

Metal Ferrite Nanoparticles and Toxicity to Normal and Cancerous Cell Lines

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Ferrite nanoparticles (NPs), with Copper and Cobalt, are important magnetic materials currently under research due to their applicability in nanomedicine. However, there is limited information concerning the interaction of such NPs with biological systems.

In several studies, we investigated the cellular response of both Copper and Cobalt ferrite NPs in human normal and cancer cell lines, such as breast cancer (MCF-7) and liver cells (HepG2). Cobalt ferrite NPs induced cell viability reduction and membrane damage, and degree of induction was dose- and time-dependent. They were also found to induce oxidative stress revealed by induction of ROS, depletion of glutathione and lower activity of superoxide dismutase enzyme. Overall, we observed that Cobalt ferrite NPs induced cytotoxicity and apoptosis in HepG2 cells through ROS via p53 pathway. Furthermore, biochemical studies showed that copper ferrite NPs induce cell viability reduction and membrane damage in MCF-7 cells and degree of induction was dose- and time-dependent. Also, Copper ferrite NP was found to induce oxidative stress in MCF-7 cells as indicated by reactive oxygen species (ROS) generation and glutathione depletion.

Further studies are underway to explore the toxicity mechanisms of metal ferrite NPs in different types of human cells. Our studies suggest that toxicity mechanisms of metal ferrite NPs should be further investigated in animal models.

References

- [1] H Alhadlaq, M Akhtar, M Ahamed, *Cell & Bioscience*, 1:5 (2015) 1.
- [2] M Akhtar *et al.*, *Clinica Chimica Acta*, 436 (2014) 78-92.
- [3] M Ahamed *et al.*, *Journal of Nanomaterials*, 2014 (2104) 17.

Figures

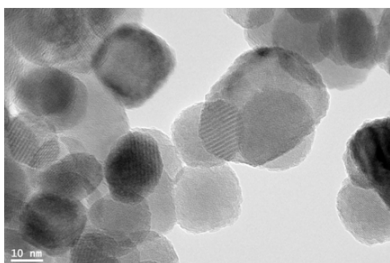


Figure 1: High resolution TEM image of copper ferrite NPs.

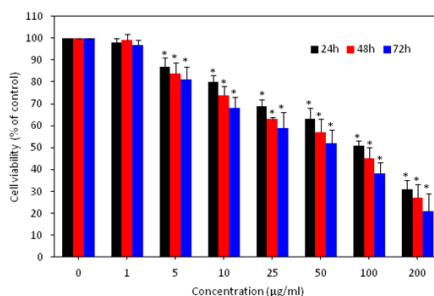


Figure 2: MTT assay of copper ferrite NP-induced cytotoxicity in MCF-7 cells at different dosages and exposure times. Data represented are mean \pm SD of three identical experiments made in three replicate. *Significant difference as compared to control ($p < 0.05$).