Tomaso Zambelli, J Biosens Bioelectron 2013, 4:3
http://dx.doi.org/10.4172/2155-6210.S1.017

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Biosensors & Bioelectronics

June 17-19, 2013 Hilton Chicago/Northbrook, USA

Force-controlled injection and dispensing in liquid using the FluidFM

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Glass micropipettes are the typical instrument for intracellular injection, patch clamping or extracellular deposition of liquids into viable cells. The micro pipette is thereby slowly approached to the cell by using micro manipulators and visual control through an optical microscope. During this process, however, the cell is often mechanically injured which leads to cell death and failure of the experiment. To overcome these challenges and limitations of this conventional method we developed the FluidFM technology, an evolution of standard AFM microscopy combining nanofluidics via cantilevers with integrated microfluidic channel. The channel ends at a well defined aperture at the apex of the AFM tip while the other extremity is connected to a reservoir. The instrument can therefore be regarded as a multifunctional micropipette with force feedback working in liquid environment.

We are focusing on three applications for single-cell biology: i) cytosolic and intranuclear injection, ii) cell adhesion, and iii) single virus deposition on cell surfaces.

At the same time we are using the FluidFM as lithography tool in liquid.

Biography

Tomaso Zambelli studied Physics at the University of Padua (Italy). He completed his Ph.D at the age of 27 years from the Fritz-Haber-Institute of the Max-Plack-Society in Berlin (Germany) and postdoctoral studies from the CNRS in Paris (France). After 7 years at the CEMES- CNRS institute in Toulouse (France) he joined the LBB at ETH Zurich in 2006. He is an expert in scanning probe microscopy both in vacuum and in liquid. He directed the invention of the FluidFM technology.

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