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

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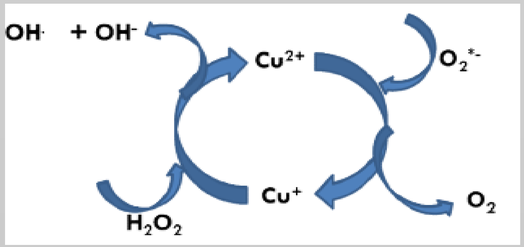
Introduction

Copper is one of the few metals currently being explored in the area of cancer treatment as metallodrugs (mostly encompass metal complexes) and nanoparticulate forms. Interest in copper-based complexes as anti-cancer agents has increased enormously since the late previous decade, as evidenced by the surge in the number of reports published with primary focus on finding alternative strategies to platinum based drugs, particularly in the context of overcoming acquired resistance to platinum therapy.[1-3]



Scheme 1. A Proposed Mechanism of Fenton-Like Chemistry.[4]

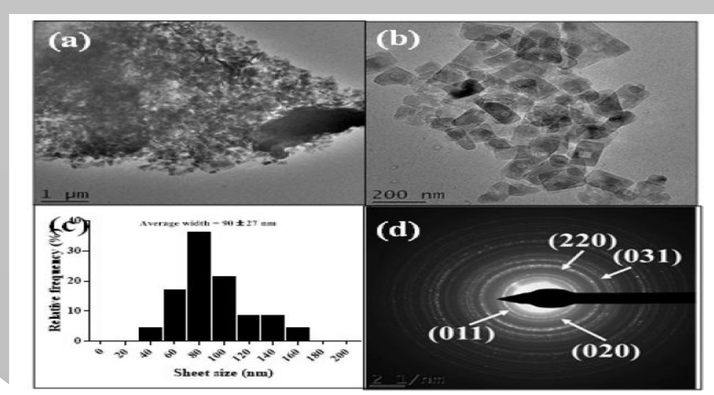
The anti-proliferative effect of the copper based NPs is attributed to the ability of surface copper generating ROS by Fenton-like reaction. As shown in the scheme 1., Cu(I) undergoes Fenton-like process, i.e. the reduction of H_2O_2 by Cu(I), to generate hydroxyl radicals. The oxidized copper is reduced back to Cu(I) by Haber-Weiss reaction completing the catalytic cycle with the net effect of generation of hydroxyl radical, hydroxide ion and molecular oxygen.[5]

Synthesis

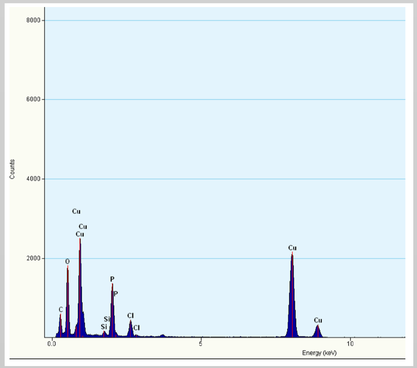
The synthesis of Libethenite as microstructures Via aqueous and hydrothermal routes was reported by others in literature.[6-7]

Characterization

TEM:

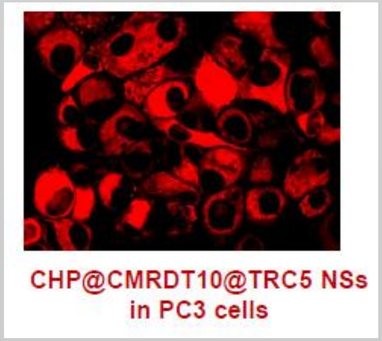


EDX Spectrum:



*Cu was also confirmed by AAS

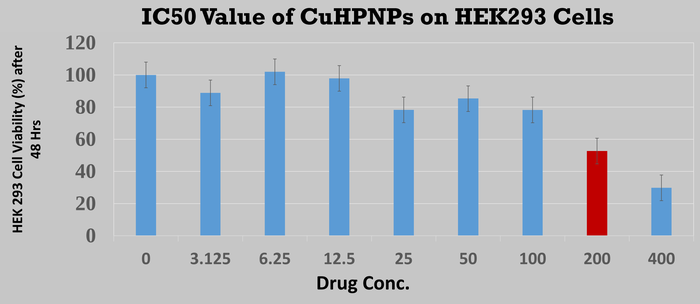
Cellular Uptake: Confocal Fluorescence Microscopy



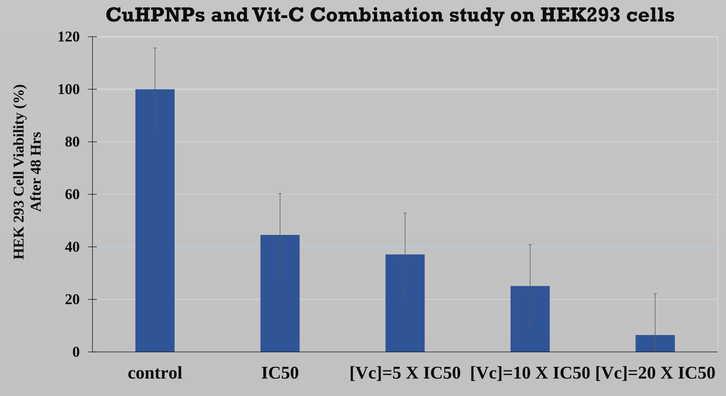
Texas Red dye labeling of NPs by EDC coupling

Anticancer Activity and Combination study with Vit-C

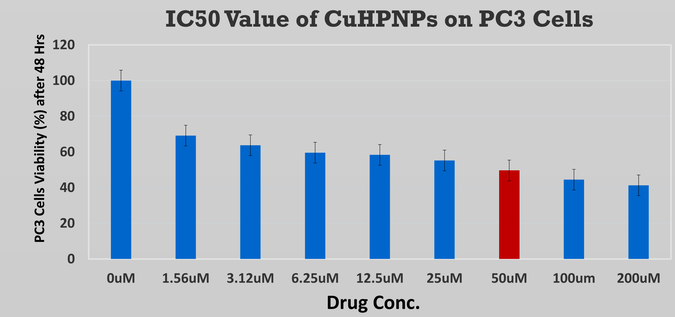
In HEK293 Cells:



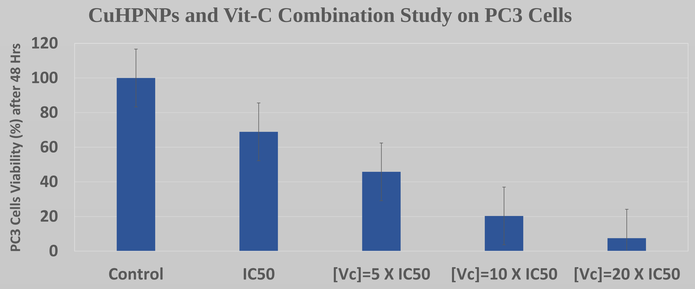
*The Estimated IC50=250 µM



In PC3 Cells:



*The Estimated IC50=50 µM



Next Steps

The nanoparticles will be further analyzed 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.

Acknowledgements

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References

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