DNA SEQUENCING RESEARCH GROUP: 2006 GENERAL SURVEY OF DNA SEQUENCING FACILITIES

David S. Needleman[1], Debbie Adam[2], Michelle Detwiler[3], Helaman Escobar[4], Jan Kieleczawa[5], Rashmi Pershad[6], Peter Schweitzer[7], Glenis Wiebe[8], and Susan Hardin[9]
[1]USDA/ARS Eastern Regional Research Center, [2]University of British Columbia, Canada, [3]Roswell Park Cancer Institute, [4]University of Utah, [5]Wyeth Research, [6]U.T.M.D. Anderson Cancer Center, [7]Cornell University, [8]Max Planck Institute(CBG), Germany, [9]University of Houston

Abstract

Over the past few years, technological advances have influenced procedures within DNA sequencing laboratories. The DNA Sequencing Research Group (DSRG) conducted an on-line survey designed to capture the current profile of DNA sequencing facilities in both the academic and commercial sectors. The impact of new instrumentation on issues such as sequencing throughput, data turnaround time, pricing and staffing was assessed. We will present a summary of our results, noting comparisons to previous studies. We anticipate that these results will serve as a benchmark against which institutions can compare their respective core facilities.

Introduction

In this study, we present a summary of the results from the 2006 General Survey of DNA sequencing facilities. As in years past, we undertook this survey to capture the current profiles of both academic and commercial DNA sequencing facilities.

The survey consisted of 90 questions that were posted to several web servers including the ABRF listserv. The survey announcements were also e-mailed to all ABRF members. We launched the survey on November 10, 2005 and accepted all submissions until the closing date of December 31, 2005. The results from the survey were collected and presented here. Comparisons are also made to the DSRG surveys of sequencing facilities reported in 2003, 2000 and 1998. These past survey data are available on the ABRF web site at www.abrf.org/DSRG.

Results

Survey Participation

Location:	USA	Canada	Europe	Other
# Respondents:	38	10	8	5

In the 2006 survey, a total of 61 responses were received: 38 from the USA, 10 from Canada, 8 from Europe, and 5 from other locations. 74% of all the respondents were members of ABRF.
Response history: 30 in 2003, 37 in 2000, and 59 in 1998.

Funding Comparisons

	2006	2003
Subsidized Funding	70%	68%

Most of the facilities obtained funding from resources other than chargebacks for DNA sequencing.

	2006	2003
Fully Subsidized	19%	7%
Partially Subsidized	51%	61%

In the 2000 and 1998 surveys, approximately 60% of the respondents reported that their facilities received subsidized funding.

Salaries

Director	2006	2003
Range	< $30,000 to > $100,000	$35,600 to $100,000
Mean	$51,000 to $60,000	$58,000
Technician		
Range	< $30,000	$18,000 to $46,000
Mean	$30,00 to $40,000	$32,600

It should be noted that the percent number of Directors/Managers with Ph. D. degrees fell from 76% in 2003 to 55% in 2006. Conversely, the number of Directors/Managers with a Master's degree or a Bachelor's degree rose from 13% to 20% and from 11% to 25% respectively.

Comparison of the Number of Sequencing Reactions per Year

	2006	2003	2000	1998
Range	<10,000 - 500,000	450 - 250,000	268 - 80,000	250 - 60,000
Median	25,000 - 50,000	47,000	13,000	12,000

The number of sequencing reactions has increased during each survey, although the average number seems to be about the same as in 2003.

Reaction Vessels

Format	Responses
96-well Plates	52
8x12 Strip Tubes	23
Single Tubes	17
384-well Plates	3

N=61

In 2006, the majority of laboratories reported using a combination of reaction vessels. In the 2003 survey, the ratio of single tubes to 96-well plates was 1:1.

Dye Terminator Primary Chemistry Comparisons

Primary Chemistry	2006	2003
BigDye v3.1	78%	14%
BigDye v1.1	17%	4%
BigDye v3.0	0%	30%
BigDye v2.0/v1.0	0%	18%
dRhodamine	0%	10%
DTCS	3%	No data
DynamicET	11%	16%

The secondary chemistry of choice is dGTP v3.0 (50%) followed by BigDye v1.1 (22%). Note that BigDye v3.1 chemistry was introduced in 2003.

Regular Use of Additives

	2006	2003
DMSO	45%	69%
Betaine	38%	5%
Glycerol	8%	21%
Invitrogen Buffers A-G	6%	---*
Thermolidilase	5%	---*
$MgCl_2$	0%	5%

*Data are not available

In 2006, 71% of the laboratories reported using additives. In 2003, 64% of the laboratories reported using additives.

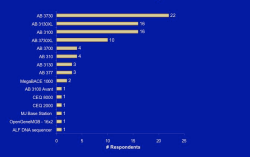
Comparison of Dye Terminator Removal

Purification Method	2006	2003	2000	1998
96-well Filter Plates	32%	---*	---	---
EtOH Precipitation	31%	32%	34%	25%
Magnetic Beads	11%	7%	---	---
Chromatography Columns	5%	62%	58%	65%

*Data are not available.

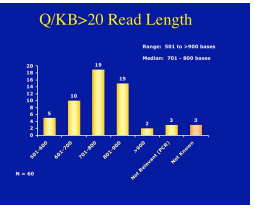
Approximately one-third of the respondents over the past 6 years use EtOH to cleanup sequencing reactions.

Instrumentation - Sequencers



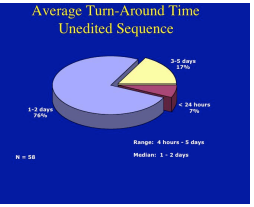
Capillary electrophoretic instruments account for 93% of all the current DNA sequencing systems.

Q/KB>20 Read Length



No correlation was made between Q/KB>20 read lengths, capillary lengths or type of instruments used.

Average Turn-Around Time Unedited Sequence



In the 2000 survey, the average turn-around time was reported to be 53 hours.

Prices for DNA Sequencing*

	2006	2003	2000	1998
Price Range	$1 to $30	$6 to $23	$5 to $25	---**
Average Price	$8	$13	$13	$15
Customer Price Satisfaction	74%	87%	---	---

*Includes sequencing reaction and instrument sequencing.
** No data are available from these surveys.

These are the chargebacks to internal customers for a single sequencing reaction. The wide range of prices in the 2006 survey also includes prices from outside the USA. The range within the USA is from $1.35 to $15.00

Additional Services

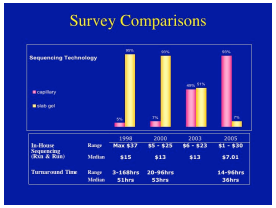
Service	Responses
Fragment Analysis	45
DNA Preparation	23
SNP Confirmation/Discovery	19
Microarray	5
RT PCR	5

N=61

Other services: PCR, quantitative PCR, library construction, colony picking, DNA synthesis, pyrosequencing, proteomics, phosphorimaging, stock room reagents, etc.

Summary

Survey Comparisons



This slide and other survey data will be discussed in more detail during a presentation by Debbie Adam at the DSRG Group Presentation.

- The number of Director/Managers with Ph.D.'s has dropped from 2003, while the number with Master's and Bachelor's degrees has significantly increased.
- The salary ranges for the Director/Managers and Technicians have not substantially changed in the last 3 years.
- 70% of the laboratories are either partially or fully subsidized.
- The average sequencing chargeback has decreased from $13.00 to $8.00.
- The average number of sequencing reactions/year may be leveling.
- There has been a significant change from gel-based systems to capillary electrophoretic systems during the past 3 years.
- BigDye v3.1 is the chemistry of choice, although the use of additives are common.
- Chromatography column are no longer preferred as a cleanup method.

Acknowledgements

- All of the laboratories who participated in the survey
- Chris Walls (University of Utah) for his help in designing the web-based survey

ABRF
DNA Sequencing Research Group