

# 2008 Flow Cytometry Report: Market Overview and Industry Survey Executive Summary

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# Report Introduction

The 2008 Flow Cytometry Report is composed of an in-depth Market Overview, an introduction to the 2008 Flow Cytometry Survey and methodology used, and analysis of the survey results.

The flow cytometry market is composed of instruments, reagents, devices, and services used across the research and clinical life sciences areas that span the academic and biomedical, biotechnology, and pharmaceutical business market sectors. The 2008 Flow Cytometry Market is estimated at \$1.5Billion and is estimated to grow to \$3.7Billion by 2015 with estimated growth rates of existing products. Sixty-eight percent of the 2008 product revenue is from Instruments and Reagents make up 32% of the revenue. Cell-based Flow Cytometry is estimated at \$1.3 Billion with a CAGR of 10-15%. Market leaders Becton Dickinson and Beckman Coulter comprise about 70% of the Research and Clinical areas of the Cell-based Flow Cytometry Market. Bead-based Flow Cytometry is estimated at \$215 Million with a CAGR of 25-30%. Luminex and partners comprise approximately 90% of the bead-based flow cytometry market.

The 2008 Flow Cytometry Survey is designed to provide life science suppliers of flow cytometry instruments, reagents, and software with information about the current needs of researchers and their future purchasing plans. Data were gathered from questions regarding their usage habits including research goals, facility type, number of flow experiments performed per week, types of flow cytometry products commonly used, average number of samples per experiment currently used and how this will change in one year, applications, and sample and cell types frequently used. Other questions were related to brand preference of instruments, kits and reagents, and software. Participants were asked to identify key features considered when purchasing a flow cytometer instrument and flow cytometry software. Specific questions addressed which fluorophores are utilized, which molecule families are studied, and number of colors/lasers used in each experiment and how that is predicted to change in three years. Other questions uncovered cell sorting needs and how many colors are used for sorting, how often sterile conditions are required, and what fluid type is most commonly used. Participants were given the opportunity to provide open-ended suggestions for next generation flow cytometry instruments, kits and reagents, and software. Demographic information was collected for each participant including country, institution type, job title, areas of research focus, highest degree attained, and purchasing authority.

## Survey Methodology

The survey consisted of 34 questions, two of which were open-ended. The survey was administered online from June 23rd - July 11th, 2008, and the data tabulated and presented as part of this market report.

## Market Overview

This market overview summarizes the use of flow cytometry for the analysis of cells, as well as for proteomic and genomic applications facilitated through bead-based flow cytometry. The present overview serves as an accompaniment to the 2008 Flow Cytometry Survey.

### Overall Flow Cytometry Market - \$1.5 Billion

The overall flow cytometry market can be divided into analysis of cells - cell-based flow cytometry - or analysis of fluorescent beads or particles - bead-based flow cytometry. Cell-based flow cytometry remains the most extensively used application of the technology. Forecasts and industry expert estimates indicate that cell-based flow cytometry is currently a \$1.3 Billion market with annual growth in the 10-15% range<sup>1</sup>. Bead-based flow cytometry is most well represented by Luminex Corporation and its extensive partner network of almost 60 companies using Luminex xMAP technology and instrument systems<sup>2,3</sup>. The bead-based flow cytometry market is estimated to be in the \$210-220 Million range and has posted a robust growth rate of greater than 25% over the past several years. Luminex Corporation and its' partners account for approximately 90% of the revenues in this fast growing piece of the flow cytometry market<sup>2,3</sup>.

### Market Drivers

Key technical and economic drivers of the flow cytometry market are listed below and are being addressed by an assortment of established and new companies. Particular needs and opportunities of the flow cytometry community have historically been rapidly translated into commercial products so there are continual advances in the instrumentation<sup>4-7</sup>, reagents<sup>1,7-10</sup>, software<sup>11</sup> and services<sup>12</sup> components of the flow cytometry market. Although major sources of product revenue for the flow cytometry market are flow cytometer instruments and reagents, several companies are also providing software and bioinformatics expertise<sup>11</sup>. The need to address throughput, higher sample volume, and workflow has also led to the development and adaptation of devices and instruments which automate sample preparation and processing<sup>13</sup>. Flow cytometers can be complex instruments. Higher level cell analysis by flow cytometry utilizes advanced protocols for sample preparation and requires sophisticated analysis. There is a need for continuous education and training on both new instruments and new applications. The need for advanced training is being met by an increase in services by existing or new entities<sup>12</sup>.

## Market Overview (con't.)

Technology related drivers of the flow cytometry market include:

- Need for higher throughput
- Facilitated use and operation of a flow cytometer
- Automation and sample preparation
- Multiparameter and multicolor analysis
- Multiplexing
- Validated biomarkers
- Aseptic, efficient, accelerated and safe cell sorting

Economic drivers include cost containment or cost reduction for:

- Instruments
- Facilities
- Personnel
- Diagnostics

### Instruments

Instruments comprise approximately 35-40% of revenues or around \$500M according to reports, releases and industry experts<sup>1,14</sup>. Depending on cytometer configuration such as number of lasers, or validation for field of use (e.g. IVD clearance), or size, a flow cytometer can be priced in the \$30-35K range for a bench top analyzer such as the new Accuri C6 analyzer<sup>4</sup> to \$500K for a high-end flow cytometer with analysis and sorting capabilities<sup>1</sup>. Several newer instruments are also becoming available at the higher end of the flow cytometer complexity range. To meet cell sorting needs for cell therapeutic doses the ALDESORTER™ is offered from Aldagen<sup>5</sup>. The Gigasort™ from Cytonome is a clinical grade optical sorter designed for rapid, sterile and safe sorting for clinical cell sorting applications<sup>6</sup>. For a more compact footprint, Bay Bioscience offers the JSAN benchtop sorter<sup>15</sup>. BD has launched the Aria II sorter platform with improved fluidics, design and UV laser options for flexibility and enhanced workflow<sup>7</sup>. BD Biosciences, Beckman Coulter, Guava Technologies, Luminex, and Partec are well recognized flow cytometer providers<sup>1</sup>. Total number of flow cytometer placements worldwide is estimated in the 20-25,000 range<sup>1</sup>. Luminex bead-based instruments alone, as far as units sold, is approximately 5,000 according to the Luminex 2007 Annual Report and SEC filing<sup>3</sup>.

### Reagents and Fluorescent Probes

Reagents for flow cytometry are predominantly fluorochrome labeled antibodies for cell-based flow cytometry and fluorescent beads conjugated with an antibody or other macromolecule for

## Market Overview (con't.)

analysis in bead-based flow cytometry. Based on overall flow cytometry revenue estimates, total flow cytometry reagent revenues account for approximately \$1 Billion<sup>1,14</sup>. Additional sources of reagent revenues besides fluorochrome conjugated antibodies and fluorescent beads, include fluorochrome dyes, fluorescent metabolic indicator dyes, fluorescent proteins and nanocrystals like quantum dots<sup>10</sup>. Green fluorescent protein isolated from jellyfish, and other fluorescent proteins isolated and cloned from other marine organism species, have been engineered to produce a wider variety of colors. These genetically encoded fluorescent proteins have been used more and more extensively over the past 10 years especially in a variety of applications using flow cytometry to provide markers for gene expression, and to identify and track molecules within intact cells<sup>8,9</sup>.

Nanocrystals such as quantum dots or QDots<sup>®</sup> from Invitrogen, are being used with greater frequency in flow cytometry as well as for cell imaging based on their brightness, and “tunable” emission wavelength based on nanocrystal size<sup>10</sup>. The promise of a single laser, relatively inexpensive flow cytometer used with a panel of QDots<sup>®</sup> or other nanocrystals of different sizes, provides adaptation and opportunity for expanded use in economic multicolor analysis.

Along with the new fluorochrome choices, especially UV and Violet laser excited dyes, there is greater availability of fluorochrome labeled reagents to intracellular markers. Examples of hot focus areas include the study of cell signaling pathways with antibodies specific for activation state molecules. The PhosFlow program from BD is an innovative approach in this newer application for cell signaling studies by flow cytometry<sup>7</sup>. Other areas of intense focus driving reagent development for flow cytometry include stem cell biology, disease related biomarkers, and lymphocyte subset identification.

### Software

The need for advanced bioinformatics has been filled by a number of companies offering various software packages to process, analyze and present the vast amounts of complex multiparameter information which can be generated by flow cytometry. Companies providing dedicated software include Tree Star Inc., Verity Software House, De Novo Software, Phoenix Flow Systems, and Soft Flow Hungary, while instrument leaders BD Biosciences and Beckman Coulter continue to design of their own software programs<sup>11</sup>.

## Market Overview (con't.)

### Automation and Sample Handling

Need for higher throughput, standardization, and cost containment have been approached in the flow cytometry area through adaptation of different devices to address the workflow issues especially important in the clinical and screening areas. To paraphrase some statements by Beckman Coulter, which pioneered and still leads laboratory automation “Automation provides efficiency of process and faster decisions. Along with expedited decisions comes accelerated patient treatment and reduced medical care costs which result from shortened hospital stays”<sup>16</sup>.

Common to both clinical and research flow cytometry is the need for improvements in sample identification, sample handling and preparation, sample loading, and sample storage - in short, pre- and post-analytical sample processing.

Beckman Coulter leads in laboratory automation and provides automated solutions through numerous instruments for liquid handling or robotic systems adapted for cell analysis by flow cytometry. The Beckman Coulter Biomek<sup>®</sup> workstations provide automation solutions for fluidics and sample preparation for tube or plate configurations<sup>13</sup>. BD Biosciences offers the BD FACS<sup>™</sup> Lyse Wash Assistant (LWA) and the BD FACS<sup>™</sup> Sample Prep Assistant (SPA II) as part of its automation and sample handling solution<sup>7</sup>.

The HyperCyt<sup>®</sup> device from IntelliCyt speeds sample introduction to the standard and prevalent flow cytometers in use today. Together with the Intellicyt HyperView<sup>™</sup> software, accelerated throughput is achieved for high throughput applications like drug screening. In addition to screening, there are numerous other assays and applications that could be enhanced or developed using this system<sup>17</sup>.

### Training and Technical Services

Refinements in fluidics, optics, bioinformatics, and overall instrument design provide solutions to more complex levels of cell analysis. Advanced applications of flow cytometry such as 6-8 color analysis, or higher levels of intracellular staining techniques for cell signaling studies, often require additional training. Flow cytometer operator training has long been an industry practice provided simultaneously with instrument purchase and installation. Along with personnel changeover and integration of advanced techniques, the need for additional and continuous training has led companies to provide additional technical training and service.

BD, for example, has a field based Technical Applications group to provide on-site technical support and training for new or existing platforms or for new, advanced and more complex applica-

## Market Overview (con't.)

tions. FloCyte Associates provides educational training and recruitment services for operators of flow cytometers for both research and clinical areas and the FloCyte Training Institute is accredited in California to offer education credits for Clinical Laboratory Scientists<sup>12</sup>.

### Cell-Based Flow Cytometry - Clinical and Research Markets

Cell-based flow cytometry can be divided into clinical and research market areas, each an almost equal piece of the \$1.3 Billion represented by cell-based flow cytometry, depending on calculation of specific platform use by design or by utilization in clinical vs. research areas<sup>1</sup>. Long-time leaders in cell-based flow cytometry are BD Biosciences and Beckman Coulter with approximately 70% share of the cell-based flow cytometry market areas between them. BD is estimated to have about a 50% market share of the cell-based flow cytometry market<sup>1</sup>. Both BD Biosciences and Beckman Coulter continue to consolidate their share of the instrument piece of the market with Beckman Coulter acquiring the Cytomation MoFlo XDP and CyAn ADP instruments from Dako over the past year<sup>14</sup> and BD most recently acquiring Cytopeia and its main product the inFlux cytometer<sup>18</sup>. Other companies providing flow cytometers for cell analysis include Guava, Partec, Pointcare, and the new entrant Accuri, whose C6 instrument provides alternatives to the Guava<sup>®</sup> PCA and other benchtop systems for economy in size and cost<sup>1,4,19</sup>. The Amnis ImageStream<sup>®</sup> system combines flow cytometry and image analysis in one platform<sup>20</sup>. Cell separations leader Miltenyi Biotec has had the MACS Quant<sup>™</sup> cell analyzer advertised for several years<sup>21</sup>. In the reagents area for cell-based flow cytometry, leaders BD Biosciences and Beckman Coulter are joined by a large number of cell analysis reagent providers, notably Invitrogen, eBioscience, and R&D Systems among them<sup>1,22,23</sup>, having particular focus in the research areas.

Cell-based flow cytometry clinical areas are comprised of instruments and reagents that address a few major applications including CD4 enumeration for HIV/AIDS and leukemia/lymphoma phenotyping<sup>1,7,13,22,23</sup>. There are approximately 35 million people living with AIDS in the world today according to the joint UNAIDS/WHO 2007 report<sup>24</sup>. Absolute CD4 enumeration, a key indicator in diagnosis and analysis of HIV infection, is conducted using flow cytometry as the gold standard. HIV/AIDS related flow cytometry revenues are several hundred \$Million even considering the lower cost per test negotiated through the Clinton Foundation several years ago<sup>25</sup> with the major companies in this area. Leukemia and lymphoma testing is the other main clinical application for flow cytometry. Hematologic and blood-borne cancers, particularly leukemia and lymphoma typing, is a significant testing market, based on newly diagnosed leukemia, lymphoma and myeloma cases per year alone<sup>26</sup>. Other clinical applications for flow cytometry include HLA-typing, and cell analysis for transplantation, particularly for CD34+ stem cells<sup>7,13</sup>.

## Market Overview (con't.)

The research area is comprised of instruments and reagents used for a wide variety of applications with the majority of analysis for cell surface phenotyping<sup>1,22,23</sup>. However, intracellular analysis by flow cytometry is utilized with more and more frequency for a variety of assays to identify and characterize cell subsets, cell function or cell response. Intracellular staining is used for cytokine and growth factor detection and quantitation, for studying cell metabolism using fluorescent metabolic indicator dyes, for characterizing signaling pathways, for studying apoptosis using annexin dyes, and for cell cycle and proliferation studies<sup>1,22</sup>.

Regardless of use in a clinical or research setting, flow cytometry is a platform of choice in cell analysis based on the attributes and provision of the following:

- Qualitative Measurements
- Quantitative Measurements
- Throughput
- Accuracy
- Sensitivity
- Adaptability and breadth of use
- Multiparameter, multicolor or multiplexed analysis
- Cell-sorting

### Bead-based Flow Cytometry - Proteomics and Genomics Applications

Bead-based flow cytometry is the fastest growing application of flow cytometry with a growth rate of over 25% according to company reports and industry estimates<sup>2,3</sup>. Bead-based flow cytometry offers the following advantages:

- Massive multiplexing
- Throughput
- Rich information read-outs
- Flexibility
- Analysis of proteins and nucleic acids
- Multi-factor analyte quantitation in small sample volume
- Content analysis of lysates or biological fluids
- Diagnostic panel development

Bead-based flow cytometry, a total market estimated at \$210-220M, is comprised of about 70-75% reagents (\$150-160M) and 25-30% instruments (\$50-60M)<sup>2,3</sup>. Proteomic analysis currently is estimated at about 70% or approximately \$160M with an estimated overall growth rate of

## Market Overview (con't.)

around 20-25% and genomic analysis at 30% of the market or approximately \$55M and a growth rate of over 25%. Major players in the bead-based flow cytometry market, according to Luminex financial reports, and corroborated by field presence, are Bio-Rad, One Lambda, Millipore, Invitrogen and Becton Dickinson. In its 2007 10-K filing, Luminex indicated that of 58 strategic partners, 30 have commercialized products<sup>3</sup>. Luminex partners in the research area include Bio-Rad Life Science, Invitrogen, Linco and Upstate businesses of Millipore, and R&D Systems. In the diagnostics area, in addition to its own Luminex Molecular Diagnostics (formerly Tm Bioscience) unit<sup>27</sup>, Luminex partners include a host of companies - Bio-Rad Diagnostics, Abbott Molecular Diagnostics, Inverness Medical Professional Diagnostics, Fisher Healthcare, all with current market presence or intent to commercialize products in the protein or molecular diagnostics area.

Proteomic analysis by bead-based flow cytometry is essentially another form of ELISA technology transferred from planar microarrays onto a bead to provide a fluorescent read-out presented as a virtual array. Cytokines, chemokines and growth factors represent a major application for this type of analysis. Specific panels of 5-8 cytokines are used for measurement of type and strength of immune response or for characterizing cytokine profiles in disease states. Most of the major competitors in the cytokine and growth factor space with traditional ELISA product lines - R&D Systems, Invitrogen through its Biosource product line, and BD Biosciences, also participate in this bead-based application area. In addition to cytokine and growth factor analysis, other application areas are being adapted to bead-based flow cytometry across the research and clinical spectrum. These applications include:

- Signaling Pathways
- Metabolic Disease Analysis
- Diagnostics
- Vaccine Development

Genetic analysis is exquisitely adapted to bead-based flow cytometry from lower density multiplexes for inherited disease susceptibility, to higher density arrays for genotyping, microbial identification and typing, and SNP analysis<sup>25</sup>.

Genetic analysis in circumscribed panels of 6-8 markers or broader arrays for haplotype screening is readily compatible with bead-based flow cytometry. Additional applications include microbial identification and subtyping, and mRNA profiling. Luminex Molecular Diagnostics (formerly Tm Biosciences), as well as others in the Luminex xMAP partner network, Qiagen, Bio-Rad and Fisher Healthcare included, are all involved in the molecular analysis/diagnostics piece of the bead-based flow cytometry market<sup>27</sup>.

## Market Overview (con't.)

### Summary

The cell-based flow cytometry market continues to grow in the 10-15% range. Bead-based flow cytometry is growing in the 25% range. New or upgraded versions of instruments and devices are being developed to address specific needs of cost containment, ease of use, throughput, sorting of cells for clinical applications, and increased multicolor or multiparameter analysis. New reagents and reagent panels together with a wider variety of fluorochromes and fluorescent probes are being utilized for analysis of pathways, more in-depth cell profiling, and driving an overall increase in the number of colors used. Continued improvements in software parallel the need for handling more complex multiparameter or multicolor analysis, higher volume, or diagnostic applications of flow cytometry. Increased focus and resources for training and education are being offered to enable optimal utilization of the more complex flow cytometers for advanced applications in research, clinical or biopharma settings.

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## Flow Cytometry Questionnaire

**1. Please characterize how often you use flow cytometry in your research or work?**

- Frequent use – daily
- Regular Use – once or twice a week
- Occasional Use – once or twice a month
- Infrequent Use – less than once a month
- I do not use flow cytometry – exited from survey

**2. Which best describes your current flow cytometry facility?**

- My lab owns a flow cytometer
- My lab shares a flow cytometer with a few other labs
- My lab uses a flow cytometer core facility
- My lab contracts our flow cytometry work to an outside lab
- Other, please specify

**3. What is the goal or primary focus of your research?**

- Basic research
- Target validation
- Assay development
- High Throughput Screening Assays
- Clinical research
- Clinical routine testing
- Infectious Disease Testing
- Other (please specify)

**4. Which of the following do you use in your flow cytometry experiments?**

- Flow cytometer/analyzer system
- Cell sorter
- Multiplexed bead assays
- Flow cytometry kits
- Positive control cells
- Fluorochrome-labeled primary antibodies
- Fluorochrome-labeled secondary antibodies
- Fluorescent particles/microspheres for calibration
- Fluorescent dyes for labeling antibodies/conjugates
- Fluorescent dyes for cell metabolism
- Fluorescent dyes for ion channel studies
- Fluorescent dyes for nucleic acid staining
- Membrane Dyes
- Quantum dots
- Flow cytometry data analysis software
- None of the above

**5. Do you require automated sampling (i.e. the ability to load samples in plate format)?**

- Yes (Please specify which plate format, e.g. 96-well, 384-well, etc)
- No

**6. How many flow cytometry experiments do you typically run per week?**

- Less than 1
- 1 – 3
- 4 - 5
- 6 - 10
- 11 - 20
- 21 – 50
- 51 - 100
- More than 100

**7. How many samples do you run in an average flow cytometry experiment?**

- Up to 10
- 11 – 20
- 21 – 30
- 31 – 50
- 51 – 100
- More than 100

**8. How do you expect the total number samples measured by flow cytometry to change over the next 12 months?**

- Increase by > 50%
- Increase by 25% - 50%
- Increase by 10 – 25%
- Increase by 1% - 10%
- No change
- Decrease by 1% - 10%
- Decrease by 10% - 25%
- Decrease by 25% - 50%
- Decrease by > 50%

**9. What type(s) of samples do you measure with flow cytometry?**

- Whole blood
- Cell culture supernatant
- Serum
- Biological fluids
- Cultured cells
- Thawed clinical samples
- Other, please specify

**10. What is the top company that comes to mind when you think of flow cytometry? (open-ended)**

**11. What brand of flow cytometer do you PRIMARILY use?**

- Accuri
- Amnis Corporation
- BD Biosciences
- Beckman Coulter
- Bio-Rad BioPlex
- Cytopeia
- Cytex
- Dako
- Guava Technologies
- Luminex
- Partec
- Union Biometrica
- I don't know
- Other (please specify)
- Do not use

**12. What are the top five reasons you chose the brand of flow cytometer you use? (Rank from 1 to 5, 1 = Primary, 2 = Secondary, etc.)**

- Number of available colors and/or lasers
- Speed/Throughput
- Footprint (instrument size)
- Technical support and training
- Software performance
- Price
- Brand recognition
- Automation
- Cell sorting capability
- Service and Warranty
- Sensitivity
- Number of Lasers
- Number of Fluorochromes Detectable
- Aseptic or Sterile Capability
- Technical support
- Usefulness of website

**13. What brand(s) of flow cytometry kits and/or reagents do you use? (check all that apply)**

- AbD Serotec
- Alpco Diagnostics
- Assay Designs/Stressgen Bioreagents
- AMERICAN DIAGNOSTICA
- BACHEM
- BD Biosciences
- Beckman Coulter
- Bender MedSystems
- BioCytex
- BioLegend
- BioVision
- Cayman Chemical
- Calbiochem
- Cell Signaling Technology
- Dako
- eBioscience
- Guava Technologies
- Invitrogen/Molecular Probes
- Millipore (Chemicon/Upstate/Linco)
- Miltenyi Biotec
- Partec
- Promega
- R&D Systems
- Roche Applied Science
- Santa Cruz Biotechnology
- Sigma
- Stratagene
- Other, please specify

**14. Which of the following flow cytometry applications do you perform? (check all that apply)**

- Light Scatter
- Fluorescence
- Immunofluorescence
- DNA Content Analysis/DNA Staining
- Gene Expression and Transfection
- Metabolic Studies
- Cell sorting
- Other (please specify)

**15. Which of the following molecule types do you analyze by flow cytometry?**

- Cytokines
- Chemokines
- Cytokine receptors
- Chemokine receptors
- Apoptosis proteins
- Cell cycle proteins
- Glycoproteins
- CD markers / cell surface markers
- Modified proteins (phosphorylated, etc)
- Adhesion molecules
- Stem cell markers
- Toll Receptors
- Viral Receptors
- Nucleic Acids
- Microbial Infectious Agent Detection
- Cytoskeleton Proteins
- Other (please specify)

**16. Which of the following cell types do you use in flow cytometry applications?**

- Primary cells
- Lymphocytes
- Granulocytes
- Embryonic stem cells
- Hematopoietic stem cells
- Dendritic cells
- Cell lines
- Cancer or Neoplastic Cells
- Transfected Cells
- Other (please specify)

**17. What fluorochromes or fluorescent dyes do you use? (check all that apply)**

- Pacific Blue
- Cascade Yellow
- Fluorescein Isothiocyanate (FITC)
- Phycoerythrin (PE)
- Texas Red
- Cy5
- Cy5.5
- Cy7
- Alexa 405
- Alexa 647
- Alexa 488
- Alexa 610
- Alexa 700
- Alexa 750
- Indo-1
- Hoechst 33342
- Cascade Blue
- Monochlorobimane (MCB)
- Allophycocyanin (APC)
- Propidium Iodide
- Rhodamine
- GFP
- PE/Cy5
- PE/Cy5.5
- PE/Cy7
- APC/Cy7
- APC/Cy5
- PerCP
- PE/Texas Red
- Other (please specify)

**18. How many colors do you typically use on your analytical flow cytometer?**

- 1-2
- 3-4
- 5-6
- 7 or more

**19. How many colors will you typically use in the next three years?**

- 1-2
- 3-4
- 5-6
- 7 or more

**20. How often does your research require cell sorting capabilities?**

- Often, # of colors \_\_\_\_\_
- Sometimes, # of colors \_\_\_\_\_
- Rarely, # of colors \_\_\_\_\_
- Never

**21. How often does your research require sterile conditions?**

- Often
- Sometimes
- Rarely
- Never

**22. Does your flow cytometer use commercial sheath fluid or deionized filtered water?**

- Commercial sheath fluid
- Deionized filtered water
- Other, please specify

**23. Which of the following flow cytometry software types do you primarily use to analyze data?**

- Software package that came with the flow cytometer
- Third party flow cytometer software – purchased
- Third party flow cytometer software – freeware

**24. What software do you use to analyze your flow cytometry data? (check all that apply)**

- FCS Express from De Novo Software
- FlowJo from FlowJo LLC
- ModFit LT from Verity Software House
- QuantCALC from Verity Software House
- WinList from Verity Software House
- WinList 3D from Verity Software House
- CellQuest Pro from BD Biosciences
- Paint-A-Gate Pro from BD Biosciences
- BD Attractors from BD Biosciences
- BD FACSDiva from BD Biosciences
- Expo 32 from Beckman Coulter
- Summit from Dako
- Guava Cytosoft from Guava Technologies
- FloMax from Partec
- Other (please specify)

**25. How many gates do you typically create when analyzing a single flow cytometry sample?**

- 0
- 1 – 2
- 3 – 5
- 6 – 10
- 11 – 15
- 16 – 20
- More than 20

**26. Please rate the importance of the following flow cytometry data analysis software features to your research? (1 = Not at all important, 5 = Very important)**

- Online documentation
- Technical support
- Histogram plot
- Ability to create a variety of gate shapes
- Export data capability
- 2D Plots (dot, density, contour)
- Overlay capabilities

**27. What would you identify as the biggest technical problem in your experience performing flow cytometry? (open-ended)**

**28. Do you have any suggestions you would like to provide to suppliers when designing next generation flow cytometry equipment, software, and kits and reagents? (open-ended)**

- Flow Cytometers:
- Kits and reagents:
- Software:

**29. When looking for flow cytometry reagents, where do you typically search to find the reagent you need? (check all that apply)**

- Supplier website
- Biocompare
- Google
- Yahoo
- Purdue Flow Cytometry Board
- Colleagues
- Other (please specify)

## Demographic Questions

**30. In which type of institution do you work?**

- Academic
- Pharmaceutical
- Private Research
- Other (Please specify)
- Biotechnology
- Government
- Clinical/Hospital

**31. Which title best applies?**

- Professor/Instructor
- Lab Manager/Supervisor
- Business Dev Director/Manager
- Department Head
- Account Manager
- Staff Scientist
- President/CEO/Owner/VP
- Postdoctoral Fellow
- Consultant
- Product Manager
- Process Engineer
- Research Associate
- Research Director/VP of Research
- Technician/Research Assistant
- Graduate Student
- Principal Investigator
- Lab Director/Chief Scientist
- Procurement Manager
- Other

**32. What is your highest professional degree?**

- PhD
- Masters Degree
- Undergraduate Degree
- MD
- MD/PhD
- Other, please specify

**33. Which best describes your purchasing authority?**

- Authorize
- Recommend
- Evaluate
- No Purchase Role

**34. Which of the following are your key areas of research or work?**

- Bioinformatics
- Drug Discovery
- Biomanufacturing /Process Development
- Proteomics
- Diagnostics/Pathology
- Microbiology/Virology
- Immunology
- Cell Signaling
- Genomics/Genetics
- Cell Biology
- Biochemistry
- Pharmacology/Toxicology
- Molecular Biology
- Neuroscience
- Bioengineering
- Purchasing
- Administration
- Marketing/Sales
- Other