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SWITCHING GEARS

In this issue we bid farewell to our "Time to Upgrade?" column as we make way for a new monthly feature starting with our January/February 2014 issue. We hope "Time to Upgrade?" has helped you with your decisions on whether or not to upgrade your instruments! In the New Year, *Lab Manager* will introduce "Maintenance Matters," a new monthly feature that will focus on the requirements for keeping your current lab instruments running at peak performance. Each issue will cover a different piece of equipment, providing maintenance tips, common maintenance mistakes to avoid, and what you should know about vendors' service and maintenance programs.

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Making the Most of Social Media

We first discussed the impact of social media on the sciences in April, 2011. Then, 100 percent of lab managers admitted to never having used flickr and over 80 percent hadn't opened a Facebook account. Revisiting the topic in September 2012, we said that getting a grip on social media remained a challenge. "Untamed and unpredictable, it rolls like a cyber tsunami, sweeping and reordering the communication landscape." This month we return to the topic again and, wow, what a difference 15 months can make.

According to author Key Kidder, the days of wariness are long past, and the scientific community's acceptance of social media can best be attributed to "restive stakeholders, a tight money climate, and a tired public image." But, despite the genie being thoroughly out of the bottle, lab professionals are advised to proceed carefully. "Every lab should have an explicit, formal social media policy," says research communication consultant Dennis Meredith, adding, "My fear is that PIs and senior lab members who haven't grown up with social media like their younger colleagues are unaware of all the risks."

Each month our Perspective On articles look at how research-specific labs run their businesses. This issue we explore *three* different types of labs. In Perspective On: A Food and Beverage Lab we meet Eric Collop, lab manager at Lifeline Foods, whose lab tests roughly 2,000 samples each month for moisture, fats, and granulation. Collop and his staff work 12-hour rotating shifts to provide 24/7 coverage to the facility. Turn to page 62 for more.

In Ask the Expert (page 44), Philip Schwartz, PhD, explains what's needed to manage a stem cell lab. When asked about automating his processes, Schwartz said that, while his own lab was not currently automated, "there is a big initiative in California to provide 3,000 stem cell lines over three years. This is a tall order and is going to require robotics and automation."

Similarly, in this month's INSIGHTS on Streamlining a Microbiology Lab (page 78), author Angelo DePalma also discusses the role of automation in such labs, saying, "Many companies view automation simply through the lens of throughput. Few would argue that processing an additional two or three plates per day justifies the purchase of expensive robotic systems, while almost everyone agrees that automation can save time and money for labs that process 200 plates per day."

Relevant to all three of these labs is the application of Lean design, discussed in this month's Lab Design & Furnishings article on page 30. "Careful adaptation of [Lean design] techniques based on a thorough understanding of laboratory processes will deliver significant benefits in terms of productivity or speed or both," say the authors.

No matter what kind of lab you run or work in, much can be gained from the shared experiences of others in your field.

And speaking of fields, wouldn't it be nice if all professional interactions were conducted on a fair and level playing field in which the most capable players win? Unfortunately, that's not how the world works. Enter: politics. Unpleasant as that reality might be, it is best to acknowledge the power of institutional politics and figure out how to make it work to your advantage. Turn to this month's Leadership & Staffing article, "Political Science," (page 24) to learn how.

Here's wishing you a safe, joyful, and healthy holiday season.

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SOCIAL MEDIA

THE GENIE IS OUT OF THE BOTTLE

LABS AND RESEARCHERS NEED TO FOLLOW A STRATEGIC AND CAUTIOUS COURSE OF ACTION by F. Key Kidder

"All sound and fury signifying nothing" pretty much sums up the scientific establishment's take on Twitter, Facebook, and company at the dawning of social media. Given researchers' reputation as a media-averse, socially restrained crowd, social media seemed the worst of all worlds.

From their ivory research towers and scientific sanctuaries, they watched as social media technologies inundated society at large, assured that the tide would never breach their labs, much less amount to something salutary.

Senior scientists already established in their careers were particularly dismissive. Having succeeded without social media, their admonition to up-and-coming researchers was along the lines of "I don't need this, and neither do you."

> "Social media, an extemporaneous free-for-all where Everyman was king, embodied the very antithesis of the scientific method."

If the benefits were sketchy, the risks were not. Social media, an extemporaneous free-for-all where Everyman was king, embodied the very antithesis of the scientific method. Social technologies, prized for their speed and immediacy, flew in the face of deliberated scientific consensus. Researchers marshaled facts to arrive at and promulgate truths. Social media, where many users shoot from the lip, is rife with rumor and opinion and a repository for lowbrow comment.

The tipping point occurred rather recently, at a time when the scientific community was besieged by restive stakeholders, a tight money climate, and a tired public image. The elephant in the room was pinpointed. For decades, scientists had employed the deficit communications model to educate outside publics, tantamount to a forced feeding of unappetizing factoids. It was a far cry from a two-way dialogue, the kind of genuine engagement that draws outsiders into the scientific fold. Social media was at the ready, in the right place at the right time.

It is way too late to put the genie back in the bottle. Scientists now use social media for a broad array of research activities, a narrower range of business functions, and expanding exchanges with government agencies, including aspects of two paramount scientific concerns—funding and regulatory compliance. Twitter, Facebook, LinkedIn, and YouTube constitute social media's workhorses, but scientists choose from a thundering herd of other platforms and channels.

"To put it in 140 characters or less," intones the measured voice of the *New York Times*, "science and social media found each other in 2012."

For the uninitiated, 140 characters is the maximum load for a Twitter transmission. Of the approximately 1.8 million apps in the Apple and Android marketplace, Twitter is the app of choice for many, unsurpassed for in-the-moment conversations, networking, and building

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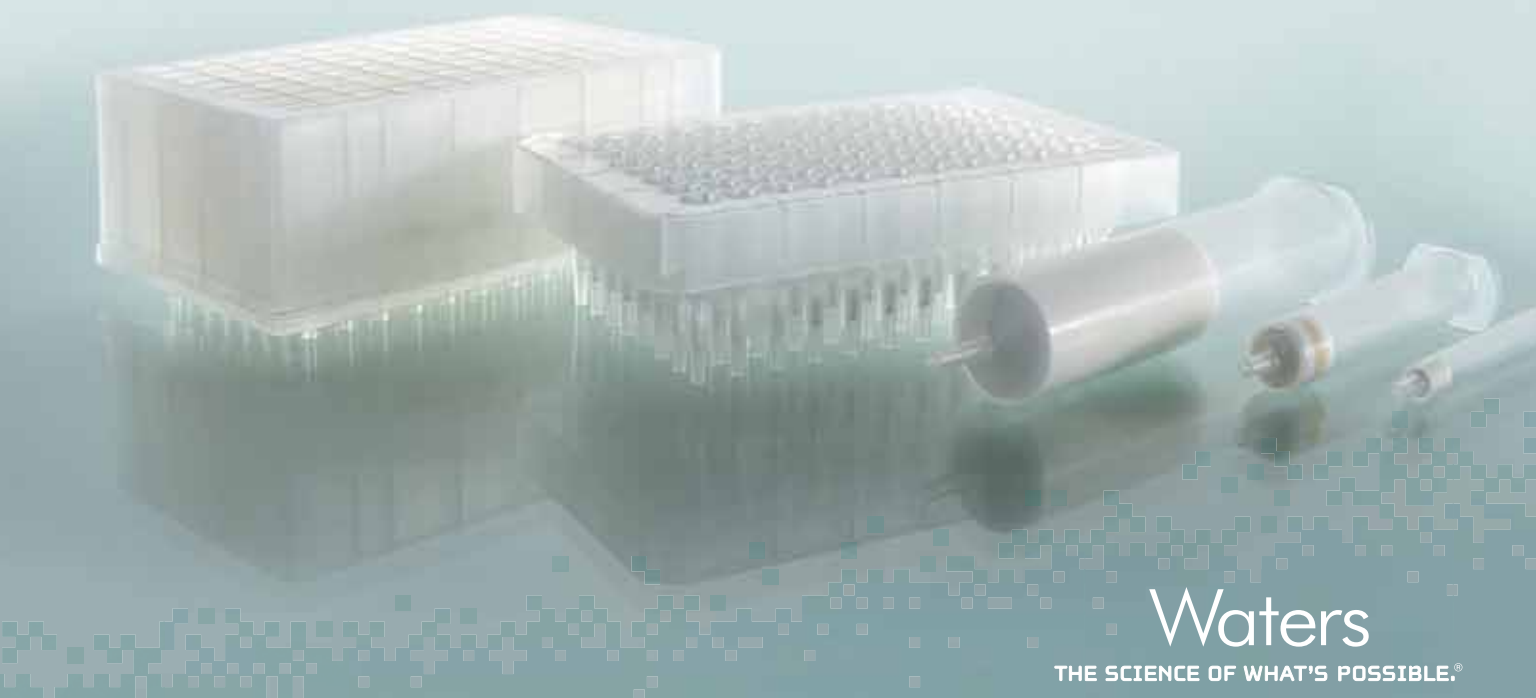

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communities. Twitter boosts credentials and careers—one study found that highly tweeted journal articles were 11 times more likely to be cited than articles without strong social media mentions.

A rising tide lifts all ships. Social media is fundamentally all about more conversations between more dispersed, diverse participants. As these conversations leave the lab to meander through rivulets or enter a mainstream, they encourage more active involvement of scientists and stakeholders in the greater scientific enterprise. In this context, social media's overarching value is as a communication facilitator serving global labs and scientific colleagues—the new connective tissue.

"Scientists now use social media for a broad array of research activities, a narrower range of business functions, and expanding exchanges with government agencies."

As a research tool, social media is nothing short of "revolutionary," says molecular biologist Jamie Vernon, a policy fellow at the American Association for the Advancement of Science. Channels such as Facebook, Storify, and Tumblr that allow users to share video, photo, and written content promote interpersonal "sharing and experiencing emotions" and provide "subtle cues" that build relationships and effective collaborations with distant colleagues. Vernon recalls walking a young scientist some 1,500 miles away through a polymerase chain reaction technique using YouTube and methodology links.

Blogs and discussion forums are favored for thoughtful consideration of niche topics by online communities and are also increasingly used to post manuscripts for peer review. Twitter has become an information filter for many in the scientific community, and is a means for journalists to stay abreast of developments. More scientists favor Facebook for research/interest groups, says Vernon, adding that Google+ "may be better at communicating the creation" of these specialty circles.

Digitize then monetize is the thinking of venture capital firms and individual investors, including Bill Gates, who fund mega social scientific sites that may change the research method. ResearchGate—2.8 million members strong from over 130 nations—is a professional social network where scientists connect and share their work, a cross-cultural virtual lab and library with 15,000 job listings thrown in. Academia.edu is a digital social networking site designed for scholars; competitors include Mendeley and Zotero. All intend to accelerate progress and enhance collaboration.

"Social media has multiple (user communities) developing at different rates," adds Vernon. Many scientists already capitalize on its communication potencies. Another subset "pushes the concept of open science," going online with their notebooks to receive constructive feedback, which is how Vernon envisions "science will be done in the future." A third, smaller subset uses social media to "demonstrate a public value" of their research."

As a business proposition, social media has promise for just about everyone, evidencing unrivaled capability as a marketing tool. For researchers, self-marketing is a giant step forward, a break with the old orthodoxy that the intellectual challenge of performing good science was reward enough. "Science is a battlefield of ideas and brands," declares Marc Kuchner, author of *Marketing for Scientists*. In the Internet era, marketing is "based on genuine two-way conversations and community building," something social media does with the best of them.

As a practical matter, getting a résumé before the right eyeballs remains the first step in the hiring process. Enter LinkedIn, the preferred résumé-posting site for serious scientists, a channel Vernon describes as "the minimum time commitment" for scientists to navigate the social media universe and "a great professional networking tool."

As the new marketing mix shifts toward a more consumer-oriented focus where communications is key, life science and pharmaceutical firms have seized on social media for sales and marketing outreach that builds brand awareness and engages prospects, and for customer support that monitors and responds to mentions. Besides its utility as a human resource tool, social media is also used to gather business intelligence on competing brands, monitor changing perceptions, and conduct public relations, such as responding to negatives and falsehoods. Social media, says one observer,

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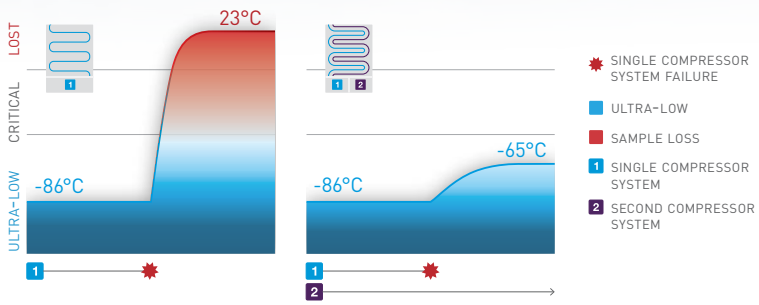

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While non-digital sales and marketing expenditures flatten and decline, social media is stepping up. A survey of the users in the biotech sector identified primary challenges that most can identify with—generating and capturing prospects, engaging thought leaders, and achieving ROI.

"Science and social media found each other in 2012."

A reluctance to institute an aggressive social media program can stem from fears of unintended consequences. By creating a dialogue with an audience, the sponsoring entity opens itself up to receiving reports of adverse events of interest to federal agencies, disclosing proprietary information, or transmitting inconsistent messages. Smart labs proceed with caution, says research communication consultant Dennis Meredith.

In the rush to capitalize on social media, organizations that post in haste repeat the mistakes of the dot.com frenzy. "Every lab should have an explicit, formal social media policy," he says. "My fear is that PIs and senior lab members who haven't grown up with social media like their younger colleagues are unaware of all the risks." Meredith urges labs to designate a social media strategist, "not a cheerleader, but someone who understands the lab mission and how these channels can be used for internal and external communications."

Vendors strive to make inroads into labs via mobile marketing. In a recent membership study by The Science Advisory Board, roughly 25 percent of industrial and academic scientists were "highly interested" in digital applications that accessed supplier promotions

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like coupons, although a greater percentage expressed no interest. More than one-third was "somewhat interested." The study found that North American and European scientists are less enamored of social media than their counterparts in other regions of the world, where users spend about one hour a day using mobile apps, compared to about 44 minutes in the U.S.

In an earlier study, The Science Advisory Board found that a majority of scientists admit that social media does influence their purchasing decisions, but remain less likely to employ it during the purchasing process.

"Self-marketing is a giant step forward, a break with the old orthodoxy that the intellectual challenge of performing good science was reward enough."

The public sector is jumping in too. In dispensing grant money, the National Science Foundation requires scientists to demonstrate "broader impacts" by engaging the public to experience the value of their research, an obligation social media frequently helps fulfill. According to a white paper from the National Archives and Records Administration (NARA), 70 percent of federal agencies use social technologies for public outreach purposes, further validating the fact that social media channels are transitioning toward conducting social business. But best practices remain a work in progress, says NARA. As America's archival agency with the oversight of government documents and records, NARA anticipates "a great deal of change in the social media landscape…as technologies converge" even as agencies already clamor for guidance.

The use of social channels "may create federal records that must be captured and managed in compliance with federal records management laws, policies, and regulations," declares NARA, which hedges on platform-specific guidance.

Federal agencies have plenty to say about critical global challenges. Although scientists from the National Aeronautics and Space Administration, the Environmental Protection Agency, the Food and Drug Administration (FDA), and the National Oceanic and Atmospheric Administration could certainly inform a debate, many are constrained from jumping into social media "by agency policies and a culture of timidity," says Michael Halpern, program manager at the Union of Concerned Scientists/Center for Science and Democracy.

For every step backward—the Occupational Safety and Health Administration (OSHA) decided to cancel its Twitter account—Halpern applauds agencies that boldly embrace social media. "The Centers for Disease Control (CDC) used zombies to highlight the importance of disaster preparedness in a viral novella," Halpern says. The National Institutes of Health (NIH) uses social media to recruit clinical study participants. "It's easy to find scientists with significant Twitter followers," but challenging to locate government scientists who "list their agency affiliation and tweet freely," he adds.

The NIH received the highest grade in the CDC's report card on agency social media policies. The U.S. Department of Agriculture and OSHA scored lowest. Other agencies—the Nuclear Regulatory Commission, NSF, CDC and the FDA—have no policy and "ignore the world of social media at their own risk," says Halpern.

In September, the FDA announced that it had retained IB5k, a firm specializing in social media solutions, to provide "comprehensive coverage" of the agency's digital offerings. The FDA aspires to "communicate more effectively and provide timely content," and hopes that this informed scrutiny of its social media practices eventually will improve its traction on Twitter and Facebook. With 71,000 Facebook "likes" and 35,000 Twitter followers, the FDA stands in the shadow of NASA's nearly 5 million Twitter followers.

The biggest rap on social media—that it encourages unproductive socializing at the expense of research,

especially in academia, where the stigma is strongest—doesn't fly with Vernon, who maintains that "distraction is more of a personality trait, not inherent to social media." Gretchen Goldman, a public policy analyst at the Union of Concerned Scientists, is hard-pressed to find negatives. Social media activity during Hurricane Sandy provided scientists with timely updates, even if it "possibly promoted people putting themselves in harm's way to get the best photo."

"Every lab should have an explicit, formal social media policy."

As is typically the case with booming technologies, usage has outstripped efforts to manage and measure social media platforms in play. Some commentators decry the absence of hard data; alarmed scientists are proceeding without it. Dietram Scheufele, the John E. Ross Professor in Science Communication at the University of Wisconsin-Madison, helped spearhead the campaign to upend the discredited deficit communications model. Social media "is a whole new world," he says, "and we know very little about it empirically."

F. Key Kidder *left journalism to pursue a career in government relations, politics, and PR, but he still likes to keep his hand in writing. He can be reached at k2@keykidder.com or by phone at 410-963-4426.*

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KNOWING STANDARD CONTRACT LANGUAGE IS CRUCIAL IN SECURING FAVORABLE TERMS AND CONDITIONS

by Jennifer Daugherty

Given the current state of the economy, laboratories have had to significantly change their equipment purchasing practices. Lab managers are running their labs more like businesses and are therefore tasked with greater financial and purchasing responsibilities. Controlling costs and buying wisely have become common practice throughout most labs across the country. In a typical situation, the lab manager enters into a service agreement with the original equipment manufacturer (OEM) at the time new laboratory equipment is purchased. It's standard practice and has been done this way for years. Other labs, particularly clinical research/hospital, university/college, or government funded, may require bids solicited from multiple suppliers for the purchase of equipment, and oftentimes a service contract will be included as part of the solicitation. In either instance, a detailed purchase process is necessary in order to ensure that the lab's equipment needs are fulfilled.

> "Controlling costs and buying wisely have become common practice throughout most labs."

Securing the appropriate levels of maintenance coverage is just as important as purchasing the right equipment in the first place. It's essential to determine the level of service that is required for each piece of equipment. One size does not fit all when it comes to maintaining various types of laboratory equipment. You will most likely be in a better position to determine what type of service plan is needed for your new equipment after you have owned it for a period of time. Unfortunately, most lab managers may feel pressured to buy the OEM's service agreement at the same time the equipment is purchased. It's important to remember that once a service contract is signed, it's a legally binding document. So, due diligence is crucial! Knowing standard contract language will help you negotiate favorable terms and conditions during the equipment purchase process.

Below are five key areas of the OEM service contract that require special attention when you are considering the purchase of new laboratory equipment and the corresponding maintenance agreement.

1. The Manufacturer's Warranty

Know the length of the manufacturer's warranty, because it varies with equipment types. It is very important for the lab manager to know exactly when the warranty expires and what conditions may void coverage. Federal law requires that warranties be available for the consumer to read before the purchase of a product. If the equipment has a lengthy warranty, a service contract may not be necessary until the warranty expires. On a similar note, if the warranty is short-lived, it may be possible to negotiate an extended warranty.

2. Effective and Expiration Dates

Different terminology with the same meaning may be used, such as contract coverage term, agreement term, service start date/end date, service plan from/to, and contract duration. Before signing any contract, it's important to fully understand when the service contract begins and when it ends. It is not unusual to see long-term contracts with five- or ten-year terms. It's in the best interest of the service provider to keep lab managers under a service contract for as long as possible because

this is their most profitable revenue stream. It is also important to mention again that the service contract is legally binding upon signature. Here, the contract duration can be negotiated to what will work best for the particular lab.

"Once a service contract is signed, it's a legally binding document."

3. Early Cancellation/Termination

Don't ever presume that a service contract can be cancelled or terminated before the expiration date. If it is allowed at all, early cancellation or termination fees can be very costly. Lab managers can be penalized anywhere from 25 percent to 50 percent of the remaining contract charges owed. Quite often, long-term contracts will not provide an "opt out" clause for the consumer but do allow the manufacturer to terminate the contract before the expiration date for any number of reasons. However, some government entities and public universities may be exempt from any penalty fees, depending on their standard terms and conditions. Especially with long-term contracts, it's important to negotiate an opt-out clause with minimal penalties.

4. Auto-Renewal Clause

The automatic renewal clause in a service contract does just that—as the expiration date approaches, if written notification from the lab manager requesting termination hasn't been received by the contract holder within 30, 60, or 90 days, then the contract will be automatically renewed for another year. If the contract is auto-renewed, the early cancellation/termination fee goes into effect as well. To avoid this, request that the auto-renewal clause be removed altogether from the service contract before signing.

5. Other Terms and Conditions to Consider

Depending on the manufacturer, make, and model, there are other elements of the service contract to consider when purchasing new laboratory equipment:

- What is the availability of replacement parts, and are they new or refurbished?
- Consider the payment terms as well. Is the contract price broken down monthly or quarterly, is payment in advance or arrears, are there late charges?
- What is covered during a service call? Will you be responsible for travel charges, overtime, or holiday hours?

It's important to seek clarification of any terms and conditions that are difficult to interpret and to get it in writing. Be sure to always question confusing or ambiguous phrases before signing the contract. As you are the lab manager, it's up to you to seek favorable changes to the terms and conditions of any service contract in question.

Jennifer Daugherty *is a business development coordinator at Remi, the lower-cost alternative to equipment manufacturer service contracts and extended warranties. Since 1998, Remi has been providing equipment maintenance management programs to the five major market segments: government, health care, education, financial, and commercial. To learn more about Remi and the services it provides, visit www.theremigroup.com or call 1-888-451-8916, #1.*

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SOURCING THE RIGHT REAGENT

A CENTRAL ONLINE RESOURCE CAN HELP PINPOINT HIGH-QUALITY REAGENTS EFFICIENTLY

by Tania Petruzziello-Pellegrini

As the principal investigator's right-hand person, the lab manager is a critical player in ensuring a lab's success. Day-to-day activities require a multifarious skill set and an ability to seamlessly switch gears at the drop of a hat. Although specific responsibilities vary between institutions, lab managers are generally master multitaskers, performing bench work, training personnel, maintaining existing lab equipment, contributing to grant submissions, overseeing safety permit applications and inspections, and establishing relationships with vendors. Managing lab purchases and juggling finances are among the top priorities, and as the world of research reagents continues to expand, lab managers are faced with the growing challenge of cost-efficiently acquiring high-quality reagents for the lab.

> "Seasoned scientists are well aware that substandard reagents are risky and can compromise the outcome of a study."

Maximizing lab efficiency

Minimizing the cost and time spent searching for suitable products are priorities in order to maximize lab efficiency and productivity. Scientists today are fortunate to have an abundance and a variety of reagents available, but sifting through the assortment to select just one quickly becomes daunting. The process of paring down a long list of comparable products is not straightforward, and the fact that not all products perform equally well complicates the decision further. Seasoned scientists are well aware that substandard reagents are risky and can compromise the outcome of a study. Searching for a product, performing the experiment, troubleshooting, searching for a new product should the original one not work as expected, and repeating the experiment cost the lab money and cost the staff time that would be better spent elsewhere. Therefore, in order to maximize efficiency, it is in the best interest of the lab to consciously source high-quality products.

An increasing concern in the life science field is that of reagent quality. Researchers often take for granted that a product will perform as marketed, but some, in fact, perform below par. Research using commercial antibodies suggests that while many perform as intended, some do not work as expected, and users are cautioned to rigorously test their research antibodies prior to use.[1,2]

Upon generating a list of possibilities, the researcher must differentiate the quality of a product manufactured by company X versus that of similar products manufactured by company Y, company Z, and so on. A seemingly quicker alternative to this approach is to blindly purchase any reagent from the list. While bench work may begin sooner, the researcher runs the risk of wasting a great deal of time and money having to troubleshoot a problematic reagent.

Another limitation with which scientists are faced is that the uses of a product are dictated by what the manufacturer has tested. For example, a rabbit antihuman CD31 antibody tested by its manufacturer for flow cytometry is naturally suited for detecting human CD31 by flow cytometry. However, might it also be useful to a scientist looking to determine CD31 expression by immunohistochemistry? Knowing whether an unconventional use or application has already been tested, successfully or unsuccessfully, is significant information that would undoubtedly impact the design of an experiment.

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A great deal of effort and resources go into designing and carrying out a study. To improve productivity and to avoid losses in time and money, it is key to be able to identify a product with a proven performance record. The challenge then is to find useful information about product quality and performance in order to make an informed decision.

Identifying information resources

High-quality reagents are central to experimental success, and information about a product helps determine its suitability for a particular study. As a result of continual lab turnover, key information can sometimes get lost in old notebooks. Knowing that a previous researcher spent two months troubleshooting three different antibodies before finding one that performed as expected is invaluable information and can quickly set the next lab member on the right track. Too often, however, labs lack a formal repository to store such key information. In other instances, the lab may be moving into a new area of research in which it has little experience. The learning curve may be steep due to inexperience with study-related reagents unless there is a resource—a colleague, a citation, or other—from which to gain insight. To avoid squandering lab resources trying to reinvent the wheel, it is imperative that experiences be shared among members of the lab and others in the same field of study.

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A lab manager not only offers firsthand research experience but also has seen the mistakes and successes of past members of the lab who have since moved on. Other colleagues are also great resources and may be able to suggest a suitable reagent they have used. They may be able to provide guidance and technical details based on their experiences with the product. Of course, the insights they are able to offer are limited by their familiarity with the area of study.

Scientific literature represents another vital source of information worth investigating. Papers that reference a product of interest provide pertinent experimental details and, better yet, provide concrete proof from independent scientists that a product works and produces publication-quality data. A caveat, however, is that final figures represent several repeated experiments and do not necessarily indicate how easy or difficult it is to optimize and work with the product of interest.

Streamlining lab purchasing

"I'm going to need another order of IL8 antibody by Monday." Lab managers hear similar phrases every day. While every lab has its own unique protocol for purchasing reagents, requests may take the form of an informal note scribbled on a piece of scrap paper, a verbal communication, or a more formal purchase requisition form. However, in the course of a hectic day in the lab, it is quite easy for a sticky note to go missing or a conversation to slip one's mind. Moreover, the wrong product might be ordered when product details are jotted down too quickly or insufficient information is provided. Electronic requisitions containing all necessary product information would greatly facilitate the purchasing process and help ensure that the end user receives the intended product.

Digital advances facilitate research

Labs spend enormous amounts of money on reagents throughout the year. Minimizing the time and cost associated with sourcing and troubleshooting products is an important aspect of managing the lab's budget and productivity. Consider hundreds of thousands of products

from the largest and smallest life science reagent manufacturers consolidated in one online repository, together with related publications and insight from researchers who have direct experience using the product. Such a resource would essentially streamline the process of finding reagents with proven product performance in a minimal time frame. 1DegreeBio is one such resource. In addition to facilitating product comparisons by presenting reagents from various vendors on one site, the company connects scientists to valuable information required to make wise purchasing decisions.

Researchers belong to a vast worldwide network, and each scientist holds a wealth of information within his or her lab notebooks. There is no reason that a search for a reagent should end with immediate colleagues. Information shared by a distant colleague, perhaps located in a different country, may prove extremely helpful in advancing a project. This insight can be passed onto others in the form of written reviews contributed by the scientists who have used the product. An additional advantage of such a system is that it avoids the lag between conducting an experiment and publication. Information can be quickly and easily shared with the greater scientific community months or even years before formal publication of an entire body of work. This key feature effectively shrinks the expanse of the scientific community with the intent of maximizing research productivity.

While one is searching for products online, purchase orders can be easily generated and emailed directly to the lab manager at the click of a button, thus streamlining the order process. All necessary information, including supplier, product name, and catalog number, is provided in electronic format to help the lab manager maintain organized records of pending orders. As a bonus feature, past purchase orders remain on file to facilitate future orders of the same products.

With the ever-growing catalog of commercially available reagents, the process of narrowing down a long list of options is becoming more and more complex. When time or money is at a premium, there is increased pressure on the lab manager to purchase the best-quality reagents as quickly as possible. A central resource to facilitate the search for products from hundreds of suppliers is both timesaving and cost-efficient. Weighing all available information—publications, advice from trusted colleagues, and user reviews—makes the selection process easier, and pinpointing a high-quality reagent with a proven track record can lead to success at the bench.

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POLITICAL SCIENCE PART I

HOW MANAGERS CAN AND SHOULD USE ORGANIZATIONAL POLITICS TO THEIR ADVANTAGE

by Ron Pickett

Two of my colleagues held positions with similar responsibilities. One would listen extensively to the grapevine and hold short discussions with senior management. He would then quickly institute new programs on the basis of wispy information. These programs would often die quickly because of a lack of interest, poor attendance, and insufficient research, leaving the carapaces of dead programs strewn about the company. Another colleague was in frequent contact with a large group of "trusted sources." On the basis of these conversations, he would develop a concept. He would then meet with a long list of opinion

> According to Aristotle, "Politics stems from a diversity of interests."

makers and leaders and get their input. He would next make modifications and go back to his sources, repeating this process endlessly and never getting anything done. These two examples illustrate oversensitivity to or incorrect assessment of the politics of an organization.

"The successful practice of organizational politics is perceived to lead to a higher level of power, and once a higher level of power is attained, there is more opportunity to engage in political behavior." (Farrell and Peterson, 1982)

There are five major issues related to politics that are important to managers:

- **Politics exists in organizations.**
- **Politics can be understood.**
- **Politics can be "worked."**
- **Denial won't make politics go away.**
- **You can become a better organizational politician.**

Let's begin with the assertion that all organizations have a political flavor or undercurrent. What do we mean by politics? Power or influence that results from contacts, relationships, trades, or other factors not clear or obvious from the formal organization chart. Politics is a means of recognizing and, ultimately, reconciling competing interests.

The political face of the organization

There are several "faces" that an organization presents to the world. There is the annual report, the advertising and public relations face, and the organizational chart; the political face, however, is never exposed, so managers must draw that portrait for themselves.

The political face involves:

- **A world of trades, exchanges of favors, relationships, reprisals, obstructionism, and coalition building.**

This sometimes goes beyond the normal processes of getting the job done and having everyday interchanges with peers and colleagues, as well as participating in the common trades of information, equipment, and expertise. This world exists to gain a specific advantage or to create a debt that will be collected later—to paraphrase the Godfather's line: I'm gonna make you an offer you can't refuse. These trades are intended to create a dependency, and they are not trades in the normal course of doing business. Similarly, relationships can be pursued for many reasons—for support, for friendship, for building coalitions, and for access to information. The skillful, devious organizational politician builds relationships primarily for personal use in furthering his or her career.

- **Understanding what you have that is of value.**

To be effective in the political world, you need to be very objective in assessing what you have that is of value to someone else and in assessing for whom these things have value. This requires a very different way of thinking or mind-set. Think of information, knowledge, or facts you have that will not violate confidences, that other people do not have access to, and that other people will find useful. Then decide how to get this information to someone who

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can use it and not make it look as if the intent were for personal gain. Be cautious about turning the process into a gossip hunt; if it is too easy and too much fun, you are probably headed in the wrong direction. Become part of a coalition, join a working group or committee, and publicly state or support someone's case or position.

- **Recognizing what the other person has that is of value. Repeat the instructions in the paragraph above!**
- **Following the money.**

To really understand organizational politics, you have to start thinking about who is going to gain from a particular event or change. Anytime a steady-state system is perturbed, someone is going to benefit and someone is going to lose. Almost all situations in organizations are "zero-sum games." Practice applying analytical skills to the inner workings of the organization.

- **Recognizing that self-interest is the key to understanding motivation.**

Altruism does exist, we keep assuring ourselves, and occasionally we find examples. However, if you assume that behavior in the workplace is motivated by self-interest, you will seldom be surprised or disappointed.

- **Realizing that it takes time.**

About this process: Analysis, planning, and building relationships are demanding, and those skills do not come easily to many managers, especially those who have come up from the ranks and are scientifically oriented.

Here's a summary of the research findings on politics in organizations:

- **The higher the level of management activity, the greater the amount of perceived political activity.**
- **Larger organizations have more political activity.**
- **Staff positions are more political than are line positions.**
- **Most managers believe that engaging in politics helps their career advancement.**
- **Organizational politics probably distracts from organizational goals.**
- **Organizational change elicits political activity.**

The bases of political power

Since political power is such a pervasive and potent force, it must come from somewhere. Most managers have little experience with politics and don't understand the sources. How do people acquire political power? Here are some of the most important bases. (Adapted from *Office Politics,* Marilyn Moats Kennedy)

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1. Access—This is the amount of contact that the person has with top managers and opinion leaders. It comes through necessary interaction as part of a job or special projects, and it could include personal pursuits, such as golf.
2. Independence—The degree of freedom of action and the level of decision-making authority are closely related to political power. The level of trust is a strong indication of the power that a person has.
3. Contribution—The amount of revenue the department puts toward the bottom line is another source of power. As certain types of labs become major profit centers, their influence within the organization and their manager's ability to participate in the politics will rise.
4. History—The manager's personal background and the success of his or her department are important factors in influencing political power. It is difficult to wield political clout as the leader of a poor-performing unit.
5. Management Style—A manager who is seen by peers as being autocratic, despotic, or demeaning will likely be avoided and shunned. Incidentally, reputation among peers is one of the factors that makes 360 assessments so accurate and valuable. It is harder to fool your colleagues than it is to fool your bosses.
6. Department Size and Type—The more people you manage, and the more closely they contribute to the line function (the reason for the organization's existence), the more potential for political power you will have.
7. Associates—With whom a manager has relationships during and outside working hours can be a major determinant of his or her influence. This is where social activities can have a significant impact.
8. Political Sense—Some people seem to have a feeling for politics that comes naturally. However, it probably comes from holding office in school, belonging to clubs and associations, and other life experiences. We believe it is a learned skill that managers can acquire through observation, analysis, and contemplation.

"He had taken over a position in an association that involved extensive personal contact with the members. The person he replaced in this role was the founder of the organization, now the executive vice president. After several months in the role, at a major meeting of the membership, the two were standing together and greeting members as they arrived at one of the functions. The new person knew and greeted almost all the members, while the EVP knew very few. One of the astute, observing members of the organization pulled him aside and said, 'I think you have good political instincts, and I suggest you pay attention to what is happening here. You are becoming a threat to the EVP.' The warning helped, and the new person deferred to the EVP, stepped into the background, and pushed the visibility of the EVP."

Politics in your department

While you are reviewing the political environment of your organization, take some time to think about your own department and how "political" the environment is. Consider how the bases of political power described above apply to your department.

1. How political is your own department? If people are vying for visibility, if there is an attitude of competition that is counterproductive, if some people complain about unfairness in the treatment of staff, and if your organization chart is wildly different from the way things really are, you may have a more politically charged environment than you want. Spend some time evaluating the way things get done by asking your trusted staff members how much political maneuvering is going on, whether the amount has increased, and who the informal leaders are. If you are instituting changes in structure, equipment, or responsibilities, be especially watchful for increases in the politics.
2. How political is the rest of the organization? If the rest of the organization is highly political, there is a good likelihood that the climate rubs off on your department to some extent. If your assessment is that the politics are increasing, take special notice of changes in your department.
3. As your importance and influence grow, your concern with large-scale politics should increase. If your department has increased in its importance and contribution to the organization, there is a good possibility that politics will begin creeping in.

Application on the job

In part two of this article I will describe ways to:

- **Gain and retain political power,**
- **Exercise that power in a wise, ethical, and principled way.**
- **Keep your department or organization as free of politics as possible.**

Suggestions for further reading:

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DESIGNING LABS FOR LEAN OPERATION

CAREFUL ADAPTATION OF LEAN TECHNIQUES CAN INCREASE BOTH PRODUCTIVITY AND SPEED

by Tanya Scharton-Kersten and Tom Reynolds

The design, layout, and placement of laboratories have significant impact on lab processes, behaviors, and communications. A good design will proactively support lean processes including flow, visual management, standard work, and excellence in workplace organization, whereas a bad design may actually create waste and make flow more difficult.

In a unique collaboration of lab design companies and lean experts, including Flad Jacobs, Foster Wheeler, BSM, and end users at Novartis, a workshop was held in Rosia, Italy, in 2012, to develop laboratory design guidelines to support lean operations. The output of this workshop was subsequently developed into the white paper, "Incorporating Lean Principles into Pharmaceutical QC Laboratory Design: building design influencing laboratory behaviors and effectiveness." The complete paper is available to download at http://www.bsm-usa.com.

Lean in lab environments

Lean was first developed in the Japanese automotive manufacturing sector but has since migrated across the globe and into every sector of industry.

It is usually defined as the elimination of waste, where waste (*muda* in Japanese) is anything above the minimum effort, time, resources, movement, materials, and space required to add value from the customer's perspective. However, this is only a partial definition. The real intent of lean is to maximize value by minimizing all wasteful practices. This of course includes *muda* (i.e., the waste within processes), but it also includes the following:

Mura: unevenness (workload volatility)

Muri: overburden (overloading of people or equipment)

Mura and *muri* are especially significant in lab environments.

Laboratories are of course not the same as manufacturing environments, but lean can and should be applied. There are some unique challenges involved in implementing lean principles in laboratories. However, careful adaptation of the techniques based on a thorough understanding of laboratory processes will deliver significant benefits in terms of productivity or speed or both.

In most laboratories, short-term volatility (in overall workload and in the mix of sample types) is by far the biggest lean opportunity. This volatility causes low productivity (during lulls) and/or poor lead time performance (during peaks). Very often there is no mechanism to level the workload in the lab, and this volatility results in the consumption of excess resources and valuable lab space. Lab processes also become stressed, leading to constant reprioritization and "stop start" progress on individual projects or samples. This reduces effectiveness and adds waste. The rate of failures and rework to efficient work also increases. In short, *mura* (volatility) creates *muda* (waste).

Poor utilization of analyst resources (usually in the form of volatility and imbalance in individual analyst workloads) is usually the second largest lean opportunity. Leveling, flow, and standard work allow the development of "productive roles" for the more routine work elements in a lab. Doing the routine well and in a productive manner allows more time and resources to be spent on less routine but more valuable development activities.

Lean in the lab shifts the focus of improvement initiatives from individual tests or activities to the flow of samples and data through the total lab process. It uses "leveling" techniques to address workload volatility and generates flow by creating "defined test sequences" that move samples quickly through all required tests and reviews. Test activities are combined into balanced, productive, repeatable analyst roles that use people's time well (standard work).

A lab design and layout that actively supports these principles will increase the effectiveness and sustainability of the lean processes.

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Laboratory areas should be designed to:

1. Support leveling, flow, and standard work

Leveling, flow, and standard work are key lean lab principles. Building design to proactively support them normally involves:

- Fewer internal walls and less separation of labs—this promotes flexible operations and the sharing of workloads and resources to level short interval workloads.
- Incorporation of space for sample management and visual cues—visualization of workloads is a core concept of lean.
- Use of sample-centric and/or test-centric cells and cellular bench arrangements—cellular workspace design facilitates the combination of tests to create balanced, productive analyst workloads and standard work, and reduces travel and motion wastes.
- Allowing space for visual management systems of laboratory performance—for example, daily and weekly meeting boards to allow visualization of work to be performed in the short term and of lab performance over time.

2. Support effective use of people's time

- Integration of write-up, review, and approval areas, enabling efficient and timely documentation and review of tests supporting both flow and leveling of workloads.
- Use of a limited number of adjacent but separated "hot" desks for project work and non-test tasks.
- Adjacent collaboration areas and meeting rooms.

3. Minimize "transport" and "motion" wastes

- Location of labs close to manufacturing (simplifying sample management and chain of custody).
- Colocation or amalgamation of labs that will share samples, equipment, or storage.
- Central location of shared lab services (e.g., glass wash).
- Central location of equipment or storage that will be shared within a lab.

4. Minimize space and equipment requirements

- Space and equipment requirements should be calculated based on levelled demand rates rather than peaks.
- There should be a move away from personal ownership of equipment, bench space, or desks; analysts should operate as true teams sharing resources and workloads.

5. Maximize future configurability

- Via flexible bench configurations and (semi-) configurable services (air/extraction, etc.).

6. Support effective laboratory inventory management

- Via limited and defined storage at the point of use.
- Central lab storage for shared materials or high-volume unique materials.

7. Support effective performance management

- By incorporating areas for visual management displays, huddle meetings, etc.

8. Foster lean behaviors and communication

- Via centrally located, glass-walled offices for lab managers and supervisors.
- Via extensive use of glazing to visually link lab areas.

9. Support excellence in workplace organization and cleanliness (5S)

- Via open or glass-fronted cabinetry.
- Limited and defined storage through the lab.
- No drawers.

Needs assessment

How can you determine the space and equipment requirements for a new lab?

Two parallel approaches ("top down" and "bottom up") are often used to help ensure that the quantity and quality of space is exactly what is needed to perform the testing activities.

In the top-down approach, pertinent metrics such as headcount with various historical and benchmark data can be used to help determine space requirements, functional areas, the number of rooms and their size, and the amount of equipment that can be placed in each room.

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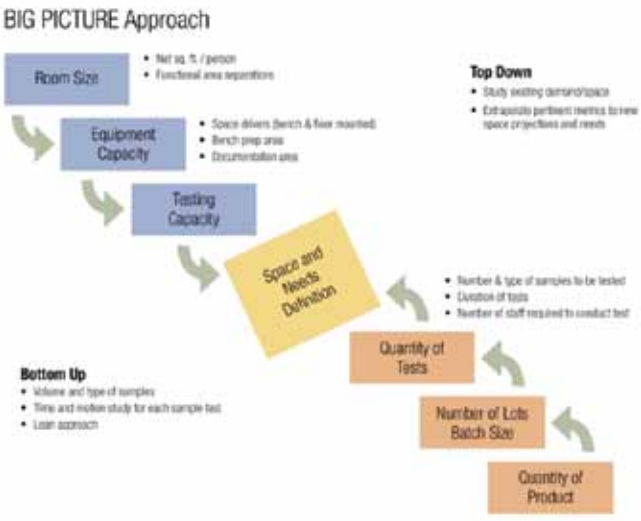
The bottom-up approach examines how many batches and how many lots are being manufactured to determine how many tests are required, the equipment needed for each test, and the frequency of equipment use. This information dictates how much space is needed for each test.

The combination of these two approaches can help create a holistic picture of both the quantity and quality of space required.



▲ *Fig 1: Space Needs Planning Approaches (Source: Flad Architects)*

Note: To be truly lean, the space and equipment requirement calculations should be based on leveled rather than peak workloads, and an appropriate leveling strategy should be used to control short-interval workloads when the lab is operating.

"The key objective in work cell design is to have clearly defined work areas and sample flows."

Designing spaces to foster interaction

Also important to the success of a laboratory design based on lean principles are the visual connections of different functional and common areas. Views into the labs and office areas, conference rooms, dining areas, and circulation arteries support the "visibility" of everyone in the organization and the importance of a cohesive purpose through a sense of community.

Through the use of common spaces, an environment can be created where the different departments are brought together to interact, forming bonds and inter-departmental connections. These interactions help to increase operational efficiency within the facility and to develop trust and collaboration.

By knowing their coworkers, the staff are better able to communicate through networking, collaboration, and problem-solving sessions. Understanding one another as people, rather than by job title, increases teamwork and fosters communication for constructive problem solving during operation.

Designing for flexibility in lab installations

Furniture in laboratories must fit with the needs of the activities that will take place in the lab, and not vice versa. This simple principle may seem obvious but it is not always respected.

It is not unusual to find situations in which the testing activities are not as lean as they could be, due to the constraints of furniture arrangement and utilities distribution.

Also the user needs, type of tests, equipment used, and activities carried out in a laboratory evolve over time. Often a design that was originally perfect may become obsolete, and may become so quickly. Indeed, sometimes it is necessary to revamp a lab area immediately after the conclusion of the construction phase.

To mitigate this problem, laboratory designers and furniture suppliers have developed flexible solutions over the past ten years:

1. Flexibility at bench level

Traditional benches are fixed and in practice are difficult to relocate. Flexible benches, however, are on wheels to allow a reconfiguration of the lab layout. They can be detached and moved, but the reconfigurability is limited as they need to be close to the utilities and services distribution.

2. Flexibility at distribution level

The distribution of services such as gases, electrical power, vacuum, and water are typically rigidly fixed on the bench in a nonflexible configuration. However, the services and utilities "distribution wall" can be detached from the bench, breaking the rigid connection between bench and services and allowing some level of reconfiguration; or they can be distributed from above via flexible connections, with blind connections at various points in the lab ceiling void to allow a much greater degree of future configurability.

3. Bench configurations

By far the most common bench configuration in labs today is a straight run, which is almost never the optimum configuration.

The key objective in work cell design is to have clearly defined work areas and sample flows, with all necessary equipment, services, and materials close at hand and with reaches and movement minimized. Achieving this normally requires a bench configuration that "loops" around. The classic work cell shape is the "U" (also known as the horseshoe), but there are several alternatives that can achieve the same objectives.

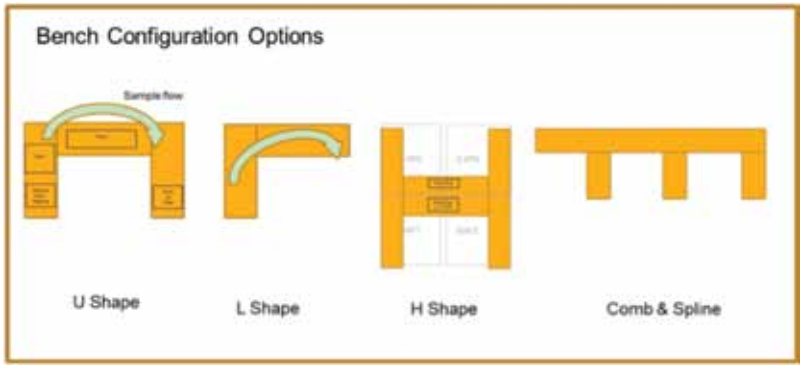


Fig 2: Bench Configuration Options for Testing Work Cells (Source: BSM)

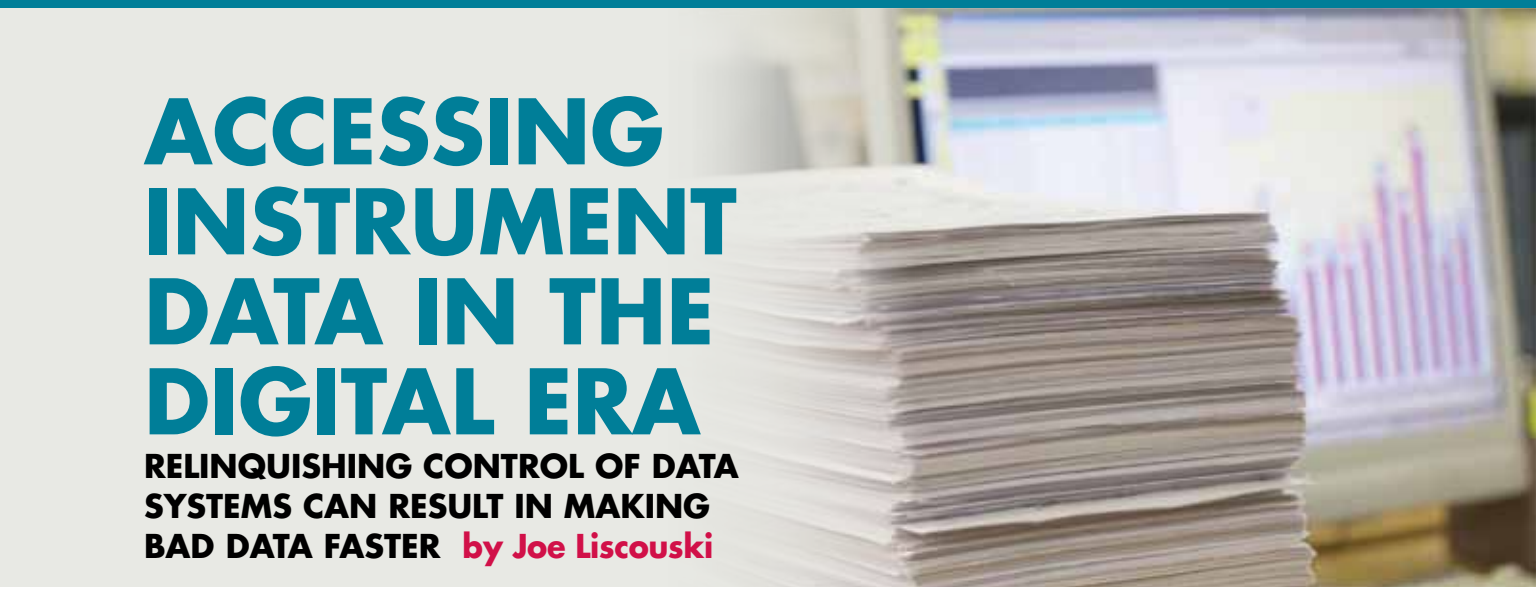
Arguably, the most versatile and reconfigurable option is the "comb and spline," in which the spline can be fixed with services supplied from above and the comb elements are movable. This allows multiple U and L shapes to be easily created and reconfigured when required.

Conclusion

While pharmaceutical QC laboratories are different from manufacturing environments, they are nonetheless operational entities. They have a major impact on the release of product and are often significant cost centers in their own right. Lean principles can and should be applied in order to optimize lab processes and operational performance. The design, layout, and placement of labs can have a significant positive or negative impact on the implementation and sustainability of lean processes and behaviors within the lab.

Note: This article is an edited abstract from the white paper "Incorporating Lean Principles into Pharmaceutical QC Laboratory Design: building design influencing laboratory behaviors and effectiveness."

*The authors of this article are **Tanya Scharton-Kersten**, Global Head of QC Laboratory Management, Novartis Vaccines & Diagnostics (www.novartis.com), and **Tom Reynolds**, Operations Practice Director at BSM (www.bsm-usa.com).*



ACCESSING INSTRUMENT DATA IN THE DIGITAL ERA

RELINQUISHING CONTROL OF DATA SYSTEMS CAN RESULT IN MAKING BAD DATA FASTER

by Joe Liscouski

In the pre-digital era, changes to laboratory instruments didn't have the same impact that they do today. A device or instrument may have changed but access to the recorded data didn't; the paper charts and notebooks were still there and accessible for someone to read. In the digital era, the data is tied to the instrument's data system. Without careful planning, data system changes can impact access to important instrument data.

Data management in the pre-digital era was pretty simple. You worked with notebooks (paper) and instrument output that was either read and entered in a notebook or recorded on charts or film. Everything was human-readable.

"Managing" the data was a matter of managing the notebook and cataloging charts and films in file drawers and cabinets. There wasn't much concern about media compatibility, because the only thing between the data and your eyes was air; as long as you had the education needed to understand the output, you were ready to go. Reevaluating the data was a matter of finding the right material and looking at it. It was all there. Even decades later, if you could locate the material, you could make sense of it. Data management was a matter of managing physical items, keeping track of where they were, making copies for backup, and storing them so that they would be protected from deterioration.

> "When instrument data systems arrived in labs, things changed."

When instrument data systems arrived in labs, things changed. In the early days it was by choice; we looked for products to offload routine work. Later it became part of the instrument-data system package purchase. These were readily accepted because they relieved us of tedious work. Rather than our evaluating a hundred feet or more of strip chart paper from a chromatograph, the system did it and even printed out a nicely formatted report. That convenience came with changes and at a cost that sometimes wasn't obvious.

In the digital era things are a lot different

The first change was in the need to acquire new skills; you knew how to do the analysis, but getting the computer to do it took some learning. Data had to be entered in order to identify samples, and those sample IDs had to be matched to the designations the computer used. You also had to understand how control parameters worked and how they affected the analysis—using the wrong set of parameters, or just relying on the vendor's defaults, could produce erroneous results. This becomes more significant as vendors move toward the-instrument-as-an-appliance, where the instrument is essentially a closed box and all the interaction is through the computer systems. As more of the control functions are assumed by onboard processing, your ability to independently verify settings (flow rates, etc., depending on the type of instrument) and to ensure that the device is operating according to your specifications is reduced. Another change was in data utilization and management.

One of the most significant changes is that the data is digital rather than analog output. You couldn't view the actual detector output, only the computer's estimation of the detector's signal, and it wasn't a continuous data stream but a sequence of points that represented the detector's continuous signal output. If enough points were taken, the distinction might not matter for the initial calculations, but it would if you wanted to reevaluate

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the data, possibly looking for anything unusual about the shape of a peak or small, unexpected elements. Then the difference between a sequence of points representing the data and a pen trace is significant.

Did the computer keep the raw data? If not, you have to rerun the sample (*still have it?*). In some cases the printed report may have a graphic representing the data. Is it sufficient for your needs? Can you detect small shoulders, the way you might have on a strip chart? Making allowances for these kind of contingencies is something you have to do *before* the samples are processed—you have to anticipate what questions might be asked and make sure the system is capable of capturing enough data to answer them. In the pre-digital days, the data was recorded on paper and you had all of it.

"Using the wrong set of parameters, or just relying on the vendor's defaults, could produce erroneous results."

Second, there is the process of looking at the data. It is no longer a matter of looking directly at the recording but of looking at it through a series of components. You need a computer with access to the data files (which may require authorization) and the software application used to acquire and process that data. Without the application, you can't make sense of the files; you may not even have access to the files if the application maintains its own data directory structure. Exported data files may not have all the information you want (the vendor may not export everything), and then you need something to view it with. If the exported data is in the form of a PDF file, what you see is what you get; you may be able to expand the image, but all you are doing is making the pixels bigger, not getting more detail.

Data storage management

Third, there is the issue of data storage management. Not only do you have to manage the print output and the data files, but you also need to preserve the computer-application-data structure if you want to look at anything beyond the printed report (paper or PDF). Going paperless reduces those options to one. That means you have to set up a file management system with a catalog of entries and provide on-site and off-site backup. On-site backup protects against the failure of a computer or disk drive; off-site backup protects against more significant failures.

What you back up is important. It isn't restricted to the data files but requires the tools needed to work with them, and that can include everything from the operating system (some vendor applications may not keep up with operating system changes, particularly the products of small companies), database systems (which change independent of operating systems and applications), the applications, AND the data. Omitting elements of this structure may leave you with the data but no means of using it or gaining value from it.

One way of backing up everything is to duplicate the computer system and everything on it. That isn't as difficult as it might seem. The IT concept of "virtualization" allows you to capture an entire computer's data structure—everything from the operating system on up through the applications and data—and store it as a large file or "container." The container can be stored on data center servers and run on an as-needed basis. Once the container is accessed, it looks and behaves like the computer system you were used to working on, with access to the applications and data. You may not be able to acquire new data, but you can work with the data that is there. You can create as many containers as you like, and doing so for a system before an upgrade would be a good way of preserving laboratory data systems for future use.

Managing laboratory operations

There are other issues as well. As we relinquish control over the devices, we move toward push-button science. Are people going to lose critical skills as they become dependent on systems to carry out the analysis? How are you going to verify that the systems are working as you need them to work? "Trust the vendor" is not a good option. When an analyst looks at data, he or she consciously or unconsciously looks for clues that something is off. Extra peaks, a baseline that doesn't look right, a separation that isn't as clean as it should be. Will the systems allow you to build that into the analysis? We need to

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maintain control over the systems and how they function. Relinquishing that in the name of higher productivity may result in making bad data faster.

Planning is an essential part of managing lab operations. For example, if your lab has a number of the same type of instrument, can you use a multi-instrument, multiuser system to manage them? Rather than several instrument-computer pairings, having the same type of instrument connected to a common data system simplifies data and system management, reduces costs, and increases operational flexibility.

The extent of your use of automation technologies (including instrument systems, robotics, laboratory information management systems, electronic lab notebooks, scientific data management systems, lab execution systems, etc.) is up to your discretion. Their use can have a beneficial effect on lab operations. In the past, advances in instrumentation—new features, more speed, more capability—were incremental. However, the use of advanced technologies is not just a 1+ over existing instruments; the use of digital systems in concert with measuring equipment changes the dynamics of laboratory management and operations. It is a transformational change in how labs work, well beyond anything taught in schools. These systems require thought, education, and planning to be fully effective. They are part of the continuing and rapidly developing evolution of lab technologies, and being prepared for them is a necessary course of action. Our role is to help you with that preparation.

"*Labs in TransitionSM*" is a series of articles discussing the impact of modern information technologies on lab personnel and operations. Rather than dealing with "hype," the series focuses on how these technologies and products transform laboratory work and the skills needed to work with them. The articles are supported by the ILA's educational (http://www.institutelabauto.org/courses/coursesovrvw2.htm) and "Elements of Lab Technology Management" (http://www.institutelabauto.org/publications/ELTM.html) programs.

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HOW TO AVOID SWOT ANALYSIS PARALYSIS IN YOUR LAB

By Sandra Shelton

Logically, one would think that once SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is learned, people and teams would rise to new heights of productivity and team synergy. However, since that is the rare case and not the norm, perhaps changing the focus and methodology of SWOT is in order. "Analysis paralysis" occurs when a team becomes so lost in the process of examining and evaluating the elements of SWOT that they are unable to make a decision or change a process using the new information.

The key difficulty in approaching SWOT is perception. Perception is that pesky thing that often perpetrates conflict, escalation of conflict, or a "position" that others have to be wrong because you are right. You may be thinking that this upcoming webinar may not be a comfortable, low impact, and little involvement experience. Good. That is, good if your perception is positive about the lifelong need for continuous personal growth that in turn strengthens the workplace.

Perception is pesky because each of us sees ourselves as correct until someone else offers a different perspective. The cognitive dissonance comes when we decide to consider that new view. Example: You may perceive that your greatest strength is accuracy down to the smallest detail. However, a colleague doing a 360° assessment of you determines that "strength" to be a weakness called *perfectionism*. Your first response might be negative or might be to ignore it. Now for the pesky part. You and others see things not necessarily as they are but more accurately from one perspective. Or, as author Anaïs Nin says, "We don't see things as they are, we see them as we are." Yet when it comes to your personal brand—your professional reputation—it's not about how you view yourself. What matters is how the world sees you. "If three people tell you you're a horse, buy a saddle," says angel investor Judy Robinett. In other words, listen to what the outside world is telling you, because they're probably right (http://bit.ly/GABNdR).

That quote above may sting a bit and is exactly what can defeat SWOT! Rather than approach the SWOT as an opportunity to grow, many approach it as a time to be sure the team understands that you are a contributor to the team and, more importantly, that the team needs you. Going a bit deeper, there is sometimes a secret hope that the team member who "gets under everyone's skin" (in your opinion) is shown to be nonessential. Warren Buffett puts it, "What the human being is best at doing, is interpreting all new information so that their prior conclusions remain intact."

To get to a great SWOT that engenders positive change, nudging, or recognition of heretofore unseen potential, one has to begin with the complete understanding of a team's relationship to each other. To get there, the team has to become excruciatingly clear about its current status quo individual by individual. That is where the SWOT learning can start to become a part of a lab's continuing pursuit of excellence.

Sandra Shelton, *Med., CTACC is a professional speaker, executive coach and a nonprofit executive director. What never changes for Sandra is the need to encourage a clearer understanding of leadership development as it relates to every person's communication focus, that is, higher levels of service and communication so that each of us perpetuates a portfolio of good working relationships. Contact Sandra at Sandra.shelton@strengthbank.com or 817-230-4523*

LABCAST Be sure to attend Sandra Shelton's Lab Manager Academy webinar, "How to Avoid SWOT Analysis Paralysis," on Wednesday, January 8 (or afterward at www.labmanager.com/swotanalysis to watch the archived video).

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DEALING WITH THE DIGITAL DELUGE

By Mark A. Lanfear

One great thing about science today is that it's more social than ever. We're no longer exclusively on the bench, isolated with our work. We're working together across countries, across continents, and even across specialized social networks as the ivory towers dissolve and we recognize the benefits of collaborating on important research. In many ways this new frontier in collaboration isn't just convenient—it's also necessary. The business of science, after all, has changed, and chances are, whether you work in a small lab or the lab of a multinational corporation, budget constraints are dictating the need to pool resources.

Of course, there have been consequences of this kind of connectivity in the lab and other scientific workplaces, just as there have been consequences across all industries. Things such as email and other electronic forms of communication have become so easy and "convenient" that they seem to be everywhere, all the time. It's been called the "digital deluge" in various media reports, that constant ping of an incoming email that threatens to fracture our workday. Email has even become the subject of research itself as our modern society has begun to recognize its omnipresence in our lives.

The Radicati Group, a technology market research firm in California, for example, has projected that by the year 2015, there will be close to 4.1 billion individual email accounts around the world. The number of corporate email accounts (i.e., the email we all use at work) is expected to grow much faster than consumer email accounts. And those of us using corporate email at work can expect to receive at least 105 emails a day. Yes, 105 emails a day.

> "Budget constraints are dictating the need to pool resources."

The age of the smartphone is only helping fuel the email beast, making it easier than ever to connect wirelessly and literally never to be without electronic communication. Radicati projects that there will be more than 1.2 billion wireless email users by 2015.

Of course, certain emails may very well be critical to your workday. But then again, many emails can be put off for another time. Some may have nothing to do with the task at hand. A majority may have nothing to do with your work at all. And research has already shown that this kind of electronic "overload" can actually hinder productivity as much as it enhances it. A 2012 study from the University of California at Irvine also suggests that constantly looking at email increases stress and that those who take a vacation from email usually experience decreased stress levels.

It all just means that scientists in labs—once considered isolated and content to work alone—must start to deal with email overload like everyone else, especially in an age when communication with remote colleagues can't necessarily be avoided.

Technology firms have actually been doing this for several years now, continually looking for innovative ways to help email users deal with the beast that the technology firms created. There are flags, filters, and priority statuses that we can employ with our email accounts. There are options to turn off notifications. But unfortunately, there are no options to turn off email altogether. If you don't deal with it at some point, it keeps piling up, threatening to become a bigger problem down the road.

There's no one-size-fits-all approach to dealing with the digital deluge, of course. But there are some pretty effective, straightforward ways to make sure email doesn't take over your work life. First of all, we've probably all become used to dealing with electronic messages the instant they happen. But you don't have to do that! Turning off the email alerts function is a good way to start weaning yourself from this habit. Then, try setting aside a certain time each day to deal with email, and

keep on schedule. Next, get to know all the bells and whistles of the email program that you use, because there really are some great ways to manage your inbox that you may not be aware of. This could help you prioritize email from certain people—and may help you avoid other unimportant emails altogether. Another tip is to work on the best communication possible when writing emails, because often our time is used up answering and clarifying prior emails that may not have been effective the first time around.

"By the year 2015, there will be close to 4.1 billion individual email accounts around the world."

No one will argue that electronic communication in our modern workplace hasn't indeed revolutionized and enhanced our jobs. But know that when it's used effectively—when we're able to deal with the digital deluge—it can become an even more powerful and much more manageable tool.

Mark Lanfear *is a global practice leader for the life science vertical at Kelly Services, a leader in providing workforce solutions. He has operated clinical trials around the world for almost two decades. In addition, Mark is a featured speaker at many life science industry conferences and a writer for life science periodicals. He can be reached at MARL773@kellyservices.com or 248-244-4361.*

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ASK THE EXPERT

SETTING UP A STEM CELL CULTURE LAB: DOS AND DON'TS

by Tanuja Koppal, PhD

Philip Schwartz, PhD, supervisor and senior scientist and director of the National Human Neural Stem Cell Resource at the Children's Hospital of Orange County Research Institute, talks to Contributing Editor Tanuja Koppal, PhD, about the subtle particulars and expertise needed to design and maintain a laboratory dedicated to culturing stem cells. He also talks about the common mistakes made and the need for adequate personnel training, and portends what the future holds for this promising field.

Q: What does your lab work on?

A: We are a research lab with about a dozen people working mostly with human stem cells, primarily neuronal stem cells. It's a comprehensive setup involving six different aspects. One involves the R&D work for methods development on how to grow stem cells, which we then publish in scientific journals and methods publications. We are also a training lab where we teach people how to do what we do. Our training is meant for groups of students from the California state universities and for our collaborators who get cells from us. We are also a resource for different kinds of stem cells, including human stem cells that are associated with specific diseases. This is made possible under the aegis of the National Human Neural Stem Cell Resource (NHSCR). We also have ongoing research projects using stem cells to understand and treat disease. In order to understand diseases, we create stem cells from skin biopsies taken from patients and use them to study various disorders. For treating diseases we are looking at transplantation using mouse models of disease. We are using stem cells in an effort to come up with a cure for certain types of pediatric brain diseases. Finally, we provide stem cells as a service by isolating fibroblasts from skin biopsies, characterizing them, and turning them into induced pluripotent stem (iPS) cells, which are then differentiated into neural stem cells and sent to people who need these cells to study various diseases.

Q: How does a stem cell laboratory differ from a regular cell culture lab?

A: For the most part the differences are not obvious, but there are important differences. There are lots of approvals and much oversight is needed for stem cell work. For instance, approvals from the Stem Cell Research Oversight Committee (SCRO), the Institutional Review Board (IRB), the Biosafety Committee Review (IBC), and the Institutional Animal Committee (IACUC) are typically needed for this work. The cell culture process is largely the same, but things are different from the very beginning and definitely more steps are involved. In order to change the skin fibroblasts into neural stem cells, we use either non-integrating viruses or viruses that integrate into the DNA and express transcription factors that lead to changes in the phenotype of the cell. The iPS cells are grown as little colonies on a feeder layer of mouse fibroblasts, and those colonies have to be manually picked out for further passaging. The iPS cells are then differentiated into neural stem cells and the cell phenotype and methodologies change once again. So although the lab equipment is the same, there are differences in the details. These details are important, which is why we offer a training course so people gain the expertise to do this work efficiently and reproducibly.

Q: Can the processes in a stem cell lab be automated?

A: In our laboratory there is no automation at all, and there are a couple of reasons for that. One is that culturing stem cells is still an art form to a certain extent, and passaging these little colonies of iPS cells requires an eye. But that's changing and the methods are getting better and becoming more amenable to automation. The second reason is that we are constantly improving what we are doing. So there is no point automating something that might very well change next week. However, people are definitely looking into more automation. There is a big initiative in California to provide 3,000 stem cell lines over three years. (More details are available at http://www.cirm.ca.gov/node/11785/review.) This is a tall order and is going to require robotics and automation.

Q: Are there any special considerations around lab design for this work?

A: The primary consideration when designing any cell culture lab is to have the atmosphere set in such a way that you don't contaminate your cells or the people in the hallways. We have a separate virus transfection room, which has restricted access since we use recombinant DNA techniques. Our lentiviral rooms have negative pressure to keep the virus inside the room and the cell culture rooms have positive pressure to keep the various contaminants out of the room. So there are ventilation requirements put in place to protect the cells and the lab personnel at all

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Philip Schwartz, PhD is a full-time stem cell biologist who trained at UCLA's Brain Research Institute. He holds the supervisor senior scientist position at the Children's Hospital of Orange County (CHOC) Research Institute, having worked there since 1996. Dr. Schwartz is the founder and director of CHOC's National Human Neural Stem Cell Resource, and an associate neuronal research biologist at the University of California, Irvine. Dr. Schwartz's early work included studies of several models of energy failure-induced brain damage as well as preclinical and clinical studies of pharmacologic agents aimed at maintaining cerebral perfusion and/or neuroprotection. For the last 14 years, he has been involved in the harvest of neural stem cells from human brains of patients (primarily children) who have died with neurogenetic disease. This research in his laboratory is directed toward understanding the biology of neural stem cells—and their differentiated derivatives, neurons, and glia—in the normal and neurogenetically diseased brain. This work now includes the use of neural stem cells differentiated from induced pluripotent stem cells derived from skin fibroblasts and other somatic cells. His research evaluating the efficacy of neural stem cell transplantation in an animal model of a fatal pediatric neurodegenerative disease has direct application to the clinical use of stem cells for the treatment of children with neurodevelopmental disorders. Other work is focused on using neural stem cells derived from patients with autism in an effort to define new therapeutic and diagnostic targets for this most prevalent and enigmatic neurodevelopmental disorder.

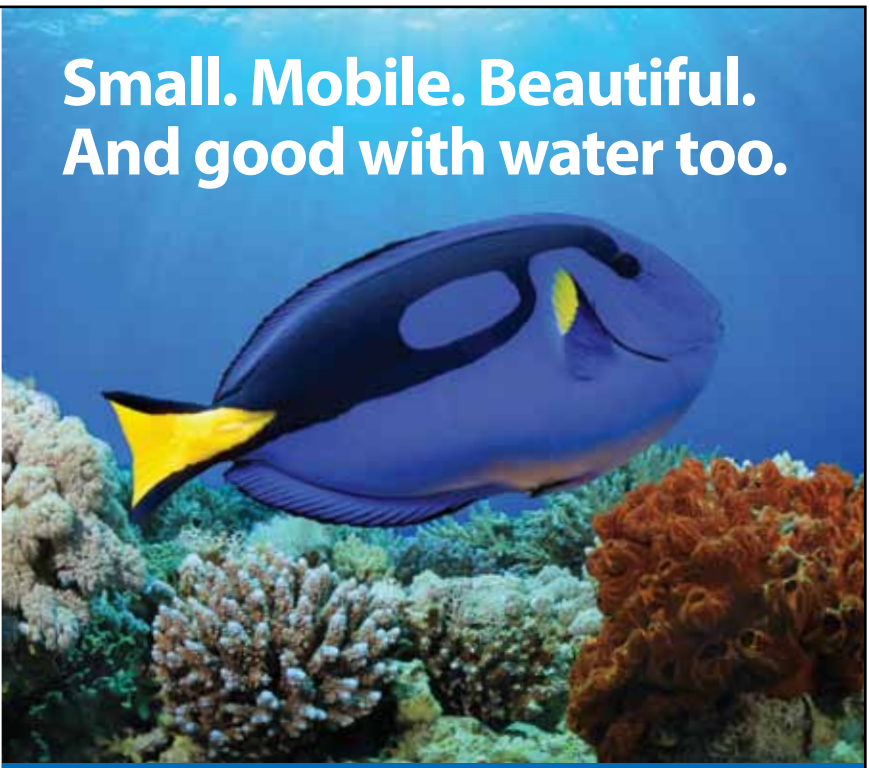
times. If you are culturing different types of cells it's best to work with each of them in separate rooms to avoid cross-contamination of cell lines, which is a fairly common problem.

Q: What practices have you put in place to minimize contamination?

A: Right now we have four separate cell culture rooms, and in about six months we will have two more. Each room has its own biosafety cabinet, incubator, centrifuge, refrigerator, and other equipment to keep the cell lines separate. The protocols for testing contamination are also very stringent, and we do some testing ourselves and outsource the rest. I am a firm believer in not reinventing the wheel and not doing things that are easily, commercially available. For instance, one of the tests that need to be regularly done with iPS cells is karyotyping, since these cells are known to develop karyotypic abnormalities in culture. So we routinely send our cells for karyotyping. The testing may be expensive, but in the long term it's cheaper because the tests are well validated and used for all types of clinical purposes. We do the same for phenotypic testing for our animal work. If there are good services available we make use of them.

Q: Have you put any contingency plans in place in case of a disaster?

A: No, we don't have any contingency plans in place. Some investigators have suggested housing the cells in two different locations, which essentially means in a different state, in case of a natural disaster like an earthquake. In order to do that you have to set up contracts with labs and doing so involves expenditure that sometimes becomes hard to justify. It sounds like a great idea,



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but we don't have anything set up for a major catastrophe. However, in case of power outages we are on an emergency power supply and all the critical equipment such as freezers and incubators get powered in seven seconds. We also have a contingency in terms of manpower, since a cell culture lab operates 24/7. The staff shares responsibility for feeding and maintaining the cells and our employees come in during the week, weekends, and holidays so there is constant coverage of the lab.

Q: What is your advice to lab managers who work with stem cells?

A: My advice would be to get good training so you can visualize how to modify your setup to meet the lab's needs. The most critical aspect is to know what you are doing. Stem cells are very finicky and trying to keep them from differentiating is not that easy. It requires an attention to detail that far surpasses anything in a cell culture laboratory. Unless you have good training, you will spend a lot of time with failed cultures because of technical issues.

Q: What are some of the common mistakes that people make when using stem cells?

A: The most common mistake is that people think they know what they are doing and do not follow the detailed protocols that are given to them. This is common because in some ways cell culture is an art form and the people who have been in it for a while have their own ways and superstitions, and have a mind-set on how things should be done. However, an advanced cell culture technique, such as working with stem cells, requires a real attention to detail. Hence, people should never change the protocol before they learn how to do it the original way that was given to them.

Q: What are some of the big changes you see coming?

A: The automation that we discussed earlier is definitely happening and that will make stem cell work more manageable and easier to scale up. Clinical trials using stem cells will also become commonplace in the coming years.

KEY CONSIDERATIONS FOR OPERATING A SUCCESSFUL CELL CULTURE LABORATORY

- Skilled Personnel (training, knowledge, resources)
- Established Standard Operating Protocols (quarantine incoming cells, culture cells, long- and short-term storage)
- Laboratory Planning and Design (budget, space, scope, mechanical, engineering considerations)
- Proper Equipment (for tissue culture, microscopy, biochemistry, molecular biology)
- Quality Control (reliable techniques, validated reagents, checklists)
- Documentation and Approvals

Source: Philip H. Schwartz and Robin L. Wesselschmidt (eds.), Human Pluripotent Stem Cells: Methods and Protocols. *Methods in Molecular Biology*, vol. 767, DOI 10.1007/978-1-61779-201-4_1, © Springer Science+Business Media, LLC 2011

Additional Resources:

1. National Institutes of Health stem cell information page stemcells.nih.gov
2. California Institute for Regenerative Medicine www.cirm.ca.gov
3. Harvard Stem Cell Institute www.hsci.harvard.edu
4. WiCell www.wicell.org

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DISINFECTION DILEMMA

SAFE USE OF LIQUID SPORICIDAL STERILANTS

by Vince McLeod

The class of liquid sporicidal disinfectants are popular non-bleach disinfectants used for clean rooms and biosafety cabinets. Since their introduction, liquid sporicides have become one of the products of choice for many biological research and production facilities wherever high-level microbial control is critical. These sporicides make up a category of liquid, cold, fast-acting disinfectants/sterilants primarily used on hard, pre-cleaned surfaces. They provide quick and effective microbial control, including the ability to destroy bacterial spores. They are generally regarded as safe to use on stainless steel, glass, plastics, walls, and floors. Most sporicides are available as a ready-to-use premixed solution or a concentrate and can be applied by immersion, spraying, fogging, or wiping. Although they are marketed as low-toxicity products, appropriate care during use is essential to prevent potentially dangerous conditions, exposures, and injuries.

> "Liquid sporicides have become one of the products of choice for many biological research and production facilities."

The popular liquid sporicides are a stabilized blend of hydrogen peroxide and acetic acid. As a cold chemical disinfectant/sterilant, it is one of the fastest-acting microbial controls available. Most sporicides will disinfect in around ten minutes and kill spores within eleven hours, according to product literature.[1] Concentrates, which contain up to 22 percent hydrogen peroxide and 4.5 percent peroxyacetic acid, are meant to be diluted, usually 100 times (one part sporicide to 99 parts purified water) for the working solution. Surfaces are left wet for up to 11 hours and devices soaked for the same time in order to provide sterilization with spore inactivation. For germicidal disinfection or use as a cleaner/sanitizer, the working solution requires a ten-minute contact and is either sprayed on and allowed to air dry or wiped on with a cloth or sponge and then rinsed with purified water and air dried. Working solutions for disinfection and sanitization can be stored for up to seven days.

The premixed solutions usually contain less than ten percent acetic acid with small amounts of hydrogen peroxide and peracetic acid. Premixed or ready-to-use sporicide solutions require similar contact or immersion times for sterilization and/or disinfection, ranging from 5.5 hours to as little as 30 seconds for use as a germicidal disinfectant spray. Whether you use the concentrate or the premixed solutions, the sterility assurance level (SAL) for the widely used sporicides are at least 10-6, meaning there is only a one-in-a-million chance that a live microbe survived contact, demonstrating the products' lethal effectiveness.[2] However, these liquid sporicides are not without latent drawbacks. Hydrogen peroxide is very reactive, and if it is inadvertently mixed with bleach, release of hydrogen gas occurs; this is highly flammable and potentially explosive. Liquid sporicide use requires rigorous attention to ventilation and proper employee personal protective equipment (PPE).

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SAFETY TIP

QUESTIONS TO ASK WHEN CONDUCTING EXPERIMENTS WITH HAZARDS OR POTENTIAL HAZARDS

By James. A. Kaufman

Can you identify the hazards that are present? Are they chemical, physical, biological, mechanical, electrical, radiation, noise, stress, or high/low pressure? Those are life's nine hazards and you should look for them before beginning an experiment.

What kinds of emergency situations can you anticipate? Fires, explosions, electrical shocks, bleeding, burns, cuts, poisonings, slips, trips and falls, spills, extreme weather, medical problems, workplace violence and natural disasters should be considered. What about other medical emergencies and utilities failures? And, everybody's favorite … a colleague who goes "postal." Are you prepared to deal with these kind of problems? Do you have written procedures describing what to do?

Do you have the necessary safety equipment and emergency equipment? Deluge showers, eye wash fountains, first aid kits, fire blankets, fire extinguishers, communication system? What about gloves, goggles, and lab coats? What are the generally recognized safety practices that a reasonable person would follow before experimenting? Carefully reading labels and MSDSs is a good beginning. Hand washing when finished is another.

Have you considered reducing the scale of the experiment, substituting a less hazardous chemicals or eliminating the experiment altogether? Teachers/supervisors need to adjust the experiments so that the health and safety risks involved are appropriate for the facilities, the equipment, the experience of the teacher/supervisor, and the abilities of the students/employees.

Some organizations, both non-academic and academic, have a hazards review committee and/or process. The function is to try to make reasonably sure that all the issues have been properly considered.

Source: Kaufman, James A., Laboratory Safety Guidelines - Expanded Edition, The Laboratory Safety Institute, www.labsafetyinstitute.org.

Can using a liquid sporicide be dangerous? (Recognizing the hazards)

Hydrogen peroxide is a colorless liquid with a bitter taste at room temperature. Its molecular weight is 34; thus it is heavier than air, meaning that vapors will settle if not exhausted properly. Although it has a high boiling point of 152°C (306°F), the vapor pressure is very low (5mm Hg), so it readily evaporates. Even though hydrogen peroxide is not combustible, it is a powerful oxidizer, creating many opportunities for contact with incompatible materials that could result in violent explosions, spontaneous ignition, and combustion. Avoid contact between hydrogen peroxide and combustible materials such as wood, paper, and oil; organic materials such as alcohol, acetone, and aldehydes; metals and metal salts; and strong mineral acids, all of which could lead to violent reactions or explosions.

"If liquid sporicides are used in your facility, you should evaluate potential exposures."

Due to its reactivity, hydrogen peroxide presents a serious health hazard. It is a potent irritant of the eyes, skin, and mucous membranes. Inhalation of vapors or mists may cause extreme irritation of the upper airways (i.e., the nose and throat). Signs and symptoms of exposure range from stinging and tearing of the eyes to mild bronchitis to pulmonary edema. Skin contact can produce redness and blisters and bleaching or whitening of the hair and skin. Exposure to concentrations as low as 7ppm can cause lung irritation, and the OSHA occupational permissible exposure limit is only 1 ppm for a regular eight-hour work shift. Concentrations above 75ppm are immediately dangerous to life and health (IDLH).[3]

Acetic acid, the other active ingredient of popular liquid sporicides, is very similar to hydrogen peroxide in terms of physical properties and exposure symptoms. It is primarily a reactive in concentrations relative to sporicidal use. Most people probably think of vinegar when acetic acid is mentioned. Acetic acid, a colorless liquid with a vinegar odor, has a molecular weight much heavier than air (60), a high

boiling point (244°F), and low vapor pressure (11mm Hg). It is also irritating to skin, eyes, and mucous membranes and induces the same exposure symptoms as hydrogen peroxide, except skin will turn black instead of bleaching out. The OSHA permissible exposure limit is 10ppm, with the IDLH limit at 50ppm.

Are hazardous exposures present? (Evaluate the hazard)

If liquid sporicides are used in your facility, you should evaluate potential exposures. The best way is to test representative employees who are directly involved in handling and using the disinfectants by conducting initial personal exposure monitoring following approved and validated OSHA chemical sampling methods.

Before conducting initial monitoring, it is good practice to check the use area for suitable ventilation and exhaust. Ensure that the area contains dedicated single-pass air without any recirculation and that the supply flow is sufficient, with volumes equal to design. Smoke tubes can provide a quick qualitative check of ventilation systems, but to verify that flows and volumes are meeting design criteria it is best to perform a test and balance. It is money well spent to get all these things in order before spending money on expensive monitoring.

Due to the highly reactive nature of hydrogen peroxide, accurate worker exposure is measured by drawing the air sample volume through a glass bubbler with a special solution of titanium oxysulfate, which chemically binds the hydrogen peroxide. Gas detector tubes are also available for quick checks and screening, but measurement uncertainty ranges from eight percent to 25 percent when using these. Acetic acid concentrations in air are measured using either standard activated charcoal or silica gel tubes.

How do we prevent overexposure? (Control the hazard)

As when controlling any hazard, the first level of protection is engineering controls (i.e., ventilation) following best management practices. We supplement hardware with comprehensive training and safe work practices to prevent potential exposures. When it comes to liquid sporicides, make sure all employees are adhering to the label and safety data sheet for the right PPE. This entails protective eyewear, gloves, apron, and boots. Because there is a possibility of splash, goggles are most appropriate for eye protection, used with or without a face shield, depending on the application method.

Respirators are allowed during installation of engineering controls, during maintenance or repair, and when engineering controls are not feasible in preventing exposures. The latter scenario is likely when using liquid sporicides, and respirators may become necessary. The problem is that hydrogen peroxide requires supplied air respirators, while acetic acid protection is achieved with standard organic vapor cartridge respirators. Keep in mind, use of respirators triggers another OSHA standard, 29CFR1910.134, Respiratory Protection, and employees must be cleared by a physician, trained, and fit tested prior to use. So respirator use is a last resort for limiting exposure.

Summing up

Additional information and technical assistance are available from manufacturers as well as on the NIOSH and OSHA websites. The key to working with hazardous chemicals is (first) recognition of the hazards, followed by evaluation of any potential exposures, and finally implementation of proper controls. In the areas where liquid sporicides are used, it is most important to ensure proper and sufficient facility supply and exhaust and use of appropriate PPE. We also recommend that you conduct periodic inspections and monitoring of the air concentrations.

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Vince McLeod *is an industrial hygienist, certified by the American Board of Industrial Hygiene, and the senior industrial hygienist in the University of Florida's Environmental Health and Safety Division. He has 25 years of occupational health and safety experience at the University of Florida, and he specializes in conducting exposure assessments and health hazard evaluations for the university's 3,000-plus research laboratories.*

PIPETTES

ERGONOMICS, ELECTRONICS DOMINATE INSTRUMENT TRENDS

by Angelo DePalma, PhD

Pipetting is part of nearly every laboratory's workflow. Yet this established technology continues to undergo improvements, most related to usability and consistency.

At the top of every manufacturer's priorities, says Raymond Mercier, business director for liquid handling at Thermo Fisher Scientific (Waltham, MA), is ergonomics, which affects nearly every aspect of pipetting. Larger companies with serious health and safety initiatives lead the demand for pipettes that reduce repetitive strain while providing a high degree of reproducibility.

Pipette design also goes a long way toward reducing strain. Examples of design changes include ultralight pipettes, positioning plungers in more user-friendly configurations, using electronic pipetting, and reducing frictional forces that translate to strain.

The latter idea is one of the advantages of Thermo Fisher's Clip Tip design, which significantly alters the mechanical relationship between pipette and dispensing tip. Instead of using friction to hold tips in place, Clip Tip employs hinges, similar to those found on luggage, that fit over a flange on the pipette. "You can't pull the tip off unless you unlock the clips," Mercier says. "If the pipette picks up a tip, it's definitely sealed."

> "Multichannel pipettes provide parallelism but require many multiples of the force needed to operate single-channel pipettes."

Today's microplate-based assays would never have emerged without multichannel pipettes incorporating eight, 12, or 16 dispensers. Multichannel pipettes provide parallelism but require many multiples of the force needed to operate single-channel pipettes. Most of the strain falls on the operator's thumb. A parallel and related trend, arising from the high cost of samples and reagents, is the desire to operate at lower and lower volumes.

Traditionally, operators combat repetitive strain by sitting properly, taking regular breaks, and following training.

Electronic pipettes

Electronic pipettes represent the most serious attempt to provide consistency and improve ergonomics. From a design standpoint, electronic models provide great leeway in how the operator activates the plunger. Instead of manually pressing and releasing a plunger, the user actuates it by pressing a button. This has the effect of relieving the thumb of actuation forces, positioning the actuator button more conveniently and more ergonomically, within easy reach of the forefinger, for example. Tip ejection is mechanized as well and is under control of fingers instead of the thumb.

The downside of electronic designs is they're heavier, which adds to user fatigue. But the main reason many users have difficulty getting used to non-mechanical pipettes is that, along with the loss of repetitive thumb movements, users miss the tactile feedback that indicates the pipette is working correctly.

This was exactly the complaint old-time drivers had with power steering, a fact Mercier picks up on. "The analogy with driving is you're still steering, but a motor does all the work."

Some experts view the trend toward electronic pipetting as a kind of low-risk intermediate step between fully manual and fully automated liquid dispensing. On the basis of cost, learning curve, and throughput, electronic models are more closely related to manual devices than to automated liquid handlers. But they resemble automated systems to a greater degree in terms of accuracy, programmability, and reproducibility.

Melinda Sheehan, product manager for liquid handling at Eppendorf North America (Hauppauge, NY), views electronic pipettes as a smart value addition to many laboratory workflows. "Although you pay a premium for their functionality, electronic models streamline processes and make them more mistake-proof." The cost of pipetting aside, labs can potentially reduce the number of replicates in analyses or processes based on the superior reproducibility of electronic pipettes.

"Everyone is guaranteed to follow the same protocol and to do pipetting in exactly the same manner," Sheehan adds.

Workflow considerations

The question "to automate or not to automate" brings a variety of responses from experts. The most common answer is, "It depends." Lab managers decide based on a complex assessment of throughput, the value of consistency, and the importance of walkaway time. In regulated industries one can add documentation and the ease with which methods are validated.

Regardless, for many labs an affirmative answer is that it's easier to reach for electronic pipettes than for complex robotics and their steep learning curves.

"If you have a lot of people using the exact same kit, say, RNA or DNA extraction or ELISA, following a protocol might involve dispensing 250 microliters of one buffer, 100 microliters of another, 125 microliters of a reagent, etcetera," Sheehan explains. "Users have to go through each step over and over."

Manual pipetting requires that operators adjust volumes at each step. Expert users also adjust draw/dispense speeds when viscosity changes significantly, for example, between a high-salt aqueous solution and alcohol or a detergent. "But if two people set out to pipette manually at a specific speed, you'll get two different results," Sheehan warns. Electronic pipettes can store protocols and execute each step, including speed changes, by pressing buttons. "This ensures that experiments are conducted the same way, no matter who is running them."

The industry is not yet at the stage where users can design protocols on a computer or download them from a kit on the manufacturer's site, then upload to the pipette. Sheehan says that "some customers have inquired about that feature, which is common in fully robotic systems."

But as Alex Spector, president of pipettes.com, comments, "I would be surprised if every major manufacturer is not looking into this capability."

"Rumors of my death …"

Tides of technology aside, Spector believes the demise of manual pipettes has been greatly exaggerated. "Ten years ago everyone thought that electronic pipettes would take over the market, but today, mechanical units make up 80 percent of sales."

Early electronic designs, he explains, were too bulky, not as reliable as today's models, and two to three times as expensive as manual pipettes. "Many scientists felt that they were more in control with manual designs, especially with tricky liquids that they could not control dispensing as accurately as by hand." He describes preferences for one pipette type to another as a personal decision, "like a knife to a sculptor or a writer's favorite pen. People get attached to their preferred tools."

Angelo DePalma *is a freelance writer living in Newton, NJ. You can reach him at angelo@adepalma.com.*

FOR ADDITIONAL RESOURCES ON PIPETTES , INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABMANAGER.COM/PIPETTES

GC SYSTEMS

CARRIER GAS SHORTAGES, MS ADOPTION MAJOR TRENDS

by Angelo DePalma, PhD

For all its maturity and secure establishment in chemical analysis, predicting the future of gas chromatography is an exercise in uncertainty.

On the positive side, mass spectrometry detectors were predicted to succeed and that is happening. Today's most common MS components, single ion traps, are slowly giving way to more capable (and costly) time-of-flight and triple quad detectors. Dr. Ignazio Garaguso, chromatography product specialist at Omnilab-Laborzentrum (Bremen, Germany) notes that newer MS modes allow users in research and discovery labs to probe unknown compounds through fragmentation patterns.

Another trend is the switch from helium carrier gas to hydrogen, yet the zeal with which users are embracing hydrogen is not as clear-cut as for TOF or triple quad MS detectors. The carrier gas switch is based on the worldwide helium shortage, which after four years shows no signs of abating. With major suppliers cutting back on production and issuing "Dear Customer" letters announcing delayed shipments, users are scrambling for solutions.

Hydrogen is far less expensive and more plentiful than helium, and as the carrier gas it serves as fuel for flame ionization detectors. Runs are also significantly shorter due to the atomic mass difference between the two elements. Negatives include flammability (although not at GC usage levels) and the need to rethink methods in several ways.

Garaguso comments that "even when results are similar, the helium-to-hydrogen conversion requires method revalidation." The other drawback is that where helium is inert, hydrogen is reactive, a characteristic that may complicate MS detection by creation of additional fragments. But Garaguso is reluctant to say that MS detection under hydrogen is inferior. "You get different retention times and different fragments, but I would not say hydrogen is less suitable for MS. It's different."

Less certain have been adoption rates of GC and multidimensional GC (GC-GC), which have been growing but not as robustly as experts predicted. Uptake in environmental analysis, for example, has been slow for both GC modalities. The reason is probably related to standardization of common environmental methods and a reluctance on the part of labs to devote resources to redesigning and revalidating newer methods.

No fix for the helium shortage is perfect, as none achieves all desired goals without compromise. Switching to hydrogen or nitrogen carrier gases is fine if methods exist for those mobile phases but inconvenient if they do not.

The simplest solution involves minimizing helium usage. Several firms, including Agilent and Shimadzu, claim substantial gas savings by utilizing less expensive mobile phases for noncritical operations. Thermo Fisher's approach is based on a new technology being implemented on the split/splitless injector of the company's TRACE 1300 Series GC, similar to the technology which adopts instant connect detectors and injectors, introduced last year, to facilitate swapping components in and out.

"The idea is to allow users to continue using helium but to conduct all sample splitting and septum purges under much less expensive nitrogen gas," explains Massimo Santoro, GC marketing manager at Thermo Fisher Scientific (San Jose, CA). "This way, a helium tank will last anywhere from more than three years up to fourteen years, even under heavy use. Even more important, labs run a much lower risk of operational shutdown."

Unlike with gas-switching strategies, the helium mobile phase chromatography remains unaffected. There is no need to validate new methods or account for lower sensitivity or unanticipated fragmentation in MS detection.

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SPECIALTY GASES

LAB PROCESSES AND ANALYTICAL STANDARDS

by Angelo DePalma, PhD

Chemical processing and analysis are fueling a resurgence of interest in highly purified specialty gases. Novel gas-phase chemical reactions reduce the number of unit operations and side products while eliminating the disposal of toxic solvents. Ultrapure supercritical carbon dioxide is experiencing a renaissance of its own, both in processing (mainly through extraction) and in analytics. Several vendors are pushing supercritical fluid chromatography as a mainstream analysis tool, especially for chiral compounds, with Waters (Milford, MA) adapting supercritical fluid analysis to its ACQUITY platform.

Energy-related applications of specialty gases are not limited to analysis. Manufacturers use low-conducting gases like argon as insulation between glass panes in energy-efficient windows.

One normally thinks of specialty gases as components of processes (as above for chemical synthesis) or laboratory operations (GC carrier gases, sparging of liquids). But Tony Reccek, director of business development for specialty gases at Airgas (Radnor, PA), notes the importance of high-purity specialty gases as analytical standards.

Automotive emissions are one critical application. "The EPA is tightening emissions specs. As emission controls get tighter and more components are added to the list, manufacturers must demonstrate compliance," Reccek tells *Lab Manager*.

Go-to sources

Recent additions to air emission standards, including mercury and hydrochloric acid to part-per-billion levels, apply to traditionally "dirty" industries such as power plants and cement making. In addition to maintaining those species in an analysis-friendly state, companies must demonstrate compliance with evolving regulations based on methods that utilize NIST-traceable standards. Specialty gas manufacturers have become go-to sources for those standards.

NIST-traceable standards are the buzzword in natural gas analysis, as energy companies explore more and varied sources. "Natural gas varies significantly based on where it's from," Reccek explains.

The need for pure standards trickles down to the point of use as well. For example, natural gas-powered vehicles are tuned for specific gas compositions and vetted based on their emissions profiles. Designers must therefore determine the precise composition of both their fuel and what emerges from the tailpipe. Both data sets rely on precise analytical standards.

"If you're a chemist in a laboratory charged with keeping a product within spec, or a company that must demonstrate compliance, the first thing you're wondering is whether you're right," Reccek says. "Your instrument says you are, but the only way you can be sure is by incorporating in your analysis NIST-traceable standards that all governments and regulators accept."

Calibration gases

Standard gas mixtures are common reference tools in analytical laboratories, both for quality control and for environmental applications. Calibration gas mixtures contain as few as two gases or as many as 160. Lucie Prost, vice president, metal fabrication at Air Liquide Canada (Montreal, Quebec, Canada), notes that these mixtures are used for testing, analysis, and quality control in environmental, energy, food, and manufacturing industries.

For energy customers, Air Liquide provides custom-formulated mixtures that reflect the customer's product. Mixes contain the range of expected hydrocarbons—ten to 15 molecules are typical—at their anticipated concentrations. ALC offers pure gases at two purity standards, ALPHAGAZ 1 and ALPHAGAZ 2.

Standard hydrocarbon gases assist in calibrating the response of gas chromatographs or other testing/monitoring equipment to actual samples. In GC this is the idea of "response ratio"—the ratio of detector response to the quantity of an analyte known to produce a signal. For monitors and sensors, the gases provide calibration.

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BATHS & CHILLERS

KEEPING PROCESSES UNDER TEMPERATURE CONTROL

by Mike May, PhD

Across research laboratories and industrial-manufacturing facilities, many processes must be kept at a specific temperature, and that requires baths and chillers. In terms of refrigeration, Amy Drummond, regional sales manager, USA, Grant Instruments (headquartered in Cambridgeshire, UK), says, "It's one of our most diverse product ranges—spanning education, government, pharma, and industry."

Even that does not describe the broad use of these products. In fact, the overall extent keeps changing. As Bob Given, director, product management, Thermo Fisher Scientific (Waltham, MA), says, "We kind of get surprised at some of the applications where people are looking to use some of our products." As intriguing examples, he mentions video-game testers using chillers to get rid of the heat generated by the electronics, a top-fuel dragster incorporating a chiller to keep the engine cool between heats, and even cooks applying special temperature control.

For the last example, Given says, "We were contacted by a restaurant that wanted to use our bath to start to precook chicken and other meats. Then, they vacuum sealed the meat in a marinade." He adds, "They don't need to freeze it after this process, and it makes it easy to do final preparation, like grilling or frying or pan searing."

To make sure that everyone understands the breadth of this product area, Given says, "We touch everything from trying to find a cure for Alzheimer's disease to using our equipment to cool lasers." Some of these applications require extremely reliable cooling. "In health care and the pharmaceutical industry," Given says, "it could take six months to get a specimen ready to test, so our equipment can't go down."

Best buys

This market brings customers a wide variety of options. "In refrigeration," says Drummond, "we have four different thermostats and five different refrigeration units, and you could have a combination of any of them. So you can imagine the variety."

> "We touch everything from trying to find a cure for Alzheimer's disease to using our equipment [chillers and baths] to cool lasers."

Getting greener

For chillers in particular, energy use is a key concern, primarily because these devices consume considerable amounts of energy. "Due to the heat and noise generated refrigeration is not typically environmentally friendly, but manufacturers are aware of this and this is a key component in the design of new refrigeration products," Drummond says.

Given agrees with the green trend, saying, "Energy use is very important." He adds that reducing noise also matters. "For bath products in a lab," he says, "you don't want excessive noise."

Tomorrow's devices could be even greener. "In the future, we will see more thermal electric—Peltier—devices used in cooling and heating technology rather than Freon compressor-based units," says Mark Circo, president and CEO at Tritech (Edgewater, MD).

To get the right cooling product, a customer must consider many factors. First, what temperature is needed for the intended application? Also, how accurately must that temperature be maintained? As an example, J. Michael Trapp, laboratory director of the environmental quality laboratory at Coastal Carolina University (Conway, SC), says that the most important features are "the ability of the bath to hold very accurate and constant temperature."

Other features, such as the size of the bath chamber, might also be considered. "Too large is as bad as too small," says Circo. He adds that the types of controls also matter. "Analog controls are great if you use a constant temperature for your samples and do not need to adjust temp on a regular basis," he says. "If you need to adjust temps for different samples, digital

controls are the way to go, because they offer a more precise method for controlling temp."

In many cases, customers could use some help deciding what features a bath product should provide. As Given says, "We find all too frequently that customers really can't define their applications well enough in terms of how much power they need, how much heat load they have, and so on." He adds, "It's critical to take the time to understand all of the elements up front." Vendors will also help a customer come up with the best specifications for a specific application.

Every aspect of an application, though, must be considered in order to get the best fit. "Are you using the device for the bath or do you need to pump water out to cool something?" Drummond asks. "Some production processes require pumping, such as heating or cooling a food mixture to see how temperature changes the components." If an application does require cooling something, the size of the object must be considered when purchasing a cooling device.

products and fluid in the system itself. If you use corrosive cleaning products, for example, you can cause irreparable damage."

Beyond putting in the right fluid at the start, Given points out that it must be maintained. So the fluid used in a bath should be replaced over time or adjusted for specific characteristics, such as pH.

Though baths and chillers can be used in many different industries, a device for a specific application must often meet very precise needs. To get the right device, a customer must know the necessary features, and the market provides a wide assortment of them.

__Mike May__ is a freelance writer and editor living in Ohio. You may reach him at mike@techtyper.com.

"Refrigeration is not typically environmentally friendly."

Make the most of maintenance

Like any product, the key operating and maintenance tips can usually be found in one obvious place, the manual. As Drummond says, "We provide a very detailed description of how to clean and maintain a product in our manual."

Still, Drummond points out some crucial things to keep in mind. For example, she says, "Don't turn on the device when there is no liquid in it, because trying to heat or cool something that is not there damages the product." She adds, "You must also use the correct cleaning

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CO_2 INCUBATORS

MORE FEATURES DEMAND MORE QUESTIONS WHEN SHOPPING FOR ENVIRONMENTAL CONTROL

by Mike May, PhD

In a 2012 report, Global Industry Analysts in San Jose, California forecast a growing market for carbon dioxide (CO_2) incubators. That comes as no surprise given this technology's laundry list of applicable fields, which includes cell and tissue culture, protein synthesis, and much more.

According to Charlie Villano, product manager for Eppendorf North America (Hauppauge, NY), "Cell-culture scientists are always trying to recreate *in vivo* conditions for optimal cell growth, recreating 'in the body' cell environments." As an example, he talks about using CO_2 incubators in "cell-based and tissue-based therapies, especially with the advances in personalized medicine."

How a CO_2 incubator gets used also changes as researchers face novel experimental challenges. One such challenge, noted by Villano, comes from working with suspensions of cells in a CO_2 environment. In such cases, he says, "Customers are placing shakers inside of CO_2 incubators instead of using spinner flasks, which are more aggressive and produce shearing forces and higher cell death than shaking in a standard shake flask inside of a CO_2 incubator, especially with stem cells."

"Cell culture scientists are always trying to recreate *in vivo* conditions for optimal cell growth, recreating 'in the body' cell environments."

Multi-gassing

Learning more about the most nurturing environments for growing cells drives changes in incubator technology. "Historically, cell culture has been performed with ambient air containing 19 percent oxygen with only control of CO_2 levels required," Villano explains. "Recently, cell-culture scientists have recognized that cells grow better under hypoxic conditions or physiological levels of oxygen that are below 10 percent." That requires a CO_2 incubator that includes oxygen control. Villano says, "Additional research with tumors in oncology requires conditions below 1 percent, with control of some CO_2 incubators at levels of 0.1 percent O_2 control."

Other vendors see similar trends. For instance, Deepak M. Mistry, director of strategic development and marketing at Panasonic Healthcare Company of North America (Wood Dale, IL), says, "There's more interest in multi-gas incubators." He adds, "We're seeing more people using CO_2 incubators for stem cells and cell therapy, and that requires highly accurate maintenance of the CO_2 and O_2 levels."

To keep those levels accurate, scientists often seek incubators with real-time monitoring. "This can include real-time detection of CO_2 and pH, possibly even monitoring each cell plate," Mistry says.

Keeping it cozy

Many users require more than one CO_2 incubator. For instance, Marissa T. Cooke, the research operations manager who oversees the stem cell core and the McDevitt

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Laboratory at the Georgia Institute of Technology in Atlanta, says, "We use seven CO_2 incubators." When running so many devices, some features turn out to be crucial. As Cooke says, "Features that matter most are those that maintain sterility, such as nonreactive surfaces, easy-to-use decontamination cycles, etcetera."

To keep an optimum environment for cells, other factors must also be maintained. For example, Villano recommends: "Customers should check CO_2 and O_2 levels with an independent analyzer or Fyrite tester on a periodic basis. With time, all incubators require calibration to maintain the correct measurement of chamber environments." Temperature, when included as a controllable option, should also be tested.

Finding the right features

When searching for a new CO_2 incubator, Villano recommends thinking beyond CO_2 control by answering this list of questions:

- Will you also need to control O_2 levels?
- Will you need to incubate cells at or near ambient conditions, requiring a cooling option to work at these temperatures?
- Are you looking for an easy way to minimize potential contamination issues by choosing an easy-to-clean incubator together with a high-temperature decontamination cycle?
- Do you want to stack your incubators or select smaller, benchtop units to maximize lab space?
- Is it more efficient for you to dedicate a smaller incubator—say, a 14-liter one—to hypoxic conditions for difficult primary cells instead of dedicating a standard-size incubator for special cell applications?
- Do you need multi-doors to improve recovery time after openings, reduce gas consumption, and decrease the chances for contamination?

Mistry adds to the last point: "Do you put cells in and only open the incubator every five days or every hour? For more frequent opening, you need something that recovers quicker." That is, a frequently opened incubator needs faster rates of rebalancing all the crucial environmental factors. In an incubator that stays closed more, it might not pay the user to spend the money for faster recovery rates.

As an additional point to consider, Villano suggests that users "select an IR sensor for more direct measurement of CO_2 levels versus the older TC—thermal conductivity—that requires more periodic calibration." Mistry adds, "The more sensitive the cells you're working on, the more you need to look at the sensor technology. Ask the supplier to convince you what type of sensor would work best for you."

Perhaps the trickiest part of researching incubators involves some soothsaying. As Mistry explains, "Being an end user myself back in the day, I would say that you should consider what you are doing now and what you will be doing five years from now."

Plus, getting the best CO_2 incubator for a particular application involves more than the kinds of cells that will be kept. It also depends on what devices hold the cells. Mistry says, "We did a customer study that showed that the same cubic capacity lets you keep more of some flasks than others, depending on the design." So the shape of the cubic space impacts the overall capabilities of an incubator.

In a GMP environment, other factors come into play. "In this case, users benefit from a product that can be easily validated for temperature, gas levels, and so on," Mistry says. For each instance, the best CO_2 incubator provides the needed balance of features for today and tomorrow.

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QUALITY CENTRAL

IN THE MIDDLE OF MANY DEPARTMENTS, COMMUNICATION IS KEY FOR THIS LAB

BY RACHEL MUENZ

"If it can be made out of corn, we pretty well make it."

That statement by Eric Collop, lab manager at Lifeline Foods' (Saint Joseph, MO) quality control lab, sums up the corn product and ethanol plant in a nutshell. Or, a corn kernel, in this case. Using every part of the corn kernel, the food plant at Lifeline produces brewer's grits, multiple varieties of corn meal, masa flour (used in Mexican-style foods such as tortillas), and food binder—based on corn starch—for some of the largest food and beverage manufacturers in North America. The parts of the corn kernel not used for food products are transferred to the company's fuel ethanol facility where they are used to produce ethanol, dried distillers grain—a high-quality animal feed—and corn oil.

It's the lab's job to make sure those products meet the customer's needs.

"Our role in the lab is to ensure the quality of the product throughout the process and to certify the product before it leaves the facility," Collop explains. "All products are routinely tested throughout production by both lab and production staff to ensure that any issues are corrected before final packaging. Once in the finished container (bulk rail, truck, or packaged), the product is tested for all the key attributes the customer requires, and a COA [certificate of analysis] is produced before the shipment leaves the facility."

Lifeline Foods lab manager Eric Collop.

Almost all of the roughly 2,000 samples the lab deals with each month are tested for three main attributes—moisture, fats, and granulation. Brewer's grits, for example, are much coarser than cornmeal or corn flour.

Those analyses are handled by Collop and his staff of four lab techs, who work 12-hour rotating shifts to provide 24/7 coverage to the facility, and one full-time microbiologist. However, all 150 of Lifeline's employees play a role in the quality of the final product.

Company culture and getting schooled

Employees taking ownership of their tasks is a big part of working at Lifeline, as reflected in the fact that all employees receive company culture training when they start.

An aerial shot of the Lifeline Foods facility, which sits on about 35 acres.

"For example, if a guy's filling bags of snack meal all day long, we want him to take ownership of that process, so that if he sees something that could be done better or differently, more efficiently, we definitely encourage him to bring those thoughts forward," Collop explains. "It just makes our job easier and, by default, makes us more profitable."

Specifically for those in the lab, training concentrates mostly on standard operating procedures (SOPs) and good lab practices for the first two weeks before employees are schooled in how the corn mill and ethanol plant work.

"The more they know about the actual production processes, the easier it is for my department to be able to assist them [production staff] with any issues they're having," Collop says.

Training also involves HACCP (hazard analysis and critical control points) and plant safety, with all employees doing mandatory safety training for one hour each month. While lab staff don't face the same hazards as production staff, they do need to make sure they are wearing steel-toed boots, hard hats, safety glasses, and hair nets to protect the products they produce, and just use common-sense caution, Collop says, adding that Lifeline has a full-time environmental health and safety manager to handle all safety issues.

> "[The employees] appreciate that—that I've done their jobs before and have a pretty good understanding of what they're doing."

Collop has a unique insight into his employees' jobs, as he has worked essentially all the positions in the lab since starting as a lab tech at Lifeline nine years ago, moving on to the ethanol testing side, then unofficially filling the microbiology position before becoming lab manager.

"That gives me a better outlook, I feel, than somebody just coming in and managing the lab," Collop says. "I've actually done their jobs and I know what's required to do their jobs, so I know how much workload they can or can't handle. I think they appreciate that—that I've done their jobs before and have a pretty good understanding of what they're doing."

He adds that, while Lifeline prefers lab staff to have a bachelor's degree in either biology or chemistry, past experience

Lab tech Melissa Miller tests the granulation profile of a product.

in a lab setting is also important, and postsecondary education isn't absolutely necessary to do well.

"I have had lab techs with a high school diploma up through master's degrees, and all can be successful," Collop notes.

Job variety, challenges, and communication

Like many lab managers, Collop is responsible for a number of duties that change with Lifeline's business needs. Those tasks include handling all staffing issues in the lab to maintain 24/7 coverage, communicating results to production employees and upper management, troubleshooting off-spec product or processes, and maintaining and repairing testing equipment throughout the facility. He also takes care of the inventory and purchasing of lab supplies, assists customers with any product issues, helps the sales team with new product development and customer plant visits, and is involved with the SQF (safe quality food) audit process, as well as other third-party audits.

"The lab has oversight of all production areas in the plant, so I constantly have to stay updated on changes in the process," Collop says, adding that variety is what he enjoys most about his position. "It is never the same; I cover a lot of ground throughout the day. In any given day I can be sitting at my desk working on reports one minute, then be crawling in a tank or be covered in corn flour the next."

The sheer size of the Lifeline facility, which is situated on about 35 acres, also presents some challenges to the job. The lab itself is 4,500 square feet, and there are five satellite labs spread across all production areas and the scale house (grain receiving area) to test in-process product as well as incoming corn.

"As with any production facility, there are many moving parts that can affect quality. Our corn mill alone is six floors," Collop says. "As an example, one sifter screen out of hundreds can become worn and affect the granulation profile—finding that worn screen requires constant vigilance."

> "I have had lab techs with a high school diploma up through master's degrees, and all can be successful."

Lab manager Eric Collop works with the Lifeline lab's HPLC system.

Communication is the key to handling the challenges of working in such a large facility, with lab staff constantly monitoring the data and detecting issues before they become major problems.

"The lab staff is trained to communicate any variance in the product to the operators so it can be corrected," Collop

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says. "Using historical data from the lab, the maintenance department can then adjust our preventive maintenance program accordingly."

Documentation is also an important part of that communication process.

"If you call someone on a radio and say, 'Hey your moisture's high,' there's no record of that," Collop explains. "If it's not written down, it never happened."

Lifeline, which got started in 2001 and added its ethanol plant in 2007, now has a system similar to a LIMS, in which any analysis of moisture, etc., is automatically entered into a database, which can then be accessed live on the Web by the production staff.

"That's helped a lot, and I see a lot more of that coming in the future," Collop says of the system, adding that many of the production and maintenance areas have switched to using iPads for documentation. "This has streamlined our documentation to a very efficient level, since documents are accessible to management immediately on completion. I see the lab moving to this setup in the next year."

Each lab tech also communicates what occurred during his or her shift to the next lab tech during the changeover to the following shift, helping to keep things organized.

"Communication is the key, whether it's verbal, email, text, phone, radio, or documentation," Collop says. "Communication in the lab is flowing at all times."

"In any given day I can be sitting at my desk working on reports one minute, then be crawling in a tank or be covered in corn flour the next."

➤ *Microbiologist Veronica Arroyo tests the moisture content of ethanol.*

➤ *Brewer's grits are just one of the products Lifeline Foods makes in its corn milling plant.*

How things are changing

Currently, Lifeline is going through a renovation of its entire corn mill, which has meant installing state-of-the-art Buhler milling equipment. It also means the strong communication and teamwork between lab and corn mill staff will be more important than ever.

"This will increase our mill's efficiency, allowing us to make more product using less corn," Collop says of the upgrades. "In the coming month [November], the lab will be instrumental in assisting the milling staff in fine-tuning the new equipment."

As far as recent changes in the overall industry, Collop says new requirements by food retailers have had the biggest effect.

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▲ *Ethanol operator Mike Holt counts yeast cells to assess fermenter health.*

"In the past few years, major retailers have begun to require suppliers to [meet] a standard approved by the Global Food Safety Initiative," he says. "Lifeline Foods obtained SQF certification in 2012, which ensures that all policies, procedures, and actions of the facility are directed toward making safe, quality food."

"Communication is the key, whether it's verbal, email, text, phone, radio, or documentation."

And, of course, the FDA's Food Safety Modernization Act (FSMA) of 2011, which aims to ensure that the U.S. food supply is safe by shifting the focus from reaction to prevention, had an impact as well.

"Although most of the requirements were already being addressed by Lifeline Foods, it added more government reporting requirements," Collop noted of the recent change.

However, meeting those requirements, as well as the company's own high standards for quality, is made easier by Lifeline's strong focus on teamwork and results, which are rewarded through company-sponsored lunches, tickets to sporting events, gift certificates, and an employee bonus plan.

"At Lifeline Foods, we focus on, reward, and celebrate results, not effort alone," Collop says. "The whole process is a team effort."

And it also helps with motivation that Lifeline is linked to industries that aren't likely to become unimportant anytime soon, including companies that make Collop's favorite corn-based products—extruded corn snacks such as cheese puffs, and beer.

"It's nice to be tied in with industries that aren't going away, and the corn snack-food industry and beer sure aren't going away," he says. "It's good to have that security."

***Rachel Muenz**, assistant editor for* Lab Manager, *can be reached at rachelm@labmanager.com or by phone at 888-781-0328 x 233.*

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TECHNOLOGYNEWS

slas 2014 3rd annual CONFERENCE & EXHIBITION

SLAS2014, the Society for Laboratory Automation & Screening's third annual conference and exhibition, will take place January 18-22 in San Diego, CA. Here, attendees will get to take advantage of networking opportunities, scientific education, and check out a scientific program featuring 130 podium sessions, hundreds of posters, 17 short courses, exhibitor tutorials, and satellite symposia. And of course, they'll be able to see the latest offerings from lab automation product manufacturers, some of whom we've highlighted in this edition of Tech News. Please note that the products shown here won't necessarily be at SLAS, but the highlighted companies will be.

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- Available with a choice of controllers including the company's new ECOair™ touchpad control with color display interface
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- Five standard sizes available

Air Science USA www.airscience.com

Jacketed Reaction Vessel

ReactoMate Pilot

- Offers precise control of reaction variables, a powerful direct drive overhead stirrer and excellent reaction visibility even with the vacuum jacket option
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- Available packaged with a Julabo A40 Presto Circulator, a ReactoMate-Pilot Super Support system, and IKA overhead stirrer

Asynt www.asynt.com

High Precision Digital Pipettors

Ultra EZpette™

- Provides both accurate and precise liquid dispensing in a comfortable ergonomic design
- Available in the choice of pink or blue with 8 different models that cover volume ranges from 0.1µL to 10mL
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Denville Scientific www.denvillescientific.com

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Part No. 3200345

- Designed specifically for in-line liquid-liquid separation, liquid-liquid contacting, dead-end and cross-flow filtration, and electrochemistry applications
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Dolomite www.dolomite-microfluidics.com

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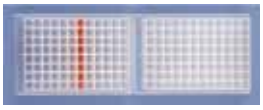

- Enables scientists to rapidly dry their samples without cross-contamination or loss of sample due to solvent bumping
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- Available for all current models of Genevac centrifugal evaporators, from the affordable EZ-2 through to the production-scale HT-24

Genevac www.genevac.com

Serological Pipettor

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PIPETBOY acu 2

BOOTH 911

- Provides a significant increase in pipetting speed and a sizeable weight reduction, making using the instrument over extended periods of time even more comfortable
- Also gives users precision, ease-of-use, long operating battery life and reliability
- Designed for use with all commercially available glass and plastic serological pipettes in the volume range 1-100 ml

INTEGRA www.integra-biosciences.com

Peristaltic Pump System

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- Allows maintenance free, continuous flow pumping for various fluids
- Can easily dispense in forward or reverse direction using the touchscreen display
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KD Scientific
www.kdscientific.com

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LabPackage

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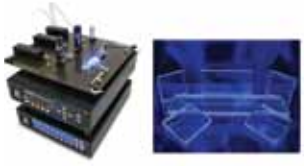

- Includes the HVS448 eight channel sequenceable high voltage power supply, the SVM340 synchronized video microscope, uProcess™ automated pumps, valves, and sensors, and CapTite microfluidic microconnectors
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PolyScience www.polyscience.com

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QImaging www.qimaging.com

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- Easy to assemble containers feature more useable interior space but keep the same small, space-saving footprint
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CELL CULTURE

Animal-Free and Endotoxin-Free Stem Cell Factors

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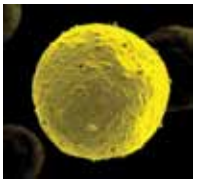

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AMSBIO www.amsbio.com

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Solentim www.solentim.com

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- Features an integrated cell counter and automated liquid handling

TAP Biosystems www.tapbiosystems.com

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Cellmate Mk9

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- Can be UL certified and include in-line particle counter that can be used to monitor non-viable particle loading in the processing area
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Sclerostin-LRP Interaction Screening System

Leading Light™

- Developed to meet the market need for a simple, sensitive biochemical screening assay for detection of sclerostin (SOST) inhibitors
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Enzo Life Sciences www.enzolifesciences.com

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EMD Millipore www.millipore.com

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Affymetrix www.affymetrix.com

High Throughput Array System

BioFlux Quattro

- Can expand the capabilities of any existing BioFlux 200 or BioFlux 1000/1000z system
- Runs up to four BioFlux plates at the same time
- Plates can be read by a microscope or High Content Screening system as a time-point or end-point assay
- Increased throughput is especially valuable for lead optimization applications

Fluxion Biosciences www.fluxionbio.com

Single-use Waste Collection Bottles

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VACUSIP

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- For INTEGRA's VACUSIP benchtop aspiration system, which provides a compact, portable solution for safe and convenient disposal of small volumes of biological liquid waste
- Made of heavy duty polypropylene
- Shatterproof and vacuum resistant design eliminates risks of breakage and contamination by the biological agents during manipulation

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ChIP Assay Plate

Chromatrap®96 HT

- Designed to enable researchers to perform up to 96 ChIP experiments in parallel
- Assays can be performed either by using hand-held multichannel pipettes or by using automated liquid handling robots for even higher throughputs
- Volume and dimensions of the wells in the microplate are very similar to that of the established Chromatrap Spin-columns

Porvair Sciences www.porvair-sciences.com

96-position, Deep-well Microplate

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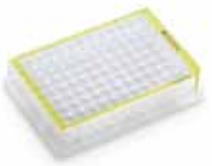
AC Extraction Plate™

BOOTH 405

- Automation-friendly solution designed to streamline sample preparation for LC-MS analysis of small molecules
- Reduces the sample preparation process to a convenient 'pipette and shake' routine
- Inner surface of each well is coated with a highly controlled layer of TICE (Tecan Immobilized Coating Extraction) material
- Coating efficiently extracts low molecular weight analytes from aqueous solutions



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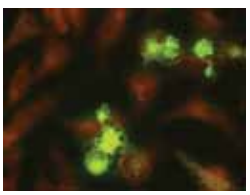

ViroStat www.virostat-inc.com

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Software-based LIMS

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Abbott www.abbott.com

NGS Data Analysis Software

BioDT™

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BioDatomics www.biodatomics.com

Software for Fear Conditioning, Tail Suspension and Porsolt Swim Testing

FreezeFrame

- Features a video-based system for fear conditioning
- Able to detect minute movements of grooming, sniffing, turning and rearing
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Coulbourn Instruments
www.coulbourn.com

Quantitative Open Access Software

Quan Solution

- For use with Shimadzu's LCMS-8030, LCMS-8040 and the LabSolutions LCMS
- Gives users unfamiliar with LCMS software the opportunity to perform LC/MS/MS analysis using pre-set methods without extensive training
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- Equipped with a function that copies analyzed data files to a file server

Shimadzu www.ssi.shimadzu.com

Flow Totalizer Software

QuadraTherm® 640i/780i

- Designed for the QuadraTherm 640i/780i mass flow meter
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High-Performance Workflow Manager

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Terascala www.terascala.com

SUPPLIES & CONSUMABLES

Dual 10 to 50 Milliliter Flask Clamps

EZ-Clamp

- Answer the demand for a clamp capable of holding small sample sizes
- With the new clamp, LabStrong now offers EZ-Clamp Flask Clamps ranging in size from only ten milliliters up to two liters
- Feature magnets on the base of the clamp allowing for simple attachment and reconfiguration of the clamp, without the hassle of any tools

LabStrong www.labstrong.com

Low Profile Screw Caps

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- Compatible with Micronic's entire range of 96-well format Screw Cap storage tubes (0.50ml, 0.75ml, 1.10ml, 1.40ml and 2.00ml)
- Since the tube height with Low Profile Screw Caps is now identical to the tube height with a TPE Cap—the same low profile rack cover can be used for both types of caps, increasing operational flexibility for organizations using both types of storage tube closures

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96-Well Deep Well Plate

- Delivers 2.00 ml liquid capacity / well in an automation compatible SLAS / ANSI footprint
- Enables labs involved with fraction collecting, storage, plate replication and mixing applications the chance to use the full well capacity without compromise
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Porvair Sciences www.porvair-sciences.com

Tissue Vials

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CryoELITE®
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- Designed for the safe, secure and effective cryopreservation of biological tissue specimens
- Offers researchers a uniform vial able to maintain sample integrity while maximizing storage capacity and organization
- Feature a wide-mouth opening, 5mL capacity and high integrity closure
- Manufactured from low binding, cryogenic-grade virgin polypropylene that meets USP Class VI classification

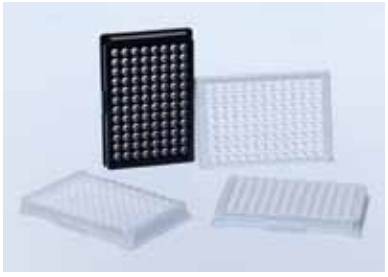
WHEATON www.wheaton.com

INSIGHTS ON STREAMLINING A MICROBIOLOGY LABORATORY

DOING IT THROUGH RAPID TESTING, AUTOMATION, AND "CHEMISTRY" INSTRUMENTS

by Angelo DePalma, PhD

▲ *Agar Media Dishes / Microsart @media Sartorius / www.sartorius.com*



▲ *96-Well Microplates with 3D Epoxy Surface Greiner Bio-One / www.greinerbioone.com*

▲ *Air-cooled Benchtop Centrifuge / Allegra X-5 Beckman Coulter / www.beckmancoulter.com*

Microbiology—the study of microscopic organisms, mostly single-celled—is one of the deepest, broadest scientific disciplines. Microbiology is an essential component of human and veterinary medicine, pharmaceuticals production and safety, wastewater treatment and bioremediation, food fermentation and quality, agriculture and plant biology, environmental and workplace testing, and at least a dozen areas of pure research.

Several subsets exist within each category, and each business segment is characterized by unique workflows and, to a lesser degree, equipment, instrumentation, and consumables.

Cell culture and microbiology labs differ in several important aspects. In cell culture, the cells themselves or the molecules they produce are usually the "product." In microbiology, the "answer" is a test to determine the presence, viability, or quantity of some organism.

But two important overlaps exist, in the form of cell-based assays for cultured cells and fermentation cultures in microbiology.

Both cell culture and microbiology labs use microplates. Plates are used in cell culture for screening before amplification within flasks and bioreactors. Microbiology does not generally scale up beyond what is necessary to conduct an assay, whether the format be a microplate, petri dish, or instrument. Cell culture labs follow good laboratory practices and good manufacturing practices (for therapeutic cells and cell-derived proteins), while microbiology labs operate under a myriad of laws and standards from the EPA, OSHA, American Society for Microbiology, College of American Pathologists, and various industry groups and the FDA's food regulations.

Yet operationally the two labs are quite similar. Alex Esmon, PhD, global product manager at Thermo Fisher Scientific (Asheville, NC), notes that both keep an eye on costs and readily acquire equipment that offers advantages to users, workflows, and obtaining consistent results.

Both labs use centrifuges, microscopes, clean benches and hoods, rockers, rotators, and mixers. "A microbiology lab looks a lot like other labs, with some equipment differences," Esmon explains. "For example, they typically ask different questions of their organisms of choice than a cell culture lab does."

Culture media are equally critical for microbiology and cell culture labs, as both industries seek quality, trustworthy basal media that support the expansion of cells and microorganisms. Unless they are following set protocols, cell culture labs often tweak media to encourage growth and protein productivity in recombinant cells. Industrial microbiology tends to use off-the-shelf media optimized for their specific organism; media optimization occurs only in media development and general research labs.

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"Media tends to be more standardized in microbiology, particularly in clinical labs," Esmon explains. "But in research they're probably asking the same types of questions as in cell culture labs, where media are much more variable."

Speed to result is important in any analytical industry, but it is particularly critical in microbiology. "Labs are always looking for a faster result," comments George Tice, R&D director for molecular diagnostics at DuPont Nutrition & Health (Wilmington, DE). "In the food industry, products are kept on hold until they have a result. If you're dealing with fresh ground meat, time is money." Here, sampling variability adds a dimension that is rarely seen elsewhere. "Some assays are designed to detect one CFU (colony-forming unit) or viable cell per sample. That sample can be anywhere from twenty-five to 375 grams, but you must still detect that one CFU," Tice adds.

Vendors of media, instrumentation, and equipment are assiduously pursuing workflow improvements in sample preparation, sample processing, workflow integration, and making organism testing more user-friendly. Medical and food labs, moreover, are looking for assays that provide information on multiple pathogens through a single test.

These improvements will take time. Some are in their earliest stages, while others have already hit the market. The vibrancy and growth in microbiology almost ensure that they will be achieved.

RAPID MICROBIOLOGY

Slow acceptance, strong take-up

Rapid microbiology methods are taking the world of microorganism testing by storm, with applications in medical diagnostics, foods, and agriculture leading the way. PCR is now routine for field testing and, in hospitals, to manage life-threatening infections. In foods, both farms and factories have adopted PCR, particularly in rapid or portable formats.

Because of the diversity of microbiology assays, defining "rapid" is not straightforward. Some rapid tests take a few minutes to run but require more or less traditional culturing. Other methods take a few hours. Michael J. Miller, PhD, president of Microbiology Consultants (Lutz, FL), describes rapid methods in relative terms: "Any method that provides identification, quantitation, or enumeration in significantly less time than classical methods, often with greater sensitivity."

Miller's website, microbiologyconsultants.com, is an educational resource used by thousands of microbiologists worldwide.

> "Because of the diversity of microbiology assays, defining 'rapid' is not straightforward."

Some growth-based rapid methods home in on surrogates of colony-forming units, such as metabolites or cellular targets such as ATP (a measure of viability); others employ fluorescence, Raman, or light scattering to detect microcolonies long before humans are capable of seeing them. Still other methods use stains or fluorescent tags that prefer one organism over others. These techniques are often used without enriching (culturing) the sample. Detection occurs through flow cytometry or solid-phase cytometry.

Polymerase chain reaction (PCR) is the basis of a separate branch of microbiology that amplifies genes over the course of several hours, then detects signature genetic sequences. In addition to positive identification, PCR provides an estimation of cell count.

"Some techniques approach real-time detection and counting of viable microorganisms, which is a far cry from waiting days for colony-forming units," Miller says.

▲ *Droplet Digital PCR System / QX200 / Bio-Rad / www.bio-rad.com*

▲ *Flow Cytometry System / Navios / Beckman Coulter / www.beckmancoulter.com*

▲ *PCR Workstations / AC600 Series AirClean Systems / www.aircleansystems.com*

While all classical and many rapid techniques depend on expanding organism populations through culturing, some organisms will not grow in culture due to stress or non-optimized culture conditions. Rapid methods that do not rely on culturing are by definition more sensitive than other methods because they detect fewer organisms.

Infectious disease, pharmaceutical, and biopharmaceutical assays normally focus on viable organisms with the ability to reproduce inside a host. In injected drugs, even dead organisms and their fragments can cause severe allergic responses.

Infectious agent testing is big business. In its 2012 report, *The World Market for Infectious Disease Diagnostics*, Kalorama Information estimated this market at $14.5 billion in 2012. With predicted percent yearly growth, it will reach $18.3 billion in 2017. While traditional immunoassays and culture-based microorganism identification and antimicrobial sensitivity testing are holding their own, demand for rapid, specific, sensitive tests fuel this market segment's growth.

It takes time

Rapid methods are not yet mainstream in all markets. Although the methods were introduced nearly simultaneously in clinical and pharmaceutical markets, in the early 1990s clinical labs adopted rapid methods, while their use in drug safety testing lagged.

Both industries require validation and qualification of assays and instrumentation, and both are highly regulated, but their cost structures differ significantly. Medical testing is a commodity business, while pharmaceutical businesses have been slow to adopt cost cutting. A large roadblock for therapeutics was a lack of regulations for adopting rapid methods. Absent such guidance, companies are loath to embrace new technologies.

"With predicted percent yearly growth, [the infectious agent testing market] will reach $18.3 billion in 2017."

But relief is on the way. For the past five years, Miller has chaired a Parenteral Drug Association task force on validating rapid methods for the drug industry. *Technical Report 33*, published in October 2013, is expected to serve as the pharm/biotech industries' primary regulatory guidance on rapid testing.

As with classical microbiology, no rapid method does everything. All platforms favor certain samples or organisms. For example, flow cytometry works only with liquids, whereas samples must in addition pass through a filter membrane for solid-phase cytometry. Fluorescence-based methods are prone to interferences from naturally fluorescing components in the organisms or sample, whereas DNA interferences can thwart PCR analysis.

"You have to match the right technology with the analysis need," Miller cautions. And time to result varies widely. "The term 'rapid' can mean anything from close to real time to overnight to increase the organism count." Even PCR, which itself is an amplification method, requires a critical mass of organism DNA to initiate.

AUTOMATION

What it delivers, what it does not

Automation can streamline traditional microbiology workflows by providing consistency and increasing walk-away time. Many platforms exist that borrow ideas and components from cell culture. The BioLumix automated microbiology instrument from BioLumix (Ann Arbor, MI) is an example of a platform dedicated to microbiology.

A traditional assay for total count of yeast/mold, coliform, and salmonella from a food sample is lengthy and labor-intensive. After diluting liquid samples or liquefying and diluting non-liquids, technicians pour plates and cover them with liquid agar, followed by incubation for as long as five days. They then pull the plates and count the colonies, adjust for dilution, and collate the three results into a report.

With BioLumix, operators pipette samples into assay-specific vials containing a sensor and all necessary media and reagents. The instrument takes over, first culturing the organism, then conducting the assay, performing all calculations, and producing a report. Most bacterial assays take less than 24 hours; for molds the holdup is up to 48 hours.

BioLumix president Ruth Eden says no hard and fast rules dictate when a microbiology lab should automate. "A small company lacking a dedicated microbiology lab must send samples out. Automation allows labs to internalize testing, get results faster, and ultimately save money." Eden adds that the BioLumix instrument does not require a degreed microbiologist for operation. Turning operation into a technician-level job, however, does not eliminate deciding on what to test and interpreting results.

The automation imperative is just as compelling at the high end, in labs that run many hundreds of samples per day. "Going paperless, having almost all operations automated, consistency of results, and cutting labor by half are the main drivers for high-throughput labs," Eden says. But in the end, "different customers have different reasons to automate."

A spectrum of solutions

"Automation means many things to many people," explains Paul Held, PhD, manager of BioTek Instruments (Winooski, VT), "with gradations throughout the spectrum." BioTek offers stand-alone products at the lower end that perform one or two specific tasks. Third-party automation companies often integrate BioTek components with additional instruments to provide full, end-to-end automation.

Industrial microbiology has many characteristics that favor automation. Repetitive, multiplicative tasks involving measurement, dilution, liquid dispensing, and incubation followed by manual manipulation or semi-manual instrumental analysis are what robots and liquid-handling systems do best. While some labs believe that automation cedes a degree of control over operations, the benefits of walk-away time, consistency, and results transferred directly into printable reports are often enough to tip the scales during decision making.

Many companies view automation simply through the lens of throughput. Few would argue that processing an additional two or three plates per day justifies the purchase of expensive robotic systems, while almost everyone agrees that automation can save time and money for labs that process 200 plates per day.

"At some point it is less costly to buy an instrument than to hire more employees," Held notes. Instruments take up less room, do not receive a salary, and never ask for longer coffee breaks. And for labs somewhere in the middle of the throughput continuum, where number of replicates provides no conclusive justification, consistency and scheduling are often the deciding factors. "Instruments always do what they do the same way. An instrument may not be as good as the best technician, but you can count on the results."

Consistency is particularly desirable in, for example, drug discovery labs where sub-microliter samples and dispensing are the norm.

▲ *Microplate Stacker / BioStack™ 4*
BioTek / www.biotek.com

▲ *PCR Setup Workstation / PCR setup STARlet™*
Hamilton Robotics / www.hamiltonrobotics.com

Jeff Papi, director of microbiology at bioMérieux (Hazelwood, MO), defines automation as any instrument- or device-based strategy that takes a manual process and improves it in a way that reduces labor, speeds production, and ensures consistency and quality. "Ultimately, automation reduces total time from sample to decision, so products reach the market faster."

Not everyone is enamored of robotics and automation, however. "You lose a little something, I believe, when you automate," comments Christopher A. Catani, marketing director at Hardy Diagnostics (Santa Maria, CA). "Automation is wonderful, but when the machine breaks down, labs descend into crisis mode. And it's not a matter of if but of when. You also lose some proficiency as a workforce. Sure, you gain consistency and can even cut costs, but it's a trade-off."

Automation is expected to affect how microbiology labs are built and operated. "Particularly, adopting alternative methods will make labs leaner," explains Michael Miller. Instrument footprints are shrinking, but rapid techniques tend inherently to take up less space. "Labs may be able to reduce personnel or education and training requirements. In some instances portability and rapid testing enable moving traditional laboratory activities into manufacturing or out to the field."

Despite these long-term trends, classical microbiology is by no means extinct.

Microbiology labs will change, but the most significant impact will be on microbiologists who, over time, face the need to adopt new skills. Miller predicts that because many rapid platforms are based on chemistry, "microbiologists are going to have to pick up analytical chemistry

skills. Or in the case of PCR, they're going to have to learn genetics techniques. They're going to have to learn a lot more to keep up with these systems."

Miller warns that microbiology cannot continue to be relevant by losing its classical mind-set. "The data still must be understood and translated by classically trained microbiologists who still must understand what the relevance of data means to product safety or contamination."

▲ *Triple Quadrupole Mass Spectrometer / LCMS-8050 / Shimadzu www.ssi.shimadzu.com*

Two goals, one instrument

One of the most exciting developments in microbiology, which satisfies the desire for rapidity and automation, has been micro's embrace of instrumentation from chemistry and biology, particularly mass spectrometry (MS). Two instrument types, MALDI-TOF and electrospray ionization (ESI) mass spectrometry, provide a "soft" ionization critical to preserving the integrity of signature large-molecule fragments from cell membranes or walls. Both techniques work with or without cultivation/expansion or chromatographic fractionation to generate data through mass, affinity, or other parameters.

According to Yen-Peng Ho, PhD, of Taiwan's National Dong Hwa University, "Rapid and reliable identification of microorganisms without extensive manipulation is a major goal in environmental and clinical microbiology." MS fits the bill, Ho continues, for its robustness, low cost per sample, rapidity, and suitability for high-throughput analysis.

MALDI-TOF uses very low sample mass and requires little or no preparation, yet it can confirm the presence of microorganisms in minutes. Two general workflows are possible. One involves cultivation/expansion or cell enrichment followed by fractionation (gas chromatography, liquid chromatography, or capillary electrophoresis) and MS analysis. The other works without sample prep or achieves cell or sample enrichment through affinity, microfluidic interactions, or PCR. Among the leading approaches to separation/enrichment are magnetic microbeads coated with organism-specific antibodies or antibiotics that bind to test organisms.

"At its simplest, you can scrape a colony off a plate, pop it into the MALDI, and get the genus and species directly," Miller says. "These same methods have existed in the world of analytical chemistry for years and are now finding application in microbiology."

One does not normally think of acquiring a mass spectrometer as a cost-cutting measure, but that is how Catani describes MALDI-TOF. Catani claims that MS cuts assay costs from about $10 per test for some automated systems to about $1 per test. "And it takes seconds, not hours or days. Yes, you need a mass spec, and they're quite expensive, but a busy lab can make its money back in less than a year."

Another "cool trend," Catani says, is the emergence of chromogenic media that provide superfast detection without the need to purchase an MS. Hardy, Sigma Aldrich, Becton-Dickinson, BioRad, and bioMérieux (among other companies) manufacture chromogenic media for microbiology.

> "Automation is wonderful, but when the machine breaks down, labs descend into crisis mode."

As its name implies, chromogenic media uses color to identify specific pathogens, even in mixed-pathogen samples. The media are optimized for the test organism, both for nutrients and biochemical-colorimetric detection and reporting. Some media also contain antibiotics to inhibit the growth of competing organisms.

Angelo DePalma *is a freelance writer living in Newton, NJ. You can reach him at angelo@adepalma.com.*

ARE YOU IN THE MARKET FOR... COLD STORAGE EQUIPMENT?

Freezers and refrigerators are an integral part of any laboratory that requires temperature controlled storage. Maintaining samples at an optimal temperature while in storage is vital for many lab professionals and this makes choosing the right freezer or refrigerator a crucial task. While the average kitchen freezer operates at about -20°C, laboratory variants have a much wider range of options depending on the storage conditions needed.

Freezer types currently in use as reported by survey respondents

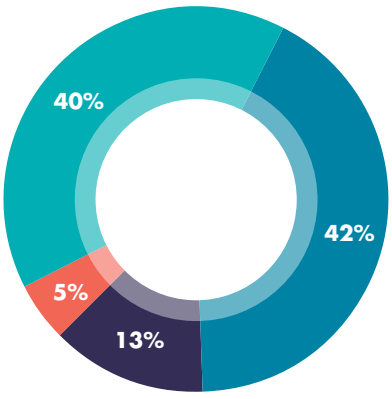
Upright general purpose lab freezers	21%
Upright ultra-low temperature freezers	14%
Low temperature upright lab freezers	12%
Under-counter general purpose lab freezers	9%
Flammable materials storage	6%
Explosion-proof	5%
Low temperature chest lab freezers	5%
Chest ultra-low temperature freezers	5%
Blood bank and plasma	4%
Other	4%

Service used to repair/maintain cold storage equipment as reported by survey respondents

In-house service department	27%
Third-party contract	16%
Instrument manufacturer time/material	14%
Instrument manufacturer service contract	13%
Third-party time/material	11%
Our department	7%
Multi-vendor service provider	5%

Nearly 30% of respondents plan on purchasing new or additional cold storage equipment in the next year. The estimated budgets for these purchases are:

- Less than $5,000
- $5,000 - $15,000
- $15,000 - $30,000
- $30,000+



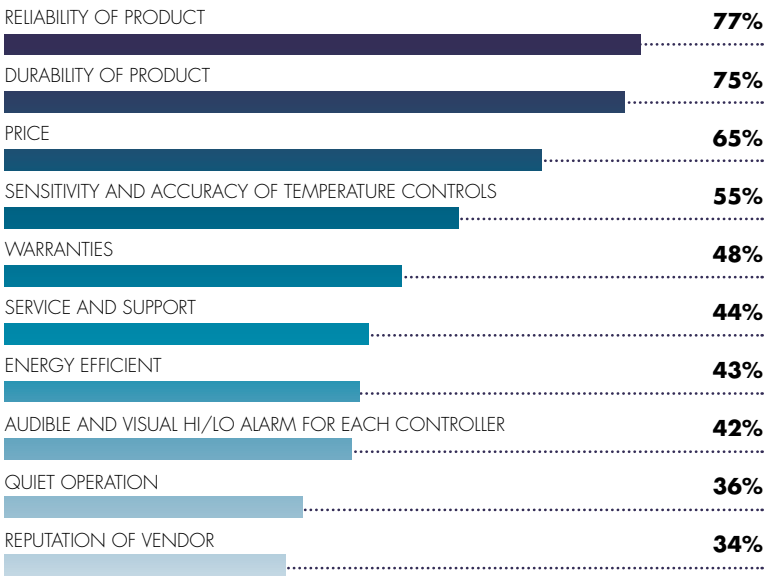
TOP 5 QUESTIONS

You Should Ask When Buying Laboratory Cold Storage Equipment.

1. How is the product manufactured? Ask about the quality of the materials used and the product life expectation based on manufacturing testing.
2. What is the warranty? What does it include and for how long? Will anything void the warranty?
3. How green is the product? Ask the company to provide details on energy efficiency and have them relate it to your return on investment (e.g. in four years will you save enough money in energy costs to pay for your freezer/fridge?).
4. How much sample capacity are you getting for your space?
5. What are the optimal voltage/wiring conditions for running the fridge/ freezer? If the building is older, will low voltage or voltage fluctuations affect the performance of the freezer/fridge?

TOP 10 FEATURES/FACTORS

respondents look for when purchasing cold storage equipment



Completed Surveys: 228

For more information on cold storage equipment, including useful articles and a list of manufacturers, visit www.labmanager.com/fridges&freezers

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Section 508 Accessibility Guidelines
HIPAA Accountability Act of 1996
HIPAA Patient Safety and Quality Improvement Act of 2005 (Patient Safety Act)

Compatibility:

- PC/MAC
- Tablet
- Smartphone
- Web-based

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ARE YOU IN THE MARKET FOR A... LABORATORY SHAKER?

The wide variety of lab-shaker designs on the market reflects the increasing diversity of scientific experimentation. Labs now use a greater range of sample sizes than ever before, from liters to microliters. And while replicate and combinatorial studies increase the number of samples, requirements for environmental control create yet a third dimension that shaker designers must consider.

Shaker types currently in use as reported by survey respondents

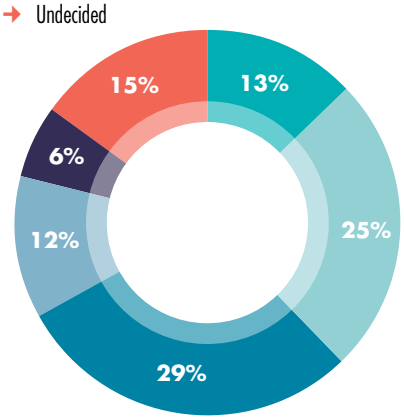
Vortex shaker	25%
Orbital shaker	19%
Rocking shaker	16%
Incubator shaker	15%
Vibrating shaker	11%
Biological shaker	7%
Reciprocal shaker	5%
Nutating shaker	3%

Shaker usage per day as reported by survey respondents

less than 1 hour	33%
1 - 3 hours	26%
3 - 5 hours	14%
5 - 7 hours	5%
more than 7 hours	22%

Nearly 28% of respondents plan on purchasing a new or additional laboratory shaker in the next year. The estimated budgets for these purchases are:

- Less than $500
- $500 - $1,500
- $1,500 - $3,000
- $3,000 - $6,000
- $6,000+
- Undecided



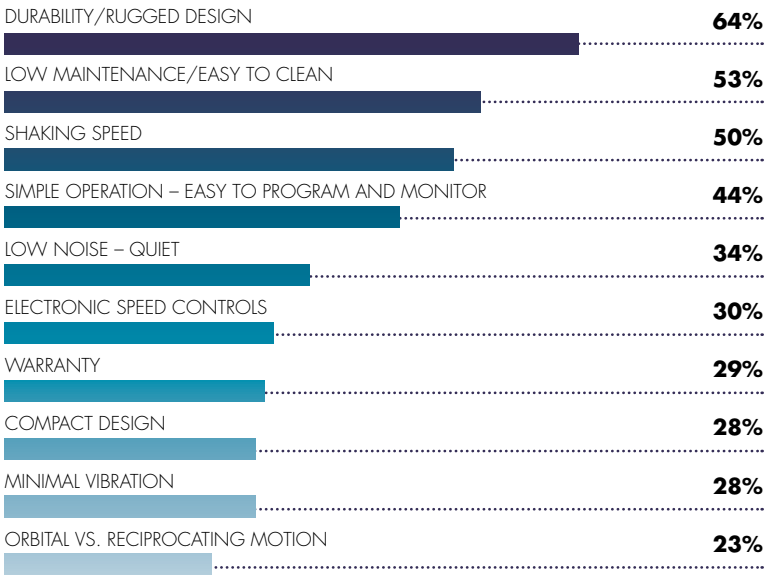
TOP 5 QUESTIONS

You Should Ask When Buying a Laboratory Shaker.

1. What is the capacity of the unit (both for total weight and volume)?
2. What accessories are available?
3. What is the RPM range and what increments can it be controlled in?
4. What are the temperature and humidity operating conditions for the unit?
5. What programming functions, if any, does the unit have?

TOP 10 FEATURES/FACTORS

respondents look for when purchasing a laboratory shaker



Completed Surveys: 202

For more information on laboratory shakers, including useful articles and a list of manufacturers, visit www.labmanager.com/shakers

ARE YOU IN THE MARKET FOR A... MICROWAVE DIGESTER?

Microwave-acid digestion is a common sample preparation step for atomic absorption, atomic emission, or inductively coupled plasma analysis of metals. Microwave digestion takes minutes, compared with hours for conventional hot plate digestion. Because it uses high temperature and strong acids—commonly nitric and hydrofluoric—microwave digestion mineralizes any matrix. For example, EPA method 3052, based on microwave, provides total metal analysis from soil, sediments, sludge, oils, plastics, and biological materials.

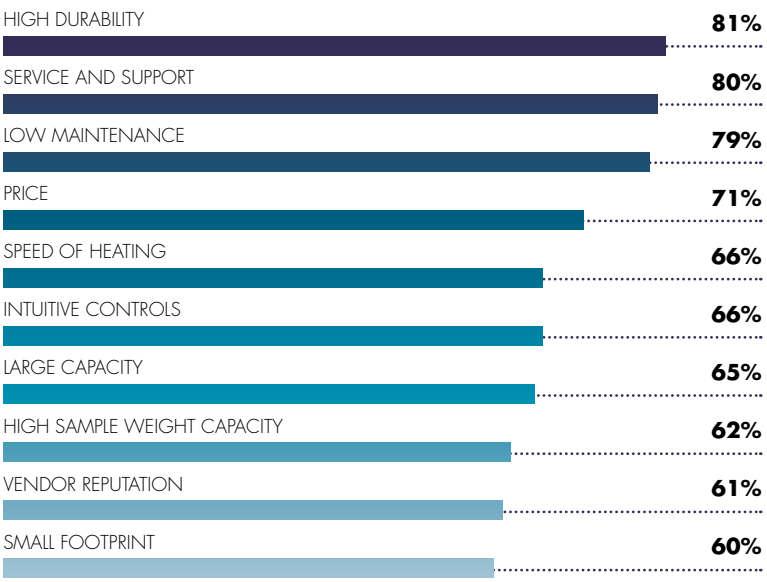
TOP 5 QUESTIONS

You Should Ask When Buying a Microwave Digester.

1. What is the system's maximum microwave power output? Microwave energy heats substances quickly to high temperatures. The higher the temperature, the faster and more completely substances are digested. Extractions also need sufficient power, as some solvents can act as a heat sink and are difficult to heat.
2. Can the system monitor and control every vessel? Temperature and pressure monitoring and control are extremely important. Inadequate safeguards can result in damaged vessels and equipment, and a lack of temperature and pressure control can pose a safety hazard to lab personnel.
3. How many samples can be processed per run? Though the number of samples processed is dependent upon your laboratory's needs, planning for growth is always a good idea.
4. Does the company offer free applications support? Do they offer dedicated, direct service support and local factory-trained field service technicians? Dependable applications and service support are essential since you never know what may go wrong.
5. How user-friendly is the system? As with many instruments, if a system is very complicated to operate, it generally becomes either a glorified shelf to store things on or a headache to those having to operate it. The easier a microwave system is to use, the better off you will be. Also make sure the vessels are easy to handle and set up.

TOP 10 FEATURES/FACTORS

respondents look for when purchasing a microwave digester



Vessel type used for microwave digestion as reported by survey respondents

Teflon vessels	37%
Pyrex vessels	26%
Quartz vessels	19%
Volumetric pyrex vessels	13%
Other	5%

Microwave digestion applications as reported by survey respondents

Trace metal analysis	26%
Analyzing metals	22%
Material analysis	19%
Biological sample analysis	11%
Other	7%
Soil analysis	6%
Oil and lubricant analysis	6%
Agri-waste analysis	4%

For more information on microwave digestion, including useful articles and a list of manufacturers, visit www.labmanager.com/microwave

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BIOLOGICAL SAFETY CABINETS

DON'T FORGET ABOUT TOTAL COST OF OWNERSHIP

by Rachel Muenz

Biological safety cabinets (BSCs) are crucial for the safety of staff and the protection of products, so it's important to know when they should be upgraded.

Luckily, many of the signs that you should buy a new BSC are pretty common sense.

"Corrosion on the outside of the cabinet is bad, corrosion on the inside is worse," says Thermo Fisher Scientific (Waltham, MA) technical applications specialist Marc Dunn of one major sign that you should replace a cabinet. He adds that rust on the plenums inside the BSC is particularly bad.

As with many other types of lab equipment, when replacement parts for your BSC are becoming scarce or will be obsolete in six months to a year, you'll want to consider buying a new cabinet. A BSC that requires constant servicing to keep running or that is failing its annual NSF certification test is also one you should probably replace, Dunn adds.

Age is also a factor, according to Cybelle Guerrero, national sales manager at The Baker Company (Sanford, ME).

"If the cabinet's more than 25 years old, it's probably time to start thinking about budgeting for a new cabinet because of all the improvements to design that have been done over the years," Guerrero says.

▲ The Baker Company's latest Class II, Type B2 biological safety cabinet, the BioChemGard.

▲ Thermo Scientific's newest Class II, Type A2 biological safety cabinet, the 1300 Series.

The main benefits to the latest BSCs include better ergonomics, greater energy efficiency and a more robust performance envelope that allows the most forgiveness when researchers have an off-day, Guerrero adds.

"They might have a bad day and have some sloppier aseptic technique that day," she says. "So you want to have a design that allows for forgiveness in a dynamic setting."

Dunn adds today's BSCs are also quieter and use DC motors which are more durable, energy efficient, and maintenance-friendly than the AC motors of older cabinets.

As with anything else, if your current cabinet is running fine, passing its annual certification, parts are still available, and maintenance costs are low, you probably don't need a new BSC, the two experts say. Dunn adds that if you only need to protect a product in your lab, rather than the operators, you may not even need a BSC— something like a clean bench may suffice.

Apart from the initial cost, as well as the costs of certification and delivery, buying a new BSC has some minor inconveniences as it is a large piece of equipment to install, Dunn says.

OPTIONS FOR BUYERS ON A BUDGET:

- Even on the low-cost end of the BSC spectrum, you can get great quality
- Do your research on the options available to ensure you get the best value
- Leasing programs
- Some vendors have special pricing for academic labs

OTHER CONSIDERATIONS:

- Once you've bought your BSC, take advantage of training from the vendor to ensure you and your staff use it properly
- Do a proper risk assessment through your biosafety office
- Make sure the BSC fits the space and workflow
- Ask questions such as what the power consumption is, if spares are readily available, cost of filters, how long the warranty is, and if you really need to exhaust to atmosphere

"Also if you're replacing an old BSC, you have the inconvenience of decommissioning the old BSC and that might mean making it safe," he says. "You might need to fumigate to make it safe and …you have to dispose of it responsibly. All of these can be managed."

Both experts stress that users must consider the total cost of ownership when purchasing.

"Not all cabinets cost the same," Guerrero says. "If you can factor in cost of ownership over the life of the cabinet as part of your consideration and then your justification for purchase, then that's something that should be looked at."

And, of course, safety of lab staff trumps any kind of monetary cost.

"Try to spend as much as your budget allows to get the best device possible with the best features, simply because safety cannot and should not be compromised," Dunn says.

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STREAMLINING DNA LIBRARY PREPARATION FOR NGS

Problem: Modern high-throughput sequencing technology has led to a boom in sequencing projects spanning a wide range of research. High-throughput sequencing methods like next generation sequencing (NGS) are now a critical tool for both basic and clinical research, as evidenced by the leap from 236 NGS PubMed citations in 2009 to 1,878 in 2013. However, in many cases genomic DNA can't be accurately sequenced by NGS, a frustrating challenge for researchers. NGS requires input DNA to first be chopped into short fragments, and then sequences the fragments to determine the order of the bases. Finally, these fragments are reassembled into an approximation of the actual genome. Unfortunately, not all genomes are created equal. Genomes with long stretches of repeating sequence, with regions rich in guanine and cytosine, or with missing base pairs can all lead to gaps in the sequencing data. For researchers trying to identify and make sense of sequence variations, this has been a major hurdle. Another obstacle is the chopped DNA fragments—whether they're short or long—must pass the Goldilocks test: the size and concentration of the input DNA sample must be "just right" to get high quality NGS results.

Scientists have been combining new and old approaches to refine sequencing, but challenges remain. While some researchers turn to traditional Sanger sequencing to validate their NGS results, this method is more labor-intensive and cannot be scaled up to match the high-throughput nature of NGS. Some companies are developing sequencing technologies that deliver longer reads and potentially eliminate some of the data gaps caused by repeating sequence. However, longer reads can be more difficult to resolve. With a new wave of sequencers that have varying requirements for fragment length and concentration, researchers are faced with the challenge of accurately quantifying and qualifying their DNA fragments prior to sequencing.

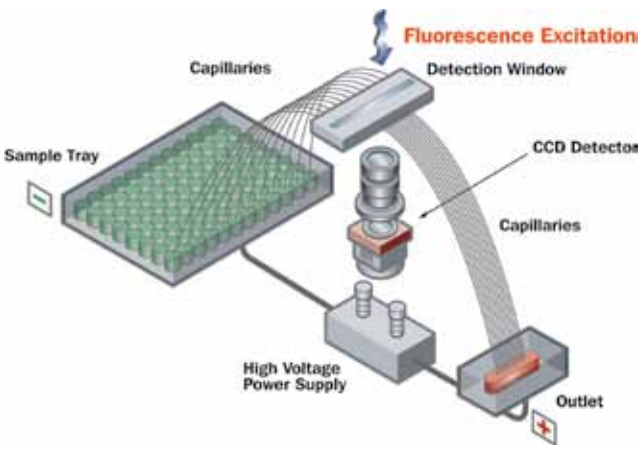
Solution: Whether fragments are long (>1,000bp) or short as in conventional NGS work (<500bp), NGS library preparations benefit from quantitative and qualitative analysis. Prioritizing these quality control steps can save researchers thousands of dollars, and days of wasted research time.

A number of companies have focused on developing instruments that help researchers prepare DNA fragments for sequencing. For example, Advanced Analytical Technologies, in Ames, Iowa, has developed the *Fragment Analyzer*™ Automated Capillary Electrophoresis (CE) System, which analyzes and verifies the integrity, fragment length and concentration of researchers' DNA samples.

The instrument applies an electric field to a tiny amount of DNA sample, pulling DNA fragments into long, thin capillary tubes. The capillaries contain a gel with a fluorescent dye that binds to the DNA molecules. During electrophoresis, voltage is applied to the capillaries and the DNA fragments move through the gel, separating according to size with longer length fragments moving more slowly. As molecules pass by a window in the capillary, a continuous light source excites the dye bound to the DNA molecules. A camera detects emitted light from the dye, visualizing the DNA fragments. The time required to pass the window relates to DNA size, while the emitted light intensity indicates DNA concentration. Analytical software shows the output as an electropherogram or digital gel image.

The instrument tells researchers whether the size distribution of their DNA fragments is within the appropriate range for their sequencing platform and whether the DNA is at the right concentration. The instrument can resolve DNA fragments of up to 20 kilobases in length, making it an ideal solution for long fragment reads. Furthermore, instruments such as the *Fragment Analyzer*™ feature highly automated workflows. With an explosion of NGS related studies surfacing in labs everywhere, a streamlined workflow for quantification and qualification of DNA fragments *both short and long* is critical.

For more information, visit www.aati-us.com



▲ *Advanced Analytical Technologies' fragment analyzer tests DNA quality, concentration and fragment length before sequencing.*

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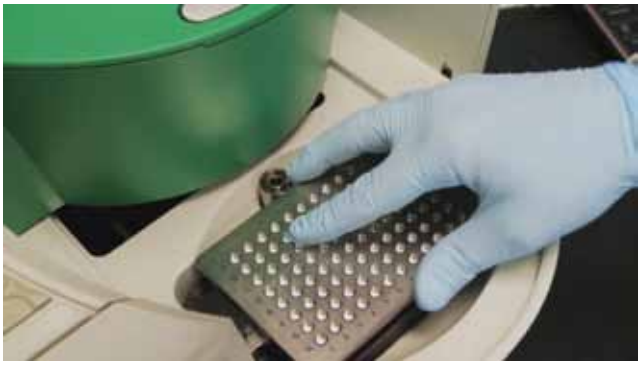
DIGITAL PCR FOR GMO QUANTIFICATION

Problem: Food testing labs have traditionally used conventional PCR and quantitative real-time PCR (qPCR) to detect the presence of genetically modified organisms (GMOs) in food and feed. When quantification is required, GMO content in these samples is expressed in relative terms as the ratio of the quantity of the transgene, which is the nucleic acid fragment introduced in the host genome, to that of an endogene, a gene normally found in the host genome. Currently, more than 60 countries—representing 40 percent of the world's total population—require food and feed to be labeled once they contain GMOs beyond a certain threshold. These countries have implemented strict regulations and policies pertaining to products containing GMOs, or any materials derived from GMOs. Thus, screening for and quantifying GMOs is critical to upholding the integrity of labeling policies.

The gold standard for analyzing the presence of nucleic acids in food and feed samples has been qPCR, because of its sensitivity, accuracy, precision, and specificity. However, qPCR also presents a unique set of challenges when it comes to GMO analysis. The technique can be unreliable and inaccurate when quantifying very small numbers of DNA targets. Accuracy becomes a greater concern when those DNA targets are part of complex matrices (e.g. seed-powder flour, corn flakes etc.) that contain substances that inhibit qPCR—a common occurrence in foods or feed.

Solution: Recent research[1] has demonstrated that digital PCR technology is more accurate and reliable than qPCR for quantifying GMOs, especially for GMOs present at low levels. Digital PCR provides the absolute number of targets present in a sample, based on the principles of limiting dilution, end-point PCR and Poisson statistics. Two approaches are used in commercially available dPCR systems. One approach, chamber digital PCR (cdPCR), relies on the partitioning of up to a few thousand individual reactions in microfluidic chambers. The second approach, droplet digital PCR, combines partitioning of the sample into several thousands of individual droplets in a water-oil emulsion, with the use of flow cytometry to count positive reactions. Droplet Digital PCR technology was developed as a more practical alternative to cdPCR; it features an easy workflow, lower per sample costs, and higher throughput. Commercialized by Bio-Rad Laboratories, Inc. as the QX100™ Droplet Digital PCR system, the ddPCR system provides thousands more partitions than cdPCR, resulting in greater precision and more affordable per-sample costs. While cdPCR does deliver accurate quantification at low target copy number, its high costs make it impractical for real-world use.



▲ *Advanced Analytical Technologies' fragment analyzer tests DNA quality, concentration and fragment length before sequencing.*

Dr. Dany Morriset at Slovenia's National Institute of Biology conducted research that demonstrated ddPCR confers advantages relative to qPCR for GMO quantification in a number of areas. The team analyzed food and feed matrices containing different percentages of a well-characterized GMO transgene. The ddPCR system's precision, accuracy, sensitivity, and dynamic range complied with the guidelines set by the European Union Reference Laboratory for GM Food & Feed and were comparable or superior to those for qPCR. Compared with the conventional qPCR assay, the ddPCR assay offered better accuracy at low target concentrations and exhibited greater tolerance to inhibitors found in matrices such as wheat flour and feed. International food safety standards specify that new methods should be easy for labs to implement in terms of cost, time, and workflow. The ddPCR technique showed strong improvements on all of these fronts. The technique is a less expensive alternative to qPCR due to the lower number of reactions and its duplex ability (i.e. interrogate two targets per well) as opposed to qPCR's requirement of performing separate assays for both control and transgene targets. Thus, for food laboratories looking for higher throughput, lower cost and most importantly, more accurate screening methods for GMOs, droplet digital PCR is a viable option.

For more information on droplet digital PCR, visit http://www.bio-rad.com/QX200

References

1. Morisset D, Štebih D, Milavec M, Gruden K, Žel J. Quantitative Analysis of Food and Feed Samples with Droplet Digital PCR. 2013. *PLoS ONE* 8(5): e62583. doi:10.1371/journal.pone.0062583

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Your centrifuge is essential to your work. It can also be a bottleneck to efficient research unless you choose the family of Thermo ScientificTM general purpose centrifuges designed around you and your applications. With lightweight Thermo ScientificTM FiberliteTM rotors that provide fast sample processing, maximized capacity for your sample type, and the Thermo ScientificTM Auto-LockTM rotor exchange system that allows the flexibility to change applications in the blink of an eye, we'll get you off the bench and on to answers faster—any way you spin it.

Thermo Scientific general purpose centrifuges feature increased capacity and flexibility with rotor innovations including the new Thermo Scientific TX-1000 rotor, which offers a 4-liter capacity in a traditional 3-liter footprint. Additionally, the new Thermo Scientific MicroClick 30 x 2 rotor offers a 30-place capacity for microtube and nucleic acid spin columns, and is ideal for molecular biology applications. These high-capacity rotors process more tubes in less runs, saving time while reducing energy and wear on the centrifuge.

The Thermo Scientific general purpose centrifuge line is designed for a wide range of clinical and life science applications from cell culture to bioproduction to proteomics, food safety, pharmaceutical, stem cell, microbiology and genomics. The general purpose centrifuge floor models conserve valuable bench space with a nearly 25% smaller footprint than refrigerated benchtop models and have a low working height of 79 cm, providing true ergonomic design for removing tubes and exchanging rotors.

The new rotor innovations in the general purpose centrifuge line offer a number of features and benefits. With the TX-1000 rotor, you can spin up to 40 X 50 mL conical tubes, 196 blood tubes or 24 microplates. It features Thermo ScientificTM Slide CoatTM anti-friction finish, which acts as an advanced lubricant and corrosion resistant coating. The dual-purpose large bucket design accepts adapters for tubes or microplates. There are no additional buckets to store, no additional carriers to purchase and no need to swap buckets—saving space, money and time. The rotor is designed to be as aerodynamic as possible. With diamond-cut technology, each bucket has 45 facets on the outside to reduce the weight.

The MicroClick 30 x 2 rotor offers increased flexibility in the general purpose centrifuge portfolio. It features a Thermo ScientificTM ClickSealTM biocontainment lid for quick and easy sample access.

New Slide Coat anti-friction finish is available on the Thermo Scientific TX-1000, TX-750 and TX-400 rotors, and is designed to eliminate the need for lubrication at the contact point between the rotor cross and bucket. This helps to ensure smooth runs with minimal vibration and reduce regular maintenance steps. Its corrosion-resistant properties help promote longer rotor life and enhance safety.

For more information about Thermo Scientific general purpose centrifuges and rotors, visit **www.thermoscientific.com/spinit.**

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A NEXT-GENERATION INTEGRATED PIPETTING PLATFORM

Problem: As laboratory budgets tighten and laboratory automation purchases come under scrutiny, R&D efforts are still expected to function efficiently and with increased data quality. With this threshold of effectiveness raised, laboratories are often asked to repurpose instruments rather than migrate to state-of-the-art technology, which may have a new learning curve.

Scaling up also typically involves running more units in parallel; however, instruments can take up valuable space, making the surrounding workspaces noisy and crowded

Solution: Instruments such as Hamilton's new platform, the Hamilton VANTAGE™, address many lab automation challenges, saving labor costs while eliminating outdated bulky systems.

"This single system can easily replace four to six other pipetting robots, offering more functionality," says Alvaro Cuevas, VANTAGE senior product manager. "Users can build process redundancy with a second robot at the same price."

The Hamilton VANTAGE, in particular, offers users a space-conscious, vertically integrated liquid handler with multiple technological advances to improve performance and flexibility.

The new NanoPulse™ technology provides contact-free pipetting over a wide volume range of 100 nL to 1 mL within a single channel, eliminating the need to change hardware between varying applications. The platform's linear motors increase pipetting speed while decreasing noise, heat and vibration, allowing users to work in close proximity to the instrument and decreasing maintenance costs. Finally, the on-deck camera enhances traceability by identifying and verifying all labware on the system and even detecting non-barcoded labware.

Flexibility extends past the technology to include the expandable nature of the platform. Labs can upgrade their single benchtop pipettor at any time with a Logistics Cabinet and its accessories. Upgrades may include innovative tip and plate shuttling from below the pipetting deck, a telescopic plate gripper, and sensors that control the customizable waste containers. The VANTAGE can accommodate 96-, 384- or 1,536-well plates to satisfy a variety of throughput needs.

To increase the productivity of lab personnel, the instrument can be remotely monitored from any mobile device, increasing walk-away time for technicians and offering lab managers remote visibility into project status.

▲ *Hamilton's new platform, the Hamilton VANTAGE™, addresses many lab automation challenges.*

The system's INSTINCT V software brings intelligence to laboratory automation to meet both simple and complex pipetting needs. From automatic labware transportation to advanced collision control, the system intelligently handles all robotic movements automatically, without programming. For increased efficiency, the Dynamic Scheduler optimizes run times of the same or different assays in parallel. The new CARE technology (Contamination Avoidance Response) also keeps track of all liquids, including those specified as contaminating substances, and will either warn the user or change tips automatically.

Pipetting and device integration using software like INSTINCT V is easy to execute, even for users with little or no automation experience. Drag-and-drop editors graphically display the plate processing workflow while automatically pre-programming robot movements behind the scenes. Once assays are written, 3D simulations offer additional opportunity for optimization before running the actual instrument.

Overall, platforms such as the Hamilton VANTAGE offer users a novel path to integration and automation intelligence in an affordable, user-friendly package, with the ability to meet application needs in the future.

For more information, visit www.hamiltonrobotics.com

SIEMENS INDUSTRY, INC.

BUILDING TECHNOLOGIES DIVISION

"Laboratories are among the biggest energy consumers in any facility," says Franco Atassi – Director of Life Science Solutions from the Building Technologies division of Siemens Industry, Inc. "Whether in a university, healthcare or corporate setting, they conform to a set of safety codes and standards; need specific ventilation rates using a non-circulated supply of fresh air; require precise environmental control, and demand high thermal load due to heat emitting lab equipment. These special requirements help drive energy costs in labs to be three- to eight- times greater than the average office building."

A leading expert in critical environments, Siemens understands how every detail impacts long-term energy savings and efficiency. It's the only building automation systems provider with a complete package of laboratory controls. Its approach to laboratory energy solutions is built around four core competencies:

- **Assessment and Benchmarking**
- **Technical Solutions**
- **Information Management**
- **Service Solutions**

Assessment - During its qualification assessments, Siemens evaluates both energy usage and overall compliance and benchmarks against the latest codes and standards. In addition to identifying potential energy improvements, Siemens finds ways to use existing equipment more efficiently.

Technical Solutions - Increasing energy efficiency is where Siemens technology excels. In laboratories, ventilation and cooling can account for two-thirds of energy use. Siemens employs a host of technologies and Facility Improvement Measures – FIMs, to make these processes more efficient. A typical solution may include variable air volume controls, occupancy monitoring, low flow/high performance fume hoods, sash management, thermal load decoupling, and a combination of other technologies.

Information Management - Siemens helps various facility users and operators manage their data and use what's relevant to their needs. Siemens helps laboratories monitor conditions, including energy consumption, with its Energy Monitoring and Control (EMC) tool. EMC pulls data from throughout a laboratory. It offers seven specific reports including overall energy consumption updates, room environment summaries, fume hood performance and air volume drivers. Laboratory managers also use its reports and data archiving to meet documentation requirements for ventilation system performance.

Service Solutions - Proper service is critical to ensure energy efficiency and compliance within a laboratory environment. Siemens provides its clients with expert service professionals well versed in building technologies and laboratory regulations. As a result, services offered help ensure both long-term optimum system performance and continuous regulatory and accreditation compliance.

Once considered improbable, Siemens is making laboratories energy efficient. Its solutions are in use at university research laboratories, pharmaceutical manufacturers, and even at one forensic lab that achieved LEED™ certification, a designation of environmentally friendly building design given by the United States Green Building Council. Siemens laboratory technologies and services are available from any of its 100 branch offices nationwide.

To learn more about Siemens solutions for energy efficient laboratories, go to: **usa.siemens.com/lifesciences.**

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PRE-OWNED EQUIPMENT MARKETPLACE

PARTING POINTS

Takeaways from this month's issue:

SOCIAL MEDIA – THE GENIE IS OUT OF THE BOTTLE

The march of digital technology continues to open up new uses in the laboratory—transformational research and business tools and platforms that are revolutionizing lab practices and attracting adherents. Social media is now used in the lab for:

- A broad array of research activities
- Some business functions
- Expanding exchanges with government agencies
- Attracting funding and staying on top of regulatory compliance

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NEGOTIATING SERVICE CONTRACTS

Securing the appropriate level of maintenance coverage is just as important as purchasing the right equipment in the first place. Four of the five main aspects of a service contract that you should consider when buying new equipment are:

- The manufacturer's warranty
- When the service contract begins and ends
- Early cancellation/termination
- Auto-renewal clause

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POLITICAL SCIENCE

Organizational politics involves trades, exchanges of favors, relationships, reprisals, obstructionism and coalition-building. This sometimes goes beyond the normal process of getting the job done and the normal interchanges with peers and colleagues. Some of the main politics-related issues important for managers include:

- Politics exists in organizations
- Politics can be understood
- Politics can be "worked"
- Denial won't make politics go away

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PERSPECTIVE ON: A FOOD & BEVERAGE QUALITY CONTROL LAB

Lifeline Foods' quality control lab tests the corn products the company produces before they are shipped to some of the largest food and beverage manufacturers in the U.S. Keys to this lab's success include:

- Communication
- A work culture that encourages employees to take ownership of their tasks
- Documentation
- Rewarding good results

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INSIGHTS ON STREAMLINING A MICROBIOLOGY LAB

Microbiology—the study of microscopic organisms, mostly single-celled—is one of the deepest, broadest scientific disciplines. Major developments in such labs include:

- Vendors of supplies and equipment are pursuing workflow improvements
- The rise of rapid microbiology methods such as PCR
- Automation
- The adoption of instrumentation from chemistry and biology, particularly MS

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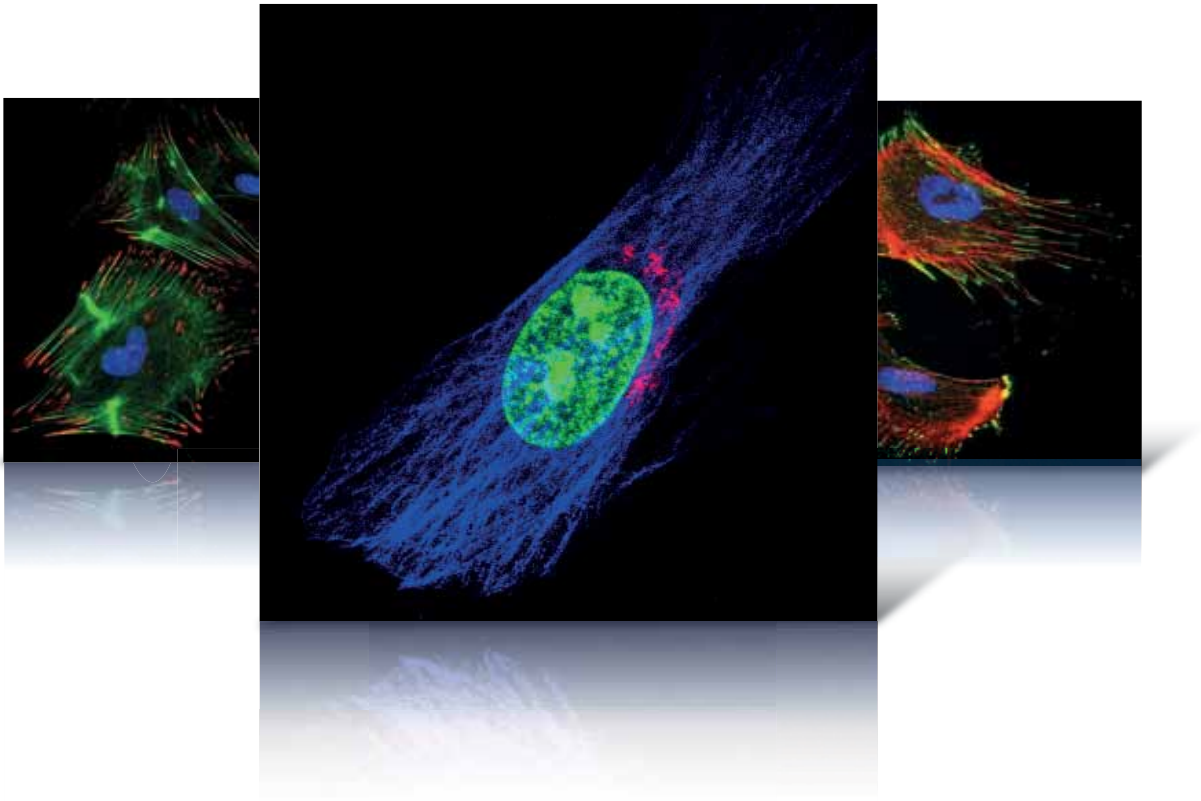

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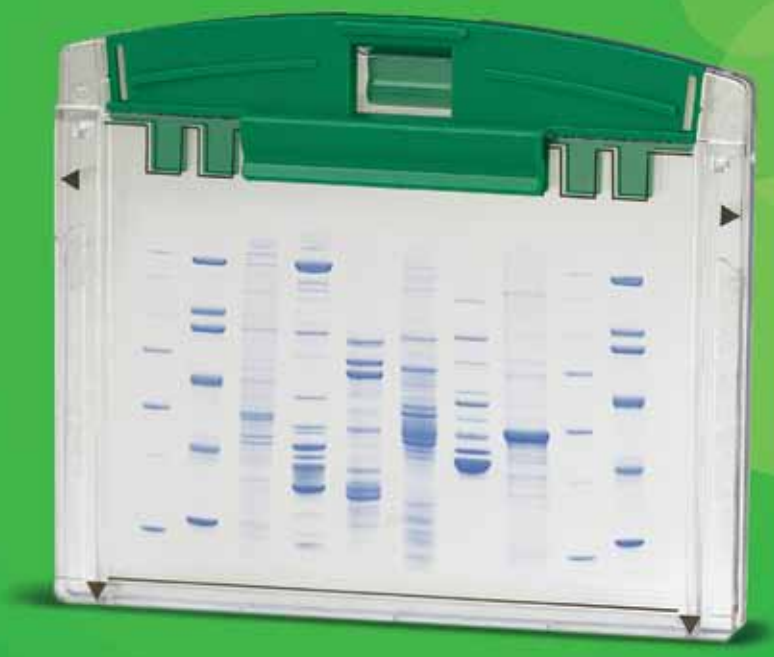

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