Morphodynamics and mechanosensitivity of spreading T cells

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The ability of a T cell to explore environmental mechanical cues, through bonds formed by its special receptors called T cell receptors (TCRs), is crucial for the first steps of immune recognition. While the mechanobiology of the TCR at the molecular level is increasingly well documented, its link to cell-scale response is poorly understood. We show that the response of T cells, quantified in terms of their spreading behaviour, is biphasic with substrate stiffness when mediated through TCRs [1]. However, when the ligands of the T cell integrins are additionally involved, the cellular response becomes monotonic [1]. This ligand-specific mechanosensing is effected through an actin-polymerization–dependent mechanism [2]. Based on a mesoscale model, this unusual response can be attributed to differences in force sensitivity and effective stiffness of the link formed between the ligand/receptor pairs and the actin cytoskeleton [1,2]. This may provide a general mechanism for immune cells to discriminate mechanosensitive bonds.

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[2] P. Dillard, R. Varma, L. Limozin and K. Sengupta., Biophys J. 107, 2629 (2014).