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Advancing the Arizona State University Knowledge Enterprise

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Integrated Microarray Printing and Detection System

Microarray technology has dramatically advanced the study of protein interactions and validation of new biomarkers and therapeutics. However, current microarray technology suffers from several key limitations that hinder it from gaining broader utility: 1) both the printing and analysis steps consume large sample volumes, which is particularly problematic where only small amounts of proteins are available or affordable; 2) the exposure of sample solution to the entire microarray restricts the kinetic interaction analysis of only one probe to N targets (1xN interactions only), significantly limiting the types of applications and analytical power of microarrays; and 3) complete microarrays must be pre-printed with no a priori feedback on spot uniformity, target activity, or probe selectivity which may lead to inconclusive data, unnecessary tests, and delays in obtaining effective results.

Researchers at the Biodesign Institute of Arizona State University have developed an Integrated Microarray Printing and Detection System (IMPDS) to address the key limitations restricting the analytical power and broader appeal of microarray technology. This system has the ability to incorporate feedback of microarray formation and testing in order to generate more relevant results sooner, perform high resolution droplet-based testing with ultra-low nanoliter volume samples, conduct a more versatile M x N (many-to-many) protein kinetic interaction analysis of high density microarrays, and measure molecular interactions and binding kinetics in cell-based microarrays.

IMPDS has the promise to be a powerful tool for commercial use in high-throughput protein interaction studies leading to the discovery and validation of new molecular diagnostic biomarkers and therapeutic drugs.

Potential Applications

- High throughput interaction studies
  - New Molecular diagnostic biomarkers
  - New therapeutics

Benefits and Advantages

- Streamlining microarray spotting and detection into a single instrument
- Simpler, faster and more accurate results Ultra-low volume nanodroplet-

based analysis of high density microarrays

- Flexible and multiplexed M x N label-free protein interaction kinetic analysis in real time
- Cell-based microarray analyses with single cell resolution
- Low consumption of sample volume
- Enables measurement of membrane protein interaction kinetics in their native cellular environment
- Affinity index between 0.02 and 1, so as to have a balanced influence of the linker effect

For more information about the inventor(s) and their research, please see Dr. Tao’s laboratory webpage