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Polymeric nanoparticles for the pulmonary delivery of miRNA to treat Chronic Obstructive Pulmonary Disease (COPD)

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Altered miRNA expression has been associated with both neoplastic and inflammatory lung diseases, including chronic obstructive pulmonary disease. RNA interference (RNAi) based interventions are promising for the therapeutic modulation of gene expression and small non-coding RNA molecules known as microRNAs (miRNAs) may be tractable targets for the treatment of lung disease. In this study, cationic polymeric nanoparticles (NPs) were prepared from poly (glycerol adipate-co-ω-pentadecalactone) via oil in water emulsion solvent evaporation method using DOTAP (%w/v). The particles were characterized for size, zeta potential (ZP) and A549 cell viability (MTT assay). The size and charge of the NPs was dependent on the concentration of DOTAP with an increase from 5% to 20% resulting in a decrease in particle size and polydispersity. Optimum NPS of an equivalent size and polydispersity to those produced without DOTAP were prepared by the addition of 15% DOTAP increasing the ZP from -18.9±0.9 to +14.8±0.26 mV. Over 65% of A549 cells remained viable following 24 hours exposure to the DOTAP NPs (1.25 mg/ml) and the NPs alone had little effect on cell viability. Fluorescently-labelled synthetic miRNA (40 µg/ml) was adsorbed onto optimum NPs, which led to a slight decrease in ZP +11 mV, and approximately 77% of miRNA was released in PBS after 24 hours. Confocal microscopy using NPs with encapsulated nile red indicated uptake of the particles into the cells and further bioassays are currently on-going. Overall, results suggest that miRNA-coated NPs will be a useful formulation for future *in-vitro* studies.

Biography

Gillian A Hutcheon completed her PhD in 1996 from University of Strathlcyde, UK and undertook Post-doctoral studies at Nottingham University. Before her appointment as a Senior Lecturer at Liverpool John Moores, University, 2007, she was appointed as a Reader in Biomaterials. She is a chartered chemist and a Fellow of the Royal Society of Chemistry. She has published more than 35 papers in peer reviewed journals.

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