

Marine Algae for Brain Health

Il Soo Moon

Department of Anatomy, Dongguk University Graduate School of Medicine, Gyeongju 38066,
Republic of Korea

*e-mail: moonis@dongguk.ac.kr

With ever increasing life expectancy, brain health is of growing concern because all mental processes, even the most complex psychological processes, derive from operations of the brain. One main cause for neurodegeneration in both normal brain ageing and pathological disorders is the reduced level of neurotrophic factors, which are critical for neuronal differentiation, growth, development, function, plasticity and survival. Therefore, one preventative and therapeutic strategy is to increase the availability of the neurotrophic factors or their inducers in the brain. So far, search for neuroactive substances has been mainly focused on land resources. However, there is a vast resource in the marine environment, many of them yet to be explored. Marine algae are potential sources for such substances. Marine macroalgae have been explored as a source of bioactive compounds having several pharmacological effects including antiobesity, antioxidative, antiaging, and anticancer activities. On the contrary, little attention has been paid to the neurotrophic effects, and even those were done with PC12 cells, which are peripheral neuroendocrine cells. My laboratory has been evaluating some marine algae for their neuritogenic and neuroprotective activities in primary cultures of rat brain hippocampal neurons. Here, I will discuss the advantage of brain neurons over PC12 cells and the methodology such as morphometric analysis for neuritogenesis and synaptogenesis, electrophysiology and live cell imaging for synaptic functional analysis, and QuantSeq 3'mRNA-Seq analysis for signaling mechanism.

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