Stingless bee honey improves spatial memory in mice, probably associated with brain-derived neurotrophic factor (BDNF) and inositol 1,4,5-triphosphate receptor type 1 (Itpr1) genes

ABSTRACT

This study was conducted to evaluate the effects of stingless bee honey (SBH) supplementation on memory and learning in mice. Despite many studies that show the benefits of honey on memory, reports on the nootropic effects of SBH are still lacking, and their underlying mechanism is still unclear. SBH is a honey produced by the bees in the tribe of Meliponini that exist in tropical countries. It features unique storage of honey collected in cerumen pots made of propolis. This SBH may offer a better prospect for therapeutic performance as the previous report identifies the presence of antioxidants that were greater than other honey produced by Apis sp. In this study, SBH was tested on Swiss albino mice following acute (7 days) and semichronic (35 days) supplementation. Experiments were then conducted using Morris water maze (MWM) behaviour analysis, RT-PCR for gene expression of mice striatum, and NMR for metabolomics analysis of the honey. Results indicate spatial working memory and spatial reference memory of mice were significantly improved in the honey-treated group compared with the control group. Improved memory consolidations were also observed in prolonged supplementation. Gene expression analyses of acutely treated mice demonstrated significant upregulation of BDNF and Itpr1 genes that involve in synaptic function. NMR analysis also identified phenylalanine, an essential precursor for tyrosine that plays a role at the BDNF receptor. In conclusion, SBH supplementation for seven days at 2000 mg/kg, which is equivalent to a human dose of 162 mg/kg, showed strong capabilities to improve spatial working memory. And prolonged intake up to 35 days increased spatial reference memory in the mice model. The phenylalanine in SBH may have triggered the upregulation of BDNF genes in honey-treated mice and improved their spatial memory performance.