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Interactions with cellulose surfaces

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Cellulose is the predominant polymer of the biosphere. An understanding of the interaction of cellulose surfaces with different kinds of adsorbed molecules is key to many fundamental questions in biological, environmental and materials sciences. Unlike other biopolymers, the synthases for cellulose polymerize the monomer (glucose) directly into the nanostructure, unitary crystallites called microfibrils. This mode of synthesis imposes, due to the crystallographic packing of the cellulose chains, a well defined surface chemistry and thus interactions to adsorb molecules on cellulose surfaces. Here we have examined and discuss the interaction of a simple model protein adsorbed from solution with a model flat cellulose surfaces with neutron reflectivity. Smooth deuterated cellulose films were prepared from reconstituted and spin coated bacterial as the substrate in order to optimize the contrast between the protein and the cellulose layer. A contrast variation series of the water sub-phase was performed to estimate the density of cellulose chains in the cellulose film. From this compositional information we draw inferences to the density of hydroxyl groups on the cellulose surface and compare this with the density of hydroxyl's on a microfibril surface. information we draw inferences to the density of hydroxyl groups on the cellulose surface and compare this with the density of hydroxyl's on a microfibril surface.

Primary authors: Dr GARVEY, Christopher (MLZ); Prof. GARNIER, Gil (Monash University); Dr RAGHUWANSHI, Vikram (Monash University)

Presenter: Dr GARVEY, Christopher (MLZ)

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