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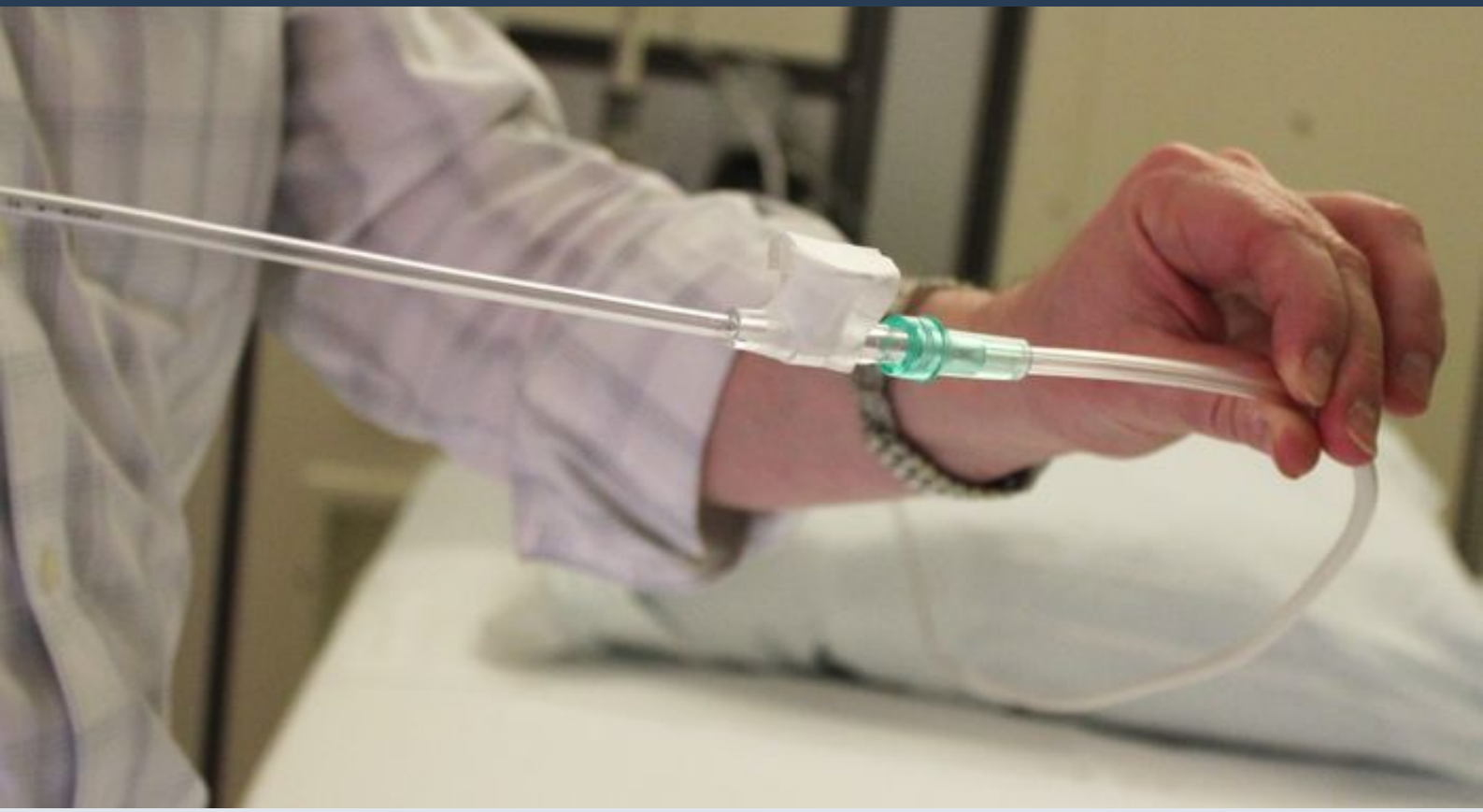
Novel Synthetic Materials that Minimise Bacterial Attachment and Cellular Adhesion

A novel class of materials (unique acrylate and methacrylate polymers) resistant to bacterial attachment



Please note, header image is purely illustrative. Source: Quinn Dombrowski, Flickr, CC BY-SA 2.0

IP Status

Patent application submitted

Seeking

Licensing, Seeking investment, Commercial partner

About **University of Nottingham**

The University of Nottingham produces world-changing research by focussing on the problems and challenges that affect societies and people on a wide scale. More than 80% of Nottingham research is ranked in the highest categories ‘world-leading’ or ‘internationally excellent’.

Background

A key challenge for the optimal performance of medical devices is the prevention of bacterial attachment. The consequence of bacterial attachment to the surfaces of medical devices is the potential to initiate the establishment of highly resistant surface associated biofilms. Biofilms then present as sources of bacterial infection and reservoirs of plasmids that carry antibiotic resistant genes.

It is estimated that 80% of hospital derived infections involve biofilms and this technology would potentially reduce this figure and have a positive impact on patient outcomes.

In vitro testing of a novel class of structurally related polymers identified using a high throughput approach have been shown to outperform commercially available silver-containing coatings.

Tech Overview

The technology is a novel class of materials (unique acrylate and methacrylate polymers) resistant to bacterial attachment discovered using a high throughput materials discovery platform with up to 81%, 99%, 99% reduction in bacterial coverage of *P. aeruginosa* (gram-), *S. aureus* (gram+) and uropathogenic *E. coli* (gram-) respectively, compared to market leading anti-bacterial silver hydrogel as well as clinically isolated strains.

Lead formulations prevent biofilm formation through resistance to bacterial attachment rather than a killing mechanism (supported by the unaltered growth profile of bacteria in contact with hit materials).

Coating silicone with these 'hit' materials achieved up to a 30-fold (96.7%) reduction in the surface area covered by bacteria compared with a commercial silver hydrogel coating *in vitro* .

Figure 1

Figure 2

Further Details

Combinatorial discovery of polymers resistant to bacterial attachment. *Nature Biotechnology* Vol 30, No. 9, Sept 2012.

Discovery of Novel Materials with Broad Resistance to Bacterial Attachment Using Combinatorial Polymer Microarrays. *Advanced Materials* . 2013, 25, 2542-2547.

Benefits

- Drastically reduces bacterial attachment to commonly used clinical grade silicone
- Reduction in biofilm associated implant failure
- Reduction in likelihood of harbouring reservoirs of plasmids containing antibiotic resistant genes

Applications

This technology has applications in the manufacture of medical devices, implants or critical surfaces that require resistance to bacterial attachment.

Opportunity

Licence and commercial collaboration or investment opportunities are available for this technology.

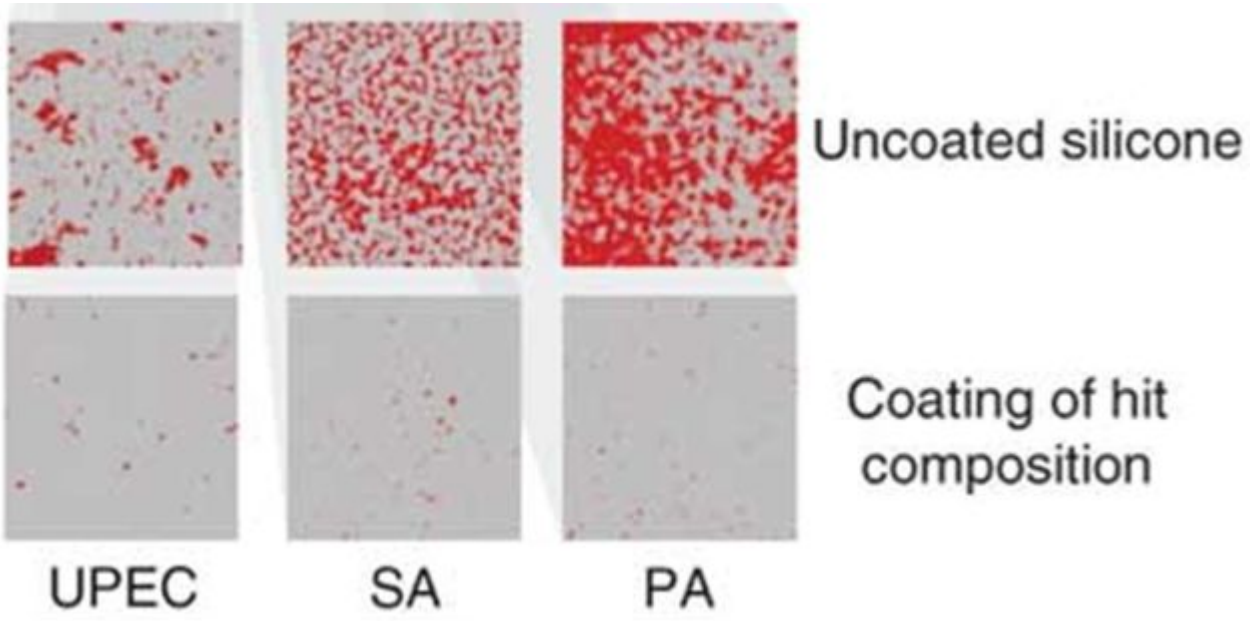
Patents

- US/EP applications from PCT (GB) Publication No. WO2012/150467 (priority date: 04-11-2011). 'A method for inhibiting bacterial attachment to a surface by the application of a (meth) acrylate or (meth) acrylamide monomer or copolymer'

Appendix 1

Figure 1

Figure 1: Red stained biofilm for the three pathogens studied (*P. aeruginosa* (PA), *S. aureus* (SA), UPEC) from coated and uncoated silicone catheters.



Appendix 2

Figure 2

Figure 2: Catheters dip-coated with hit polymer were implanted subcutaneously in mice. Mice were inoculated after 1 d with S. aureus Xen29, injected into the center of the tube. (a) The bioluminescence at the infection site was measured on the day of inoculation (day 0) and for the next 4 days. The difference in bioluminescence between coated and uncoated samples from day 1 to 4 was confirmed to 99.5% confidence (t-test). (b,c) Luminescence images with overlaid brightfield images of mice implanted with both uncoated (left) and coated (right) catheter segments on day 0 (b) and day 4 (c). Adapted from Nature Biotechnology. Vol 30, No. 9, Sept 2012.