FORMULATION, CHARACTERIZATION AND EVALUATION OF CURCUMIN-LOADED γ-CYCLODEXTRIN LIPOSOMAL NANOPARTICLES ON OSTEOSARCOMA CELL LINES.


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Aim: Curcumin, the constituent of Curcumin Longa has been shown to possess potent anti-neoplastic activity against a number of tumors including prostate, breast and colon cancer. Curcumin is water insoluble and hence bioavailability has been the barrier in the treatment of curcumin on clinical level. The aim of this project is to test if curcumin has antiproliferative effects on Osteosarcoma cells and if liposomal formulation increases the bioavailability of curcumin.

Methods: We used two osteosarcoma cell lines (KHOS and RFOS) to test and a breast cancer cell line (MCF-7), normal mesenchymal stem cells (MSCs) and fibroblasts as controls. Cells were plated in 96 well plate and allowed to adhere, then treated for 48 h with 3 different curcumin formulations as follows: classical curcumin in DMSO, curcumin in liposomes using DMPG (1,2-Dimyristoyl-sn-glycero-3-(Phospho-rac-(1-glycerol)) (sodiumsalt) and DPPC (1,2-dipalmitoyl-sn-glycero-3-Phosphocholine), γ-Cyclodextrin (CD) curcumin liposomes. Cells were also treated with respective DMSO and blank liposomes controls. After 48 h, % cell proliferation was determined using a Cyquant assay. Liposomes were prepared by dry film method followed by hydration and extrusion through 100 nm membrane. Transmission electron microscopy (TEM), JEOL 2011, Gatan, was used to assess liposomal structures. IC50 for curcumin formulations was estimated using GraphPad Prism.

Results: The effect of all curcumin formulations was studied on aforementioned cell lines comparatively. IC50 values of DMSO-curcumin, curcumin liposomes and γ-CD curcumin liposomes were 23 µg/ml, 5.5 µg/ml and 6.4 µg/ml respectively for KHOS. IC50 values for RFOS were 32 µg/ml, 41 µg/ml and 39 µg/ml respectively. IC50 for MCF-7 were 20 µg/ml, 10.2 µg/ml and 11.5 µg/ml respectively. High IC50 values for RFOS indicates its resistance against curcumin as compared to KHOS. Normal MSCs show high IC50 values and good resistance to liposomal curcumin at respective IC50 for cancer cell lines. TEM pictures depict uniform spherical liposomes of 100 nm. Gamma-CD liposomes encapsulate more curcumin than normal curcumin liposomes and hence found to be more potent.

Conclusion: This is the first report of liposomal curcumin against osteosarcoma cell lines. Curcumin liposomes were found to be at least 3 times more effective against cancer cell lines than curcumin in DMSO. Interestingly, liposomal curcumin was less toxic on normal cells. Efficacy of curcumin formulations increase ascending from DMSO curcumin, curcumin liposome to γ-CD curcumin liposomes.

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