

Evaluation of the Anticancer Activity of newly synthesized Copper-Based Nanoparticles

Mir Monir Hossain^{1*}, Sriramakrishna Yarabarla², Nick Penman², and Songping D. Huang²

^{1*}*Department of Chemistry, Cleveland State University, Cleveland, Ohio-44115, USA*

²*Department of Chemistry and Biochemistry, Kent State University, Kent, Ohio-44240, USA*

Abstract: Copper-based nanoparticles (Cu-based NPs) have an immense potential in the future of anticancer therapy due to their ability to induce the production of reactive oxygen species (ROS) by Fenton-like chemistry, free radicals that cause damage in mitochondria and DNA, resulting in apoptosis in cancer cells. Copper's toxicity has been attributed to its ability to act as a catalyst for oxidative damage to tissues through redox cycling between Cu(I) and Cu(II), particularly in the presence of H₂O₂, a by-product of oxygen metabolism. The present study was carried out to investigate the anticancer potential of synthetic Cu(OH)PO₄ NPs. After synthesis, the stability, size and shape, and cellular uptake of such NPs were measured. The results revealed the formation of the desired NPs with the average size suitable for our intended application. The investigation of anti-proliferation effect was carried out by using at first HEK-293 cells (Normal Kidney Cells) as control, giving the LD₅₀ value of 250 µM. After establishing the LD₅₀ on normal cell line, PC3 cells (Prostate cancer cells) were assayed to investigate the potential of such NPs as an anticancer agent in combination with ascorbic acid (vitamin C) in various ratios. In this case, the combinatorial product showed an excellent anti-proliferation effect on this cancerous cell line, which indicates the effectiveness of Cu(OH)PO₄ NPs as anticancer agent. Further intensive studies are necessary to find out the safety and efficacy of this NPs in animal models prior to the application in humans as drug candidate for treating cancer.

Key words: Anticancer activity, apoptosis, LD₅₀, Cu(OH)PO₄.

* **For Correspondence:** Mir Monir Hossain, m.m.hossain39@vikes.csuohio.edu