

Quantification of Magnetically Induced Changes in ECM Local Apparent Stiffness

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ABSTRACT The stiffness of the extracellular matrix (ECM) is known to influence cell behavior. The ability to manipulate the stiffness of ECM has important implications in understanding how cells interact mechanically with their microenvironment. This article describes an approach to manipulating the stiffness ECM, whereby magnetic beads are embedded in the ECM through bioconjugation between the streptavidin-coated beads and the collagen fibers and then manipulated by an external magnetic field. It also reports both analytical results (obtained by formal modeling and numerical simulation) and statistically meaningful experimental results (obtained by atomic force microscopy) that demonstrate the effectiveness of this approach. These results clearly suggest the possibility of creating desired stiffness gradients in ECM in vitro to influence cell behavior.