
Folding oneself into shape: Apical actomyosin buckles an embryonic epithelium

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Abstract

Cell apical constriction driven by actomyosin contraction forces is a conserved mechanism during tissue folding in embryo development. While much is now understood of the molecular mechanism responsible for apical constriction and of the tissue-scale integration of the ensuing in-plane deformations, it is still not clear if apical actomyosin contraction forces are necessary or sufficient per se to drive tissue folding.

To tackle this question, we use the *Drosophila* embryo model system that forms a furrow on the ventral side, initiating mesoderm internalization. Past computational models support the idea that cell apical contraction forces may not be sufficient and that active or passive cell apico-basal forces may be necessary to drive cell wedging leading to tissue furrowing. By using 3D computational modelling and in toto embryo image analysis and manipulation, we now challenge this idea and show that embryo-scale force balance at the tissue surface, rather than cell-autonomous shape changes, is necessary and sufficient to drive a buckling of the epithelial surface forming a furrow which propagates and initiates embryo gastrulation.

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