National Biofilms Innovation Centre

Case Study

IMPROVING PATIENTS' QUALITY OF LIFE

Helping industry find academic partners to solve unmet needs

According to the World Health Organization, each year, an estimated 4% of people with long-term urinary catheters will develop a CAUTI or blockage. Bacteria can enter the bladder during catheter insertion, through the catheter lumen and along the catheter urethral interface. Infection and blockage risks rise the longer a catheter remains in place, because the bladder and catheter become colonised with bacteria, which cannot easily be removed. The presence of a urinary catheter enables bacteria to form a biofilm, which creates a sticky, slimy, and sometimes crystalline, layer that protects bacteria from both antimicrobials and the person's natural immune response. When a bladder fills and empties normally, bacteria are flushed away; this protection is lost when a person has a urinary catheter on continuous drainage.

Catheter-related problems cause distress for patients, reduce quality of life, and create unplanned expenditure for the health service and families. Finding a solution that reduces adverse effects caused by catheters will result in significant benefits to the health service, social and voluntary services and the families who care for these patients.

NBIC Proof of Concept funding supported a collaboration between University of Southampton researchers Dr Sandra Wilks and Professor Mandy Fader and medical device company, NanoVibronix.

The project shows the effect of the UroShield™ CE-marked device on bacterial populations in patients with indwelling urinary catheters. An evaluation was conducted to assess any changes to the catheter-associated microbiome in order to understand the impact of the UroShield™ on the biofilm community. Patients were also interviewed to understand the impact of using the device on quality of life.

UroShield™ is a low-energy, battery powered device with an accessory designed for application to the extracorporeal segment of all types of urological (urethral or suprapubic) catheters and is intended to minimise bacterial adhesion and colonisation on the catheter surfaces.

The Nanovibronix UroShield™ is applied externally to the catheter and has been developed to prevent catheter blockages and biofilm contamination, resulting in a reduction in urinary infections, improved patient outcomes and lower healthcare costs. The UroShield™ utilises low-frequency ultrasonic acoustic waves (Surface Acoustic Wave) which run longitudinally along both the inner and outer surfaces of the catheter. These surface acoustic waves prevent bacteria from docking and adhering to the catheter and subsequently prevent the formation of biofilm. Initial results of the independent, real world patient study suggest changes in the microbial population diversity following use of the UroShield™, with potential beneficial effects on the urinary and catheter microbiome. A further study focused on the bladder microbiome and beneficial effects through the use of ultrasound may lead to the generation of additional Intellectual Property.

As a result of the project, the company were able to extend their aims to include more patient reported outcomes and now have a data set with microbiological data and information on device use and acceptability. Brian Murphy, Chief Executive Officer at NanoVibronix Inc. said,

"We are continuing our collaboration with the teams at the University of Southampton and applications are being developed to allow for a full randomised control trial. The microbiological results have been very interesting and we would be keen to explore opportunities to understand the mechanisms of action in more detail and to enable us to continue working with the Dr Wilks' team at Southampton".

Dr Sandra Wilks

Sandra Wilks is an Associate Professor in Applied Microbiology at the University of Southampton. Her interests are in understanding biofilm communities and she has worked across several areas, including drinking water, built environment, food safety, and medical device management.

Brian Murphy

Brian Murphy is Chief Executive Officer of NanoVibronix Inc., a medical device company focused on creating medical products utilizing its proprietary low-intensity, surface acoustic wave technology. The company's patented technology allows for creation of miniature transducers that transmit low-frequency, low-intensity ultrasound through flexible material surfaces. This unique platform is being utilised for a variety of medical applications.