UNIVERSITI TEKNOLOGI MARA

TOXIC EFFECTS OF MAGNESIUM OXIDE NANOPARTICLES ON HUMAN NEURONAL CELL LINES

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Thesis submitted in fulfilment
of the requirements for the degree of
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Faculty of Applied Sciences

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Rapid increase in the industrial application of nanomaterials such as MgO nanoparticles has great impact on the public. MgO nanomaterial is now used in medical and pharmaceutical products as well as industrial products such as paints. Thus, they are now widely used by the public, but their significant potential risks of exposure have not been systematically investigated. In this study, toxic effects of MgO nanoparticles which differ in terms of size and physical dimensions were investigated against cancer neuroblastoma SH-SY5Y cell lines and neuron-phenotypic cell lines. Viability of cells was measured by using MTS assay. Three types of MgO were used in the study, of which two of them were ultra-thin MgO sheets designated as MgO-5 (size: 500 μm, 5 nm thickness) and MgO-10 (size: 500 μm, 2 nm thickness). The other nanoparticle was spherical with average size of 10-100 nm (MgO-24). Oxidative stress was measured by the production of reactive oxygen species (ROS) using dicholofluorescein (DCF) assay. Beneficial effects of MgO nanoparticles were also evaluated for potential neuroprotection. Results indicated that the toxic effects of MgO nanoparticles on cancer neuroblastoma SH-SY5Y cell lines and neuron-phenotypic cell lines were dependent on shape, concentration and size of MgO nanoparticles. Particles with spherical shape (MgO-24) exerted more toxic effects compared to ultra-thin nanosheet particles (MgO-5 and MgO-10). MgO nanoparticles were not toxic to both cell lines at concentration $\leq$100 μg/ml and did not exert any potential for neuroprotection. However, once the concentration was increased to 1 mg/ml, MgO nanoparticles significantly reduced the viability of both cell lines tested due the production of ROS.

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