The Edible Seaweed Gelidium amansii Promotes Structural Plasticity of Hippocampal Neurons and Improves Scopolamine-induced Learning and Memory Impairment in Mice

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First Author	
Last Author	
Authors	Mohibbullah, M; Wicaksono, MYP; Hannan, MA; Dash, R; Meinita, MDN; Choi, JS; Hong, YK; Moon, I;
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Abstract	Background Gelidium amansii has been gaining profound interest in East Asian countries due to its enormous commercial value for agar production and its extensive pharmacological properties. Previous studies have shown that the ethanol extract of Gelidium amansii (GAE) has promising neurotrophic effects in in vitro conditions. Objectives The present study aimed to investigate the protective effects of GAE against scopolamine-induced cognitive deficits and its modulatory effects on hippocampal plasticity in mice. Methods For memory-related behavioral studies, the passive avoidance test and radial arm maze paradigm were conducted. The brain slices of the hippocampus CA1 neurons of experimental mice were then prepared to perform Golgi staining for analyzing spine density and its characteristic shape and immunohistochemistry for assessing the expression of different pre- and postsynaptic proteins. Results Following oral administration of GAE (0.5 mg/g body weight), mice with memory deficits exhibited a significant increase in the latency time on the passive avoidance test and a decrease in the number of working and reference memory errors and latency time on the radial arm maze test. Microscopic observations of Golgi-impregnated tissue sections and immunohistochemistry of hippocampal slices showed that neurons from GAE-treated mice displayed higher spine density and spine dynamics, increased synaptic contact, and the recruitment of memory-associated proteins, such as N-methyl-D-aspartate receptors (NR2A and NR2B) and postsynaptic density-95 (PSD-95) when compared with the control group. Conclusion With these memory-protective functions and a modulatory role in underlying memory-related events, GAE could be a potential functional food and a promising source of pharmacological agents for the prevention and treatment of memory-related brain disorders.
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Author	Dr MARIA DYAH NUR MEINITA, S.Pi