

The potential use of sialic acid from edible bird's nest to attenuate mitochondrial dysfunction by in vitro study

ABSTRACT

Edible bird's nest (EBN) is one of the expensive functional foods in herbal medicine. One of the major glyconutrients in EBN is sialic acid, which has a beneficial effect on neurological and intellectual capability in mammals. The aims of this research were to study the effects of sialic acid from EBN on cell viability and to determine its effect on mitochondria membrane potential (MtMP) in Caco-2, SK-N-MC, SH-SY5Y, and PC-12 cell lines. Fourteen samples of raw EBN were collected from four different states in Malaysia. The confluency of the epithelial monolayers measurement of the tight junction for all the cell lines was determined using transepithelial electrical resistance (TEER), and the sialic acid uptake study in cell lines was determined by using ultra-high performance liquid chromatography (UHPLC). The MTT assay was conducted for cell viability study. The MtMP in cell lines was determined using the Mito Probe JC-1 Assay by flow cytometer analysis. We have recorded a statistically significant difference between the uptake of sialic acid from EBN and the standard solution. A higher amount of sialic acid was absorbed by the cells from extract of EBN compared to the standard solution. The amounts of sialic acid uptake in Caco-2, SK-N-MC, SH-SY5Y, and PC-12 cell lines were (0.019 ± 0.001) , (0.034 ± 0.006) , (0.021 ± 0.002) , and (0.025 ± 0.000) $\mu\text{mol/L}$, respectively. The MTT results indicated that the concentration of sialic acid increased the cell viability and showed no cytotoxicity effects on cell lines when they were exposed to the sialic acid extract and sialic acid standard at all the tested concentrations. The number of active mitochondria was found to be significantly higher in SH-SY5Y cell lines with a 195% increase when treated with sialic acid from EBN. Although many researchers around the globe use SHSY5Y and SK-N-MC for Alzheimer's disease (AD) study, based on our finding, SH-SY5Y was found to be the most suitable cell line for AD study by in vitro works where it has a known relationship with mitochondrial dysfunction.

Keyword: Edible bird's nest; Sialic acid; Cell lines; In vitro; Mitochondrial dysfunction; SH-SY5Y