Lignosus rhinocerotis (Cooke) Ryvarden mimics the neuritogenic activity of nerve growth factor via MEK/ERK1/2 signaling pathway in PC-12 cells

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The traditional application of the sclerotium of Lignosus rhinocerotis (tiger’s milk mushroom) by the indigenous folks as tonic and remedy to treat a variety of ailments has been documented in Malaysia. Indigenous communities claimed to have consumed the decoction to boost their alertness during hunting. Mental alertness is believed to be related to neuronal health and neuroactivity. In the present study, the cell viability and neuritogenic effects of L. rhinocerotis sclerotium hot aqueous and ethanolic extracts, and crude polysaccharides on rat pheochromocytoma (PC-12) cells were studied. Interestingly, the hot aqueous extract exhibited neuritogenic activity comparable to NGF in PC-12 cells. However, the extracts and crude polysaccharides stimulated neuritogenesis without stimulating the production of NGF in PC-12 cells. The involvements of the TrkA receptor and MEK/ERK1/2 pathway in hot aqueous extract-stimulated neuritogenesis were examined by Trk (K252a) and MEK/ERK1/2 (U0126 and PD98059) inhibitors. There was no significant difference in protein expression in NGF- and hot aqueous extract-treated cells for both total and phosphorylated p44/42 MAPK. The neuritogenic activity in PC-12 cells stimulated by hot aqueous and ethanolic extracts, and crude polysaccharides of L. rhinocerotis sclerotium mimicking NGF activity via the MEK/ERK1/2 signaling pathway is reported for the first time.

Medicinal mushrooms and their extracts have a long and rich history of use in traditional oriental medicines as mycomedicines1. Increasingly, many are being regarded as functional foods and nutraceuticals. The neuroactivities of medicinal mushrooms are under intense study and research. Phan et al. (2014)2 reviewed a number of studies of medicinal mushrooms, revealing the promises of medicinal mushrooms as useful therapeutic agents in the management and/or treatment of neurodegenerative disorders.

In Malaysia, Lignosus rhinocerotis (Cooke) Ryvarden is also known as ‘tiger’s milk mushroom’ in English or ‘ceendawan susu rimau’ in Malay. It is considered as a unique “National Treasure” that can only be found in a small geographic region in Southern China, Thailand, Malaysia, Indonesia, Philippines, Papua New Guinea, New Zealand and Australia3. In Malaysia, L. rhinocerotis is the most popular medicinal mushroom used by the indigenous communities of Peninsular Malaysia4. The benefits of its underground tuber or sclerotium (where most of the nutritional and medicinal components are deposited) compared to its basidiocarp are well documented (Table 1). According to the ethnopharmacological

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