



# QUEEN'S UNIVERSITY BELFAST

*Title of studentship	Novel sustained-release formulation strategies for vaginal administration of drug-loaded nanoparticles
Value / what is covered?	Fully funded  100% of UK/EU tuition fees paid and an annual stipend for UK residents only (living expenses), currently at £14,777
Awarding body	DFE
Number of studentships	1
*Summary descriptive text / Example of research project	<p><b>Research Summary</b></p> <p>Sustained-release drug products are useful in prolonging the action of a drug in the body by maintaining therapeutic concentrations of the drug over extended time periods. Here, we are particularly interested in developing innovative polymeric vaginal rings for long-acting vaginal administration of drug-loaded nanoparticles.</p> <p>Various steroid-releasing vaginal ring products are currently marketed for hormonal contraception and estrogen replacement therapy, and a new ring device – developed in part by the Queen's University Belfast (QUB) and offering sustained release of the antiretroviral drug dapivirine for HIV prevention – is due to reach market soon.</p> <p>However, a major limitation of current vaginal ring technologies is that they are generally not useful for administration of either large molecule drugs or drug-loaded nanoparticles, due to limited solubility and/or diffusion in the polymeric materials used to manufacture rings.</p> <p>Here, we propose for the first time to develop and test a novel vaginal ring developed for sustained release of drug-loaded nanoparticles, with potential applications in prevention/treatment of sexually transmitted infections, mucosal immunisation, treatment of cervicovaginal cancers, etc. The ring device comprises orifices in the ring surface which expose the underlying drug-loaded core. The ring is easy to manufacture using highly-scalable and conventional injection molding technologies.</p> <p><b>Background to the project</b></p> <p>Professor Malcolm's research group at QUB has world-leading expertise in the development of vaginal ring devices for sustained/controlled release drug delivery</p>

	<p>applications. In recent years, there has been great interest in developing vaginal rings for sustained administration of molecules beyond the hydrophobic small molecules of current marketed ring products. With ongoing advances in the development of biopharmaceuticals, new ring technologies with potential for sustained release of peptides, proteins, DNA and drug-loaded nanoparticles are of particular interest. Recently, as part of a Wellcome Trust funded project ('Chemokine-based microbicides: a pathway from a first-in-human study towards Phase 2/3 and licensure'), QUB has developed a new vaginal ring technology providing controlled release of 5P12-RANTES, a chemokine analogue that potently blocks the HIV CCR5 coreceptor. That ring is currently being evaluated in large-animal studies. Here, for the first time, we propose to evaluate this new ring technology platform for sustained release of drug-loaded nanoparticles. Previously published articles reporting vaginal administration of drug-loaded nanoparticles have relied on formulating the nanoparticles in simple vaginal gels or films, which cannot provide long-acting continuous administration. If successful, this project would open the way for enhanced vaginal administration of drug-loaded nanoparticles using vaginal ring technology.</p>
<b>*Supervisor(s)</b>	Prof. Karl Malcolm and Dr. Peter Boyd
<b>*Eligibility / residence Status</b>	UK/EU only
<b>Country</b>	Northern Ireland
<b>*Start date and duration</b>	1 October 2019 Funding covers a three-year full-time PhD.
<b>*Faculty</b>	MHLS
<b>*Research centre / School</b>	Pharmacy
<b>Subject area</b>	Drug delivery; pharmaceutical formulation; mucosal drug administration;
<b>Candidate requirements / Key skills required for the post</b>	Applicants should have a 1st or 2.1 honours degree (or equivalent) in a relevant subject. Relevant subjects include Pharmacy, Molecular Biology, Pharmaceutical Sciences, Biochemistry, Biological/Biomedical Sciences, Chemistry, Engineering, or a closely related discipline. Students who have a 2.2 honours degree and a Master's degree may also be considered, but the School reserves the right to shortlist for interview only those applicants who have demonstrated high academic attainment to date.
<b>*Deadline for applications</b>	
<b>*How to apply / contacts</b>	Postgraduate Research applicants for Pharmacy who are interested in applying for a fully funded DFE studentship must have applied to Queen's, via the Direct Applications Portal, and submitted all required supporting documents by the closing date, which will be announced later in the Academic year.

	<a href="https://dap.qub.ac.uk/portal/user/u_login.php">https://dap.qub.ac.uk/portal/user/u_login.php</a>
<b>Relevant links / more information</b>	<a href="http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/PostgraduatePositions/">http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/PostgraduatePositions/</a> <a href="http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/">http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/</a>
<b>Keywords for search filters</b>	Pharmaceutics; drug delivery; vaginal rings; nanoparticles; formulation; HIV prevention; antiretrovirals
<b>Training provided through the research project</b>	<p>The project will provide hands-on training for the student in the following techniques:</p> <ul style="list-style-type: none"> <li>• drug formulation methods</li> <li>• preparation and characterisation of drug-loaded nanoparticles</li> <li>• scalable injection molding processes for manufacture of vaginal rings</li> <li>• drug quantification using high performance liquid chromatography (HPLC)</li> <li>• in vitro drug release testing</li> <li>• thermal analysis methods</li> </ul> <p>As an integral part of the project, the student will further develop the following key skills:</p> <ul style="list-style-type: none"> <li>• planning and organising: designing and planning of experiments</li> <li>• numeracy and statistical skills</li> <li>• teamwork: working confidently as part of a large research team</li> </ul>
<b>Expected impact activities</b>	The project will offer a practical and viable new technology for sustained delivery of drug-loaded nanoparticles to the vaginal mucosal tissue, sufficient for a wide range of therapeutic indications, including HIV prevention, treatment/prevention of sexually transmitted infections, and mucosal vaccines.