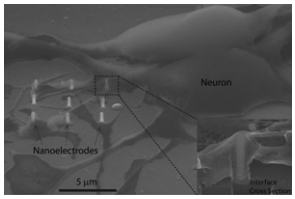
simulated studies of particle translocation, aimed at determining the optimum system for analyzing virus particles using this method.

3286-Pos Board B391
Electrical Cellular Interface by Nanoelectrodes
Chong Xie, Lindsey Hanson, Carter Lin, Yi Cui, Bianxiao Cui.
Interfacing cells with micro- and nano-electronic devices has been intensively studied over the last decade. However, a long-term and efficient electrical cell interface is yet to be accomplished. Here we report that vertically aligned nanoscale electrode arrays, which promote tight attachment to cell membrane, form good electrical coupling with cultured cardiomyocytes and neuron cells. Scanning electron microscopy (SEM) analysis shows that cells readily engulf nanoelectrodes by wrapping around them. The tight junction between cells and nanoelectrodes enables high quality and long-term electrical cell interface, which allows us to achieve non-destructive action potential recording with intercellular-like signal quality.



3287-Pos Board B392
Near Field Detection of Beta-Amyloid Proteins by the use of Olfactory Cells and Nano Particles in a Microfluidic Channel
Hee-Kyeong Sung, Jong-Il Ju, Chang-bum Kim, Jung-Dae Suh, Kwan-Soo Kim, Chul-Ju Chae, Hyo-Bong Hong, Ki-Bong Song.
It is well known that Alzheimer's disease (AD) is pathologically defined by the presence of amyloid-beta plaques and neurofibrillary tangles within the brain by advanced medical imaging technique such as computed tomography or magnetic resonance imaging. Currently, in AD-related olfactory sensory loss studies, early olfactory perceptual loss is likely contributed by nonfibrillar, versus fibrillar, amyloid-beta related mechanism in the olfactory system and nonfibrillar amyloid beta deposition is observed within the olfactory bulb. Therefore, the results of the olfactory dysfunction studies represents that if the amount of nano-sized amyloid beta proteins (nano-Abs) is quantified in *in vivo* olfactory system, *in vivo* early diagnosis of AD is possible. In this paper, we have measured the amount of nano-Abs by the use of olfactory cells and nano particles (100nm bead) in a micro-fluidic channel. For sample preparation, nanoparticles are sequentially conjugated with linkers (biotin, straptavidin and so on) and the particles are absorbed (or adhere) into *in vivo* olfactory system. The amount of the conjugated nano-Abs is measured by evanescent field-nano particle coupling effect where we use micro-fluidic channels. As results, in the *in vivo* olfactory system, the coupled optical power with single nanoparticle is around 1nW. The results of quantification with amyloid-related nano-particles in *in vivo* olfactory system will be briefly introduced.

3288-Pos Board B393
The Mechanisms of Decreasing Voltage-Gated Sodium Current by Nanosecond Electric Pulses
Vasyl Nesin.
The application of high-voltage nanosecond electric pulses (nsEP) causes the formation of nanopores in plasma membrane of mammalian cells, modifies function of voltage-gated ion channels. However, it is not known if nsEPs affect ion channels directly, or these effects are mediated in alternate method. We used the whole-cell patch-clamp technique to explore the effect of 300-nsEP on voltage-gated sodium current (INa) in NG108 neuroblastoma cells. Our data have shown that a single nsEP decreased the INa in dose-dependent manners; in parallel nsEP exposures induced a non-inactivating, voltage-sensitive inward current due to nanopore formation. At the same time, the recovery of INa after nsEP exposure took significantly longer than nanopore resealing. To check if the inflow of Na+ through nanopores was efficient enough to overcome the buffering capacity of the pipette, we measured changes of Na+ concentration in "patched" cells using the Na+-sensitive fluorescent dye (Sodium Green). These experiments showed that opening of nanopores increases the Na+ concentration in patched cells; however, the maximum increase the Na+ content, even with the most intense exposure (5.3 kV/cm), was only 2.7mM, which could unlikely cause INa inhibition. The measurement of submembrane fluorescence intensity of Sodium Green by nsEP didn't show significant increase of submembrane Na+ concentration too. The another potential pathway of reducing the INa is increasing the intracellular Ca2+ concentration after nsEP and Ca2+ mediated inhibition of INa. Our data showed that nsEP exposure in presence of high concentration Ca2+ buffer - BAPTA (20mM) in the intracellular solution caused reduce INa in NG108 cells. Our finding suggest that decreasing of INa by nsEP was not resulted of inward Na+ leakage through nanopores, as well as Ca2+ release from intracellular stores after nsEP exposure.

3289-Pos Board B394
High Resolution Single Molecule Analysis using Nanopore Recording on Microelectrode Cavity Arrays
Gerhard Baaken, Srujan K. Dondapati, Norbert Ankri, Jürgen Rühe, Jan C. Behrends.
Single molecule detection using biological nanopores in lipid bilayers is crucially limited by noise and bandwidth of the recording. We have tested a newly developed 16-channel microelectrode cavity array (MECA, Ref. 1) for single molecule detection using alpha-Hemolysin (alphaHL) nanopores. The device is based on subpicoliter cavities in a high-quality dielectric polymer adding less than 0.5 pF to the input capacitance of the amplifier (Axopach200B), thereby optimizing noise and bandwidth.
An example trace is shown in Fig.1A with an open state rms noise of 0.65pA at 0-5 kHz. Note that for the blocked state, there is no significant difference between an all points histogram of a 5 kHz filtered trace (black) and that of a event amplitudes defined by averaging (grey). Fig.1B shows 35 single PEG induced blockages superimposed and aligned in time. They are detected as square pulses down to durations<100μs and longer events seem to correlate with deeper blocks. The recording performance of MECAs with high integration densities and superior mechanical stability is expected to greatly facilitate single molecule nanopore analysis in the future.

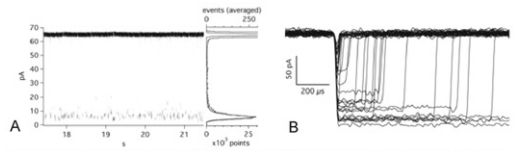


Fig.1. (A) Current trace of PEG induced blockages in a single HL pore **(B)** Single superimposed PEG blockages of a HL pore.

(1)Baaken et al.(2008),Lab Chip 8(6):938-44.

3290-Pos Board B395
Biophysical Properties of DNA Strands Attached Inside Single Nanopores
Gael H. Nguyen, Stefan Howorka, Zuzanna Siwy.
Single nanopores attract scientific interest as they serve as a basis for biosensors as well as a system to study interactions and behavior of molecules in a confined space. Nanopores with a particular geometry and surface chemistry can lead to devices that control the transport of ions and molecules in a solution. Here we present a new strategy for ionic and molecular control that is based on attaching single stranded DNA to the inside of a pore wall. The DNA attachment is restricted to the region next to the 10 nm wide small opening of a conical polymer pore. We find that the pore blockade caused by the DNA increases with lower ionic strengths of the electrolyte medium. The result can be explained by the distinct conformations of DNA at different concentrations of electrolyte solution. At low KCl concentrations (10 mM KCl) the DNA is expected to be extended and rigid and causes a greater blockade than the condensed strands at high ionic concentrations. In the future, the ability to tune the opening diameter of DNA-modified nanopores by experimental conditions may be applied to regulate transport of neutral species.

3291-Pos Board B396
Automated Lipid Bilayer Formation Facilitated by Solvent Extraction
You-Hyo Baek, Joongjin Park, Seunghwan Jeong, Wonyoung Kim, **Tae-Joon Jeon**.
Artificially created lipid bilayers(BLMs) play very important roles in ion channel studies and screening platforms, as well as biosensing applications. Although many applications with lipid bilayer platforms have been suggested, lipid bilayer formation is still based on conventional techniques invented by Montal and Mueller in 1960s. The creation of lipid bilayer membranes is labor intensive, often requiring expertise. The difficulties of lipid bilayer formation preclude a number of useful applications. In the work by Jeon, et al. (Lab Chip, 2008), a frozen membrane precursor was devised and a lipid bilayer membrane was spontaneously created when it was thawed. The frozen membrane precursor can be transported to any place and thawed when a membrane is needed, widening usability of lipid bilayer platforms. However, the film used in this work is a hydrophobic sheet, typically used in the conventional methods. Since membrane formation process driven by spontaneous assembly was unchanged, time required for membrane formation varied with a range of ~30 minutes to 24 hours. To ameliorate the variation of membrane formation time, other work using pin tools was conducted, significantly reducing the formation time by minimizing the solvent volume deposited on the aperture. Taking advantages of previously proposed platforms, we used a thin film made of Polydimethylsiloxane(PDMS) instead of using conventional films. PDMS absorbs organic solvent, thereby the thin film absorbs an excess solvent and