Effect of synthetic surface modifications on behavior of pluripotent stem cells

Josef Lavický[1], Jakub Pospíšil[1], Ilya N. Kotelknikov[3], Vladimír Proks[3], Ales Hampl[1,2], Josef Jaros[1,2]

[1] Department of Histology and Embryology, Faculty of Medicine, Masaryk University, Kamenice 3, Brno, Czech Republic

[2] Cell and Tissue Regeneration, International Clinical Research Center, St. Anne's University Hospital Brno, Czech Republic

[3] Institute of Macromolecular Chemistry AS CR, v.v.i., Heyrovského sq. 2, Praha 6-Břevnov, Czech Republic

The interaction between the human pluripotent stem cells and their environment is vital for their migration and differentiation during the embryonic development and morphogenesis. The study of these specific interactions is important. Stem cell niche is composed by proteins of the extracellular matrix, cell junctions and soluble factors. All these molecules influence wide spectrum of cellular responses. To understand these stimuli, we are preparing synthetic microenvironment by modification of cell culture surfaces utilizing peptide ligands.

First step was the preparation of repulsive layer to exclude nonspecific binding of proteins and the immobilization of ECM specific peptides with various concentrations. We utilized a planar system combining the covalent bond of peptides to linkers using click chemistry and a protein-repulsive brush made of PEG chains. This brush lowers the probability of false positive results by preventing the non-specific adhesion of cells and adsorption of proteins from the culture medium.

In this work, we present results of four examined ligands and the response of human embryonic stem cells. Final step will be patterning of biomolecules to micro and nano-meter domains and characterization of cell response. This knowledge can be further used in cell culture expansion and differentiation as well as implementation to complex 3D matrices (hydrogels) for tissue/disease modelling and developmental studies.

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