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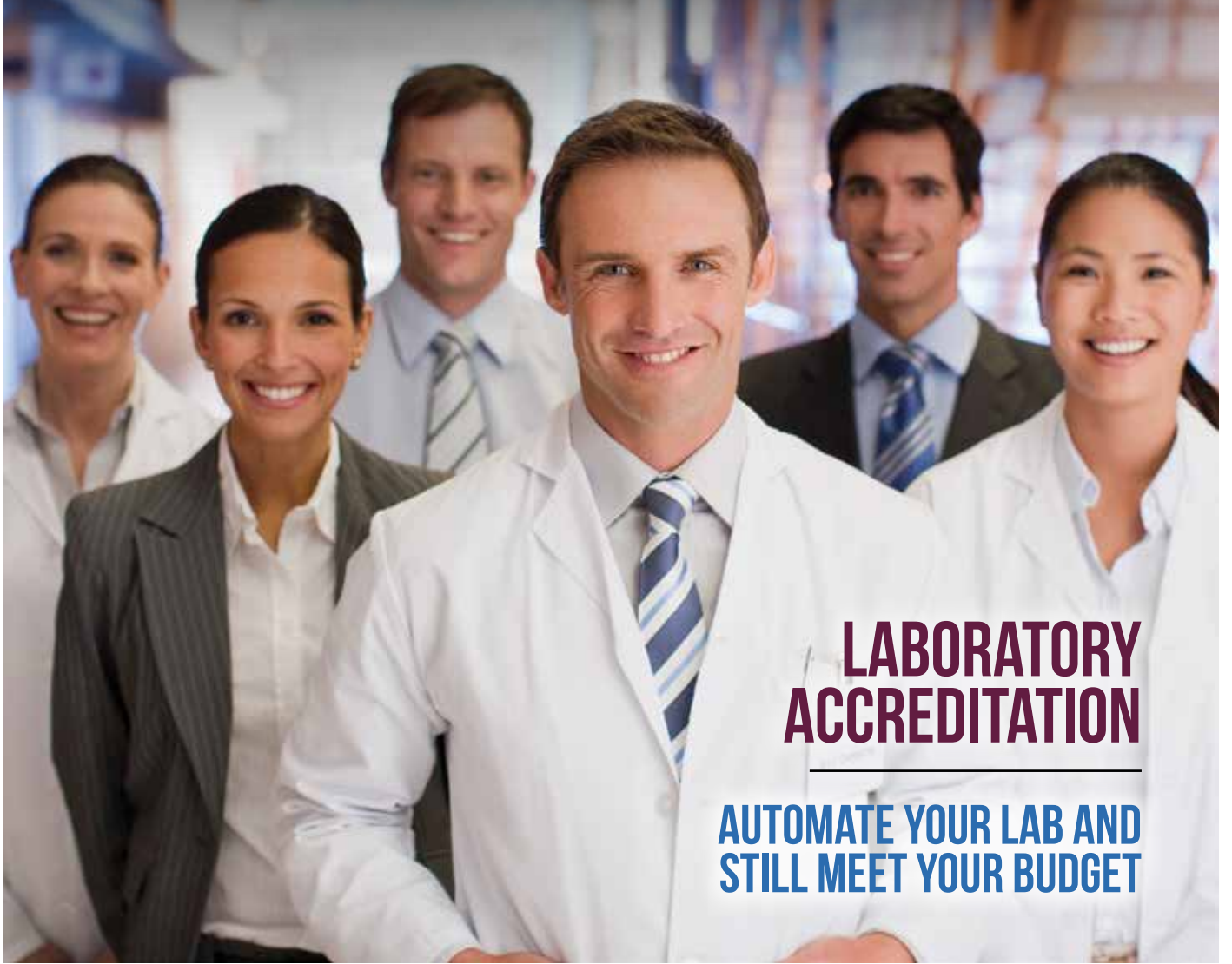
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December 2014

Volume 9 • Number 11

Building a Dream Team

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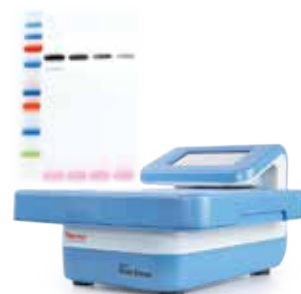
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CONTENTS

December 2014

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10

Building a Dream Team

"We will put our best team on this one," is a common refrain in many circles and is regularly heard in laboratories as directors seek to reassure customers and other stakeholders about delivering accurate and reliable results by deadlines. Trust, collaboration, and strong leadership are the keys to a team's success.

Bernard Tuls



56

Perspective On: A Food and Beverage Lab

As part of the laboratory services division of the Utah Department of Agriculture and Food (UDAF), staff members act as gatekeepers for the safety and quality of food in the state. UDAF laboratory director and state chemist Dr. Weston Judd, discusses the main issues he faces in overseeing the division's four laboratories.

Rachel Muenz



BUSINESS MANAGEMENT

16 Laboratory Accreditation

Besides laboratories, there are three groups that benefit from accreditation, perhaps more so than laboratories themselves. These three groups are users of laboratory services, private and public bodies that need accurate test data to make decent decisions, and the general public.

Peter S. Unger

LEADERSHIP & STAFFING

20 The Firing Line

No matter what the reason, whether because of an economic downturn or poor work performance, firing someone is never pleasant. It can get emotional, and sometimes there are legal consequences if it's not done right. However, having a plan in place can help make firing someone a little easier.

Rachel Muenz

TECHNOLOGY

30 Automating Your Lab

The concept of lab automation sounds almost magical, as if a sophisticated machine here or there will make a lab run by itself. Indeed, automation can improve the efficiency of a lab and more, but figuring out the best "here" or "there" creates the challenge. Some general planning helps in almost any approach to automating a lab process.

Mike May

HEALTH & SAFETY

40 Sit Up Straight

It's just a fact: In today's modern laboratory you are going to spend some time using a computer. You used to feel good all day long, but now you hurt after just a few minutes at the computer. Learn about office ergonomics and what you can do to minimize the potential ill effects of all this computer usage.

Vince McLeod

44 Compressed Gas Cylinders

Using compressed gases in the laboratory can be dangerous if they are not handled properly. Many gases can be explosive, flammable, corrosive, and toxic. Because of these risks, standards have been established for transporting, using, and handling compressed gas tanks and cylinders.

Kim Myers



LM GETS A FACELIFT

Beginning with our November 2014 issue, you may have noticed something different about the look of the magazine. That's all part of a series of subtle design changes we have been slowly rolling out to give our pages a fresher, cleaner feel. You'll see the rest of our new design with our January/February 2015 issue, which includes new analytical, life science, and general laboratory categories as well as a bold new cover design. While these changes aren't drastic, we hope they will make our content easier to find and more pleasing to the eye. You'll find some of the latest tweaks in this very issue! We hope you like them.

FIND OUR FAKE AD AND WIN! More info on page 88



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LAB MANAGER ACADEMY	26
ARE YOU CRAZY? IF NOT, YOU MAY WANT TO CONSIDER IT <i>Howard Manns</i>	
SCIENCE MATTERS	28
THE RIGHT SIZE FOR SUCCESS <i>Mark Lanfear</i>	
ASK THE EXPERT: TRENDS IN MICROBIOLOGY	34
Linda Wegley Kelly, PhD, a marine microbial ecologist in the Department of Biology at San Diego State University, and Forest Rohwer, a professor in the department, discuss what has changed in the microbiology field over the past decade. <i>Tanuja Koppal</i>	
PRODUCT FOCUS	
SPECIALTY GASES	48
PIPETTES	49
CHILLERS	50
CO ₂ INCUBATORS	52
PORTABLE GAS CHROMATOGRAPHY SYSTEMS	55
SURVEY SAYS, ARE YOU IN THE MARKET FOR...	
FUME HOODS	62
LIMS	64
pH METERS	65
INSIGHTS	66
A BUYER'S REPORT ON LABORATORY BALANCES <i>Angelo DePalma</i>	
TECHNOLOGY NEWS	70
The latest equipment, instrument, and system introductions to the laboratory market.	
MAINTENANCE MATTERS	76
COLD STORAGE	
HOW IT WORKS	
LIMS SAMPLE SCHEDULING TOOLS	78
A WEB-BASED 24/7 MONITORING SYSTEM	79
MEASURING CELL METABOLISM	80
PRE-OWNED EQUIPMENT MARKETPLACE	89
ADVERTISERS INDEX	89
PARTING POINTS	90

Lab Manager® (ISSN: 1931-3810) is published 11 times per year; monthly with combined issues in January/February, by LabX, P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9. USPS 024-188 Periodical Postage Paid at Fulton, MO 65251 and at an additional mailing office. A requester publication, Lab Manager, is distributed to qualified subscribers. Non-qualified subscription rates in the U.S. and Canada: \$120 per year. All other countries: \$180 per year, payable in U.S. funds. Back issues may be purchased at a cost of \$15 each in the U.S. and \$20 elsewhere. While every attempt is made to ensure the accuracy of the information contained herein, the publisher and its employees cannot accept responsibility for the correctness of information supplied, advertisements or opinions expressed. ©2013 Lab Manager® by Geocalm Inc. All rights reserved. No part of this publication may be reproduced without permission from the publisher.

WDS Canadian return: P.O. Box 216, 478 Bay Street, Midland, ON Canada L4R 1K9.

POSTMASTER: Send address changes to Lab Manager®, PO Box 2015, Skokie, IL 60076.



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Teamwork

"The strength of the team is each individual member. The strength of each member is the team."
— Phil Jackson

It's not as though there hasn't been enough said or written on the subject of team building and leadership. However, sometimes good ideas bear repeating. As anyone who's been fortunate enough to work for a great boss within a great organization knows, a trusting and collaborative workplace dynamic can make great things happen. And anyone who's been less fortunate and worked for a bad boss within a dysfunctional organization knows the toll it can take on one's spirit.

Last week most of us were watching when the Philae Lander made the first-ever soft-landing on a comet. Besides being a "game changer" for cometary science, watching the team of enthusiastic and committed scientists and engineers work together behind the scenes was equally inspiring. Now *that's* a team.

This month's cover story is a must-read for any lab manager who needs a refresher course on what it takes to foster happy, functional, and productive teams.

Which is not to say it's easy, as Dr. Weston Judd, Utah Department of Agriculture and Food laboratory director and state chemist, reminds us in this month's Perspective On: A Food & Beverage Lab (page 56). One challenge for Judd is the diversity of his team. "Overall, [my team] works pretty well together, though promoting teamwork is a bit of a challenge sometimes because the dairy testing lab does work that's quite a bit different from what the chemistry group does." His solution—cross training—allows the staff of one lab to help that of another in times when one lab has few samples and the other is overwhelmed.

Try as a manager may, occasionally there is one bad apple on the team whose performance or attitude is a serious detriment to the rest. When warnings and corrective actions fail to improve the situation, a manager has no alternative but to let that person go. In this month's Leadership & Staffing article (page 20), author Rachel Muenz shares tips and procedures for handling this unpleasant task. "Being both professional and kind is key at this stage. The majority of employees are generally good people but simply aren't a good fit for the position," she says.

Most everyone working in a lab these days knows that they share many of the same afflictions as office workers since laboratory work requires more and more time tethered to a computer monitor. As such, back, shoulder, and wrist problems have become much more prevalent. Vince McLeod, in this month's Health & Safety article, addresses the fundamental ergonomic risk factors related to desk work, which are position/posture, repetition/duration, and force. "The good news is that these at-risk conditions that can cause pain and potential injury can often be easily controlled if one understands basic ergonomic concepts and how to apply them." Turn to page 40 to learn just that.

If your lab is considering automating any part of its current workflow, turn to this month's technology article, "Automating Your Lab" (page 30), to determine how to make the best automation choices specific to your needs. "The key to keeping automation as simple as possible starts at the beginning. By identifying the specific spots where automation could do the most good and exploring a variety of solutions, a lab manager increases the odds of a successful implementation," says author Mike May. For a real-world example of how the automation decision-making process works, check out this month's Ask the Expert Q&A (page 34).

For other timely and valuable technology-specific information, visit this month's Product Focus, INSIGHTS, and Technology News pages.

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

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“We will put our best team on this one,” is a common refrain in many circles and is regularly heard in laboratories as directors seek to reassure customers and other stakeholders about delivering accurate and reliable results by deadlines. In many settings, sometimes with good reason, the use of teams has emerged as an answer to both routine and critical questions.

But teams may not always be the optimal answer, according to Alice Sapienza, Professor Emerita at Simmons School of Management in Boston. “There are certain conditions in which teams are highly efficient and others in which they are not,” she says, referencing the seminal work of the internationally acclaimed organizational design and management expert, the late Jay Galbraith—who passed away on April 8, 2014.

“If you are working in proximity and there are already good relationships, a team may be superfluous. Whether you are working in proximity or not, if relationships are difficult with basic interpersonal problems—people are abusive and disrespectful or managers shut down conversation and discourage candor—then forming teams will not provide the solution,” says Sapienza.

She says that considerable evidence supports the centrality of interpersonal and cultural issues in team interactions. “These issues are at the root of whether a number of processes are safe and effective and are certainly applicable to whether teams working in a laboratory could attain their objectives.

“Sometimes, there is hyperbole that teams are the most effective way to do just about anything—but the real question is how to get people to work well together, not what the formal structure is called,” says Sapienza.

She contends that the language around the team has been applied rather haphazardly. “The word has started to lose its original denotation—it is as though a word in microbiology is applied broadly to other situations,” she says, adding that team now essentially connotes “people who work well together.”

But she notes, citing Galbraith, that a team is a formal management structure. “When you have large and fairly well-defined tasks requiring the contributions of a multitude of disciplines, then you may want a formal structure called a team in which for certain periods of time individuals are chartered with the team’s ground rules—that may be an effective way to move forward.”

Sapienza says that teams are at their best “when the task is complex and uncertain—requiring a multitude of specialists to collaborate to complete it—and an enormous amount of information needs to be processed in dividing this work into groups and subtasks and assigning multidisciplinary teams to each subtask.”

To deal with complex tasks, there is a need for a formal structure where members are chartered to perform certain tasks in a project, such as in pharmaceutical labs where they have sub-job descriptions and an end date for the particular project. “Those are the conditions under which teams have been found to be more effective compared with a structure that is not formal or where people get together periodically and talk about the project and some of its issues,” says Sapienza.

“The primary goal of teams is to help people help each other get to the best work—if my best work does not contribute to what you are working on, it does not do the project or its goals any good,” she says.

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BUILDING A DREAM TEAM

Focusing on the composition of effective teams, Sapienza says that leaders are generally associated with good interpersonal skills. "The team leader is usually appointed as a linking person on the basis of having not only project knowledge but also interpersonal skills. What is more important, however, is that the technical/scientific leadership is not vested in the project leader, but changes with the expertise needed at any given time.

"The conundrum of effective teams is that one person is the link between the team and the larger part of the organization, but that person does not dictate or lead or control the scientific technical work. That actually depends on the problem and the technical expertise needed at the time," says Sapienza.

She says that laboratory directors seeking to build effective teams should select leaders who have good interpersonal skills who are capable of coordinating multiple personalities and getting people to agree to work towards a common end. Leaders should have the ability to carefully negotiate differences of opinion and work with different individual needs and idiosyncrasies, says Sapienza.

Picking team members is a simpler issue because this entails matching intellectual skills with the requirements of the project, but these are still individuals who have to be helped to share information in their work and whose assumptions can challenge each other in the best possible way; otherwise, there will be suboptimal intellectual performance, she says.

She says that this is difficult because people have different perspectives and assumptions, which she calls equivocality. "A good team leader knows that when people nod in agreement about something, they may have different perspectives about what that really is. Thinking through that and moving the team toward the project's goals is a key first step for the leader."

Wei Zheng, associate professor of management, Department of Management and Marketing, University of Wisconsin-River Falls, says teams provide a range of benefits in laboratory and research settings by broadening the perspective and harnessing a larger knowledge base and experiences to chase the same goal. "Teams represent a clever approach to pursue key objectives."

The leader is the most instrumental factor in whether a team functions well or is dysfunctional. Poorly functioning teams usually reflect the leader's

BUILDING A DREAM TEAM

inability to engender trust among the members.

These teams are often obstructed by fear of conflict among noncommittal members who avoid ownership and accountability, and who are indifferent to the project's outcomes. In contrast, leaders of effective teams cultivate trust among members, focus on successful conflict resolution, challenge members to assume responsibility, and encourage ownership and commitment to the project's goals and objectives.

In a speech in the audio conference "Best Practices for Motivating Scientists," reported in the 2010 issue of *Principal Investigator Advisor*, Prof. Alice Sapienza noted that leaders can hone their own leadership skills via self-reflection—the leader's own positive or negative attitudes about the project could be detected and emulated by members—and consulting with mentors and respected predecessors, learning about the enthusiasm and motivation of individual team members, and figuring out when non-functioning members, who could exert toxic influences on the team's work, should best be directed elsewhere.

"Laboratory directors seeking to build effective teams should select leaders who have good interpersonal skills."

Leadership is tough, says Sapienza. "The literature is replete with how good team leaders get people to talk with each other, challenge each other respectfully and come to agreement around issues as honestly as possible. There's a great deal of face-to-face slog—there is no glamor and no short cut."

Prof. Zheng says that teams have different ways to select leaders. "In most teams that I am familiar with, the leader is the one with the most expertise applicable to the project and who can also get along with other people." She adds that sometimes leaders emerge that way, but that is not the best preparation for them.

"In other cases, leaders are selected first and then they get to pick the other team members, which can be good because they often know the people they pick—building trust and collaborative spirit."

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BUILDING A DREAM TEAM

She says that in some teams, leaders emerge because of their leadership skills and capability.

Zheng says that in general, effective leaders encourage creativity and help team members to progress in a unified direction. She says that in some teams, the leaders have to be more direct and tell members what to do. In teams where members are not very committed, leaders have to motivate them and provide a strong sense of direction and purpose. On the other hand, there are highly motivated teams where the leader's job is "to get out of the way."

"Leaders have to be very careful and watchful. They have to look for a complex of cues about how competent team members are, how committed they are, and what is missing, and try to figure out what must be done to help them reach their goals," says Zheng.

With respect to the question of how the management of research and service labs should approach the creation of teams in their organizations, Zheng says the first requirement is expertise because "you are looking for knowledgeable workers to assemble a good mix of knowledge, background and expertise."

Sapienza concurs, noting that since leaders are the ones to help members work through professional biases to move to their goals, their intellectual caliber is a given. She adds, though, that their people skills are vital for the achievement of bigger objectives.

Zheng says that team spirit is important for people who want to work in a team; otherwise, "there is no point to having them on the team—the motivation for being on the team is important."

She says that management must determine how well leaders and team members are aligned with the goals of the project and with each other. "This is important to figure out early because misalignment could lead to team dysfunction."

Zheng says that management will also need to work through a host of other issues, including personality

types. She explains that in teams where there are introvert and extrovert personality types, during meetings the extroverts are active participants and contributors while the introverts are more likely to be listeners who absorb key messages. "This could lead to misconceptions—the extroverts could conclude that the introverts are detached and not interested or not contributing. On the other hand, the introverts may be thinking that the extroverts are taking over and don't want to hear their opinions."

She says that there needs to be accommodations for different personalities. "Introverts could be provided

with different communication channels other than providing spontaneous feedback in meetings. Care must be taken to ensure that differing styles and personalities do not clash, as this could create dysfunction."

Zheng stresses the need for clarity of roles and goals. "There are teams where the primary goal is not clear. Team

members would work on what they assume to be the most important goal, but this could lead people astray and cause friction in the team, and there could be a misalignment of roles leading to overlap or even duplication, which could also cause conflict."

In building teams, care should be taken to ensure that team members are collaborative, like to learn about other perspectives, value working with other team members, and are prepared to give their best efforts and work well with others. It is important to pick team leaders who will give individualized consideration to team members instead of treating them as replaceable bodies, and will set up channels to address their aspirations, values and personal goals, while getting to know them on a personal level, according to Zheng.

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"Poorly functioning teams usually reflect the leader's inability to engender trust among the members."

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LABORATORY ACCREDITATION

BENEFICIARIES INCLUDE USERS OF LAB SERVICES, SPECIFIERS, AND THE PUBLIC by Peter S. Unger



What is the value of laboratory accreditation? Whom does it benefit? And what are those benefits? What is the standard of competence? What value does accreditation have from an internationally recognized body such as the American Association for Laboratory Accreditation?

Besides laboratories, there are three groups that benefit from accreditation, perhaps more so than laboratories themselves. These three groups are users of laboratory services, specifiers (private and public bodies that need accurate test data to make decent decisions), and the general public.

“A laboratory must have persons in its organization who have the authority to execute specific functions within its overall scope of work.”

Testing and calibration laboratories gain a great deal from a technically sound assessment and accreditation by an internationally recognized accreditation body. Here are some of those benefits:

- By going through the accreditation process, a laboratory gains by necessarily building a quality management system (based on principles listed later in this article), which functions to reduce procedural errors and prevent errors from “going out the door.”
- A “credential” that designates the laboratory as qualified and competent to provide services in the field or fields in which it is accredited.

- A regular, objective “checkup” that helps a laboratory’s management make continual improvements in its operation.
- In an increasing number of instances, entrée to a given market that would otherwise be closed to the laboratory.
- Increased laboratory productivity, resulting from a decrease in the number of clients who insist on having their own staff audit the laboratory. More of these clients now base their confidence on a third-party accreditation.
- International recognition of the accredited laboratory’s competence, if the accreditation body is a signatory to the mutual recognition arrangement of the International Laboratory Accreditation Cooperation (ILAC).
- Accreditation assessments help the laboratory staff stay on the cutting edge of technology developments in their field.
- Significant discounts in liability insurance premiums are not uncommon, when the insurer appreciates the verification-of-competence that accreditation represents.
- Improved performance by laboratory staff. Undergoing regular assessments enhances staff discipline and sense of professionalism. Employees are more likely to be committed to complying with the firm’s quality management system and standards of performance.
- For calibration laboratories, accreditation by an internationally recognized accreditation body validates their pivotal place in the unbroken chain of traceability to national and international measurement standards.

Users of laboratory services are also beneficiaries of laboratory accreditation. Users have greater confidence in the accuracy of the test or calibration report they are purchasing because it has been generated by a competent

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facility. This is particularly true for an educated client, one who is conscious of the scope of the laboratory's accreditation. Accredited laboratory data underpins product certification decisions.

Clients can make use of information sources such as the ILAC Website (www.ilac.org) and its links to the online directories of ILAC Arrangement signatories to identify laboratories qualified in their area of need.

Manufacturers also gain efficiency because of accreditation; instead of their own on-site assessments, they can defer to the assessments of competent accrediting authorities. Other manufacturers

that have in-house testing or calibration facilities can reduce or eliminate these overhead costs and subcontract with confidence to outside accredited laboratories.

Specifiers, such as government regulators, have come to appreciate the importance of credible accreditation programs that are based on internationally recognized standards. With restricted budgets, many government agencies can no longer do it all themselves; increasingly, they must rely on third-party laboratories to support their regulatory efforts. When they do so, they need a fair and meaningful basis for identifying qualified providers. Accreditation provides that.

Accreditation also has a positive impact on the general public by stimulating higher standards of quality within laboratories. This leads to more consistently reliable test data, thereby contributing to more effective health and safety regulation and to products of more consistent quality. Because the science of accreditation continues to improve, holding laboratories to even higher standards, these public benefits will continue to accrue.

Internationally recognized accreditation bodies around the globe are committed to this improved accreditation system and to maximizing the benefits of laboratory accreditation for all stakeholders.

ISO/IEC 17025 – The standard for laboratory competence

The general requirements for laboratory competence are described in the ISO/IEC 17025 standard. This standard establishes a global baseline for the accreditation of all types of laboratories. Since its origin in the late 1970s, ISO/IEC 17025 (formerly known as ISO Guide 25) emphasizes competence of laboratories to perform specified tests, not just mere compliance with requirements.

Recognition of such competence generally requires that laboratories obtain accreditation. Accreditation involves on-site and performance assessments as well as ongoing proficiency testing. Assessment of competence requires persons who not only understand the requirements of the standard, but have a sufficient depth of understanding about the specified tests to make judgments of competence. The assessors must

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also understand the principles underlying the requirements of ISO/IEC 17025, which are not always obvious.

Blind adherence by a laboratory to the requirements of the standard, while better than no system at all, is not an approach that instills confidence in its ability to produce valid test results. Nor is it the best approach to acquire recognition of such competence.

Principles

Several important principles are imbedded in the requirements of the standard:

- Responsibility
- Scientific approach
- Objectivity and impartiality
- Metrological traceability
- Reproducibility
- Transparency
- Capacity

Responsibility. A laboratory must have persons in its organization who have the authority to execute specific functions within its overall scope of work—and can demonstrate accountability for their results.

Scientific Approach. A laboratory should carry out its work based on accepted scientific principles, preferably following consensus-based methods or standards, and deviations from accepted methods must be substantiated in a manner considered generally acceptable by experts in the field.

Objectivity and Impartiality. The results produced should be based on measurable quantities. If results are subjective, they must be produced by people deemed qualified to make subjective judgments. The pursuit of reliable results through the use of accepted scientific principles is the primary and overriding influence on the persons carrying out the testing. All other influences are secondary and not permitted to take precedence.

Metrological Traceability. The results produced are based on a recognized system of measurement that derives from accepted known quantities (SI system if units of measurement) or other well-characterized references. The chain of comparison of measurements between these accepted, known quantities and the device providing the objective result is unbroken for the transfer

of measurement characteristics, including uncertainty, for the whole of the measurement chain.

Reproducibility. The test method used to produce results will produce results within an acceptable spread or range during future testing and within the constraints of using the same procedures, equipment, and persons used for a prior execution of the test.

Transparency. The processes within a laboratory producing objective results must be open to external as well as internal scrutiny, so that factors that may adversely affect the laboratory's pursuit of objective results based on scientific principles can be easily identified and mitigated.

Capacity. A laboratory must have the resources (people with the required skills and knowledge; environment with the required facilities, equipment, and instruments; procedures to ensure consistency of test processes; and quality control for the key steps in the testing processes) necessary to carry out the tests and produce reliable results.

These principles do not cover every requirement of the standard, but they are comprehensive enough to allow laboratories and assessors to appreciate the reasons behind most of the individual requirements. They enable assessors to exercise their professional judgment in evaluating whether a laboratory meets the requirements for recognition of its competence to perform specified tests.

Conclusion

Laboratory accreditation within the United States and worldwide is gaining favor for procurement and regulatory purposes. Confidence in test data is paramount to product acceptance. Users are looking for assurance of high-quality products and the means to evaluate suppliers without incurring the costs associated with auditing each supplier. Reliance on third-party accreditation to perform this function for suppliers of test data is an attractive option. The use of ISO/IEC 17025 as the accreditation criteria is also considered valuable for international acceptance of test data.

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THE FIRING LINE



WITH PROPER PLANNING, THE TOUGH TASK OF TERMINATING AN EMPLOYEE BECOMES A LITTLE EASIER by Rachel Muenz

No matter what the reason, whether because of an economic downturn or poor work performance, firing someone is never enjoyable. As a manager, even if the firing is deserved, it's never fun to be responsible for terminating someone's source of income. It can get emotional, and sometimes there are legal consequences if the employee is not given enough of a chance to improve before he or she is let go. The majority of advice out there on the best way to fire someone all comes down to having a strong plan in place.

"I have, in the past, had to terminate technicians who have been under my supervision, due to poor work performance," said Tiffany Niven, a laboratory management professional with clinical and regulatory experience. "At my current institution, this is a relatively painless process, but as a personal experience, it can be upsetting."

She agrees a plan is essential to mitigating the upsetting side of firing and emphasizes the importance of being open with employees regarding their termination. "Prior to speaking with the person being terminated, I always had a plan of action in place," she said.

The following steps should help if you find yourself in the unfortunate situation where you need to fire someone.

Step one: Inform

First of all, employees should always be given a chance to correct any performance problems before they are fired, both for legal reasons and out of fairness, unless the infraction is so terrible that they need to be let go immediately. Managers should first meet one-on-one with the employee to discuss the reasons why they are unhappy with the worker's performance, presenting a clear plan to fix those issues. Cliff Ennico, a columnist

and author of several books focusing on small business, recommends in an *Entrepreneur* article that managers create a list of things they are unhappy with in that employee's performance so the person knows exactly what needs to be rectified.¹

When raising performance issues with a staff member, he says, "Do not allow the employee to drag you into a discussion that focuses on anything other than what you've just covered."

For personnel in the laboratory environment in particular, offering employees additional help or training with scientific techniques they may be having trouble with should be the first step before considering termination. Everyone learns at a different pace and should be given a chance to be successful.²

It's also wise to take into account any problems outside the workplace that may be negatively impacting an employee's performance, such as an illness in the family or other personal issues. Discussing these issues with the employee, especially if they are a worker who normally does an outstanding job, is important in order to give them a chance to recover their past level of work.³

Keeping a written record of the employee's performance over an extended period of time, as well as your plan for improving their work, is also necessary so that they can't come back with a wrongful dismissal suit. If an employee has done such a poor job that they need to be fired outright, the reasons why should always be clearly explained.

"It would not be appropriate to fire someone without telling them why they are being terminated and why they are not being offered the chance to improve their performance—and also, in some cases, why they would not be receiving letters of recommendation," Niven says.



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"I have discovered in most cases that the employee who is performing poorly is often not the one who is devastated to lose his [or] her employment."

Getting the help of your HR department can be very useful in developing your plan to fire someone as they are most familiar with your company's policies for the firing process and disciplinary actions. Most companies use a "three strikes and you're gone" type of policy, but it all depends on how serious the employee's offense is to the company.

Louzette Hattingh, a former lab manager currently working as a quality assistant at Eyethu Coal in South Africa, advises managers to keep the company rules and regulations somewhere in the workplace where they are visible so employees know what is expected of them. Managers should also keep their country or state's laws and regulations in mind when handling terminations. She says that at her company, serious workplace infractions were dealt with by a hearing.

"The one incident I had to handle involved a lab [technician who] hit an analyst [in the face] with his fist," she said. "He was sent for a hearing and discharged for a very serious act of physical violence."

Of course, you never want to fire someone without first thinking it through. And you shouldn't let your personal feelings for someone determine an employee's fate. You may not like someone, but unless they are doing a terrible job, being vindictive to other employees, or going against company policy, feelings alone shouldn't determine whether or not you fire them.^{2,4}

"This is no place for impulsive action or anger or acting in the heat of the moment," advises author Victor Lipman in his article "How To Fire Someone Effectively But (Hopefully) With Dignity" in *Forbes*. "Among other things, mishandled employee terminations can have serious legal and financial consequences. It's a place for thoughtful, well-planned action."

Step two: Follow up

After the initial warning to your employee, you should carefully monitor their performance. If they haven't improved in a few weeks or so, scheduling a meeting to discuss the problem is a smart idea. Refer back to the list of issues you wanted them to fix and give them a chance to explain any factors that

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may have kept them from meeting their goals. Reiterate exactly what you'd like them to work on and give them a period of about a month to improve unless they are such a destructive element to the rest of your team that it would be better to let them go at that point. Spell out very clearly that the next step is to fire them if they do not sufficiently improve within that time span.¹

Step three: Fire

If the employee continues to produce unsatisfactory work or behave inappropriately, you'll have no choice but to let them go. Being both professional and kind is key at this stage. The majority of employees are generally good people but simply aren't a good fit for the position. Most information regarding the firing process recommends ending on a positive note and providing any career advice you can, along with references, unless the employee was especially awful. The Burroughs Wellcome Fund, Howard Hughes Medical Institute book, *Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty, Second Edition*, points out that the world of science is a small one—therefore, it's likely you could end up working with that employee again in the future. Being kind is wise for that reason.

“It would not be appropriate to fire someone without telling them why they are being terminated.”

While it's important to tell staff why they are being fired, it's equally important to keep it brief so that the meeting doesn't turn into an argument or blame game or give the employee any false hope that they can keep their job.^{1,2,5} *Making the Right Moves* says developing a script for this conversation is a good way to stay on track and avoid rambling. Creating a checklist with the help of HR can also help ensure that you don't miss any steps, such as informing the employee about what severance they will receive from your company. You may also want to have a witness (perhaps someone from HR) during this process, both for legal and security reasons, especially if you think the employee could get aggressive.

There are differing opinions on when in the week you should fire someone. Ennico suggests doing it early in the week so that the fired employee doesn't have a chance to “stew about it” over the weekend.” However,

other articles suggest firing later in the week is better so the person's colleagues aren't thinking about the firing over the course of their workweek, distracting them from more important tasks. Of course, if the fired individual was a bad element in the lab, morale is likely to improve in the wake of termination, so in that case, sooner is probably better.

Another important step is to ensure all company or lab equipment is returned and that the employee can no longer access the lab's computer system. In her About.com About Money article, “Top 10 Don'ts When You Fire an Employee,” Susan M. Heathfield suggests teaming up with your IT department to remove the employee's system access while they are in the termination meeting with you. That way, if they are the vengeful type, they won't have a chance to get into your company's system and cause serious damage.⁵

“I've heard many funny but also sad stories about employees sending good-bye notes that started with, ‘I'm outta here, you suckers,’” she writes. “And, I am also aware of employees sabotaging computer systems in a moment of anguish following termination.”

She also suggests that managers team up with IT to monitor an employee in the weeks before termination, if possible, to make sure they don't steal sensitive information. In a lab, anything related to experiments, such as cell lines or critical data, should be watched carefully.²

Giving your employees an incentive to sign a release form is something else most guides on firing recommend, and getting the help of your company's legal team to draft such a form is encouraged—again, to prevent wrongful dismissal or workplace discrimination suits.

“If the employee is a minority, a female, or over the age of 40, I would recommend asking them to sign a release of liability,” Ennico says in his article. “Have your employment law attorney draft the necessary release before the exit interview—it should take only about an hour of the attorney's time.”

Once all the points on your checklist are checked off, see the employee safely out of the lab, taking care to keep them away from their coworkers to minimize the chances of a scene. Having someone else collect their personal belongings or arranging to have the fired employee come get them when everyone else has gone home can keep the staff member from mingling with their now-former coworkers. It also minimizes the chances that the employee will take company property with them and is a nice way to protect their dignity, as they are likely to be agitated or possibly even in tears.⁵

In the end, it's important to keep the Golden Rule in mind. Treat employees how you would want to be treated if it were you being fired. However, it's equally important to get the process done since an unproductive or bad team member can cause a lot more harm the longer you delay the decision to fire, a point highlighted in *Making the Right Moves*.

"An employee with serious work-related problems is a disruptive force and, especially in a small lab, can significantly retard research progress," the book states. "Although it is not easy to decide to terminate someone, those investigators who have had to release staff say that in retrospect, their biggest mistake was not doing it sooner."

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ARE YOU CRAZY? IF NOT, YOU MAY WANT TO CONSIDER IT

By Howard Manns

If you take a look at history and some of the greatest achievements ever made, you'll find that the people who made those breakthroughs were a little *off*. We've all heard the definition of insanity as doing the same thing over and over again and expecting different results. It seems that the individuals who stepped out of that conformity, deciding to be crazy as opposed to insane, made the greatest impact.

We have been programmed. From an early age we were told to color inside the lines, speak only when spoken to, red light means stop, green light means go, yellow light means speed up now before it turns red! We've learned to conform. And conformity is basically spending your life pleasing everyone else and forgetting your own dreams. Studies have shown that children up to the age of four have the most creative minds. Everything is so new to them that they become extremely imaginative and creative—a clothes pin is an airplane; a box is a play station. A child is just as excited to play with the wrapping paper as they are to play with the gift that's inside. That is until we (as adults) begin to give

meaning to the world around them. A meaning laced with our belief system formulated through the years.

So why crazy? John Lennon, one of the crazies who held on to that creativity, said that his mother always told him that happiness was the key to life. When he went to school, they asked him what he wanted to be when he grew up? He wrote down "happy". They told him he didn't understand the assignment. At a young age, he told them they didn't understand life.

Some other crazy people

Beethoven, another musical genius always carried a pencil and music paper. Not that crazy, right? But one of his daily habits was to count the coffee beans for his morning coffee. A total of 60 beans, no more and no less.

Charles Dickens, responsible for so many whimsical stories, would walk to the local grocery store and was always seen running back to his office with his groceries clutched to his chest. Why? Because his characters were chasing him!

L. Frank Baum, creator of the timeless *The Wizard of Oz* had a passion for gardening. He was often heard by his wife and staff talking to his flowers with such phrases as, "My characters just won't do what I want them to!"

Stephen King is a genius in the written world of strangeness. His quirk? He never quits working everyday (including holidays and birthdays) until he reaches his quota of 2,000 words.

As you can see, the best performers are considered abnormal. In fact, each of these and many other non-conformists were at first considered crazy until they were successful. Then they were geniuses! The key to an outstandingly successful lab is simply the art of thinking differently. By today's standards many of these individuals would be diagnosed with a mental illness. If this is the case, they took mental illness and made it mental *skillness*.

The two most important days in your life are: first, the day you were born and second, the day you find out why. As Mark Twain is quoted as saying, "Twenty years from now, you will be more disappointed by the things that you didn't do than by the things you did do."

Do you think you might want to consider being a little more crazy?

Howard Manns is a professional speaker, trainer, and author living in Pittsburgh PA. To contact him, call 412-855-0619.

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Be sure to attend Howard Manns' Lab Manager Academy webinar, "Success & Lunacy: What's the Connection?" on Wednesday, January 7th, or afterward at www.labmanager.com/success to watch the archived video.

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THE RIGHT SIZE FOR SUCCESS

By Mark A. Lanfear

In the past few years I've heard more and more phrases like "work spouse," "work bestie," and "office neighbor." In fact, it's not uncommon for adults to meet at least one of their close friends through work. With work imitating life these days, "breakups," no doubt, can affect us on the job, too.

So, when our life changes at work—when our friends aren't there anymore, whether due to changes in technology, profitability requirements, or policies regarding the implementation of other business strategies such as outsourcing—how do we cope with our new reality?

Talent today choose their work environments as much, if not more, than their employers choose them. We know today that 40 percent of talented professionals are planning on making a workplace change in the next 12 months. That number is even higher for laboratory and scientifically trained people. It's 2014, and your top talent may be the one who is breaking up with you for a better offer!

Still, when outside factors drive a downsizing or "rightsizing" of the workplace, people will lose their work "homes" and yes, even their friends. That's why it's more important today than ever to keep the humanity in human resources. All managers must learn to treat these workplace changes with care—just as we would treat with care what happens in the personal lives of our friends.

Amid the economic crisis of 2008, countless articles and blogs detailed a special case of modern survivor's guilt in the workplace. In the aftermath of mass layoffs, experts argued that those left behind in the workplace were just as likely to experience some kind of mental anguish over their coworkers getting the short end of the stick as those coworkers themselves. On the flip side, something called "survivor's envy" could make someone feel like they'd be in a better place if they'd been let go too.

Whatever the case, the feelings aren't good. To add insult to injury, there's usually more work to do to make up for the leaner workforce, which can only add to the stress.

For managers, there's an extra layer of challenge to a downsizing or rightsizing situation. As hard as it can be to let people go, it can be even harder to manage this mini HR crisis with a team full of people whose emotions will no doubt be raw for weeks.

One may ask, why should situations like this be so important to corporations? After all, leaders have every right to scale their workforce if business drivers demand it, especially if it will help raise the bottom line and improve the health of the company.

At the same time, not dealing with a downsizing correctly could ultimately pose a risk to your most important product of all—the organization's brand. A solid brand attracts the right talent for your core business

goals. It attracts the right customers through marketing and positive word of mouth. And it attracts the right partners through corporate responsibility and proper actions. These are the critical success factors to evaluate when companies are faced with a possible blow to their brand through downsizing or rightsizing.

So, first and foremost, if you must ever face the prospect of a downsizing, be honest about the situation and what's driving it. Once certain employees are no longer there, the cat's out of the bag. Your remaining team will know what's going on, so it doesn't make sense not to explain exactly why changes occurred.

This is the time to create positive employee outcomes through proper change management and, communicate to your employees their value to the organization and gather their feedback about the downsizing. Organizations can begin to assess the impact of the change, find the gaps, and take steps to reinforce a positive change management work environment where needed. Your responsibility is to lead through change and help the community quickly recover.

Yes, there's still work to do, and you're probably confident that, whatever your employees think about the situation, they'll be able to put their emotions aside and remain professional. But expect at least three months of change management. Create a formal communication plan, knowledge management strategies, and transfers

of responsibilities with an eye toward continuous improvement. And calling even a brief meeting to allow employees to express their emotions surrounding the workplace shift is a healthy way to address the elephant in the room. You may find that this is all you and your team need to help start getting everything back on track.

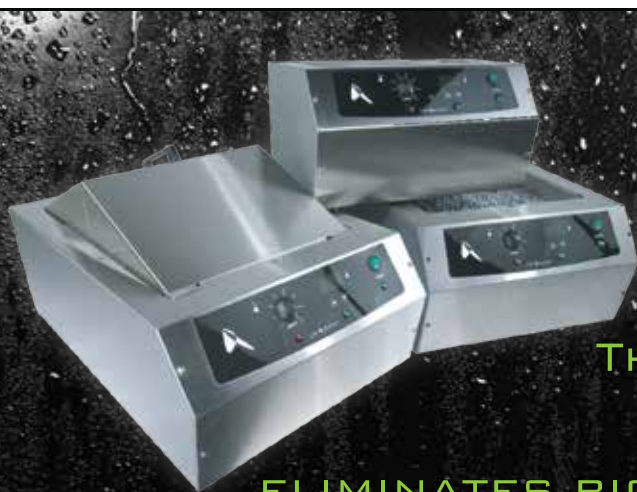
In the long term, it's imperative that you show genuine interest in the success and development of talented professionals who will now be asked to redouble their efforts. Hopefully, you've been doing a bit of this all along. But after a layoff or other major workforce shift, this is an even more essential factor, as it will raise engagement levels and possibly even lead to innovation if

you are willing to allow employees to be creative and stretch their skills. In the shadow of losing some of your critical human capital, the challenge of leadership will be to ignite a community of productivity and continue to set positive goals.

Finally, as time goes on and things have gotten back to normal, it's important to take tangible steps to cultivate the change management environment. In our globalized economy, change is the normal and steady march toward innovation. The old adage of knowledge being power still rings true, so keep your colleagues informed of strategic goals and how these can affect them and their futures.

Because of many of the drivers mentioned, in today's economy turnover on the job is an expected part of our working lives. If you can manage change while focusing on maintaining your professionalism and compassion, you'll increase your company's brand visibility and position your workers to want to continue being successful in the face of adversity.

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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AUTOMATING YOUR LAB

HOW TO GET THE GREATEST BENEFITS OF AUTOMATION AND STILL MEET YOUR BUDGET By Mike May, PhD



The concept of lab automation sounds almost magical, as if a sophisticated machine here or there makes a lab run by itself. Indeed, automation can improve the efficiency of a lab and more, but figuring out the best “here” or “there” creates the challenge. Likewise, getting the most from automation depends largely on the specific application. Nonetheless, some general planning helps in almost any approach to automating a lab process.

First, a scientist must know what goals to pursue. According to Louis Murray, applications market development manager in automation solutions at Agilent Technologies—speaking at a *Lab Manager* webinar in 2014 on “Trends in Lab Automation”—scientists automate a lab to increase throughput, walk-away time, and data reproducibility. During the webinar Murray said, “Automation will remove one bottleneck and increase the throughput of a process; however, in reality it simply moves that bottleneck to another step in the overall workflow.” Done properly, though, the new bottleneck is smaller than the one it replaces.

That means that a lab manager should know what bottleneck is being addressed with automation and where it will create a new one. As Murray said, “So really by carefully planning and coordinating lab expansion efforts, throughput can be increased as efficiently as possible, ensuring that all the different processes grow in sync, and that funds are spent as efficiently as possible.”

Pick the places

A lab manager probably has a few spots in mind for automation. As Jason Greene, senior product marketing manager at BioTek Instruments, which is headquartered in Winooski, Vermont, says, “Maybe you are running multiple assays and want to automate a few.” He adds, “Your budget surely has a limit.”

At the Center for Chemical Genomics at the University of Michigan in Ann Arbor, HTS (high-throughput screening) director Martha Larsen faces these very challenges—the balance between getting the best benefits of automation while meeting a budget. As she says, “We think about the cost and benefit of each item. If we are going to spend x number of dollars, what will be the return to the lab?”

In some cases, doing something faster is a driving force to automate, but that is not always true for Larsen. “Since we are an academic lab,” she says, “we don’t focus on faster. Instead, the benefit we look at might be that you can save hiring someone.”

Sometimes, finding out what automation works, though, is an empirical question. As an example, Larsen describes purchasing an instrument to fit plates on a deck. She says, “By the time a scientist learned how to automate this, they’d spend far more time than they would have if they just kept putting the plates on the deck by hand.” Part of the issue with that automated system arose



▲ Today’s automated platforms often include user-friendly interfaces, like the one on this TTP Labtech freezer. (Image courtesy of TTP Labtech.)



▲ *Many workflows create bottlenecks that can be easily automated, such as these microplates being automatically fed to a BioTek Cytation 5 Cell Imaging Multi-Mode Reader. (Image courtesy of BioTek Instruments.)*

from the frequency of usage. As Larsen says, “If you’re only doing something four times a month, it might be quicker to do it manually.”

Moreover, that automation failure taught Larsen a crucial lesson. She says, “Now we evaluate an automation decision based on historical usage, then think of the automation investment and how long it will take to get the time back that it takes to install and make the system work.”

That kind of analysis led Larsen to not automate her lab’s flow cytometer. “Lots of people buy a robotic arm that puts on plates. We found that it only takes 10 minutes to put on the plates, and we only do it two days a month,” she says. Plus, she uses a student to do it.

Conversely, Larsen says that the robotic arm for her high-content microscope really saves time. “It has been worth the investment,” she says.

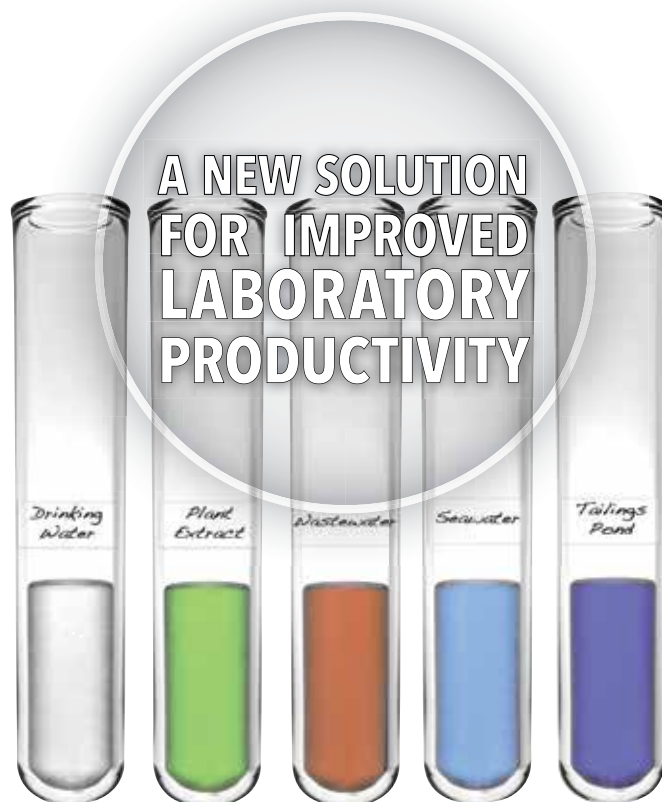
The budgetary side of automation, though, does not end after the sale. As Larsen says, “It’s not the initial cost of the automation that matters the most; it’s actually the yearly fee we face with it.” She adds, “You can buy a car for under \$20,000 and get a three-year warranty, but I spend \$150,000 on automation and they give me six months or one year of warranty. The manufacturers should be willing to stand behind products longer and build that into systems, especially for academic labs, because I can’t

afford some of the service contracts.” For instance, she says, “One robot costs \$40,000 a year for service, and I dropped it.” Such costs have made Larsen decide against automation in some cases.

Get the goals in order

To figure out the best way to add automation to a specific lab, the goals must be considered carefully. As an example, Jeremy Lambert, director for automation and microfluidic application development at PerkinElmer in Waltham, Massachusetts, mentions high-volume DNA extraction from blood or plasma samples.

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▲ *The internal robotics of the Hamilton BiOS system manage stacks of tube racks as part of the automated storage and retrieval process. (Image courtesy of Hamilton Storage Technologies.)*

“This is a very routine, predictable assay, and it doesn’t change much from day to day or week to week, and it often requires lots of liquid transfers and mixing.” He adds, “This process is often employed in workflows where any user errors in labeling tubes or wells could be critical, and errors in pipetting could lead to cross-contamination concerns.” Consequently, automation can really benefit this assay.

“If you’re only doing something four times a month, it might be quicker to do it manually.”

In other cases, the goals might not be as singular. For example, Greene of BioTek Instruments points out using detection with cell-based assays. “This often requires moving microplates between a multimodal reader and an inverted fluorescent microscope down the hall that is shared with other people,” he says. “That’s not efficient, and it can stretch steps over a couple of hours that maybe could be done in minutes.” To do it so fast, though, a scientist needs a device that provides a multimodal reader and an inverted fluorescent microscope in one, thereby automating the transition from detection to imaging.

In one instance, the goal is truly golden. David Barclay, general manager at OI Analytical, a Xylem brand located in College Station, Texas, describes helping

out a large gold-mining company. “They use cyanide to extract gold,” he says, “and they wanted to control the cyanide concentration because it’s very expensive, so we developed an online cyanide analyzer.” By automating the control of the cyanide concentration, the mining company saves time and money.

Better biobanking

Some forms of lab work might seem more suited to automation than others. For example, biobanking—collecting and storing samples for research and clinical applications—sounds like a natural for automation. According to Matt Hutnak, project engineer at Hamilton Storage Technologies in Franklin, Massachusetts, “Sample integrity and sample quality is really paramount. Applying automation to biobanking controls the whole process around the sample.” For example, controlling the temperature improves a sample’s quality. Manual biobanking subjects a sample to greater temperature variation as a freezer gets opened and closed, and even left open longer than necessary. “This can lead to tens of degrees of temperature changes,” says Hutnak. By automating this process, many steps can be completed without opening the freezer, which can produce temperature stability to within single degrees.

Also, automation adds an audit trail to a sample, so “researchers can be confident in the products they are getting out of the biobank,” Hutnak says. This can be especially useful in any regulated industry, such as biobanking samples for pharmaceutical research.

Automating a biobank benefits organizations and labs across a wide range of sizes. Hutnak says, “Our customers include very large research organizations with more than 10 million samples and university labs with just tens of thousands of samples.”

When thinking about automating a biobank, though, researchers need to think ahead. “You need an adaptable solution to meet future needs,” says James Craven, global sales manager for sample management at TTP Labtech, which is headquartered in Hertfordshire, United Kingdom. Sometimes, one simple change helps biobank researchers today and tomorrow. As an example, Craven discusses standardizing tube formats for automating tube storage and retrieval, such as using 2-D bar codes. “Then, automation can act like a vending machine in a freezer,” he says. “A researcher can track and cherry-pick samples that have been stored previously.”

Keep it simple

Not long ago, even the concept of automation sounded complicated. That surely kept many labs from adding automation to anything that could be handled even somewhat efficiently by hand. Today's technology significantly reduces that obstacle.

Part of the simplification in automation comes from an ongoing trend. Kevin Moore, manager of liquid handling product and applications management at Tecan, which is headquartered in Männedorf, Switzerland, explains this by saying: "We started off by building big systems that cover a large piece of workflow in one go, but now we are providing more workstations for small parts of the workflow, which can be moved around." Those smaller systems can be integrated in a lab more easily. Also, they allow for future flexibility, so that the same device might reduce one bottleneck today and a different one in the future.

At the same time, vendors keep trying to make automation easier. "Lab automation users are often scientists and not computer programmers," says Hal Wehrenberg, product manager of software at Tecan. "So the big push is for things to work more like smartphones." As an example, he

describes a touch-tool feature that "provides a very simple user interface on a touchscreen that is customizable." In general, a scientist should not need to write code to make an automated system work. As Bronwen Forster, Tecan's senior product manager for liquid handling, says, "It should be very visual—drop and drag, copy and paste—like you see in Excel." For scientists with some programming skills, a system built on an open software platform still makes it easier to tailor instructions to individual needs.

The key to keeping automation as simple as possible starts at the beginning. By identifying the specific spots where automation could do the most good and exploring a variety of solutions, a lab manager increases the odds of a successful implementation. Also, today's scientists should not accept hard-to-use products, because modern automation should be easier than ever to install, customize, and use. Plus, don't forget to get a system that can adapt to tomorrow's needs—giving you a fighting chance of handling unforeseen workflows.

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Linda Wegley Kelly, PhD

ASK THE EXPERT

TRENDS IN MICROBIOLOGY

by Tanuja Koppal, PhD

Linda Wegley Kelly, PhD, a marine microbial ecologist in the Department of Biology at San Diego State University, talks to contributing editor Tanuja Koppal, PhD, about what has changed in the field since 2001, when she started working in the lab. While genomic and sequencing technologies have become easier and cheaper, the work on the bioinformatics side has now become more tedious in terms of the volume of data that needs to be analyzed. While systems for sample collection and storage have become convenient and customizable, the use of automation in microbiology remains fairly limited. Contamination still remains a cause for concern, and protocols have to be rigorously outlined and implemented.

Q: What is the focus of your research?

A: The focus of our research is microbial ecology in the ocean. We also study cystic fibrosis and look at microbes in the lung and gut. Some people in the lab study bacteria, but many study viruses. My work is mainly involved with the environmental projects in the ocean, looking at bacteria associated with coral reefs, although I do study some viruses too.

Q: What do you have to do to conduct these types of studies in the ocean?

A: We go into the field a lot and collect water samples from different types of reefs. We look at both healthy reefs and degraded reefs and study the microorganisms that live on the bottom, the corals and the algae, the microbes that live on the surface, and also those that live in the water column overlying these ecosystems.

We see that a lot of things change in the water quality in terms of the nutrients and the microbial community in different regions of the ocean.

Q: How do you collect the water samples?

A: We collect large quantities of water, about 100 liters, and concentrate it to small volumes using filters, and that is what we bring back with us. We also collect water to do all the water chemistry, and that we collect in Niskin bottles and filter into vials to bring it back to analyze. We bring back punches of corals and samples of different algae. On our other project, looking at cystic fibrosis samples from humans, we are collecting mostly sputum.

Q: How do you keep samples from cross-contaminating or getting contaminated?

A: We do a lot of genomic work on our samples, and when you amplify the DNA using PCR you have to

keep the post-PCR amplified DNA in another building, as it can easily contaminate our unamplified samples. We always isolate the DNA and set up PCR assays in a clean lab. Thermocyclers used to complete the PCR and all amplified DNA are stored in another building. We never bring equipment, such as pipettors, back and forth between the two buildings. We have had a couple of contamination issues, and it's very difficult to decontaminate when that happens. This is very important to convey when we are training new people in the lab.

Q: What common contaminants do you routinely test for?

A: We routinely separate viruses from the bacterial community using cesium chloride gradients and ultracentrifugation. It is important to reduce the amount of bacterial nucleic acids when sequencing a viral metagenomic library, since bacterial genomes are so

Linda Wegley Kelly is a postdoctoral researcher in the laboratory of Dr. Forest Rowher at San Diego State University (SDSU). She received her doctorate in 2013 from the SDSU/University of California, San Diego (UCSD) joint doctoral program in cell and molecular biology. Her research focuses on understanding changes in coastal marine microbial communities in response to environmental perturbations. Most of the research thus far has focused on coral-associated microbes. She uses metagenomics to identify the taxonomic distribution and functional capacity of microbial communities in marine ecosystems that are subjected to varying nutrient availability and anthropogenic stressors and comprise different benthic compositions.

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much larger. We test for contamination of bacterial DNA in our viral libraries by amplifying the 16S rRNA genes using bacterial-specific primers. It's always hard to get rid of everything, but you can certainly minimize cross-contamination.

Q: What types of instruments do you commonly use in your lab?

A: We have many gene sequencers, thermocyclers, microscopes, microarray systems, and other types of instrumentation for routine sample extraction and preparation. We have a lot of specialized equipment that can be used in the field. We have a field microscope that can be taken apart, and it is custom-built to carry for travel. We work all over the world, in the Caribbean, islands in the Central-Pacific, French Polynesia, and Australia. Our PI, Dr. Forest Rowher, worked in the Arctic region off the coast of Russia last year.

Q: What changes or trends do you see in the field of microbiology?

A: Sequencing has definitely become a lot cheaper. A few years ago we used to work with small libraries consisting of a few hundred sequence reads. Now we can have more than a million sequences per library, and therefore the computing power is often a limitation. As biologists, we are faced with having to deal with these massive sequence libraries. Most of the viral diversity is unknown, but now with all the sequencing power the unknown is becoming a little more known. A few years ago many of the bacterial sequences that were known were those that had clinical implications. So they were either pathogens or bacteria that

could be grown in a laboratory. Now with a technology called single-cell amplified genomes (SAGs), you can sort bacterial or viral cells from their environment, isolate one cell, and then sequence the genome of that cell directly without having to grow it on a plate. We can culture only about 0.1% of all the microbes out there. So if we have to grow a cell in order to sequence it, then we can study only a very small portion of the microbial diversity that exists. With technologies like this we can study the microbes that occur naturally in an environment and not just the ones that can be grown in culture or are pathogens.

Q: Have you taken advantage of all the lab automation that's now available?

A: We don't do a lot of high-throughput work, and hence we do not have robotic systems in place. We do have one project where we have to collect thousands of samples, and we are thinking about ways to process the samples if we get about 1,200 samples every couple of weeks. We could use robotics, but the first step still has to be done manually. We are still starting with a sample in a bag that needs to be dissolved in a buffer and moved to a plate. So we are limited by the steps that can be automated.

Q: Have there been any improvements in the options for sample collection and storage?

A: Sample collection is still the same whether you are working on a ship or in the field. However, there have been some nice advances for organizing the samples in our freezers once they are collected and analyzed. We now have a database with bar codes

for all our samples. It's hard to go back and bar code all the samples that we have collected over the past decade. But having this system in place will help us find samples more easily going forward. We also have backup systems for our freezers. If the power is down, the alarms go off, we are notified by phone, and the backup systems start releasing liquid CO₂ so the samples can stay cold for a few days.

USEFUL SUGGESTIONS FOR SETTING UP A MICROBIOLOGY LAB

- Assign a separate room for receiving and storing samples
- Identify specific areas for media preparation, culture maintenance, washing and decontamination, sample testing, staff activities, and other functions
- Set up partitions and panels where needed and have them sealed to avoid air leaks and contamination
- Use equipment and workbenches made from appropriate materials and to the proper specifications for use
- Check to ensure that water, drainage, power, and ventilation systems are set up per requirements and routinely checked

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Forest Rohwer, PhD

WHAT'S CHANGED IN MICROBIOLOGY OVER THE PAST DECADE?

In the past decade the real amazing changes have taken place in sequencing and microscopy. When I set up my lab at SDSU in 2001, people did not believe that sequencing would be important in microbiology, and so it was very hard to get funding for sequencing. Today that issue does not exist. In microscopy, the improvement in resolution and the ability to look at live samples have been big steps forward. The optics have improved dramatically, but more important, the software to analyze the images, such as for deconvolution, has really changed everything. The tomography methods associated with electron microscopy, the two-photon confocal microscopy, imaging mass spectrometry, and other breakthroughs have really changed how we look at things in environmental microscopy.

Previously we used to just grab samples and bring them back for analysis and find out a year later what it is we were sampling. That's really changing. We now take microscopes with us and do sequencing out in the field, and it's like having a sophisticated lab in the middle of nowhere. Having customized equipment helps us adapt when we are in the field and set up the sampling.

The other change is in the cross-disciplinary nature of microbiology. A lot of microbiologists these days are trained in a broad range of topics and are really good at thinking about the biogeochemistry of the systems they are working on. For instance, people studying hot springs use those findings to see how the oceans work, and people studying oceans try to find an impact on the human system. So it's become an extremely interdisciplinary field. The tools that people are using are also changing. Today a graduate student in my lab will do field work to collect samples and will learn how to sequence a genome and how to use bioinformatics and statistical tools to analyze the data.

I do not make big investments in the lab. I tend to support the core facilities and let them do what they are good at. I focus on investing in my core research and expertise, such as on the core technologies that are needed to process the samples. It is very underappreciated, but having the right microscopes to take to the field and processing the right nucleic acids from your sample are what's most important. I rely on the support of the core facilities for everything else and build a collaborative research environment.

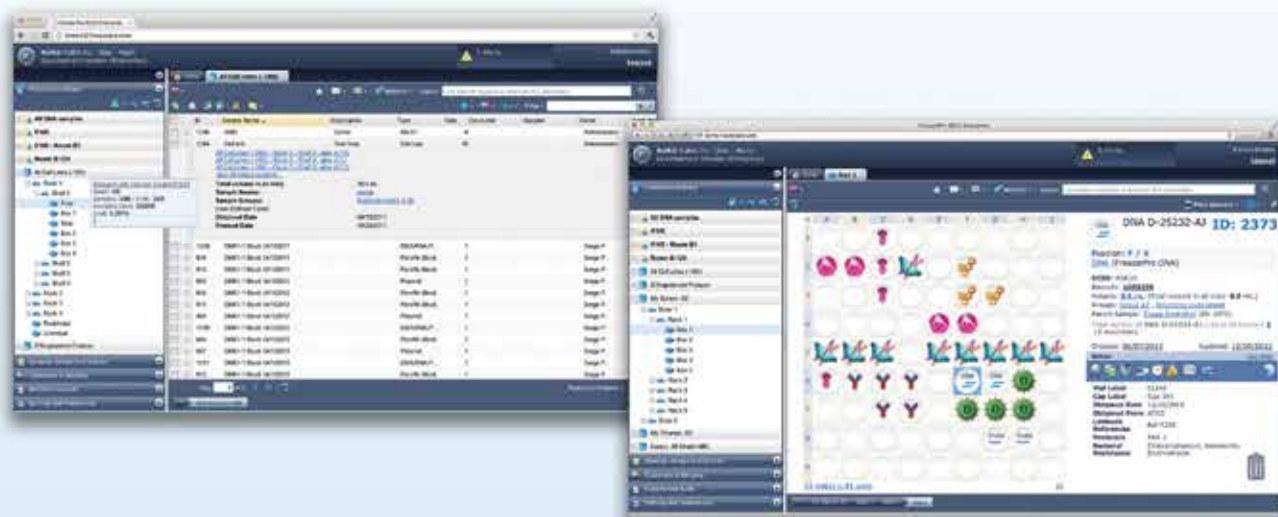
Forest Rohwer, PhD, is a professor in the Department of Biology at San Diego State University. He is a fellow of the American Academy for Advancement of Science (AAAS), American Academy of Microbiology (AAM), and Canadian Institute for Advanced Research (CIFAR). He led the development of "viromics," which involves isolating and sequencing the RNA/DNA from all the viruses in a sample. From this data, it is possible to determine what types of viruses are present and what functions they are encoding. Dr. Rohwer uses viromics to study ecosystems ranging from coral reefs to the human body and has shown that most genomic diversity on the planet is viral. Dr. Rohwer has published more than 150 peer-reviewed articles, was awarded the International Society of Microbial Ecology Young Investigators Award in 2008, and is listed as one of the World's Most Influential Scientific Minds (Thomson Reuters 2014).

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SIT UP STRAIGHT

LABORATORY ERGONOMICS - PART 1

by Vince McLeod



It's just a fact: In today's modern laboratory you are going to spend some time using a computer. You used to feel good all day long, but now you hurt after just a few minutes at the computer. You go home each day with a pain in your shoulder or neck, and perhaps you wake up at night with tingling sensations in your wrist or hand. What to do? You have grant or budget information to enter in spreadsheets; you have a stack of standard operating procedure, chemical hygiene plan, or chemical inventory documents to review and update; and it seems you get three e-mails for every one you send. No matter how you look at it, this means hours and hours glued to your keyboard and mouse. Read on to learn about office ergonomics and what you can do to minimize the potential ill effects of all this computer usage.

“Three fundamental ergonomic risk factors are position/posture, repetition/duration, and force.”

Simply put, ergonomics is the study of how people physically interact with their work environment to perform their required tasks. Ergonomic conditions can affect those working in all types of laboratories. The “office” aspect of laboratory research should not be overlooked, and that will be our focus in this issue and the next. More and more, jobs require a substantial portion of the day working with a computer. Very often, the

pain and discomfort experienced at work or at home can be tied to ergonomic risk factors. Poor ergonomic conditions and practices result in more losses due to employee suffering, lost time, and reduced productivity than many other types of injury in the workplace.¹ Fortunately, these are easily recognized and corrected.

Three fundamental ergonomic risk factors are position/posture, repetition/duration, and force. These can all be influenced by the work area setup and the activity being performed. The good news is that these at-risk conditions that can cause pain and potential injury can often be easily controlled if one understands basic ergonomic concepts and how to apply them. In this article and the next, we will take a look at these factors and provide some practical solutions to help get you through the day pain-free.

Position/Posture

The goal here is to achieve a balanced and neutral position. “Neutral” is typically thought of as the midpoint of range of motion for most joints (e.g., your wrists should be nearly straight in both the up/down and side-to-side axis, your upper arm should hang comfortably from the shoulder, your back and neck should be straight and not twisted or bent). Balanced in the ergonomic sense is when a posture or position is such that one does not have to fight (much) gravity to maintain that posture or position.

Let's look at some of the most common position-related complaints we see. These are often the easiest to correct, and implementing changes can produce very dramatic improvements in one's level of discomfort in a relatively short timeframe.

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Neck pain

Your head weighs about as much as a bowling ball. Holding a bowling ball straight upright while resting your elbow on a table takes some effort. Now visualize that you are balancing a bowling ball (your head) on a cylinder (your neck). If you begin to tip the cylinder, it becomes harder and harder to support the ball. When you sit upright and are looking directly ahead, your skeletal structure supports most of the weight; if you deviate from a vertical position, your muscles must come increasingly into play to support your head. Now imagine tipping and lifting that bowling ball hundreds of times a day—that is exactly what you are doing when you are working from a hard copy placed on your desk. Your head goes up and down and side to side each time you look down at the paper and then up to the computer screen. Similarly, if your monitor is placed on the CPU so you must tip your head back to read (particularly problematic for those of you wearing bifocals), your muscles must support this off-balance posture. A much better approach is to place your hard copy on a document stand between the keyboard and monitor. The monitor should be directly in front of you, with the top of the screen just at or slightly below eye level. This way, instead of repetitive up/down and side-to-side head motion, one can look back and forth between the paper and the screen almost by using your eyes alone, allowing you to remain in a neutral, balanced position.

“Implementing changes can produce very dramatic improvements...in a relatively short timeframe.”

Holding the telephone receiver cradled between your ear and shoulder while doing other tasks is also a classic cause of neck pain if done on a regular basis. Hold the receiver in your hand if possible. Use a speakerphone or a headset if you must speak on the phone while working (such as when reviewing written materials or computer files).

Shoulder and neck pain

Hold your arm straight out in front of you for a couple of minutes. Now try drawing your shoulders up a couple of inches toward your ears and holding them there for a minute or two. In both cases you should begin to feel discomfort and fatigue relatively quickly. Both these examples illustrate stresses from an ergonomic standpoint that can occur when one is working with a keyboard and/or mouse on a surface that is too high or too far away. For many people this is a result of using a keyboard and/or mouse on top of a standard-height desk or having an older keyboard tray that doesn't have room for the mouse (this also can cause contact stress issues we will discuss later). You must reach


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up, over the edge, and out in front to use the input devices. This might not cause an issue for really tall individuals, but we see it is being problematic for many average and shorter people. Ideally, when using a keyboard or mouse, your upper arms should hang comfortably at your side. The approach we most often take to remedy a case such as this is to recommend the installation of a combination keyboard/mouse tray.

A word of caution: a cheap tray will often not solve any problems—in fact, it may create new ones. We often see poorly designed trays collecting dust in storerooms because they just didn't help. Look for a tray that has a "tilt to lift" feature or a large release button to move it up and down. In our opinion, one should stay away from units with twist knobs to lock and release; these create trouble, especially for people who are already having wrist and hand issues.

The mouse pad or surface is best positioned in the same plane as the keyboard; it is even better when it is placed where it can rotate over the keyboard or move toward you to reduce your reach and allow you to keep your elbows in while working. The keyboard platform is best kept level or sloped slightly downward (toward your thighs) so your wrists are straight (neutral) while typing.

We have started to explore the ergonomic risk factors associated with the use of computers. The take-home message here is "balanced and neutral." Keep your monitor directly in

front of you, with the upper edge at eye level or slightly below it. Place any hard copies in front of you on a document stand—either between the keyboard and monitor or immediately to the side of the monitor. Keep the keyboard and mouse in front of you and as close as is practical to prevent over-reaching. Make sure your wrists are as straight as possible in both axes. OSHA provides an excellent review of these guidelines through their e-tool on ergonomics.² The state of Washington also has some very good self-evaluation checklists and online training guides.³ Look for Part 2 of this series on ergonomics, where we will discuss repetition and force as well as solutions to get you through the day pain-free.

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Vince McLeod is the founder and senior member of the Safety Guys and an industrial hygienist certified by the American Board of Industrial Hygiene. He currently serves as the senior industrial hygienist in the University of Florida's Environmental Health and Safety Division. He has 27 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.



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SAFETY TIP

REQUIRE GROUNDED PLUGS ON ALL ELECTRICAL EQUIPMENT AND INSTALL GFIs WHERE APPROPRIATE

By James. A. Kaufman

The National Safety Council reports that about 1,000 people are electrocuted each year in the United States. In 2005, a biology professor at Cleveland State University died as the result of an electrical shock in the lab.

OSHA specifies that all equipment in the workplace be grounded to avoid shock and possible electrocution. Removing or breaking off the ground pin is a bad and potentially fatal idea.

Most people are not aware of the danger associated with ungrounded equipment. This danger is compounded when the plug is a two-prong un-polarized type. If inserted backwards, the case of the appliance can be electrically hot. We find many in labs that are 50 to 120 volts hot.

This same problem can be caused by two other circumstances: (1) the electrician wires the receptacle backwards or (2) the appliance manufacturer does not follow the convention. In any of these three cases, if you near a ground, serious or fatal shocks can occur. Make sure that the ripple side of the appliance cord is connected to the wider side of the receptacle.

A ground monitor or circuit analyzer can be used to ensure that the receptacle is correctly wired. An AC-sensor can tell you if the case of the appliance or device is electrically hot or not. A Tension Tester will indicate if the receptacle is holding on to the plug's prongs with sufficient force to meet electrical code specifications. All three tests should be performed annually on receptacles and electrical equipment in the lab.

The use of Ground Fault Interrupters (GFIs) can provide significant shock protection. They should be installed in any location where the receptacle is within six feet of a ground or water is likely to be present on the floor or surfaces.

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

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COMPRESSED GAS CYLINDERS

A SAFETY PLAN FOR TRANSPORTING, USING, AND HANDLING by Kim Myers

Using compressed gases in the laboratory can be dangerous if they are not handled properly. Many gases can be explosive, flammable, corrosive, and toxic. Because the gases are under high pressure in tanks and cylinders, any release of gas can spread quickly and endanger lab personnel—including the possibility of death from explosion or asphyxiation. Less-deadly safety risks include physical injuries from mishandling tanks, especially to the hands, feet, and lower back.

Because of these risks, standards have been established for transporting, using, and handling compressed gas tanks and cylinders. These regulations include:

Department of Transportation 49 CFR

- 49 CFR 171—general information
- 49 CFR 172—hazardous materials tables
- 49 CFR 178—shipping container requirements
- OSHA 29 CFR 1910
- Comprehensive rules that discuss gas types, how to ensure the safety of tanks, handling and storage as per the Compressed Gas Association (CGA), pressure relief devices, and other safety recommendations
- NFPA 55 Compressed Gases and Cryogenic Fluids Code
- Handling and proper storage of tanks, safety data sheets, personnel training, operating procedures and best practices, employee training, other safety recommendations

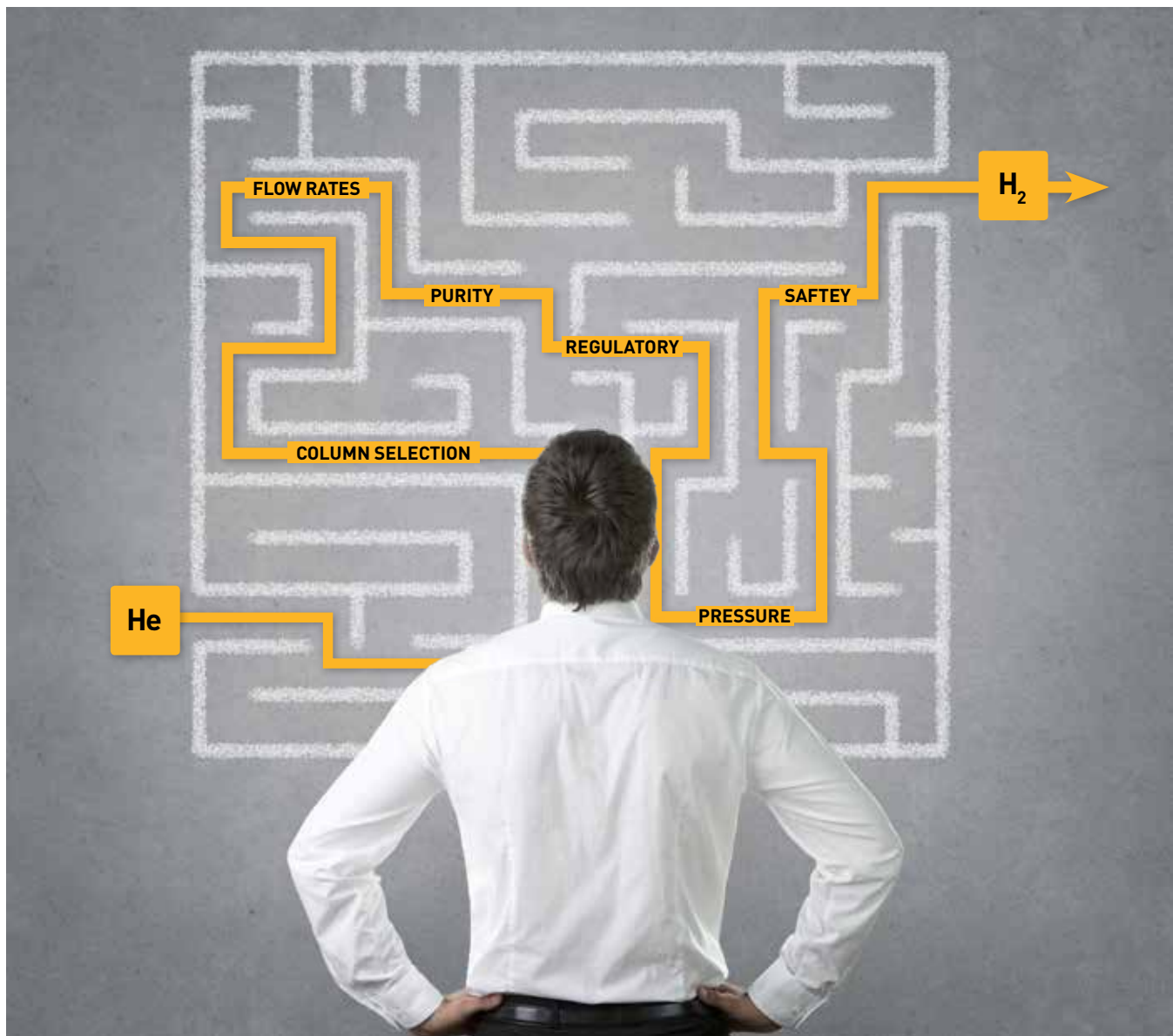
Handling and transportation

The safety process starts when a full compressed gas cylinder is delivered to a facility. All tanks and cylinders must be carefully inspected before being accepted. Safety

caps should be in place. Regulators should not be attached. Do not accept tanks that look damaged or poorly maintained (for example, oxidation or pitting). Prior to installation, inspect all piping, regulators, and stems. Be sure that tanks are marked with clear, easy-to-read labels that identify the type of gas, with the certification date from the vendor. Do not rely on cylinder color to identify the gas (color codes vary from supplier to supplier). Status (full, empty, in service) should also be identified and visible even after installation. Ask for the material safety data sheets (MSDS) for each gas type being received. Refuse to accept any tanks or cylinders that don't meet these requirements (and don't try to fix them yourself).

Once received, compressed gas cylinders must be secured in a vertical position. This includes during transport, storage, and use. Tanks should only be moved using wheeled carts—available from gas vendors and other laboratory supply companies—that are designed for this purpose. Check that the safety caps are screwed on securely. To minimize physically moving the cylinder, move the cart close to the cylinder and then carefully “walk” the cylinder on to the cart and fasten it securely with straps or chains so that it cannot slide, tilt, or fall over. Carts should always be used to move cylinders, even for short distances.

Even though they seem sturdy and safe, cylinders should always be handled carefully, without hurry. Cylinders that are dropped, or strike other tanks or hard surfaces, could explode, causing serious damage or even death. Never drag cylinders or roll them horizontally. Never lift a cylinder by the cylinder cap or by using magnets. If a cylinder must be moved manually, tilt it slightly sideways and roll it carefully along its bottom edge, maintaining good grip. Be sure the path of travel is clear of obstacles; use a spotter if needed for negotiating ramps or lift gates.



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Caps, valves, and regulators

Cap all cylinders when not in use; this protects the valve stem and prevents any accidental release of the compressed gas, even if the cylinder falls. Do not try to force or fix any cylinder connection that is not working properly. If a connection is malfunctioning, it is likely broken or not the proper connection/valve for that cylinder. Never try to repair, pry, hammer, or “unstick” any valves, regulators, or pressure-relief devices. If it does not open easily by hand, call the gas distributor, even if this means a work delay.

To prevent leaks, be sure main valves are closed when the cylinder is not in use, even if it is empty. Air that enters an empty cylinder can also bring in moisture and other contaminants that can lead to corrosion, or possibly even an explosive chemical reaction. Any pressure in the regulators should also be released when the cylinder is not in use. Every time a cylinder is brought into service, a leak test should be performed to confirm there are no leaks when the cylinder is connected.

Regulators control the delivery pressure of gas from the cylinder so that it can be delivered at the optimum pressure for the work performed. Requirements for regulators vary according to gas type and cylinder size. It's good practice to double-check that the correct regulator is being used for the gas and cylinder. It should also have the appropriate pressure range for the work being performed. Ideally the regulator should be twice as high as the required pressure. Use pressure regulators equipped with pressure relief devices and vent them if appropriate given the type of gas being used.

Two types of regulators are available for pressurized tanks: single-stage or two-stage. Single-stage pressure regulators are used when inlet pressure is steady throughout the application. With a two-stage pressure regulator, the first stage decreases the inlet pressure to a pre-set level; the second stage then further reduces this pressure to the desired pressure needed for the work being performed.

It is essential to keep regulators (especially for oxidant gases) free of surface oil and grease. These surface contaminants will combust in the presence of pure oxygen (this also reaffirms the importance of leak tests). Regular maintenance of cylinders, valves, regulators, and other devices is best performed by the original manufacturer or provider.

Storage of compressed gas cylinders

Cylinders must be stored according to hazard classification in a well-ventilated, above-grade, weather-proof storage area that is a safe distance from combustible materials, ignition sources, or intense heat. Store the oldest cylinders at the front, so they can be used first. Gas types

should be separated from incompatibles. For example, flammable gases should be separated from oxidizing gases. Separation of incompatible gas cylinders can be achieved by open space (20 or more feet is recommended), fireproof partitions, or approved storage units.

Because they conduct electricity, metal cylinders must be kept away from electrical circuits, open flame, sparks, etc. Never place a cylinder close to an electrical conductor, such as metal pipes, that could accidentally carry current.

Storing cylinders in areas that exceed 130°F (54°C) violates Department of Transportation regulations. Gas expands when heated and increases pressure in the cylinder, increasing the risk of explosion. Tanks should not be stored in direct sunlight. Personnel sometimes overlook the fact that direct sunlight can increase temperatures in storage areas to well above 100°F—a potentially dangerous situation if compressed gas cylinders are stored there.

As during transportation, compressed gas cylinders must be stored in an upright position. Don't store tanks on gas carts and do not strap cylinders together. Secure each tank with a chain, strap, or bracket to a stationary surface, such as a bench or wall. Two straps, one at about one-third of the cylinder height and the other at two-thirds of the cylinder height, are recommended to keep the tank from tipping or sliding.

When cylinders are empty, mark them as “empty” and arrange for the supplier to pick them up. Cylinders that contain “safe to breathe” gases like oxygen, nitrogen, and argon may be vented to allow residual gas to escape. If you choose to vent the residual gas, please consult your safety officer or gas provider regarding the best procedure. Venting oxidants (for example, oxygen) in a hazardous environment is not recommended. Cylinders that contain flammable or toxic gases cannot be vented and may need to be disposed of as hazardous waste.

Education = Safety

The most important step in the safe handling of compressed gas cylinders is to create an overall safety plan based on sound knowledge of the Department of Transportation (DOT), OSHA, and NFPA regulations for the handling, storage, transportation, and use of compressed gas cylinders. These standards are the basis of any comprehensive safety plan.

Employees who handle compressed gas cylinders should be familiar with the regulations. Gases are classified according to their physical and chemical properties—therefore staff must also have a deep understanding of these properties and the risks that they present in a laboratory or storage setting.

Much of this knowledge comes from the MSDS that

vendors provide for each gas, including their safety hazards. These sheets, as well as other reference materials, should be placed in several areas in the workspace to provide easy access to this information. In the event of an emergency, this material must be available for first responders and safety personnel.

Lab directors or safety directors must follow the DOT, OSHA, and NFPA regulations and MSDS information (as well as other laboratory safety guidelines and resources) to develop a comprehensive safety plan (including an emergency response plan) that can be taught to employees, posted in the laboratory, practiced periodically, and updated when needed.

Train all employees and provide each worker with a copy of the safety plan. This will include a safety and response plan for each gas. Requirements should also be established for use of personal protective equipment, safe handling of compressed gas cylinders, the ergonomics of safe lifting and handling, and keeping aisles and pathways clear of obstacles or clutter.

Hopefully the comprehensive safety plan will prevent any serious accidents. However, in the event of an emergency, laboratory personnel must be able to react quickly

(for example, know where to find emergency equipment, such as fire extinguishers, eyewash, etc.). Enforce the safety plan at all times and practice it regularly to ensure the safest workspace possible (and quick and correct responses, should an emergency occur).

In-house gas generation

In-house generators are available for each gas and multiple-gas generators are also available. The cost of operating an in-house gas generator is extremely low, since the only raw materials are air and electricity. Running and maintaining a gas generator system typically costs only a few hundred dollars a year. Return on investment takes about 12 months, depending on the specific usage and required purity. This is a significant ongoing savings compared to the recurring costs of cylinders.

Kim Myers, Global Product Manager, Parker Hannifin Corporation, can be reached at kmyers@parker.com or by phone at 978-556-2732.

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THE VIEW FROM A CLINICAL LABORATORY

by Angelo DePalma, PhD

Clinical laboratories have among the most stringent requirements for purity of input materials (reagents, solvents, assay kits, gases, etc.). Yet the Clinical Laboratory Improvement Amendments of 1988 (CLIA), officially promulgated in 1992, leave to clinical and diagnostic laboratory managers the task of assuring the quality and performance of chemicals and gases used to calibrate instruments and conduct general lab operations.

Specialty gas purity requirements for basic gases such as zero air, helium, hydrogen, and nitrogen for instrument calibrations and instrument/process purges are specified by instrument vendors and/or assay protocols. While these do not differ on the surface from gases in nonclinical labs, composition and purity may vary.

Similarly in pathology and diagnostic cell culture, no special precautions need be considered for cryopreservative gases such as liquid nitrogen, which do not come into contact with samples. Users must, however, follow Good Clinical Practices and Good Laboratory Practices, as appropriate, for certifying quality and validating the freezing protocol. Even more leeway is available for cryogenic liquid helium and liquid nitrogen for cooling components of magnetic resonance imaging probes, X-ray devices, lasers, and computerized tomography imagers in diagnostics.

Specialty gas quality and composition become more challenging as clinical or diagnostic processes become more complex or move closer to living, breathing patients. Mixtures of carbon dioxide, oxygen, and nitrogen for calibrating blood gas analyzers must meet both purity and composition specifications, while incubator gases must provide specific oxygen levels to assure growth of cells or organisms. Test gas mixtures for measuring lung function require near depletion of carbon dioxide, the measurand in these tests.

Traceability, purity

Kim Myers, global product manager at Parker Hannifin (Cleveland, OH), notes that while most lab managers would recognize the gases used in clinical lab operations, and to a lesser degree instrumentation, clinical settings are more demanding. "They're looking for traceability, that they've delivered the right gas at the right purity for the specified period of

time." As with GxP settings, labs must be prepared to demonstrate quality back to their suppliers.

Myers believes that the most effective way to assure gas quality with a minimum of documentation and validation effort is to generate routine lab gases like zero-grade air, nitrogen, and hydrogen at the point of use. A periodic calibration and quality check, which is part of most on-site generator contracts, satisfies the need to document purity. Managers need to trace the quality of gases delivered through conventional tanks by the tank. Gas suppliers will provide a certificate of purity, but these must be individually entered into compliance or quality records.

"If you have twenty cylinders, you need twenty certificates," Myers says. Parker provides gas generator certification through Mettler Toledo.

Every vendor of on-site generators provides the advantages of very high purity gas (especially hydrogen), safer operation minus heavy tanks, no need to switch out tanks, and a return on investment ranging from one and a half to three years.

On purity and composition

Specialty gas requirements among industries differ more in terms of composition than purity, cylinder type (e.g., materials of construction, lining), or delivery system (valves, regulators). The former are specified by the instrument or protocol, while the latter are standardized by the gas industry. Vendors denominate purity of pure gases as a percentage, say 99.9999%, while composition for gas mixtures is certified at the generating plant up to $\pm 1\%$ for individual components. Regardless of end user, specialty gas vendors follow ISO 9002 for quality standards.

Best-in-class manufacturers stock common specialty gas mixtures at recommended composition and purity levels, as well as container size, and tens of thousands of recipes for on-demand mixtures. While commercial clinical and diagnostic labs dealing with patients are unlikely to request nonstandard mixtures, instrument developers and protocol researchers have the opportunity to tweak gas mixtures in ways that further their science.

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

THE FUN AND EFFICIENCY OF PERSONALIZATION

by Mike May, PhD

In my days in the lab, a pipette seemed about as impersonal as a lab tool could get. Today's world of scientific equipment offers many ways to personalize your pipetting. For old-school scientists like me, though, the first question is: why personalize a pipette?

Raymond Mercier, vice president and general manager of liquid handling consumables at Thermo Fisher Scientific, which is headquartered in Waltham, Massachusetts, provides one answer. He says, "Selecting which pipette to use, and why, has a lot to do with personal preference." He goes on to say, "The decision to use a particular brand, format, or style of pipette is based on what feels comfortable to the scientist using the tool."

Looks matter

The look of a pipette might matter too. Mercier says, "We found that enabling scientists to modify the appearance of the instrument is a fun way to make the pipette unique to them." Scientists can do that with Thermo Scientific's customized MyPipette Skins. Mercier describes these as "decals that adhere to the pipette." He adds, "There are over 7,000 licensed graphics that scientists can choose among." And Mercier emphasizes, "There are no adverse effects on the performance of the pipette."

These skins can do more than make your pipettes look good. The personalizing can also be functional from a scientific perspective. As Mercier says, the skins "can even be used for quick reference in the lab to identify a particular volume range or a designated set of pipettes for a particular application."

Jennifer Carlson, lead research associate for translational research in the genomic oncology lab at Avera Health, a regional partnership of health professionals based in Sioux Falls, South Dakota, has been using the MyPipette Skins on the Thermo Scientific ClipTip pipetting system. "For my pipettes, I've picked different patterns that match the color coding of the various sized pipette tips," says Carlson. "Especially for the multichannels when setting up multiwell plates and switching back and forth between different pipettes, the skins help to easily identify which

pipette you are using. We also have multiple sets of single channel pipettes, but the skins help differentiate among the applications the pipettes are meant to be used for," Carlson says.

Customizing the control

Personalized pipetting also involves how a scientist controls it, such as the customization available with the PIPETMAN from Gilson (Middleton, WI). As Thierry Barthlen, Gilson product group manager, says, "To better control and adapt the pipettes to different applications, Gilson offers pipette settings that enable PIPETMAN users to personalize the pipette." Plus, says Barthlen, "Selecting the tip ejector material, body shape, and tip ejector position allows basic customization."

The ability to customize a PIPETMAN will soon expand even more. "To express individuality and let pipette users make this everyday tool truly personal, Gilson is developing a new accessory to enhance ergonomics and let pipette users create their own personal touches on their pipettes with customizable photos, required service dates, slogans, mottos, and so on," says Barthlen.

Tools like these personalize pipetting and make science more fun and effective.

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CHILLERS

PICKING THE BEST FLUID FOR YOUR APPLICATION

by Mike May, PhD

Many labs use chillers to control the cooling needed for some processes. To make the device work, a chiller uses a fluid, and the best kind of fluid depends on a range of factors. Part of the selection process depends on lab preferences. This article explores some of the thinking behind picking one chiller fluid over another.

Perhaps surprisingly, the fluid selection for chillers involves more than science. “After 9/11,” says Mark Diener, product manager at Julabo in Allentown, Pennsylvania, “importation laws changed so that once

“Most chillers will work with a water-antifreeze combination or silicone oil.”

you imported and sold a fluid, you were considered the manufacturer.” He continues, “Before 9/11, we got everything from our German headquarters, so we developed a project to find viable replacements from domestic suppliers.” He adds, “It was tricky for a high-temperature fluid, but mostly we located suppliers without much difficulty.” That does mean, however, that some vendors might not carry certain fluids—or versions from a particular manufacturer—that they once did. Still, every scientist can find many chiller fluids to consider.

The most common approach

The most commonly used fluid, says Kevin Hardy, principal engineer and product architect at Grant Instruments in Cambridgeshire, UK, “is a mixture of water and antifreeze—the same antifreeze that you put in your car.” He adds, “That is by far the most common fluid in recirculating chillers for use below 5 degrees Celsius. It’s very cheap, very affordable.”

Not all chiller manufacturers, though, supply fluids. For example, Hardy says, “We don’t have fluids that we

buy in, and we don’t try to sell customers expensive fluids.” He adds, “We just recommend some readily available fluids that you can use throughout the temperature range.” Typically, an antifreeze mixture covers a temperature range of –40 to 30–50 degrees Celsius. This simple mixture can be adjusted for lower temperatures by increasing the amount of antifreeze. For example, a 50:50 ratio of water to antifreeze works for about –30 to 70 degrees Celsius, according to Hardy. He adds, “If you go down just below zero, say –10, you can get away with 20 percent antifreeze and 80 percent water.”

Scientists at Cyprotex US in Watertown, Massachusetts, test compounds, especially pharmaceuticals, for ADME-Tox—adsorption, distribution, metabolism, and excretion (ADME) plus toxicology—properties. According to Manpreet Virk, associate scientist at Cyprotex US, “We do a six time point ‘Metabolic Stability’ assay, which quenches the time point plates



with a quenching solution, but we also need chillers to cool the beds on which we keep our plates.” To keep those cool, Virk says, “We use a mix of 20 percent antifreeze and 80 percent water to reach 4 degrees Celsius.”

In addition to being readily available and inexpensive, a water-antifreeze mixture is not flammable.

Two extremes

In applications that take more chilling, scientists often select a more sophisticated fluid, such as silicone oil. Hardy says that most chillers will work with a water-antifreeze combination or silicone oil. For example, some researchers prefer a low-viscosity silicone oil—such as a pure silicone fluid called 3 cSt—even for temperatures down to –60 degrees Celsius. The viscosity has to be low enough to pump the oil through the chiller. For many silicone oils, the viscosity is too high for pumping at low temperatures.

Scientists, however, pick among more than just antifreeze and silicone. One kind of fluid can even come in many forms. For example, Diener says, “Most of our products cover wide temperature extremes, so lots of our fluids are silicone-based, and there is a myriad of them to choose from.” He adds, “They have a very long lifecycle if not used at the top of their temperature range.”

At low temperatures, flammability is no concern for silicone oil, but it can be a worry at high temperatures—beyond those demanded of a chiller, though. “It’s a double-edged sword,” says Diener, “because you need a fluid that is pumpable but that constrains the flash point to a high point for safety.”

Ups and downs of old school

Despite the options of advanced fluids, don’t forget an obvious choice—water. As Hardy says, “Water is exceptionally good stuff. Use it when you can.” Many scientists agree. Hardy says, “A lot of people—up to half of the people using lab chillers to cool down glassware—just use water.” This fluid is not toxic and not flammable. “You might grow some algae in it,” Hardy says, “but that’s about it.”

Other experts agree that many scientists still like to use water in chillers. For example, Diener says, “Lots of people want to use water as much as possible, because of expense.” He does add, though, that “growing algae can hurt the equipment.”

“Up to half of the people using lab chillers to cool down glassware just use water.”

Old school, though, is not always the best, especially when it comes to heat capacity. Water requires the most energy to change its temperature, compared with a water-antifreeze mixture or silicone oil. In general, a water-antifreeze mixture requires about 10 percent less energy to change its temperature than water does, and silicone oil takes even less energy, only about 50 percent as much as water. In many cases, researchers select the fluid, says Hardy, “not so much on the temperature range but on the amount of heat it will extract.”

So when it comes to keeping lab processes cooled off just right, the fluid might matter more or less than some researchers envision. For many circumstances, the old standby—water—still works just fine. In other circumstances, only more sophisticated fluids will do. To pick the best chiller fluid for a particular application, a scientist must consider the desired temperature range, energy requirements, safety, and so on. Once all of the factors get assessed, a scientist can pick the best option.

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

CO₂ INCUBATORS

CONTAMINATION, OPERATIONS KEY ISSUES

by Angelo DePalma, PhD

The first question facing lab managers looking for an incubator is whether a dry or humidified incubator will serve their needs. Both designs have their pluses and minuses. Humidified CO₂ incubators provide tighter control over cell culture conditions such as temperature, gas mix, and of course humidity.

Users must seal cultureware in dry incubators to prevent evaporation. Water trays mitigate this requirement somewhat, but may also attract microbial contaminants. For non-humidified designs, experts recommend charging the water pan with sterile distilled water. Tap water contains chlorine, which corrodes stainless steel and copper; deionized (Type 1) water is extremely aggressive in drawing ions from its metal and glass construction components.

The pharmaceutical and biotech industries were the main market entry points for humid incubators. Today, academic, environmental, and food labs also recognize their benefits. Even microplates will not lose fluid to evaporation in humid incubators.

Humidified designs are more costly and complex, and for many applications a dry incubator will serve just fine. Linette Philip, product manager for CO₂ incubators at Eppendorf (Enfield, CT), notes that dry incubators make sense for non-biological applications, for example electronics and materials science. “They’re still useful where temperature and atmosphere control are sufficient.”

Not if, but when

Contamination control is the single most significant operational or maintenance issue for CO₂ incubators, says Mary Bates, global cell culture specialist at Thermo Fisher Scientific (Asheville, NC). In her many discussions with cell culture experts from around the world, close to 90 percent say they have experienced at least one contamination in the previous year. Humans are, by far, the predominant source of contaminating

microorganisms. Approximately 30 percent of all contamination arises from cell lines, media, and labware, while 70 percent originates with humans or the lab environment.

Except for cases of inadequate sterilization, all contamination originates outside the incubator. “It doesn’t matter whose incubator you have, microorganisms are in our breath and constantly falling off our bodies,” Bates says. “But if I had to pick one factor responsible for repeat contamination, that would be air ducts.”

She advises lab managers to keep incubators away from air ducts. When that is impossible, users should monitor air filters closely, and should consider cleaning ducts as possible contamination sources. In some cases facility managers may be able to turn off or redirect ductwork.

Water in the pan or reservoir should be replaced at least once per week with sterile distilled water. Bates cautions against using ultrapure or deionized water. “It’s great for many applications, but because it contains no salts, it draws ions out of their containers, causing corrosion.” Users should not even consider using bleach or other caustic disinfectants within incubators. “Anything that smells bad to you is bad for cells.” Quaternary ammonium salts are OK because they do not emit volatiles.

Rule by SOP?

Standard operating procedures (SOPs) dominate today’s incubator user base, says Uwe Ross, president at BINDER Inc. (Bohemia, NY). As a consequence, many labs see no need to understand the scientific basis of those protocols.

“An SOP may state that an incubator be emptied and cleaned every two, three, or twelve weeks, and all components autoclaved,” Ross observes. “If that’s what the SOP demands, that’s what the user does. But they should be thinking about why the SOP author selected that particular timeframe, and what events might serve as reasonable triggers for cleaning.”

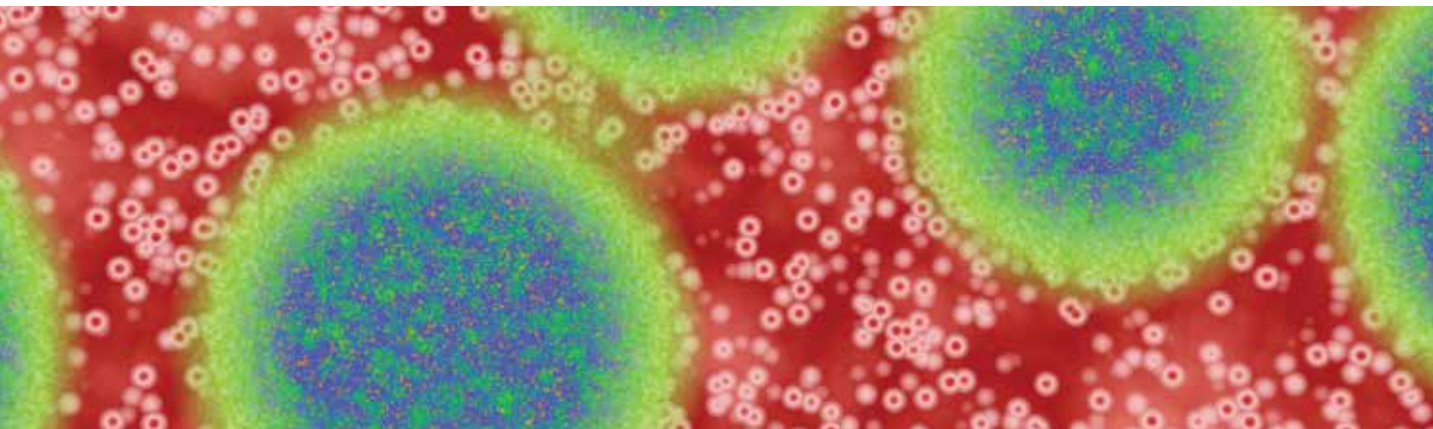
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Every organization has its own SOPs. Universities, pharmaceutical companies, and lab directors use their own or protocols that have been handed down or provided by vendors. But in too many instances SOPs are not applicable to real-world operation. “They’re written by people who know what they’re doing, for individuals who believe they do not need to know why the SOP asks for a certain cleaning timeframe,” Ross says.

Most lab managers would agree, for example, that a good time to clean is when an experiment or process ends, before the next one begins. This effectively eliminates contaminating microbes—known or unknown—that may have arisen during the just-completed experiment. A rigid time-based SOP, Ross says, will not reflect this trigger.

“Clearly our approach to SOPs in the CO₂ incubator world are outdated,” Ross concludes. “Labs should instead rely on internal quality practices, and time their cleaning or sterilization to the start of a new process. The consequence will be better results.”

Philip provides a contrary take. “It is a given that lab workers dislike paperwork. But SOPs are extremely valuable in cell culture or any lab for that matter. They simplify operations and provide a level of reproducibility in common tasks like cleaning and validation,” she says. That is not meant to imply that SOPs are written in stone. “SOPs are living documents that should be reviewed periodically.” Annual or semiannual reevaluation of SOPs forces lab managers to examine how the SOP is

working based on input from end users, with the ultimate goal of improving the process. “As long as SOPs are allowed to evolve, there is no reason they should infringe on independent thinking or creativity.”

Purchase decisions

Philip advises lab managers to evaluate both short- and long-term needs when acquiring a CO₂ incubator. “View this purchase as an investment. Look ahead three to five years. If you anticipate the need to control oxygen or humidity, plan accordingly.”

Cost of ownership is another factor to consider. Many incubators feature some sort of automated or semi-automated cleaning system, but associated energy and material costs may vary significantly. Cleaning that is cost-effective when conducted every three months may not be so on an every-two-weeks cleaning regimen.

Finally, to save time and effort, Philip recommends conducting an initial evaluation online. “So much information is available these days. Take twenty minutes to read it and compare what different vendors have to offer.”

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FOR ADDITIONAL RESOURCES ON CO₂ INCUBATORS, INCLUDING USEFUL ARTICLES AND A LIST OF MANUFACTURERS, VISIT WWW.LABMANAGER.COM/INCUBATORS

PORTABLE GAS CHROMATOGRAPHY

CAPABILITY WITH TRADEOFFS

by Angelo DePalma, PhD

Portable gas chromatography (pGC) is all about tradeoffs. Users demand value, reliability, ease of use, ergonomics, and measurement quality but with analysis limited to gases.

Field-worthy GC must be accessible at the technician level and eminently portable. Units tend to be battery powered with adequate data systems and good communication capabilities. Detection and carrier gas options are limited due to size and weight restrictions. “Operators will likely be carrying other equipment, and may be wearing protective clothing” explains Coen Duvekot, product manager at Agilent Technologies (Amstelveen, Netherlands). “The GC’s form factor must allow that.”

Duvekot differentiates between pGC and transportable systems in mobile laboratories with the same features as benchtop instruments, including broader carrier gas and detector options that include mass spectrometry. Mobile labs also provide the opportunity for sample preparation.

Although limited to gas analysis, pGC has developed a devoted following in the energy, environmental, and workplace hygiene markets. Natural gas is by far the largest market segment, particularly for inline and at-line applications where pGCs measure hydrocarbon composition and calculate calorific value continuously and, if desirable, unattended. At natural gas exploration sites, pGC sniffs out hydrocarbons and provides quality reports. Similarly, natural gas transportation and distribution sites employ pGC to monitor for leaks.

Related is pGC analysis of natural gas safety odorants, which consist most commonly of a mixture of thiols. “Odorants permitted in one country may not be allowed in others,” Duvekot notes. When used in a quality or safety setting, pGCs sold to the natural gas industry must be capable of discriminating among odorant blends.

Sensors?

Sensors respond instantly to analytes, but for an added 15 to 20 seconds of analysis time, pGC provides much more information. “Sensors usually quantify only one component,” Duvekot says. Multiple sensors are expensive, require a power source, and provide no separation capability. “Due to timing issues, individual sensors in arrays do not always measure the same sample, and may have difficulty with analytes with different response factors.”

One approach to miniaturizing instruments is to cram as many features as possible into the smallest possible box. It is possible as well to start with components of a desktop system—injector, column, oven, detector(s), data system, and carrier gas—and work backward toward some combination of absolute essentials.

Following this strategy to its logical conclusion, one might consider a more rugged column, room temperature elution, a simple detector, and air as the carrier gas. This would limit the analyte set and performance, but it could be enough for certain markets.

“That’s about as primitive a GC design as you can get,” says Hugh Goldsmith, president of SRI Instruments (Torrance, CA). SRI manufactures GCs of all types, including pGCs, to about half a dozen brands.

Non-heated, air-carrier pGCs are uniquely portable but limited to analysis of small-molecule gases. With a thin-film capillary column, a non-heated pGC handles hydrocarbons up to about C_{10} , but the instruments obviously sacrifice analytical capability for portability. Hydrocarbon gases must be present at concentrations above 1000 ppm, for example, which is fine for natural gas field work. SRI’s line of pGCs employs a dry electrolytic conductivity detector, a simple design that requires a dry air carrier.

“The trick for manufacturers is to locate the sweet spot between portability and functionality,” Goldsmith says. “At any given time there are probably a hundred research groups attempting to miniaturize GC even further, but all they’re doing is essentially reinventing the wheel. If you wanted to sacrifice even more you could get these devices down to wallet size. But under no circumstances do you want to lug around a gas cylinder.”

Goldsmith sees pGC as a niche market ideally suited to narrow applications. The potential for innovation exists but not at current sales levels: corporate customers might purchase three or four such instruments; international organizations perhaps a dozen. He shrugs off the notion that handheld pGCs might be employed as simple detectors even though that has already come to pass for handheld spectroscopy, particularly Raman.

The resolving power of GC, he says, is unique among analytical instruments, even in ultra-miniaturized formats. “GCs have not disappeared into history because they separate molecules from each other and from matrix before presenting them to a sensor. Sensors can’t detect at ppm levels in a matrix,” he says.

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PROTECTING UTAH'S FOOD SUPPLY

CROSS-TRAINING AND TEAMWORK HELP THIS LAB HANDLE A HEAVY SAMPLE LOAD
by Rachel Muenz

As part of the laboratory services division of the Utah Department of Agriculture and Food (UDAF), staff members act as gatekeepers for the safety and quality of food in the state.

“Our purpose is to protect the food supply and ensure wholesome food products for citizens of Utah as well as [to test] agriculture products such as animal feeds and fertilizers,” says UDAF laboratory director and state chemist Dr. Weston Judd. “Our main function here is to provide laboratory services to the other divisions within the department.”

His division includes four labs: a dairy testing lab, a feed and fertilizer testing lab, a meat testing lab, and a pesticide testing lab. The dairy lab is part of the U.S. Food and Drug Administration’s (FDA) Grade A milk testing program and carries out all the required tests, including bacterial counts, detection of antibiotics, and measurement of components such as milk fat. They also test dairy products for label compliance, making sure that what a product’s label says matches what’s in the actual product.

As the State Central Lab, the dairy lab is also responsible for certifying other dairy testing labs in Utah.

“Those other labs also test milk products and milk samples so that we’re not overwhelmed here,” Judd says. “If we had to test all of those, it would just be an overwhelming number, so those other labs help that way.”

He adds that some of the dairy lab’s microbiologists are certified by the FDA as laboratory evaluation officers and audit those other labs for FDA certification.

As for the feed and fertilizer lab, as its name suggests, it tackles the testing of fertilizer and animal feed products, mostly for label compliance, ensuring that fertilizers have the components listed on the label and that the protein, fat, and fiber content listed on feed labels are actually in the products.

“There are always unexpected things that happen in any lab.”

The division’s meat testing lab is part of a state program. Compliance officers collect samples from grocery and other food stores to test for label compliance and for fat and moisture content. The lab is also part of the Food Safety and Inspection Service program run by the U.S. Department of Agriculture.

“We test for the presence of pathogenic bacteria in meat samples that come from meat plants throughout the state of Utah,” Judd says, adding that they mainly test for *E. coli* O157:H7, *Salmonella*, *Listeria*, and non-O157:H7 *E. coli* (STEC). They recently started testing samples from Montana as well.

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1. Microbiologist Jennifer Sung tests a milk sample using a SomaScope. This test looks for somatic cells in milk, which are an indication of the health of the cow. 2. Chemist Jeremiah Diehl does meat component analysis for fat content in hamburger using a food-scan meat analyzer. 3. Chemist Cham Hoang prepares a fertilizer sample for analysis. 4. Chemist Mohammed Sharaf conducts a pesticide residue test using GC-MS.

Last but not least, the pesticide lab is mostly involved in testing for pesticide residues. Its biggest program is an annual screening of milk samples from almost every dairy farm in Utah for such residues. Each sample is tested for about 20 pesticide residues, resulting in a total of around 2,000 tests, taking just over a month to complete. In addition, the pesticide lab has a consumer complaint program that allows any Utahn to send in any type of sample they wish—plants, food, clothing—to be tested for pesticide residues.

Staffing

Judd estimates that all four labs take up about 10,000 square feet in total, almost an entire floor of the building they are in, with a total staff of nine that is made up of three microbiologists, one secretary, and five chemists. Those employees have at least a bachelor's degree in

various areas of science, though the lab division prefers chemistry or microbiology in particular when hiring. Half of the staff hold master's degrees and a few have PhDs.

And, of course, there is plenty of training when new staff members come on board, though it varies between each of the four labs. All staff learn their lab's standard operating procedures, but Judd says the dairy lab training is probably the most specific and stringent.

"They receive training initially from other lab personnel," he says. "After they get up to speed, then they have to go through an FDA review, where an FDA auditor will come out and review all the procedures and make sure the testing is done to FDA standards. The training is mainly geared toward passing that audit so they become FDA-certified microbiologists, which is required for them to work in that lab."

For the other labs, the chemists receive training specific to what their role will be.



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"If they're doing testing for, say, fat content in ground beef samples, then they would be trained on that method and that training would come from a laboratory employee who has done that procedure and is comfortable with [it]," Judd explains. "Once they are confident in that training, we branch out and start cross-training them on other methods."

He adds that all four labs have proficiency testing programs at least each quarter, which the analysts have to pass, and they'll also sometimes send staff to conferences and outside training.

Most of the lab division's work comes in the spring and summer months, while things are a little slower in the winter. In May, for example, the labs collectively dealt with 630 samples, with three of the labs running 975 tests over that time span, while the dairy lab ran 764 tests.

"The time to analyze samples varies quite a bit," Judd says. "Some of them go pretty quick and some take a few days."

As lab director, Judd keeps an eye on all of that work.

"I view my role mainly as overseeing the laboratory work, making sure we have the equipment that we need to do our jobs, that every individual lab has the resources that it needs, and just making sure that the testing that we're required to do is getting done in a timely manner," he says.

Work, work, work

In an average day, staff finish up tests from the day before, record those results, and send the results to Judd for signatures. They'll also deal with receiving samples brought in from the compliance officers and start lab analysis on those samples.

"Of course, there are always unexpected things that happen in any lab," Judd says. "An issue might come up with equipment, so you might plan to do one thing but end up doing something else out of necessity."

He adds that one challenge for him is the diversity of his team, though he feels it's a good challenge to have.

"Overall, they work pretty well together," he says. "Promoting teamwork is a bit of a challenge sometimes because the dairy testing lab does work that's quite a bit different from what the chemistry group does."

One way they handle that issue is through cross-training so that staff of one lab can help that of another in times when one lab has few samples while another is overwhelmed.

"We're cross-training so that our analysts can help each other out, and that helps with teamwork," Judd says. "I've seen more of that lately, where people are starting to pitch in when they see that one person receives a much larger sample load than what they have on that day, then they'll go ... and help them analyze those samples."

Like many lab managers, Judd says he enjoys the variety of each day in the labs as well as the staff's diversity.

"We analyze samples here, but it's actually quite varied," he says. "The diversity helps to mix it up quite a bit. There's rarely a whole week where one

day is the same as before. The challenge that each day brings and the diversity really contribute to that.”

To motivate his staff and ensure that they are enjoying their work as much as possible, Judd does his best to give them a sense of ownership in their work, something that naturally comes about because with some of the labs, there is only one person responsible for testing.

“I let them get involved in the decision making, even as far as equipment,” Judd says. “I like to get their input on what kind of incubator they think we should buy, for example. They’re responsible for the type of testing that they do and, in a way, they’re the manager of their individual lab. I think that motivates them and helps them take ownership in what they do.”

Organization is another challenge the lab division faces. As the dairy lab is ISO 17025-accredited, those standards help keep things under control and the other labs essentially follow those standards as well. All of the labs are also looking to improve their inventory procedures to reduce waste and better keep track of supplies.

“A lot of the supplies, especially the microbiological supplies that we order, have certain expiration dates, so it’s a challenge to keep up with not ordering so much that we’re not going to use them before they expire, but we always have to have enough on hand for the sample load that we might be receiving,” Judd explains. “It’s challenging to organize that sort of thing.”

Another upcoming challenge Judd sees is being regulated by more government agencies. The labs already deal with the FDA, USDA, and the U.S. Environmental Protection Agency. “There will probably be more to come with the Food Safety Modernization Act,” he says. He adds that staying up-to-date with changes to USDA guidelines and new methods is something they deal with often.

“We have to use methods that are equivalent to what USDA methods are, so we have to ensure that we’re meeting those requirements,” Judd says. “Once in a while there are some changes that come along with that—to our standard operating procedures that we have to keep up on.”

Another change is that they’ve recently become involved in the FDA’s Manufactured Food Regulatory Program.

Future plans for the labs involve new lab space, and they also hope to add some new technology. Currently the main instruments used in the labs include GC-MS, HPLC, IR instruments, ICP-MS, various analyzers such as fat and PCR analyzers, and a cell sorter for testing the presence of somatic cells in milk samples.

“We’re hoping to get a triple-quad LC-MS-MS,” Judd says. “That’s kind of on our wish list. That would be mainly for pesticides—it’s a more efficient way to analyze them.”

In the near future, they hope to occupy a new building as part of a state “unified lab” initiative that combines other state labs and their own into a centralized location. If approval is granted, Judd expects they will be moved into the top floor of that building within three years. That plan has gained support from the state building board, but the project is still waiting for legislative funding.

“It seems like we have quite a bit of space here, but we’re actually undersized and it’s affecting our performance,” Judd says. “Our lab was also built to be an office space, not a laboratory, and thus ventilation and environmental control threaten the credibility of some of our tests. Our workflow would be better with the design we have in place; we have already gone through with architects and given our input on the design of this [new] building. In addition to that, we would also be able to expand our testing to be able to include more food products. That’s the most exciting thing looking to the future ... for all the potential that it will bring to the laboratory.”

Rachel Muenz, assistant editor for Lab Manager, can be reached at rachelm@labmanager.com or by phone at 888-781-0328 x233.

MAIN INSTRUMENTS IN THE LABS:

- GC-MS
- HPLC
- IR instruments
- ICP-MS
- Fat analyzers
- PCR analyzers
- Cell sorter

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Fume hood type(s) currently being used in readers' labs:

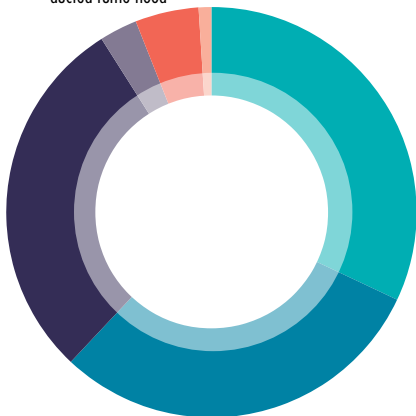
Benchtop ductless fume hood	13%
Canopy ducted fume hood	10%
Conventional ducted fume hood	36%
Laminar flow hood	25%
Portable ductless fume hood	5%
Variable air volume ducted fume hood	4%
Down flow workstation	6%
Other	1%

Fume hood related components used by survey respondents:

Airflow monitor	25%
Work surface	23%
Base storage cabinet	22%
Blowers	12%
Digital monitor	9%
Fume extractor arms	5%
Transport support cart	3%
Other	1%

Nearly 21% of respondents plan on purchasing a fume hood in the next year. The reasons for these purchases are as follows:

Replacement of aging fume hood	32%
Addition to existing systems, increase capacity	30%
Setting up a new lab / developing a brand new method	29%
Changing from a ducted fume hood to ductless fume hood	3%
Other	4%
Changing from a ductless fume hood to a ducted fume hood	1%



ARE YOU IN THE MARKET FOR A... NEW FUME HOOD?

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TOP 6 QUESTIONS

You Should Ask When Buying a Fume Hood

1. Can your lab go ductless? Ductless hoods are a viable solution for most routine laboratory applications.
2. What is the hood constructed from and how is it constructed? Will the chemicals you use attack, degrade, or physically alter the material of the hood?
3. What types of safety controls are included in the base cost of the unit?
4. Has the manufacturer/distributor gone through a thorough application review process? Does the suggested filtration make sense?
5. How hard is installation? Will there be a future/potential need to move the hood after initial installation? Should the hood be portable?
6. What are the capital, installation and operational costs? From the lab manager's perspective, capital costs are but a fraction of the overall budget.

TOP 10 FEATURES/FACTORS

respondents look for when purchasing a fume hood

PERFORMANCE OF PRODUCT	97%
SAFETY AND HEALTH FEATURES	97%
DURABILITY OF PRODUCT	95%
EASE OF USE; ERGONOMIC OPERATION	94%
LOW MAINTENANCE / EASY TO CLEAN	91%
VALUE FOR PRICE PAID	88%
LOW OPERATING COSTS	86%
WARRANTIES	85%
SERVICE AND SUPPORT	79%
AVAILABILITY OF SUPPLIES AND ACCESSORIES	77%



For more information on fume hoods, including useful articles and a list of manufacturers, visit www.labmanager.com/fume-hoods

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Types of LIMS installation configurations used by survey respondents:

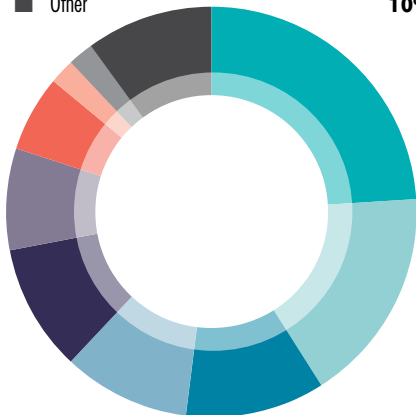
Client/server	50%
Web based	27%
Stand alone	17%
Thin client/server	3%
Other	2%

LIMS usage as reported by survey respondents:

Sample management	20%
User reporting	16%
QA/QC	15%
Workflow automation	12%
Instrument connection	12%
Regulatory management	10%
Invoicing	7%
Chemical inventory	7%
Other	1%

Nearly 24% of respondents plan on purchasing a LIMS in the next year. The reasons for these purchases are as follows

Upgrading existing LIMS	24%
Workflow automation	17%
Sample management	11%
Setting up a new lab	10%
QA/QC	10%
Addition to existing systems, increase capacity	8%
Regulatory management	6%
User reporting	2%
Web-based access	2%
Other	10%



ARE YOU IN THE MARKET FOR A... LABORATORY INFORMATION MANAGEMENT SYSTEM?

A Laboratory Information Management System (LIMS) serves as the interface to a laboratory's data, instruments, analyses, and reports. For many analytical laboratories, a LIMS is an important investment that assists management in evaluating the efficiency of the laboratory's operations and reducing costs.

TOP 5 QUESTIONS

You Should Ask When Buying a LIMS

1. Why does your organization need a LIMS? You and your staff should come up with a cost-benefit list to help you decide if a LIMS is worth investing in.
2. What are your current user requirements and how do you expect those to change five to ten years down the road? Make a list. If you expect your needs to change, a flexible LIMS is likely a good choice. Requirements can include labeling, sample registration, etc.
3. Do you need a consultant to help you decide whether a LIMS is a good fit for you or not? Examine the pros and cons and make sure you properly research potential consultants.
4. How does the company's LIMS differ from other products out there? Make sure you do your homework and phone each company you're interested in. If they can't answer your questions, they probably aren't a good fit for you.
5. Ask for fact sheets, features lists and case studies from the company. This literature is a starting point for picking the best LIMS for you. A product demonstration is essential.

TOP 10 FEATURES/FACTORS

respondents look for when purchasing a LIMS

EASE OF USE	100%
SERVICE AND SUPPORT	100%
SECURITY	98%
VERSATILITY	98%
UP TIME	97%
CUSTOMIZATION	96%
PRICE	95%
EASE OF INSTALLATION	93%
SCALABILITY	91%
WEB-BASED ACCESS	90%



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

ARE YOU IN THE MARKET FOR A... pH METER?

The expanded features in today's pH meters reflect the broad use of this technology. Researchers use pH meters in a wide range of research fields—including biological and chemical, agricultural and environmental, and more—and virtually all kinds of manufacturing.

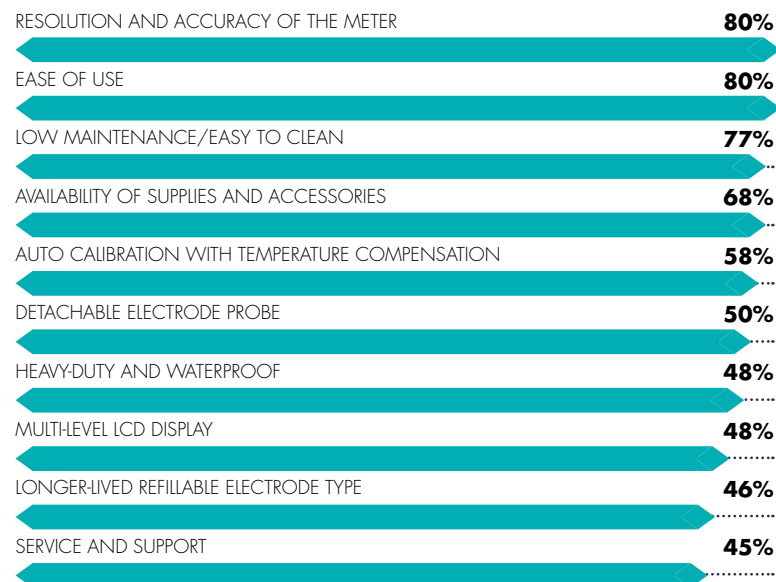
TOP 6 QUESTIONS

You Should Ask When Buying a pH Meter

1. What type of connector does the meter use?
 - Is it a BNC or DIN?
 - Is it proprietary or can other manufacturers' probes be used with it?
2. What is the replacement cost for a pH electrode?
3. What accessories are included with the meter?
 - What is the complete cost of all accessories needed to operate the meter?
4. What type of after sales support is offered?
 - If something goes wrong with the meter, can it be fixed locally?
 - What is the general turnaround time for repair?
5. What makes the company different from other companies that manufacture similar products?
5. What additional types of features are offered? (GLP data, PC connectivity (USB vs RS 232), calibration timeout, number of calibration points, ISE concentration readout, incremental methods for ISE and mv readout of concentration during calibration process).

TOP 10 FEATURES/FACTORS

respondents look for when purchasing a pH meter



Types of pH meters currently being used in readers' labs:

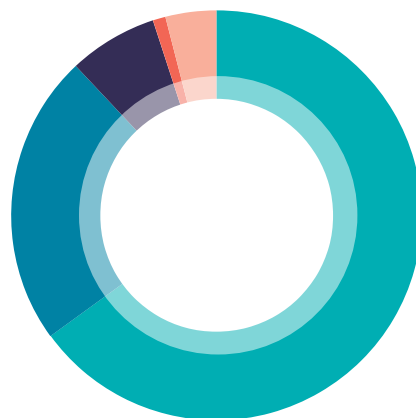
Benchtop - Multi Parameter	24%
Benchtop - pH only	41%
Portable - Multi Parameter	10%
Portable - pH only	22%
In-line - Multi Parameter	1%
In-line - pH only	3%

Methods to measure pH used by survey respondents:

Glass-electrode method	54%
Indicator methods	19%
Metal-electrode methods	11%
Hydrogen-electrode method	7%
Unknown	7%
Other	2%
Antimony-electrode method	1%

Nearly 22% of respondents plan on purchasing a pH meter in the next year. The reasons for these purchases are as follows:

Replacement of an aging system	65%
Addition to existing systems, increase capacity	23%
Setting up a new lab	7%
First time purchase of a pH meter	1%
Other	4%



For more information on pH meters, including useful articles and a list of manufacturers, visit www.labmanager.com/ph-meters

INSIGHTS ON LABORATORY BALANCES

WEIGHING IN: GETTING THE MOST FROM LABORATORY BALANCES

by Angelo DePalma, PhD

Care and maintenance practices for laboratory balances range from the sublimely simple to concerns about gravitational forces.

At the simple end, cleaning balances requires little more than common sense. Taring vessels, usually stainless steel or glass, can go into the dishwasher or a dedicated cleaning tub. No special care need be taken, as even material losses due to scratches or pitting disappear after taring.

“Worrying about taring vessels is more a question of aesthetics than function,” observes Gilbert Vial, product manager for physical measurement at Shimadzu Scientific Instruments (Columbia, MD).

Almost any noncorrosive cleaner will do for the main balance structure and weighing chamber; a paper towel wetted with ordinary household surface or glass cleaner usually does the trick. But Vial cautions against sprays that might get into crevices or external weighing mechanisms. “If you remove the pan to clean it or the weighing area, make sure to protect the now-uncovered area,” Vial says. “Clean a balance the way you would clean a fine watch.”

Location, location, location

Vendors advise locating balances in quiet, temperature-controlled, draft-free locations, but real-world laboratories cannot always afford this luxury. “We very often find balances in clean rooms with laminar flow,” observes Dirk Ahlbrecht, marketing manager for high performance balances and mass comparators at Sartorius (Göttingen, Germany). “Vendors must come up with products that serve non-ideal conditions.”



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Drafts are a serious issue for both top-loaders and analytical balances with enclosed weighing compartments. The former are generally unprotected from blasts of air, while enclosures on analytical balances may fail to fully protect due to the instruments' sensitivity.

“Cleaning balances requires little more than common sense.”

The higher the required resolution or accuracy, the more care must be taken with environmental conditions. Top-loading balances expected to weigh ten noncritical milligrams work almost anywhere. But pharmaceutical quality assurance labs whose assay standards rely on five decimal point readability should consider better-controlled conditions for weighing.

Ann Crowley, product manager at Rice Lake Weighing Systems (Rice Lake, WI), suggests positioning all balances away from drafts on a dedicated balance table or marble slab, or at the very least on a surface that does not bend, even imperceptibly. Most wooden tables have some degree of flexure and are therefore unsuitable for serious weighing.



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Ahlbrecht goes one step further: “A weighing table should be decoupled from the environment.” Stone surfaces are fine, but only with an additional layer of shock-absorbing material such as rubber or cork. “A large mass, for example marble, will thereby be less sensitive to shock and vibrations.”

“Vendors advise locating balances in quiet, temperature-controlled, draft-free locations.”

For ultrasensitive work, managers must consider every conceivable physical perturbation that might affect weighing results. For example, the middle of a floor bends more than areas closer to outside walls, and upper floors sway; even slight misalignment along the vertical to the center of the earth can introduce error.

“Unless balances are specifically designed to handle those circumstances, an R&D or QC balance on the twentieth floor will experience problems with vibration and movement,” Ahlbrecht tells *Lab Manager*. In that situation, a weighing table near an outside wall is a necessity. Managers might also consider purchasing balances that self-correct for or filter out external mechanical or gravitational influences.

Environmental issues

Changes in temperature, humidity, and air pressure all affect balances but temperature changes are by far the most serious because they occur everywhere. Temperature effects are mostly insignificant for top-loaders but a difference of 1.5° C can cause sensitivity and zero point to shift in analytical balances. Zero point drift is trivial, thanks to automated taring, but sensitivity drift will introduce systematic error. Sensitivity drift is normally specified for a particular balance, depending on the sample weight and temperature difference. For example, a difference of 5°C will affect the observed weight of a 100 g sample by up to 1 mg.

Operators should be wary of warming or cooling of tare vessels during removal from the balance. Julian Stafford, sales trainer at Mettler Toledo (Zurich, Switzerland), demonstrates this effect during training sessions by removing a beaker from the weighing pan with his bare

hands. Most trainees believe that the mass contributed by oils and sweat from Stafford’s fingers would cause the weight to rise. In reality, updrafts caused by warming the beaker by a few degrees more than compensate for the added mass. Similarly, downdrafts caused by cooling (say, placing the beaker directly onto a cold bench) can cause significant apparent weight gains. Temperature difference effects apply to balance and sample, and particularly to glassware that has recently been removed from a dishwasher.

“Most people don’t realize that air from drafts or updrafts has mass,” Stafford says. “Because we live in it and can’t see it, we tend to ignore it.” He suggests allowing sample, tare vessel, and balance to reach mutual temperature equilibrium whenever temperature differences are suspected. “For very high-precision work, users should introduce the tare container and sample into the balance chamber up to one hour before weighing. Accurate weighing takes patience and diligence.”

Humidity effects are indirect: low humidity conditions tend to promote static buildup in samples. In addition to causing annoying physical dispersion of powders, static adversely interacts with metal components, resulting in serious drifts. “You may never achieve stability for that sample, no matter how long you wait,” Ahlbrecht says. Air conditioning, which removes moisture from air, is one culprit.

Mettler Toledo’s Stafford observes that labs in tropical climates with higher humidity rarely experience serious static problems. “It’s more of a problem in locations that have four distinct seasons,” he says.

Glass or plastic vessels tend to promote static; Teflon is the worst offender, according to Ahlbrecht. Even expensive conductive glass may not satisfactorily overcome



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serious static issues. Balance vendors and third parties sell accessories to eliminate static, including charge dissipation devices and systems that deionize air around the balance. Several companies, Sartorius included, incorporate static dissipation in some of their balances.

To move or not to move?

Because transporting can throw analytical balance instruments out of calibration and balance, managers should think twice about moving them.

Some vendors take a conservative position in spite of increased automation of calibration and leveling. “I do not recommend moving a balance unless it’s absolutely necessary,” says Andrew Hurdle, market manager at Ohaus (Parsippany, NJ).

“Changes in temperature, humidity, and air pressure all affect balances.”

What about cleaning up spills? Many balances have space between the bottom and the table or benchtop. Hurdle suggests using a cloth or towel that fits into that space while disturbing the balance as little as possible. “And you can always blow away dust and dirt with compressed lab air.”

But when moving is unavoidable, Hurdle recommends having an SOP in place that covers powering down, removing and securing the weighing pan, and handling the instrument as gingerly as possible. “Pick it up from underneath and relocate to where it will not need to be moved again. Then recalibrate and level.”

Many balances prominently feature a level indicator, similar to a carpenter’s level, and options for correcting level through either two or four adjustable feet. Achieving true level is easier with four-foot leveling.

More than leveling, the need to recalibrate makes moving balances unattractive to lab workers. Calibration options include do-it-yourself, or calling an in-house engineering department, the vendor, or a third-party organization. Calibration should ideally follow usage: more weighing means higher frequency. In practice, labs follow SOPs that designate intervals between calibrations, or follow regulatory guidance (e.g., GLP, GMP) regardless of usage.

When moving is unavoidable, users should first lock the balance (if it has such a feature), turn the power off, disconnect the electrical cord, and cautiously relocate the balance. Most users will wish to recalibrate after the balance has reached its final destination.

Moving becomes practically a nonissue with certain balances that employ high-precision electric discharge processing (HPEDP), which places many of the components of a conventional electromagnetic balance into a monolithic metal structure. Such balances are practically impervious to shock.

Users must still verify calibration with HPEDP balances, but often need not perform a formal calibration provided they allow the balance to equilibrate for 15 minutes

after powering up. Users may recalibrate using standard low, medium, and high weight points, or by applying automated recalibration based on an internal dead weight.

Vial notes that the worst effects of moving result from damage to the spring or load cell on balances equipped with these components. “Load cells are classic strain gauges that easily become overloaded,” he says. Locking disengages springs and load cells from forces related to movement.

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



▲ *Tabletop Precision Balance
Adventurer Pro / Ohaus
www.ohaus.com*



▲ *Tuning Fork Balances
Vibra® / Intelligent Weighing
www.intelligentwt.com*

TECHNOLOGY NEWS



This month, we spotlight companies that will be exhibiting at the **Society for Lab Automation and Screening's Fourth Annual Conference & Exhibition (SLAS2015)**. This year's event will feature the new 2015 SLAS Leadership Forum, which is geared to the interests of executive-level professionals and co-located with SLAS2015. The event runs February 7-11, 2015 at the Walter E. Washington Convention Center in Washington, DC. Please remember that these particular products may not be at the show, but the highlighted companies will be on hand to answer any questions you may have.

ANALYTICAL

UHPLC System



1290 Infinity II
BOOTH 805

- Enables operators, scientists and laboratory managers to reach new levels of laboratory efficiency
- Features high analytical quality, ease of use and the ability to seamlessly integrate into any laboratory
- Excellent throughput is enabled by high sample capacity per bench space and fast injection cycles
- Allows smooth method transfer from any legacy equipment



Agilent

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LC Accessories



A-Line
BOOTH 805

- Designed to address key user pain points in the chromatographic workflow and ensure that users continually receive optimal productivity from their LC systems
- New accessories include Connect fittings, Quick Turn fittings, Stay Safe caps, and LC Flex bench
- Save time and provide excellent efficiency and ease of use

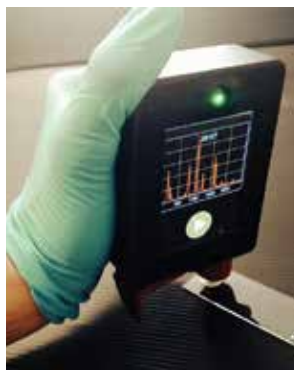


Agilent

www.agilent.com

Surface Enhanced Raman Spectroscopy Substrates SERS

- Highly sensitive, stable and reliable
- Deliver precise trace-level Raman spectroscopy measurement in applications ranging from chemical and explosive agent detection, to authentication, contaminant screening and quality control in production environments and the laboratory
- Provide fast, repeatable SERS measurements for the identification and quantification of SERS-active analytes
- Detections at the parts per billion and parts per trillion level are possible



Ocean Optics

www.oceanoptics.com

LC-MS-MS System



Q Exactive Focus
BOOTH 423

- Features high-resolution accurate-mass (HRAM) Orbitrap mass spectrometry
- Designed for cost-per-sample-sensitive workflows
- Answers routine quantitative and research analytical demands at an affordable price
- Particularly suited to food and environmental testing, clinical research, forensic toxicology, pharmaceutical/biopharmaceutical measurements, and other applied analyses
- Provides excellent mass accuracy, sensitivity and fast polarity switching



Thermo Fisher Scientific

www.thermoscientific.com

Handheld Raman Spectrometer Updates

NanoRam

- Now faster, more efficient, and easier to use for a wider range of operators
- New features include faster response on the user interface display, enhanced Wi-Fi and Ethernet operations, and faster data synchronization due to database optimization
- Also includes new multilingual support, allowing users to input notes in a variety of languages
- Offers better battery operation efficiency



B&W Tek

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Benchtop EDXRF Spectrometer JSX-1000S ElementEye

- Analyzes major to trace components on most sample types—solids, powders, and liquids—with little or no sample preparation
- Complements SEM, EPMA, NMR, and mass spectrometry analyses, providing high-sensitivity qualitative and quantitative analysis results in minutes
- High-sensitivity analysis can be performed across the entire energy range using a maximum of nine types of filters and a sample chamber vacuum unit



JEOL

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HPLC Columns

Shiseido CAPCELL PAK

- Integrates the excellent separation performance of silica-based, polymer-coated packing material
- Provides columns of reversed phase partition mode, normal phase partition mode, and ion exchange mode
- Other columns available include PC HILIC, Proteonavi, Ceramospher (Chiral), Silica, Chiral CD-Ph, Superiorex ODS, SUCREBEADS, and Reduction



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Core-Shell HPLC Columns

Kinetex EVO C18

- Incorporate a patented organo-silica grafting process that utilizes uniform stabilizing ethane cross-linking to create a unique selectivity and ultimately, pH stability from 1-12
- Provide the performance advantages of Core-Shell Technology even at extreme low and high pH
- Especially suited for analytical and preparative HPLC methods at a variety of challenging pH levels such as those in open access labs



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BASIC LAB

Snap-Freeze Tissue Clamp

BioSqueezer

- Quickly freezes animal and human tissue samples
- Tissue is compressed into a thin disc under a metal clamp head that is pre-cooled in liquid nitrogen or dry ice
- Freezing occurs in a few milliseconds, thus giving a snapshot of metabolic events in the cells
- The hard frozen disc is easily fragmented or ground without thawing for subsequent extraction of labile nucleic acids, proteins and intracellular metabolite products



BioSpec Products

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Quick Action Lab Stand

Model QB

- Simplifies the testing process by allowing a viscometer to glide up and down, enabling quick positioning, rapid sample change, and improved laboratory efficiency
- Especially suited for lab environments with multiple operators and those with frequent testing needs
- Supplied automatically for customers who order DV3T Extra rheometer or DV2T Extra viscometer



Brookfield Engineering www.brookfieldengineering.com

Laboratory Circulators

MPC

- MPC circulators have been replaced with improved models
- Now feature a redesigned front and are equipped with an RS232 interface as a standard feature
- Improved temperature indication of the MPC models provides a continuous resolution of 0.1 °C across the entire temperature range
- Easy to operate and are filled with natural refrigerant as a standard



Huber

www.huber-online.com

Hand-Held Digital Thermometers

1000 Series

- Offer speed, accuracy, and performance at an affordable price
- Simple, fast, reliable operation provides precise, stable readings in even the harshest environments
- A choice of thermocouples is available—thermistors for lower food safe temperatures, T type (-250 to 400 degrees), and K type (-200 to 600 degrees) for the more extreme heat generated by industrial applications—enabling an extensive range of temperatures to be measured



Digitron

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Concentrator

BioChromato Smart Evaporator

- Compact sized concentrator is easier and faster to set up than a rotary evaporator
- Loss of sample due to bumping is never a concern due to the vacuum-assisted air vortex technology
- Works with a variety of vessels, no need to transfer your sample
- Especially suited to small volume samples



Eicom USA

www.eicom-usa.com

Lab & Batch Processing Evaporator

Rocket Synergy

- Offers automated evaporation of a wide range of sample formats and sizes, from millilitres to tens of litres
- Can dry or concentrate up to six flasks, each containing a maximum of 450ml of solvent, or 18 ASE® vials, with no user intervention or attention
- Capable of replacing several rotary evaporators



Genevac

www.genevac.com

Precision Syringe Drive

slas 2015 PSD/6
BOOTH 501

- Compact, full-height pump is designed for precision dispensing of small to large volumes
- Performs all standard liquid handling functions including dispensing, serial dispensing and diluting
- Offers a large range of compatible syringe sizes
- Designed for simple integration, a variety of mounting configurations are possible for a single unit or a daisy chain of up to 16 pumps



Hamilton Company

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Cleanroom Wipe Dispenser

GRAB-EEZ

- Wall-mountable unit is specifically designed to be used in a variety of controlled environments including medical, pharmaceutical, life science, laboratory, and electronics manufacturing facilities
- Designed to cut back on waste in terms of wipe use
- Made from the highest grade ESD safe plastics—suitable for use in ISO Class 5 (Class 100) cleanrooms and higher



High-Tech Conversions

www.high-techconversions.com

PRODUCT SPOTLIGHT

COMBATING CONTAMINATION INNOVATIVE TECHNOLOGY ALLOWS USERS GREATER CONTROL OVER CONDITIONS

Preventing contamination is critical when using a CO₂ incubator. Baker Company aims to help laboratory professionals do just that with the release of their new CO₂ incubator, the Cultivo™, which is designed to protect against accidental cell culture contamination from a wide variety of sources.



"From the beginning, we designed Cultivo to be a 'contamination preventer,'" said Dan Eagleson, vice president of Baker. A number of features work to stop contamination from happening, including vertical, uni-directional downward airflow which delivers ISO Class 4, Class 10 clean air to the incubator chamber within 60 seconds after a door opening. In addition, a fogless interior door gives users a clearer view of cultures on every shelf, meaning they won't have to open the door as often, thus reducing the potential for contaminants to enter the chamber. Lastly, optional ultrasonic humidification allows users to eliminate the use of a water pan—and the risk of contaminants that typically go along with it.

If contamination does occur, an optional, pre-programmed and easy-to-follow vaporized hydrogen peroxide biodecontamination protocol is available, which effectively kills a wide variety of contaminants in under four hours.

Another cool thing about the incubator is its IntelliCELL™ P.I.D. control algorithm, which provides precise, stable and user-defined environmental conditions. IntelliCELL consistently maintains user-defined set points by accounting for factors that other technologies leave as unknown.

"This is beyond smart technology," Eagleson said. "This is the intelligence that drives the performance of Cultivo, delivering a level of precision, control, and uniformity not previously available to researchers within a CO₂ incubator. This allows them to explore the impact that each environmental parameter—or a change in those parameters—will have on their work."

For more information, visit <http://www.bakerco.com/products/cultivo>

Imaging Accessory

Hydro Sight

- Makes it quicker and easier to develop and apply robust particle sizing methods
- Provides real-time visual monitoring of the dispersion process that precedes every laser diffraction particle size measurement
- Another accessory, the Hydro SV, a new wet dispersion unit for the Mastersizer 3000, answers the need for reliable particle size data when material is scarce



Malvern

www.malvern.com

Ultra High-Speed 1 Mpx Digital Cameras

Phantom v2011, v1611, and v1211

- Now have almost 30% more light sensitivity, provide better image quality, and more lighting flexibility than the predecessor versions
- Make shooting in low-light and difficult-to-light scenarios less difficult
- All ultra-high-speed Phantom cameras now have sensitivity as high as ISO 6400 (daylight illumination) for color images and ISO 32,000 for monochrome images



Vision Research

www.visionresearch.com

Transmission Electron Microscope

JEM-ARM300F

- Increases STEM resolution to 63 picometers
- Extreme resolution of 63pm is achieved in STEM mode at an accelerating voltage of 300kV
- Supports accelerating voltage levels of 300kV and 80kV as standard
- Spherical aberration correctors are integrated in the image-forming system and illumination system, and automatically controlled using the JEOL COSMO corrector system module



JEOL

www.jeolusa.com

Analog Hot Plates & Stirrers

ST15 & ST19 Stirrers and

slas 2015 HS15 & HS19 Stirring Hot Plates
BOOTH 1048

- Large 12" (305 mm) square ceramic heater tops have a temperature range to 450°C
- Five-position stirring units (ST15 & HS15) can stir 5-800ml beakers, and the 9-position units (ST19 & HS19) can stir 9-500ml beakers of aqueous solutions from 100 to 1500 rpm
- Each stirring position is individually controlled
- Units are available in 115VAC/60Hz, 220VAC/60Hz, and 230VAC/50Hz



Torrey Pines Scientific

www.torreypinescientific.com

CHEMICALS, KITS & REAGENTS

Sample Preparation Kits for NGS

slas 2015 RapidSeq
BOOTH 1454

- RapidSeq Small RNA Sample Prep Kit is optimized for preparation of NGS libraries for subsequent cluster generation, using purified mRNA or total RNA which contains small RNA fragments as input
- RapidSeq Directional mRNA Sample Prep kit provides strand-specific cDNA synthesis with reduced costs and increased sensitivity

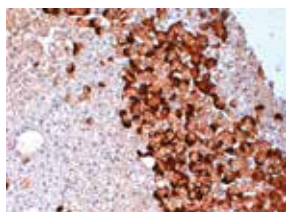


AMSBIO

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Hepatitis B Reagents

- Expanded range now available, including MONOTOPE™ and OMNITOPE™ antibodies and recombinant antigens
- Specificities include surface antigen (HBsAg), HB core, HB "e", pre-S1, pre-S2 and HB-X
- Applications for these reagents include ELISA, WB, IHC and rapid tests



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www.virostat-inc.com

Premixed Dry Reagent Cocktails

slas 2015 DuraClone IM
BOOTH 611

- Standardize and streamline workflow for high content flow cytometry in translational research studies involving identification of cellular subpopulations of the human immune system
- Optimized and easy-to-use panels
- Provide worry-free compensation to minimize labor and reduce variability and errors when characterizing alterations of immune status through detection of human blood-cell subpopulations



Beckman Coulter

www.beckmancoulter.com

LH ELISA Kit

- Can be used to quantify human LH in serum and plasma samples as well as tissue culture media
- Fully quantitative, with the ability to detect as low as 5.2 mIU/ml of LH, surpassing semi-quantitative Western blot analysis
- Produces rapid results in less than 2 hours with negligible reactivity to similar glycoprotein hormones



Enzo Life Sciences

www.enzolifesciences.com

Protein A Kit

Gyrolab™

- For use on the Gyrolab xP workstation and designed and validated for use with the Gyros nanoliter-scale immunoassay platform
- Includes automated acid dissociation of Protein A and IgG during sample preparation, to ensure contamination is accurately assessed
- Quantifies native Protein A, recombinant Protein A variants, and MabSelect™ SuRe ligand, and has fewer manual steps than other standard ELISA kits



Gyros AB

www.gyros.com

Synthetic Sorbent for SLE

Novum

- Provides a novel, synthetic alternative to traditional diatomaceous earth SLE (simplified liquid extraction) products and a simplified approach to traditional liquid-liquid extraction
- Can be used with the same procedure as traditional SLE sorbents while delivering improved lot-to-lot reproducibility
- Simplifies the liquid-liquid extraction process by eliminating manual steps and reduces solvent consumption



Phenomenex

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INFORMATICS

Hyper Reaction Monitoring Data Analysis Software

Spectronaut™

- Now supports spectral library generation from the Thermo Scientific™ Proteome Discoverer™ platform
- Enables Thermo Scientific™ users to automatically generate spectral libraries from Proteome Discoverer™ search results
- Allows for the reproducible and accurate quantification of thousands of proteins in a single instrument run
- Free for academic researchers

Biognosys

www.biognosys.ch

Laboratory Information Management System

slas 2015 LabVantage 7
BOOTH 310

LABVANTAGE®
Laboratory Knowledge. Delivered.

- Provides significantly improved user experience as well as capabilities that make it easier to enable process optimization
- A built-in search engine now makes it possible to find data as easily as you would on the Web
- New, easy-to-use workflow designer, simplifies modeling and improvement of processes to help users become more compliant and efficient

LabVantage Solutions

www.labvantage.com

ALH Management Software Updates

slas 2015 ArtelWare™ v1.1
BOOTH 1129

- The first in a series of upgrades now in development
- Adds event tracking and management capabilities that give users more information about causes and effects relating to liquid handler performance
- Users can now track many events that might affect pipetting, such as preventive maintenance, changes in protocols, consumables and labware, service, and liquid handler malfunctions



Artel

www.artel-usa.com

Weight Calibration Package ComparatorPac™

- Makes weight calibration for METTLER's new XPE comparator balances simple and efficient, saving users up to 40% in processing time
- New version of the calibration software, MC Link 2, delivers a high level of process security and assists users to meet the highest quality assurance demands
- Software also guarantees process efficiency and manages measurement uncertainty



METTLER TOLEDO

www.mt.com

Tube Code Reading Software

slas 2015 Tracxer v2.2.6
BOOTH 218

- Fully compatible with all Micronic tube scanners
- New user-friendly software is easy to install, gives reliable code readings and can be smoothly integrated into any laboratory sample database
- New features come at no extra cost with the software and include ActiveX tool kit, improved single tube reading functionality, and easy configuration of different storage rack formats



Micronic

www.micronic.com

LC-MS Software Package QuantAnalytics

- This LC-MS-MS data tool is designed for the pain management and clinical markets
- Increases the speed and efficiency of data processing and review by allowing users to highlight and review results that are of specific importance to clinicians
- Allows analysts to filter results by group or based on a clinician's orders



Shimadzu

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LIFE SCIENCE

Multi-Label Microplate Reader

TriStar² S

- Now includes monochromator technology
- Capable of UV-VIS absorbance, fluorescence, FRET, time-resolved fluorescence, luminescence, BRET, and BRET²
- Employs the new patent-pending optical concept ALL-4-ONE, which enables luminescence, fluorescence, and absorbance measurements with high respective sensitivities of less than 6 amol ATP per well and less than 0.3 fmol Fluorescein per well



Berthold

www.berthold.com/bio

Rat Genome Assays for qPCR PrimePCR

- Fully wet-lab validated for specificity, efficiency, and sensitivity, and help researchers adhere to industry best practices known as MIQE
- Bio-Rad scientists validate all PCR products using next-generation sequencing, verifying the percentage of on-target amplification
- Researchers will be able to order PrimePCR assays as individual assays (desalted or HPLC-purified), or build a custom plate (96- or 384-well)

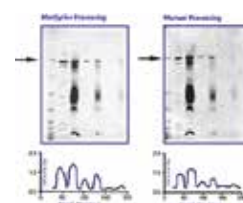


Bio-Rad

www.bio-rad.com

Western Blot Automation System BlotCycler™

- Delivers an affordable solution for busy labs demanding reproducible results
- Automates blocking, primary and secondary antibody incubation, and all washing steps
- Uses a simple and elegant design to perform up to 12 blots simultaneously
- Equipped with up to six trays, three trays on each side that can process six different primary and secondary antibodies



Precision Biosystems

www.precisionbiosystems.com

Medical Research Exome Array CytoSure™

- Highly targeted and exon-focused, enabling the accurate detection of medical research relevant microdeletions and microduplications
- The high-density array (1x1M) contains over 4,600 hand-curated genes, which have been grouped into disease- and syndrome-specific panels
- This research-validated gene content can also be customized for varying array formats (2x400K, 4x180K or 8x60K) and diseases



Oxford Gene Technology

www.ogt.com

Assays for Droplet Digital PCR

PrimePCR

- New releases include an additional 100 assays for copy number variation (CNV) and 92 assays for mutation detection
- Bio-Rad will also be adding 5,620 mutation detection assays that were created using the same algorithms and design rules as the wet-lab validated assays
- Compatible with all Bio-Rad droplet digital PCR systems



Bio-Rad

www.bio-rad.com

Rare Mutation Analysis Solution

QuantStudio 3D

- Includes a panel of wet-lab validated assays combined with an enhanced software tool
- Enables researchers to detect and quantify 40 of the most common mutations in cancer genes at a prevalence as low as 0.1 percent
- Primary and secondary software enhancements are designed with specific features for analysis of low-frequency alleles on the QuantStudio 3D digital PCR system



Life Technologies

www.lifetechnologies.com

Thermal Cycler

Mastercycler® nexus X2 BOOTH 1337

- Suited for researchers looking to carry out two PCR reactions simultaneously, without any compromise on the number of samples
- Comprised of two asymmetric blocks, consisting of 64 and 32 wells, which can be programmed and run completely independently, enabling two separate PCR protocols to be run in parallel
- Features reduced noise emission (< 40 dB), low power consumption, and a small footprint



Eppendorf

www.eppendorfna.com

Predesigned Gene Capture Pools and Plates

xGen®

- Provide easy access to customizable and cost-effective target capture
- Suited for creating customized target capture panels for enrichment of 10 or more genes or for enhancing the performance of existing panels
- Available for the coding regions of any human RefSeq gene and are delivered premixed in tubes or in individual plate wells for selective mixing



Integrated DNA Technologies

www.idtdna.com

Fluorescent Cell Imager

Zoe

- One of the first cell imaging systems able to deliver the power of microscopy in a system that is as easy to use as a tablet
- System's LEDs are instantly ready to use and it is outfitted with a light shield, enabling users to perform experiments right on their benchtop
- Includes three fluorescent channels and brightfield to simplify fluorescence imaging for cell culture applications



Bio-Rad

www.bio-rad.com

Remote Access Blot and Gel Imager

T:Genius

- Allows high performance, walk-away imaging of gels and blots on a smartphone or tablet
- Using the 'StatusLink' feature, researchers can stay updated and even share image results with colleagues in other labs, no matter where they are
- A sensitive camera provides high-res images of even the biggest gels and blots, as well as tricky applications such as stain-free protein gel imaging



Syngene

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SUPPLIES & CONSUMABLES

Single-Use QC Standards

ATCC® Minis

- Support quality control (QC) testing in pharmaceutical and industrial labs
- High quality strains are now provided in a ready-to-use mini-cryovial format to meet users' requirements
- ATCC has created single-use glycerol stocks, so users can validate their QC work quickly and efficiently without the risk of cross-contamination during banking techniques



ATCC

www.atcc.org

96-Well Plate Seal

Slit Seal

- Self-closing seal helps users avoid sample evaporation and cross-contamination
- Pre-cut slits open easily, and PET layer reduces friction for easy handling
- Easy to insert pipette tips
- Does not have adhesive on well spots
- After 22 hours, 95% of 150 µl water will remain at 37°C
- After 22 hours, 95% of 150 µl of ACN will remain at 4°C



Eicom USA

www.eicom-usa.com

COLD STORAGE

FROST, FILTERS, AND VOLTAGE ARE THE MAIN THINGS TO WATCH **by Rachel Muenz**

Removing frost regularly is critical in laboratory freezer and fridge maintenance.

“For home fridges, it’s not something that people are concerned with, but for cold storage freezers, removing the frost [is important] because it will affect uniformity, energy consumption, and possibly product viability long-term if [users] don’t remove it,” says Joe LaPorte, director of product management at Panasonic Healthcare.

LaPorte adds that frost should be removed when it becomes too thick to see the inside walls of the unit. Many freezers and fridges also have indicators that show when it’s time to deal with frost, and having difficulty closing the inner or outer door of an ultralow freezer is another sign to get scraping, LaPorte says.

Having the correct voltage for your unit is also essential.

“Unstable voltage may cause malfunction of freezers, thus voltage must be provided at less than plus or minus the five percent range,” says Jean Fallacara, CEO of Z-SCI Biomedical. “Power supply must be 25 percent higher than required.”

The surrounding environment also plays a role.

“Temperature and humidity affect the performance of freezers, thus the environment must be maintained within the recommended conditions,” Fallacara says. “Crowded rooms will tend to overheat and the equipment along with it.” Those optimal conditions are from 5-25°C, ideally 20°C, with lower than 50 percent relative humidity (RH).

Both LaPorte and Fallacara stress users should ensure they keep enough space around the unit and don’t store anything on top of it so air can properly circulate.

Cleaning the filters on a regular basis is also necessary.

“If it’s in a common area, [the filter] typically has to be cleaned more often than in a quiet laboratory environment,” LaPorte explains. He adds lab workers should consider using the switchover to and from daylight savings time as a guide for when to clean filters. “It [cleaning filters] usually only takes, for each piece of equipment, less than a minute to do it but it can make all the difference for equipment performance.”

Fallacara agrees that changing filters is important, however, he also points out that the latest generation of freezers is filter-free, meaning users can avoid this task.

In general, Fallacara says users should do maintenance at least twice a year.

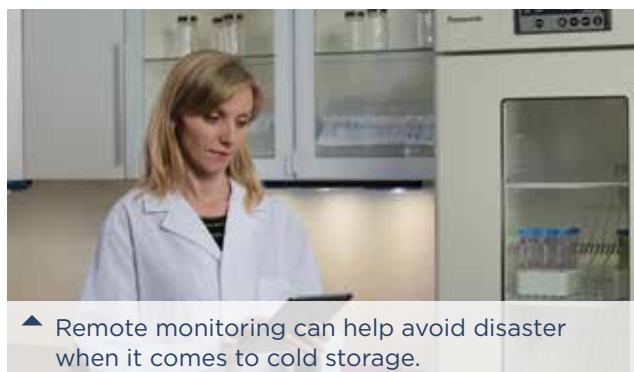
“This all depends on where the equipment is placed, ambient temperatures, and humidity,” he says. “Also how often the fridge or freezer doors are opened during a day [is a factor].”

Common mistakes in fridge and freezer maintenance, apart from not regularly taking care of the frost and filters, include cleaning the freezer while it is up, running, and connected to a power supply; overloading the unit; using non-dedicated electrical circuits; and ignoring vertical and horizontal installation requirements.

Both LaPorte and Fallacara add that leaving the unit’s door open too long when removing ice is another common error.

“You try to move as quickly as possible so that you’re not affecting the temperature inside the unit,” LaPorte says.

Strange noises, vibrations, or alarms going off are signs you should probably inspect your unit. However, LaPorte cautions that it’s not a good idea to wait for some alarms to go off before doing maintenance.



▲ Remote monitoring can help avoid disaster when it comes to cold storage.



▲ Understanding what all of the alarms and indicators on your fridge or freezer mean is critical for proper maintenance.

“A lot of equipment, including ours, has a filter sensor on it, but that filter sensor really isn’t an indication that you should clean your filter,” he explains. “It’s more of an indication that it’s gotten to such a severe level that you really need to address it now.”

For that reason, users should make sure they understand what all of the indicators and alarms on their unit mean by reading the user’s manual and consulting with technical support. Fallacara adds that, in addition to those resources, the freezer engineer can be a good source of education for users at the time of installation and the Internet is always useful.

In the end, following a regular maintenance schedule and ensuring the environment is ideal are the main things users should focus on.

“[Users] just have to stick to a schedule and a step-by-step protocol with checkboxes,” Fallacara recommends. “Have a schedule for stocking and cleaning out the fridges and freezers, [as] this [will] avoid long periods of door openings.”

WHAT YOU SHOULD KNOW BEFORE SIGNING UP FOR A FRIDGE/FREEZER MAINTENANCE PROGRAM:

- Ask about the technician’s installation methods
- Make sure you find out how much time will be spent when technicians make a maintenance call, as this accounts for a large portion of the cost
- What is the response time when an emergency repair call is made?
- Are backup units available if repairs are needed?
- If your samples are critical, 24/7 monitoring is usually a good service to have
- Often, maintenance programs are run by regional service providers; make sure they are qualified

Hi Robert,
Got an alert on server; the temperature in Twincore ZH8990* is at -64°C, but all parameters are good.
ULT Team

Actually, we are loading our freezers. The rapid temp changes are probably because they are mostly empty. Thanks.
Robert.

WE ARE
WATCHING

YOUR TWINCORE’S VITAL SIGNS

WiZBOX real time 24/7 free monitoring: Set point, thermistor, door opening, power, voltage booster, compressor temp, pressure, gas charge, unit integrity, alarm status ...

PREDICTING FAILURE BEFORE IT OCCURS.

* Serial number has been changed to protect the identity.

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FORECASTING. MONITORING. PEACE OF MIND.



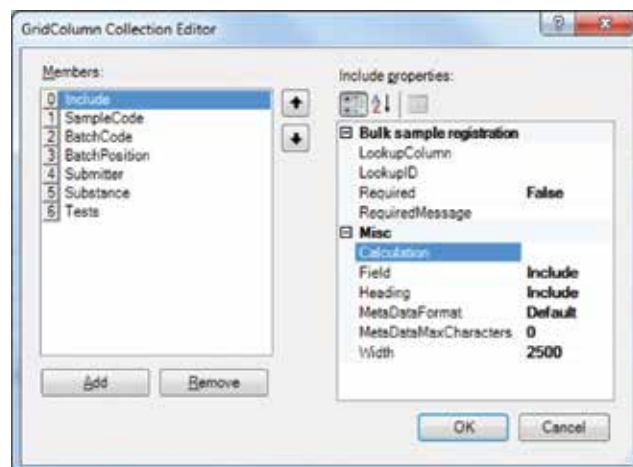
LIMS SAMPLE SCHEDULING TOOLS

Problem: Many service or contract laboratories need to process the same sets of samples on a regularly-scheduled basis. In addition, many processes within factories of various types require collection of samples at pre-set dates and times to ensure the quality of the product being produced. One example is collection of air and surface samples to test the sterility of rooms used in the production of pharmaceuticals, foods, and medical devices. Another example is collection of samples during beer production. The task of logging these samples into a LIMS (laboratory information management system) can be cumbersome and time-consuming and it is easy to miss collection of a scheduled sample. Although these are two entirely different scenarios, both require the same basic scheduling of multiple sample collections.

Solution: The Matrix Gemini LIMS from Autoscribe Informatics employs two features to assist in resolving this problem. The first is Bulk Sample Registration and the second is Matrix Scheduler.

Bulk Sample Registration provides a spreadsheet style grid that allows the designer of the LIMS to designate certain columns to collect specific information. For example, one column may be the room, the second column the area within a room, the next the set of tests to be performed, etc. After the grid is designed and put into use, the end users of the system enter static information into the grid either directly or by copying and pasting from a spreadsheet and save this as a template for future use. A fill down feature allows fast data entry without the need to enter the same data multiple times and a test or group of tests can be easily added to a particular sample row as many times as needed. Templates are particularly useful for contract laboratories that have regular repeat batches of samples for analysis, whether from single or multiple disciplines. However, the grid does not have to be used as a template. In the situation of beer production, for example, the scheduled collection of samples may vary depending on the type of beer being produced. So in that scenario, a user enters all of the information about the samples being collected and also enters specific scheduled collection dates. The user then registers all of the scheduled samples into the LIMS for future collection.

Alternatively, in the situation where templates of data are recorded, the Matrix Scheduler tool may be used in conjunction with the Bulk Sample Registration templates to automate login of samples. Scheduler allows the scheduling of tasks based on specific dates or dates built from the



▲ Bulk Sample Registration.

classifiers of years, months, weeks, and days together with times. One example might be: '14:30 on the third Thursday of January, March, and September'. The module also allows non-working dates (i.e weekends and public holidays) to be programmed in with the option to include or exclude tasks that would be scheduled to occur during these periods. Matrix Scheduler runs as a "service" so that even if a user logs off their PC, the schedule is still executed. Scheduler is fully audit-trailed, allowing all changes made to a schedule to be seen and reviewed.

In addition to scheduling registration of samples, Matrix Scheduler can also schedule the creation of reports. This too is very useful in automation of laboratory functions. For example, every morning, each person in the lab may have an "incomplete samples" list automatically emailed to them directly before they begin their work day. Or perhaps a plant manager could receive a list of failing results as a PDF on their desktop at 1:00 AM Monday through Friday.

For more information, visit www.autoscribeinformatics.com/lims-tracking/additionalmodules

A WEB-BASED 24/7 MONITORING SYSTEM

Problem: At this very moment across the United States, thousands of digital eyes watch over laboratory equipment. It's nothing scary; it's the way we protect fragile samples from being damaged or destroyed. From facilities stocked with vaccines for the flu season ahead, to embryos frozen for future fertility treatments, life and livelihoods are literally on the line. For this reason, laboratories use continuous monitoring systems to closely watch over the environment of their specimens during experimental, growth and storage phases.

Monitoring software continuously scans variables including temperature, pressure and CO₂ levels, as well as the power and health of storage equipment motors. All data is stored for ongoing analysis and for compliance with external agencies such as the Food and Drug Administration. Perhaps most critically, when something goes awry, alarms are sounded, preventing emergencies such as equipment malfunctions from spiraling into the loss of high-value samples.

Monitoring systems have come a long way since the earliest redundant (secondary) probes were installed for back-up temperature readings. Despite this, they are far from perfect. Few products offer complete solutions, and there are many common weaknesses. These include an inability to customize alarms, which results in blanket alerts or false emergencies that undermine real calls to action. In modern times, systems also need to record the monitoring data as proof for regulatory reports. The final consideration is ease of use. Install a difficult program, or one that only works with specific software, and staff just won't want to use it.

Solution: What is needed is a monitoring system that delivers data from the lab directly into the hands of the user, accessible 24/7, from home or on your smartphone. Wherever you are, digital eyes would be watching over your inventory, ready to alert you with preprogrammed, modifiable alarms. If emergencies strike, real-time data would fill in the gaps and context, allowing you to gauge the best possible response. One recent example of a product designed with this omnipotent capacity is the LabAlert Monitoring System by Panasonic Healthcare (www.labalert.com).

With LabAlert, an infinite number of probes can be installed in equipment such as biorepositories or freezers, pulling together data from diverse geographic sites. LabAlert equipment independently logs continuous temperature, CO₂ readings, opened doors—and more. Each probe sends data to a local receiver, which is then transmitted to the cloud and accessible through a web-based platform.

Designated lab managers and staff can gain 24-hour access to readings and program flexible alerts for when equipment fails or samples are otherwise put at risk. LabAlert is easy to install and intuitive to use. Instead of adding to your facility's workload, the system streamlines data collection and safeguards your most precious cells, samples and supplies.

Logging on to the LabAlert monitoring system is as easy as signing into a regular email account. Through any Internet-connected phone (iOS or Android), tablet, or computer, staff can access the website and log in for real-time data tracking. Information is presented on an intuitive dashboard that can be readily personalized for each team member. Staff can control the information they receive in their feed, without affecting their colleagues' monitoring capabilities.

LabAlert alarms are also highly specific; detailing what is happening, what response is needed, and how quickly corrections must take place. Frequent, nonspecific warnings

may eventually be overlooked or, worse, simply add to unwanted annoying "noise." With LabAlert, managers can specifically target the key people that need to respond to an emergency. Users can adjust the signals they receive as the experiment changes, or depending on who is on hand to help. Alarms are programmed according to urgency: a few beeps if temperatures dip or a phone call if equipment is failing. Once alerted, real-time data availability provides the full story, allowing scientists to see that, for example, equipment is naturally recovering, and the only action required is for them to go back to sleep. Sometimes, the alarm will correspond to rapidly deteriorating equipment, but caught early enough, scientists can act before samples are damaged.

Mistakes and equipment failures are always a consideration. The variable is how adequately your alarm systems provide backup. A comprehensive monitoring system can catch and prevent specimen damage while providing regulatory data that proves cell viability was never lost.

Learn more about LabAlert at www.labalert.com

▲ *With its customizable dashboard, Panasonic Healthcare's LabAlert Monitoring System is easy to access and intuitive to use, keeping scientists in sync with their samples in the lab.*



MEASURING CELL METABOLISM

Problem: At the crossroads of understanding cell physiology, disease pathology and etiology lies cell metabolism, encompassing the cellular set of life-sustaining chemical transformations. Dysregulation of cell metabolism is now known to be a common component of cancer, immunology, obesity, diabetes, and neurodegenerative disease. This is because mitochondrial respiration and glycolysis are the major sources of life-sustaining and biosynthetic processes for the cell, specifically energy in the form of ATP (adenosine triphosphate) and macromolecules such as membranes, nucleotides, transporters, organelles, etc. Metabolic pathways are increasingly considered as potential therapeutic targets. Therefore, the ability to measure and understand cellular bioenergetics can provide valuable insight into disease and contribute to the potential identification of drug discovery targets.

Traditionally, metabolic assays employed a variety of instruments and techniques including Clark electrodes to measure oxygen consumption, “omic” platforms to detect increases and decreases in metabolic gene and protein expression, fluorescent and radiometric tags of various enzymes and substrates to estimate metabolic activity, and luminescent ATP assays as a surrogate of total energy metabolism. The value of these approaches is lessened by the fact that they are destructive, insensitive, indirect, single-point measurements, use invasive labels, and most importantly lack the functional context of a living cell.

Solution: The Seahorse Bioscience XFp Extracellular Flux Analyzer simultaneously measures mitochondrial respiration and glycolysis, the two major energy-producing pathways in a cell, in a cell culture microplate, in real time. XF technology works with a variety of cells offering physiologically relevant cellular bioenergetic assays, with comparable performance to biochemical and radioactive methods, with better throughput, and without the preparation and use of labels or radioactive materials. Thus, this technology overcomes many of the challenges and weaknesses of traditional endpoint assays that either directly or indirectly measure metabolic function.

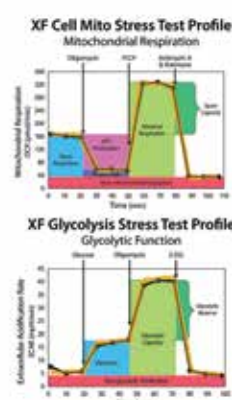
XF technology has led to the establishment of the Gold standard assays to measure metabolic function such as the Cell Mito Stress Test to measure mitochondrial function, the Glycolysis Stress Test to measure glycolytic function, the Metabolic Flexibility Assay, and the Metabolic Switching PhenoGram to illustrate metabolic switching.

The XFp Analyzer uses sensor arrays to measure extracellular fluxes in oxygen consumption (OCR) and extracellular acidification (ECAR), indicative of mitochondrial respiration and glycolysis, respectively. This technology allows measurements to be taken in minutes rather than hours, and prevents significant oxygen tension depression or media acidification.

Four injector ports surround each XFp Miniplate well and can be used for multiple injections of reagents to probe metabolic function, fuels and pathways in intact cells as well as generating dose-response curves. XF assays are label-free and non-destructive, allowing the user to perform ATP or other viability assays on the same cell plate to generate additional information and/or normalize the XF data.

The role of cell metabolism in cellular and physiological processes is well established, with many diseases now linked to metabolic dysfunction. With XF technology, scientists can quickly and easily obtain functional metabolic data and gain a greater understanding of cell metabolism, enabling new advancements in life science research.

For more information, visit www.seahorsebio.com/xfp



▲ Seahorse Bioscience XFp Analyzer and XF Stress Test Profiles.

Lab Manager

LOOKING FOR THE RIGHT
BALANCE? WE CAN HELP

PRODUCT
FINDER



The screenshot displays the Lab Manager Product Finder interface. The main navigation bar includes 'Balances | Product Finder | Lab Manager' and 'dynamicproductfinder.labmanager.com'. The 'Balances' section is highlighted, showing a list of 159 products. The products are categorized into four types: Precision Balance, Analytical Balance, Microbalance, and Ultra-microbalance. Each category includes a brief description of the equipment's capabilities and a list of specific models. For example, the Precision Balance section lists models like A&D Weighing BM Series, A&D Weighing BK-1 / BK-1 Series, A&D Weighing FX-WP Series, A&D Weighing FL-VFX-1 Series, A&D Weighing GF Series, A&D Weighing GX Series, A&D Weighing GP Series, Acculab ALC Series Analytical, Acculab ALN Series Analytical, Adam Equipment Core Series, and Adam Equipment Dune Series. The Ultra-microbalance section lists models like A&D Weighing HR-1 Series, Adam Equipment Core Series Compact Balances, and Adam Equipment CBK Series. The interface also features a 'Request Information' button for each product category. Other sections visible in the background include 'Centrifuges', 'Lab Washer', and 'Labconco' equipment.

Balances
159 Products

Type
What type of laboratory balance do you require?

- Precision Balance**
Precision Balances are those with a readability typically between 1 mg (0.001 g) and 1 g. Precision lab balances offer the widest range of weighing capacities with maximum capacities usually around 20,000 g.
- Analytical Balance**
Analytical balances are those with a readability between 0.01 mg (0.00001 g) and 1 mg (0.001 g). Analytical lab balances offer the widest range of weighing capacities usually around 500 g.
- Microbalance**
Microbalances are those with a readability typically between 1 µg (0.000001 g) and 0.01 mg (0.00001 g). Lab microbalances usually have a maximum capacity of approximately 50 g.
- Ultra-microbalance**
Ultra-microbalances are those with a readability of 0.1 µg (0.0000001 g). Laboratory ultra-microbalances usually have a maximum capacity of approximately 5 g.

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Lab Washer
Capacity
What size of lab do you require?

- Large Capacity**
Large-capacity washers offer high throughput, central accommodation of a wide range of labware or large items which may be washed manually.
- Standard Capacity**
These washers are designed for small to medium-sized labs. They offer a wide range of options to suit your specific needs.

Centrifuges
Orientation
Do you require benchtop centrifuges?

- Floor Stand**
Floor standing centrifuges offer large volume applications, high speed, and a wide range of options to suit your specific needs.
- Benchtop**
The numerous options for benchtop centrifuges offer a wide range of options to suit your specific needs.

WWW.LABMANAGER.COM/PRODUCTFINDER

Integrated Laboratory Informatics Deliver the Traceability and Data Management Needed for Comprehensive Food Safety Monitoring

By Colin Thurston, Thermo Fisher Scientific

Most food producers are subject to a broad range of regulations and standards, from industry-wide ones such as ISO 22000 (which sets out several communications and system management guidelines), the United States Food Safety Modernization Act (FSMA) of 2011 and the European Union Regulation (EC) No. 178/2002 to process-specific ones like the Egg Products Inspection Act (EPIA) or the Federal Meat Inspection Act (FMIA). Most of the industry-wide regulations require extensive application of the Hazard Analysis and Critical Control Points (HACCP) methodology, a systematic approach to preventing food safety hazards that has been in use for several decades.

Ensuring Compliance

Establishing a “preventive controls plan” (as described in FSMA Section 103 – Hazard Analysis and Risk-Based Preventive Controls) based on the HACCP methodology is the best and simplest way to achieve enterprise-wide compliance. This route is not without its challenges, however: HACCP, when properly practiced, generates a significant amount of instrument data and records.



An integrated informatics solution like SampleManager LIMS, delivering method execution, laboratory and data management, is one of the most critical investments any food and beverage company can make if they are moving towards a truly integrated and connected enterprise.

Managing this information is key to success, which is why many food producers put a Laboratory Information Management System (LIMS) at the core of their regulatory compliance system. A LIMS enables producers to monitor and record the progress of all product batches as they enter into, travel through and are shipped from production facilities. In addition, it also guides producers through the five steps for establishing a preventive controls plan: evaluating the hazards, specifying preventive steps, specifying how the facility will

monitor its controls, maintaining monitoring records and specifying corrective actions to correct problems.

LIMS and Preventive Controls Plans

1. Evaluating the Hazards

The first and most important step in managing food safety hazards is identifying them: one can't minimize a hazard without being aware of it. Contamination risks are commonly found where materials are added, product is extracted, vessels are opened, raw materials are introduced, finished products are packaged or, most pernicious of all,

where employees are most unlikely to follow operating procedures.

A LIMS can help food safety professionals by generating a software map of these hazard points. In addition to locations within the facility, the LIMS can also store supplier data for all incoming shipments. Using this map, the manufacturer can then use the LIMS to group data by batch, supplier, date or any other relevant parameter, allowing management to easily identify potentially contaminated or out-of-spec materials.

2. Specifying Preventive Steps

With food safety, prevention is always better than hazard response. This is why defining preventive measures is one of the most critical parts of a controls plan. Hazards can be introduced to the production process in many ways, including equipment failures, human error, poor environmental or site-specific conditions, as well as the use of non-conforming materials. A LIMS can play a role in preventing all of these hazards.

When a LIMS is integrated with all laboratory instrumentation, it can provide automated maintenance reminders for those instruments to relevant staff members in the lab. In addition to maintenance records, detailed operator competency and training records are stored so that management can verify whether staff have received the appropriate training, and so that untrained personnel are prevented from performing critical tests and procedures. This safeguard will be particularly important if the organization is audited for any reason, or has to deliver

reports proving full traceability of processes and materials to a regulatory agency.

Finally, a LIMS can be used to monitor the quality of raw and process materials as they pass through quality checks during processing, helping manufacturers detect non-conforming materials as early as possible, ideally before they leave the facility.

3. Monitoring Controls

The hazard points identified in the first two steps require regular monitoring – as a result, they generate significant amounts of data. Using a LIMS, food safety professionals can schedule measurements, apply control limits, set alerts and analyze data for each control point in the facility.

Sampling plans for control points can be managed as a group, which means that producers can use a consistent protocol for each type of product moving through the facility. This capability allows management to compare data from one batch to those from another. All data generated by process monitoring is stored in a relational database and can be presented in the way that's most useful to each user, including graphs, real-time alert messages and process map overlays.

4. Maintaining Records

Food safety regulations require extensive record-keeping for use in regular compliance audits. A LIMS greatly simplifies the process of record-keeping and retrieval by enabling entirely paperless data collection and reporting. All records stored within the LIMS are searchable, secure and authenticated by electronic signatures and audit trails,

making audits much easier by capturing and organizing all data necessary to demonstrate compliance and producing it in report formats either required or easily recognized by auditors or regulatory authorities.

5. Specifying Corrective Actions

When a food safety incident occurs, clearly defined corrective actions – developed in advance – must be known by all relevant staff. The records housed within a LIMS play an important role here: by analyzing the data pertaining to the affected batch, food producers can know in real time the extent of the problem and what corrective actions are required. Detailed incident reports are then stored within the system for critical review, driving continuous process improvement and streamlining any regulatory review.

Conclusion

What all food regulation has in common is data – producers must collect, store and present massive amounts of it. This is why LIMS are now so prevalent in the food industry: proven data collection, analysis and recording capabilities can help producers monitor product quality at every step of the process, enabling them to account for full traceability of all processes and materials. From low-tech loading docks to high-tech packaging cleanrooms, a LIMS can continuously monitor an entire food production process and make demonstrating regulatory compliance much easier. More important, a LIMS can help ensure that the trust customers place in their food is supported by the most advanced technologies available today.

CYTATION™ 5



Cytation™ 5 is a uniquely integrated, configurable system that combines automated digital widefield microscopy with conventional multi-mode microplate detection to provide phenotypic cellular information and well-based quantitative data. With up to 60x magnification, the microscopy module provides high-quality cellular and sub-cellular visualization in fluorescence, brightfield, H&E and phase contrast channels. The multi-mode detection module features BioTek's patented Hybrid Technology™, incorporating variable bandwidth monochromator optics and high sensitivity filter-based detection optics for unmatched performance. Temperature control to 65 °C, shaking, available CO₂/O₂ control and dual reagent injectors optimize conditions for cell-based imaging and detection. Image capture, data collection and powerful image and data analysis are managed with Gen5™ software, specifically designed for uncomplicated processing of even the most complex assays.

Automated microscopy, specifically live cell microscopy, typically requires complex, expensive hardware and software installations that

require a high skill level to operate. BioTek's Cytation 5 Cell Imaging Multi-Mode reader offers fluorescence, brightfield, H&E and phase contrast imaging in a modular format that can be combined with fluorescence, luminescence, UV-Vis absorbance and laser-based Alpha detection to bridge the gap between cell-based phenotypic data and quantitative data in a single instrument. The imaging module in Cytation 5 uses a 16-bit monochrome camera, 6-position objective turret and a wide range of LED cubes along with filter cubes, with four color channels available for imaging from 2.5x to 60x magnification. Phase contrast imaging from 4x to 40x is an available module.

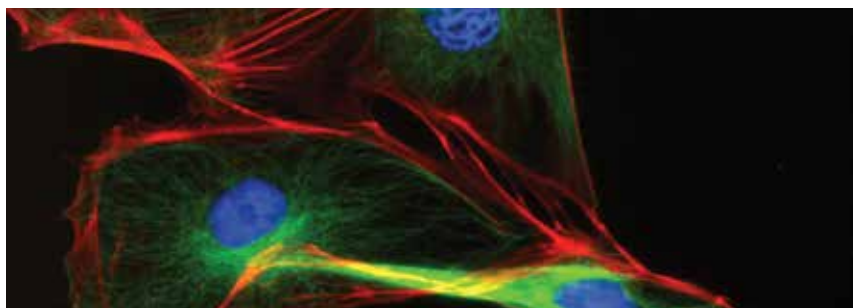
Many key features in Cytation 5 address key limitations or complaints of current imaging systems available on the market for live cell microscopy. Cytation 5 and its controlling Gen5 software incorporate an ease-of-use for both imaging and image analysis that saves users hours of setup and optimization time. From CO₂/O₂ and temperature control setup to advanced image analysis and processing steps, all parameters can be defined with just

a few mouse clicks. Image analysis results can then be viewed in intuitive formats, including heat maps, graphs and dose response curves. Image auto-focusing is another key challenge in automated live cell microscopy, especially when debris or dead cells are present in the sample, causing focus failures. Cytation 5's user-trained autofocus addresses this directly; a user can teach the instrument where the best sample focus plane lies, after which Cytation 5 can consistently and optimally focus by ignoring debris and dead cells that could otherwise divert focus to an incorrect focal plane. This novel autofocus method and other important imaging features, coupled with the available multi-mode detection modules for quantitative data acquisition, make Cytation 5 an essential platform to cell biologists interested in advancing their research capabilities.

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PANASONIC'S LABALERT SYSTEM



Protecting your life's work with a proper monitoring system has become increasingly important in research. A study conducted by Stanford University revealed that more than \$2 billion worth of samples were stored within their freezers. Furthermore, many biorepositories and biobanks have hundreds of freezers storing priceless samples.

With the rise in the use of mobile technology, it has become even easier to watch over your lab whenever you are away from it. Panasonic's LabAlert system is at the forefront of advanced laboratory monitoring systems, offering an easy setup, affordable pricing, infinite scalability, and an intuitive user interface. It allows you to instantly monitor sensitive parameters, such as your freezer's temperature or your incubator's CO₂ levels.

Setup is quick and simple. A small battery-operated, wireless sensor is attached to every unit you want to monitor. These probes communicate through receivers which relay data through a single receiver connected to your internet, either via

Ethernet or WiFi connection. Your account data is then transmitted continuously to a secure hosted platform. No software or computer is required to set up or run the app-based system. A locally-hosted, software-based solution is also available.

There are many lab monitoring solutions, but what makes LabAlert unique are the several advantages it brings over its competitors. LabAlert features customizable alerts, local and remote platforms, secure data storage, and visibility from any location.

With customizable alerts, find out exactly when something goes wrong with real-time notifications sent right to your phone, laptop or tablet. Alerts are easily customizable to meet the demands of your lab. Adjust alert triggers based on specific temperature ranges, humidity levels, CO₂ concentrations and more. Alert recipients and delivery methods can be adjusted as well. Customizations are done within the user interface and can be adjusted at any time.

LabAlert's flexibility also allows for infinite scalability. Acquire a setup package of any size and add additional sensors to your setup at any time depending on your needs. Furthermore, keep watch over units from multiple locations at once. LabAlert can be easily configured in different locations to synchronize together under one account, so you're able to easily monitor all your equipment together. Whether you need to cover multiple floors, buildings, or states, LabAlert has you covered.

In addition, all remotely hosted data is securely transmitted and stored at all times, using encrypted communications. The servers are continuously archived and backed up to alternate remote locations, so your data is secured and protected at all times. LabAlert also lets you collect all FDA required data in a simple 21 CFR Part 11 package, allowing you to cut down on cumbersome manual data recording processes, and neatly store your data so that it's accessible at any time.

Panasonic

www.panasonic.com/biomedical

HETTICH LAB TECHNOLOGY: WHERE VERSATILITY MEETS QUALITY

Hettich Lab Technology's UNIVERSAL 320 benchtop centrifuge offers versatility, longevity, and efficiency within a compact footprint. The UNIVERSAL 320 is a mid-sized single-solution premium centrifuge well suited and easily adapted for many applications. Lab managers across the globe choose the UNIVERSAL 320 as an investment to serve diverse projects for years to come.

For over 110 years, Hettich Lab Technology has worked with lab managers to provide quality equipment that meets the ever-changing needs of the modern laboratory. As today's budgets tighten, laboratory managers must maximize not only the functionality of their equipment but the space of their laboratories as well. The UNIVERSAL 320 helps lab managers meet both these goals by supporting nearly twenty rotors for different applications. The versatility of the UNIVERSAL 320 eliminates the need for different units for different research, saving space on the lab bench and in the

budget. Additionally, the UNIVERSAL 320 is contained within a competitive footprint to save further space on the bench.

Hettich offers convenient purchasing packages for several of the most popular UNIVERSAL 320 applications. These packages include all centrifuge parts required for operation: the centrifuge itself, the rotors, buckets, and the adapters. Hettich has preconfigured UNIVERSAL 320 packages for blood tubes, cell cultures, urinalysis, and microliter plate centrifugation, but custom packages can also be configured. All UNIVERSAL 320 packages are available as refrigerated and non-refrigerated units.

Hettich Lab Technology products are designed, engineered, and manufactured with our hundred-year dedication to quality and safety. Accordingly, our equipment is produced with the strongest materials to provide the maximum product lifespan. All Hettich equipment is backed by our five-year warranty and 24/7 at-instrument support system.

The UNIVERSAL 320 offers a mid-range capacity and is ideal for most routine applications. To check the specifications of the UNIVERSAL 320 packages, visit hettweb.com/UNIVERSAL-320. If your laboratory requires greater capacities, consider the Hettich ROTINA 380 or ROTINA 420, which offer the same quality and versatility with higher capacities and performances. Visit hettweb.com for more information.

Hettich Lab Technology is an industry-leading laboratory equipment manufacturer. We design, engineer and manufacture precision equipment for the modern day laboratory. Known for our vast array of centrifugation products, Hettich delivers on quality, safety and reliability. Our engineering and manufacturing capability is showcased in both our standard and customized product solutions. We focus on our customers, their requirements and environmental responsibility. Hettich Lab Technology, proven for more than 100 years.

HETTICH ROTINA 380



HETTICH ROTINA 420



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Brookfield Engineering	www.brookfieldengineering.com	42,88
Carbolite	www.carbolite.com	13
Conquer Scientific	ConquerScientific.com	89
Drummond Scientific Company	www.drummondsci.com	22
ELGA	www.elgalabwater.com	33
Eppendorf North America	www.eppendorfnna.com	9
EquipNet, Inc.	www.EquipNet.com	89
Federal Equipment Company	www.fedequip.com	89
Flow Sciences	www.flowsciences.com	92
Gilson, Inc.	www.gilson.com	5
Hettich Instruments, LP.	www.hettichweb.com	61
INTEGRA	www.integra-biosciences.com	47
International Accreditation Service, Inc.	www.iasonline.org	88
Julabo	www.julabo.com	18
Lab Armor	www.labarmor.com	29
Labconco	www.labconco.com	57
Mystaire™ Inc.	www.mystaire.com	63
NuAire Inc.	www.nuaire.com	7
Ohaus	www.ohaus.com	59
OI Analytical	www.oico.com	31
Panasonic Healthcare	us.panasonic-healthcare.com	3
Parker Hannifin Corporation	solutions.parker.com/nomorehelium	45
Pittcon	www.pittcon.org	67
Retsch	www.retsch.com	12
Ruro	www.ruro.com	17,39
Sapphire North America	www.sapphire-usa.com	14
Shimadzu Scientific	www.ssi.shimadzu.com	23
Sigma-Aldrich Co.	www.sigma-aldrich.com	21,91
Sonntek, Inc.	www.sonntek.com	88
Thermo Fisher Scientific Inc.	www.thermoscientific.com	2,6,27,35,53
Waters Corporation	www.waters.com	11
WHEATON	www.wheaton.com	41
Zsc1	safesult.com	77

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PARTING POINTS

Takeaways from this month's issue:



BUILDING A DREAM TEAM

"We will put our best team on this one," is a common refrain in many circles and is regularly heard in laboratories as directors seek to reassure customers and other stakeholders about delivering accurate and reliable results by deadlines. The success of any team depends upon:

- Having a strong leader
- Building trust
- Enabling collaboration
- Effective communication between group members

10



20

THE FIRING LINE

No matter what the reason, whether because of an economic downturn or poor work performance, firing someone is never pleasant. However, having a plan in place can help make firing someone a little easier. Key steps of that plan should include:

- Informing the employee why you aren't happy with their performance
- Clearly communicating what you want the staff member to work on
- Following up with the employee on how well they are addressing your concerns
- Firing the employee if they have not shown satisfactory improvement



30

AUTOMATING YOUR LAB

Automation can improve the efficiency of a lab and more, but figuring out how to best integrate sophisticated machines into a lab's workflow creates the challenge. When going automated, lab managers should:

- Know exactly what goals they wish to accomplish
- Find out where automation will bring the most value to the lab
- Consider not only the initial costs but ongoing maintenance and service costs
- Explore as many options as possible to ensure the right choice is made



34

ASK THE EXPERT: TRENDS IN MICROBIOLOGY

Linda Wegley Kelly, PhD, a marine microbial ecologist in the Department of Biology at San Diego State University, and Forest Rohwer, a professor in the department, discuss what has changed in microbiology over the past decade. Key changes include:

- Genomic and sequencing technologies are cheaper and easier to use
- Volume of data is the latest challenge
- Better sample organization and the ability to analyze samples in the field
- The field is now cross-disciplinary in nature



56

PERSPECTIVE ON: A FOOD & BEVERAGE LAB

As part of the laboratory services division of the Utah Department of Agriculture and Food (UDAF), staff members act as gatekeepers for the safety and quality of food in the state. UDAF laboratory director and State Chemist Dr. Weston Judd discusses:

- The challenges and benefits of having a diverse team
- How cross-training has helped boost teamwork
- Dealing with new methods and government regulations
- The lab division's need for more space



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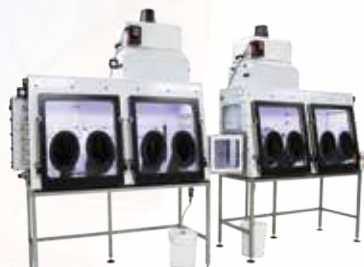
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