

Gradient and uneven nano-patterns distributions for cell adhesion and differentiation studies

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Cell adhesion onto bioengineered surfaces is affected by a number of variables, including the former substrate derivatisation process. Cells can sense and respond to their immediate surroundings. The information arising from this environmental sensing is integrated into the cell machinery through receptor proteins located at the cell membrane. We have studied the correlation between cell adhesion and cell-adhesive ligand surface gradient concentration. Similar procedure has been used to systematic *in vitro* screening of the effects of different concentrations of immobilized Bone Morphogenetic Protein (BMP-2). For this purpose, gradient surfaces were created on poly(methyl methacrylate) substrates by continuous hydrolysis and were then grafted with biotin-PEG-RGD molecules or BMP-2 molecules. In addition, nano-patterning of arginine-glycine-aspartic acid (RGD)-tailored dendrimers has been used to obtain uneven distributions of cell-adhesive motives. Cell adhesion studies reveal that first adhesion events are dictated by the surface layout and reinforced by a narrow interligand spacing and high local ligand densities.. This is a simple, all-organic nano-patterning approach that can be easily scaled up to large surface areas. The biocompatible and biodegradable nature of dendrimers also opens for biomaterial applications.