SiRNA Drug Delivery using Polymer-Grafted Porous Silicon Particles

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Across the globe, cancer is the second most common cause of death [1]. Treatment options for cancer currently include surgical interventions, radiation therapy, and chemotherapy. The limitations of conventional treatments have led to the development of nanotechnology approaches in biomedicine [2]. Smart nano-sized drug delivery systems are one of the most promising nanotechnologies for diagnosing and treating cancer as due to the nanocarrier's structural design, it can overcome biological barriers and improve drug solubility, making it effective for localized drug delivery [3].

This work aims to optimize the loading and delivery of siRNA from porous silicon nanoparticles (pSiNPs) by surface-initiated polymerization with poly[2 (dimethylamino)ethyl methacrylate]-b-poly(oligo(ethylene glycol) methyl ether methacrylate) (POEGMA-*b*-PDMAEMA). The hypothesis is that PDMAEMA can improve the siRNA loading of pSiNP and the incorporation of POEGMA can negate cytotoxicity.

The POEGMA-*b*-PDMAEMA coating was successfully applied using 'grafting from' RAFT polymerization and resulted in a colloidal stable nanocarrier with a high siRNA loading (up to 380 µg/mg SiNP). The siRNA-pSiNP complex showed low cytotoxicity and released siRNA over 24 hours. Currently, in vitro assays are carried out in the MDA-MB 231 breast cancer cell line to investigate cell association and gene silencing capabilities, followed by *in vivo* studies in an orthotopic breast cancer model.

Refs:

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