Fabrication of a Biodegradable Polymeric Nanostructural Carrier Mediated Target Specific Drug Delivery System for the Treatment of Lung Cancer

Synopsis of the Thesis

Submitted by

Leena Kumari

Doctor of Philosophy (Pharmacy)

Department of Pharmaceutical Technology

Faculty Council of Engineering & Technology

Jadavpur University

Kolkata, India

2023

Abstract

Non-small cell lung cancer (NSCLC) is one of the most prevalent cancers diagnosed worldwide, yet managing it is still challenging. The epidermal growth factor receptor (EGFR) exhibits aberrant signalling in a wide range of human cancers, and it is reported to overexpress in most NSCLC cases. The monoclonal antibody [Cetuximab (Cet)] was conjugated onto the surface of the poly (lactide-co-glycolide) (PLGA) nanoparticles which were loaded with docetaxel (DTX) for the development of targeted therapy against lung cancer. This site-specific delivery system exhibited an enhanced cellular uptake in lung cancer cells which overexpress EGFR (A549 and NCI-H23). The nanoparticles also showed better therapeutic effectiveness against NSCLC cells, as evidenced by reduced IC50 values, cell cycle arrest at the G2/M phase, and increased apoptosis. The improved efficacy and *in vivo* tolerance of Cet-DTX NPs were demonstrated in benzo(a)pyrene (BaP)-induced lung cancer mice model. Histopathological analysis showed that intravenous injection of Cet-DTX NP to mice carrying lung cancer greatly reduced tumour development and proliferation. Comparing Cet-DTX NP to free drug and unconjugated nanoparticles, it also had negligible side effects and improved survival rates. Therefore, Cet-DTX NPs present a promising active targeting carrier for lung tumour-NSCLC-selective treatment.