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Novel Polymer Coatings to Reduce Infection on Blood Contacting Devices

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Abstract

Following insertion of medical devices, those in blood contacting environments undergo rapid adsorption of blood proteins to their surfaces, leading to suitable conditions for bacteria and fungi to adhere and develop into biofilms [1]. The biofilm environment increases tolerance to both antimicrobial agents and the host immune system. Once a biofilm has formed on the device surface, removal is often the only effective treatment [2], causing pain and discomfort to the patient, as well as increasing health care costs and hospital stay durations. We aim to prevent biofilm formation using polymers that are unsupportive of biofilms, rather than being biocidal. This strategy aims to increase the effectiveness of drug treatments, while minimising the development of antimicrobial resistance. Non-bactericidal polymer coatings have been shown to reduce bacterial biofilm formation on urinary catheters, *in vitro* and *in vivo* [3], as well as in the clinic [4]. However, the addition of blood proteins presents an additional challenge to the coatings' performance [5]. Protein adsorption can cause activation of various cascades within the blood, making haemocompatibility an important consideration in the development of new coatings. In this work, we create *in silico* models of biofilm resistance profiles. In addition, we synthesise polymer coatings and analyse their *in vitro* ability to prevent biofilm formation in a non-bactericidal way after conditioning in whole human blood, with the final goal of identifying a candidate coating for *in vivo* testing.

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