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TOF-SIMS Analysis of Bio-Functionalized Surface Structures for Specific Cell Adhesion

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INTRODUCTION: Adhesive contacts between neighbouring cells and to the extracellular matrix play a crucial role in maintaining tissue integrity, cell differentiation and cell function as well as in understanding processes like bio-film formation [1, 2]. To achieve specific cell adhesion on inanimate matter (e.g. as substrates for tissue engineering) it is necessary to "mimic" the extracellular matrix by immobilizing extracellular matrix proteins - e.g. on the surface of a substrate - in a spatially well defined manner. This requires (1) the necessary extracellular matrix proteins, (2) a toolbox to prepare nano- and micro-patterned surfaces as well as (3) techniques for orientated immobilization of the proteins on the patterned surface. A common way to immobilize proteins or peptides by chemisorption is the coupling via amino-functionalized surfaces which normally requires extensive chemistry with the risk of damage for the surface and/or the peptide [3].

METHODS AND RESULTS: Here we prepared -NH_2-functionalized patterns on glass and a one-step coupling mechanism of isothiocyanide-terminated peptides under mild experimental conditions. As model peptides we use synthesized isothiocyanide-terminated RGD-peptides. The amino acid sequence RGD is recognized by the integrin proteins of the extracellular matrix. The successful coupling to our amino-functionalized surface patterns is verified by cell adhesion assays.

TOF-SIMS analysis was carried out to follow all preparation steps. Spatially resolved chemical images from the sample surfaces verified the chemistry of the individual steps. These results will be discussed and used to derive future experiments.

REFERENCES: [1] M.P. Sheetz, B.J. Dubin-Thaler, G. Giannone, G. Jiang, H.-G. Döbereiner (2005) *Cell Migration* (ed. D. Wedlich) ISBN: 3-527-30587-4. [2] S. M. Pancera, H. Gliemann, D.F.S. Petri, Th. Schimmel (2006) *J. Phys. Chem. B* **110**: 2674. [3] U. Hersel, C. Dahmen, H. Kessler (2003) *Biomaterials* **24**: 4385-4415.