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Testing Cytotoxicity on a Chip

With some 30 percent of all drug candidate failures blamed on the appearance of unexpected toxicity, there is a need for rapid and sensitive measures of cytotoxicity that can be used in the drug development process. Such assays could also help identify potential anticancer therapies. Work published in the journal *Analytical Biochemistry* highlights one potential approach to high-throughput cytotoxicity testing based on microfluidics.

Ju Hun Yeon, Ph.D., and Je-Kyun Park, Ph.D., both at the Korea Advanced Institute of Science and Technology in Daejeon, South Korea, developed a method of measuring the electrochemical impedance (similar to resistance) of cells captured in a microfluidic chamber on a chip. The chip contains eight cell culture chambers, each connected to three electrodes fabricated on the chip. The three-electrode configuration provides better reproducibility than a standard two-electrode setup when measuring impedance. Cells can be captured and grown in the chambers and dosed with drug-containing solutions.

In tests with HepG2 liver cells, the investigators found that impedance changes with cell concentration in the growth chamber. The researchers attribute this to the fact that cells attach themselves to the electrodes when a weak voltage is applied across the electrodes. The investigators then found that adding various cytotoxic drugs, including tamoxifen, triggered a distinct change in impedance within three hours after dosing. They confirmed that the change resulted from cytotoxicity using standard assays.

This work is detailed in a paper titled, "Cytotoxicity test based on electrochemical impedance measurement of HepG2 cultured in microfabricated cell chip." This paper was published online in advance of publication. An abstract is available on the journal's website.
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