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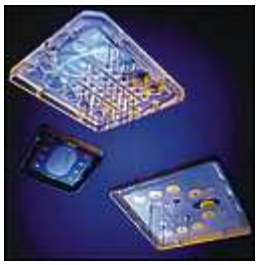
Transforming Diagnostics with Microfluidics



Lab-on-a-chip technology has transformed diagnostics testing. Image courtesy of Caliper Life Sciences (Hopkinton, MA)

Lab-on-a-chip technology has helped transform diagnostics as a replacement for gel electrophoresis and also by enabling high-throughput, low-volume high-performance liquid chromatography (HPLC) enzymatic assays for drug discovery.

One company that has been literally instrumental in advancing these technologies is Caliper Life Sciences. "We've been around since the mid-1990s and were pioneers in lab-on-a-chip technology. We've accessed a lot of the market through collaborations with companies such as Agilent. The Agilent 2100 Bioanalyzer, for example, has licensed the patents from us, and we produce all of the chips as part of that license agreement," says Nate Cosper, PhD, senior director of marketing for Caliper.

Cosper says that the Agilent 2100 has seen good adoption into diagnostics because it has the ability to do 12 samples at a time for DNA analysis, particularly for polymerase chain reaction (PCR) and post-PCR, to see whether samples have amplified a region of interest. It can be useful, for example, for looking for HIV or any other infectious diseases.

"That market is starting to mature and the throughput—the number of samples per day—is increasing quite a bit. Our directional instrument, the Caliper LabChip GX, which does high-throughput electrophoresis for DNA and RNA, is just at the early stage of being adopted into diagnostics," he says. The LabChip GX is targeted at genomics applications, while the GXII combines both genomics and protein research applications. The instruments will be marketed by Caliper and are designed to provide scientists higher throughput and economical plate processing ability.

He says that molecular diagnostics is playing a big part in driving the need for higher throughput. "Once you get to high throughput, gel electrophoresis is very time-consuming. It's not digital data, and it's easy to make a mistake and pipet the wrong sample and the wrong amount," he says. "Microfluidics devices enable you to do very fast and high-quality separations of very small amounts of sample, which make it ideal for diagnostic settings."

Cosper compares the microfluidic channel to hollow pieces of hair inside a credit card. "You can put a gel inside of those tubes and then run your sample through. It's really a chromatographic technique. You're pushing liquid through some medium and enabling a separation to occur," says Cosper. The chip can accomplish the same goal as electrophoresis. "We apply a positive and negative terminal on either side of the channel

in the chip. We have liquids flowing through interacting with the gel inside the channel and we're applying voltage across them." The combination allows the separation of different-sized nucleic acids or proteins.

"The way we look at it is, 'What kinds of assays can you develop in a microfluidic chip?' To date, the focus has been on separating whole molecules like fragments of DNA or individual proteins."

http://www.devicelink.com/mddi/archive/09/07/convergence.html