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April 2007 Volume 2 • Number 4

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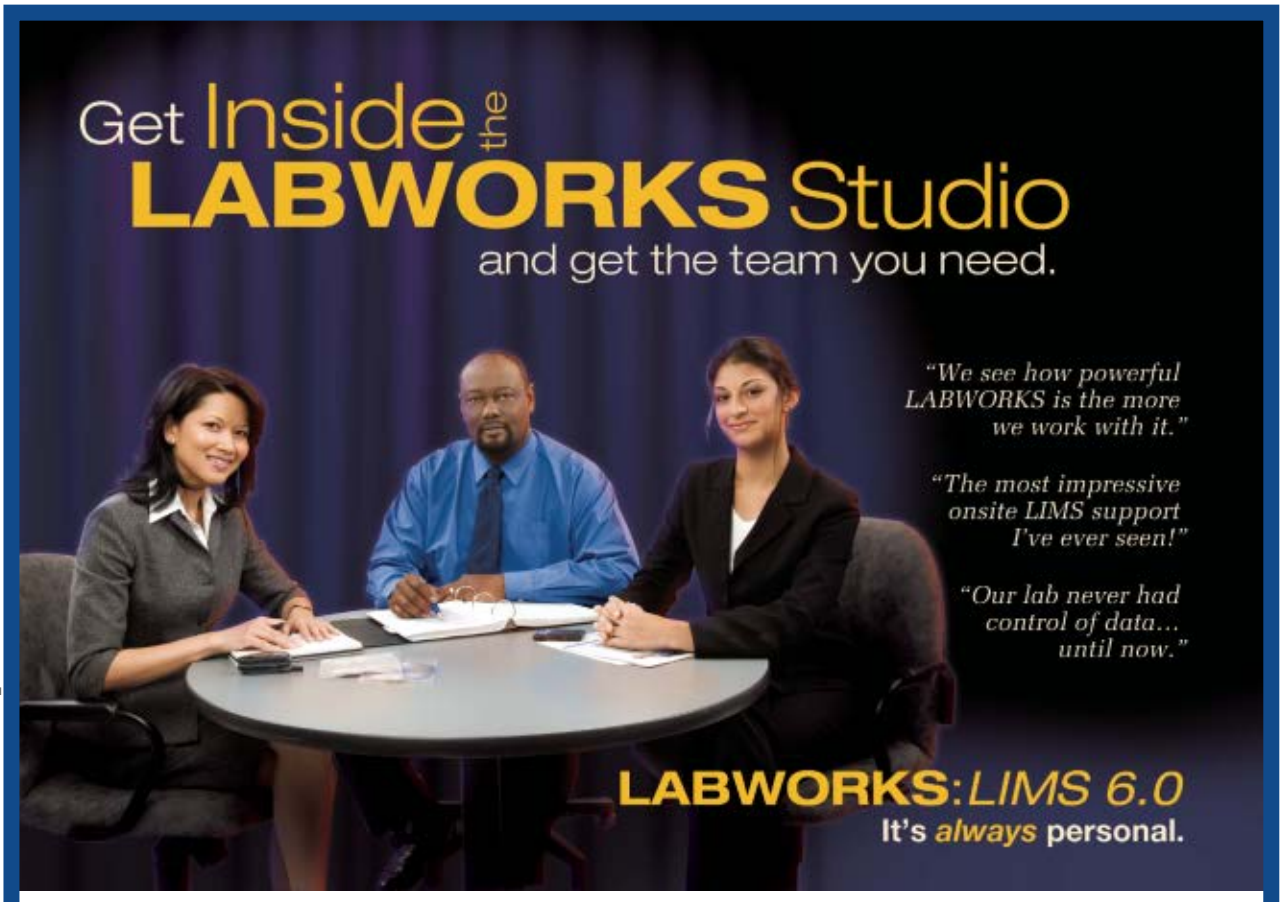

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Author Guidelines

Lab Manager Magazine® is a printed publication of resources, products, and information for today's laboratory manager. Articles should address some aspect of laboratory management from the perspective of a professional who is both a scientist and a manager. Topics areas would include: managing budgets, personnel, technology, information, funding, training, safety, risk, expansion, building or renovation, among others related to the role of a lab manager.

The article review process should begin with a query by e-mail or phone followed by a brief abstract or outline. Please state your topic and objective, and indicate your perspective as well as your professional relationship to the topic. Content must be unbiased and cannot promote a particular product or company. Article length may range from 1500-2500 words. All manuscripts must be submitted electronically by email or disk.

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upfront

As we move into our second year of publication, there are some new additions to the magazine that we hope will add depth to what we offer as well as broadening the arena of where to find ideas and inspiration to hone your management skills.

ANALYST JOSEPH DANIEL MCCOOL JOINS LAB MANAGER

Lab Manager Magazine welcomes writer, author, speaker, and talent management expert Joseph Daniel McCool as a columnist. Joe has contributed to and been quoted in an impressive array of publications. He writes on a wide variety of topics relating to recruiting and career management and will share this knowledge in his "Workforce and Career Insights" column.

This month, Joe tracks the trends and indicators to prove "companies that put people first finish first." Just when you thought that human capital didn't drive the bottom line, Joe reports, "The truth is that… companies are pouring money into research and development and the human side of their enterprises to drive innovation, elevate the customer experience, and build a competitive market advantage for the long-term." Good news to hear. Read the first installment of his new column to get the full picture and what it can mean to your career.

ONE MISSION: BE A BETTER LAB MANAGER

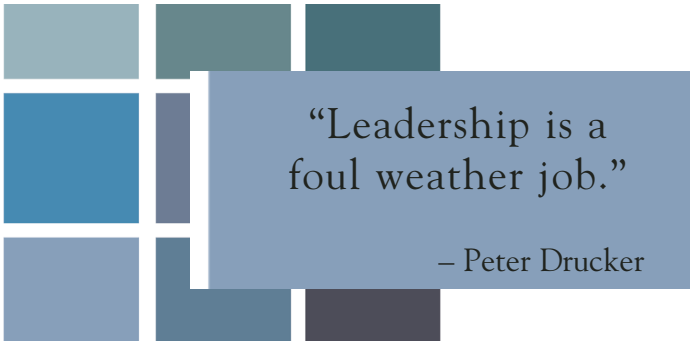
Also in this issue, we announce the launch of the Lab Manager Boot Camp. This one-day conference will be held on Thursday, October 25, 2007 at the headquarters of the Massachusetts Medical Society in Waltham, MA. The conference center is an outstanding facility just ten miles outside of Boston. Boot Camp will be an immersion into all aspects of management for those looking to develop, assess, or expand their administrative repertoire.

There will be a call for papers announced in an upcoming issue of the magazine. Also, our website, www.labmanagerbootcamp.com, will be updated with information on attending, speaking opportunities, conference topics, and more. The goal of the Lab Manager Boot Camp is to provide scientists with professional development in management skills and tools — things they didn't teach you in chemistry class.

MANAGEMENT TIPS, QUOTES, AND IDEAS

Beginning in this issue, you'll find some quick notes on management resources, books, and other ideas from the web and around the management universe. We hope to point you in the direction of new (and some old, tried and true) ideas that help engage you in building your managerial style and practices. Feel free to send us any helpful suggestions, websites, or stories to share with your scientific colleagues.

Patrice Galvin



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How to be a Good Scientific Mentor

PIs HAVE AN ABUNDANCE OF RESPONSIBILITIES. SERVING ON ACADEMIC COMMITTEES, TEACHING, RUNNING A LAB, WRITING PAPERS AND GRANTS, AND MANAGEMENT DUTIES ARE SOME OF THE REQUIREMENTS. IN THIS MAZE OF TASKS, IT'S EASY TO FORGET ONE OF THE MOST IMPORTANT ASPECTS OF YOUR JOB: BEING A MENTOR.

The harsh reality is that graduate students have enormous expectations from their mentors. They're looking for someone who is an accomplished scientist and also excels at training, motivating, inspiring, and supporting them as they complete their journey from graduate student to independent scientist. The upside of being recognized as a great mentor? The best and brightest graduate students will flock to your lab and be the driving force behind a highly successful operation. Here's a refresher course for how to become a "great mentor."

THE GOLD STANDARD: PUBLISH OR PERISH

It goes without saying that good mentors should have productive publication records, publishing in top-tier, peer-reviewed journals often. If you don't, graduate students will assume either the research coming out of your lab is not deemed newsworthy by journal editors, or that you don't frequently submit articles — both lead one to question the quality of your research and your leadership skills.

Knowledge transfer is the lynchpin of a successful mentor-grad student relationship.

A GOOD MENTOR IS PATIENT AND INSPIRATIONAL

From the student's perspective, graduate school is a long arduous process that will undoubtedly involve many missteps in designing experiments and generating testable hypotheses. Often times, the student can become so encumbered by the details of their project that they lose sight of the forest between the trees. Your job as an inspirational mentor is to recognize when a student is frustrated by the fickle nature of science and nudge them forward by reminding them that their research will provide answers to an important scientific question. Being a patient mentor means that you encourage your students to view their project from other vantage points and then give them the room to develop their own troubleshooting skills.

THE BEST MENTORS KNOW HOW TO TEACH AND MANAGE PEOPLE

Being a mentor means you have a long list of things to teach your students, including but not limited to: how to ask meaningful scientific questions and design sound experiments, how to execute various protocols, how to organize and present data, etc. You're also responsible for managing an entire staff that may include undergraduate students, graduate students, lab technicians, animal care technicians, and postdoctoral fellows. As in any work environment, conflicts arise and you are often called upon to arbitrate. Ironically, mentors are scarcely ever trained in either teaching or managing so that students can easily wind up with mentors who

Jennifer Sbrogna, Ph.D.

lack both these skills. It's important to be conscious of these qualities and to strive to be the best possible teacher and manager. If you feel deficient in either of these areas, seek out instructional workshops for formal training or consult more seasoned professors whose teaching and management skills you admire.

DEVELOPING A HYPOTHESIS-DRIVEN RESEARCH PROJECT THAT IS NOVEL AND FOCUSED

In addition to ensuring that your student is meeting program requirements (i.e., taking the required courses, passing comprehensive exams), you need to help the student design a hypothesis-driven project. Initially, you should work with the student to identify a novel scientific question and to generate the research aims and experiments to address this question. However, at some critical point, it's imperative that you step back and allow the student to interpret their own data and evaluate whether their project is heading in the right direction. This step is crucial as it will foster independent and critical thinking in the student. You should also encourage the student to "think outside the box" as this is often how the best scientific advancements are achieved.

SELF-PROMOTION — THE ART OF BECOMING A GOOD STORYTELLER

Once the student has enough data to share with the scientific community, it's your job to recognize this crossroads and teach the student how to weave his/her data into an interesting story. This is not a trivial skill — there are many seasoned professors out there who may be world-renowned experts in their field of expertise yet still lack the ability to infect their audiences with the enthusiasm their work merits. To prevent this, you should set the presentation bar high for your students and expect them to reach for it. Encourage your students to apply often for talks at local and national meetings.

Once your student is awarded a talk, set plenty of time aside to coach him/her and insist on multiple practice talks. While presentation styles differ, you should instruct your students to always present the best picture of their data; the audience should not have to strain to see the data nor should it be a stretch for them to believe it. Teach your students how to develop a story that flows flawlessly from one slide to the next — perhaps by using question-based transitions to set up each slide. School your students on the importance of giving concise explanations and avoiding the dreaded monotone — a sure way to lull an audience to sleep. The final words of wisdom you can impart to your students are to enjoy themselves. After all, this is their data; if they're fortunate enough to have a captive audience, they should present their data clearly and enthusiastically in order to inspire the audience to ask questions. Remind your students that every presentation is a golden opportunity to solicit constructive feedback from people who are experts in their field and who may be reviewing their papers someday.

That said, when students have a first-rate story, you, as their mentor, should be the first one to tell them to write it up. Paper writing is an art. The process will undoubtedly involve many rounds of back and forth between yourself and the graduate student, enduring reiterative permutations before reaching its final form. Supportive mentors know this and will guide their students through the process so that eventually, the student is capable of editing their own drafts. Putting the initial instructive time in with the student saves you countless hours in the long run as the quality of the drafts the student brings to you will dramatically improve.

LEARNING THE BREAD AND BUTTER OF A LAB: GRANT WRITING

One of your final tasks as a mentor is to prepare your students for their eventual release into the work force. While you may think your job is mostly done at this stage, this is actually a highly significant time for a mentor and his/her student. Ultimately, the success and achievements of your students will reflect back on your mentoring. One critical tool with which you can equip your students is the ins and outs of grant writing. Although funding opportunities are scarce for foreign students, there are plenty of NIH-funded NRSA grants accessible to American students. While grant writing is time-and labor-intensive for both the mentor and the student, you will be richly rewarded if NIH chooses to fund your student's grant. Not only will your student's stipend now be paid by NIH instead of your own payroll, you will also have confirmation that NIH views your lab and mentoring as a promising training environment. Your graduate students will have successfully learned what it takes to secure outside funding and, in so doing, will be in a better position to acquire additional funding once they graduate.

CONDUCTING A BROAD JOB SERACH

Although you may expect your students to pursue the same path you did, a tenure-track position in academia, the reality is that these positions are highly competitive and scarce. Aside from this stark reality, it's important to remember that not every Ph.D. candidate wants to wind up in academia. Your role here is to take the time to sit down with your students, hopefully a year or two before they graduate,

and get a feel for where the student is headed. Regardless of whether their careers aspirations are in industry, academia, or possibly both, encourage them to apply to as many positions as possible. Advise them to explore a variety of avenues, to keep an open mind, and to consider the whole picture when making this important decision (i.e., money, work/life balance, autonomy, intellectual stimulation, etc.).

INTRODUCING STUDENTS TO THE POWER OF NETWORKING

Something that goes hand in hand with fulfilling career aspirations is the importance of networking. As an established scientist, you are undoubtedly well aware of the value of networking in your community and should use every opportunity to introduce your students to your contacts and promote them as often as possible. The best place to do this is at conferences where face to face introductions can be made; however, you can also introduce your student in absentia by presenting their work in your talks and giving glowing reviews of their drive and intellect. Another easy method of introduction is through e-mail. These simple connections often lead to research collaborations between labs on different continents and may enable your students to author additional papers.

To reiterate, being a mentor can seem like an endless task. You may already feel overwhelmed by the myriad of other responsibilities that go hand in hand with being an academic scientist. However, minimizing the importance of your role as a mentor is to shortchange the potential productivity of your lab and could even adversely affect your own scientific reputation. Embrace the qualities of a good mentor and you will never find yourself at a loss for talented students whose research will result in a proliferative publication record for your lab.

In the next issue: what a grad student should look for when choosing a good scientific mentor

Jen Sbrogna, Ph.D*. is a freelance writer. A graduate of Bates College and the University of Massachusetts-Amherst, she previously worked as a postdoctoral fellow at Dana-Farber Cancer Institute, Boston, MA. Jen can be reached at: jensbrogna@yahoo.com.*

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With Growth Comes Change… and Lab Relocation

THE PACE OF CHANGE AND GROWTH IN THE PHARMACEUTICAL AND BIOTECH ENVIRONMENT MEANS THAT MOST COMPANIES FACE THE DAUNTING TASK OF RELOCATING LABORATORIES AT SOME STAGE IN THEIR DEVELOPMENT.

In recent times, the number and frequency of lab relocation has increased dramatically. There are a myriad of reasons for relocation, such as mergers, acquisitions, funding, and basic organic growth. The "why" to move is the easiest question to answer. The "where'" and more importantly the "how'" are the causes of much angst where relocation experience is not typically an internal core competency. Regardless of these questions, minimizing downtime and overall disruption to business and scientific objectives are paramount.

GETTING STARTED

Moving high-end analytical instrumentation, precious samples, and hazardous materials efficiently is not a job for the uninitiated. Certainly not the type of job a standard moving company can handle. Add the complication of operating within GLP/GMP guidelines and quickly the need for an experienced technical resource — a resource that has a proven time, safety, and compliance track record — becomes apparent.

Sourcing a qualified lab relocation provider means doing a thorough audit of the provider's experience, processes, capabilities, and resources.

...most time is spent, not in the actual act of moving, but in the exhaustive measures required for preparation.

- Does the provider have defined processes that can be tailored to your specific requirements?
- Does the provider sub-contract most activities or can the provider perform all or most tasks?
- Does the provider have the ability to access additional resources rapidly or provide the resources appropriate to the scale of the move?
- Can the provider present case studies and references that demonstrate their ability to overcome unique obstacles?

The initial meeting with a prospective lab relocation provider should include a checklist that takes into account these issues as well as the critical aspects of the move as outlined by internal stakeholders.

From the provider's perspective, an experienced lab relocation resource first seeks to understand the background to the relocation, the culture of the work environment, and important issues that will affect the overall project. Developing relationships with stakeholders and ensuring that their concerns are highlighted within the project plan means that most time is spent, not in the actual act of moving, but in the exhaustive measures required for preparation.

As a result of the initial meeting, a lab relocation provider should be able to craft a preliminary project plan for evaluation. The preliminary project plan should demonstrate clear ownership and accountability through a high level map of resources and checkpoints. This is especially important

Joe Tehrani, Ph.D.

where sub-contractors may be leveraged to assist with moves of considerable scale or specialty. The appointment of a Project Leader who takes ownership for the entire relocation and is responsible for the creation of a project plan in partnership with the client company should also be known. The performance of the Project Leader can mean the success or failure of the move; for any relocation to be successful there must be a climate of trust and partnership. Lab relocation providers are entrusted with managing a company's ability to perform in the future and the Project Leader plays a key role in ensuring overall coordination and communication.

PLANNING, PLANNING, PLANNING

The project plan should include every operational aspect of the move in detail complete with timetables, ownership, and logistics. An equipment inventory audit must be carried out to verify what equipment needs to be moved and to address any shipment issues. Each instrument's location, configuration, operational condition, and usage are documented. Any sensitive instrument that requires specialized transportation, such as air-ride trucks, is identified. Then all assets are tagged systematically.

Identification and resolution of logistical obstacles must also be addressed as part of the project plan. Hoisting a large robotic workstation in or out of a third floor window using a crane, for instance, requires preparation and experienced personnel.

The project plan should include a new location readiness status. The lack of utilities specifically can delay the entire operation. In addition, there should be enough flexibility built into the plan to account for any potential increase to the equipment inventory list.

Ultimately, the project plan is based on the input of many different stakeholders and it is up to the Project Leader to ensure that there are clear channels of communication. The Project Leader has ownership of the project plan and, as such, must have the experience to anticipate any potential issues and have contingencies built in accordingly.

EXECUTION

A lab relocation provider should employ an experienced relocation team made up of specialists who have experience working with varied instrumentation and software platforms. Typical backgrounds ranging from analytical chemistry to nuclear

physics are appropriate given the environment and the sensitive nature of the analytical instrumentation involved.

Regardless of who manufactured the instruments being moved or the level of customization, the lab relocation team must ensure that breakdown, shipment, re-commissioning, calibration, and qualification are carried out efficiently. Having a lab relocation team staffed with life and analytical science instrumentation specialists means that the relocation is not dependent on the individual original equipment manufacturers (OEMs) to come in and conduct these services. This saves a lot of time and money, not to mention consistency in the quality of service delivery.

On the day of the move, equipment is broken down systematically in a documented fashion and then prepared for shipment.

After the instruments complete the journey, the lab relocation team handles the unpacking. When possible, the same members of the lab relocation team should work both ends of a move. This takes care of any oddities in the breakdown and makes the transition easier during reinstallation.

Once at the new site, the equipment is re-installed according to the system map established during breakdown. Alternatively, equipment can be reconfigured according to customer specification. In a GLP/GMP environment, the installation qualification/operational qualification (IQ/OQ) is conducted immediately.

The very essence of laboratory relocation, from preparation to successful project plan execution, is the safe and efficient move of laboratory assets. This typically entails working in a hazardous material environment. Working in conjunction with Environment Health and Safety staff and Radiation Protection Services personnel, a deliberate stepwise approach is applied for the safety of all personnel. Procedures for the disposal of all hazardous materials prior to the move are first communicated. Chemical, biohazardous, and carcinogenic inventory needs to be characterized and reduced before relocation. Packing, labeling, and storage of these materials must be in compliance. Safety procedures in the event of an emergency are reinforced.

The logistics of any laboratory relocation can be overcome as long as the provider has the ability to tailor services that are also scalable. Today, the global economy fuels the need for intercontinental moves so that country-specific customs and licensing knowledge must be leveraged. Using a global provider for lab relocation reduces the overall complexity of relocation and the probability that an aspect of the relocation could fall through the cracks

FROM COMPLEXITY TO OPPORTUNITY

The logistical complexity of a company or laboratory relocation also represents a great opportunity to evaluate the cur-

rent status of all laboratory assets. The thousands of pieces of equipment from the simplest centrifuge to NMR systems represent millions of dollars in asset equity that may be underutilized. Additional steps in the equipment inventory audit can include:

- Obtaining existing service records, history, current preventive maintenance (PM), and validation schedules
- Checking with OEMs to determine current parts inventory for older instrumentation
- Appraising all assets and making determinations for efficient deployment
- Delivering findings and recommendations so that informed decisions can be made

The activity allows for the identification of surplus laboratory equipment so that it can be used where it is most needed within a customer's organization. Redeploying idle laboratory equipment can positively offset forecasted capital expenditure. This asset management step integrated into the actual laboratory relocation planning process ensures that the correct equipment is moved and deployed for the highest utilization. The redeployment of idle assets is only a part of the overall benefit for customers. Challenge lab relocation service providers to:

- Conduct a life cycle analysis of currently utilized equipment to facilitate planning for future capital expenses
- Sell surplus equipment that represents an untapped source of revenue and frees up valuable laboratory real estate.
- Dispose of unwanted laboratory equipment in accordance with EPA guidelines

KEYS TO SUCCESS

The future productivity and profitability of a company is directly impacted by the ability to execute relocation efficiently. Lab relocation is a specialized activity that requires careful detailed planning and execution by experienced technical personnel. Choose your lab relocation provider carefully. Challenge their track records, check their references, and audit their resources.

***Joe Tehrani**, Ph.D. is Global Business Leader, OneSource Laboratory Relocation for PerkinElmer. He can be reached at joe.tehrani@perkinelmer.com.*

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Using Research Metrics Helps Get More Bang for Your R&D Buck

A REVIEW OF SOME PAPERS PRESENTED AT THE ELEVENTH ANNUAL CONFERENCE ON PRODUCT DEVELOPMENT METRICS.

"Technical professionals provide 85% of new product profitability," states consultant Brad Goldense, CEO of the Goldense Group (Needham, MA). Therefore, it is only natural that firms would turn to using metrics to improve their R&D process after applying metrics to other, less complicated business processes. These processes include financial, sales and distribution, and manufacturing to which companies applied metrics in the pre-1970s, 1970s, and 1980s respectively.

Table 1. Most Commonly Used R&D Metrics[a]

Metric	% of Companies Using the Metric
R&D spending as % of sales	68
Total patents filed/pending/awarded	50
Current year % of sales of new products developed last N[b] years	47
Number of new products released	6
% increase/decrease in R&D headcount	3
Number of products/projects in active development	2
% resources/investment devoted to new product developmen	1

[a] Goldense Group "Big Picture: Corporate R&D Metrics Used in Industry – 2002 Survey." This biannual survey has been performed since 1998.
[b] Typically N is 3 or 5

Goldense commented that systematic efforts to develop metrics for R&D began only in the 1990s and continue today. The seven most common predictive metrics used by seventy-six companies are summarized in Table 1. The use of twenty-four other R&D metrics was reported but none were used by as many as 33% of the responding firms.

What separates the best from the rest and why do the top businesses do so exceptionally well?

Goldense observed that the main new metric to rise to general usage in the 1990s was sales due to new products. This metric was invented and popularized by 3M circa 1988 and rose to industry prominence over the next decade. He suggested that one way to measure overall R&D program effectiveness is the equation:

$$\text{ROII} = \frac{\text{(Cumulative N-year Profit from New Products)}}{\text{(Cumulative N-year Expenditure on New Product Development)}}$$

wherein: ROII = return on innovation investment
N = a given number of years after the investment is made

The numerator is sometimes referred to as "profit before tax." By using the net present value for both the numerator and denominator, the time factor can be taken into account. Net present value can be affected by inflation and other increases in the cost of raw materials, salaries, and sale price of the new product.

Consultant Scott Edgett (Product Development Institute, Inc.) offered another key metric, the new product development (NPD) success rate. This is defined as the fraction of NPD projects

John K. Borchardt

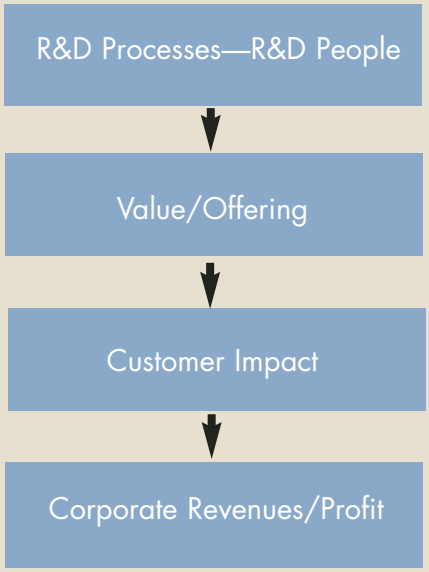

Figure 1. R&D performance metrics must be aligned with strategic objectives of both the parent organization and the customer.

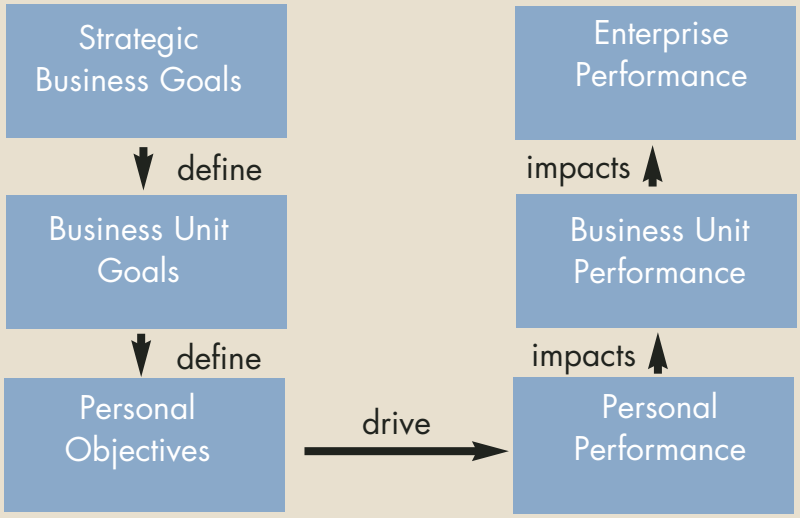

Figure 2. Enterprise strategies and objectives should be communicated to all employees to better align business strategies, tactics, actions, and measures of success.

entering the commercial development stage that become commercial successes that meet or exceed financial objectives. The average for the U.S. industry is 60.2%. But there is a big difference between the top 20% of businesses and the average; the top 20% has an almost 20% higher new product success rate at 79.5% and less than half the failure rate of the average business. These big differences raise the question: what separates the best from the rest and why do the top businesses do so exceptionally well?

One can begin to explore this question by looking at case histories.

CASE HISTORY — ACCESS BUSINESS GROUP

Access Business Group has a 500-person R&D organization with five people working full-time to support the firm's development and utilization of R&D metrics. (Access Business Group is more familiar to many by the name of its largest business unit, Amway.) In 2003, the firm instituted a research metric program under the leadership of Patrice Gausselin, senior research scientist.

She noted that historical measures, such as the percent of total revenue produced by new and improved products less than three years old and staff hour work expenditures, are retrospective metrics providing good indicators of R&D performance outputs (e.g., products and processes). However, they provide little predictive guidance on how to improve R&D effectiveness when designing projects and during the product development process.

To deal with this issue, Gausselin led a team that developed metrics for "real-time" R&D management, particularly of time, personnel, and budget resources. Her goal was to use metrics "to create an aligned, integrated, and performance-driven organization." To do this she held extensive discussions with consultants, utilized expert networks, and studied literature references and various websites.

She determined that R&D performance metrics must:

- Be aligned with strategic objectives of both the parent organization and the customer, in Amway's case, individual consumers. This alignment is depicted in Figure 1.
- The metrics methodology must be communicated to all members of the R&D organization so they have a good understanding of it.
- Connections must be forged between the metrics and the personal objectives of the researchers.

The team used this information to establish external benchmarking to organization leaders in utilizing metrics to improve corporate performance and to review the key deliverables to establish how R&D activity links to strategic objectives and corporate performance. They developed a list of common industry metrics they could use to align R&D activities with corporate performance. These included:

- ratio of R&D spending to total sales (R&D intensity)
- number of new products released and the number of

products in the development pipeline
- sales from new products
- percentage of sales from new products
- percentage of products meeting time and cost commitments
- value of the organization's patent portfolio
- market share of each newly commercialized product
- effectiveness of cost controls

Performance metrics should be measured as value-added contributions at the individual, departmental, business unit, customer, and, ultimately, the enterprise level (e.g., corporate sales and profit margin). The team developed metric variables for R&D and corporate financial performance based upon key R&D activities: conceptual research, business development, and business sustaining activities. They gathered historical data for the following metrics and created x,y scatter plots:

- *x* variable datasets
  - Total R&D funding
  - R&D funding for developing new and improved products
  - R&D staff hours
  - R&D staff hours spent on developing new and improved products
  - R&D intensity
  - Number of patents
- *y* variable datasets
  - Total corporate revenue
  - Revenue generated by new and improved products
  - Top market revenue
  - Top new and improved product revenue
  - Percent of revenue generated by new and improved products

In particular, these graphs indicated a strong correlation between the number of new patents and new product sales by the relevant business unit.

The company instituted a comprehensive resource management process and a 3-5 year resource utilization plan that would support Access Business Group's 5-year business plan. Specific actions included adding thirteen researchers and then holding the staff level constant. The number of people in different technology areas was adjusted to better support corpo-

rate goals. The number of staff hours devoted to new product R&D was increased. To support this increase, ideation and planning activities were developed to augment the number of products in the R&D development pipeline.

Enterprise strategies and objectives were communicated to all employees to better align business unit and division strategies, tactics, actions, and measures of success. This alignment is depicted in Figure 2.

CASE HISTORY – CARGILL, INC.

Two case histories from Cargill, Inc. were presented by Business Development Manager Larry Micek. Cargill has 140,000 employees and annual revenues of $70 billion. It is a complex organization with 90 business units. Micek estimates that his business development team commercializes one new product for every 250 R&D project ideas they evaluate.

Micek uses what he calls qualitative metrics to determine Cargill's organizational fit for both successfully undertaking a research project and successfully commercializing a new product. The key qualitative metric to consider when determining organization fit is whether the technology to be developed by the project is disruptive or sustaining. These classifications aid in deciding whether to deploy a project as a separate business entity (disruptive technology) or keep a project within an existing business unit (sustaining technology).

Disruptive technologies offer greater potential for penetrating new markets. However, disruptive technology-based businesses are often killed due to the associated overhead and resistance to change by existing businesses — both those within the company that produces the disruptive technology product and customers whose utilization of the disruptive technology would require major changes in the way they operate. Adoption of a disruptive technology is often facilitated by customers comparing a disruptive technology, not to a current technology, but to having nothing at all to solve their problem.

Cargill's SafeLane™ Polymer Overlay, a new Cargill product, is an example of a disruptive technology. This is a patented polymer overlay treatment for bridges to prevent ice formation in winter weather. Cargill licensed the product from Michigan Technological University. The polymer is based on starch. Micek considers it a disruptive technology because until it was introduced, customers, mainly local and state departments of transportation (DOTs), lacked environmentally acceptable, cost-effective solutions that would prevent bridge pavement from icing. The primary alternative is spraying brine or salt on bridge surfaces. Particularly in southern states, DOTs will compare using the product to using nothing at all, which is what many do now. The product opens up a new market in southern states without any anti-icing capability.

Because these customers are not served by existing Cargill businesses, SafeLane Polymer Overlay was introduced through Cargill's Emerging Business Accelerator, a unit that concentrates on businesses that do not have a "natural home" within existing Cargill business units.

Micek provided a list of product benefits to customers. These include: decreased accidents, increased vehicle traction, prolonged bridge life, reduced pavement maintenance, reduced usage of bridge maintenance chemicals, and reduced environmental impact compared to spraying of salt or brine.

SafeLane Polymer Overlay customers can quantify these benefits and use them as project metrics to measure success in using the product.

Micek went on to discuss a product, C*Film™ Film paper coating solutions process, as an example of sustaining technology. It utilizes Cargill's current competitive advantage in starch technology and provides improved performance compared to current paper coating technology — performance customers are willing to pay for. Customers can use current coating equipment when using the product. The product was commercialized through existing Cargill's Industrial Starch business unit by personnel familiar with the value drivers for coatings customers. In selling a new product to a customer and evaluating its benefits, Micek noted that the process begins with providing customers with a list of product/process benefits and applying these benefits to the customer's needs. Then the customer and the supplier need to agree on project goals and metrics to use in measuring achievement of these goals. Achievement of target metrics becomes the standard for evaluating project success.

WRAP-UP

Three general themes emerged from these and other papers presented at the conference. First, simple metrics are useful even if they don't measure all of the project activities. Second, one should be careful of having too many metrics and turning metrics into an overly bureaucratic exercise. Finally, timely updates of metrics are essential if the metrics are to drive project planning and progress.

The Eleventh Annual Conference on Product Development Metrics was held November 6–8, 2006 in Chicago, IL. The conference sponsor, Management Roundtable, is a knowledge and networking resource for individuals involved in new product and product technology development.

***Dr. Borchardt** is a consultant and technical writer. The author of the book "Career Management for Scientists and Engineers," he writes often on career-related subjects. He can be reached at jkborchardt@hotmail.com.*

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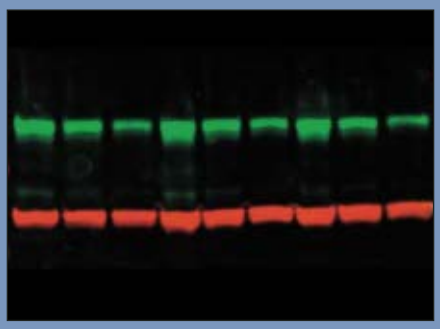
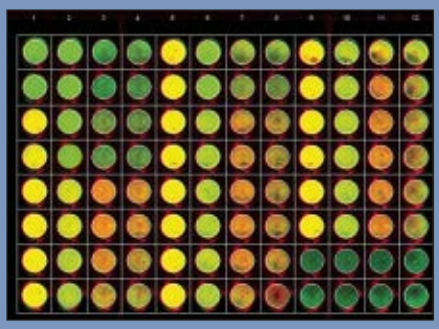
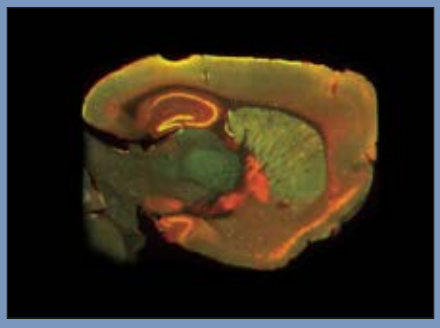


Quantitative Western Blots

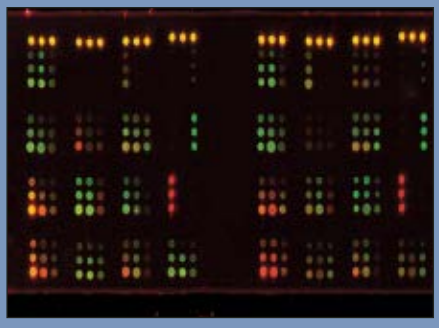


Cell-Based Assays

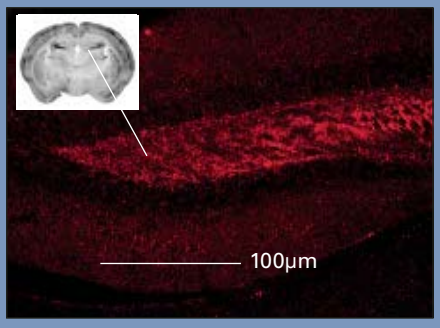
In Vivo Imaging



Tissue Sections*



Protein Arrays



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Demonstrations of Compliance — Continuous Maintenance Monitoring and More

"Aaugggh… the audit's next week!!"

I have enjoyed forty-five years in scientific assignments. We have prepared for audits, helped customers prepare for audits, and now supply software to help others prepare for audits.

Once in my early days as a bench chemist, lab notebooks were collected to serve as evidence in a patent law suit. This experience put "the fear" into me. I learned a lesson in all aspects of documentation and in reporting defensible data.

My scientific career started in 1960. The DuPont Company wanted their scientists to be well-trained, precise, and accurate. We were given special training in weighing on a triple beam balance. Everyone was issued the finest K&E slide rule — scales all over the place. Take the slide out. Reverse it and turn it upside down — so much math — and more fun than the calculators and computers that weren't heard of yet!

CONTROL AND THE TECHNOLOGICAL REVOLUTION

Let's consider the 1960s through today as an era of Analytical and Technological Revolution. In the 1950s, hospital labs were running hand chemistries on patient blood. Technicon offered a few automated chemistries in the '60s. In the '70s, DuPont marketed the Health Care Industries first random access discrete clinical chemistry analyzer. And in the '70s, computers began to formulate their roles in lab data management and instrument control.

When systems are in control, predictive models can be developed, utilized, and built upon.

From the '60s forward, we have seen growth at logarithmetic rates — growth in computer programs, in analytical instrumentation, test protocols, and in numbers of analytes to quantitate. Along with this growth came the need for data control. Controls have ranged from very good to overly cautious but we continue to move forward. Control has at times been self imposed and sometimes court mandated.

Licensing and accrediting agencies perform a needed control function. Their service is sometimes perceived in negative connotations but these controls provide the glue to unite, correlate, and validate data streams. When systems are in control, predictive models can be developed, utilized, and built upon. Various labs can run the same project samples and generate correlative data. This year's studies can be compared to some past year's findings.

It is important to control the validity of data and help keep audits moving forward. This in turn helps increase lab (or industry) productivity and profitability. In addition, the management of this process should be year round and not only when an audit is just around the corner.

COMPLIANCE

Certification inspections are part of the business of science. Auditors can (and should) routinely ask to see instrument maintenance records. The first step in generating reportable data is in practicing a proactive program to insure instruments are always maintained to the manufacturer's recommendations. In 1972, Philip Crosby wrote a book, "Quality is Free." His target audience was manufacturing operations. But production is production — Toyota, Pepsi, aircraft, or

Gerry Hall

data. His premise was that the cost of a quality program more than paid for itself based on fewer reworks or reruns; fewer discarded, lost, or expired samples; fewer exception reports; a higher yield of billable results; and a saving of face. (This one is my own. Don't you just hate to have to explain "Why" to an auditor or to a customer?)

Here is an example of documentation required for one little segment of National Environmental Laboratory Accreditation Program (NELAP) and other certifying agencies. These selections are taken from Chapter 5 of the DOD updated NELAP version:

- 8.0 b) Equipment and Reference Materials — All equipment shall be properly maintained, inspected, and cleaned. Maintenance procedures shall be documented…
- 9.4.1 Support Equipment — a) …maintained in proper working order…records kept…
- 9.4.1 Support Equipment — e) …documentation on all routine and non-routine maintenance…
- — e) 8) …details of maintenance carried out to date and planned for the future; and…
- — e) 9) …histories of any damage, malfunction, modification or repair…

These types of documentations normally require a fair amount of written records and/or "paper trail" notes. Due to the rigid requirements of producing product (data) within time constraints, records may not be updated immediately, fully nor legibly. In the lab, orthophosphorus or nitrite analysis and BacT platings are examples of "time limited" analyses or procedures. To meet time requirements these actions might supersede documentation of recently performed maintenance and repair. This can later become troublesome if paperwork has been set aside (for the moment) to complete time sensitive analyses.

TWO OPINIONS

First, it is critical that every organization and every employee understand and participate in a proactive maintenance program. (I believe the old DuPont rule was safety first, housekeeping and maintenance second, and production third.) This helps insure that data reported to your customers is of the highest quality possible. Controls, curves, blanks, duplicates, and spikes demonstrate that this well-maintained instrument consistently generates "good data." PTs and unknowns demonstrate your well-maintained instruments are performing within acceptable limits compared with your own lab and other laboratories.

Second, computers are doing more and more for us in the lab. Lab managers need to stay open to, and receptive to the new products that are starting to enter this marketplace. Some laboratories have allowed themselves the time and salary required to build their own supplemental lab computer programs. These programs fill holes in the hero's job being done by many LIMS systems. But good programmers cost a lot of money; and debugging new programs is a monumental task. Also, this is probably a never-ending task as certifying agencies continue to grow, to add to, or to change certain existing audit criteria.

New software companies are addressing these holes in task tracking and documentation. Commercial products are being created to perform or guide you through these scheduled and unscheduled actions — and at affordable prices.

One friend, an agency auditor, says that when hand-written entries are illegible, incomplete, non-existent, or appear to be written all at the same time, alarms go off. Inspections go much deeper. They take much longer. If nothing else, this impacts your productivity (and may trigger an acid reflux attack). One of our new customers had lost track of a couple of remote location autosamplers. The auditor found them. Some maintenance actions were overdue.

Explore all of the emerging opportunities. Take all the steps possible to stay proactive in protecting your lab's product. And, if you can, help send the auditor to lunch early.

The basic fact is — with or without software programs — your lab needs to demonstrate compliance to an auditor. This demonstration includes scheduling, tracking, and documenting instrument and facilities maintenance. This also includes being able to show an ongoing maintenance program that even plans for future actions.

Gerry Hall *is President of TimeKeeper® America. He took an early retirement from DuPont in '85 and has involved himself in many experiences since. These include building a DME medical company in California, contributing to a biofuel project associated with the University of Florida, working as an Environmental Chemist for the State of Florida, and helping an OEM demonstrate EPA acceptable performance with their new chemistry analyzer. He can be reached at gerry@timekeeperamerica.com or at www.timekeeperamerica.com.*

The HBR IdeaCast™ is a free biweekly podcast (also available to listen from your computer) featuring management ideas and commentary from the editors and authors of Harvard Business School Publishing. Episode 17 is a talk with author, Gary Pisano, on his book "Science Business: The Promise, The Reality, and The Future of Biotech." Pisano contends that biotech suffers from underlying problems related to the business of science and the unique challenges these businesses face.

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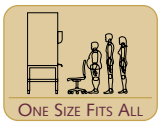

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ALTHOUGH ONLY RECENTLY IDENTIFIED AS A NEW CLASS OF MOLECULES, microRNAs HAVE EMERGED AS A ONE OF THE MOST PROMISING AREAS OF RESEARCH TODAY. RECENT DATA FURTHER SUGGEST THAT MEDICAL CONDITIONS, SUCH AS CANCER, CAN BE ASSOCIATED WITH SPECIFIC microRNAs PATTERNS. IDENTIFYING THESE PATTERNS MAY LEAD TO THE DEVELOPMENT OF TARGETED TREATMENTS.

Studies indicate that microRNAs, which are a class of non-coding regulatory RNA molecules that affect gene expression by binding to 3'-untranslated regions of messenger RNAs (mRNAs), may regulate as many as one-third of the genes within the genome and influence a wide range of biological activities and cellular processes, including cellular proliferation, maintenance, and apoptosis; differentiation of cell lines; developmental patterning and timing; and carcinogenesis.

MicroRNA analysis can be challenging for researchers because the database of identified microRNA is expanding quickly. Also, microRNAs are short sequences ranging from 17–23 nucleotides in length that are highly similar to each other in sequence with inherently different melting temperatures.

As researchers study microRNA sequences and focus on critical, relevant microRNA, they require technology specifically designed for microRNA analysis that can be applied to screening against a broad panel of targets and used for focused multiplexing of microRNA targets and patterns of interest against numerous samples consistently and efficiently. This technology also must easily expand or subtract feature sets and process these features against large banks of samples.

This "liquid array" approach also offers excellent manufacturing and assay standardization due to the nature of the microspheres when compared to competing flat arrays, which are limited by solid phase kinetics.

Hard-coded planar arrays are at a disadvantage in offering the customization needs of emerging microRNA research, but a combination of a bead-based array and Tm-normalized locked nucleic acids (LNA) offers a solution for the challenges microRNA research poses. Favorable reaction kinetics of a liquid bead array give faster, more reproducible results than solid, planar arrays. This "liquid array" approach also offers excellent manufacturing and assay standardization due to the nature of the microspheres when compared to competing flat arrays, which are limited by solid phase kinetics.

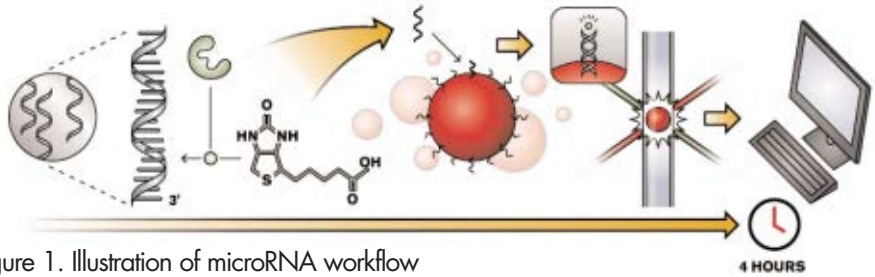

Figure 1. Illustration of microRNA workflow

Ramin Saberi and Christie Hughes

LNA is a conformationally restricted nucleic acid analogue in which the ribose ring is "locked" with a methylene bridge connecting the 2'-O atom with the 4'-C atom and increases the melting temperature of the nucleic acid duplex by 2–8 °C per LNA monomer when integrated into one strand. The microRNA detection panels for human, mouse, and rat targets give researchers the ability to measure the expression of microRNA sequences from public databases using total RNA samples without the need for RNA size fractionation or amplification. The general flow of such products, illustrated in Figure 1, allows researchers to biotinylate the 3' end of total RNA, followed by a hybridization step where the labeled microRNA hybridizes specifically to LNA capture probes coupled to microspheres. The detection of the biotinylated microRNA is achieved by the reaction with streptavidin-phycoerythrin (SA-PE) and final read of the samples in a standard 96-well plate on an analyzer.

EXPERIMENTAL DESIGN

For the human panel, more than 300 mature microRNA targets are split across five (5) microsphere pools that allows for use of the same microsphere set or region across multiple wells. In addition to the 60–70 microRNA targets per pool or well, nine (9) multi-purpose controls are included in each well for evaluating attributes such as integrity of the assay, integrity of the assay performance, normalization of signal across the wells for one sample, and normalization of signal across a batched run.

There are two protocols associated with microRNA analysis: labeling and detection. Labeling involves adding a biotin molecule to each RNA target via enzyme ligation. Detection consists of hybridizing the labeled RNA with microRNA-specific LNA probes coupled to microspheres and binding a reporter fluorescent molecule to the hybridized microRNA for detection on an analyzer.

From each human tissue, 30 µg (10 µg per replicate) total RNA was combined in a nuclease-free microcentrifuge tube with labeling buffer, biotin conjugate, a biotinylation enzyme, and nuclease free water. Following mixing and centrifugation, the labeling reaction was incubated at 0 °C for one hour. The labeling reaction was stopped by incubation at 65 °C for fifteen (15) minutes, followed by centrifugation. After labeling the total RNA, the labeled total RNA were combined with microspheres coupled to microRNA-specific LNA probes within sixty (60) wells of a 96-well PCR plate. Nuclease-free water was used for the background control replicates. For best efficiency, the samples are set up on the PCR plate batched by microsphere pool.

Direct hybridization of the microRNA targets to the LNA probes was performed in a thermal cycler and consisted of incubation at 95 °C for three (3) minutes to denature any secondary structures in the reactions followed by hybridization incubation at 60 °C for 1 hour.

Following hybridization, the reactions were washed twice with pre-warmed wash solution using a 96-well filter plate and vacuum filtration to remove unbound products. The reporter molecule, SA-PE, was added to the reactions and incubated at room temperature for fifteen (15) minutes on a plate shaker set at 600 rpm to bind with the biotinylated targets hybridized to the microRNA-specific LNA probes that were coupled to the microspheres. The reactions were transferred to a PCR plate and run on an analyzer at about thirty (30) seconds per sample. The reactions also may be run on the analyzer straight from the filter plate as long as the probe height is properly adjusted for the plate. Total time from start of labeling reaction to final read of the samples was about four and one half (4.5) hours.

RESULTS

The experiment generated a total of 4368 data points in just over four hours. More specifically, 364 data points were generated per sample replicate, yielding a total of 1092 data points for each of the three tissues and for the background control. The median fluorescence intensities (MFIs) for the background control were averaged across the three replicates and later used for background correction of the tissue sample results. The MFIs for all tissues were averaged across three replicates and background corrected.

CONCLUSION

As microRNA research becomes more prevalent and additional microRNAs and microRNA patterns are identified, researchers will need technology that allows for both high density and high-throughput screening. Many traditional technologies that allow for high-throughput applications cannot multiplex many tests at once, while many technologies that enable high-density screening cannot maintain the reproducibility required in high-throughput applications. The flexibility of the products — a combination of a bead-based array and Tm-normalized locked nucleic acids — offers researchers the ability to customize a set of microRNAs while maintaining high specificity and simple workflow. These attributes should prove useful to those interested in focusing research to specific microRNA targets or patterns.

Ramin Saberi *is a research scientist and* ***Christie Hughes*** *is a product manager at Luminex Corporation, Austin, TX; (512) 219-8020; flexmir@luminexcorp.com; www.luminexcorp.com.*

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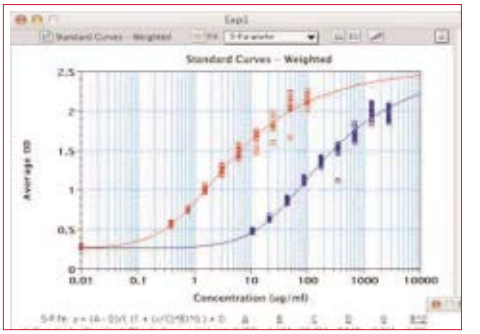


Environmental Monitoring Software

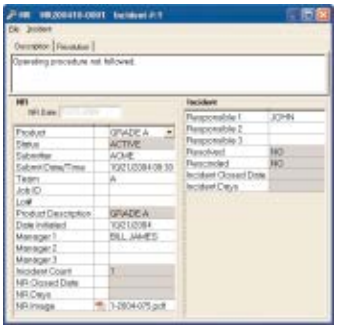
Already offering dissolution, stability management, product and batch management, and system interfacing, Darwin 2.0 adds environmental monitoring. These standard requirements of pharmaceutical companies are addressed by the software as standard functionality requiring minimum configuration. Environmental monitoring includes such functionality as test allocations for monitoring sampling points and frequency of collection.

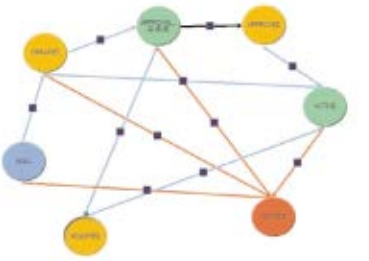
Thermo Fisher Scientific
www.thermofisher.com

Noncompliance Software

This LIMS tool is used to efficiently manage noncompliance records. It provides a method to focus on the root-cause and determine the reasons, circumstances, and responsible parties. The tool can store and view all related documents of a record and access and link data to other LIMS tools.

LabSoft LIMS
www.labsoftlims.com





Workflow Management System

LABWORKS™ LIMS 6.0 is designed for applications in the chemical, petrochemical, water and wastewater, agriculture, food and beverage and process control arenas, helping customers automate instrumentation, integrate laboratory processes, and provide sample information management and quality control from scheduling through analysis and reporting. It delivers a common architecture for both web and console/client applications.

PerkinElmer
www.perkinelmer.com

Maintenance Software

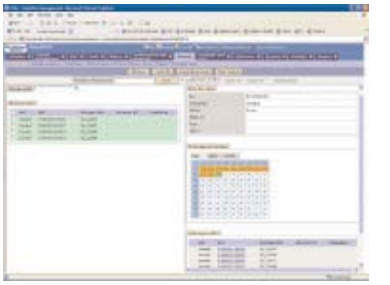
Continuous maintenance monitoring, capability, and chemical inventory tracking are a few of the features of TimeKeeper® America (TKA). This software program schedules, tracks, and documents several compliance and management actions. Several new features are planned and one free upgrade is offered with each purchase. Packages are available for one computer up through extensive networks.

TimeKeeper America
www.timekeeperamerica.com

Laboratory Item Locating Software

The Advanced Storage & Logistics Module for Sapphire (Sapphire ASL) provides complete location management and storage of any laboratory item, with electronic signature records for chain of custody and audit trails across multiple storage facilities. It also facilitates package shipping and receiving associated with each item providing accurate material handling within any organization.

LabVantage Solutions
www.labvantage.com



product news

CONSTANT TEMPERATURE CONTROL SYSTEMS

This system contains heating and refrigeration modules that maintain a stable temperature inside a glovebox, pass-through, or desiccator chamber. The complete system consists of a compressor/condenser and a heater housed inside 304 stainless steel and an evaporator cooler. The closed-loop refrigeration unit operates with CFC-free coolant.

Terra Universal
www.terrauniversal.com

pH KIT

The S2OU University pH Kit includes a S20 SevenEasy® pH meter, durable InLab® 404 pH electrode, and a flexible holder and stand. These pH meters are designed for daily use in all types of laboratory settings. The kit is available with a service package tailored to fit any laboratory's needs.

Mettler Toledo
www.mt.com

THERMAL CYCLER

This multigene gradient thermal cycle features several common protocols that come pre-programmed and can be customized. Up to 99 protocols can be stored in memory. Both a 96 x 0.2 mL and a 60 x 0.5 mL block version are currently available. Six Peltier units allow for enhanced temperature control and ramping rates of up to 3°/sec.

Labnet International
www.labnetlink.com

CONTROLLED ATMOSPHERE GLOVE BOXES

Precise™ controlled atmosphere glove boxes maintain a leak-tight, controlled condition environment for applications such as organometallic chemistry, alternative energy cells, or hydrophilic chemicals. The boxes can maintain low levels of oxygen or moisture. Features include a polyethylene shell with a chemical-resistant work surface, six manual valves, and inner and outer transfer chamber doors.

Labconco
www.labconco.com

GLUCOSE ANALYZER

The StatStrip™ glucose monitor is approved by the FDA for use in neonatal testing. The monitor accurately measures glucose and hematocrit on a single strip, automatically correcting for an abnormal hematocrit value. In addition to hematocrit, the monitor measures and corrects for interferences from acetaminophen, uric acid, ascorbic acid, maltose, galactose, xylose, and lactose.

Nova Biomedical
www.novabio.com

PURIFICATION KIT

This 3–in-1 purification kit enables scientists to isolate total RNA, genomic DNA, and proteins simultaneously from a single sample, without additional supplementary protocols or acetone precipitation of proteins. This kit is useful for the characterization of precious samples such as needle biopsies and cell line foci, as well as for pathogen detection.

Norgen Biotek
www.norgenbiotek.com

BUFFERS

In addition to regular testing, the Biotechnology Performance Certified (BPC) buffer line is qualified for molecular biology, cell culture, and electrophoresis. The BPC product line will eliminate the need to purchase multiple grades of the same buffer allowing for reduced experimental variability along with storage space savings.

Sigma-Aldrich
www.sigma-aldrich.com

WELL EXTRACTION PLATES

ILE well plates can extract small molecules directly from serum efficiently and reproducibly over a wide range of analyte concentrations. A portion of every well in the plates is coated with a layer of polymer which acts as the extracting solvent. These well plates do not require a vacuum or pressure system.

Wohleb Scientific
www.wohleb.com

CHIRAL COLUMNS

Employing Daicel immobilization technology on a chiral stationary phase, this CHIRALPAK®IC column exhibits stability, separation reproducibility, and durability when used in normal phase, reverse phase, and SFC modes. It was designed for screening, preparative chromatography, and method development. The columns are available in 250 x 4.6 mm and 150 x 4.6 mm sizes.

Chiral Technologies
www.chiraltech.com

LINT-FREE SWAB

The HUBY swab line was specifically designed to meet the needs of those working in critical environments. Each applicator in the line is designed for cleaning lint-sensitive components that require precise cleaning applicators. Featuring two highly absorbent cotton tips, the swabs come in a variety of head styles.

Puritan Medical Products
www.puritanmedproducts.com

DIGITAL CALIPERS

The Traceable® Digital Calipers make length/diameter measurements two ways —outside and inside. Digital display models measure to 6-inches (150 mm). At the touch of a button, units switch from inches to millimeters and a zero button instantly sets the unit to zero when jaws are at any position. They are made of strong-composite carbon fiber.

Control Company
www.control3.com

lab agenda

APRIL 14–18, 2007
AACR Annual Meeting 2007
American Association for Cancer Research
Los Angeles, CA
www.aacr.org

APRIL 15–19, 2007
13th Annual SBS Conference and Exhibition
The Society for Biomolecular Sciences
Montreal, Canada
www.sbsonline.org

APRIL 26-28, 2007
Business Practices Meeting
American Council of Independent Laboratories (ACIL)
Las Vegas, NV
www.acil.org

APRIL 28 — MAY 2, 2007
Experimental Biology 2007
Federation of American Societies for Experimental Biology (FASEB)
Washington, DC
www.faseb.org

MAY 16–17, 2007
IMACS 2007
International Meeting on Automated Compliance Systems
Princeton, NJ
www.imacs-world.com

MAY 21–25, 2007
ASM 107th General Meeting
American Society for Microbiology
Toronto, Canada
www.asm.org

JUNE 3–7, 2007
55th ASMS Conference on Mass Spectrometry
American Society for Mass Spectrometry
Indianapolis, IN
www.asms.org

JUNE 17–21, 2007
High Performance Liquid Chromotography (HPLC) 2007
Ghent, Belgium
www.hplc2007.org

JUNE 24–27, 2007
2007 AAPS National Biotechnology Conference
American Association of Pharmaceutical Scientists
San Diego, CA
www.aapspharmaceutica.com

JULY 15–19, 2007
AACC Annual Meeting & Clinical Lab Expo
American Association for Clinical Chemistry
San Diego, CA
www.aacc.org

AUGUST 6–9, 2007
IBC's Drug Discovery and Development of Innovative Therapeutics (DDT) World Congress
Boston, MA
www.drugdisc.com

AUGUST 19–23, 2007
ACS Meeting & Expo
American Chemical Society
Boston, MA
www.acs.org

SEPTEMBER 26–27, 2007
NIH Research Festival
Boston, MA
researchfestival.nih.gov

OCTOBER 25, 2007
Lab Manager Boot Camp
Lab Manager Magazine®
Waltham, MA
www.labmanagerbootcamp.com

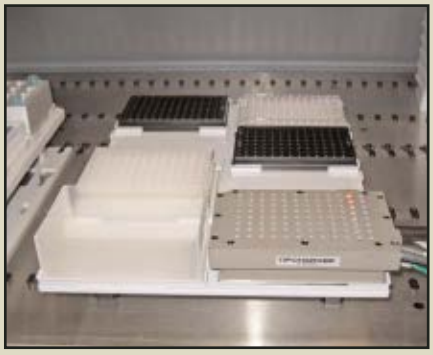
How it Works

Increasing the Efficiency of Automated Liquid Handlers

Problem: Most analytical methods used in the automated biopharmaceutical laboratory require at least one liquid transfer operation. Incomplete or inadequate washing of pipet tips introduces a risk of contamination and impedes assay productivity, especially if viable cells or intact organisms are involved. To avoid the risk of contamination, many labs use expensive disposable pipet tips, but the tip costs and associated logistical bottlenecks associated with tip delivery are onerous, especially for high-production labs. Alternatively, stainless tips are more cost effective, but exhaustive solvent-based washing procedures using organic or caustic materials merely dilute contaminants rather than truly clean. Most lab managers would choose to save both the direct and indirect costs of storing, using, and disposing hazardous solvents.

Solution: Automated pipet tips cleaned with the TipCharger™ System have contaminants removed at a molecular level. Solvents are no longer needed for stainless tips, and plastic tips can be reused without the fear of contamination and carryover.

The patented TipCharger System by Cerionx™ employs a dielectric barrier discharge "cold" plasma technology. TipCharger™ Cleaning Stations™ are provided in 8, 96, and 384-well plate densities and are easily integrated into most liquid handling platforms using standard SBS footprints. TipCharger is taught as either a device or consumable within the liquid handler software with appropriate X-, Y- and Z-offsets; often, TipCharger is taught as a conventional tip wash station. The TipCharger™ Controller Module™ manages the system operation; the component is placed on the floor, counter, or deck and is connected to the Cleaning Station as well as to a wall outlet.



TC-96™ installed on Tecan EVO® platform

TipCharger System Components including Controller Module and TC-8, TC-96 and TC-384 Cleaning Stations

Plasma generation is triggered by an optical sensor when tips are inserted into the Cleaning Station. You determine the length of a TipCharger cleaning cycle; generally, the dirtier the tips, the longer the cleaning cycle. Most cleaning cycles are between 10 and 30 seconds.

Plasma generates no solid or liquid waste. The by-products of the cleaning process (specific to the nature of the contaminants being cleaned) are effectively trapped first by the TipCharger's internal filtration system, and secondarily are vented through an external exhaust system, likely already in existence.

Customers report that substituting TipCharger cleaning for bleach "washes" produces substantial time savings, often allowing assays to be run in one-third the time, and permits greater productivity, e.g. a 2-3 fold increase in the number of samples analyzed. Because atmospheric plasma provides cleaning and sterilization by altering surface chemistries, the length of the cleaning cycle within the TipCharger Cleaning Station determines the lifespan of the pipet tip. Cerionx precision and accuracy data indicates that plastic tips can be cleaned up to and greater than 200 cycles, far in excess of the average expected life of plastic tips. And since plasma exposure does not affect surface chemistries on stainless steel, either metal cannulae or pins can, most likely, be exposed indefinitely.

For more information on the TipCharger System, visit www.cerionx.com.

You Stand in Front of Our Instruments All Day... We Stand Behind Them...24x7

High Value, Substantially Expanded Services from Applied Biosystems

With over 25 years of experience in the development, manufacture, and service of innovative instruments, and with over 1000 highly trained, dedicated service professionals, AB Global Services is uniquely qualified to deliver a full suite of real-world lab services. From Remote Services to On-Site Application Consulting to Qualification and Professional Services and everything in between, AB Global Services is your value-added partner to help boost your productivity and maximize the return on your technology investment.

- Instrument Repair and Maintenance
- Smart Services
- Qualification Services
- Professional Services
- On-Site Application Consulting
- Training

To learn more go to http://info.appliedbiosystems.com/abservices or contact your local Applied Biosystems sales representative.

Applied Biosystems

REPORT LAYS OUT ROADMAP FOR NUCLEAR RESEARCH EDUCATION

In a report titled, *Nuclear's Human Element*, the American Nuclear Society (ANS) outlines six specific recommendations to the United States Department of Energy (DOE) and congressional leaders that are critical to sustaining the faculty, students, and infrastructure needed to support a healthy U.S. nuclear education system and future workforce. Some of the recommendations include the following: to conduct a national nuclear workforce study, strengthen the future workforce, increase funding, and expand nuclear research programs. The report calls on lawmakers to support and fulfill the Energy Policy Act of 2005 and expand the reach of Nuclear Science and Engineering (NSE) programs. The complete report is available at <www.ans.org/pi/fine>.

NEW IEST WORKING GROUP MEETINGS AT ESTECH

Two new working groups will meet to develop Recommended Practices during ESTECH 2007, the Institute of Environmental Sciences and Technology (IEST). The new working group on Liquid-borne Particle Counting will focus on developing a new Recommended Practice (RP). The RP will cover topics such as types of LPC instruments, bubble issues, refractive index ratio effect, coincidence level, cumulative versus differential counts, lower detection limits, and particle extraction methods. The new working group titled HALT and HASS will discuss these test methods. Highly Accelerated Life Testing (HALT) and Highly Accelerated Stress Screening (HASS) uncover design defects and weaknesses in electronic and mechanical assemblies to help deliver better products to the marketplace. The conference will take place April 29-May 2, 2007 in Bloomingdale, Illinois.

THERMO FISHER SCIENTIFIC HONORED WITH AWARD FOR AUTOMATION SOLUTIONS

Thermo Fisher Scientific Inc. was honored with the 2006 Frost & Sullivan Product Line Strategy Award for its outstanding contribution to the European laboratory automation market. The award acknowledges the distinctive expertise of Thermo Fisher Scientific in advanced laboratory automation solutions. Commenting on the Award, Christopher McNary, vice president and general manager, laboratory automation solutions, said "We are delighted to receive this award recognizing our range of application-based solutions. Our in-depth expertise in diverse product areas means we can offer an enviable breadth of key technologies, innovative products and advanced software — all driven by customer requirements. Frost & Sullivan has also identified our emphasis on integration which is fundamental to successfully addressing our customers' needs."

AGILENT AND GROTON BIOSYSTEMS SIGN AGREEMENT FOR PAT SOLUTIONS

Agilent Technologies Inc. and Groton Biosystems LLC announced an agreement to co-market solutions for the Process Analytical Technology (PAT) Initiative for the pharmaceutical industry in the United States and Canada. The alliance is designed for biopharmaceutical customers who perform in-process and final product testing in a wide range of production segments and who are looking for online sampling with HPLC analysis for rapid quality-related decision-making. The agreement, expected to expand to Europe and Asia in the near future, brings together Agilent's HPLC systems with Groton Biosystems' online sampling products and services.

MILLIPORE'S BIOSCIENCE DIVISION ANNOUNCES AGREEMENT WITH JOHNSON & JOHNSON PHARMACEUTICAL R&D

Millipore Corporation announced an agreement with Johnson & Johnson Pharmaceutical Research & Development (J&JPRD), Division of Janssen Pharmaceutica N.V., for protein kinase screening using the Upstate® KinaseProfiler™, Millipore's radiometric service. Under the terms of this agreement, J&JPRD will supply potential protein kinase inhibitors for kinase selectivity profiling against Millipore's panel of 252 protein and lipid kinases.

ACTIVATED CARBON RESEARCH INSTITUTE

PACS is initiating the Activated Carbon Research Institute near Pittsburgh, PA. This institute is for activated carbon manufacturers and users to provide better performance and growth. The institute is open to all. All you need to do is send a few pages describing an activated carbon problem for solving. Problem solutions are paid for by the submitter or groups of interested parties.

NEW PATENT FOR STEM CELL INNOVATIONS

The development of human pluripotent stem cells, distinct from embryonic stem cells, is covered in a new U.S. patent. It is licensed to Stem Cell Innovations (SCI), which announced the patent stating that primordial germ (Pluricells) and ES cells are the only two known to be pluripotent and have the ability to become any of the 220 human cell types, including heart and neural cells. Pluricells are excluded from the Presidential ban on federally funded research of embryonic stem cells and can be used in any NIH-funded research facility.

Recently released: The Pocket Mentor Seven-Volume Library, Expert Solutions to Everyday Challenges. The Pocket Mentor Series offers immediate solutions to the common challenges managers face on the job every day. Each portable paperback guide contains handy tools, self-tests, and real-life examples to help you identify your strengths and weaknesses and hone critical skills.

From the Harvard Business School Press.

Recruiting for Competitive Advantage

An increasing body of knowledge tells us that companies that put people first finish first.

Organizational climate — including employee morale, engagement, and workplace culture — accounts, by some measures, for as much as 40 percent of corporate financial performance in any given year.

So it should come as no surprise that the shareholder value generated by companies included on various "Best Places To Work" lists far surpasses the stock price gains posted by their industry peers. Collectively, the returns generated by the large public companies recognized for embracing human capital best practices also outperform those created by the broader stock market, by a wide margin.

Today, the labor market pendulum has shifted, putting more bargaining leverage in the hands of active job seekers and those talented, gainfully employed but perhaps somewhat unfulfilled high performers who might be persuaded to consider a new career opportunity.

These market conditions are putting upward pressure on compensation and intensifying the competition to recruit the best and brightest. They should also move more organizations to assess individual and team performance with an eye toward making some much-needed investments in employee retention.

The truth is that, especially in our rapidly expanding global talent market, companies are pouring money into research and development and the human side of their enterprises to drive innovation, elevate the customer experience, and build a competitive market advantage for the long-term.

That means the long-term sustainability of an organization's business strategy and market differentiation hinge on effective recruitment, talent development, and retention. The problem for many companies is that they almost completely ignore the need for meaningful retention programs until the economy opens up more job opportunities and moves more people to switch jobs.

But don't just take my word for it, especially in my very first guest column for *Lab Manager Magazine*.

Consider the findings of some recent research by Hewitt Associates, a global human resources company, which found that the attraction and retention of pivotal employees plays a critical role in increasing shareholder value.

Hewitt analyzed human resources data from more than 1,000 large companies that employ a total 20 million employees — a microcosm of the U.S. labor market — to determine the financial impact of human capital programs.

The results showed that the flow of pivotal employees — defined as employees in the top quartile of their peers in pay progression — into and out of an organization is a strong predictor of changes in cash flow return on investment and shareholder value.

Hewitt captures this workforce advantage in the form of its "Talent Quotient" (TQ), which attempts to quantify the financial impact that pivotal employees make on an organization's business results. According to Hewitt's research, for the average Fortune 500 company, a 10-point increase in a company's TQ score adds approximately $70 to $160 million to its bottom line over the next few years.

The results of effective recruiting, talent management, and retention can be just as compelling for small companies, albeit on a much smaller scale.

"Human capital continues to be the single largest investment a company makes,

Joseph Daniel McCool

and now management can quantify the return on investment of its human capital and connect it to business results," says Mark Ubelhart, the leader of Hewitt's value-based management practice. "Companies need to make better, more informed decisions across the entire human capital spectrum…"

He adds: "Finally, organizations can prioritize human capital investments, such as compensation, training and benefits programs, because they can model the return on investment of shareholder value."

What It Means For Your Career: If your employer isn't recruiting smart people, offering you development programs and keeping your compensation competitive with the kinds of job opportunities you may have already seen out there, it may be time to make your next career move. Leading employers are beginning to hold managers accountable not only for keeping their own skills sharp but also for building high performing teams.

Bottom line: It's becoming a career imperative to keep an open mind and embrace lifelong professional learning and development. If your employer isn't constantly building the value of its human capital, you should consider how your skills and experience might just do that for another employer.

Joseph Daniel McCool *is a sought-after writer, speaker and independent consultant on talent management, executive recruiting best practices, and corporate leadership succession. He is currently writing a book about the global executive search consulting business and its impact on corporate performance, culture and profits. He is the former editor of Kennedy's Executive Recruiter News and Recruiting Trends, and his perspectives on recruiting best practices have been cited in BusinessWeek, The Economist, The Financial Times, The Wall Street Journal, and other media around the world. Contact him at jdmccool@comcast.net.*

The Proper Way to be Cool

Lab managers, as well as all those involved in the acquisition of equipment and supplies, are faced with many constraints and dilemmas. No matter what market you're in — academia, clinical, biotechnology, pharmaceutical, etc. — you often find yourself asking the questions, "How much should I spend on a specific item? Should the cost or quality of one item or product take precedence over another?"

This is often the case when it comes to refrigeration. In my travels both domestically and internationally, I see the same problem over and over again. The common comment is, "I spent x dollars on a new widget for my lab (for my research, for my hospital, or for my building), so I'm now looking for the least expensive refrigerator I can buy." Or, "My budget is almost used up so I need to buy the least expensive refrigerator I can."

The answer has often been to consider purchasing an inexpensive or household refrigerator. However, household refrigerators are not suitable for most lab uses.

When you consider that your years of research, your chemicals, or vaccines are being stored in it, why would you gamble with their safety? Why would you purchase a household unit meant to only store food? Or a unit that isn't designed or manufactured to be built-in, thereby taking a chance for it to fail or cause a fire?

I personally know of facilities losing their flu vaccines at the height of the recent flu epidemic scare. They stored the vaccine in two new, household refrigerators that were not designed to accurately hold temperature. When they looked at the warranty after the failure, it stated "for storage of food only." I know of a few laboratories that had fires when units were built-in and overheated, causing their power cords to melt and short with the sparks igniting casework. Ignoring the limitations or choosing the wrong refrigeration equipment can be costly.

Would you purchase reagents without a Certificate of Analysis (COA)? Would you use outdated or wrong materials in your work? You should choose a refrigerator the same way you would select a more specialized or sophisticated piece of equipment. Quality and applicability are still important even when in regards to a seemingly ordinary item like a refrigerator.

The lack of concern or education on what is needed for GLP or safety versus what you use in your home is surprising, and needs to be seriously considered. A commercial rating versus a household rating is dramatically different and needs to be part of your purchasing decision-making process.

THE DIFFERENCE IS IN THE UL, ETL, OR NSF RATING

Due to constant vigorous use and the potentially enormous cost of a unit failure or fire in a hospital, laboratory, or similar facility, commercially rated products are constructed to meet higher fire safety standards and are more durable.

When a refrigerator or freezer purchase is made based on price, without consideration for quality, reliability, suitability for application, or consequences of liability, often the choice is a household product. It is important to note that most household products are not commercially rated nor are they designed, manufactured, or warranted for laboratory use.

Here are a few of the key differences between a household-rated and commercially rated listing for refrigerators, freezers, and ice machines:

HOUSEHOLD RATED

- Warranted for household use; commercial use voids warranty
- Only a single layer of insulation must surround power conductors in the power cord
- Bottom of mechanical compartment may be open to the floor and surrounding combustible materials; back and sides may be open or covered by non-metallic material

COMMERCIAL RATED

- Warranted for commercial use

Steven H. Moss

Differences in Performance and Warranty between Commercial Refrigerators and Household Refrigerators

Household Refrigerators	Commercial Refrigerators
1. Due to energy efficiency requirements, household refrigerators often use a smaller compressor and have a longer pull-down time, with the result that contents can be compromised	1. At times, large BTU compressors to ensure a faster temperature pull-down time afte refrigerator is loaded
2. Slower recovery time after door openings; contents may be compromised	2.Faster recovery time after door openings; especially important when door openings are frequent in lab use
3. Any use other than household voids the warranty. A typical warranty states: "Warranty coverage applies only to refrigerators which are used for storage of food for private household purposes."	3.Warranty covers laboratory, commercial industrial, hospital, institutional, and scientific applications
4 .Fan motors and other components are not as durable and might wear out in just a few years	4 Fan motors and other parts are commercial in performance. stringent hospital-use standards
5. Household plug is standard for household use only	5. Plug is hospital grade, constructed to pass
6. Often there are no front breathing vents that could cause overheating.	6. Front breathing vents
7. Stainless steel typically not available except in very expensive, high-end household products	7. Stainless steel

- Two complete layers or better insulation materials and forming of insulation material surrounding power conductors in the power cord to provide added protection against electrical shorts
- Bottom, back, and sides of mechanical compartment are usually enclosed in steel to prevent any electrical spark from reaching combustible materials surrounding the unit

In addition, there are real differences in performance and warranty between commercial refrigerators and household refrigerators (see Chart).

In addition to all of this, most small, compact household refrigerators that are not designed to be built in have coils on the back that must have sufficient ventilation in order to perform adequately. If the refrigerator is built in undercounter, there is the possibility that it will overheat and cause an electrical short or, worse, a fire. Commercially listed refrigerators are front vented and usually do not have any coils on the back or different coils so they can be built in undercounter without loss of performance, fear of fire, or sacrifice of design.

Taking the time to evaluate the consequences of equipment failure makes commercial refrigerators a wiser choice for lab use.

Steven H. Moss *has over twenty years of constant temperature equipment sales experience having worked for a number of key manufacturers in the scientific, clinical, medical, and laboratory industries. He can be contacted at 25302 Dartmouth Lane, Dana Point, CA 92629; 949-443-1535.*

Are you ready to give that presentation?

Shore up your confidence and polish your content and delivery by using the simple oral presentation checklist at <www.mftrou.com/oral-presentation-checklist.html>. Lyndsay Swinton's website "Management for the Rest of Us" offers the checklist on preparing to give a talk as well as a companion rubric to grade a presentation.

Glenn Ketcham, CIH and Vince McLeod, CIH

Planning Chemical Management for the New Laboratory

In our day jobs, we Safety Guys have dealt with start-up issues in hundreds of new laboratories as construction is completed, new research buildings open and the labs come on line. We have also wrestled with lab close-outs and new investigators moving to our facility. Common critical issues in these situations are ensuring that proper organization, storage, and segregation are provided for the chemicals that will be used and kept in the lab. So this issue's column will provide fundamental information on managing chemicals in research facilities and offer initial suggestions and guidance for proper chemical handling.

There are literally thousands of chemicals available and new ones being developed every day. In order to plan chemical storage for your lab, it is ideal to begin with a chemical inventory or at least a list of substances anticipated to be used based on the focus of the research. Your job is much easier with the chemical inventory in hand listing the items and quantities that will be used and stored. Without an inventory or when setting up a general purpose lab, you will have to plan storage areas for each major chemical class. (More on these chemical classes later.) Given the sheer number of chemicals available, even with a good inventory you will probably want a few reference sources on chemicals and their properties. So, let's get started.

CHEMICAL INFORMATION SOURCES AND REFERENCES

Since 1991, federal law has required every laboratory where hazardous chemicals are used to have a written Chemical Hygiene Plan (CHP). The CHP includes the chemical inventory and standard operating procedures for protecting personnel from the health hazards associated with the chemicals present in the lab. If you are lucky enough to have a CHP, for instance when an existing lab is moving into new space, you have a jumpstart on planning the chemical handling requirements. Without one, for example when setting up a new research lab, you will need to do more homework. After checking for a CHP or chemical inventory, the next task is to collect the material safety data sheets (MSDS) from the vendors or chemical manufacturers. In order to fill the inevitable gaps in the MSDS, we suggest you combine these MSDS with a good chemical dictionary or two, such as the Merck Index[1] or Sax's.[2] You will also want to secure a few quality chemical references such as the NIOSH Pocket Guide for Hazardous Chemicals,[3] the DOT Emergency Response Guide,[4] or similar compilations.

Material safety data sheets, chemical dictionaries, and references like the Pocket Guide, provide essential information on specific chemical substances. Included are data on the physical, chemical, and toxicological properties of the substance along with concise information on handling, storage, and disposal. In addition, most of the references mentioned will outline emergency and first aid procedures as well. One other reference that we highly recommend is the National Research Council's Prudent Practices in the Laboratory: Handling and disposal of chemicals.[5] This book contains invaluable information on many topics including planning of experiments, evaluating hazards, and assessing risks and disposal of wastes. It also introduces the concept of laboratory chemical safety summaries and contains LCSS (Lab Chemical Safety Summary) for 88 commonly encountered chemical substances.

GENERAL CHEMICAL MANAGEMENT INVENTORY AND LABELING

Prudent management of any laboratory using dangerous substances begins with a chemical inventory. If you are opening a new research facility and prior to setting up any new lab where hazardous chemi-

cals will be used, we recommend you definitely consider how chemicals for that location are going to be managed and tracked. Establish written procedures for acquiring chemicals and developing the inventory and ensure that laboratory occupants understand and adhere to them. Keep in mind that in many jurisdictions, fire codes and local ordinances may establish maximum limits for both the total quantities and container sizes allowed for the various classes of chemicals. (More information on this will be provided in part two of this series.)

Chemical inventories can range from simple, such as listing each container on an index card, to sophisticated, robust, dedicated computer systems. Some advanced systems make use of product barcodes (or allow users to affix their own), thus speeding up data entry and eliminating entry errors. Most laboratories use a computer-based system that provides many advantages. One is being able to incorporate a tracking system by regular updating of quantities and location of chemicals. This promotes economical and efficient use by sharing chemicals held by different research groups or labs. Accurate inventories are also essential to emergency responders.

Regardless of the type of inventory implemented, here are a few recommended guides to follow. We feel in general each record in the database should correspond to a single container and not merely the chemical itself. Information fields for each record should contain at a minimum:

- Chemical name
- Chemical Abstract Service (CAS) registry number
- Size of container
- Date of receipt
- Storage location

OPTIONAL FIELDS RECOMMENDED:

- Molecular formula
- Hazard classification
- Owner's name
- Expiration date

The CAS number is important for making certain identification in light of different naming conventions and numerous pseudonyms. Received dates and expiration dates ensure that unstable chemicals are not kept beyond their useful life.

In order to maximize benefits of a inventory system, you must institute a diligent labeling program. Most commercially packaged chemical containers will have adequate labels, including hazard information. However, we recommend you supplement even commercial labels with date received, principle investigator's or researcher's name, and storage location at a minimum. Also, ensure that any older containers that might be relocated are updated to meet current requirements. And keep an eye out for chemicals that are transferred or repackaged into secondary containers, making sure they are marked with all essential information as the original.

Organizing and handling chemicals for a busy research laboratory is a daunting task. Here we have given you three important first steps — collect your MSDS and references; develop your inventory system; institute a labeling program — to get you started down the right path to safe operation. In future articles, we will look at general storage considerations, specific chemical hazards and properties, and segregation and compatibility issues. So watch for coming Safety Guys; you won't want to miss these informative columns.

GENERAL STORAGE CONSIDERATIONS

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The Safety Guys welcome your comments and questions. You can email them at thesafetyguys@labmanager.com.

Managers Can Make and Un-make Cynical Employees

Poor managers create cynical employees, says Dr. John Wanous, professor of management and human resources at Ohio State University. Many managers dismiss employee cynicism about company policies as the griping of a few "bad apples" — employees with bad attitudes who complain no matter what. However, an Ohio State University study indicated the most important issue in causing employee cynicism was the perceived effectiveness of supervisors.

According to Wanous, three types of workplace experiences can make employees cynical: many workplace changes that employees perceive as unsuccessful the leadership style of one's immediate manager or supervisor the degree to which employees have input into workplace decisions.

Before looking at what we, as managers, can do to combat employee cynicism, let's look at employee cynicism in more detail.

CAUSES OF CYNICISM

Wanous said that most managers believed "a rotten core of employees with bad attitudes caused employee cynicism. But that's not what we found. It wasn't bad apples that caused problems at the company — the problem was that management spoiled the fruit."

"Employees learn to be cynical when organizations continually fail to succeed at planned changes, or if they don't publicize their success at change," said Wanous. "If there is a history of failed initiatives, employees may become so cynical that future attempts are essentially doomed to failure," said study co-author Arnon Reichers, associate professor of management and human resources at Ohio State. "Cynicism about organizational change becomes its own self-fulfilling prophecy."

Highly cynical salaried employees were much less likely than others to think they would be paid more if they performed well. "This shows how cynicism can poison a company," Wanous said. "Our questions measuring cynicism had nothing to do with compensation, yet highly cynical employees still saw a connection. Cynicism spills over and colors how employees see everything about the company and their jobs." Highly cynical employees were more likely to file grievances against the company, showed lower levels of commitment, and were less likely to believe management would reward good work.

REDUCING EMPLOYEE CYNICISM

How can we, as managers, avoid being part of the problem and become part of the solution? Managers need to be honest and open to their employees about their successes and failures, the Ohio State researchers recommended. "When plans fail, management needs to give credible and verifiable reasons for the failure to employees," Wanous said. "If management made a mistake, then say so."

Wanous said managers can reduce employee cynicism by clearly publicizing successful changes in their company or department. "Sometimes managers may be embarrassed because the improvements seem slow in coming or relatively minor. But if you say nothing, employees are only going to assume that nothing has changed, or that things have actually gotten worse," he commented. This is when one principle of project management, using milestones to determine progress in meeting goals, can be useful. Don't wait for achievement of the final goal. Rewarding attainment of milestones with praise to the appropriate people and an appropriate celebration can be highly motivating and reduce cynicism.

There is hope for even the most cynical of employees to become more satisfied with the workplace. During the Ohio State study, cynical employees expressed some willingness to make attempts for positive change in the workplace, Reichers said. "They're still willing on an individual level to make changes on things they can control." This suggests that the constructive manager who tries to make things in his/her department better despite the strictures of the overall corporate policies can improve workplace morale. Perhaps the single most important thing these managers can do is to recognize individual accomplishments work team members.

Employee empowerment, giving them input into decisions affecting their jobs and, when possible, letting them make these decisions themselves can increase their sense of control in a rapidly changing workplace that often seems out of control. This can increase productivity while decreas-

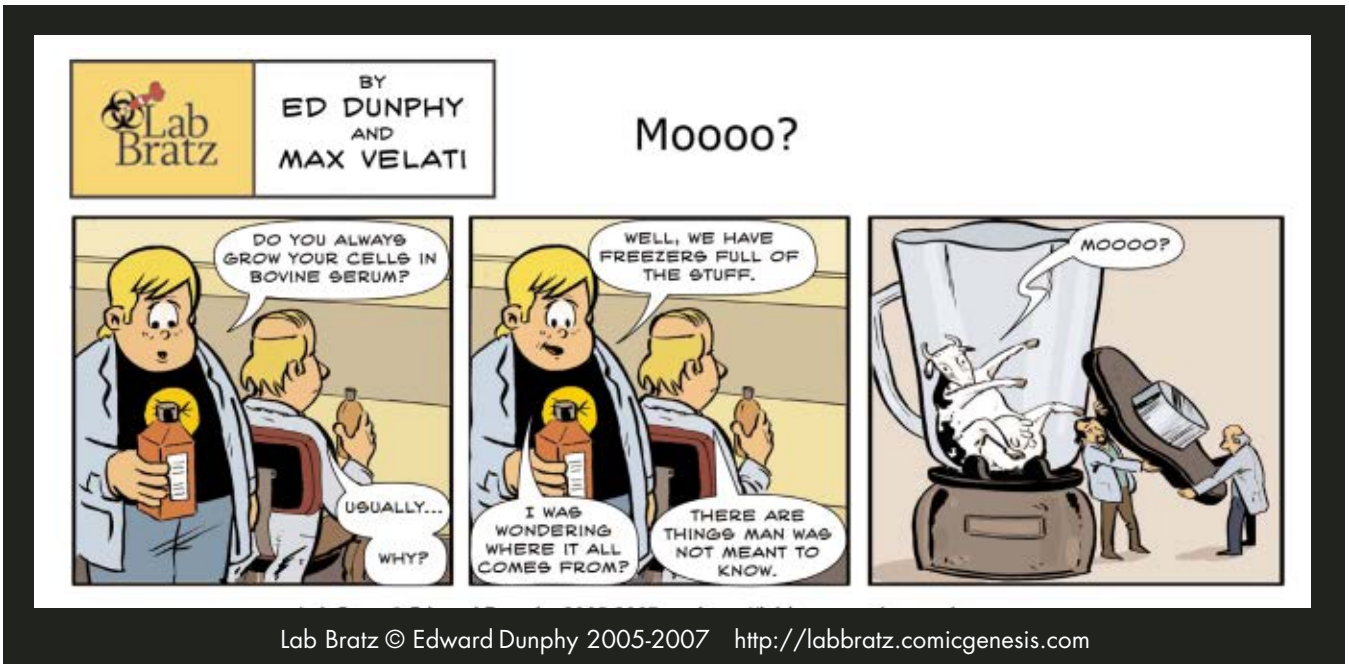
John K. Borchardt

ing cynicism.

When a company's stated values clash with its actions, employees grow cynical and angry. Idealistic pronouncements raise employee aspirations and then create a bigger drop in productivity and morale when actions clash with stated values. Such clashes can permanently damage workplace relationships and even prompt people to change jobs.

Company values should provide guidelines for decision-making. Firms should maintain these values in all operations if they are to be a true part of the corporate culture. Only then will the reduced productivity and low morale caused by cynical employees dissipate. As individual managers we should make decisions that are consistent with corporate values. Managers' adherence to values on a day-by-day basis is essential to make them a true part of corporate culture.

Dr. Borchardt *is a consultant and technical writer. The author of the book "Career Management for Scientists and Engineers," he writes often on career-related subjects. He can be reached at jkborchardt@hotmail.com.*



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