specific procedures of this tool are as follows; (1) the preparation of cells and Aβ (beta-amyloid)$_{1-42}$ mixture, (2) the drop of cells mixture were achieved using micro-pipette in input port, (3) To delivery of mixture cells, the output port was created by negative pressure through a syringe pump (or by hand). The liquid through filter system channel is characterized by Immunocytochemistry. In addition, we demonstrate how its filter system channel how its using Raman spectroscopy active site was developed to observe Aβ and other materials. The integrated lysis chip can be readily modified to apply to a wide variety of common cell lysis and protein experiment procedure.

2968-Pos Board B738

Alzheimer's Disease Pathogenic Factor Method Sensing using the Photo-Sensitive Field-Effect Transistor

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Since the discovery of Alzheimer's disease (AD) in 1906, scientists have been focusing on finding the biological structure of beta-amyloid (Aβ) plaque and neurofibrillary tangle in 1950s, known as the pathogenic hallmarks of AD. Thereafter, as the AD research has grown intensively during the past decades, scientists have adopted various biochemical approaches from many angles: genetic mutation for early-onset of AD, biochemical pathways linking Aβ aggregation to toxicity, and development of transgenic mouse model. Recently, the importance of clinical diagnosis has been recognized to diagnose people at high risk of AD. We propose an effective method to measure the quantity of Aβ peptides labeled with fluorescein isothiocyanate (FITC) by using a photo-sensitive field-effect transistor with an on-chip single-layer optical filter. We actually measured the photo-current resulted from FITC-conjugated Aβ peptides expressed on a cell line. The result indicated that with even a small amount of Aβ peptides the on-chip filtered p-FET was able to detect the optically tenuous fluorescent emission. Also the result demonstrates the applicability of our simple p-FET sensor to potentially quantitative detection of Aβ existing in a biological sample. To accurately evaluate the quantity of Aβ peptides within one single cell as an ultimate purpose of this study, the number of FITC molecules within one single cell was calculated. And, to evaluate the correlation between the generated photo-current and the number of emitted photons from one single cell, we measured the number of photons of the single cell using a photomultiplier tube.

2969-Pos Board B739

A Submicron Coulter Counter for Enumeration of Viruses and Nanoparticles

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The ability to detect, identify, and enumerate particles on the scale of tens or hundreds of nanometers with a point-of-care device would enable great strides forward in treating and preventing infectious diseases, especially in resource-limited settings. Here we demonstrate the ability of a submicron Coulter counter to enumerate nanoparticles in buffer including synthetic beads and several species of virus. Furthermore, we investigate modifications to basic Coulter counting that may enable the determination of structural characteristics of certain viruses or even specific virus identity. This technology complements previous work on a microfluidic cytometer for the enumeration of CD4+ T cells [1] and can lead to the development of a novel, point-of-care diagnostic device to facilitate the treatment of HIV/AIDS in resource-limited settings. The direct counting of particles of around 100 nm can also be extended to the detection of human exosomes with several potential applications in disease diagnosis [2]. In the future, additional techniques will be developed for the interrogation of viruses and exosomes in whole blood samples.

1. Watkins, NN, et al. Lab Chip. 2011, 11, 1437-47.
2. Record, M, et al. Biochem Pharmacol. 2011, 81, 1171-82.

2970-Pos Board B740

A Novel Silicone Magnetic Microsphere for Ligand-Targeted Drug Delivery

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In ligand-targeted drug delivery, a carrier particle is conjugated with a ligand designed to bind specifically to a receptor expressed on the membrane of a chosen cell type. A therapeutic agent is adsorbed onto or absorbed within the carrier, and its release is often triggered by magnetic stimulation or other means. In this work, we present a novel silicone-magnetite microsphere as the drug carrier for ligand-targeted drug delivery. Each carrier contains up to 50% wt. magnetite nanoparticles (10nm diameter) each coated with a monolayer of an amine-functionalized silicone polymer for a total microsphere diameter scalable between 0.5-2.0 microns. The silicon matrix of this carrier facilitates compatibility with lipophilic drugs, the high magnetic content allows the potential for magnetically-stimulated drug release, and an abundance of primary amines within the matrix enables surface functionalization with a variety of ligands. We demonstrate the utility of these new microspheres for ligand-targeted drug delivery by binding folic acid to the microsphere surface, and explore targeting of malignant cells which overexpress folate binding protein. Binding in this study is verified via fluorescence microscopy of a tagged immunoassay.

2971-Pos Board B741

Silicone-Based Magnetic Microspheres for Magnetic Hyperthermia Therapeutics

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Magnetic microspheres are used in a wide variety of applications within the scientific community - from cell-sorting to microscale force experiments. Recently, they have shown promise in magnetic hyperthermia therapeutics, which may be an effective substitute for more traditional chemotherapy and radiation treatments of malignant tumors. An ideal magnetic microsphere for magnetic hyperthermia must have a high magnetic content and a biocompatible matrix. We present here the first instance of a silicone-based magnetic elastomer with the nanoscale homogeneity required for the fabrication of uniform magnetic microspheres. We fabricate microspheres (0.5 - 1 μm diameter) of this material with magnetic content approaching 50% wt. and demonstrate heating with an external high frequency magnetic field. High magnetic content and the absence of aggregation of the constituent magnetic nanoparticles in our material leads to a high specific absorption rate (SAR, or the power absorbed per gram of material) upon magnetic stimulation, and therefore effective heating. Furthermore, hyperthermia studies with magnetite nanoparticles have shown that SAR depends very heavily on diameter; therefore, in this work we produce magnetic microspheres containing monodisperse nanoparticles across a range of applicable diameters and explore the effects of particles size on SAR.

2972-Pos Board B742

Magnetically Actuated Artificial Cilia as Microfluidic Mixers

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The absence of turbulence is a hallmark of fluid flow in the microfluidic regime, and so mixing is difficult to accomplish. Approaches to microfluidic mixing have varied widely, from passive devices which encourage complex flow with various modifications of the channel geometry to active mixers actuated by electric or magnetic fields. An ideal active mixer would be small enough to fit inside the narrowest microfluidic geometries and easily manipulated by external fields. We present here a novel material which is a composite of magnetic nanoparticles and silicone polymer. This material has a high magnetic content (up to 50% wt.) and is homogenous at length scales below 100 nm, making it ideally suited to the fabrication of micro-scale mixing devices. We optimize this material for use in microactuator applications and demonstrate a protocol for fabricating micro-mixers similar in scale to biological cilia (25 microns in length by 1 micron in diameter). A large array of these mixers may be fabricated within the confines of a microfluidics channel and actuated via an external magnetic field from a permanent magnet.

2973-Pos Board B743

Intracellular Trafficking and Molecular Effects of Peptide Functionalized Gold Nanoparticles on Hep-2 Cells

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Gold nanoparticles have been extensively used in various biomedical applications especially in the diagnosis and therapy of cancer, targeted delivery to subcellular organelles, molecular detection etc., due to their ease of synthesis, lower levels of cytotoxicity and biocompatibility. Recently, various methods have been developed to functionalize the gold nanoparticles in order to serve specific biomedical needs of targeted delivery. Depending on the type of functionalization, the gold nanoparticles can have significant effects on the host cells making it necessary to study their effects on the host cells. In the present study, we have functionalized gold nanoparticles using a carrier peptide. The functionalized gold nanoparticles (FGNPs) were characterized using UV-Vis