

Runner-up Technology
Mark Rohrbaugh, NIH
In Vitro Assembly of Protein Microarrays

Protein microarrays are becoming an indispensable biomedical tool to facilitate rapid high-throughput detection of protein-protein, protein-drug and protein-DNA interactions for large groups of proteins. The novel Protein Microarray of this invention is essentially a DNA microarray that becomes a protein microarray on demand and provides an efficient systematic approach to the study of protein interactions and drug target identification and validation, thereby speeding up the discovery process. The technology allows a large number of proteins to be transcribed, translated and immobilized at their individual site of expression on an ordered array without the need for protein purification. As a result proteins are ready for subsequent use in binding studies and other analysis.

The Protein Microarray is based on high affinity and high specificity of the protein-nucleic acid interaction of the Tus protein and the Ter site of *E.coli*. The DNA templates are arrayed on the microarray to perform dual function: 1) synthesizing the protein *in situ* (cell-free protein synthesis) in the array and 2) at the same time capturing the protein it synthesizes by DNA-protein interaction. This method utilizes an expression vector containing a DNA sequence which serves a dual purpose: a) encoding proteins of interest fused to the Tus protein for *in vitro* synthesis of the protein and b) encoding the Ter sequence, which captures the fusion protein through the high affinity interaction with the Tus protein.

Further advantages of the method are: a) the stability of the array is much longer than for other protein arrays, because there is no protein present in the array to begin with and only DNA is present in the prefabricated array; b) there is no need for protein purification, as proteins are captured as they are synthesized; and c) the cloning of large number of protein coding genes in-frame fusion with Tus and Ter is very simple using expression (destination) vectors based on recombinational cloning systems such as Gateway.

The described technology is in the advanced stages of development and samples will be available in the near future.

Potential Commercial Impact and Revenue Stream:

- Estimated market of 2.47-2.6 billion dollars in 2006.
- A 2005 study demonstrates biochip technologies are helping Pharma companies by decreasing the time spent on drug discovery
- Study shows more scientists are incorporating protein microarrays into their research as the technology is becoming more consistent and reliable

For further information, contact Mark Rohrbaugh at rohrbaum@od.nih.gov.