Microarray Projects at the Center for Bioelectronics, Biosensors, and Biochips (C3B) Biochips Laboratory

Scott Taylor and Tony Guiseppe-Elie

In the C3B Biochips Laboratory, we are focused on the production, usage, and analysis of a special type of biochip called a DNA microarray. This type of biochip is composed of thousands of tiny spots (probes), each containing multiple copies of a single gene, printed onto a common glass microscope slide (Figure 1). The DNA microarray is an important technology that allows researchers to investigate gene expression in virtually any tissue type or organism, and may potentially be applied to everything from toxicology and drug discovery to tissue classification and diagnostics.

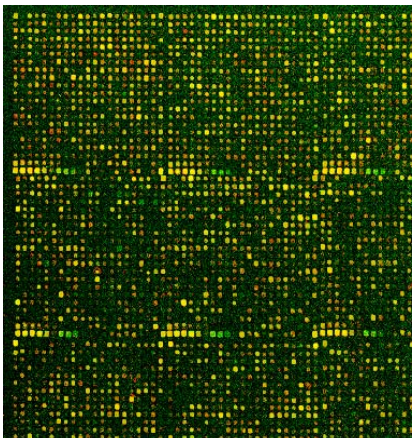

Figure 1: Example of the C3B 10K DNA Micorarray

DNA microarrays produced in the C3B biochips lab are fabricated in a class 1000 clean room using a printing robot. The robot uses special stainless steel or silicon pins to transfer and deposit, using capillary forces, small volumes (nL) of fluid containing the gene fragments from a 384 well storage plate to the surface of a 1" x 3" "chip" or microscope slide. The C3B biochips lab has a human gene library composed of approximately 10,000 genes that are contained in twenty-six 384 well plates, each well containing a different gene. Other instruments involved in the production of DNA microarrays that are utilized in the biochips lab include a thermal cycler for PCR, a robotic liquid handler, an RNA quantification and quality analyzer, an automated hybridization station, and a microarray scanner.

There are several projects currently being conducted in the biochips lab that encompass different aspects of microarray technology. We have been engaged in two studies that are focused on engineering aspects of microarrays such as surface chemistry, DNA printing concentration, variation between production lots, and type of hybridization buffer. A study is currently underway investigating the effect of chemotherapeutic compounds on brain tumor cell lines, in which we hope to gain an understanding of how the chemotherapeutic agents affect tumor cells at the molecular level. Another study in progress is designed to survey the gene expression as a function of tumor anatomy where we hope to gain insight into ways to improve brain tumor diagnostic procedures. Finally, we are engaged in a brain tumor classification study comprised of two parts. The first part is a microarray study of 126 tumor samples aimed at identifying genetic markers that can be used to delineate the four classes of astrocytoma-type tumors. The second part entails using the identified suite of genetic markers as the basis for molecular recognition on a targeted impedimetric biochip. This chip is intended to aid in diagnosis and prognosis of astrocytomas and help determine which patients may be good candidates for alternative therapies.

To learn more please visit: www.biochips.org