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Anticancer potential of L-asparaginase impregnated selenium-cyclodextrin nanobiocomposite against mouse B-cell lymphoma cells

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Lymphoma remains a significant challenge in cancer treatment due to its high prevalence and resistance to conventional therapies. There is a growing demand for innovative and targeted treatment strategies that can enhance therapeutic efficacy while minimizing side effects. The present work focuses on the synthesis of selenium-cyclodextrin (Se-CyD) nanobiocomposite of L-asparaginase using the co-precipitation method for drug delivery against lymphoma cells. The size of the synthesized Se-CyD nanobiocomposite was found to be 29.74 nm. Using a scanning electron microscope, the spherical shape of the nanobiocomposite was observed. The absorption of the nanocomposite was observed in the range of 200 to 600 nm using a double-beam UV-Vis spectrophotometer. The FTIR spectrum showed peaks of transmittance at specific wavenumbers, indicating regions of low and high absorption due to the involvement of functional groups in the nanobiocomposite. The X-ray diffraction analysis revealed the crystalline structure of the nanocomposite by representing sharp and prominent peaks. The Methyl thiazolyl diphenyl-tetrazolium bromide (MTT) assay on CH27 mouse B-cell lymphoma cell line loaded with Se-CyD nanobiocomposite showed 65.9% toxicity at a concentration of 100 µg/mL. This concentration represents the IC50 value of the Se-CyD nanobiocomposite for the CH27 mouse B-cell lymphoma cell line. Thus, a combination of selenium and cyclodextrin nanocomposite coated with L-asparaginase proves to have anticancer properties.

Keywords: Nanoparticles, β-cyclodextrin, Sodium selenite, Drug delivery, Enzyme-based cancer therapy