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Force Measurement for E-Cadherin-Mediated Intercellular Adhesion Probed by Protein Micropattern and Traction Force Microscopy

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Abstract : Cell's mechanical forces provide important physical cues in regulation of proper cellular functions, such as cell differentiation, proliferation and migration. It is believed that adhesive forces generated by cell-cell interaction are able to transmit to the interior of cell through filamentous cortical cytoskeleton. Prominent among other membrane receptors, Cadherins are prototypical adhesive molecules able to generate remarkable forces to regulate intercellular adhesion. However, the mechanistic steps of mechano-transduction in Cadherin-mediated adhesion remain very controversial. We are interested in understanding how Cadherin protein complexes enable force generation and transmission at cell-cell contact in the initial stage of intercellular adhesion. For providing a better control of time, space, and substrate stiffness, in this study, a combination of protein micropattern, micropipette manipulation, and traction force microscopy is used. Pair micropattern with different forms confines cell spreading area and the gaps in pairs varied from 2 to 8 microns are applied for monitoring the forces that cell pairs generated, measured by traction force microscopy. Moreover, cell clones obtained from epithelial cells undergone genome editing are used to score the importance for known components of Cadherin complexes in force generation. We believe that our results from this combinatory mechanobiological method will provide deep insights on understanding the biophysical principle governing mechano- transduction of Cadherin-mediated intercellular adhesion.

Keywords : cadherin, intercellular adhesion, protein micropattern, traction force microscopy
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