

## Metabolic alteration in obese diabetes rats upon treatment with *Centella asiatica* extract

### ABSTRACT

Ethnopharmacological relevance: Pegagaø is a traditional Malay remedy for a wide range of complaints. Among the pegagaø *Centella asiatica* has been used as a remedy for diabetes mellitus. Thus, we decided to validate this claim by evaluating the in vivo antidiabetic property of *C. asiatica* (CA) on T2DM rat model using the holistic <sup>1</sup>H NMR-based metabolomics approach. Method: In this study, an obese diabetic (mimic of T2DM condition) animal model was developed using Sprague-Dawley rats fed with a high-fat diet and induced into diabetic condition by the treatment of a low dose of streptozotocin (STZ). The effect of *C. asiatica* extract on the experimental animals was followed based on the changes observed in the urinary and serum metabolites, measured by <sup>1</sup>H NMR of urine and blood samples collected over the test period. Results: A long-term treatment of obese diabetic rats with CA extract could reverse the glucose and lipid levels, as well as the tricarboxylic acid cycle and amino acid metabolic disorders, back towards normal states. Biochemical analysis also showed an increase of insulin production in diabetic rats upon treatment of CA extract. Conclusion: This study has provided evidence that clearly supported the traditional use of CA as a remedy for diabetes. NMR-based metabolomics was successfully applied to show that CA produced both anti-hyperglycemic and anti-hyperlipidemic effects on a rat model. In addition to increasing the insulin secretion, the CA extract also ameliorates the metabolic pathways affected in the induced diabetic rats. This study further revealed the potential usage of CA extract in managing diabetes mellitus and the results of this work may contribute towards the further understanding of the underlying molecular mechanism of this herbal remedy.

**Keyword:** *Centella asiatica*; NMR-based metabolomics; Obese-diabetic rats; Urine metabolites; Serum metabolites