Isotropic acto-myosin dynamics promote organization of the apical cell cortex in epithelial cells

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Abstract

Although cortical actin plays an important role in cellular mechanics and morphogenesis, there is surprisingly little information on cortex organization at the apical surface of cells. Here, we characterize organization and dynamics of microvilli (MV) and a previously unappreciated acto-myosin network at the apical surface of Madin-Darby canine kidney (MDCK) cells. In contrast to short and static MV in confluent cells, the apical surfaces of non-confluent epithelial cells form highly dynamic protrusions, which are often oriented along the plane of the membrane. These dynamic MV exhibit complex and spatially correlated reorganization, which is dependent on myosin II activity. Surprisingly, myosin II is organized into an extensive network of filaments spanning the entire apical membrane in non-confluent epithelial cells. Dynamic MV, myosin filaments and their associated actin filaments form an interconnected, pre-stressed network. Interestingly, this network regulates lateral mobility of apical membrane probes such as integrins or EGF receptors, suggesting that coordinated acto-myosin dynamics contributes to apical cell membrane organization