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Title: MECHANICAL BASIS FOR EPITHELIALIZATION

Abstract

Epithelial tissues are comprised of sheets of cells that must establish and maintain proper architecture to function. The role cell mechanics in architecture development has been difficult to study in vivo since tissue development is predicated on the existence of cell-cell contacts. Our work addresses the question of how physical constraints such as the cellular density of a tissue, cell stiffness, and cell-cell or cell-substrate connections affect the development of a polarized tissue architecture. We made a 2D computational model of cells in a plane perpendicular to the tissue plane and found that a spatial constraint holding the cells in close proximity is required for cells to develop cell-cell borders. The model also predicts that cell-cell borders form in reduced adhesion simulations. These results were validated in culture using Madin Darby Canine Kidney cells. Our work suggests that cell density is the primary factor in cell-cell border development and that cell-cell adhesion is subordinate. We are currently working to address the question of how cell density affects the regulation of epithelial architecture.