594a Fibronectin/Polyelectrolyte Multilayer Assemblies: Film Formation and Cell Attachment Studies

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Electrostatically driven layer-by-layer (LbL) self-assembly is a simple and robust method for realizing structurally tailored biomaterial coatings, of thickness ca. 10 nanometers, containing biofunctional ligands. We investigate the placement of fibronectin – a matrix protein useful in tissue engineering applications – onto multilayer films formed by the alternate deposition of poly-L-lysine (PLL) and dextran sulfate (DXS). We use optical waveguide lightmode spectroscopy (OWLS) and quartz crystal microbalance with dissipation (QCM-D) to characterize film formation in situ. We find fibronectin adsorption to a film terminated with PLL to exhibit rapid kinetics and a large saturation, and to be essentially irreversible. In contrast, fibronectin adsorption to a film terminated with DXS is characterized by slower kinetics and a more modest saturation, and is partially reversible. We find no evidence of fibronectin penetrating the multilayer film. We use optical microscopy to determine the influence of fibronectin/polyelectrolyte multilayer assemblies on human umbilical endothelial cell (HUVEC) behavior. We observe the addition of fibronectin to DXS terminated assemblies to result in drastically increased HUVEC spreading and circularity. In contrast, the addition of fibronectin to PLL terminated assemblies leads to only subtle changes in the HUVEC response. We discuss this key difference in terms of the structure of the adsorbed fibronectin layer as well as the charge and hydration of the multilayer film.