Principles of Production and Applications of DNA Microarrays

Microarray Mini Course for BBSI Students Summer 2004
Three 2-hour sessions
Prof. Anthony Guiseppi-Elie, Chemical Engineering and Emergency Medicine

Thursday, 24th June 2004
1:30 - 2:30 *Lecture* - Introduction to Microarrays and Microarray Experiments
2:30 - 3:00 *Hands on activity*- Preparation of microarray substrates: Wright Virginia Microelectronics Center (VMC), First Floor School of Engineering

Thursday, 1st July 2004
1:30 - 2:30 *Lecture* - Design of Microarrays and Design of Experiments Using Microarrays
2:30- 3:00 *Hand-on activity* – Fabrication of Oligonucleotide Microarrays: C3B Biochips Laboratory, Rm. 345, Third Floor School of Engineering

Thursday, 8th July 2004
1:30 - 2:30 *Lecture* – Data: Collection, Quality and Analysis Issues
2:30 - 3:00 *Hands-on activity* - Scanning of Microarrays -- Wright Virginia Microelectronics Center (VMC), First Floor School of Engineering

DNA microarrays have become a prominent technological tool for genotype characterization and gene expression analysis. Global transcription patterns may be readily evaluated using DNA microarrays. This functional genomics technology offers a powerful approach to the analysis of molecular mechanisms associated with physiological changes within cells. This combined lecture and laboratory course will show how DNA microarrays may be used for different applications in the biomedical sciences with special emphasis on the use of DNA microarrays in the analysis of gene expression in the study of cancer and will provide hands-on training with this complex technology.

Lecture Topics: Overview of DNA microarrays; Fabrication of DNA microarrays; Hybridization, data collection, and analysis; Use of microarrays for gene expression analysis; Integrating expression data with genomic sequences and other functional genomics techniques; Application of microarrays to the classification of cancers; Microarrays, biochips, and their use in cancer diagnostics, prognostics, and treatment; Microarrays in drug discovery; Novel uses of DNA microarrays.

Laboratory Topics: Preparation of microarray substrates, 96-well PCR to prepare DNA samples; Fabrication of DNA microarrays using a Cartesian Microarraying robot; Isolation and workup of total RNA for expression analysis; Direct labeling of RNA and labeling of cDNA; Hybridization of cDNA to spotted DNA arrays; Scanning and data collection using a Perkin Elmer Scan Array Express; Analysis and display of data using clustering programs; Validation of microarray expression analysis by real-time (RT-PCR) and conventional PCR.