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Probing Eukaryotic Chemotaxis with Optically Manipulated Biomimetic Microparticles. HOLGER KRESS, CECILE MEJEAN, JIN GYU PARK, TAREK FAHMY, ERIC DUFRESNE, Yale University — Chemotactic cells are able to sense chemical gradients and to move towards the source of a chemical agent. Eukaryotic chemotaxis is an important part of the mammalian immune system and poses many questions about the cell's physical mechanisms to detect, process and respond to external stimuli. While an understanding of this process is emerging, new methods for precise, controlled and flexible quantitative cell stimulation are needed to test existing hypotheses. We present such a method which is based on optically manipulated biomimetic microparticles. We are developing colloidal particles that provide controlled release of a chemoattractant. These micro-sources of stimulating agents are positioned with optical tweezers at arbitrary locations close to chemotactic cells in order to apply flexible spatio-temporal stimulation patterns to the cells. We show that chemotactic cell response - directed cell polarization, motility and turning - can be induced by our novel stimulation method. In conjunction with live cell microscopy this method is suitable to study the dynamics of intracellular signaling loops.

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