

Growth and Behavior of Chondrocytes on Nanoengineered Surfaces

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The behavior of cells *in vitro* varies greatly in comparison to normal cell behavior *in vivo*. Replicating the *in vivo* microenvironment of the cells is highly critical in the field of tissue engineering. This work studies the effect of multilayer nanofilm composition (deposited using the layer-by-layer technique) on the behavior, viability, and cellular activity of chondrocytes. The chondrocyte phenotype is very labile, and its morphology and behavior were expected to be significantly influenced by the surface composition of the substrates. The different materials tested were poly(styrenesulfonate), fibronectin, poly-L-lysine, poly-D-lysine, laminin, bovine serum albumin, chondroitin sulfate, poly(ethyleneimine), and poly(dimethyldiallylammonium chloride). Unmodified tissue-culture polystyrene (TCPS) was used as a standard control surface, with collagen as positive control and poly(ethylene glycol) amine as negative control. The different nanofilm configurations tested were monolayer, bilayer, and trilayer. Cell morphology & attachment, viability, and functionality were determined using bright field microscopy, Live/Dead viability assay, and anti-type II collagen & aggrecan immunohistochemistry, respectively. All experiments were performed with triplicate measurements for statistical evaluation of the results. The results indicate that there is a difference in the cell morphology, viability, and functionality for the multilayer nanofilms as compared to monolayer films.