

Design of a nanoparticulate drug delivery system for cancer therapy

Duc P. Do, Keane O. Soluade, Kunal P. Desai and Jay V. Patel

Chicago State University, USA

Most anticancer agents are not targeted to neoplastic cells. As a result, the development of dosage forms and drug delivery systems containing anticancer drugs capable of targeting cancer cells is highly desired. Our research investigated an albumin-based nanoparticulate delivery system as a platform technology for the delivery of anticancer agents. Doxorubicin hydrochloride was used as the model drug. Drug-encapsulated nanoparticles were prepared by microencapsulation through spray-drying and were characterized for their physicochemical properties. Raman spectroscopy was used to investigate the stability of the encapsulated drug. Additionally, Zeta potential measurements were used to assess the colloidal stability and surface properties of the nanoparticles. Dissolution studies were carried out to examine the release profile of the drug from the nanoparticles. The *in vitro* efficacy of the drug-loaded nanoparticulate drug delivery system was analyzed in MCF-7 breast cancer cell line. Raman spectroscopy data suggested that the drug is stable in the nanoparticulate drug carrier. Nanoparticles have Zeta potential measurements of approximately -30 mV, suggesting that the system is stable in an aqueous environment. Dissolution studies showed that the drug was released from the nanoparticles at a sustained rate over a period of over 24 hours. *In vitro* data in MCF-7 cell line indicated that there was more than 10% more inhibition of cell viability when doxorubicin was used with the biodegradable polymeric carrier. Similar results were observed from clonogenic studies. Additionally, our *in vitro* data suggested that cell death induced by the drug-loaded nanoparticles was caused by apoptosis. Hence, the data suggest that biodegradable albumin nanoparticles are capable of targeting cancer cells.

ddo@csu.edu