

Acoustic Flow Cytometry

Use of an ultrasonic field makes flow cytometers smaller, lighter, and less expensive.

Have you heard? A Laboratory-developed innovation is using sound waves to make cells or particles line up for accurate, fast analysis. The new technology—acoustic flow cytometry—may bring much-needed medical diagnostics to many parts of the Third World.

Flow cytometry is particularly useful to the medical profession, which uses flow cytometers for producing blood counts and monitoring the progress of HIV/AIDS patients. The standard instrument uses a hydrodynamics (fluidics) system to transport cells, one by one, through a horizontally focused laser beam. The cells are suspended in saline solution that flows at the center of, and in the same direction as, a larger and faster-moving stream (a "fluid sheath"). This configuration forces the cells into single file for their trip through the laser beam, so the light they scatter or emit can be readily detected and analyzed by a data system.

But the bulk, expense, and fragility of the hydrodynamics system have long confined cytometers to the most-sophisticated laboratories and clinics.

The new technology, licensed by the Laboratory to Acoustic Cytometry Systems (ACS), a Los Alamos company, eliminates the fluid sheath. Instead, it sends the suspended cells through a glass capillary that has a "piezoceramic" acoustic source bonded to its outer wall. The source converts an electric charge into an ultrasonic field that drives the cells to the center of the capillary.

The new design makes cytometers smaller, lighter, less complicated, and also less expensive. Compared with the fluid sheath, the ultrasonic field produces a slower transit of cells through the laser. Because each cell gets interrogated longer, scattering and emitting more light, a smaller, less-expensive laser and less-demanding optics can be used. All these advantages—including eliminating the sheath's purified water, which may be rare in Third-World countries—may free flow cytometry for wider use. Indeed, acoustic cytometry is about to go global. ACS has been purchased by California's Invitrogen Corporation, which provides life-science products and services around the world. So a Laboratory-developed technology will soon be helping many more people.