Dynamics of immune cell morphology and motility on a topographical surface with controlled elasticity

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In this presentation, we experimentally show the spatiotemporally correlated parameters which determine the surface-adhered cell shape change during migratory processes. Guided crawling of a single immune cell (neutrophil), activated by chemoattractant concentration fluctuation, is demonstrated by adopting cell-attachable elastic micrograting and real-time optical live cell imaging techniques. After cell spreading on the micrograting surface, the pattern anisotropy and elastic modulus of the substrate induce significant changes in the cell morphology-motility interaction characteristics. Time-resolved interaction dynamics is quantitatively analysed, revealing the relation between the parameters of 2D shape and 2D motility. In addition, effects of substrate stiffness on the guided cell mobility are investigated by tuning the elastic modulus of the micropatterned surface. We finally discuss phenomenologically how immune cell shape and motility are dynamically correlated under the interaction with interfacial anisotropy and elastic energy [1,2].

[1] X. Jiang et al., Proc. Natl. Acad. Sci. U.S.A. 102, 975-978 (2005).

[2] P. J. M. Jones et al., Phys. Biol. 12, 066001 (2015).