Theoretical Models for Cell Adhesion

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We theoretically analyze recent experiments on cadherin-induced cell-cell and cell-wall adhesion.

In this system a first-order phase transition takes place between a weakly and a strongly bound state. We present an empirical model which explains the experimentally observed growth dynamics of the contact points of aggregated cadherins. The morphology of the emerging cell-cell interface depends on the polarity of the cells: the cell wall is either flat (where cadherins form contact-lines) or it develops finger-like protrusions. In a theoretical model which takes into account the elastic properties of the cell membrane, the interaction with lipid reservoirs and the dynamics of the actin network we calculate the growth dynamics of fingers and line contacts. Our results explain qualitatively the experimental data.