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Theoretical Modelling of Dynamic Phenotypes of Human HSC Affected by Clinical Agent

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The deformation of cells involves active, energy-consuming processes such as the remodeling of cytoskeletons. To numerically describe the effect of clinical agents on dynamic phenotypes of cells, we study the deformation and motion of human hematopoietic stem cells (hHSC) on surrogate substrates functionalized with the cell adhesion molecule N-cadherin, mimicking bone marrow surfaces. The deformation and migration of HSC is investigated by live cell imaging in the absence and presence of a clinical agent ADH-1. To account for the experimental observations, we utilize a theoretical model of deformable, self-propelled particles. Our experimental data shows that ADH-1 reduces the adhesion and active deformation of hHSCs on the surface displaying N-cadherin. The combination of the simple theoretical model and the label-free, quantitative in vitro experiments of hHSCs opens a large potential to numerically identify the differential effects of clinical drugs on dynamic phenotypes of primary cells.