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Effects of polar cortical cytoskeleton and unbalanced cortical surface tension on intercellular bridge thinning during cytokinesis

Li Wang, Mei-Wen An, Xiao-Na Li, Fang Yang, Yang Liu

Institute of Applied Mechanics and Biomedical Engineering, Taiyuan University of Technology, 030024 Taiyuan, China

Abstract To probe the contributions of polar cortical cytoskeleton and the surface tension of daughter cells to intercellular bridge thinning dynamics during cytokinesis, we applied cytochalasin D (CD) or colchicine (COLC) in a highly localized manner to polar regions of dividing normal rat kidney (NRK) cells. We observed cellular morphological changes and analyzed the intercellular bridge thinning trajectories of dividing cells with different polar cortical characteristics. Global blebbistatin (BS) application was used to obtain cells losing active contractile force groups. Our results show that locally released CD or colchicine at the polar region caused inhibition of cytokinesis before ingression. Similar treatment at phases after ingression allowed completion of cytokinesis but dramatically influenced the trajectories of intercellular bridge thinning. Disturbing single polar cortical actin induced transformation of the intercellular bridge thinning process, and polar cortical tension controlled deformation time of intercellular bridges. Our study provides a feasible framework to induce and analyze the effects of local changes in mechanical properties of cellular components on single cellular cytokinesis.

Keywords: Cytokinesis Normal rat kidney epithelial cells Intercellular bridge

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