

Change in physicochemical properties in the lungs in response to chemically modified two-dimensional substrates with controlled elasticity

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The main goal of the presented results is a performance of comparative analysis of physico-chemical properties of originating from two distinct Interstitial Lung Diseases (ILD) - idiopathic pulmonary fibrosis (IPF) and nonspecific interstitial pneumonia (NSIP) cultured on two- and three-dimensional elastomer (PDMS) substrates with tuned mechanical and chemical properties and defining a set of parameters enabling label-free distinction between them.

Chemical properties of cells will be characterized using time-of-flight secondary mass spectroscopy (ToF-SIMS) while their mechanical properties will be determined using atomic force microscopy (AFM) working in force spectroscopy mode.

This brings a capability to study cell-substrate interactions at both single- and multi-cell levels as well as the combined influence of different external factors on cell adhesion and proliferation process. Such complex analysis, especially performed on 3D substrates imitating porous lung tissue will enable deeper understanding of environmental factors and mechanisms favoring fibrotic process and will contribute to recognition of its etiology. Subsequently a set of parameters enabling unambiguous distinction of fibroblasts originating from IPF and NSIP will be defined, which can be used as a basis for effective label-free identification of cells, delivering powerful tool for early stage diagnosis and personalized therapy.

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