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Assessment of nanohydroxyapatite toxicity on mouse bone marrow mesenchymal stem cells

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Hydroxyapaptite has been extensively used as a bone substitute material and dental implants. The main focus of the study is to evaluate the toxicity of synthesized nanohydroxyapatite on isolated bone marrow mesenchymal stem cells. Mesenchymal stem cells are multipotent progenitor cells found in bone marrow and various tissues. Morphologically these cells have a long thin cell body and a large nucleus. These cells have the potential to differentiate as adipocytes, chondrocytes, osteoblasts and neurons under stimulated condition.

Hydroxyapatite nanoparticles (HANPs) were synthesized by wet chemical method and were characterized by TEM, FTIR, XRD, EDS and SEM analysis.

Here, an attempt was made to isolate mesenchymal stem cells (BMSC) from mouse bone marrow and characterize them with the positive surface marker CD44, CD90. Cells were sub-cultured when it reached 80% confluence and cells after the third passage were used for further studies. The synthesized and characterized HANPs (50nm) were exposed to BMSC and the various toxic responses were studied as per standard protocols. Cytotoxicity (MTT assay), reactive oxygen species (ROS) production and apoptosis (Annexin/PI staining) and caspase 3/7 activation was evaluated. The results of the study indicated that HANPs does not induce cytotoxity (MTT assay) up to 800µg/ml. Similarly HANPs failed to induce oxidative stress related apoptosis and ROS production. Hence the present study concludes that the synthesized 50nm sized HANPs were non-toxic and safe at the molecular level and also suggests that the BMSC can be used as an alternative test system for animal experimentation for the preliminary screening of nanomaterials toxicity.

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