



2003/2004 MSPPSA SERIES

MOLECULAR BIOLOGY REAGENT SYSTEMS

VOLUME 2.

AMPLIFICATION, SEQUENCING,
CDNA SYNTHESIS, LABELING, DETECTION
& OTHER KITS

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 market for molecular biology reagent systems (including the present consumption of kits for DNA sequencing, nucleic acid labeling, cDNA synthesis and cloning, nucleic acid detection, amplification and other applications) in the United States and of the attitudes of a cross section of researchers who utilize these kits in their work. Because the areas covered on this survey are so extensive, we perform a completely separate survey and analysis of the nucleic acid isolation and purification market with the results presented in a companion report, Volume 1. This second volume deals with the analysis of molecular biology reagent systems designed for amplification, sequencing, synthesis, labeling and detection of nucleic acids from various sources.

A random cross-section of U.S. researchers from the PhorTech panel of life science researchers was used for this survey. The surveying was blind, with no reference made to any clients for the survey. To encourage respondents to express themselves freely and without bias, the survey was anonymous, and made frequent use of open-ended questions.

The demographic screens used to characterize respondents included years of experience with molecular biology techniques, and the respondents' type of organization.

Early in the survey, respondents were asked whether or not they currently used molecular biology reagents in their work. Researchers responding negatively were directed to back out of the survey since they were not qualified to answer the questions. Molecular biology reagent users were then asked to indicate the size of their group for which they will be responding, and to indicate the format of their reagents. In particular, respondents indicated whether they purchased reagents in kit format exclusively, as individual reagents exclusively, or in both formats and to explain the reason behind this decision. Respondents were then directed to the first of several detailed audit questions.

Users were asked to itemize the commercial kits they utilized for DNA sequencing, including the brand and type of kit, number of kits used annually, approximate price per kit and the forecast percent change over the next 12 months for radioactive manual sequencing kits, non-isotopic manual sequencing kits and automated sequencing kits.

Respondents were then queried regarding their usage of thermostable enzymes. They were first requested to identify current applications from a list of 17 options including allelic discrimination, cloning PCR products, cycle sequencing, expression profiling, genetic mapping, GMO detection, in-situ





PCR, in vitro labeling, microarray prep, multiplex PCR, presence of sequence, quantitative PCR, quantitative RT-PCR, RT-PCR, site-directed mutagenesis, SNP genotyping or an 'other' option for those performing an unlisted application. Respondents were then asked to provide detailed audit information regarding their thermostable enzyme kit usage by itemizing the brand and name of kit, annual kit consumption, the number of reactions per kit, cost and percent change over the coming 12 months. The next audit requested detailed information about separate thermostable enzyme purchases, including the brand, product name, consumption of units per year, the price per unit and anticipated change over the coming year. Respondents were also asked to provide audit information on commercial kits for ribonuclease protection assays.

After completing a multiple choice question regarding the types of nucleic acid labeling kits currently in use (from a list including random primer, nick translation, in vitro transcription, 5' end labeling, and direct enzyme labeling of oligos), respondents were then asked to complete an audit of these kits. They were specifically asked to identify the type of kit from the above list, the brand, name, number of kits consumed annually, the price per kit and the anticipated percent change over the coming 12 months.

Respondents were then directed to provide a multiple choice question identifying which of the following six cloning audit data regarding their consumption of molecular biology kits for cDNA synthesis and cloning. Furthermore, specific questions requested respondents performing cDNA synthesis to identify the reverse transcriptase used. Choices included AMV-RT, MMLV-RT, MMLV-RT RNase H-, Tth or an optional write-in category.

The final series of questions refers to respondents' usage of other types of commercial kits. This begins with a multiple choice question asking respondents to identify the other types of commercial kits currently in use from the following list of seven options: Differential display, Genotyping/fingerprinting, In vitro transcription (RNA production), In vitro translation, RACE, Site-directed mutagenesis and Transfection. This is followed by an audit question requesting product details in each of these kit categories.

Finally, respondents asked a series of open-ended questions. The first related to all types of molecular biology kits, and asks the respondent to indicate how that stated number of reactions per kit compares with that routinely obtained in the laboratory. They were also asked to describe what improvements they would like to see in molecular biology kits and, if there were any additional applications in which they would like to see a commercial molecular biology reagent system.





Major objectives of the survey were to estimate the present size and growth rate for the molecular biology kit market as a whole and for major segments within this market. Secondly, we wanted to determine the present market share for major kit categories among leading companies in the US and to project which supplier has the best prospects for growth in the coming year. Lastly, profiles of respondents most likely to purchase the various kits will be carefully examined.

The audit 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 third 2003/2004 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 already published in this 2003/2004 series covers the following U.S. topics:

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 are available at a modest cost. Please contact us for further details. Those wishing to know publication dates for any of these reports, or wanting to read summaries of the 72+ reports in this series are invited to visit our Web site at: www.phortechn.com.





B. SURVEY METHODOLOGY

E-mail invitations to take part in the survey were sent to a selected cross-section of life science researchers from our panel of 5,000 U.S. life science researchers. After selection for appropriate areas of interest, invitations were sent to 1,557 U.S. members of the panel who have been in contact with us in the last year and previously indicated their involvement in work with nucleic acids, amplification or sequencing techniques. Customized email invitations to the web site survey were sent on March 4th. The survey was kept open until March 26th at which time nearly 390 responses had been received.

Each participant received an email invitation including the web address of the survey and a unique validation code.

To improve response rates, respondents were able to select from a choice of six prizes for completing the survey. These were a custom designed tee-shirt, a \$5 gift card towards any purchase at a Barnes & Noble bookstore, a 120 minute phonecard from MCI, a box of Ferrero Rocher chocolates, an electronic stopwatch, a stainless steel folding pocket knife or a laser pointer.

No reference was made to any of our clients as sponsors of the survey. The questionnaires were anonymous, a combination of tabular entry, check-offs, and open-ended probes. Apart from the prizes, no inducements were employed. However, the majority of respondents did identify themselves by filling in the prize form. This made it possible for us to double-check the responses to some questions by contacting respondents, which improved the accuracy of the data.

Undeliverables to the PhorTech database mailing were measured at 79 or 5.1%. By the close of the survey, 388 responses had been received for an overall response rate of 26.3%, which exceeded expectations.

We felt that respondents spent considerable time explaining their positions on the open-ended questions. We have no reason not to believe that the survey is representative of the entire U.S. population of molecular biology kit and reagent users. We have found that, within the limits of experimental error for sample size we have obtained, no demonstrable bias could be detected that could affect our results.

Based upon these responses, the overall statistical results presented in this report are accurate to within ± 5.0 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 $\pm 2.5\%$ 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 clients 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 500 has a 95% confidence interval of $\pm 4.2\%$.

95% Confidence Intervals for Various Percentages & Sample Sizes

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







II. DEMOGRAPHIC SEGMENTATION





QUESTION 1.

Question:

Do you currently use any molecular biology reagents in your work?: Yes, No
(Please stop now by hitting your browser's *BACK* button.)

Rationale:

This first question primarily screens out researchers who are not currently using molecular biology reagents and are therefore not qualified to respond to this survey.

Results:

Since only those researchers currently using molecular biology reagents or procedures are qualified to complete the survey, all researchers responded positively to this question.





QUESTION 3.

Question:

Do you use molecular biology reagents in kit format or individual reagents? Please explain.: We use reagents in kit format only; We use individual reagents only; We use both kit formats and individual reagents. Reason:

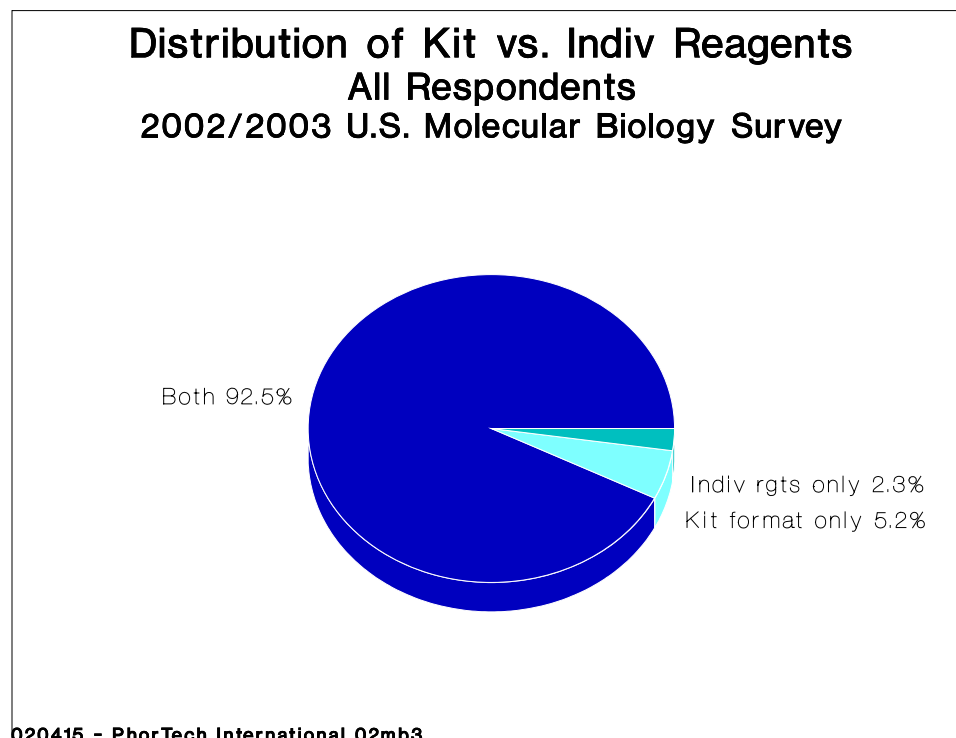
Rationale:

By analyzing the responses to this question, we will determine the proportion of researchers purchasing reagents in kit format and as individual reagents, and examine the reason behind the choice of format.

Later in the report, we will use this information, in conjunction with our estimate of researchers using molecular biology reagents, to extrapolate the size of the U.S. population purchasing individual reagent systems vs. those selecting kits.

Results:

The following pie chart shows the distribution of kit use versus individual reagent use amongst all 388 of the respondents to this survey.



This graph is dominated by the over 90% of respondents utilizing both kits and individual reagents. In fact, just 7.5% of these researchers indicate purchasing one format only with twice as many, or 5.2%, using kits





exclusively compared with the 2.3% who purchase all of their molecular biology reagents separately.

Based on these results, we calculate that 97.7% of the respondents use kits for at least some of their molecular biology reagent needs. This is consistent with previous studies of the U.S. market performed in 2000/2001 and 1997/98, and also with kit usage measured amongst Far East researchers in 1999. Unfortunately, the most recent data on the European market dates back to 1995. At that time, a slightly lower proportion, 90%, of molecular biology reagent users indicated purchasing kits. The similarity in all of these studies suggests that kits have been adopted by the vast majority of researchers performing molecular biology applications worldwide. However, it is also important to remember that nearly as many, 94.7%, of these researchers purchase at least some of their reagents separately suggesting that, in most cases, molecular biology kits have not replaced separate reagents entirely. Rather, there is a market for both forms of reagents.

Next, we examine the reasons, as described by 315 researchers, for preferring one format over the other. We begin by presenting the 296 explanations for the most common choice, the use of both kits and individual reagents. Identical comments mentioned by more than two respondents have been listed once followed by the total number of responses in italics.

Verbatim Comments Explaining Reasons Behind Combined Use of Both Kits and Individual Reagents

- A mix of price, time and reliability issues. Some reagents are very tolerant of variation, others aren't.
- Allows flexibility in our assays.
- Applications and modifications not always adequately or best covered by kits alone.
- As required
- At times I need to replace certain reagents that are found in the kits and it is cheaper to buy reagents separately than in kit form.
- At times we develop our own kits
- Based on the needs of the experiments
- Based on the needs of the experiments
- Best application for our needs
- Better flexibility
- Both formats are necessary.
- Buying enzymes, we prepare our own buffers.
- Certain homebrewed protocols aren't in kit format!
- Convenience (*x4*)
- Convenience and assay
- Convenience and cost (*x5*)
- Convenience and individual needs
- Convenience and low cost
- Convenience and or cost savings
- Convenience and quick results
- Convenience and reliability, cost





Convenience and value
Convenience of kit vs. lower cost of individual reagents
Convenience of kits...quality and specificity of individual reagents
Convenience vs. cost
Convenience, but some procedures are not in kit format yet
Convenience, what works best
Convenience; Some enzymes work better than others.
Convenience/price
Convenient and precise
Cost (x4)
Cost and convenience
Cost and convenience
Cost and ease
Cost and efficiency
Cost and optimization of reaction conditions
Cost and time efficiency
Cost differences, ease of use
Cost effectiveness (x3)
Cost including tech time
Cost savings
Cost vs. speed
Cost/convenience
Dependent on need for testing of materials we may use either format
Dependent upon need and cost evaluation
Depending of the product, some can be used for more than one function and it is not necessary to buy the whole kit which is usually much more expensive.
Depending on its usage and performance
Depending on personal preferences, price, convenience, etc.
Depending on protocol, sometimes the kit provides faster and easier results.
Depending on the application---sometimes use single reagents to fit in with our own products.
Depending on the need - sometimes you only need the enzyme.
Depending on the price and the availability of the individual reagents, we use both formats.
Depending on the protocol we use
Depending on the reagents, some are more useful in a kit.
Depending on the type of experiments carried out
Depending on use, more cost efficient to use a kit or individual reagents
Depending upon the experimental requirement
Depends on availability and price
Depends on convenience and price
Depends on cost and whether we can make the items ourselves
Depends on cost of kit and difficulty/ease of using individual reagents
Depends on needs
Depends on our assay
Depends on personal preference
Depends on price and/or convenience (Past experience/success with kits sometimes play a role.)
Depends on price; We use kits for new techniques where we'd buy all the reagents anyway, and want positive controls.





Depends on proposed and modified protocol
Depends on researcher's personal preferences
Depends on stringency of reagent formulation
Depends on technique
Depends on the application
Depends on the application; Sometimes we only need one higher quality reagent which may only be provided in kit form.
Depends on the convenience of use and cost of the reagents
Depends on the convenience, price and quality
Depends on the experiment
Depends on the needs of the experiment
Depends on the person and the kit
Depends on the quantity needed
Depends on the reagent or kit
Depends on the technique used
Depends on the volume and convenience
Depends on use and experience
Depends on what technique we are using if we need to use a kit or just individual reagents
Depends upon cost and if time consumables or large quantities
Depends upon cost of kit/reagents
Depends upon our experiences and what we have done in the past
Depends what is easy to use
Different applications
Different purposes
Due to reagent already have in lab
Ease and cost
Ease of use for kits occasionally just need individual reagent for specific applications
Ease of use vs. cost
Ease of use, amount of use # of people using, etc.
Ease-kits, flexibility-individual reagents
Easy, fast, and convenient
Economic reasons
Efficiency and cost
Expense balanced against cost-effectiveness
Expense/simplicity-sometimes much easier to buy a kit
Feasibility, cost, familiarity
For a lot of techniques, we have switched to kits for reasons of ease of use and quality assurance.
For convenient, I use kit. But sometimes, I prefer cheaper individual reagents.
For different purposes
For more involved projects, kits are more cost-effective and save time.
For reasons of convenience (kits) and cost (individuals)
For some applications, kits are easier and for other individual reagents are more economical.
For some protocols, no kit is available.
For well-known procedures, individual reagents are used and tweaked while for things done less often kits are sometimes used.
Having students make the reagents is more economical when possible.
History (price and quality)





I use kits when they perform better or are a better price.
If we can, we make our own reagents. Otherwise we use kits.
If we can't find a kit, we use individual reagents, simply because we don't do a lot of mol. bio.
In some cases, kits are more practical, other times they are not.
In some instances reagents work better.
It depends how many samples are treated or analyzed.
It depends on the application we are doing....
It depends on the experiment design.
It depends on the protocol and also the cost. Kits tend to be more expensive than individual reagents.
It depends on the protocols we are using.
It depends on the researcher and the project. Kits are used for ease and reproducibility.
It really depends on the assay.
It varies with application.
It works for us.
Just as easy to use individual reagents for some procedures
Kit is easy but expensive. We sometimes buy reagents to fill a kit.
Kit is easy for beginners to start and confidence to know it would work.
Kit is the best, but not everything comes with a kit.
Kits are convenient and sometimes practical for our work but at other times we really only need certain enzymes for our applications and will just purchase the enzymes separately.
Kits are convenient but sometimes individual reagents are better.
Kits are convenient for isolating DNA, while individual reagents are necessary for restriction digests to analyze the DNA or generating the DNA.
Kits are convenient, but individual reagents allow flexibility.
Kits are convenient, but individual reagents are economical.
Kits are convenient, but there isn't a kit for everything.
Kits are easier and more consistent, but sometimes the flexibility of individual reagents is preferred.
Kits are easier for DNA preps.
Kits are easy to use but expensive.
Kits are easy to use, but reagents are much cheaper.
Kits are easy; individual reagents are inexpensive relatively.
Kits are good for certain procedures, individual reagents better for others/things we modify.
Kits are great but expensive.
Kits are handy, but some things don't come in kit format.
Kits are more convenient and faster than individual reagents, but we do use individual reagents for established protocols.
Kits are much more convenient than individual reagents and we use them whenever we can. But there are many experiments where reagent kits are not available, and we have to use individual reagents in such cases.
Kits are nice because they have been already optimized. We use individual reagents also because we use some protocols that we've already worked out and used for years.
Kits are often more expensive than individual reagents, or we only need to replenish a single reagent in a kit.
Kits are sometimes worth the convenience.
Kits are used for their ease of use and individual reagents for their cheaper price.
Kits are used when convenient.





Kits can be expensive and lack flexibility, but do save time.
Kits can be very convenient. Sometimes there are leftovers that one can then use in other applications. Single reagents are important for protocols that one has painstakingly developed and does not want to change.
Kits do not always meet our needs and it is sometimes cheaper to make reagents.
Kits don't always provide what we need.
Kits for convenience and reliability, individual reagents for cost
Kits for convenience, individual reagents work best for some apps.
Kits for convenience, reagents to save some money
Kits for problem DNA, individual reagents otherwise
Kits for reproducibility and individual reagents for cost effectiveness
Kits for simplicity and individual for flexibility
Kits offer convenience, but sometimes they are too costly if you perform the procedure frequently.
Kits often offer all necessary ingredients, presumably known to work together.
Individual reagents are cheaper and allow us greater flexibility in experimental design.
Kits save time; some things are just too cheap to try a kit.
Kits to get started, then switch to individual reagents to save \$
Kits used where possible for convenience
Make selection based on experimental need, efficient use of time, and price
More economic
Most cost effective
Mostly we use kits; however, for some things we need more customizing ability and individual reagents are more suited for those purposes.
Need the ease of kits and the flexibility of individual reagents
No reason, according to work request
None
Not everything is available in kit form.
Often, creating your own kit with individual reagents is less expensive.
Only use kits if cost effective, considering time of preparation
PCR, sequencing, DNA preps
Prefer kits but sometimes use custom protocols
Prefer to use kits if possible, but sometimes they require additional reagents not supplied, so we purchase and prepare those separately.
Price
Price and availability of individual reagents; We often use kits as they have been optimized.
Price and volume
Price vs. quality vs. application
Price vs. reproducibility
Price vs. time
Price, convenience
Price, kits for convenience and reliability
Price, need/availability
Price/quality/convenience
QC and cost
Reagents do not run out at the same time.
Real time multiplex PCR requires additional reagents.
Save money
Some applications are best tackled with kits, others with individual reagents.





Some are better supplied in kit, others by individual reagent.
Some are good.
Some kits are good to use entire system. The others are too expensive to buy each time.
Some kits are good, others are incomplete.
Some kits are great for our purposes. Sometimes we need the individual reagents.
Some kits are more efficient than individual reagents.
Some kits are worth the price, others don't work reliably and individual reagents are better.
Some kits contain unnecessary reagents for our applications.
Some kits meet our needs, but not all.
Some kits provide convenience that is worth the cost.
Some kits we are able to use and we obtain good results, but some products we are unable to isolate the product so we use individual reagents.
Some kits work really well, others don't.
Some kits work well for basic things; but some of our methods are modified to fit our needs.
Some kits work, some do not.
Some manual techniques are very reliable and cheap.
Some of the individual reagents that we use are used because it is a traditional method, or we haven't found a kit we like.
Some reagents and protocols are given to us by another lab that is exclusively molecular. Anything else, we tend to buy a kit.
Some reagents are not available as a kit that performs well.
Some reagents are not available in kits.
Some reagents are proprietary to our company.
Some reagents we can make ourselves, and kits are good for quality control issues.
Some techniques lend themselves to kits while others do not.
Some things are not yet in a reliable kit format.
Some things are very time consuming to make and test, so kits are appropriate. Things that are easy/cheap we make ourselves.
Some work better than others.
Sometimes convenience, some because of price
Sometimes individual kits work better
Sometimes individual reagents are cheaper but often times the kits have all the materials plus a tested protocol.
Sometimes it is cheaper, and other times we are using a method only once and not worth buying a kit.
Sometimes it is less expensive to use individual reagents, but generally it is more convenient to have the kit with everything you need right there.
Sometimes kits are more convenient, sometimes too expensive.
Sometimes kits do not exist or are too expensive for our experiments.
Sometimes making our own reagents is cheaper and works just as well as the kits.
Sometimes price, sometimes (kits) for efficiency and reliability
Sometimes the kit components run out. Then, I have to buy more.
Sometimes the kit is not available.
Sometimes the kits have expired before we have used 50 % of them.
Sometimes there are specialized experiments that require non-kit conditions.
Sometimes, kit is not working well as we expected.
Study dependent
Success rate for different applications
The format is conditioned by the use frequency.





The use of kits versus individual reagents really depends on the specific applications. There are many procedures in which a kit is fast and economical and there are many, which are not economical. We also have many procedures, which are not available in kit format.

There are no kits for many uses.

These days it is more efficient (in terms of money and time) to use kits for most applications.

This depends on our needs and protocols.

To keep costs down we usually use individual reagents, but if a kit offers some useful special feature we will buy it.

To maximize flexibility and productivity

To provide flexibility for multiple needs

To save money or time

To speed up the process

Tradition and cost

Try to get the best deal : cost vs. ease of use

Usually price

Various protein expression projects

We go with what works and is inexpensive.

We have an enzyme core facility, so it is often less expensive to buy reagents individually.

We have certain protocols that use individual reagents and are fast and easy.

We like kits for convenience, but also buy individual especially if price is better.

We like them.

We like to control and specifically tailor reactions to our needs.

We like to perform modified procedures.

We make some of our reagents but use kits to prepare DNAs. We use the kits recommended by the sequencing facilities. That is why we switched recently from Eppendorf to Promega and may switch again to Qiagen.

We prefer individual PCR reagents (have had success with making our own master mixes) but like kits for plasmid preps, etc.

We prefer kits when applicable, but some uses are specific to our lab.

We run out of some reagents before the kit is finished.

We seek the most cost-effective ways of using reagents.

We set up most protocols from scratch but are now trying some new single cell techniques for which we will use kits.

We sometimes use ELISA kits.

We tried to use individual reagents but sometimes kits do provide convenience.

We use individual reagents if only one or two are required in the lab, but if a kit has most of the reagents we need we will get the kit if it is cost affective.

We use kits for plasmid preps and some DNA extractions and individual reagents for DNA extraction from whole blood for high molecular weight DNA. Kits do not give us the yield we need. Also individual reagents for cDNA synthesis

We use kits for several types of DNA preps, but also buy individual reagents for special protocols.

We use kits only when we have to since individual stuff is cheaper.

We use kits to save time, but for quantitative work it is sometimes advantageous to prepare home made reagent kits so that we have control over concentrations, pH, [salt] and other conditions.

We use kits vs. reagents when the cost of the kit offsets added labor costs of using individual reagents.





We use kits when available and affordable.
We use most of our reagents in kit format out of convenience. Our student worker makes the rest. We send our DNA to core labs for sequencing.
We use mostly kits, but also have additional reagents bought separately.
We use the kits only if they offer superior results and don't cost too much.
Western blots, in-situ, RT-PCR
What we use depends on the application - we use whatever provides the best results at the lowest cost.
Whatever is most practical or effective
Whatever is most suitable
Whatever works best
Whatever works best for the particular application
When a kit matches our needs and cost, we use it.
When possible, we use kits.
While kits are convenient and have significant QC, individual components allow us increased versatility to adjust protocols as the experimental parameters change.
With the different protocols we have, we have found kits to have replaced only some aspects and the rest we use individual reagent and use our standard protocols because they work better than any kit we have thus far tried.

Below, we list the 14 comments from respondents using only kits.

Verbatim Comments Explaining Reasons Behind Use of Kits Only

Convenient
Ease and speed
For verification of viral culture results only
Impurities
Limited time & expertise
Most kits are readily available and work well
Mostly for speed
Save time and have consistent results
Saves time
Speed and ease
Standardized procedure
That is what is available in store room and we don't want to waste time doing it any other way.
Time efficient, convenient
Usually kit format, we like to use established procedures

Finally, we list the 5 comments from respondents using individual reagents alone.

Verbatim Comments Explaining Reasons Behind Individual Reagents Only

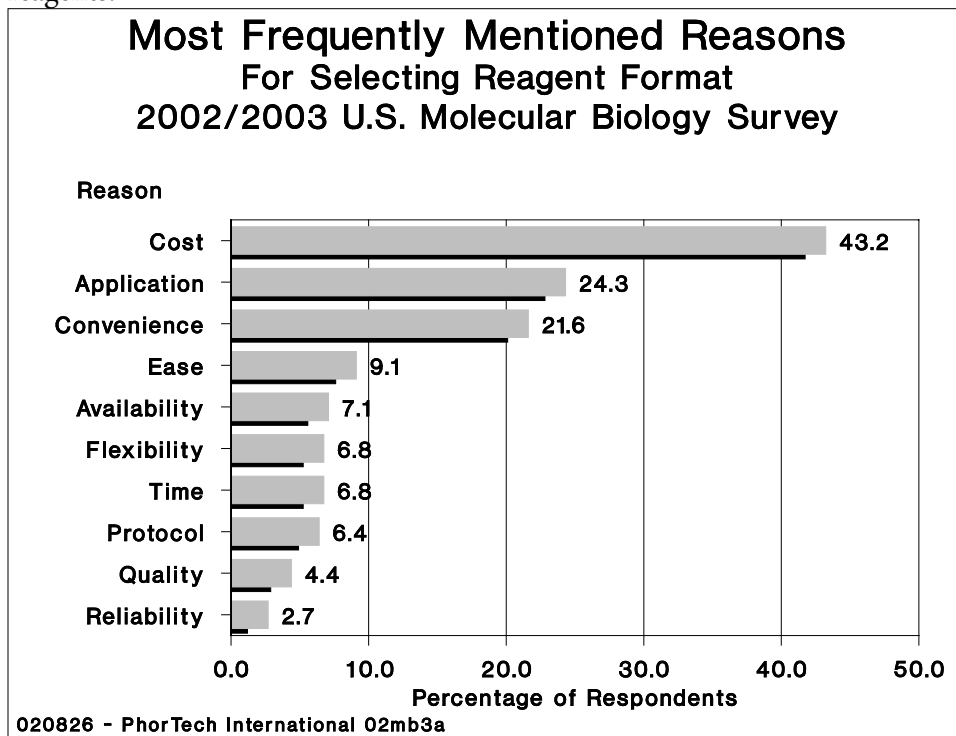
Better quality control and cost
Cost effective
I mix the reagents at the concentration I want for a particular cell line.
Make own
PCR reagents; Taq polymerase and 10x rxn. buffers are from one vendor and the dNTPs are from another. Using same components as another lab in my company where PCR is done regularly.





Analysis:

The horizontal bar graph at the top of the next page presents the most frequently mentioned reasons for selecting a reagent format as described by 296 of our respondents who initially indicated using both kits and individual reagents.



The most prominent issue is cost, the primary reason given for purchasing molecular biology reagents individually. There also seems to be a consensus of opinion amongst researchers that they generally use 'whatever works best'. This depends heavily on the application, and the demands of the specific protocol; many labs have developed their own protocols, and therefore cook up the same recipe each time using individual reagents. This allows fine control over the conditions, and is usually more cost efficient than using kits. Furthermore, suitable kits are not available for all applications.

On the other hand, researchers prefer to use kits for convenience, particularly for applications run occasionally, and also, where reproducible quality and speed are important. Although more expensive, they are easier to use than individual reagents, and come pre-optimized for the appropriate application. A few respondents mention that kits sometimes run out of a component, requiring the purchase of an individual reagent to replace it.

Based on these criteria, the vast majority of our respondents opt for a balance between both individual reagents and kits. This gives maximum flexibility and cost efficiency.





One respondent's succinct comment appears to sum up the attitude of many saying 'What we use depends on the application - we use whatever provides the best results at the lowest cost.'





QUESTION 20.

Question:

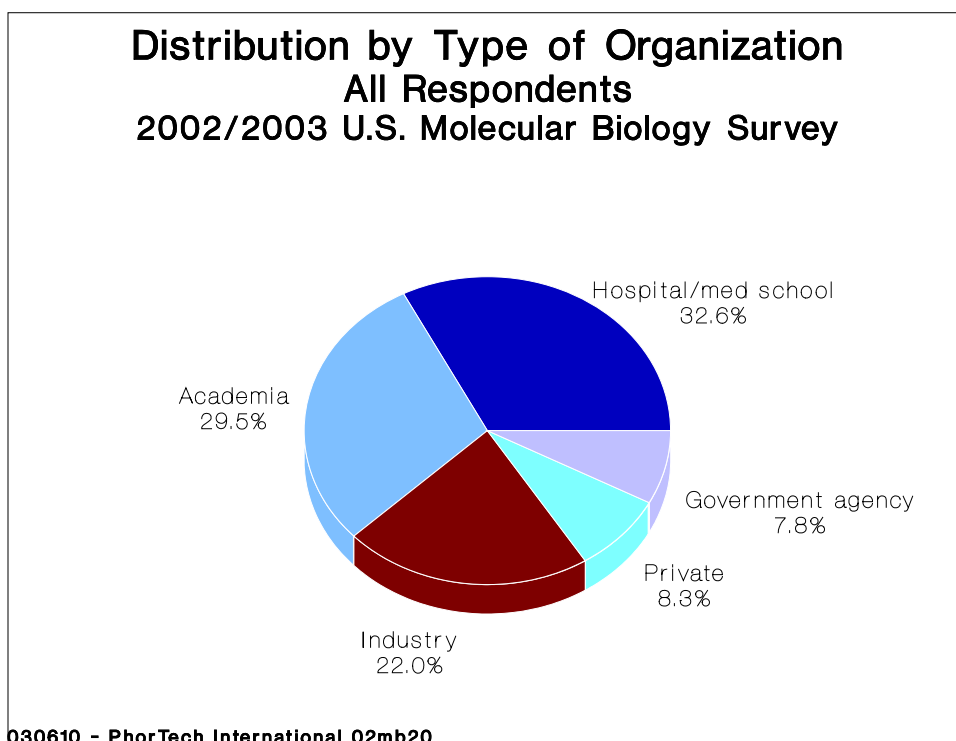
How would you best describe your organization: academia, hospital/medical school, industry, government agency, or private research foundation?

Rationale:

This standard demographic question identifies where customers are most likely to be found. Specifically, we wanted to investigate the relative utilization of molecular biology reagents and reagent kits amongst academic, hospital or medical school, industrial R&D, government and private laboratories.

Results:

In the following pie chart, we present the demographic profile for 387 of the 388 respondents to this survey.



Analysis:

Just over 60% of our molecular biology reagent users are split near equally between academia and a hospital or medical school setting. A further 22% work in an industrial laboratory while private research foundations and government agencies account for less than 10% each. It is interesting to note that there is a slightly higher representation of industrial and hospital or medical school researchers here than amongst respondents to the 2000/2001





survey. This is at the expense of the share for academics, which as decreased by just over 10%. Albeit slightly different from our earlier study, this mix still provides an excellent cross-section of life science researchers.

For readers who are interested, we continue by presenting the list of organizations represented by respondents to this survey. These have been sorted first by type, then placed in alphabetical order. The types of organizations are listed in descending order beginning with the classification with the largest representation, hospital and medical school laboratories.

Organizations Represented by Respondents to This Survey, by Type

Hospital/Medical School

Abbott Northwestern Hospital
Albert Einstein College of Medicine
Baylor College of Medicine
Beth Israel Deaconess Medical Center
Boston University Medical Center, Mallory Institute of Pathology
Children's Hospital LA Research Institute
Children's Hospital, Boston, MA
Cincinnati Children's Hospital Medical Center
Dana-Farber Cancer Institute
Dartmouth Medical School
Duke University Medical Center
East Carolina University School of Medicine
Emory University
Fox Chase Cancer Center
Georgetown University Medical Center
Georgetown University, Children's Medical Center
Hannover Medical School
Harvard Medical School
Hollings Cancer Center, Medical University of South Carolina
Indiana University Medical Center
Johns Hopkins School of Medicine
Laboratories at Bonfils
Louisiana State University Health Science Center
Loyola University Medical Center
Massachusetts General Hospital
Medical College of Pennsylvania, Hahnemann University
Medical College of Wisconsin
Medical University of South Carolina
Mount Sinai School of Medicine
North Eastern Ohio University, College of Medicine
Notre Dame Children's Hospital/University of Montreal
Ohio State University Medical Center
Pennsylvania State College of Medicine
Purdue University
Reference Pathology Services
Southern Illinois University School of Medicine
St. Michael's Hospital, Toronto, Canada





Stanford University Medical Center
Texas A&M University Health Science Center
Texas Tech Health Sciences Center
Thomas Jefferson University
Tufts University
Tufts-New England Medical Center
Tulane University School of Medicine
University at Buffalo (SUNY) School of Medicine
University of Alabama School of Medicine
University of Arkansas for Medical Science
University of California, Davis, School of Medicine
University of California, Los Angeles –Jules Stein Eye Institute
University of California, San Diego Medical Center
University of California, San Francisco
University of Cincinnati
University of Connecticut Health Center
University of Florida
University of Hawaii
University of Illinois at Chicago Medical School
University of Iowa
University of Kentucky
University of Louisville
University of Maryland, Greenebaum Cancer Center
University of Medicine & Dentistry NJ-Robert Wood Johnson Medical School
University of Miami
University of Michigan Medical School
University of Minnesota
University of Missouri
University of Nebraska Medical Center
University of Nevada School of Medicine
University of North Carolina School of Medicine
University of Pennsylvania
University of Pittsburgh Medical Center
University of Rochester Medical Center
University of South Dakota School of Medicine
University of Tennessee Health Sciences Center
University of Texas Health Science Center
University of Texas Medical Branch
University of Texas Southwestern Medical Center
University of Virginia School of Medicine
University of Wisconsin Comprehensive Cancer Center
Vanderbilt University Medical Center
Wake Forest University School of Medicine
Washington University School of Medicine

Academia

Allegheny College
Armstrong Atlantic State University, Georgia
Auburn University
Boston University





Brigham Young University, Hawaii
California Institute of Technology
Center for Cell & Molecular Biology, Cincinnati
Clemson University
College of Veterinary Medicine-Texas A&M University
College of William & Mary
Cornell University
Duke University
East Carolina University
Georgia Tech
Goteborg University, Sweden
Indiana University-Purdue University Indianapolis
Iowa State University
Johns Hopkins University
Lakehead University, Paleo-DNA Lab
Loma Linda University
Louisiana State University
Lyon College
Michigan State University
North Carolina State University
Northern Arizona University
Northern Illinois University
Northwestern University
Ohio State University
Oregon Health & Science University
Rice University
Saint Louis University
South Dakota State University
Stanford University
Texas A&M University, College Station
Texas A&M University, Institute of Bioscience & Technology, Houston
Tulane University
University at Buffalo (SUNY)
University of San Diego, iDNA Designs Inc.
University of Alabama
University of Calgary
University of California, Irvine
University of California, Los Angeles
University of Cincinnati
University of Florida
University of Florida Center for Mammalian Genetics
University of Guelph
University of Illinois College of Pharmacy, Chicago
University of Illinois, Urbana
University of Iowa
University of Kentucky
University of Louisville
University of Maryland
University of Massachusetts
University of Minnesota





University of Missouri
University of Montana
University of Nebraska
University of New Mexico
University of Notre Dame
University of Pennsylvania
University of Pittsburgh
University of Puget Sound
University of Rochester
University of South Florida
University of Tennessee
University of Texas, Austin
University of Texas, Houston
University of Virginia
University of Wisconsin
University of Wyoming
Utah State University
Vanderbilt University
Western Reserve University
Wilson Magnet High School
Yale University

Industry

Abbott Laboratories
Allergan, Inc.
Alltech
Amaxa
Ambergen
Ambion, Inc.
Amersham Biosciences
Amgen
Associated Universities Inc./GenoVar Diagnostics
AstraZeneca R&D
Aventis Pharma
Bayer Corp.
Bayer Pharmaceutical Corp.
BioVision Inc.
Cambria Biosciences
Capital Genomix
Celera Genomics
Cell Pathways Inc.
Cellular Genomics Inc.
Cephalon
Charles River Labs
Codexis
Conforma Therapeutics
Consensus Pharmaceuticals
Corixa Corporation
CV Therapeutics
DuPont Ag BioTech





Eli Lilly
Elitra Canada
EntreMed
GelTex Pharmaceuticals
Gene Check Inc.
Gen-Probe Inc.
GenVec Inc.
Genzyme Corp.
Hoffmann LaRoche Inc.
Ichor Medical Systems
Immunex Corp.
Incyte Genomics
Johnson & Johnson PRD
Kirkegaard & Perry Lab
L & L Company
LabCorp
Lilly Research Labs
One Lambda Inc.
Onyx Pharmaceuticals
PerkinElmer
Pfizer Global R&D
Pharm Development Consulting
Pharmacia Corp.
Procter & Gamble
Profile Diagnostic Sci Inc.
Promega Corp.
Protein Design Labs Inc.
Schering-Plough Research Institute
Sigma-Aldrich Inc.
Suntory Pharmaceutical Research Lab
Trimeris Inc.
Trinity Biotech USA
Visible Genetics Inc.
VistaGen Inc.
Vysis Inc.
Waratah Pharmaceuticals
Wyeth Ayerst Research
ZymeTx Inc.

Private Research Foundation

A I Dupont Hospital for Children
Academy of Natural Sciences
American Medical Center, Cancer Research Center
Cedars Sinai Medical Center
Chemical Industry Institute of Toxicology (CIIT), Center for Health Research
Evanston NW Healthcare
Gemini Science Inc/La Jolla Institute for Allergy & Immunology
Guthrie Foundation
Howard Hughes Medical Institute/UCLA
Illinois Institute of Technology Research Institute





John B. Pierce Lab/Yale University
Joslin Diabetes Center
Lahey Clinic
Max Planck Institute of Biophysics
Mayo Clinic, Rochester, MN
Mayo Clinic, Scottsdale, AZ
MD Anderson Cancer Center/University of Texas
Minneapolis Medical Research Foundation
Oklahoma Medical Research Foundation
Roswell Park Cancer Institute
St. Jude Children's Research Hospital
The Burnham Institute

Government Agency

Agricultural & Agri-Food Canada
Brookhaven National Lab
Centers for Disease Control
Department of Justice
Environmental and Natural Resource Management VA Hospital
Frederick Cancer Research & Development Center
Lawrence Livermore National Laboratory
National Institutes of Health (NIH)
New England Regional Primate Research Center
NIH/National Cancer Institute, Bethesda
NIH/National Institute of Aging
NIH/National Institute of Diabetes and Digestive and Kidney Diseases GBB
NIH/National Institute of Environmental Health Sciences
NIH/National Institute on Deafness and other Communication Disorders
NIH/Technology Transfer Branch
NY State Department of Health
US Army Edgewood Chemical & Biological Center
US Army Medical Research Institute for Infectious Diseases
US Department of Agriculture-ARS
US Environmental Protection Agency
VA Medical Center, Memphis, TN
VA Medical Center, Minneapolis, MN
VA Medical Center, Washington DC
VA Medical Center, West Roxbury, MA

Although, at first glance, some of the organizations listed as private research foundations might appear to fall into one of the other categories, each is indeed a not-for-profit organization. In addition to having .org extensions on their email addresses, these have been independently confirmed by information obtained on the Internet.





QUESTION 19.

Question:

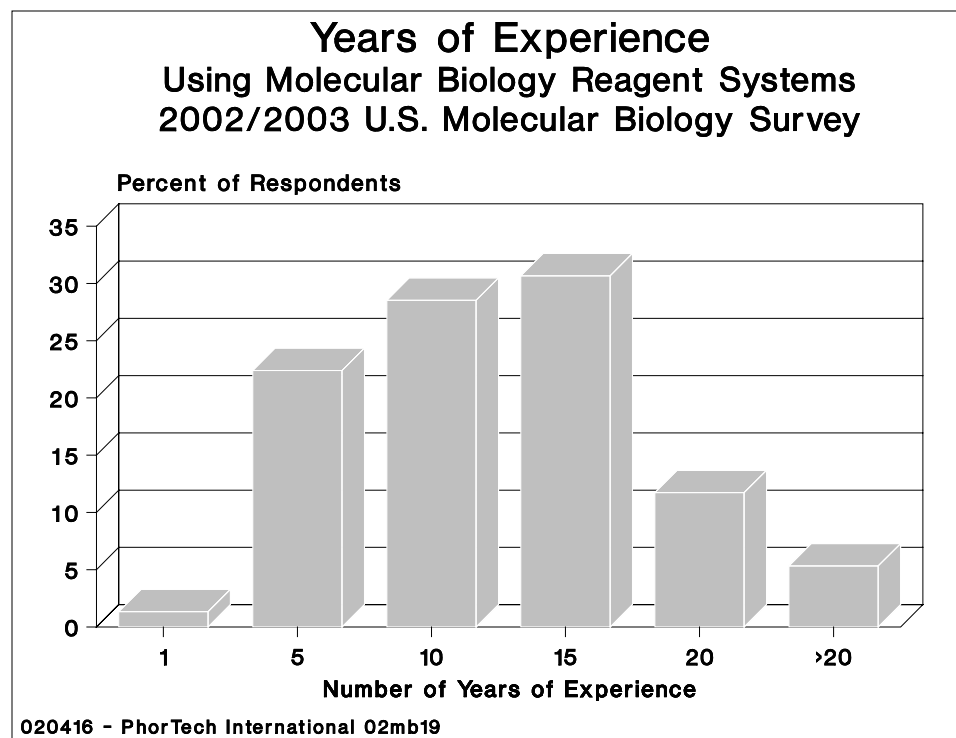
How long have you been using molecular biology techniques? _____ years

Rationale:

Based on the responses to this question, the level of experience in this field can be measured. Ideally, we would prefer to see a broad spectrum of responses here varying from relative 'beginners' to highly experienced researchers.

Results:

A total of 375 respondents answered this question, between them having accumulated 4,132.5 years of experience. The length of time working with molecular biology reagent systems ranged from 3 months to 30 years, with a mean of 11 years, a 10-year median and modes of 10 and 15-years. The histogram shown below depicts the distribution of these responses.



Analysis:

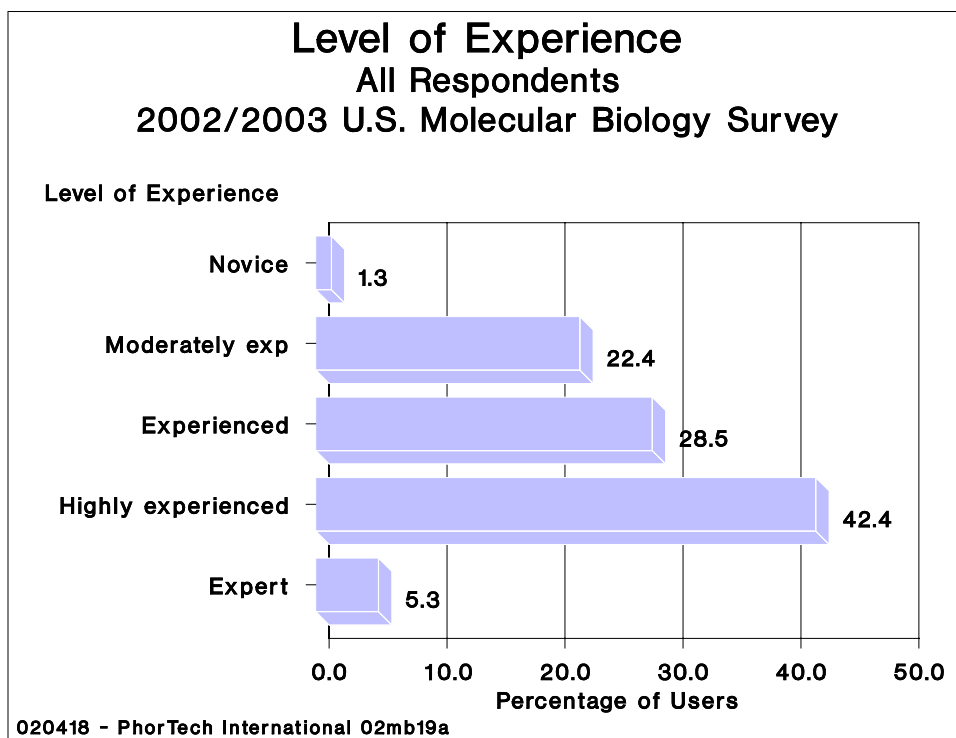
To further analyze this data, we have set arbitrary limits for different levels of experience. These are presented in the table at the top of the next page.





Definitions of Levels of Experience	
Years Experience	Level
up to 1	Novice
1.5-5	Moderately Experienced
5.5-10	Experienced
10.5-20	Highly Experienced
>20	Expert

After assigning respondents to the appropriate category, we can examine the distribution of our respondents by their level of experience, as shown below.



The respondents to this survey are clearly well qualified with a very small proportion, just over 1%, considered novices. At the other end of the scale, near 48% are very experienced, reporting more than 10 years of work with molecular biology techniques.

Finally, we look at the experience level of researchers using molecular biology reagents in different organizations.

The horizontal bar graph at the top of the next page shows the relative amount of experience for researchers from each organizational type, independent of the number of respondents.

