Ameliorative and synergistic effects of Ergothioneine and Hispidin on memory dysfunction in diabetic mice

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ABSTRACT

Background. Patients with long-standing diabetes commonly develop diabetic encephalopathy (DE), which is characterized by cognitive impairment and dementia. Ergothioneine (EGT) and hispidin (HIP) are two active components of many mushrooms especially Phellinus igniarius. EGT reduces the cognitive ability of aged mice and the formation of β-amyloid peptide. HIP has been shown to inhibit protein glycosylation and to scavenge oxygen radicals, and its mechanistic actions are related to inhibition of aldose reductase, leading to reduced formation of advanced glycation end products (AGEs). Methylglyoxal (MGO) is a toxic precursor of advanced glycated end-products (AGEs) and responsible for protein glycation.

Objectives. We investigated whether EGT and HIP could protect against MGO (500 mg/kg bw)-induced neuronal cell damage in male Wistar rats.

Methods. Rats treated with methylglyoxal (MGO;500 mg/kg bw) were used to examine the effects of EGT, HIP, or their combination (EGT+HIP) on learning and memory abilities. The rats were divided into five groups and injected subcutaneously with MGO except for group 1 (normal controls). Group 3 was orally supplemented with EGT [2 mg/kg bw], group 4 with HIP (2 mg/kg bw, p.o.), and group 5 with EGT+HIP. EGT and HIP were provided daily for 88 days, while MGO was provided between days 7 to 56 to induce brain neuron cells damage in rats.

Results. The oral pretreatment with EGT and HIP significantly protect against learning and memory deficits in rats treated with MGO. EGT and HIP significantly lowered the serum insulin, AGE, triglycerol, glucose and GOT level, and these protective effects were related with EGT and HIP prompting the GST and SOD activity and decreasing MDA and AGEs formation in brain and liver. In addition, EGT content of EGT-treated group was significantly higher than that of the other groups in the serum, brain and liver of rats. However, there is no synergistic effect by combination of EGT and HIP.

Keywords: Diabetic encephalopathy (DE), ergothioneine, hispidin

REFERENCES