Mcgarry, J. P.; **Fu, J.**; **Yang, M. T.**; **Chen, C. S.**; **Mcmeeking, R. M.**; **Evans, A. G.**; **Deshpande, V. S.**

Simulation of the contractile response of cells on an array of micro-posts. (English)

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Summary: A bio-chemo-mechanical model has been used to predict the contractile responses of smooth cells on a bed of micro-posts. Predictions obtained for smooth muscle cells reveal that, by converging onto a single set of parameters, the model captures all of the following responses in a self-consistent manner: (i) the scaling of the force exerted by the cells with the number of posts; (ii) actin distributions within the cells, including the rings of actin around the micro-posts; (iii) the curvature of the cell boundaries between the posts; and (iv) the higher post forces towards the cell periphery. Similar correspondences between predictions and measurements have been demonstrated for fibroblasts and mesenchymal stem cells once the maximum stress exerted by the stress fibre bundles has been recalibrated. Consistent with measurements, the model predicts that the forces exerted by the cells will increase with both increasing post stiffness and cell area (or equivalently, post spacing). In conjunction with previous assessments, these findings suggest that this framework represents an important step towards a complete model for the coupled bio-chemo-mechanical responses of cells.

MSC:

74L15 Biomechanical solid mechanics
92C37 Cell biology

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