WE ARE QUEEN'S UNIVERSITY BELFAST

We are exceptional

School of Pharmacy PhD Project 2017 / 2018

Smart Polymeric Materials for Biofilm Sensing and Control

Professor Brendan Gilmore and Professor Andrew Mills

Hospital acquired infections, (HAIs) are a global concern with, the US healthcare industry alone, estimating their cost to the service at ca. $10 B p.a. Key to their persistence is biofilm formation, which increase antimicrobial resistance (AMR) and improve microbial survival, with the result that biofilms are responsible for an estimated 80% of all chronic infections. Biofilms form on most surfaces and, in the healthcare environment many of these are polymer based, including: disposables (such as curtains, sheet-coverings and aprons) and more permanent items, such as door handles, push plates and toilet seats. As a consequence for polymeric surfaces, found in the healthcare industry, there is a real imperative to be able to identify the presence of such biofilms, so as to facilitate their removal using biocides/anti-microbial agents. The main objectives of this proposal are two-fold to develop: (1) a smart ink that can be printed onto plastic surfaces and (2) a smart plastic film. Both systems will have the potential to provide an early indication of biofilm formation by exhibiting a striking and reversible colour change within the area occupied by the biofilm, and so prompt action that leads to its subsequent removal.
The research proposed here will allow the 24/7, non-invasive monitoring of various, recognised important wound parameters/markers and communicate this information easily and readily, via one or more colour changes of a range of selected indicators; this information is valuable with respect to identifying the status (with respect to infection and biofilm formation) of the wound. This will help minimise unnecessary wound dressing changes (in order to establish the state of the wound) and unnecessary delays in treatment. This feature is especially important, since it is known that, without rapid intervention, an infected wound can deteriorate very quickly and so lead to a much higher overall cost of care. The smart polymeric system will utilise inexpensive, production-scalable, colour-based indicators that are sensitive to important wound care markers and conditions within the dressing, including: pH, humidity, odour, O2 and CO2. As suggested by the title, the sensor technology will form an integral part of the wound dressing. Finally, we will utilise specific changes associated with infection biomarkers to stimulate release of conventional antimicrobial agents from the polymeric system. All systems will be evaluated against biofilm in vitro against the ESKAPE pathogens, and using a novel ex vivo pig skin biofilm model.

General Email Enquiries

pharmacypostgrad@qub.ac.uk

Project Email Enquiries

Professor Brendan Gilmore
b.gilmore@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