Viscoelastical properties of MCF-7 cells modulated by substrate stiffness

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Cells sense stiffness of surrounding tissues and adapt their activity, proliferation, motility and mechanical properties based on such interactions. Cells probe the stiffness of the substrate by anchoring and pulling to their surroundings, transmitting force to the extracellular matrix and other cells, and response to the resistance they sense, mainly through changes in their cytoskeleton [1]. Cancer and other diseases alter stiffness of tissues, and the response of cancer cells to this stiffness can also be affected [2]. In the present study we show that MCF-7 breast cancer cells seeded on polyacrylamide gels have the ability to detect the stiffness of the substrate and alter their mechanical properties in response. MCF-7 cells plated on soft substrates display lower stiffness and viscosity when compared to those seeded on stiffer gels or glass. These differences can be associated with differences in the morphology and cytoskeleton organisation, since cells seeded on soft substrates have a round morphology while cells seeded on stiffer substrates acquire a flat and spread morphology with formation of actin filaments, similar to that observed when seeded on glass. These findings show that MCF-7 cells can detect the stiffness of the surrounding microenvironment and thus, modify their mechanical properties.

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[2] L. Chin et al., Curr Opin Chem Eng, 11: 77-84 (2016).