FluidFM: A novel nanofluidics instrument for single cell applications

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Abstract

The ability to obtain information at the single-cell level is becoming of central importance for numerous biological questions and represents a major challenge. FluidFM represents a new technology that uses microchanneled atomic force microscope cantilevers connected to a nanofluidic channel (1). Recently, we could demonstrate the suitability of this technology for spatial manipulation of individual microbial cells, i.e. bacteria and yeast, whereby the use of over- and underpressure applied to the built-in fluidic circuit allows lifting and release of cells with micrometric precision in a nondestructive way (2). The displacement procedure is supported by the AFM force-feedback ensuring that it can be carried out in a serial fashion and that the organisms are not damaged during the manipulation. FluidFM technology is suited for a number of different experiments. These include the selection of individual selected cells from environmental samples for clonal reproduction, placement of microorganisms in synthetic communities, deposition of viruses/bacteria on individual human cells, and adhesion experiments to measure adhesion forces of microbial cells to abiotic or biotic surfaces. Besides, single cell injection experiments are currently under way. Step by step, we aim to develop FluidFM technology into a versatile tool for single cell microbiology REFERENCES: 1. A. Meister, M. Gabi et al., Nano Letters 9 (2009) 2501. 2. P. D´orig, P. Stiefel et al., Appl. Phys. Lett. 97 (2010) 023701

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