



CDB SEMINAR

Speaker: Eiichi Tamiya

< Japan Advanced Institute of Science & Technology >

Title: “ Novel tools for biomedical research and applications:
Advanced biosensors and biodevices based on
nanomaterials and microchip technology”

Date:	Wednesday, June 30
Time:	15:30 - 16:30
Place:	7F Conference Room of Building A,CDB

Summary:

The miniaturization of devices and facilities and high levels of integration have significantly increased capacities for biological sample throughput. Powerful synthetic methodologies such as polymerase chain reaction (PCR) and in vitro protein synthesis now allow for the creation of biochemically diverse sample libraries. Consequently, there is great interest in applying similarly synthetic techniques to the screening of biological samples such as genomes, RNAs, peptides, enzymes, receptors and antibodies, which exist and are available in vast quantities. Using semiconductor and polymer microfabrication technologies, our lab has created microchamber arrays that allow for the analysis of neuronal cells and have potential applications in drug screening and cell diagnosis. We have also developed a microfluidic device for the measurement of immunoreactivity. This device consists of a single flow channel with an inlet and outlet basin at each end, and which is divided into two parts by a partially opened septum. Polystyrene beads immobilized with antibodies are placed in the first part of a channel. Measurement of the concentration of antigen in the sample mixture is achieved based on a competitive assay between HRP conjugated antigen using AmplexTM red. The detection signal is captured by a CCD camera-equipped fluorescence microscope. AFM and SNOAM (scanning near-field optical atomic force microscopy)-based nanoscopic analyses demonstrated new electrochemical DNA sensing and high resolution imaging of chromosomes and living cells, respectively. We have also developed a novel method for discriminating and coding all possible combinations. SNPs are coded by monitoring changes in the electrochemical signal of monobase modified colloidal gold (Au) nanoparticles. If there is a SNP in the DNA sequence and the mismatched bases are complementary to the monobase, Au nanoparticles accumulate on the electrode surface in the presence of DNA polymerase I (Klenow fragment), resulting in a detectable change in the Au oxide wave. In this report, monobase modified Au nanoparticles show not only the presence of an SNP, but also identify the bases involved within the pair. In particular, the identification of transversion SNPs, which contain a pair of identical pyrimidine or purine bases, is greatly simplified. This versatile nanoparticle-based electrochemical protocol is a promising new technology for use in the coding of genomic mutational changes.

Host: Shin-Ichi Nishikawa <Stem Cell Biology, CDB>

E-mail: nishikawa@cdb.riken.jp Tel: 078-306-1893 (ext:5301)

RIKEN Center for developmental Biology <http://www.cdb.riken.go.jp/>