Bio-instructive Polymers for Medical Applications

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Abstract

Two areas that are of critical importance in modern heath care are the prevention of hospital acquired infections and the treatment of chronic wounds. In the case of the latter, in the UK alone, the number of chronic wound patients is rapidly increasing due to medical conditions such as obesity and diabetes and is estimated to cost the NHS >£8 billion a year. Meanwhile, typical treatments such as regular cleaning, debridement and using inert dressings are not very effective. At Nottingham, we have recently identified several, non-eluting polymeric materials that promote either (a) resist biofilm adhesion or (b) an anti-inflammatory phenotype in macrophages which induces fibroblast proliferation and supports wound closure in a model chronic wound. These polymers achieve these biological/therapeutic outcomes due to the nature of the polymers molecular structure alone i.e., without the need for the elution of pharmacologically active compounds. This seminar will describe the discovery process from the use of high throughput screening to identify the novel concept of 'bio-instructive' polymers, through the copolymer process development to synthesis coatings to promote biofilm resistance from urinary catheters and microfluidic particles for use in wound dressings that promote wound healing.