Microfluidics-Based Separation and Detection Technology for Lab-on-a-Chip Applications

Bernhard H Weigl, Ph. D.
Manager, Business Development and Senior Scientist
Micronics, Inc. (www.micronics.net)
8717 148th Ave NE, Redmond, WA 98052
phone 425-8959197 ext. 15, fax 425-8951183
email bernhardw@micronics.net

Novel designs of integrated fluidic microchips allow separations, chemical reactions, and calibration-free analytical measurements to be performed directly in very small quantities of complex samples such as whole blood and contaminated environmental samples. This technology lends itself to applications such as clinical diagnostics, including tumor marker screening, and environmental sensing in remote locations.

Lab-on-a-Chip based systems offer many advantages over traditional analytical devices: They consume extremely low volumes of both samples and reagents. Each chip is inexpensive and small. The sampling-to-result time is extremely short. They perform all analytical functions, including sampling, sample pretreatment, separation, dilution, and mixing steps, chemical reactions, and detection in an integrated microfluidic circuit. Lab-on-a-Chip systems enable the design of small, portable, rugged, low-cost, easy to use, yet extremely versatile and capable diagnostic instruments.

In addition, fluids flowing in microchannels exhibit unique characteristics ("microfluidics"), which allow the design of analytical devices and assay formats that would not function on a macroscale.

Existing Lab-on-a-chip technologies work very well for highly predictable and homogeneous samples common in genetic testing and drug discovery processes. One of the biggest challenges for current Labs-on-a-chip, however, is to perform analysis in the presence of the complexity and heterogeneity of actual samples such as whole blood or contaminated environmental samples.

We will present Lab-on-a-Chip technologies (T-Sensor™, H-Filter™, and MicroCytometer™, all developed by Micronics, Inc.) that can overcome those shortcomings. These technologies have been demonstrated for a variety of analytes including enzymes, proteins, electrolytes, heavy metals, drugs, as well as for cellular analysis. An early prototype has also been tested in microgravity on board of a NASA KC135A.

Micronics, Inc., based in Redmond, WA was formed in January 1996 to develop and commercialize innovative diagnostic and analytical products utilizing the unique characteristics of fluids flowing in microfluidic channels. More information about Micronics can be found at www.micronics.net