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Novel polymers which resist bacterial attachment

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Technology description

The Opportunity

·We have developed a novel polymer which prevents bacterial adhesion.

·We are using it to coaturinary cathetersto prevent encrustation and catheter associated urinary tract infection (CAUTI).

·We have shown that not only is the coating non-toxic and non-irritant, but thatin vivoits use dramatically reduces the ability of bacteria to cause infection.

·The urinary catheter market is worth ~$1bn p.a. and there are a number of catheters on the market which purport to be anti-bacterial. However, CAUTI remains avery real and growing problem which current technologies have failed to address.

·We are looking to partner with a company active in the medical device field to commercialise our technology

·If our technology is of interest to you we would be delighted to share further details with you.

Summary

With funding from Wellcome Trust, a team led by Professor Morgan Alexander has developed a technology which enables them to rapidly produce novel polymers with unique bespoke properties. Their first product is a novel monomeric formulation of acrylates which are polymerised to coat the internal and external surfaces of urinary catheters (both latex and silicone).

The Market

The urinary catheter market is worth ~$1bn p.a. and within this market some sectors are increasing in value by more than 10% CAGR. The insertion of any catheter into the body is a potential route for infection by the very nature that they are in contact with the outside world; additionally urinary catheters carry a concomitant risk to encrustation leading to blockage and catheter associated urinary tract infection (CAUTI) which increases significantly with the indwelling time of the catheter (+5% per day). CAUTI accounts for >40% of all institutionally acquired infections.

The Foley catheter was first introduced in the mid-1930s and is the most common form of urinary catheter in use today. It has undergone a series of incremental changes resulting in the modern version, predominantly through a change in materials and lubrication technologies for patient comfort.

The Foley catheter however is implicated in 80% of the CAUTIs noted above.

Current solutions in catheter technology provide for antibiotic impregnated devices and silver ion coating technologies. These devices have been widely adopted, but the data available now do not fully support the claims associated with these technologies and bacterial antimicrobial resistance to these approaches has been noted as a potential problem due to the selective pressure induced by the nature of their action. There are significant market drivers to provide improved solutions to CAUTI, the treatment of which adds a huge burden on the health service ($1,000 per patient). These costs are no longer reimbursable under the Medicare program in the US.

Technical Information

We are producing materials that have intrinsic anti-adherence properties on which bacteria find it difficult to attach and grow. In screening against a range of pathogens (uropathogenicEscherichia coli,Pseudomonas aeruginosaandStaphylococcus aureus) the large number of polymers screened have demonstrated a wide range of bacterial adherence characteristics (Figure 1).

A total of 22 candidate polymers have been selected that show significant reduction in bacterial adherence. These polymers are the subject of scale-up protocols indicating significant improved performance against uncoated silicone catheters and the market leading anti infective coating Bactiguard® (Figure 2). Candidate polymers are being further characterised and evaluated for their suitability in production and/or as coating technologies.

Figure 2. Comparison of bacterial coverage for PA and SA on a hit polymer (4 100%), uncoated silicone catheter, a commercial catheter (Bacti-Guard) and a positive control with the negative media-only controls.

In vitro studies have demonstrated the rationale and predictable antibacterial properties of the candidate polymers. Scale-up onto silicone catheters have resulted in excellent in vivo results from a murine subcutaneous foreign body model shown in Fig 3.

This illustrates clearance of a bacterial inoculate by the host immune defence system when placed in the lead polymer in vivo, compared to the silicone catheter where bacteria adhere, form biofilm and persist over the 4 day period of the experiment.

We are undertaking a 4 year program to evaluate this polymer coating technology and aim to license the technology to key businesses that provide urinary catheters throughout the world markets. We are not seeking to make incremental changes in the performance of these devices, rather we are gearing up to provide step change improvements over the existing competition.

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