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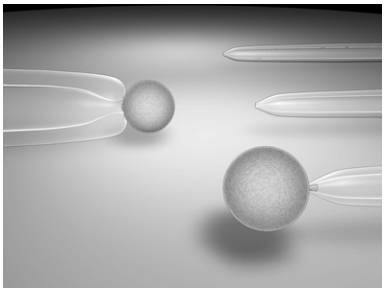
The flexibility of the proposed architecture allows different configurations, ranging from a limited number of data channels to be monitored, suitable for manual experiments, to thousands of data channels, coping with automatic HTS requirements.

2957-Pos Board B727
Dynamic Modulation of Multi-Cellular Clusters by Repetitive Microscope Projection Photolithography using Bio-Friendly Photoresist
Jongcheol Choi, Kwang Hoon Song, Hong-Ryul Jung, Junsang Doh.
POSTECH, Pohang, Korea, Republic of.
Multicellular interactions are critical for many essential cellular functions under various physiological/pathological circumstances including embryonic development, cancer metastasis, and immune responses. Recent development of surface chemistry and microfabrication has provided new opportunities to better understand behavior of multicellular clusters. Surface micro-patterning of cell-adhesion ligand (e.g. fibronectin, RGD peptide) islands surrounded by cell-repelling backgrounds (e.g. poly(ethylene glycol), bovine serum albumin, etc.) can be used to create multicellular clusters with different sizes and shapes to examine various biophysical and biochemical factors critical for multicellular interactions. However, the number of cells occupying identical size of islands within a surface may vary depending on local cell density and kinetics of cell adhesion/spreading. Variation in number may not be a serious issue for multicellular clusters composed of tens of hundreds of cells, but would be critical for small multicellular clusters composed of less than ten cells. Dynamic modulation of micropatterned cells were typically achieved by electrochemical or photochemical removal of cell-repelling moieties on the surfaces and subsequent adsorption of cell-adhesion proteins, therefore cellular responses tended to be delayed until enough cell-adhesion proteins were deposited.
Here, we developed a new technique that enables us to control the size/shape/composition of multicellular clusters composed of small numbers of cells, and to spontaneously modulate the shape and migratory behavior of multicellular clusters. Microscope projection photolithography (MPP) based on a bio-friendly photoresist poly(2,2-dimethoxy nitrobenzyl methacrylate-r-methyl methacrylate-r-poly(ethylene glycol) methacrylate) (PDMP) previously developed for the micropatterning of multiple proteins and cells with precise registration was extended. Using this technique, we successfully monitored actin, E-cadherin dynamics and collective migration of multicellular clusters.

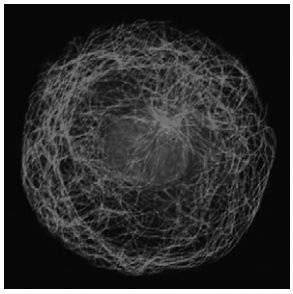
2958-Pos Board B728
Automation of "Classical" Patch Clamp Experiments Featuring Multi Channel Recordings, Optical Cell Selection and Ultra Fast Compound Application
Timm Danker, Elke Guenther.
NMI TT GmbH, Reutlingen, Germany.
We present a new approach of automating the ''classical'' patch clamp experiment based on cost efficient standard patch pipettes. Built on top of a standard patch clamp setup, the system enables recording of multiple cells in parallel. Pipette positioning, as well as seal and whole cell formation are automated. Unlike concurrent approaches utilizing ''planar'' chip designs, the method retains important features of the classical patch clamp methodology, including the possibility to optically select individual cells to be patched. This enables the use of transiently transfected cells qualified by fluorescent markers. The system also offers enhanced throughput for experiments which so far could only be addressed by tedious ''manual'' patch clamp. This includes piezo-driven, ultrafast application of compounds to the cell membrane with millisecond exchange- and exposure times which is crucial to investigate the kinetics of fast inactivating ligand gated ion channels. Thus, the new method offers a cost efficient approach to significantly enhanced throughput in areas of neurobiological and neuropharmaceutical research which so far were not amenable to automation.



2959-Pos Board B729
Intracellular Recording of Cardiomyocyte Action Potentials by Nanoelectrode Arrays
Carter (Ziliang) Lin, Chong Xie, Lindsey Hanson, Yi Cui, Bianxiao Cui.
Stanford University, Stanford, CA, USA.
Recent years have seen numerous applications of nanoelectronic devices for cell electrophysiology measurements. Here we present vertically aligned Pt and Au nanopillar arrays for both extracellular and intracellular recording of HL-1 cardiomyocytes. The small footprint of our nanopillar arrays holds the advantage of high spatial resolution recording. We discover that the tight cell membrane-electrode interface allows recording of a large extracellular signal despite the small detection area. After local electroporation of the cell membrane around the pillars, we demonstrate intracellular recording of action potentials. Because this method is minimally invasive, we are able to record action potentials from the same cell over a span of three days.

2960-Pos Board B730
A Micro-Fluidic Power Generation using an Electrical Double Layer
Jong Kyun Moon, Jaeki Jeong, Hyuk Kyu Pak.
Pusan National University, Busan, Korea, Republic of.
Any solid in contact with a liquid acquires some immobilized charge on its surface. The immobile charge on the surface attracts counter ions. This structure is so-called electrical double layer (EDL). This is a kind of capacitor, an electrical double layer capacitor (EDLC). We investigated an EDLC in a liquid droplet bridge between two parallel solids under vertical vibration. The solid substrate is an Indium tin oxide (ITO) and the upper solid plate has teflon coating on the ITO surface. It changes that the contact area of the solid-liquid interface at the upper plate when the lower plate vibrates vertically. During this process it repeats that the EDLC is charged and discharged. The results of this experiment can be useful for constructing an micro-fluidic power generation.

2961-Pos Board B731
Altering the Cellular Morphology Results in the Mechanical Regulation of Nuclear Shape and Functions by Central Actin Filaments
Marie Versaevel, Thomas Grevesse, **Sylvain Gabriele**.
University of Mons, Mons, Belgium.
Growing evidence suggests that cytoplasmic actin filaments are essential players in the modulation of nuclear shape and functions. However, the mechanistic understanding of the internal orchestration between cell and nuclear shape is still lacking. In this communication, we shape-engineered single endothelial cells to quantitatively and non-invasively assess the nuclear morphology and the intracellular force balance in response to large-scale cell elongations. Our study reveals for the first time that nuclear orientation and deformation are regulated by lateral compressive forces driven by tension in central actomyosin stress fibers. We show that tension in central stress fibers is gradually generated by anisotropic force contraction dipoles as the cell elongates and strongly dependent on the cell spreading area. Our findings indicate that large-scale cell shape changes induce a chromatin condensation and dramatically affect cell proliferation. On the basis of these findings, we propose a simple mechanical model that quantitatively accounts for our experimental data and provides a conceptual framework for the mechanistic coordination between cell and nuclear shape.



2962-Pos Board B732
Electrophysiology Methods to Investigate Molecular Interactions Between Nanoparticles and Lipid Bilayers
Alexander Negoda, Ying Liu, Georgina A. Comiskey, Quanxuan Zhang, Gregory L. Baker, Robert M. Worden.
Michigan State University, East Lansing, MI, USA.
A diverse range of molecular interactions can occur between engineered nanomaterials (ENM) and cell membranes, some of which could lead to toxic outcomes. The ability to measure, predict, and control these molecular interactions would enable ENM to be designed to be both effective and safe. While some classes of ENM-membrane interactions involve participation of proteins or other membrane-associated macromolecules, ENM can also interact directly with the membrane's lipid bilayer. This latter class of interactions can be characterized using electrophysiology methods, in which transient ionic currents