Self-organisation of acto-myosin leads to closure of the cytokinetic ring in mammalian cells

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Abstract

Cytokinesis is the final step of cell division during which a cell is separated into two cells. In many cell types, this process is driven by the contraction of a ring composed of actin filaments and myosin motors. How the interaction between motors and filaments generates the stress necessary for contraction is still poorly understood. Here, we orient the cytokinetic ring in mammalian cells by placing individual cells in designed microcavities [1,2]. Our approach allows visualising the ring in a single plane of focus. We reveal a pattern of regular clusters of myosin and formin. These structures are stable and follow a radial trajectory throughout closure. In addition, formation of the clusters coincides with the onset of constriction. We propose that the myosin/formin pattern is self-organised and that its emergence is associated with a sharp increase in the stress generated by the acto-myosin ring. These results are supported by a continuum mean field model for active gels.

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