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Curcumin loaded PLGA nanospheres as therapeutics against prostate cancer

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Among the potent anti-cancer agents, curcumin has been found to be very efficacious against many cancer cells. However, the major disadvantage associated with curcumin is its low systemic bioavailability when administered orally due to its poor aqueous solubility. Many established pharmaceutical industries are gearing-up their efforts towards developing more effective and performance-based new drug delivery systems. The growing need for biodegradable polymers for use in the emerging technologies like tissue engineering and regenerative medicine, gene therapy, novel drug delivery systems, implantable devices and nanotechnology have resulted in the development of a range of biodegradable polymers for drug delivery. Based on these aspects, our present work investigates the method for the efficient encapsulation of curcumin in PLGA nanospheres using a unique solid/oil/water emulsion solvent evaporation method. The nanospheres were formulated and then characterized for percent yield, encapsulation efficiency, surface morphology using SEM, particle size, drug distribution studies, drug polymer interaction studies and in vitro drug release profiles. Our studies showed the successful formation of smooth and spherical curcumin loaded PLGA nanospheres with high encapsulation efficiency. The particle size distribution, determined by dynamic light scattering, showed a mean particle size being 145 nm. Evaluation of these curcumin loaded nanospheres was carried out in prostate cancer cell lines. Results showed robust intra-cellular uptake of the nanospheres in the cells. Cell viability studies revealed that these curcumin loaded nanospheres were able to exert preferential toxic effects to cancer cells as compared to normal cell lines. Also, the effect was more pronounced with curcumin loaded nanospheres than with free curcumin. Our studies conclude the successful formulation of curcumin loaded PLGA nanospheres, thus highlighting the potential of biodegradable polymer nanospheres as drug delivery systems in treatment against prostate cancer.

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