



School of Pharmacy PhD Projects 2014

Project Title Microneedle-mediated Intradermal Delivery: Potential for Targeting of Therapeutic Agents

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Description This interdisciplinary project represents a significant opportunity for development of technology-based strategies for improving health-related-quality-of-life of patients worldwide. Successful completion of the work in this project will undoubtedly present enhanced opportunities for commercialisation of innovative microneedle delivery systems developed at QUB and facilitate future funding from major UK and EU funders, with the potential for high-quality research outputs and valuable new intellectual property. Importantly, this work will be of significant interest to industry, while emphasising QUB's reputation as a World-leading centre for microneedles research.

Microneedle arrays are minimally-invasive devices that painlessly by-pass skin's *stratum corneum* barrier, creating microscopic holes. Novel microneedles developed by the School of Pharmacy rapidly dissolve in skin interstitial fluid to release their cargo. Our Microneedles Programme has attracted £3.5 million in funding in the period 2007-2013, through awards from BBSRC, EPSRC, the Wellcome Trust, Action Medical Research, the Royal Society and Invest NI. Development grants from major pharma aim to take the technology to market.

We have recently found that, while low molecular weight drugs are rapidly absorbed into blood via the dermal microcirculation when delivered using our microneedles, macromolecules and nanoparticles are first transported to the lymphatic system, either by interstitial fluid drainage or cellular migration following specific uptake by potent immune antigen-presenting cells in the epidermis and dermis. ***This phenomenon creates a unique opportunity for specific targeting of therapeutic agents to the lymphatic system.***

In this project, we will load our dissolving microneedle platforms with drug-containing nanoparticles engineered to prevent absorption by the dermal microcirculation and enhance retention in the lymphatic system. By using targeted nanoparticle approaches, we plan to avoid toxicity associated with systemic delivery of chemotherapies, whilst exploiting active drug targeting through surface carbohydrates and/or antibodies.

Once fully developed, this technology has the potential to target chemotherapeutics to lymphatic tumours while minimising distribution to the rest of the body. This may allow increased doses to be delivered, leading to enhanced treatment success rates, whilst minimising side effects.

Start Date 1 October 2014

Keywords Intradermal delivery, microneedles

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How to Apply

Postgraduate applications should be made using Queen's Online:

<http://go.qub.ac.uk/pgapply>

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:

<http://www.qub.ac.uk/pha>

and the Queen's Postgraduate website:

<http://www.qub.ac.uk/home/ProspectiveStudents/PostgraduateStudents/>