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| **\*Title of studentship** | Infection-responsive coatings for the prevention of catheter-associated urinary tract infections |
| **Value / what is covered?** |  |
| **Awarding body** | Self-funded project |
| **Number of studentships** | 1 |
| **\*Summary descriptive text / Example of research project** | Medical care has transformed over the last century with significant improvements in the variety and extent to which various diseases can be treated and/or prevented. One of the most transformative factors has been the increased use of indwelling medical devices, particularly in critical care, such as endotracheal tubes, intravenous catheters, and urinary catheters. These indwelling devices have provided significant improvement in patient care during treatment and recovery, however, they are prone to bacterial contamination which can facilitate biofilm formation and lead to the development of medical device-associated infections. In particular, catheter-associated urinary tract infections (CAUTIs) are the most common nosocomial infection in UK hospitals with >50,000 cases annually, costing the health service more than £30 million every year.  A key strategy to address this growing problem is through the prevention of bacterial colonisation and biofilm development on urinary catheter surfaces. This is most commonly achieved through use of antimicrobial-eluting coatings which can delay the onset of CAUTI but this strategy is often short-lived, uncontrolled, and may give rise to antibiotic resistance. Over the last decade, our research group has focused on the use of 'smart' stimuli-responsive drug release coatings that exploit chemical changes, such as pH, that occur in the urine of patients during the onset of CAUTI.  This project will continue this strand of exciting research by developing novel coating materials capable of responding to specific bacterial biomarkers to produce an infection-responsive catheter coating capable of preventing CAUTI over an extending periods of time. Specifically, the project aims to:   * Identify suitable biomarker targets of clinically relevant urinary bacteria * Synthesise and characterise a suite of bacterial-responsive monomeric candidates suitable for responsive drug delivery * Formulation of drug delivery systems using synthesised responsive monomers * Assessment of the coatings to prevent bacterial biofilm development using *in vitro* dynamic flow bladder models.   Through the development of novel polymeric coatings and assessment using sophiscated models of the urinary bladder the project will develop new strategies to address the rising incidence of CAUTI, and may be further extended to other device applications. This interdisciplinary project will provide the successful candidate with extensive experience in organic synthesis, materials science, and microbiology, using cutting edge microscopy equipment. |
| **\*Supervisor(s)** | Dr. Matthew Wylie, Professor Colin McCoy |
| **\*Eligibility / residence Status** | Self-funded project |
| **Country** | Northern Ireland |
| **\*Start date and duration** | 1st October 2022 |
| **\*Faculty** | MHLS |
| **\*Research centre / School** | Pharmacy |
| **Subject area** | Pharmacy, Infection control, Biomaterials, Microbiology |
| **Candidate requirements / Key skills required for the post** | Applicants should have a 1st or 2.1 honours degree (or equivalent) in a relevant subject. Relevant subjects include Pharmacy, 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. |
| **\*Deadline for applications** | September 2022 |
| **\*How to apply / contacts** | Postgraduate Research applicants must have applied to Queen’s, via the Direct Applications Portal.  <https://dap.qub.ac.uk/portal/user/u_login.php> |
| **Relevant links / more information** | <http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/PostgraduatePositions/>  <http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/> |
| **Keywords for search filters** | Biomaterials, urinary catheters, stimuli-responsive, infection, device coatings |
| **Training provided through the research project** | The candidate will benefit from broad training in materials science, organic chemistry, microscopic techniques (SEM, AFM, fluorescence microscopy), and surface fouling assay techniques e.g. microbiology, tissue culture, and protein adsorption studies. Presentation, writing and interpersonal skills will be developed. The student will also have access to a wide range of training opportunities provided by the university's graduate school programme. |
| **Expected impact activities** | Our research has attracted interest from several leading medical device companies with several ongoing industrial collaborations related to this project. This project will further this research and it is envisaged findings from the project may lead to further opportunities to engage with our industrial partners.  Overall, the project will develop antimicrobial coatings for indwelling urinary catheters which can reduce the risk of catheter-associated urinary tract infections. Findings from this project will lay the groundwork towards potential optimisation for future clinical translation. |