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Funding Source: College of Engineering Undergraduate Research Option

Micropost sensor array for cell traction forces studies

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A rapid fusion of MEMS (Microelectromechanical-Systems) and biology provides many diverse spheres and methods in cell studies. Micropost can be an important role in many different biological analyses because forces from cells can be obtained by calibrating micropost sensor array. Therefore, making better microposts will be useful for getting accurate force analysis. One way to make microposts is to pour poly-dimethylsiloxane (PDMS) onto wafer that has cylindrical holes array and peeled off from it after PDMS cured at room temperature for 24 hours. Before cultivating cells on microposts, deflection force relationship of micropost is expected be acquired in order to obtain forces that exerted by cells on its top. When cells were placed to Micropost Force Sensor Array (MFSA), they stuck and grew on MFSA's top surface which causes deflection of microposts, and this deflection can be transferred to the force. The relationship between laterally exerted point force at the top of microposts and micropost deflection force was observed by AFM (Atomic Force Microscope). Calibration shows that the relationship between deflection of microposts and force applied was non-linear. From the process of using MFSA technology, the result was that human skin fibroblasts (HSFs) made bigger traction forces than human patellar tendon fibroblasts (HPTFs). Therefore, MFSA is more accurate and a better technology that can help in useful knowledge such as the molecular and cellular system of tissue injury curing. In conclusion, we have used the MFSA technique with a non-linear micropost displacement/deflection-force relationship for measurement of the cell traction forces. New image analysis methods for measurement of displacement of microposts are implemented and high density micropost array were accomplished. This technique will be a very useful technology for many biological applications used in researching the reaction of cell shape and cytokines on CTFs and measuring CTF to find bad cells.