SURFACE MODIFICATION WITH ENGINEERED BACTERIAL BIOCOMPATIBLE NANOMATERIALS FOR CELL PROLIFERATION

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Bacterial inclusion bodies (IBs) are highly pure protein deposits produced in recombinant bacteria.[1] Being insoluble in water, they are observed as porous and highly hydrated amorphous particles in the size range of a few hundred nanometers. The polypeptide chains that form IBs fold into an unusual amyloid-like molecular architecture compatible with their native structure, thus supporting the biological activities of the embedded polypeptides (eg fluorescence or enzymatic activity).[2] Therefore, a wide spectrum of uses as functional and biocompatible materials might arise upon convenient engineering.[3] Although theoretically feasible through adjusting genetic and production conditions, the biophysical features of these proteinaceus nanoparticles, such as activity and size, have been never engineered. In this study we characterize the relevant nanoscale properties of IBs as novel particulate materials using AFM, SEM and fluorescence confocal microscopy (Figure 1). Moreover, we have also explored at which extent the produced particles can be tailored by simple approaches (Figure 1D). In addition, as an intriguing proof-of-concept, inclusion body-grafted patterned surfaces have been obtained using the microcontact printing (μCP) technique[4] (Figure 2). The obtained modified surfaces dramatically stimulate mammalian cell proliferation exclusively on the IBs patterned areas, proving the potential of IBs in tissue engineering and regenerative medicine among other promising biomedical applications.[5]

References:

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[5] (a) Patent ES- P200900045 (b) E. García-Fruitós, E. Rodríguez-Carmona, C. Diez-Gil, R. M. Ferraz, E. Vázquez, J. L. Corchero, M. Cano-Sarabia, I. Ratera, N. Ventosa, J. Veciana, A. Villaverde, *submitted*

Figures:

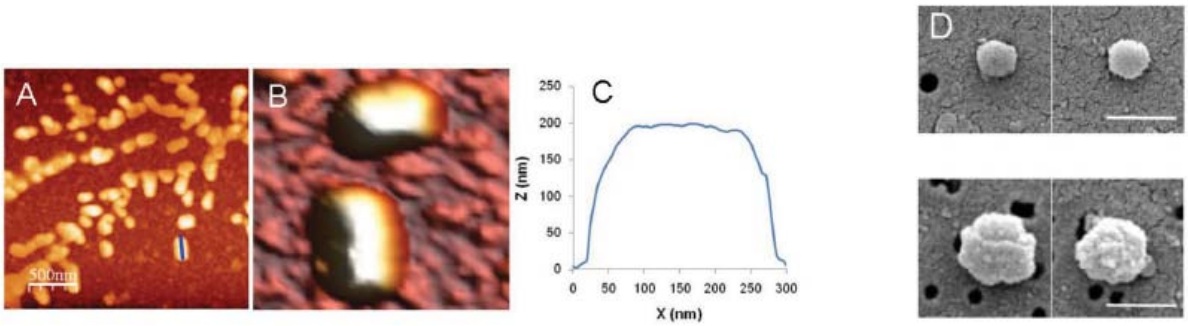

Figure 1. A-B-C: 3h-aged GFP IBs imaged by AFM; D: SEM images of 3h-aged IBs produced with different cells. White bars indicate 500 nm.

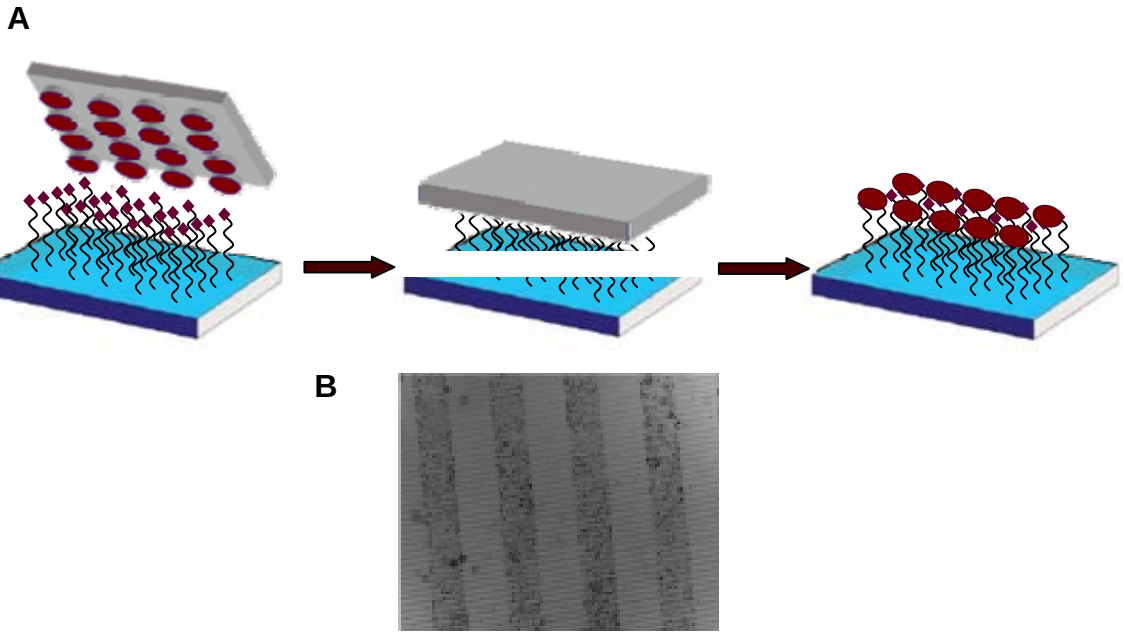

Figure 2. A: Scheme of the microcontact printing technique used to pattern IBs on pre-functionalized silicon with amino-terminated monoalayers. B: Optical microscopy image of 50 μm lined IBs patterned on amino terminated silicon surfaces using μCP.