

Stimuli responsive lipid coated mesoporous silica nanoparticles for drug delivery

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Abstract:

Immediate release of the drug from the drug delivery carrier after cellular uptake is a big challenge. Premature leakage of the chemotherapeutics during circulation, causing side effects to healthy tissue, is even more relevant. Stimuli responsive drug delivery systems have addressed these issues and have become more attractive in last few years. Physical stimuli including ultrasound (US) due to its non-invasive nature are considered very safe and effective. Mesoporous silica nanoparticles due to their salient features are very suitable for drug delivery to tumor cells. These features include larger surface area, hydrophilic and hydrophobic nature, tailorable pore size and pore volume, inner and outer surface for attachment, mechanical strength and non-toxic nature. By combining distinguishing features of liposomes to mesoporous silica nanoparticles very satisfactory results can be achieved. We have developed an US responsive drug delivery system where we have used mesoporous silica nanoparticles as a drug carrier, doxorubicin as a model drug, perfluoropentane (PFP) as an US responsive material and liposomes as gatekeeper. The release of the drug was successfully triggered by US due to the disruption of low boiling point PFP inside pores, building up pressure and causing the immediate release. This immediate release was also observed in cell culture experiments where our system has produced more cytotoxic effects to tumor cells as compared to non-US carriers. Lipid coating to MSNPs not only provided the gate keeping effects but also enhanced the cellular uptake of the carrier.

Biography:

Muhammad Umair Amin is Pharmacist by profession and has done his Master in Pharmaceutics. Currently he is doing PhD under DAAD/HEC Pakistan Scholarship program, in the supervision of Prof. Dr. Udo. Bakowsky at Department of Pharmaceutics and Biopharmaceutics, *Philipps-Universität Marburg*, Marburg, Germany. The major area of interest is development of drug carrier systems and characterization. Primary research goals are directed toward the fabrication of mesoporous silica nanoparticles and targeting of nanoparticles loaded with anti-cancer drugs to resistant hypoxic tumor cells. He has an experience in research, teaching and administration in education institutions.

Research Interests: Nanotechnology, Drug delivery

References:

Mura, S *et al*. *Nature materials* **2013,** *12* (11), 991.
Liu, X *et al*. *ACS Nano* **2016,** *10* (2), 2702-2715.

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