

## **Selected Kefir Water from Malaysia Attenuates Hydrogen Peroxide-Induced Oxidative Stress by Upregulating Endogenous Antioxidant Levels in SH-SY5Y Neuroblastoma Cells**

### **ABSTRACT**

Kefir, a fermented probiotic drink was tested for its potential anti-oxidative, anti-apoptotic, and neuroprotective effects to attenuate cellular oxidative stress on human SH-SY5Y neuroblastoma cells. Here, the antioxidant potentials of the six different kefir water samples were analysed by total phenolic content (TPC), total flavonoid content (TFC), ferric reducing antioxidant power (FRAP), and 2,2'-diphenyl-1-picrylhydrazyl radical (DPPH) assays, whereas the anti-apoptotic activity on hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) induced SH-SY5Y cells was examined using MTT, AO/PI double staining, and PI/Annexin V-FITC assays. The surface and internal morphological features of SH-SY5Y cells were studied using scanning and transmission electron microscopy. The results indicate that Kefir B showed the higher TPC ( $1.96 \pm 0.54$   $\mu\text{g GAE}/\mu\text{L}$ ), TFC ( $1.09 \pm 0.02$   $\mu\text{g CAT eq}/\mu\text{L}$ ), FRAP ( $19.68 \pm 0.11$  mM FRAP eq/50  $\mu\text{L}$ ), and DPPH ( $0.45 \pm 0.06$  mg/mL) activities compared to the other kefir samples. The MTT and PI/Annexin V-FITC assays showed that Kefir B pre-treatment at 10 mg/mL for 48 h resulted in greater cytoprotection (97.04%), and a significantly lower percentage of necrotic cells (7.79%), respectively. The Kefir B pre-treatment also resulted in greater protection to cytoplasmic and cytoskeleton inclusion, along with the conservation of the surface morphological features and the overall integrity of SH-SY5Y cells. Our findings indicate that the anti-oxidative, anti-apoptosis, and neuroprotective effects of kefir were mediated via the upregulation of SOD and catalase, as well as the modulation of apoptotic genes (Tp73, Bax, and Bcl-2).