Cellular mechanosensing by means of atomic force microscopy

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Mechanobiological sensing brings together biology, physics, medicine and engineering, thus helps to characterize how the protein molecules, cells and tissues respond to mechanical cues contribute to differentiation, development, structural and disease processes. The mechanobiology contributes to recognition of the sensing, transduction and application of mechanical signals by the biological systems. Atomic force microscopy (AFM) has grew up from the solid material characterization method to the a important device allowing the simultaneous topographical and mechanical characterization of living biological systems.

In this work such a potential of the AFM method will be described on selected examples. It was shown that cell stiffness determined by AFM can be used as a marker for cancer progression and metastatic potential. Different cancer types feature distinct cell stiffness and a connection between attenuated cell stiffness and increased invasion capacity was also observed. The force microscope can serve as mechanotransducing actuator of the cardiac cells contractility. Combination with the other methods, such as microelectrode array, leads to a comprehensive description of the contractile phenomenon. Pathophysiological electro-mechanical coupling needs to be characterized in a detail, if the alterations often resulting in mechanical heart failure would be understand and treated. \We would like to demonstrate AFM together with other biophysical merthods brings a promising approach that helps understand the correlation between the cell structure, cell mechanics, and function.

Keywords: mechanobiology, mechanosensing, cells, Atomic Force Microscopy

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References:

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