Umetrics AB; Umeå, Sweden). The pattern trends of related groups were documented using PCA and OPLS analysis.

Results: A similar ameliorated correlation pattern was detected between improvement in physiological sickness behavior and anti-inflammatory biomarkers by the 1H NMR spectra of the sera following treatment with CN (500 and 1000 mg/kg body weight (bw)) and the control drug (dextromethorphan hydrobromide, 5 mg/kg of rats bw) in rats. Here, 21 biomarkers were detected for neuroinflammation. Treatment with the aqueous CN extract resulted in a statistically significant alteration in neuroinflammation metabolite biomarkers, including ethanol, choline, and acetate.

Conclusion: This result denotes that the metabolomics approach is a reliable tool to disclose the relationship between central neuroinflammation, and systemic metabolic and physiological disturbances which could be used for future ethno-pharmacological assessments.

Keyword: Behavior; Clinacanthus nutans; LPS-induced rats; Metabolomics; Neuroinflammation; Response biomarkers