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In vitro reconstitution and characterization of actomyosin-dependent mechanosensitive machineries associated with adhesion complexes

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Cells and tissues sense and respond to changes in the mechanical properties of their environment to maintain tensional homeostasis or to change fate. In cells, the actin cytoskeleton conveys this mechanical information towards the mechanosensitive machineries, present in cell-cell adherens junctions and cell-matrix focal adhesions that transduce mechanical forces into biochemical signals. The molecular basis of this mechanosensitive behaviour involves the exposure of cryptic protein interaction domains upon force-induced protein stretching. Hence, vinculin binds to mechanically stretched talin in FAs, while it interacts with stretched α-catenin in AJs. To dissect the molecular mechanisms by which these machineries act, we developed a microscopy assay with pure proteins in which the self-assembly of actomyosin cables controls the association of vinculin to talin- or α-catenin-micropatterned surfaces in a reversible manner. The systematic comparison of the parameters that govern the formation and the stability of these two key mechanosensitive switches open the way to a better understanding of the cooperation between focal adhesions and adherens junctions in the control of tensional homeostasis in tissues.