Nanoarrays Cut Diagnostic Cost

Start-up company leverages NUS technology to produce next-generation proteomic arrays for the pharmaceutical and biomedical-diagnostic markets.

ND-array Technologies, a new biotechnology company, believes its patented S-curve type of technology can provide up to 96% cost savings over existing protein-screening methodology by miniaturising microplate experiments. This platform innovation has proved extremely scalable and flexible for a plethora of proteomic research and biomedical diagnostic applications.

The start-up firm exploits core technology developed in the Functional Genomics Laboratory, under a joint research effort by the Department of Chemistry and the Department of Biological Sciences at NUS. The ND-array plate combines the miniaturisation benefits of a microarray approach with the well-based screening of a microplate. The system allows simultaneous screening of more than 10,000 assays for multiple targets, a new high-throughput approach currently not on the market.

Instead of performing assays in typical 100-microlitre volumes in microplate wells, just 1 nanolitre suffices for each assay on the microarray platform, representing a 100,000-fold reduction in reaction volume required on the ND-Array System, says Mahesh Uttamchandani, chairman/chief technology officer of ND-array, and a NUS PhD student in biological sciences. A typical microplate screens only 96 molecules at a time whereas a microarray platform can screen 10,000 molecules, thus drastically cutting costs by reducing the amount of reagent needed for the procedure. For example, an enzyme-screening procedure priced at about S$2 will cost less than 15 cents with the new technique.

The unique method uses the company’s patented technique of pre-coating reaction plates with specialised fluorogenic substrates and depositing proteins. Each droplet formed using the patented nanodroplet technology creates an individual bioreactor for proteomic discovery.

The user can apply the ND-array kits for large-scale enzyme-inhibitor screening for drug discovery, high-throughput lead discovery for life-sciences research, bedside diagnostic kits for large-scale disease screening, viral- or bacterial-protease detection in the event of epidemics or bioterrorism, and

screening for health checks or population studies.

The start-up company, comprising team members from NUS and Ngee Ann Polytechnic, won the 2006 Lee Kuan Yew Global Business Plan competition and clinched a S$100,000 grant from the 2006 HSBC Youth Enterprise Fund as well. Securing additional funding will allow it to build up the screening platform to include additional pharmacological targets.

Figure 1: Nanodroplet approach for inhibitor screening. Specialised coatings generated on glass slides create the biosensor surface. Applying potent inhibitors perturb protein activity in the nanodroplets, thus reducing the fluorescent yield obtained, providing a rapid-acting and robust platform for high-throughput inhibitor screening.

Source: Chem Commun (Camb) 7 (21 Feb 2006): 717-9.

Figure 2: Actual array image showing 400 inhibitors screened in duplicate. A single microscope slide using the nanodroplet approach readily allows screening of a few thousand inhibitors.

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