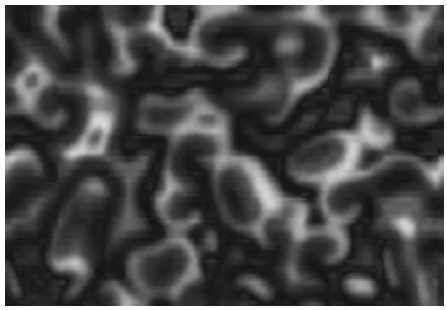

the proper continuum limit - is aptly captured by a set of stochastic partial differential equations. The system's stochastic dynamics is shown to lead to the emergence of entangled rotating spiral waves. While the spirals' wavelength and spreading velocity is demonstrated to be accurately predicted by a (deterministic) complex Ginzburg-Landau equation, their entanglement results from the inherent stochastic nature of the system. [Nature 448, 1046-1049 (2007)]

Biotechnology & Bioengineering II

3259-Pos Board B306

Prototype and Applications for Asynchronous Rotation of Magnetic Microspheres

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Magnetic microsphere suspended in a fluid aligns its magnetic moment with external magnetic field and follows a rotating external field with a constant phase lag. While this is true for low enough driving frequencies, the dynamics of the rotation change above some critical frequency and the particle rotates asynchronously with the driving field. This nonlinear response of the microsphere depends on physical parameters such as the magnetic moment and the size of the particle as well as the viscosity of the surrounding fluid.

Asynchronous rotation of magnetic microspheres has many applications including magnetic particle characterization, viscosity measurements in small amounts of fluid, and pathogen detection. The technique enables continuous sensing of the sample which allows for real time viscosity measurements and single cell growth analysis.

One of our technological and research goals is to develop a portable, easy to use and low power device that utilizes a magnetic field to asynchronously rotate magnetic particles. Owing to the platform technology nature of the method, the prototype setup explained in this poster can be utilized in many applications with minor modifications. Asynchronous rotation analysis can be done using off the shelf magnetic particles (usually used for magnetic separation) or custom made Janus particles (MagMoons) depending on the application. This poster will discuss progress toward this device as well as the applications of asynchronous rotation of magnetic microspheres.

3260-Pos Board B307

Unnatural Amino Acid Mutagenesis For Site-specific Incorporation Of Keto And Azido Functionalities Into Functional G Protein-coupled Receptors

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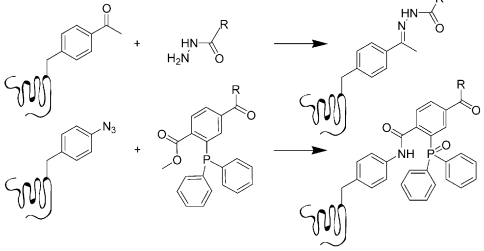
The insertion of unnatural amino acids into proteins using amber stop codon suppression has shown promise as a technique for probing protein structures. To investigate applications to studies of G protein-coupled receptors, we have developed methods that allow incorporation of each of three tyrosine analogues – *p*-acetyl-phenylalanine (Acp), *p*-benzoyl-phenylalanine (Bzp) (Ye, Kohrer et al. 2008), and *p*-azido-phenylalanine (Azp) - into GPCRs site-specifically at high yields in mammalian cell culture. The unique keto and azido functionalities allow specific attachment of tags and fluorophores into GPCRs by hydrazone and Staudinger-Bertozzi ligation respectively under physiological conditions. Together with cysteine-specific labeling methods, our technique will make it possible to introduce pairs of fluorophores in a general way. This is a prerequisite for single molecule fluorescent resonance energy transfer (smFRET) studies, which will yield receptor dynamic information not readily available by other experimental methods.



3261-Pos Board B308

pHLIP-bionanosyringe for Targeting Acidic Solid Tumors and Selective Delivery of Nanomaterials

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We have found a way to target tumors based on their elevated levels of extracellular acidity. Acidosis is a hallmark of tumor development both at very early and at advanced stages. However, the acidic extracellular environment in tumors has not been properly explored yet probably due to a lack of compounds that dramatically change their properties in the range of pH 6.0-7.5. Recently we designed the pH Low Insertion Peptide (pHLIP), which acts as a bionanosyringe, it inserts into cellular membrane and forms transmembrane helix at acidic extracellular pH (6.0-6.5) but not at normal pH. Our data demonstrated that the fluorescently labeled pHLIP was accumulated in tumors established in mice. pHLIP can find cancer cells and insert itself in cell membranes. No insertion occurs in normal cells (pH 7.4). The pHLIP can be used to deliver various compounds, including diagnostic probes, drugs, nanomaterials, radiation or photosensitizers and thermosensitizers, to or into cancer cells. Here we demonstrated that pHLIP can selectively deliver near-red dyes, gold nanoparticles and carbon nanotubes to the tumors established in mice. We found that pHLIP targeted particularly well on the highly metastatic tumors including newly formed metastatic lesions. Our technology opens the new opportunity to target cancer tumors with high selectivity and decrease side effects. The work has been supported by grants from the Department of Defense PCRP CDMRP BC061356 and National Institutes of Health NCI133890.

3262-Pos Board B309

Controlled Assembly of Vesicle Layers on Layer-by-layer Particles via DNA Hybridization

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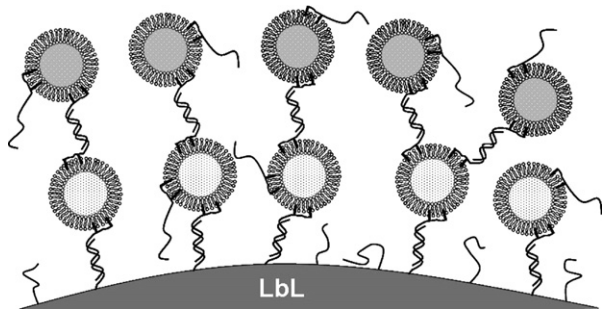
We report here on the formation of layers of large unilamellar vesicles (LUVs) superimposed on Layer-by-Layer- (LbL-) particles. DNA oligonucleotides were covalently attached to the outermost negatively charged polyelectrolyte layer of the particles and thus vesicles, with complementary lipophilic DNAs incorporated into the membranes, could be assembled in layers via sequence specific hybridization (see figure). Entrapment of calcein, NBD-rhodamine FRET fusion assay, FRAP, and cryo electron microscopy proved that LUVs attached to LbL-particles remained intact. The assembly was reversible, e.g. heating above the melting temperature of the DNA-hybrids led to the dissociation of the vesicle layer. Fusion of vesicles attached to the LbL-particles and leakage of the entrapped molecules was triggered on demand by addition of melittin. Using different DNA sequences, lipid anchors or compositions of the membrane can regulate the assembly of layers. The LUVs-LbL-particles have many advantages: a controlled and reversible assembly, small and defined size, easy manipulation, biocompatibility, and biodegradability of the particles, and the possibility of a triggered release of different reactants entrapped in different layers of vesicles. LUVs-LbL-particles can be potentially used in diagnostics or for the organization and regulation of reactions on nanoscale.



3263-Pos Board B310

Measurement Of Hydrogen Ion Activity In The Intercellular Space Of Schwannoma Tumors

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