Molecular Biology Reports
https://doi.org/10.1007/s11033-021-06779-y

ORIGINAL ARTICLE

Neuroprotective effect of bromelain in 6-hydroxydopamine induced in vitro model of Parkinson's disease

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Received: 25 June 2021 / Accepted: 20 September 2021

Abstract

Background This study was designed to investigate the neuroprotective effects of bromelain, which is known to have antioxidant and anti-inflammatory properties, against the neurotoxicity (induced by 6-OHDA) in SH-SY5Y cells.

Methods and results To establish Parkinson's Disease (PD) model in cell culture conditions, SH-SY5Y cells were exposed to 200 µM 6-OHDA for 1 day. Prior to 6-OHDA treatment, SH-SY5Y cells had been pre-treated with bromelain (25 µg/mL, 50 µg/mL, 75 µg/mL and 100 µg/mL). After 1 day, cell viability was determined with the 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide (MTT) and lactate dehydrogenase (LDH) assays. Oxidative stress was assessed with total antioxidant capacity (TAC), total oxidant status (TOS), glutathione reductase (GR) and malondialdehyde (MDA) analyses. The effect of the bromelain in SH-SY5Ycells was also examined by 4′,6-diamidino-2-phenylindole (DAPI) staining. We found that 6-OHDA increased LDH leakage, and cellular apoptosis in SH-SY5Y cells. 6-OHDA aggravated oxidative stress by increasing TOS, MDA and GR and eventually promoted apoptosis in SH-SY5Y cells, while pretreatment with bromelain attenuated these toxic effects of 6-OHDA.

Conclusions These findings indicated that bromelain, with its neuroprotective features can be useful for neuroprotection in PD.

Keywords 6-OHDA · Bromelain · Neuroprotection · Parkinson's disease · SH-SY5Y cell

Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disease that occurs with aging. This disease impacts nearly 1–2% of the community above the age of 65, and it is considered that the PD cases will be doubled until the year 2030 [1]. Therefore, there is an urgent need to develop new treatment methods and strategies to prevent onset for PD.

Many studies have been conducted to elucidate the underlying mechanism of PD, but the specific etiology and pathogenesis are still not fully understood. The clinical characteristics are tremor, bradykinesia, rigidness and postural instability and the pathological characteristics are loss of dopaminergic neurons in the substantia nigra and the existence of neuronal intracytoplasmic inclusions named as Lewy bodies [2]. The factors that cause cell death and neuronal dysfunction in PD remain undefined but there are many theories ranging from oxidative stress and inflammation to abnormal protein aggregation [3]. Treatment of PD usually consists of pharmacological therapies aimed to alleviate the symptoms, but these treatment modalities do not prevent the progression of disease. Therefore, neuroprotective therapy emerges as a highly effective treatment strategy against the complex degenerative process in PD [4].

It is thought that natural products with antioxidant and neuroprotective properties offer great opportunities in the prevention and treatment of PD due to their safety and low side effects. Antioxidants maintain redox/oxidation

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Published online: 13 October 2021