

# 2007 RNAi Survey: An End-User Study

## Executive Summary

Biocompare Surveys and Reports  
Published June 30, 2007

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## Report Introduction

The 2007 RNA interference (RNAi) Report contains a concise overview of the RNAi market, an introduction to the 2007 RNAi Survey, a comprehensive discussion of the survey results, and summarily, conclusions and recommendations that are based on both market analysis and survey data gathered from researchers in this area. The Market Overview focuses on the key applications for RNAi research in gene and protein expression, high-throughput screening, and *in vivo* studies. For continued growth in the RNAi field, required mandates for a decrease in the frequency of the silencing of unintended mRNAs as well as improvements in transfection efficiency are needed. The RNAi market has seen large growth in screening and analysis tools, which are responsible for revenues more than doubling over the past 2–3 years. The revenue forecast for the RNAi market is expected to top \$294 million by 2012, with over \$123 million coming from the screening and analysis sector. As the assessment of expressed protein levels reflects the success of RNAi experiments, RNAi methodologies have been quick to incorporate protein microarrays, 2-D gel electrophoresis, and Western blots to the realm of relevant applications. The goals and methodology of the 2007 RNAi Survey are outlined in the Survey Introduction, with key findings from each survey question presented in the Discussion of Results. Overall conclusions and recommendations regarding the current RNAi market are presented in the final section of the report. The detailed survey questionnaire, data, and tabulated results are also presented.

## Market Overview

You don't have to say much when it comes to describing the importance of certain discoveries: Nobel Prize. That's what you can say about both the 1953 discovery of the double helix and the 1998 paper that detailed the mechanism of RNA inhibition (RNAi). But explaining the response to each finding isn't as cut-and-dry. The introduction of the double helix didn't garner much attention until several years later when DNA was definitively tied to protein synthesis<sup>1</sup>. The story – and profits – from the unveiling of RNAi has been vastly different. Within a few years, this gene silencing technique proved “to be indispensable tools for functional genomics research and for identifying, as well as validating, potential drug targets,” says Jonathan Witonsky, an analyst at Frost & Sullivan.

Arriving at this point required the foundational work of researchers like Francis Crick and James Watson. Back when they were piecing together the DNA puzzle, biologists were just starting to understand the genetic world. Now, more than 50 years later, manipulating it is commonplace along with the demand for new-and-improved ways of experimenting with DNA, RNA, protein and everything in between. An efficient and easy tool for silencing gene expression, RNAi “has created a small revolution in functional genomics,” wrote the editors of a special supplement on RNAi in the journal *BioTechniques*<sup>2</sup>.

But RNAi is far from new. The phenomenon is part of the cell's normal gene-regulating apparatus. Harnessing the natural occurrence and directing it to silence specific genes, then, was relatively straightforward and effective. It all begins when the RNase III-like enzyme called Dicer chops up the double-stranded RNA (dsRNA) into 20- to 25-nucleotide strands of small interfering RNA (siRNA). One strand complexes with a multi-protein apparatus called the RNA-induced silencing complex (RISCs), which features an endoribonuclease. By identifying the complementary sequence to its target, the siRNA leads the RISC to destroy the appropriate mRNA.

Thus, “RNAi has become a vital tool for conducting both gene and protein expression analyses, especially with regard to understanding the pre- and post-transcriptional functions of genes in relation to diseases,” Witonsky says.

The technique has quickly won over researchers looking for efficient ways to explore the vast sequence of the human genome. RNAi also provides relief from costly animal experiments, which also required months before results could be determined. Indeed, these days, “RNAi-based screening is being used to identify gene function rapidly, systematically, and in an unbiased manner,” according to a paper published in the journal *Genetics*<sup>3</sup>. “...full genomes can be screened...”

In just a few years, the market sprouted and is now blossoming to offer a vast selection of products, including reagents, tools, software and custom services. Over that span of time, products have evolved to provide the ever-changing needs of scientists and strategies. Currently, many scientists are shifting projects into high gear and looking for products amenable to high throughput screening. With initial *in vitro* studies already undertaken, products designed for *in vivo* studies are also becoming more popular.

## Market Overview (continued)

“We predicted this shift several years ago,” said Bill Marshall, vice president of technology and business development of biosciences at Thermo Fisher Scientific (Waltham, Mass.), which acquired the Dharmacon product line (Lafayette, Colo.) in the merger between Thermo Electron and Fisher Scientific in late 2006. “People are screening collections of siRNAs in cell based screening assays and letting the biology guide them to which genes are important, rather than testing a hypotheses one gene at a time. Several institutions are screening on a genome-wide basis.”

What remains constant is the need for synthetic siRNA. These chemically synthesized molecules and virally encoded shRNAs – gene constructs that express siRNAs within the cell – are the most widely used reagents, according to a recent paper published in *Nature Methods*<sup>4</sup>. According to Frost & Sullivan analysis, this RNAi content market brought in \$36.7 million in 2005<sup>5</sup>. While 2002 revenues were \$15 million, the forecast for 2012 is \$127.6 million.

“We’re still in a significant growth phase,” Marshall says. “We haven’t reached a plateau as far as additional new users entering the market.” The competition to attract customers is intense. “There’s no doubt about that,” he says.

Based on 2005 figures, Thermo Fisher Scientific’s Dharmacon product line leads the pack, carrying 42.3% of the RNAi content market according to Frost & Sullivan analysis<sup>6</sup>. Qiagen (Hilden Germany) carries 17.1% of market share, closely followed by Applied Biosystems’ (Foster City, Calif.) Ambion (Austin, Texas) with 14.3%. Invitrogen (Carlsbad, Calif.) holds 5.7% market share. The remaining 20.6% market share is held by various other companies, including Clontech (Mountain View, Calif.), Open Biosystems (Huntsville, Ala.), Promega (Madison, Wisc.), Sigma-Aldrich (St. Louis, Mo.) and Stratagene (La Jolla, Calif.).

In total, the RNAi market in the US brought in revenues of \$66.2 million in 2005, according to Frost & Sullivan analysis<sup>7</sup>. The total is forecasted to reach \$294.9 million in 2012. Thermo Fisher Scientific again leads the pack, earning 29.1% of total revenues, based on 2005 figures. Applied Biosystems came in second, earning 17%. Qiagen and Invitrogen share third place, earning 13.6% and 13.4%, respectively. The remaining 26.9% of total revenues shared by a group of companies, including Bio-Rad (Hercules, Calif.), Clontech, Open Biosystems, Promega, Roche Applied Sciences (Indianapolis, Ind.) and Sigma-Aldrich.

Further growth in the RNAi market and attracting more users requires decreasing the frequency of off-target events in which unintended mRNAs are silenced. Dharmacon has led the way in this area. In 2006, they published a paper in *Nature Biotechnology*<sup>8</sup> that detailed the root cause of the problem. As the first to do so, the company has also developed a bioinformatics siRNA design program and identified chemical modifications that produce siRNA with heightened specificity. Many companies are following suit. “With higher specificity siRNA, people are going to have higher confidence,” Marshall says. “And that’s going to grow the market faster.”

## Market Overview (continued)

Improving transfection efficiency is also necessary for the market's growth. While several delivery options are available and suitable, the fact remains that some reagents can harm cells, which can deter researchers who are using precious and/or hard-to-transfect cell lines. Still, the market for RNAi delivery tools is expected to grow to \$43.5 million by 2012 from \$7.8 million in 2005, according to Frost & Sullivan<sup>9</sup>.

With "as much as 20% of researchers using more than one type of delivery tool in a single study," Witonsky says, "vendors that supply numerous delivery solutions that are optimized to work with each other become a one-stop shop for delivery tools...[to] enable further RNAi research and also generate greater revenues."

A large part of the RNAi market consists of screening and analysis tools. In 2005, sales of these products brought in revenues of \$21.7 million, according to Frost & Sullivan analysis<sup>10</sup>. Healthy growth is forecast for the future. Revenues are expected to reach \$50.5 million by 2008 and \$123.8 by 2012.

Integrating such tools and downstream applications into product designs could help companies participate in the flourishing industry. Quantitative real-time PCR, with its mRNA quantifying capability, has emerged as partner to RNAi experiments. With the realization that mRNA levels don't necessarily reflect phenotypic change, researchers are also welcoming RNAi products designed for downstream protein analysis with microarrays, 2-D gel electrophoresis, Western blots and various phenotypic assays.

Offering RNAi products with the flexibility for various types of downstream analyses and applications could also make RNAi products more attractive, which could enable companies to survive the pricing pressures of competition. In addition, convenient transition into existing and familiar applications could encourage researchers to incorporate RNAi into their projects.

## Survey Introduction and Methodology

The 2007 RNAi Survey is intended to help vendors of RNAi supplies and reagents gain a better understanding of how they fare in the RNAi marketplace. Data were gathered from questions regarding the goals of RNAi customers in their research, what types of model organisms are used and whether in vitro or in vivo models are used and how often, the cell lines and cell types used, how siRNA is generated for the researchers' studies, which systems, kits, and reagents researchers work with, what products they plan to purchase and from whom these products will be purchased, the important qualities of these products, the primary vendors identified with RNAi research tools, the required level of purity of siRNAs, how many unique sequences are tested per gene target, how many gene targets are tested and whether this number is expected to change, how gene silencing efficiency is measured, improvements needed in the RNAi field, whether microRNA (miRNA) is studied, what miRNA products are used, how long miRNA has been studied in the laboratory, and what currently unavailable RNAi product or service would help facilitate the researchers' work. With this information, vendors will be better positioned to capitalize on the ever-changing, multi-million dollar RNAi market, primarily in terms of new product development for identified trends in RNAi research applications.

The 2007 RNAi Survey consisted of 28 questions. Of these, 3 were open-ended and 9 questions included "other" as an answer choice, providing an opportunity for survey participants to compose a more appropriate answer to the particular question that was asked. Demographic information was obtained from answers to 5 of the survey questions including the country of origin of survey participants. The survey was administered on-line from May 30th-June 8th, 2007 and the data tabulated and presented here.

## References

- <sup>1</sup> Strasser BJ, "Who Cares About the Double Helix?", *Nature* 422(6934):803-804, April 24, 2003.  
<http://www.nature.com/nature/journal/v422/n6934/full/422803a.html>
- <sup>2</sup> Gaur RK and Rossi JJ, "The Diversity of RNAi and Its Applications", *BioTechniques*, 40:S4-S5, April 2006.
- <sup>3</sup> Perrimon N and Mathey-Prevot B, "Applications of High-Throughput RNA Interference Screens to Problems in Cell and Developmental Biology", *Genetics*, 175:7-16, January 2007.  
<http://www.genetics.org/cgi/content/full/175/1/7>
- <sup>4</sup> Mathey-Prevot B and Perrimon N, "Do-it-yourself RNAi Made Easy?", *Nature Methods*, 4(4):308-309.
- <sup>5</sup> Frost & Sullivan, "US RNAi Markets", May 10, 2006.
- <sup>6</sup> Ibid.
- <sup>7</sup> Ibid.
- <sup>8</sup> Khvorova A, "3' UTR Seed Matches, but Not Overall Identity, are Associated with RNAi Off-targets", *Nature Methods*, 3(3):199-204, March 2006.
- <sup>9</sup> Ibid.
- <sup>10</sup> Ibid.

## Appendix I: Questionnaire

**1. Please characterize your RNAi usage.**

- I am currently using RNAi as a research tool.
- I plan to use RNAi within 3 months.
- I plan to use RNAi within 6 months.
- I plan to use RNAi within 12 months.
- I do not use or plan to use RNAi in my research or work. (*exited from survey*)

**2. What is/will be the goal of your RNAi research?**

- RNAi-based therapeutics
- Lead optimization
- Target identification
- Target validation
- Gene functional analysis
- Pathway analysis
- Other (please specify)

**3. What model organism(s) do you currently use/plan to use for your RNAi experiments?**

**Please rank your selections. (1 = Most frequently used)**

**Please leave the selection blank if you do not use the organism.**

- Human
- Mouse
- Rat
- C. elegans
- Zebrafish
- D. melanogaster
- Plant
- Other (please specify)

**4. What types of cell lines and cell types are you currently using/planning to use?  
(please specify).**

**Cell types**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Cell lines**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Only for current users*

**5. How often do you use *in vitro* and *in vivo* models? (please fill-in the blank)**

- I currently use *in vitro* models \_\_\_\_\_% of the time
- I currently use *in vivo* models \_\_\_\_\_% of the time

*Only for current users*

**6. If you are using *in vitro* models, how soon will you be transitioning to *in vivo* models?**

- Within 3 months
- Between 3 - 6 months
- Between 6 - 12 months
- More than 12 months
- We currently do not plan to at all
- N/A

**7. How do you typically generate (or plan to generate) your siRNA?**

- *In vitro* transcription
- Dicer/RNAse III
- Expression in cells from a siRNA/shRNA expression plasmid
- Expression in cells from a shRNA-containing packaged viral vector
- Expression in cells from a PCR-derived siRNA expression cassette
- Synthetic - from a commercial supplier
- Synthetic - made in-house
- Other (please specify)

*Only those who selected 'Commercial Supplier' will receive questions 8 - 11:*

**8. What percentage of the siRNA reagents you currently use/plan to use are chemically modified?**

- Current \_\_\_\_\_
- Planned \_\_\_\_\_

**9. What percentage of the siRNA reagents you currently use/plan to use are in libraries/gene collections?**

- Current \_\_\_\_\_
- Planned \_\_\_\_\_

**10. What percentage of the siRNA reagents you currently use/plan to use are validated (functionally tested by the vendor)?**

- Current \_\_\_\_\_
- Planned \_\_\_\_\_

**11. What siRNA purity level do you typically purchase/plan to purchase?**

- PAGE purification
- Column purification
- HPLC purification
- Other (please specify)
- I don't know

**12. How many unique siRNA/RNAi sequences/duplexes do you typically test/plan to test per gene target?**

- 1
- 2
- 3
- 4
- 5 to 10
- More than 10
- I don't know

**13. How many gene targets are you currently focusing on/planning to focus on?**

- Less than 10
- 11 to 50
- 51 to 100
- 101 to 500
- More than 500

**14. How do you expect this number to change over the next 12 months?**

**Increase by:**

- More than 50%
- 25% - 50%
- 10% - 25%
- 1% - 10%

**Decrease by:**

- More than 50% \_\_\_\_\_
- 25% - 50% \_\_\_\_\_
- 10% - 25% \_\_\_\_\_
- 1% - 10% \_\_\_\_\_

No change

I don't know

**15. Which supplier comes to mind when thinking about where to purchase RNAi research tools? (*open-ended*)**

**16. Which of the following RNAi reagents, kits, and services do you currently use or plan to use in your lab? (select all that apply)**

	Currently Use	Plan to Use
<b>siRNA</b>		
Manufacturer-predesigned single siRNA		
Manufacturer-validated designed single siRNA		
Manufacturer-designed siRNA pools		
Custom-designed single siRNA		
Custom designed siRNA pools		
Chemically modified siRNAs		
siRNA libraries		
<b><i>In vitro</i> Transcription Products</b>		
Kits for preparing siRNA populations by <i>in vitro</i> transcription		
Kits for preparing siRNA populations by Dicer/RNAse III		
<b>Products for vector-mediated RNAi</b>		
Gene-specific shRNA expression plasmid		
Empty expression plasmids		
Purified gene-specific viral particles - AV		
Purified gene-specific viral particles - AAV		
Purified gene-specific viral particles - retro		
Purified gene-specific viral particles - lenti		
Viral packaging kits and reagents		
<b>siRNA Delivery Products</b>		
siRNA-specific lipid transfection reagents		
General lipid transfection reagents		
Other reagent		
Biolistic products		
None of the above		

*Only for current users*

**17. Below are the RNAi products you selected you currently use. For each product type you use, please select your primary supplier. Only the product types selected in the previous question will appear.**

	Supplier Names (Drop Down Menu)
<b>siRNA</b>	
Manufacturer-predesigned single siRNA	
Manufacturer-validated designed single siRNA	
Manufacturer-designed siRNA pools	
Custom-designed single siRNA	
Custom designed siRNA pools	
Chemically modified siRNAs	
siRNA libraries	
<b><i>In vitro</i> Transcription Products</b>	
Kits for preparing siRNA populations by <i>in vitro</i> transcription	
Kits for preparing siRNA populations by Dicer/RNase III	
<b>Products for vector-mediated RNAi</b>	
Gene-specific shRNA expression plasmid	
Empty expression plasmids	
Purified gene-specific viral particles - AV	
Purified gene-specific viral particles - AAV	
Purified gene-specific viral particles - retro	
Purified gene-specific viral particles - lenti	
Viral packaging kits and reagents	
<b>siRNA Delivery Products</b>	
siRNA-specific lipid transfection reagents	
General lipid transfection reagents	
Other reagent	
Biolistic products	
None of the above	

**Drop Down Options:**

**siRNA (single and pools)**

- Ambion
- Bioneer
- B-Bridge
- Dharmacon
- Eurogentec
- IDT
- Invitrogen
- OligoEngine
- Proligo/Sigma
- MWG Biotech
- Qiagen
- Retrogen
- Cell Signaling Technology
- Millipore (Upstate/CHEMICON)
- New England Biolabs
- Other
- I don't know

**siRNA Libraries**

- Ambion
- Dharmacon
- Open Biosystems
- Other
- I don't know

**In vitro Transcription products**

- Ambion
- EPICENTRE
- Genlantis
- Invitrogen
- New England Biolabs
- Promega
- Spring Bioscience
- Other
- I don't know

**Products for vector-mediated RNAi**

- Ambion
- Clontech
- GenScript
- Invitrogen
- InvivoGen
- Millipore (Upstate/CHEMICON)
- Origene
- Promega
- Sigma
- Stratagene
- Other
- I don't know

**siRNA Delivery products**

- Ambion (siPORT™)
- Bio-Rad (siLentFect™)
- Dharmacon (DharmaFECT®)
- Invitrogen (Lipofectamine, Oligofectamine)
- Millipore/Upstate (siMPORTER™)
- Mirus Bio(TransIT-siQUEST™)
- New England Biolabs (TransPass™)
- Novagen (RiboJuice™)
- Open Biosystems (Arrest-In™)
- PolyPlus Transfection (INTERFERin™)
- Promega (CodeBreaker)
- Qiagen (TransMessenger)
- Roche Applied Science (FuGENE, X-tremeGENE siRNA )
- Stratagene (GeneEraser™ siRNA
- Other
- I don't know

**18. How do you currently/planning to measure gene silencing efficiency in your RNAi experiments? (select all that apply)**

- Reporter gene assays (e.g. Luciferase)
- Quantitative RT-PCR/PCR
- Northern blot
- Western Blotting
- ELISA
- Microarray analysis
- Flow Cytometry
- Other (please specify)
- I don't know

**19. Which of the following THREE improvements would have the most beneficial impact to your RNAi research? Please rank them from 1 to 3 (1 = Most beneficial)**

- Improve software for designing siRNA
- Increase transfection efficiency
- Reduce delivery reagent toxicity
- Increase siRNA silencing effects
- Reduce off-target effects
- Increase siRNA nuclease resistance
- Increase number or type of RNAi applications
- Reduce experimental time-to-results
- Other (please specify)

**20. Please rate the following siRNA transfection reagent features from 1 to 5 on a scale of importance to your research. (1 = Very important, 5 = Not important)**

- Efficient siRNA delivery to a variety of different cell lines
- Reproducible delivery
- Low cellular toxicity
- Ease of use
- Works in the presence of serum
- Price
- Effective in a wide range of conditions (multiple cell densities, multiple siRNA concentrations)
- Stable transfection
- Both *in vivo* and *in vitro* delivery capability

**21. Are you currently studying microRNA (miRNA)? If so, for how long?**

- Yes: For less than 3 months
- Yes: Between 3 – 6 months
- Yes: Between 6 – 12 months
- Yes: For over 12 months
- No: But plan to in the next 12 months
- No: Do not plan to at all (*skip next question*)

**22. What microRNA product(s) do you currently use or plan to use in the next twelve months? (check all that apply)**

- Synthetic miRNA
- miRNA inhibitors
- miRNA detection products
- miRNA purification products
- miRNA microarrays
- Other (please specify)

**23. What RNAi product or service, currently not available commercially, would be help facilitate your research? (*open-ended*)**

## Demographic Questions

### 1. In which type of institution do you work?

- Academic
- Pharmaceutical
- Private Research
- Biotechnology
- Government
- Clinical - Other (please specify)

### 2. Which title best applies?

- Professor/Instructor
- Lab Manager/Supervisor
- Business Development 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

### 3. Which of the following are your key areas of research or work?

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

### 4. Which best describes your purchasing authority?

- Authorize
- Recommend
- Evaluate
- No Purchase Role

## Appendix II: Presentation of Survey Data

## Demographic Survey Data

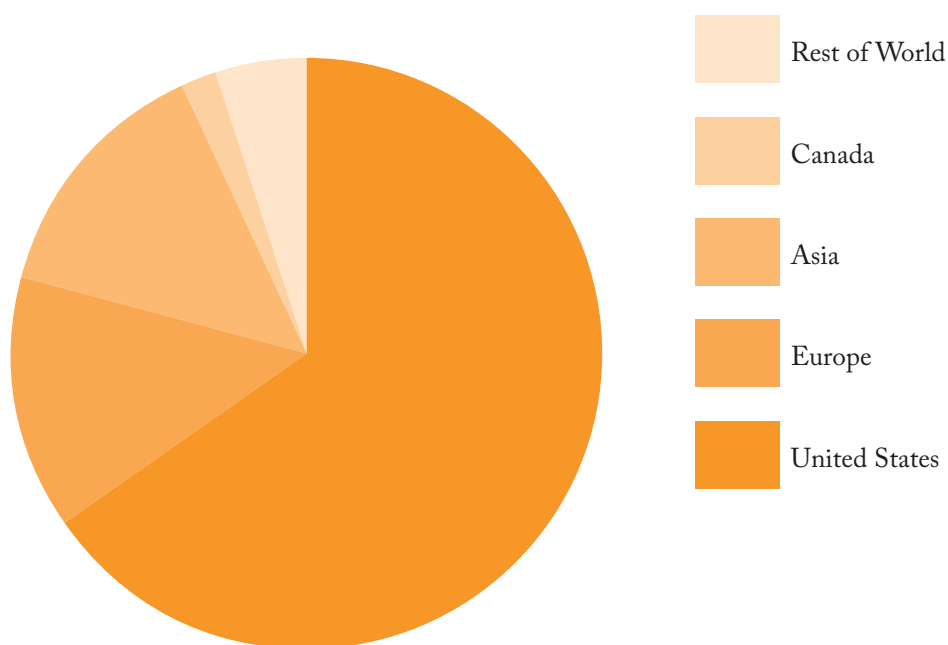
### Country

68% of survey respondents are from the United States and Canada, 14% are from Europe, 14% are from Asia, and 5% are from the ROW.

*N* = 403

Country	Count	%
United States	264	66.3%
Europe	56	14.1%
Asia	56	14.1%
Canada	8	2.0%
Rest of World	19	4.8%

### Country



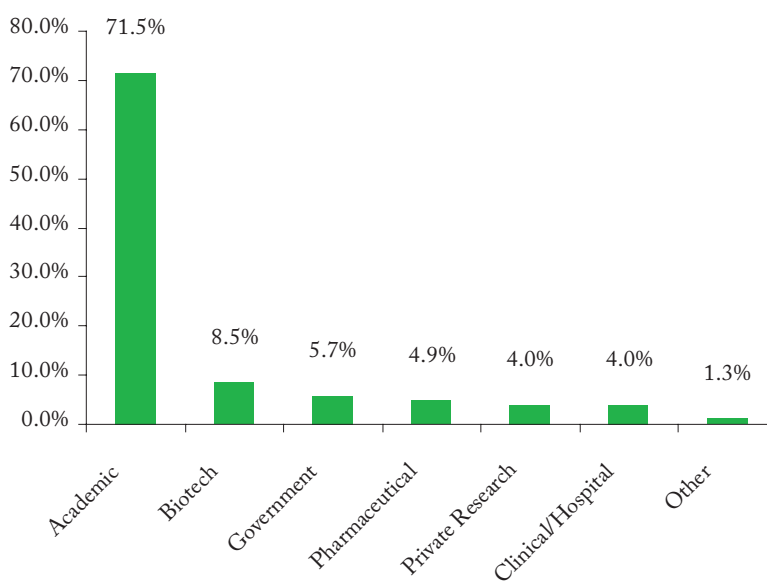
### What is your Institution Type?

Over 70% are from academia and 15% are from biotech or pharmaceutical institutions.

*N* = 470

Institution Type	Count	%
Academic	336	71.5%
Biotech	40	8.5%
Pharmaceutical	23	4.9%
Government	27	5.7%
Private Research	19	4.0%
Clinical/Hospital	19	4.0%
Other (Please specify)	6	1.3%

**Institution Type**



**Which title best applies?**

76% of survey participants are bench scientists.\*

*N* = 470

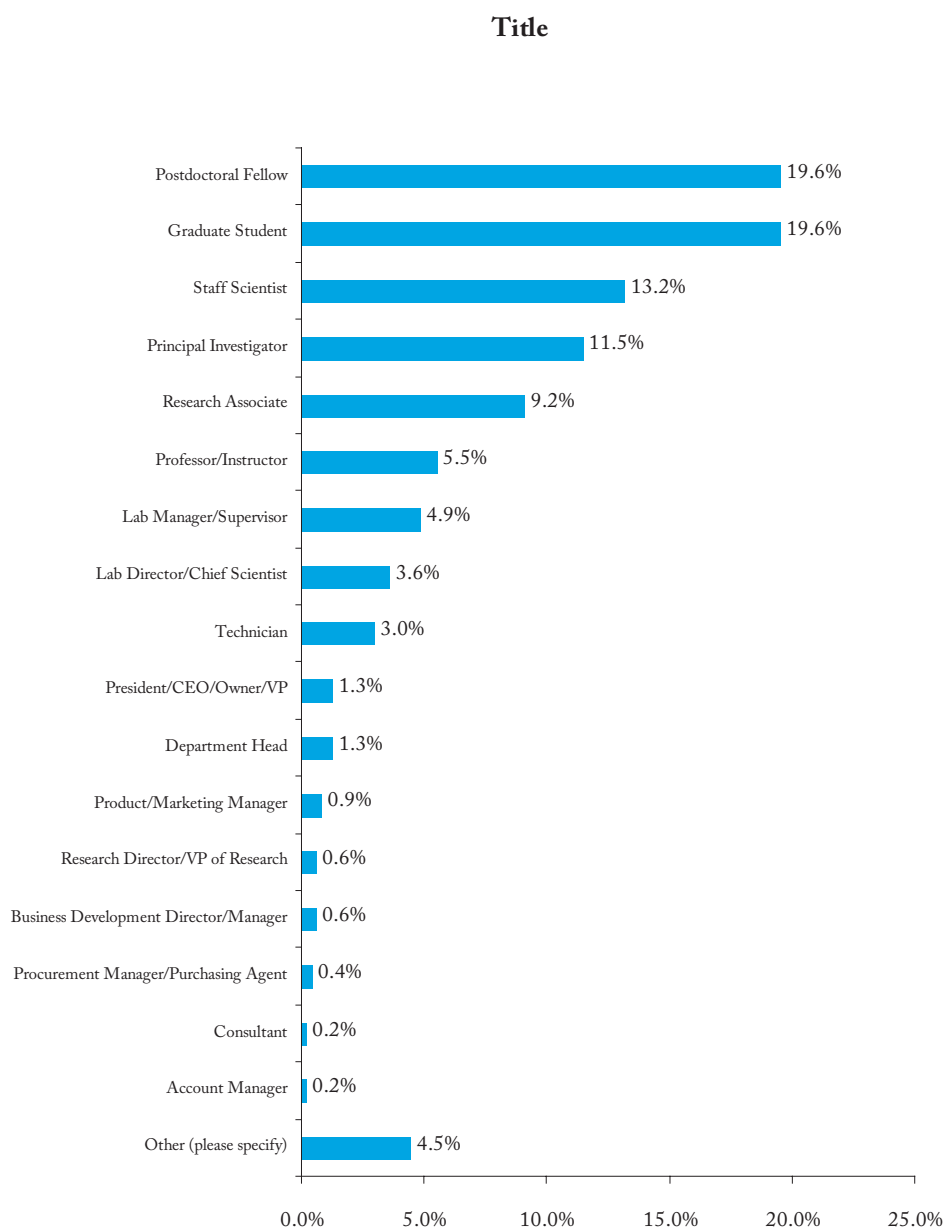
Title	Count	%
Postdoctoral Fellow	92	19.6%
Graduate Student	92	19.6%
Staff Scientist	62	13.2%
Principal Investigator	54	11.5%
Research Associate	43	9.2%
Professor/Instructor	26	5.5%
Lab Manager/Supervisor	23	4.9%
Lab Director/Chief Scientist	17	3.6%
Technician	14	3.0%
President/CEO/Owner/VP	6	1.3%
Department Head	6	1.3%
Product/Marketing Manager	4	0.9%
Research Director/VP of Research	3	0.6%
Biz Dev Director/Manager	3	0.6%
Procurement Manager/Purchasing Agent	2	0.4%
Consultant	1	0.2%
Account Manager	1	0.2%
Other (Please specify)	21	4.5%

\*Includes: Postdoctoral Fellow, Staff Scientist, Graduate Student, Research Associate, Principal Investigator, Technician.

### Which title best applies?

76% of survey participants are bench scientists.\*

N = 470



**Which of the following are your key areas of research or work?  
(check all that apply)**

The survey audience identified Molecular Biology (59%) and Cell Biology (53%) as their primary areas of research.

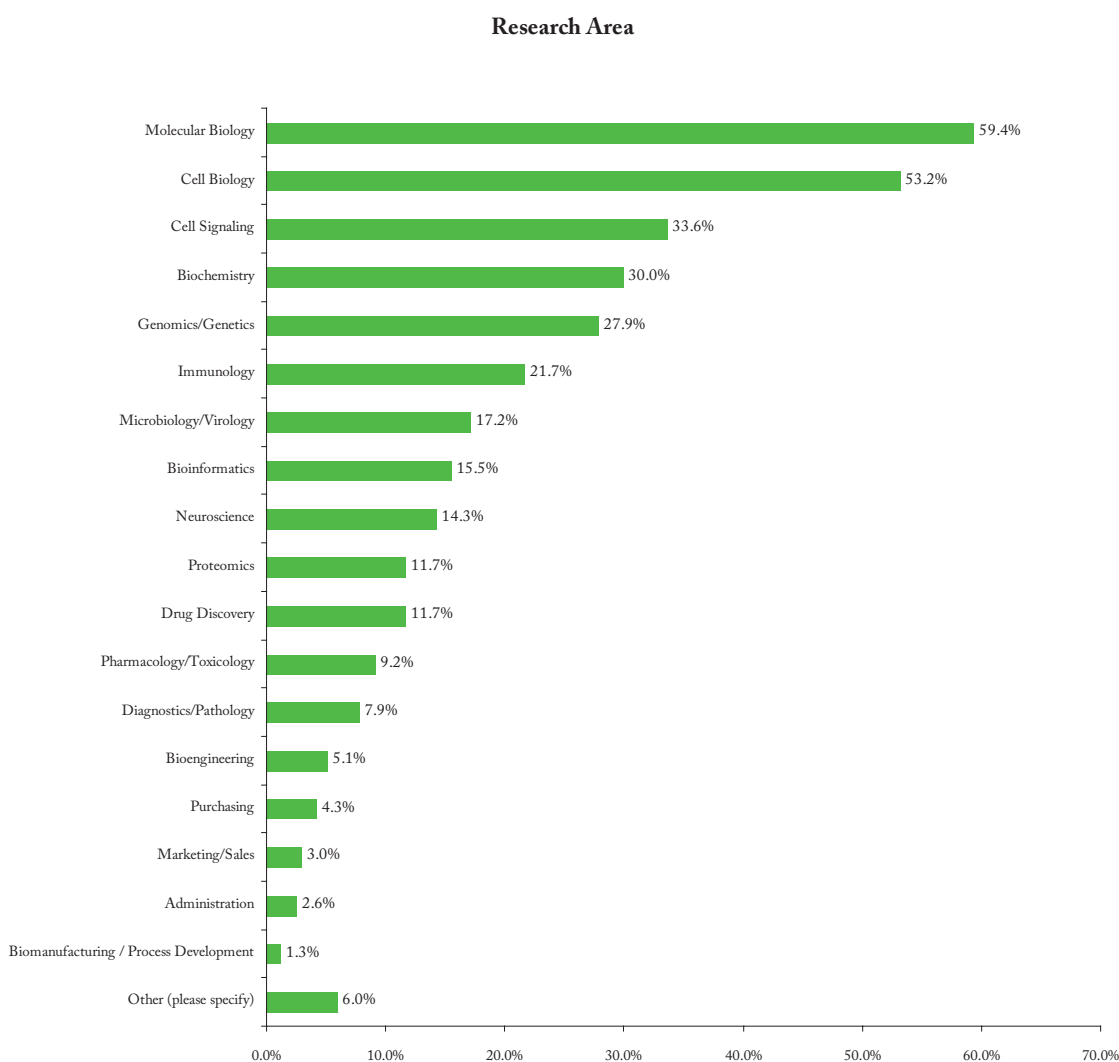
*N* = 470

Research Area or Work	Count	%
Molecular Biology	279	59.4%
Cell Biology	250	53.2%
Cell Signaling	158	33.6%
Biochemistry	141	30.0%
Genomics/Genetics	131	27.9%
Immunology	102	21.7%
Microbiology/Virology	81	17.2%
Bioinformatics	73	15.5%
Neuroscience	67	14.3%
Proteomics	55	11.7%
Drug Discovery	55	11.7%
Pharmacology/Toxicology	43	9.2%
Diagnostics/Pathology	37	7.9%
Bioengineering	24	5.1%
Purchasing	20	4.3%
Marketing/Sales	14	3.0%
Administration	12	2.6%
Biomufacturing/Process Development	6	1.3%
Other (Please specify)	28	6.0%

**Which of the following are your key areas of research or work?  
(check all that apply)**

The survey audience identified Molecular Biology (59%) and Cell Biology (53%) as their primary areas of research.

*N = 470*



### Which best describes your purchasing authority?

85% of participants either authorize or recommend purchases.

*N* = 470

Purchasing Authority	Count	%
Authorize	199	42.3%
Recommend	200	42.6%
Evaluate	32	6.8%
No purchase role	39	8.3%

### Purchasing Role

