**Trends in flow cytometry**

Initially, flow cytometers were used as experimental devices; however, as in other industries, the strides made in technology mean that flow-cytometry instruments and their accompanying products have become a major market. Today’s flow cytometers sport multiple lasers and fluorescence detectors, which aid users in labeling multiple antibodies and in identifying precisely a target population by its phenotype. Sophisticated flow cytometers take digital images of individual cells so that users can analyze fluorescent signal locations within cells or on their surfaces. A multitude of websites exist to help the novice learn about flow cytometry. Oregon State University, for example, hosts a Community Outreach and Education Program that sponsors “Unsolved Mysteries of Human Health” at [http://www.unsolvedmysteries.edu/flow_cytometry_06.shtml](http://www.unsolvedmysteries.edu/flow_cytometry_06.shtml). Additionally, the companies listed below have informational websites, including learning guides that are useful for teaching new users as well as serving as review documents generally.

### Multicolor flow

“Multicolor flow cytometry is fast becoming a reality. Mainstream clinical flow cytometers are now capable of simultaneously utilizing five to six fluorescent markers to identify subsets of critical cell populations. Integrated software fully automates instrument setup, acquisition, and analysis. One example is the determination of mature T, B, and NK lymphocyte populations, as well as CD4+ and CD8+ T-cell subsets in human peripheral blood in a single tube. Instruments with more than six-color capabilities are utilized to elucidate antigen-specific immune responses and provide information to better understand immunopathogenesis of infectious diseases, autoimmunity, and cancer — as well as generate knowledge that will improve diagnostics. Blood-cancer immunophenotyping will profit from multicolor-flow capabilities, as fewer tubes will be needed to gather the required phenotypic information. Pharmaceutical research may apply the multiparametric capability of flow methods to monitor clinical trials and effective treatment. Ease-of-use features and integrated software will take multicolor flow to wider audiences and enhance the clinical use of this technology.”

**Rudi Varro, PhD**

Associate Director
Reagent Development
BD Biosciences - Immunocytometry Systems
Franklin Lakes, NJ

**Maker of immunocytometry antibodies, chemicals, EDTA, flow-cytometry systems, fluorescent calibration particles and fluorescent particles, multiplex assay systems/fluorescence multiplex arrays, RBC control cells and lysis reagents, and shear fluid.**

### What is ahead for flow cytometry?

“Simplified data management is clearly the next major trend in the flow-cytometry lab. While chemistry and hematology labs have employed bidirectional interfaces for years, flow-cytometry data has been harder to manage due to the manual nature of pathology studies and the complexity of the analysis. With the use of more colors and lasers, the amount of data generated has multiplied and become increasingly unmanageable. Yet, seamless connectivity is now within our reach. Advanced data-management tools are being developed and deployed that incorporate bidirectional information flow and decision rules, along with streamlined results reporting. For example, routine processes, such as the uploading of T-cell subset test results, can be automated to reduce operator time requirements and improve accuracy. This frees lab personnel from tedious manual tasks, allowing them to spend more time on complex flow-cytometric analysis.”

**Robin Bramson, Product Manager**

Clinical Flow Cytometry
Beckman Coulter Inc.

**Maker of flow-cytometry antibodies, controls, instruments, reagents, support reagents, and systems and kits.**

### The push for technology adoption

“Current trends in flow cytometry are helping to drive increased adoption of this technology in clinical testing, pharmaceutical studies, and basic research in novel areas. Advances in sample-preparation automation, detection sensitivity, digital-signal processing speed, rare-event analysis, and cell-sorting performance — coupled with a broad portfolio of reagents with a varying spectrum of dyes and fluorochromes — provide the tools necessary to answer questions in immune monitoring, immunophenotyping, stem-cell analysis, cell-signaling, and signal transduction. Information from flow-cytometry research is generating a clearer picture of cellular pathways that create options for new pharmaceutical interventions and methods for monitoring patients who are living with some types of cancers. Work is underway in new areas as well, such as determining what cellular markers can better determine risk for disease areas, such as cardiac disease and sepsis. We see continuing growth for flow cytometry as questions are asked that can uniquely be answered by the power and flexibility that flow brings.”

**Karen Bezold, Director**

Flow Cytometry Strategic Marketing
Beckman Coulter Inc.

**Maker of flow-cytometry antibodies, controls, instruments, reagents, support reagents, and systems and kits.**
Flow Cytometry

One diagnostic tube

“Five percent to 10% of cases received daily in our laboratory consist of quantitatively limited samples, allowing only one diagnostic tube for flow-cytometric immunophenotyping. Running up eight markers from the one-tube assay, necessitated by low cell yield, substantially increases the diagnostic information that can be obtained from testing — compared to routine three-, four-, five-, or even six-color flow cytometry.”

Lawrence Hertzberg, MD
Medical Director
CSI Laboratories
Small independent flow-cytometry laboratory currently serving medical facilities in AL, GA, NC, SC, KY, TN, MS, and VA.

Extending tube stability

“Collection of whole blood is the first step in assessment of HIV patient status by flow cytometry. The CDC guidelines for CD4+ T-cell analysis require that blood specimens collected in a standard K2EDTA tube must be analyzed within 48 to 72 hours of collection. We have extended the stability claim for the HIV panel of markers — CD3, CD4, CD8, CD16+56, CD19, and CD45 — in terms of absolute cell counts and percent recovery to 14 days at 18˚C to 22˚C for samples collected in our tube. This addresses a major obstacle encountered during large, global clinical-trial studies. Additionally, we provide flow-cytometry cellular controls like a positive procedure control manufactured from normal human peripheral blood leukocytes and erythrocytes. Unlike a fresh whole blood sample, this product provides reproducible data when used for daily QC of immunophenotyping procedures. Another flow-cytometry control is a whole blood process-control manufactured from CD34 positive cells.”

Connie Ryan, President
Streck,
Maker of Cyto-Chex BCT, CD-Chex Plus, and CD-Chex CD34

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