2004/2005 MSPPSA SERIES

HPLC COLUMN USAGE

AN ANALYSIS OF MARKET SIZE & GROWTH MARKET SHARE, PURCHASE PLANS & SUPPLIER ASSESSMENT FOR THE U.S. LIFE SCIENCE RESEARCH MARKET

A Multi-Client Report

by
PhorTech International
San Carlos, California

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I. Background

A. Survey Objectives

The purpose of this survey was to provide the management of our client companies with an analysis of the current usage of HPLC columns in the U.S. life science research market. This includes an analysis of the consumption of HPLC columns for major suppliers according to the type of packing, inner column dimensions and length, and the particle size by a cross section of researchers who utilize this technique in their work.

The survey was Web-based, at a location on our Web site made known to respondents through email invitations. The surveying was blind, with no reference made to any clients for the survey. To encourage respondents to express themselves freely, the survey was anonymous, and made frequent use of open-ended questions.

Four demographic screens were used to characterize respondents, the position or job title, the primary function of the laboratory or department, involvement in the purchase of HPLC columns and type of organization. Those working in the industrial sector, including private companies, were asked two supplemental multiple-choice questions, indicating the kind of industry and the total number of employees, and researchers working in academia were identified according to their principal area of expertise.

Early on in the survey, respondents were asked whether or not they currently use HPLC in their work or plan to start within the next 18 months. Those respondents who answered negatively were not qualified to continue and therefore were directed to exit the survey.

Current or future users were asked to complete a series of questions describing their current work. The first of these describes the chromatographic methods used from five options including HPLC, HPLC-GC, preparative HPLC, FPLC or LC. The types of sample classes analyzed, including eight classes and an optional open-ended write-in category, was the subject of the next query. Respondents were also asked to enumerate the number of injections per week performed for analysis or purification purposes for each of these nine classes (proteins, peptides, amino acids, DNA/RNA/oligos, carbohydrates, organic acids, organic polymers, inorganic ions, or other samples).

This was followed by a query regarding the number of HPLC systems and FPLC systems owned by their group or laboratory, defined as the smallest group that shares equipment and supplies. The next series of questions identify researchers' average annual spend on prepacked chromatographic columns, the average number of columns this represents, the anticipated percent change in this consumption over the coming year and the reason for this increase or decrease in workload. The general frequency of using refilled

columns, with possible responses being always, often, sometimes or never, was also examined.

Respondents were then asked to provide a detailed description of their current consumption of HPLC columns, providing the supplier name, type of packing, inner diameter, length in centimeters, particle size and quantity used per year. The types of packing included reversed phase standard, C18; reversed phase standard, C8; reversed phase, other; ion exchange; affinity; chiral; gel permeation; gel filtration; normal silica; amino phases; cyan phases; diol phases; phenyl phases or other. Column IDs varied from capillary up to > 5 mm and particle sizes ranged from < 2um to > 5 um.

Respondents were also asked to identify the single most important factor when choosing a column supplier and to indicate the where the HPLC columns are purchased from, either directly from the manufacturer, from a suppliers of HPLC/FPLC instrumentation, from a distributor, internal department or via the Internet. These HPLC users were then asked to describe desired improvements in column specifications which would encourage them to switch to a new supplier, and, for the two types of HPLC columns used most frequently, to explain in detail the reason for choosing that particular supplier. Respondents were then asked to select the highest-rated HPLC column manufacturer from a list of 18 options in four key areas including best value for money, easiest handling, best technical support, and best refill service. Dissatisfaction with column suppliers, and the reason behind both satisfaction and dissatisfaction was the subject of the next question, followed by an open-ended query regarding suggestions for new developments in HPLC columns and/or instrumentation which respondents would like to see in the future.

Major objectives of the survey were to estimate the present size of the HPLC/FPLC column market and to determine the present market share for major column categories for leading suppliers in the U.S. market for life science researchers, based upon the current rates of column consumption. The attitudes of current users towards HPLC column suppliers would be measured. In particular, the audit of column consumption along with our respondents assessment of these suppliers assessment should permit the evaluation of our clients' present market positions, identify marketing strengths and weaknesses, and suggest strategies to develop or improve sustainable competitive advantage.

This report is the first 2004/2005 study in a growing series of market research analyses that began in 1993. We plan to continue the series, adding titles and alternating between U.S. and international markets, depending upon our clients' suggestions and support.

Reports published in the 2003/2004 U.S. series cover:

Molecular Biology Reagent Systems, Vol. 1 & 2
Protein Expression Systems
Proteomics Research, Volume 1
Proteomics Research, Volume 2.

Reports released in the 2002/2003 series include the following U.S. topics:

DNA Amplification Instrumentation
DNA Amplification Reagents & Methodology
Microplate Reader & Equipment Market

Topics in the U.S. series published in 2001/2002 include:

Electrophoretic Instrumentation & Reagents
Molecular Biology Reagent Systems, Vol. 2

This series also includes the following reports covering international markets:

Densitometers & Image Analysis in Europe
DNA Sequencing in the Far East.

The 2000/2001 series covered the following three reports:

U.S. DNA Amplification
U.S. Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 1 in the Far East.

In the 1999/2000 series, we have released three reports examining the following markets. These are:

Microplate Equipment in Europe
DNA Sequencing in the U.S.
Monoclonal Antibodies in the U.S.

The following nine titles have been released in the series for 1998/1999:

Cell & Tissue Culture in the U.S.
Cytokines & Growth Factors in the U.S.
DNA Amplification in the Far East
DNA Sequencing in Europe
Electrophoretic Gel Media in Europe
HPLC in the Life Sciences in the U.S.
Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 2 in the Far East
Protein Expression Systems in the U.S.

The following titles have been released in the U.S. series for 1997/8:

DNA Sequencing
Molecular Biology Reagent Systems, Vol. 1
Molecular Biology Reagent Systems, Vol. 2
Molecular Diagnostics.

Clients are reminded that additional copies of any of these reports that have been purchased in the past within your organization are available at a modest cost. Also offered are the original databases upon which each these reports are based, and for the most recent series, electronic site licenses. Please contact us for further details.

Clients wishing to know publication dates for any of these reports, or wanting to read summaries of many of the 70+ reports in this series are invited to visit our Web site at www.phortech.com.

B. Survey Methodology

E-mail invitations to take part in the survey were sent to a selected cross-section of 5,880 U.S. scientists from the panel of PhorTech life science researchers. Customized email invitations to the web-based survey were sent in 10 batches between September 23rd and November 11th. There were approximately 580 invitations per batch on average.

There were exactly 1,000 email messages returned as undeliverable from the mailings to the PhorTech panel, corresponding to a rate of 17.0%. By deducting the 1,000 undeliverables from the 5,880 outbound invitations, we calculate that a total of 4,880 life science researchers received invitations to participate in the survey.

The questionnaires were anonymous, using a combination of tabular entry, check-offs, and open-ended probes. However, almost all respondents did identify themselves by filling in the prize address form. This makes it possible for us to double-check the responses to any questions by emailing or telephoning respondents, improving the overall confidence in the data. We did not observe any survey fatigue in this questionnaire, and felt that respondents spent considerable time explaining their positions on the open-ended questions.

With a current total of 365 responses from the 4,880 invitations, the overall response rate is 7.5%, which met expectations. The overall statistical results that will be presented in the final report will be accurate to within ±5.1 percentage points at the 95% confidence level.

In our experience, 95% confidence levels are appropriate primarily for scientific experiments. Most business people making decisions are content to be right more often than they are wrong. In this case, a 65% confidence level, (in which you would be right twice as often as you would be wrong) is more appropriate. Conveniently, 65% confidence levels are nearly exactly one half the size of the 95% level, thus our 65% levels would be ±2.6% for all respondents.

According to the binomial distribution theory, these values are valid when the measured event has about a 50% probability. When the measured event is considerably more rare than this, the corresponding confidence intervals get smaller. On the other hand, these confidence intervals are valid for answers based upon the complete pool of respondents. When analyzing data for a group that includes only a small segment of respondents, the answers are less certain and confidence intervals are correspondingly larger.

In this report, we will calculate more exact individual confidence intervals when appropriate. In our comments, we will note whether given differences

are significant at either the 65% or 95% level. To aid our client in determining the appropriate confidence interval for various combinations of sample size and measurements, we have created the following table. Just read the closest percentage on the left and find the closest sample size column. The intersection will show the confidence interval for that combination. For example, a measured 35% value with a sample size of 200 has a 95% confidence interval of ± 6.6%.

95% Confidence Intervals for Various Percentages & Sample Sizes

Percent	n=10	n=20	n=50	n=100	n=200	n=500	n=1000
5%	±13.5%	±9.6%	±6.0%	±4.3%	±3.0%	±1.9%	±1.4%
10%	±18.6%	±13.1%	±8.3%	±5.9%	±4.2%	±2.6%	±1.9%
20%	±24.8%	±17.5%	±11.1%	±7.8%	±5.5%	±3.5%	±2.5%
35%	±29.6%	±20.9%	±13.2%	±9.3%	±6.6%	±4.2%	±3.0%
50%	±31.0%	±21.9%	±13.9%	±9.8%	±6.9%	±4.4%	±3.1%
65%	±29.6%	±20.9%	±13.2%	±9.3%	±6.6%	±4.2%	±3.0%
80%	±24.8%	±17.5%	±11.1%	±7.8%	±5.5%	±3.5%	±2.5%
90%	±18.6%	±13.1%	±8.3%	±5.9%	±4.2%	±2.6%	±1.9%
95%	±13.5%	±9.6%	±6.0%	±4.3%	±3.0%	±1.9%	±1.4%

II. Demographic Segmentation

QUESTION 19.

Question:

How would you best describe your type of organization: Academia/university, Government agency, Hospital/medical school, Industry, Private or Research foundation? *(Best SINGLE answer, please).*

Rationale:

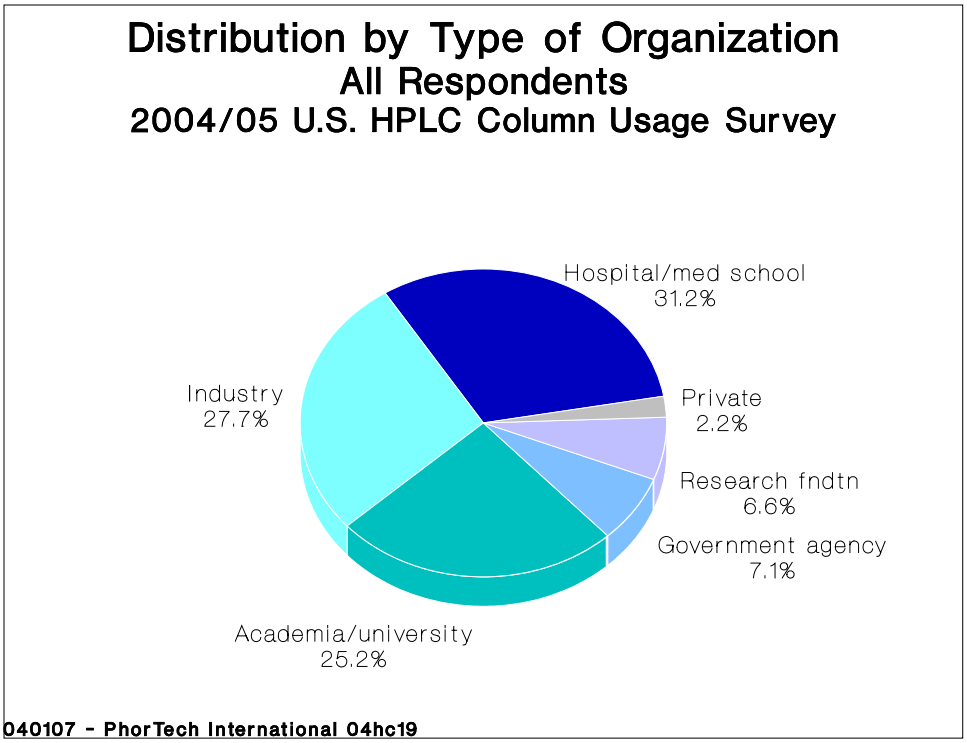
The responses to this question will show the distribution of these respondents over the six organization classifications. This will identify where our respondents are located and primary sources of funding for both current and future HPLC work.

Results:

Before analyzing, the data required some editing in order for responses to be consistent. In order to reflect the source of funding, those working in either a hospital, medical school or health science center have all been categorized as a hospital or medical school. Researchers working in private research foundations, many of which have an email ending in .org, and those receiving private funding from organizations such as HHMI, have been classified as research foundations. VA Medical Centers and military organizations are considered to be government agencies.

The distribution of responses from all 365 respondents is shown in the pie chart at the top of the next page.

Just under one third of these researchers are working in a hospital or medical school setting, the type of organization with the largest representation, followed by the 27.7% working in industry and the 25.2% located in an academic or university setting. Just under half of the remaining 15.9% of respondents are from a government agency or research foundation with only a few percent indicating a private organization.



Analysis:

Compared to most of studies in the life science research market, this is a uniquely different distribution in that the percentage of respondents from the industrial sector is higher than the 15 to 20% typically found, and the share of academics is proportionally lower.

For completeness, we present a list of the organizations represented by the respondents to this survey. These are grouped by type of organization, which are then listed in descending order according to the share of respondents that each represents. This begins, then, with the location of researchers working in a hospital or medical school, which are presented in alphabetical order.

Location of Respondents Using or Planning to Use HPLC Columns, by Type of Organization

Hospital/Medical School
Albert Einstein College of Medicine
Baylor College of Medicine
Beth Israel Deaconess Medical Center
Brody School of Medicine
Cancer Research Center of Hawaii
Case Western Reserve University
Columbia University Health Science
Dartmouth Medical School, Hanover
Dartmouth Medical School, Lebanon
Douglas Hospital Research Center, Canada
Duke University Medical Center
East Carolina University

Emory University
Fox Chase Cancer Center
Harvard Medical School
Indiana University School of Medicine
Institute of Human Virology
Johns Hopkins University School of Medicine
Loyola University Medical Center
Medical University of South Carolina
Mount Sinai School of Medicine
New York Medical College
Northwestern University
Oklahoma University Health Science Center
Oregon Health & Science University
Purdue University
Rutgers University
Texas A&M Health Science Center
Thomas Jefferson University
University of Alabama, Birmingham
University of Arkansas for Medical Science
University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of California, San Diego Medical Center
University of California, San Francisco
University of Chicago
University of Colorado Health Science Center
University of Delaware
University of Florida
University of Illinois, Chicago
University of Kentucky
University of La Coruna
University of Louisville
University of Medicine & Dentistry of New Jersey
University of Medicine & Dentistry of New Jersey/New Jersey Medical School
University of Miami
University of Michigan
University of Minnesota
University of Mississippi Medical Center
University of Nebraska Medical Center, Omaha
University of Nebraska, Lincoln
University of North Carolina, Chapel Hill
University of North Texas Health Science Center (UNTHSC)
University of Pennsylvania
University of Pittsburgh
University of Rochester Medical Center
University of South Florida
University of Texas Health Science Center, Houston
University of Texas Health Science Center, San Antonio
University of Texas Southwestern Medical Center
University of Virginia

University of Washington
University of Wisconsin
Vanderbilt University Medical Center-Nashville
Wake Forest University School of Medicine
Washington University School of Medicine
Yale University School of Medicine

Industry

Abbott Labs
Agentase
Allergan
Alltech
Ambergen
Ambion
Amgen Corp, Seattle
Amgen Corp, Thousand Oaks
Applied Biosystems
AstraZeneca
Aventis Pasteur
Bayer Health Care
Bayer Pharmaceuticals
BD Biosciences
Biomarin Pharmaceuticals
Biomeasure
Bio-Rad Labs
Bristol-Myers Squibb
Cellomics, Inc
Chiron Corp
Cue BIOtech
diaDexus, Inc
DuPont
Eli Lilly & Co
Elitra, Canada
Ellipsis Biothera Corp, Canada
Eppendorf 5' Prime
Evolutionary Genomics
Favrille, Inc
FDAH, Inc
FemmePharma, Inc
Fujisawa Healthcare, Inc
Genentech
GlaxoSmithKline
ICOS Corp
Isco, Inc
ISTA Pharmaceuticals
J&J Pharmaceuticals Research Division
La Jolla Pharmaceuticals
Ligand Pharmaceutical, Inc
LMAC
Maple Leaf Foods, Canada

Merck & Co
Merck Frosst, Canada
MitoKor
Monsanto Co
Nestor Associates
Neurogen Corp
Novascreen Bioscience Corp
Novel AvenueTechnologies
O D 260, Inc
OSI Pharmaceuticals
P&G Pharmaceuticals
Peak Media
Pfizer, Inc - PGRD, Groton
Pfizer, Inc, Ann Arbor
Pfizer, Inc, Newport
Phage Biotech Corp
Pharm Development Consulting
Phylos, Inc
Pierce Biotech, Rockford
Pierce, Milwaukee
Pioneer Hi-Bred International, Inc
Plexxikon, Inc
Procter & Gamble Pharmaceuticals
Progenics Pharmaceuticals, Inc
Quorex Pharmaceuticals
Regeneron Pharmaceuticals
Roche
Sequenom, Inc
Sigma Chemical Co
SpectruMedix
Taro Pharmaceuticals USA
The Frankel Group
Third Wave Technologies
Tranxenogen
Trimeris, Inc
Trinity Biotech USA
Vical
Vive Technologies, Inc, Canada
Wellstat Biologics
Wyeth BioPharma

Academia/University

Arizona State University
Baylor University
Brigham Young University
California Institute of Technology, Pasadena
Colorado State University
Cornell University
East Connecticut State University
Emory University

Florida Atlantic University
Harvard University
Indiana University of Pennsylvania
Iowa State University
JCTS
Johns Hopkins University
Louisiana State University, School of Veterinary Medicine
McGill University, Canada
Michigan State University
Montana State University
National Chung Hsing University
North Carolina State University
Northeastern University
Northwestern University
Ohio State University
Ohio University
Oklahoma Animal Disease Diagnostic Lab
Old Dominion University
Oregon State University
Purdue University
Rockefeller University
San Diego State University
Selma University
St Olaf College
Stanford University
State University of New York, Buffalo
Tulane University
University Hawaii at Manoa
University of Alabama at Huntsville
University of Arizona
University of Calgary, Canada
University of California, Irvine
University of California, San Diego
University of Chicago
University of Cincinnati
University of Delaware
University of Denver
University of Florida
University of Georgia
University of Houston
University of Illinois College of Pharmacy
University of Illinois, Chicago
University of Illinois, Urbana
University of Kentucky
University of Maryland
University of Maryland School of Pharmacy
University of Maryland, College Park
University of Massachusetts
University of Michigan
University of Minnesota/Analytical Instruments

University of Mississippi
University of New Mexico
University of North Carolina at Chapel Hill
University of Rochester
University of South Florida
University of Texas, Austin
University of Vermont
University of Virginia
University of Wisconsin, Madison
Washington State University
Yale University

Government Agency

Center for Disease Control/Nat'l Institute of Occupational Safety & Health
Fisheries & Oceans, Canada
Idaho Nat'l Engineering & Environmental Laboratory (INEEL)
Nat'l Institutes of Health, Bethesda
NIH/Gerontology Research Center – Nat'l Institute of Aging (NIA)
NIH/Nat'l Cancer Institute (NCI), Frederick
NIH/Nat'l Institute of Standards & Technology (NIST)
NIH/Nat'l Institutes of Diabetes and Digestive and Kidney Diseases, (NIDDK)Phoenix
NIH/Nat'l Institute of Environmental Health Sciences (NIEHS)
Oak Ridge Nat'l Laboratory
Tennessee Wildlife Resources Agency
United States Department of Agriculture (USDA)
US Army Medical Research Institute of Infectious Diseases (USAMRIID)
US Environmental Protection Agency (EPA)
US FDA/Nat'l Center for Toxicological Research (NCTR)
USDA-Agriculture Research Service (ARS), Columbia
USDA-Agriculture Research Service (ARS), Madison
USDA-Agriculture Research Service (ARS), Raleigh
USDA-Agriculture Research Service (ARS), Wenatchee
VA Hospital, Iowa City
Walter Reed Army Institute of Research (WRAIR)
Walter Reed Army Medical Center

Research Foundation

Cancer Institute of NJ
Cincinnati Children's Hospital
Cleveland Clinic Foundation
H Lee Moffitt Cancer Center
HHMI-Howard Hughes Medical Institute /UT Southwestern Medical Center
HHMI-Howard Hughes Medical Institute/UCSD
John Wayne Cancer Institute
Joslin Diabetes Center
Laboratories At Bonfils
Lahey Clinic
Lifespan/Rhode Island Hospital
North Shore LIJ Research Institute
Oregon Health & Science University/Neurological Sciences Institute (NSI)

Partners Health Care/Mass General Hospital
Roswell Park Cancer Institute, Buffalo
Roswell Park Cancer Institute, East Amherst
St Jude Children's Research Hospital
The Burnham Institute
The Scripps Research Institute
The Wistar Institute

Private Industry

BlackBiosystems
Foxy Research, Development & Software
Jackson Laboratory
LINCO Research, Inc
MP Biomedicals
QD