

All-Electronic Immunophenotyping Device for Point-of-Care Testing (#8045, 8047)

A convenient microarray system that allows for digital immunoanalysis

This technology is an antibody microarray with an electrical readout for label-free immunophenotyping of cell populations. It leverages a unique and flexible method for immobilizing antibodies in the chambers of the microfluidic arrays, a crucial step of performing an immunoassay. The device consists of an array of interconnected capture chambers arranged to subject the sample to a sequence of antibodies. Micropillars are used to increase the cell capture efficiency in the chambers while code-multiplexed electrical sensors across the device quantify the capture rate in each chamber. The sensor data is collected in a single waveform, which is then computationally analyzed to obtain immunophenotyping results.

This device achieves all-electronic combinatorial immunophenotyping of cells against multiple antigen targets. It allows for the immobilization of multiple antibodies in the same microfluidic device without any complex modification processes. The Georgia Tech research team has tested the technology with human blood, and their results were comparable with those from a commercial hemocytometer.

Benefits/Advantages

- **Convenient:** Provides an all-electronic immunophenotyping process with straightforward equipment and techniques
- **Low cost:** Performs sophisticated, multistep analyses in a system that is affordable enough for point-of-care settings
- **Flexible:** Allows for the easy immobilization of multiple antibodies in the device—a shortcoming of current systems
- **Scalable:** Serves as a building block to work in parallel with other microarrays

Potential Commercial Applications

- Oncology diagnostics and other point-of-care testings
- Biotechnology research
- Industrial purification
- Cell manufacturing

Background/Context for This Invention

Immunophenotyping of heterogeneous cell populations uses the expression of antigens on cell surfaces to make important clinical decisions about diagnoses and treatments. Microfluidic devices are a common

mechanism for immunophenotyping. Usually the target antibodies are pre-immobilized on the inner layer of the microfluidic channels, which does not allow for modification of the antibody array. Additionally, most microfluidic immunophenotyping systems require microscopic analysis to understand the results, making the overall process more complex and costly. This Georgia Tech device not only provides flexibility in modifying the antibody layer, but it also achieves a completely electronic immunophenotyping technique, making point-of-care testing more accessible and convenient.

To see more technologies like this by Dr. Sarioglu and his team, please [click here](#).

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More Information

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Publications

[Combinatorial Immunophenotyping of Cell Populations with an Electronic Antibody Microarray](#), Small, October 21, 2019

[Microfluidic Antibody Microarray with an Electronic Readout for Combinatorial Immunophenotyping of Cell Populations](#), National Science Foundation Public Access Repository, November 11, 2018

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/all-electronic-immunophenotyping-device-point-care-testing>

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot