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School of Pharmacy PhD Project 2017 / 2018

Nanoengineered microneedle arrays for enhanced therapy of basal cell carcinoma

Professor Ryan Donnelly, Professor Steven Bell and Dr Jonathan Coulter

Basal cell carcinoma (BCC), the UK's most common cancer, is caused by skin exposure to ultraviolet radiation. The face is the most commonly-involved site. BCC is not typically fatal but, if not treated effectively, will invade through the skin, resulting in significant disfigurement, pain, ulceration, nerve damage and, potentially, loss of vision for lesions around the eyes. Management by surgical excision causes unsightly scarring, affecting patients' health-related-quality of life. Photodynamic therapy (PDT), the combination of a topically-applied photosensitising drug and visible light, is an effective treatment for superficial lesions, but not for nodular BCCs, which represent 60% of cases, as the red light typically used does not penetrate to the base of the lesion. In this innovative interdisciplinary project, we will design polymeric microneedle arrays containing gold or iron oxide nanoparticles such that particles are not released during skin insertion, remaining within the crosslinked polymer matrix. Illumination of gold nanoparticles with near infrared light, or application of a magnetic field to iron oxide nanoparticles, will cause them to heat up, leading to local tissue heating sufficient to destroy cancer cells. Local anaesthetic release will reduce discomfort during and immediately after treatment. Crucially, this treatment will be minimally-invasive and leave no polymeric or particulate material in skin. This project combines pharmaceutical technology with physical chemistry, biophysics and biology. The student will design and evaluate both microneedles and nanoparticles, developing skills in formulation science, spectroscopy and biological sciences, with the project culminating in demonstration of efficacy in an animal model.

General Email Enquiries
pharmacypostgrad@qub.ac.uk

Project Email Enquiries
Professor Ryan Donnelly
r.donnelly@qub.ac.uk

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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