**Anisotropies in cytoskeletal organisation induced by ROS and Rho signalling underlie multicellular sensing and spatial patterning in a Drosophila epithelium.**

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The morphogenesis and resilience of epithelial tissues relies on dynamic, heterogeneous and coordinated cell behaviors. We have used the amnioserosa, an active participant during Drosophila dorsal closure, as a model epithelium to investigate the origin and nature of cues that i) influence individual cell behaviors (both stochastic and collective), ii) drive transitions between behaviors and iii) enable their coordination. Using single cell genetic and nanoscale laser perturbations (to influence chemistry and mechanics respectively) in combination with 4D confocal microscopy and quantitative morphometry, we show that differences in cell behavior (cell delamination, pulsed apical constriction and unpulsed apical constriction) result from asymmetries in the spatial organization and dynamics of the actomyosin cytoskeleton. These asymmetries, specifically the restriction of actomyosin dependent contractility to either medial or circumapical pools or to specific cellular interfaces, are in turn influenced by stochasticities and asymmetries in physical cues (geometry and tension) and chemical signals (mitochondrial remodeling and oxidative stress signaling) that we find act both cell-autonomously and non-autonomously. We demonstrate that the influence of mitochondrial ROS on the spatial organization of the actomyosin contractility is mediated by its dose-dependent influence on the spatial restriction of the Rho-kinase ROCK to circumapical (high ROS) or medial (low ROS) pools. Collectively, our findings invoke the interplay between chemical and mechanical signals for multi-cellular sensing and the spatial patterning of epithelia during morphogenesis and maintenance. They also provide an explanation for compromised tissue integrity and resilience in metabolic and oncological pathologies.