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UC Santa Barbara Researchers Make Significant Advance in Cell Sorting

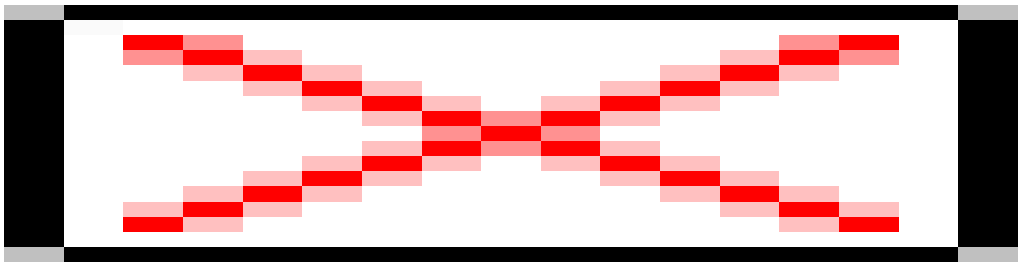
Santa Barbara, California, November 17, 2008-Researchers at UC Santa Barbara have developed a cell sorting device that separates multiple target cell types with high throughput, high purity, and near lossless recovery. T heir multitarget magnetically-activated cell sorter (MT-MACS), discussed in this week's *Proceedings of the National Academy of Science, Early Edition*, utilizes a combination of microfluidics and magnetophoresis to achieve simultaneous addressable sorting of multiple target cell types in a continuous flow.

Throughput of multiple bacterial cell types in the device has been demonstrated at 109 cells per hour, with the sorting yielding >90% purity and near total recovery of the two tagged types. (Recovery within the device is virtually 100%; there are negligible losses in the interfaces to the device.)

"The microfluidics technology gives us the unique capability to control the hydrodynamic and the m agnetophoretic forces with exquisite accuracy" commented H. Tom Soh, professor of mechanical engineering and of materials, and corresponding author of the paper. "That lets us balance the two forces to achieve new functionalities in cell sorting."

The MT-MACS chips were fabricated utilizing a combination of glass and PDMS (polydimethylsiloxane). Excluding external magnets and fluidic connections, the assembled chip is 15.7x64 mm, with a thickness of 1.5 mm. The microchannel has a height of 50 µm and width of 500 µm at the main flow path, and contains 2 sets of mi crofabricated ferromagnetic strips (MFS). The 2 MFS regions in the microchannel generate high magnetic field gradients which deflect the differentially-tagged target cells into their respective outlets in the chip.

Ph.D. candidates Jonathan Adams and Unyoung Kim, co-authors of the paper, anticipate that throughput will be increased considerably by a combination of widening the microchannel and operating multiple MT-MACS units in parallel, attaining clinically-relevant rates. "We also expect to be able to increase the number of targets that can be simultaneously separated," noted Adams. "It will be interesting to integrate other cell sorting modalities such as acoustic and electrokinetic separation into our chip - it will allow unprecedented multiplexing,"



The physics of MT-MACS, showing the relationship between hydrodynamic and magnetophoretic forces and the resultant sorting of two differentially-tagged cell types.

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Images

Related Links

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