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Drug-free hydrogel based antibacterial hybrid polymers for wound healing applications

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The unique mechanical and structural features of microbial cellulose (MC) make this polymer a promising starting material for applications in wound dressing and skin regeneration. MC presents a higher degree of crystallinity compared to plant cellulose, which results in better mechanical properties such as higher tensile strength and Young's modulus. Moreover, the hydrogel-like structure enables MC to incorporate up to more than 90% its weight of water, ensuring an optimal level of moisture where applied. However, limitations to its use are related to the lack of antibacterial properties. Bacterial infections represent one of the major issues of concern for modern medicine because of the increasing resistance of bacteria against the traditional treatments. In this context, the need of novel strategies has become critical. HyMedPoly is a European project involving academic, industrial and clinical partners with an intent to generate a novel class of drug-free antibacterial materials based on natural and synthetic polymers as well as inorganic substrates. The focus of the research carried out at University of Westminster is to develop bacterial polymers with antibacterial properties for biomedical applications. In particular, this study aims to produce and chemically modify bacterial cellulose to obtain intrinsically active materials for wound dressing applications. A simple one-step reaction was performed to achieve the functionalization of the cellulose. The modified material was characterized using solid-state techniques such as Energy-dispersive X-ray Spectroscopy (EDX) and Fourier-Transformed Infra-Red (FT-IR). The activity of the antibacterial groups was evaluated by studying the inhibitory effect against Gram positive bacteria *Staphylococcus aureus*. Scanning electron microscopy (SEM) performed on modified MC samples after incubation with the bacteria showed a cell lysis based antibacterial activity (Fig. 1). Biocompatibility was assessed by testing the indirect cytotoxicity and the direct biocompatibility of the functionalised material using the HaCat cell line, a human keratinocyte cell line.

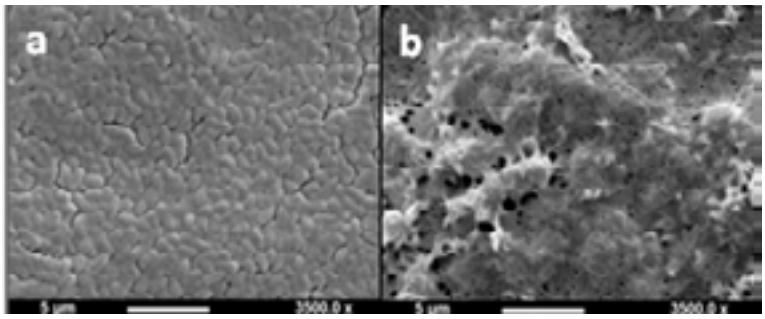

Figure 1: SEM image of microbial cellulose samples after incubation with S. aureus for 48 hours; a) Non-functionalized cellulose, b) Functionalized cellulose

Biography

Isabel Orlando is a Ph. D student in the Department of Molecular and Applied Biosciences at University of Westminster, London. Her Expertise lies in the field of Biosynthesis, Biotechnology, Polymer Chemistry and Organic chemistry.

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