Plenary Speaker

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Talk title: Biochip Enabled Clinical Translational Medicine

With accomplishment of the human genome project, more and more genomic and proteomic information were used for clinical diagnosis. A variety of biochip technology is thereby emerging for massive information analysis and lays the foundation of molecular typing for the coming 3P medicine era.

For sample preparation, rapid and effective isolation of cells and molecules from body fluids can be achieved on chip either mechanically or electronically. This is the first step before the following biochemical reactions taking place.

For the chip-based amplifications, in addition to the well known thermal cycling amplification technology PCR, there are a variety of distinctive isothermal amplification technologies, such as strand displacement amplification (SDA) and loop-mediated isothermal amplification (LAMP). Among these technologies, some are suitable for DNA testing and some for RNA detection; some are suitable for laboratory analysis and some for field analysis.

There are a variety of biological analysis technologies using micro particles as carriers, such as the microbeads encoded with multicolor fluorescence, the micro-columns generated by laser holography, and the micro disks fabricated with optical lithography. All these technologies allow for future analysis with a great flexibility and rich imagination.

For separation-based detection technology, there are plenty of methods are available including the high-performance liquid chromatography-chip (HPLC-chip), capillary electrophoresis and chip-time-of-flight mass spectrometry (chip-TOF MS). Additionally, a lot of high-density microarrays have been utilized for the discovery of disease-related biomarkers, including single-nucleotide polymorphism (SNP) array, mutation detection array, array-comparative genomic hybridization, methylation profiling array, mRNA expression array, miRNA microarray, transcription factor array, promoter array, protein array and peptide array, etc. Some low to medium density microarrays have also been developed for individual treatment and applied in clinical laboratories, including the hereditary deafness gene mutation detection chip, mycobacterium tuberculosis drug resistance detection chip, food-borne pathogenic microorganism detection chip and protein chips for autoimmune disease diagnosis
In the future, biochip technology in different forms, from microarray, microfluidic chip to the lab-on-a-chip system, will be more extensively applied in the disease prevention and intervention, individual diagnosis and prognosis.

Biography

Jing Cheng, PhD, is a Cheung Kong Professor at Medical Systems Biology Research Center, Department of Biomedical Engineering, Tsinghua University School of Medicine, Director of National Engineering Research Center for Beijing Biochip Technology， Member of the Chinese Academy of Engineering.

Dr. Cheng received his B.Eng. degree in Electrical Engineering from Tongji University (China) and PhD degree in Forensic Sciences from the University of Strathclyde (UK). His experience includes 8 years as an Electrical Engineer at Ziyang Internal Combustion Locomotive Factory (China) and as a Lecturer in Forensic Sciences at Southwest University of Political Science and Law (China). He also gained additional postdoctoral experience at the University of Strathclyde and the University of Aberdeen (UK) and University of Pennsylvania (USA) where he was appointed as a Research Assistant Professor in the School of Medicine. In 1996 he joined Nanogen Inc in San Diego as a Staff Scientist /Engineer where he was later promoted to Principal Scientist and Engineer, and Principal Investigator. From 1999 to 2001 he assumed the role of Chief Technology Officer at Aviva Biosciences Corp in San Diego, USA. From 2000 to present, he is managing the over-all research as the director of National Engineering Research Center for Beijing Biochip Technology.

Dr. Cheng developed the world's first system of laboratory-on-a-chip in 1998 and the work was featured in the front cover story of the June 1998 issue of Nature Biotechnology, also cited in the breakthrough of the year by Science in the same year. He was awarded Nanogen's most prestigious award NanoGrant in 1999, National Young Scientist Award in 2004, Qiushi Outstanding Youth Technology Transfer Award in 2004, Second Prize of the National Awards for Technological Innovation in 2007, Ho Leung Ho Lee Prize for Scientific and Technological Innovation in 2008, Tanjiazhen Life Science Innovation Award in 2008 and Tengfei Award in 2010. Dr. Cheng has published 106 peer-reviewed papers and edited 8 books. In addition, he has obtained 38 European and US patents. He has been an invited speaker to many international conferences. His current interest is in the development of biochip-based microsystems and ultra-high throughput drug screening systems.

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