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School of Pharmacy PhD Project 2017 / 2018

Identification of novel polymeric nanoparticle formulations with favourable characteristics for future therapeutic development

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Nanoparticles are widely used in the biomedical field due to their potential as therapeutics, drug delivery systems and in diagnostics. However, there is a need for novel nanoparticle formulations as many of those available have issues in biological systems due to toxicity and inflammation.

Dr Themistou is working with amphiphilic block copolymers based on the highly biocompatible 2-(methacryloyloxy)-ethyl phosphorylcholine (MPC) monomer, which can self-assemble to polymer vesicles and carry both hydrophobic (in their membrane) and hydrophilic (in their core) drugs. She uses a new polymerisation strategy allowing the in situ formation of sterile polymer vesicles in biologically-friendly conditions (buffer pH 7-8, 37°C). Both the process and the monomer choice are critical for the production of biocompatible polymers, something that this project will explore.

This project will produce a range of nanoparticle formulations based on different monomers and assess their biocompatibility in tissue culture and cellular assays. This will include assessing toxicity through standard MTT and cell titer-glo assays, as well as assessing inflammation through cytokine production and caspase activation, as done before (Hughes CS, et al., Part Fibre Toxicol. 2016). In addition, it will assess the cellular uptake of these nanoparticles by incorporating rhodamine conjugated monomers to allow their visualisation by confocal microscopy.

Nanoparticles exhibiting favourable characteristics will be further assessed for loading of selected hydrophobic and hydrophilic drugs, as well as their cellular delivery. In addition, hydroxysuccinimide methacrylate monomer units can be incorporated providing a functional group for subsequent antibody conjugation, potentially allowing targeted delivery of these particles

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How to Apply
Postgraduate applications should be made using Queen's University Direct Applications Portal. Please note that there are two application processes: one for admission to the university and another for postgraduate awards.

Further Information
Additional information for prospective postgraduate students can be found on the School of Pharmacy website and the Queen's Postgraduate website.

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