WE ARE QUEEN'S UNIVERSITY BELFAST

We are exceptional

School of Pharmacy PhD Project 2017 / 2018

Simultaneous sensing and self-regulating treatment of infection in biomaterials

Prof C McCoy, Prof SEJ Bell, Prof T Gunnlaugsson and Dr N Irwin

Medical devices can act as reservoirs for infection of patients, and is a significant cause of death and illness. Two significant hurdles impede solving this problem. Firstly, rapidly and sensitively detecting infection in situ is difficult. Secondly, approaches to combat infection are of limited efficacy or encourage bacterial resistance.

Recently, Bell et al. demonstrated how densely-packed 2-dimensional silver nanoparticle arrays can be easily assembled at the surface of thin polymer sheets; McCoy showed these can control microbial infection (Small, 2016, in press).

Separately McCoy & Gunnlaugsson (TCD) developed a high-sensitivity hydrogel-embedded sensor which "switches on" strongly, and only, in the presence of urease-producing bacteria (JACS, 2016, in press).

There now exists an opportunity to bring together these skill sets to develop materials to simultaneously sense and treat urinary catheter infection.

Both aspects rely on the ubiquity of urease-producing pathogens in device infections (Stickler, World J Urol 1999,17,345). Theranostic materials will be able to be coated onto catheter shafts and respond simultaneously to infection in two ways. Firstly, soft, self-conforming silver coating layers will be developed by assembling particle arrays on hydrogel coating surfaces. These will combine with anti-encrustation compounds whose release is triggered by infection to combine continuous silver ion release to prevent infection with triggered release of additional anti-encrustation compounds when this first line of defence begins to fail. The self-regulating system switches on and off in the presence or absence of infection. Secondly, they will report the infection through a urease-selective optical sensor based on pH-switching luminescent sensors.

General Email Enquiries

pharmacypostgrad@qub.ac.uk

Project Email Enquiries

Professor Colin McCoy
c.mccoy@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.

Queen's University Belfast