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Remote, In-Plane Mechanosensing by Cells on Thin Floating Collagen Matrices[1] HAMID MOHAMMADI, University of Toronto, PAUL JANMEY, University of Pennsylvania, CHRISTOPHER MCCULLOCH, University of Toronto — The mechanical properties of the extracellular matrix impact many cellular functions but little is known about the contribution of matrix deformations to cellular mechanosensing that extends beyond the immediate cell-matrix interface. We examined remote mechanosensing by developing a cell culture model that employs collagen gels circumferentially supported by nylon mesh frames that float on culture medium. This approach obviates mechanical interference from the underlying rigid foundation of tissue culture plastic and enables assessment of remote, in-plane mechanosensing. With this model we found that 3T3 cells rapidly formed cellular processes whose lengths and number per cell depended on the frame opening size. When the opening sizes were increased (from 200 μm to 1700 μm widths) mean cell extension length, mean number of extensions per cell, and the sum of cell extension lengths significantly decreased (40-60%; $p < 0.0001$). In grids of 200 μm and 500 μm widths, cells sensed the presence of nylon frames because cell-generated deformation fields extended to the grid boundaries while this did not occur in grids of 1700 μm width. This new model demonstrates the ability of cells to sense remotely, variations of matrix stiffness in the absence of a rigid underlying substrate.

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