Forward

MATERIALS

Cheaper Diagnostics

By simultaneously scanning for thousands of genes or proteins in a biological sample, doctors could diagnose many diseases in a single step. But today's DNA or protein microarrays are too expensive for widespread clinical use, in part because their manufacture is a complex, multistep process.

A potentially cheaper tool for detecting telltale DNA and proteins appears on this page: capsule-shaped polymer particles, each 180 micrometers long. Each particle can be loaded with a specific biomolecule so that one half of the particle fluoresces when it detects a disease target. Imprinted with bar-code-like patterns of holes, the particles can be read optically; they could serve as detectors for more than a million distinct biological targets. Technicians with the right optical equipment could, in theory, mix the particles with a sample and read off the results.

Unlike microarrays, the particles can be manufactured using a single, integrated process, which was developed by MIT chemical engineer Patrick Doyle, doctoral student Daniel Pregibon, and colleagues at MIT and Harvard Medical School. The process begins with two adjacent 100-micrometer-wide streams of fluid. One of the streams contains biomolecules that will attach to disease targets. A pulse of ultraviolet light passes through a stencil and strikes the streams, causing precursors of polyethylene glycol in both to solidify into a single particle. The stencil gives one half of each particle an identifying pattern of holes.

Jay Groves, a chemist at the University of California, Berkeley, calls the synthesis a "clever" step toward low-cost diagnostics. One remaining challenge is to develop a more practical system for reading the particles: Doyle and colleagues use a bulky, impractical fluorescence microscope.

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