Case Study

National Biofilms Innovation Centre

A NEW CLASS OF ACRYLATE POLYMERS

Helping to support biofilm models to assess novel interventions

Indwelling urinary tract catheters are the most commonly employed implanted medical devices. However, indwelling catheters promote catheter-associated urinary tract infections (CAUTIs) that, if left untreated, may lead to acute pyelonephritis, urosepsis and death. Treatment for CAUTIs usually depends on catheter removal and antibiotic therapy. Worldwide, 70-80% of the 150 million urinary tract infections reported annually are CAUTIs which impose both serious health problems and are a significant economic burden.

Attempts to reduce the likelihood of CAUTIs have focused on improved hygiene, intermittent catheterization and the development of novel catheter materials. Efforts to develop biocompatible catheter materials that resist biofilm formation have focused on the incorporation of antimicrobial agents by impregnation into, or surface conjugation onto, the biomaterial. However, silver-coated catheters have been disappointing in clinical use while impregnation with antimicrobials suffer with loss of efficacy as the active agents leach away. They also increase the challenges associated with the emergence of multi-antibiotic resistant pathogens. Consequently, the ideal urinary catheter biomaterial should prevent biofilm formation in the first place.

Profs. Morgan Alexander and Paul Williams are NBIC Co Investigators from the University of Nottingham. With support from the Wellcome Trust they have developed a high throughput polymer microarray methodology to screen for biofilm resistant polymers. Over 20,000 assays on 1300 unique co-polymers resulted in the discovery of a new class of acrylate polymers that resisted bacterial biofilm formation called BACTIGON®.

The Nottingham NBIC Innovation Research Fellows and the EPSRC-funded 'Next Generation Biomaterials' team in July 2019 at the Royal Society Summer Science Exhibition in London.

In collaboration with Prof. Derek Irvine from the University of Nottingham, and NBIC partner Camstent Ltd, a polymer-coated urinary tract Foley catheter has subsequently been developed and manufactured, receiving CE mark approval in 2017 for clinical use in hospitals in the UK and Europe.

In collaboration with the Nottingham NBIC Innovation Research Fellows and the EPSRC-funded 'Next Generation Biomaterials' team, this topic was presented at the Royal Society Summer Science Exhibition in July 2019. The 'Great Greeting Experiment', a live research project developed by NBIC Co Investigator Dr Kim Hardie from the University of Nottingham, used UV iridescent powder and a UV light box to allow volunteers to observe transference and the effectiveness of hand washing. 'Stick or Slide' and 'Stop the Superbugs' exhibits illustrated how difficult it is to remove a biofilm and how our novel catheter biomaterials work to prevent infection.

Professor Paul Williams

Paul Williams is Professor of Molecular Microbiology at the University of Nottingham. He is a Wellcome Trust Senior Investigator, Director of a Wellcome Trust Ph.D Training Programme in Antimicrobials and Antimicrobial Resistance.

Professor Morgan Alexander

Morgan Alexander is Professor of Biomedical Surfaces at the University of Nottingham and director of the EPSRC Programme Grant in Next Generation Biomaterials Discovery, the 3D OrbiSIMS facility and a Wellcome Trust Senior Investigator.