

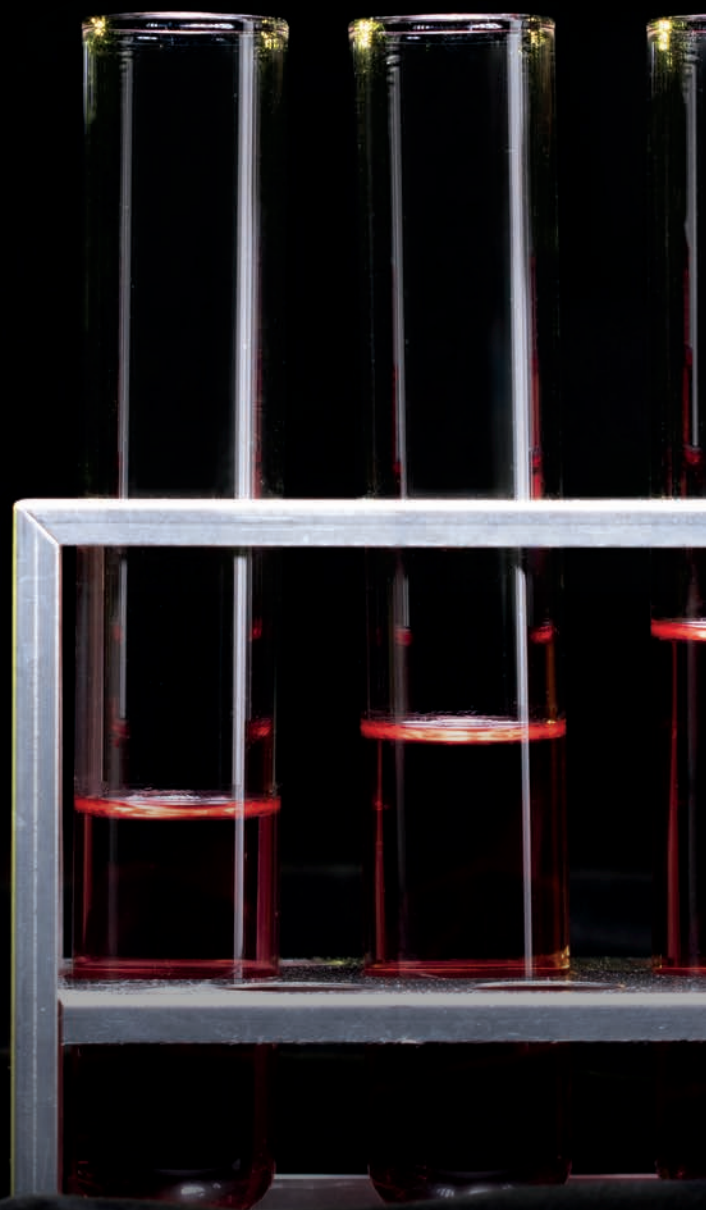
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26

COVER STORY

Tips for Managing Your Lab Budget

4

Building Supply Chain Resiliency in a Modern World

10

Meet the Plant That May Help Us Survive Catastrophes and Reduce Food Insecurity

18

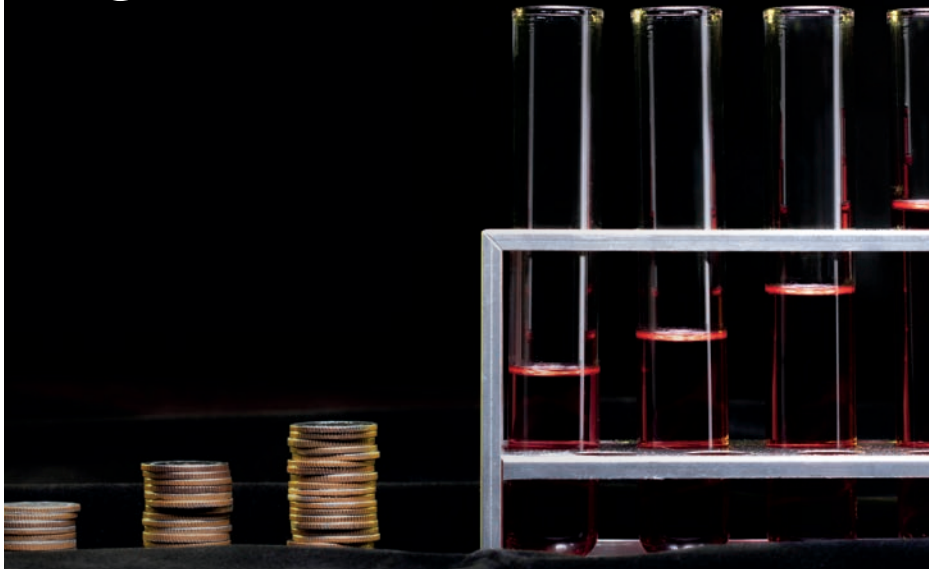
Working Together for a Healthier World: Introducing the Trusted Sustainability Partner Program

34

AI and the Future of Scientific Discovery

42

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SUPPLIER ARTICLES



13

Your Contamination Control Strategy: 5 Things to Consider

Micronova



32

Promoting Equitable STEM Education

Fisherbrand

SUPPLIER PRODUCT GUIDE

Agilent BioTek 406 FX Washer Dispensers	24	Fisher Scientific Cell and Gene Therapy Solutions.....	16
Agilent BioTek BioStack Microplate Stackers.....	24	Fisher Scientific Clearance and Temporary Price Reductions.....	47
Agilent BioTek Cytation C10 Confocal Imaging Readers.....	24	Fisher Scientific Edge Program	52
Ansell BioClean Nitrile Isolator/RABS Gloves	6	Fisher Scientific Facility Construction for Production	48
Bel-Art Secador Desiccator Cabinets.....	17	Fisher Scientific Protein Biology Methods	45
Brady Lockout Tagout Products and Services.....	46	Fisher Scientific Safety Programs.....	37
BUCHI Rotavapor R-80 Rotary Evaporators.....	22	Fisher Scientific Spotlight Offers	38
Bulwark Flame- and Chemical-Splash Protection Lab Coats.....	51	Greiner Bio-One Cryo.s Tubes with Datamatrix Coding.....	8
Cole-Parmer Cryo-Blade Cryogenic Grinders.....	40	Heathrow Scientific Sterile Reservoirs.....	31
DuPont Tychem 2000 Garments and Accessories.....	9	Kimberly-Clark Professional KIMTECH POLARIS Gloves	21
Eisco Premium Clamps and Bossheads.....	50	Labconco Nexus Horizontal Clean Benches	7
Eppendorf Innova S44i Stackable Incubator Shakers	33	Medique First Aid Kits and Products.....	30
Eprexia SlideMate Laser Slide Printers	20	METTLER TOLEDO MX Analytical Balances	12
Fisherbrand Bead Mills	31	Nasco Whirl-Pak Sampling Bags	36
Fisherbrand Chairs and Stools.....	20	New Pig HazMat Absorbent Pads	41
Fisherbrand Furniture	17	Silicycle Chromatography and Purification Products	50
Fisherbrand Isotemp Stirring Hotplates	39	SPEX CertiPrep Certified Reference Materials.....	7
Fisherbrand MaximaDry Vacuum Pumps.....	49	TCI America Chemicals.....	15
Fisherbrand Mini Centrifuges	14	Thermo Scientific Nalgene and Nunc Cryogenic Tubes	8
Fisherbrand pH Test Strips	41	Thermo Scientific Orion Lab Star Meters	30
Fisherbrand Traceable Digital Thermometers	25	Thermo Scientific Pipette Tip Recycling.....	44
Fisherbrand Ultrasonic Cleaners	23	Thermo Scientific TSX Universal ULT Freezers	49



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Building Supply Chain Resiliency in a Modern World

From Research Through Production

By Christina P. Hooton

In recent years, global supply chains have been tested by events like the pandemic, natural disasters, and trade issues. As a result, supply chain resiliency has emerged as a critical factor for the success and sustainability of businesses across industries. Organizations that can quickly adapt to evolving requirements and recover from unforeseen events will be better able to maintain uninterrupted operations and customer satisfaction in the face of disruptions.

The Evolving Landscape for Regulated Industries

Regulated industries like biopharma, semiconductor, food, and agriculture, which face strict quality control requirements, stand to

benefit significantly from proactively identifying and managing risks to uphold these standards and not slow down or stop the production of essential resources and life-saving therapies.

According to a November 2023 White House Issue Brief on supply chain resilience, the semiconductor and pharmaceutical industries are more sensitive to disruptions because of an issue called supply chain concentration. This happens when there is an overreliance on a limited number of suppliers or a geographic concentration of suppliers. For example, according to a 2022 Department of Defense report titled “Securing Defense-Critical Supply Chains,” 88 percent of semiconductor production happens overseas. To help enhance the sourcing of raw materials, legislation like the CHIPS & Science

Act was introduced by the Biden-Harris Administration to spur private-sector investment in domestic manufacturing and its raw material inputs.

As the production of essential goods is moving closer to home, reporting requirements are increasing for pharmaceutical manufacturers. According to the *Contract Pharma* article “The Road Ahead for CDMOs in 2024,” the U.S. Food and Drug Administration is now requiring facilities producing active pharmaceutical ingredients and finished dosing forms to report their annual output. The article describes this as another method for preventing drug shortages and better predicting these occurrences in the future.

“The Fisher Scientific channel is an extension of our customer’s supply chain, and we are here to partner to support their requirements and challenges.”

Jillian Otto

*Vice President and General Manager
Production Products and Services, North America
and Emerging Markets, Thermo Fisher Scientific*

Helping You Secure and Strengthen Your Supply Chain

In addition to these evolving regulations, manufacturers are faced with challenges like compliance, quality control, risk management, supply chain visibility, supplier qualification and management, and cost optimization. The good news is that businesses can find innovative ways to optimize their supply chain without compromising regulatory requirements. The Fisher Scientific channel can support you with a number of production-centric capabilities to help you streamline your operation, including:

Unrivaled product choices: By offering a wide range of options for customers seeking second sourcing across their laboratory, cleanroom, and bioprocessing applications, we can help mitigate risk and ensure business continuity.

“We’re able to provide real-time visibility to our customers as they browse our website. We aggregate the needs of all our customers and their requirements for advanced planning and reporting,” explained Jeff Ferricks, director of Supply Chain Planning for Thermo Fisher Scientific.

“Because of our choice and convenience, we’re able to give customers multiple sources for products without making them go through multiple vendors so they can ensure the availability of essential inputs,” added Svitlana Malik, vice president of Supply Chain Planning for Thermo Fisher Scientific. “And we have the professionals who understand customers’ requirements and can help them transition seamlessly to alternative sources.”

Regional availability: Our extensive warehouse network helps us prevent supply chain disruptions by offering regional proximity, safety stock management, redundancy options, scalability, continuity planning, and technology integration. When inclement weather hits, we’re able to divert customer orders to nearby facilities so we can provide an uninterrupted supply to our customers.

This also results in faster turnaround times. “In North America, our distribution locations are strategically located to deliver efficient next-day ground service to nearly all customers through the Fisher Scientific Edge program,” Ferricks explained. “While there are some exceptions, most orders placed by 2 p.m. are delivered the next day.”

Enhanced traceability and planning: With our SureTRACE program, we’re able to provide assurance of traceability through automated quality certificates and change notifications. This program also involves enhanced levels of supplier quality management, allowing you to ensure product authenticity, mitigate risks, and protect your brand reputation.

The next level of this offering is our SureTRACE+ program, which provides customized solutions, including enhanced levels of inventory planning, safety stocking, and customer service.

“We’re able to work directly with customers to create critical product lists and specific requirements for those items as well as direct shipment requirements,” said Ferricks. “And, once they’ve gone through the work of validating a batch of products, we can hold that lot for them over a period of time, so they can save costs from not repeating that process.”

All of these capabilities combined can contribute to making your supply chain more nimble and adaptable.

“The Fisher Scientific channel is an extension of our customer’s supply chain, and we are here to partner to support their requirements and challenges,” explained Jillian Otto, vice president and general manager of Production Products and Services, North America and Emerging Markets for Thermo Fisher Scientific. “We do this through our extensive distribution network and our talented team across supplier management, supply chain purchasing and planning, customer service, sales, and quality functions, working closely with our customers to understand pain points and provide solutions that enhance supply chain security, mitigate risks, and ensure compliance with regulatory requirements.”

In today’s dynamic business environment, it’s a strategic imperative for critical industries to develop the ability to withstand disruptions and maintain continuity. It not only safeguards operations but also strengthens customer relationships, helping ensure your competitive advantage now and into the future.

Christina P. Hooton is a Thermo Fisher Scientific staff writer.

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	GGL10NIT59	19-501-198	10 in. (254 mm)	20 Pieces/Case
	GGL36NIT59	19-500-802	12 in. (305 mm)	20 Pieces/Case

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Description	Capacity	Thread	Bottom	Cat. No.	Quantity
Freezing Tubes	1 mL	Internal	Conical	07-000-978	500/Case
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Storage Tubes	2 mL	Internal	Round	07-000-275	500/Case
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Material	Sterile	Capacity	Thread	Bottom	Self-Standing	Closure	Printed	Cat. No.	Quantity
Nalgene Cryogenic Tubes									
PPCO	Yes	2.0 mL	External	Conical	Yes	Yes	Yes	03-337-7D	500/Case
PPCO	Yes	5.0 mL	External	Conical	Yes	Yes	Yes	03-337-7H	250/Case
PP	Yes	2.0 mL	External	Conical	Yes	Yes	Yes	03-337-7W	1,000/Case
Nunc Cryogenic Tubes									
PP	Yes	3.6 mL	Internal	Round	Yes	Yes	Yes	12-565-162N	400/Pack
PP	Yes	1.8 mL	External	Round	Yes	Yes	Yes	12-565-163N	450/Pack
PP	Yes	1.0 mL	Internal	Conical	Yes	Yes	Yes	12-565-168N	500/Pack
PP	Yes	1.8 mL	Internal	Round	No	Yes	Yes	12-565-170N	500/Pack
PP	Yes	1.8 mL	Internal	Round	Yes	Yes	Yes	12-565-171N	450/Pack
PP	Yes	3.6 mL	Internal	Round	No	Yes	Yes	12-565-172N	400/Pack
PP	Yes	4.5 mL	Internal	Round	No	Yes	Yes	12-565-173N	300/Pack

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Meet the Plant That May Help Us Survive Catastrophes and Reduce Food Insecurity

By Mark Miller

According to the U.S. Department of Agriculture, Economic Research Service, food insecurity is a condition where there is limited or uncertain access to adequate food. It's a problem that can be exacerbated by extreme, climate-change-related weather scenarios such as droughts, heat waves, windstorms, floods, and more. The article "What are the odds that extreme weather will lead to a global food shock?" published by Yale Climate Connections, reports that insurer Lloyd's is gauging the possibility that such events could lead to drastic food scarcity, cost trillions of dollars (USD), and potentially kill millions of people.

Growing and accessing sustainable food supplies will play a significant role in our ability to survive such events. Researchers from Penn State University's College of Agricultural Sciences have published a study in *Food Science and Nutrition* about their work with Carolina azolla (*Azolla caroliniana*), a plant that may help us endure global catastrophes and address more immediate food insecurity concerns.

Polyphenolic Potential

Carolina azolla is an aquatic fern native to the eastern United States and is also known as mosquito fern, fairy moss, and water fern. It's widespread, but unlike other azolla, it hasn't been adopted as a food source. A Penn State Research report about the study entitled "Common plant could help reduce food insecurity, researchers find" states that other strains of azolla grown in Africa and Asia are used as livestock feed but aren't suitable for people.

The Penn State researchers found that Carolina azolla holds promise as a human food source because it contains lower levels of polyphenolic content than its African and Asian counterparts. This makes it more digestible and nutritious, according to the report. Polyphenols have antioxidant properties that benefit humans, but higher amounts limit our ability to absorb nutrients. The Penn State team found that Carolina azolla has a total phenolic content of approximately 4.26 grams—comparable to some fruits and beans—while Asian and African varieties have phenolic content between 20 and 69 grams.

Now We're Cooking

Even though the levels of polyphenols in Carolina azolla were already relatively low, the researchers looked to lower them further by cooking the plants. They tested natural fermentation, pressure cooking, and boiling to see if they could reduce antinutritional factors for humans and livestock.

Pressure cooking was the most effective method; it lowered the phenol content by 92 percent. Boiling reduced it by 88 percent and natural fermentation by 62 percent. The story from Penn State Research doesn't provide details about how the results tasted, but it does indicate that Carolina azolla has a "neutral" taste and a "crisp" texture in its raw state.

Carolina azolla has the potential to provide large amounts of protein and calories for people and livestock.

Well-Rounded Resource

Establishing that Carolina azolla is edible by humans is certainly crucial, but it's just one of the factors determining its effectiveness during a crisis or in helping ease food insecurity. The plant appears to meet several other criteria for addressing these challenges.

It grows in water, which can help preserve resources such as land, soil, and water needed for cultivation. It grows quickly, doubling its biomass in two days. It's adaptable and can be used as feed for poultry and livestock or as a sustainable fertilizer because of its propensity for fixing nitrogen. These attributes also address many of the needs of smallholder farms and low-income agriculture.

"Whether it be for a 'quick-fix' solution in catastrophe scenarios or long-term resilience plan, Carolina azolla has the potential to provide large amounts of protein and calories for people and livestock," said study leader Daniel Winstead in the Penn State Research report. "If systems for azolla cultivation and preparation can be made more efficient, its indoor or outdoor cultivation after natural disasters could provide supplemental nutrient production that are [*sic*] climate resilient."

Mark Miller is a Thermo Fisher Scientific staff writer.

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Model MX105	120 g	0.01 mg	01-804-326
Model MX205DU	82 g, 220 g	0.01 mg, 0.1 mg	01-804-328
Model MX105DU	42 g, 120 g	0.01 mg, 0.1 mg	01-804-330

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Your Contamination Control Strategy: 5 Things to Consider

The revised Annex 1 guidelines for good manufacturing practices (GMP) went into effect on August 25, 2023. As of May 2024, the contamination control industry has had over six months to implement changes to Annex 1 as part of a comprehensive contamination control strategy (CCS).

Organizations are in the process of evaluating their CCS protocols based on these updated requirements and questions:

- Is our CCS complete?
- Is our strategy sound, but execution lacking?
- Does our strategy fully consider foundational elements and their impact on contamination?

CCS Objectives and Focus

The three main objectives of a CCS include:

1. Identifying which control elements are in place
2. Evaluating why control elements are effective
3. Controlling potential contamination throughout the manufacturing process

Begin with these basic considerations when developing or reviewing your CCS for gaps:

- **Plant:** Design, process, and associated documentation
- **Equipment:** Qualified life cycles
- **Personnel:** Awareness, training, and qualification

- **Facility/Utilities:** Cleanroom design and specifications
- **Raw Materials:** In-process and other controls



Consulting with Micronova/ICS

Partnering with an expert who specializes in contamination control is one way to develop a successful CCS. For larger organizations, a consultant can offer collaboration while helping you establish protocols for your unique sites and processes. Smaller organizations can also obtain the individualized support needed to implement an effective CCS.

Micronova's consulting process is conducted in three phases:

Risk Assessment

Accurate identification and evaluation of current control protocols and all GxP processes is crucial during this initial phase. Companies receive a comprehensive report of risk factors within processes, facilities, personnel, equipment, SOPs, training, and materials. This phase includes a proposed plan for preventive and corrective actions, plus detailed activities to foster a successful strategy. We'll determine which processes can be retained, advise targeted modifications, and recommend new

equipment or technology to achieve the required levels of control.

Implementation

Implementing new strategies requires appropriate and individualized milestones tailored to each organization and its specific processes. Updating, modifying, or creating new SOPs and other QMS-related processes is critical during this phase. Our team of experts provides effective planning and CCS execution.

Training

Successful implementation includes training personnel to follow processes effectively and increase their knowledge of and confidence in the organization. Micronova/ICS creates a tailor-made approach to help you achieve the best results for the short and long term.

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Working Together for a Healthier World: Introducing the Trusted Sustainability Partner Program

By Gina Wynn

As champions of a healthy planet that sustains human health and natural resources, the Fisher Scientific channel, part of Thermo Fisher Scientific, works to build partnerships that help our customers achieve their environmental sustainability goals and our own. Our latest initiative, the Trusted Sustainability Partner Program, is a collaboration with suppliers who demonstrate a commitment to protecting the environment by meeting a strict set of criteria.

Through this program, we aim to help customers like you easily identify environmentally conscious brands when you shop so you can quickly find items that help advance your sustainability goals. Products from qualifying suppliers display the green Trusted Sustainability Partner icon across fishersci.com. In the coming months, we plan to include the icon on fishersci.ca as well.

Rigorous Qualification Standards

Since Trusted Sustainability Partners set goals aligned with science, you can trust them as committed, environmentally conscious industry leaders. So far, nearly 20 well-known brands have earned the Trusted Sustainability Partner distinction, including Agilent, BD, Biotix, Corning, DuPont, Eppendorf, Greiner Bio-One, Honeywell, Kimberley-Clark Professional, METTLER TOLEDO, OHAUS, Sartorius, Siemens Healthineers, Sonoco ThermoSafe, Thermo Scientific, and Troemner.

They qualified for the program by showing that they are dedicated to taking action to help prevent the worst impacts of climate change, as outlined by the 2015 Paris Agreement. Trusted Sustainability Partners must have met the following standards in order to have earned the distinction:

Set science-based targets: The Paris Agreement's goal is to limit global temperature increases to 1.5°C above pre-industrial levels. Qualifying suppliers have set a target that aligns with that goal at sciencebasedtargets.org/set-a-target.

Take an EcoVadis assessment: EcoVadis is a global sustainability rating platform that evaluates a company's environmental, social, and ethical performance. Qualifying suppliers have rated at least "Good" (45 points or greater) on the assessment.

Complete our Sustainability and Social Responsibility survey: Qualifying suppliers have confirmed their commitment to protecting the environment and the Trusted Sustainability Partner program goals.

Reaching Net-Zero Goals Together

As one of our newest sustainability initiatives, the Trusted Sustainability Partner program builds on our suite of

sustainability solutions designed to help you reach your climate goals through greener product choices, convenient recycling programs, and expertise in the latest advancements in sustainability. We also continue to develop and expand upon these initiatives to help us reach our company target of net zero by 2050. You can read more about our strategy for achieving net zero and our other sustainability programs by visiting fishersci.com/sustainability and fishersci.ca/sustainability.

Reduce Your Environmental Impact One Product at a Time

One of our well-established initiatives, the Greener Choice program, shares similarities with the Trusted Sustainability Partner program, but it identifies products—rather than suppliers—that align with your sustainability goals. Greener Choice products are marked with a leaf icon  on our websites. To qualify for the program, products must offer one or more of the environmental benefits itemized in the U.S. Federal Trade Commission (FTC) "Green Guides" and meet other criteria stated on fishersci.com/greenerchoice and fishersci.ca/greenerchoice.

A Partnership for the Planet

In addition, Thermo Fisher supports sustainability in science through our partnership with My Green Lab. Together, we aim to help educate researchers about the importance of reducing waste in laboratories through the My Green Lab Certification program and choosing smart, sustainable products through the ACT Environmental Impact Factor Label program. Laboratories use up to four times more water and 10 times more energy per year than equivalent office spaces, according to the article "A Partnership for the Planet—My Green Lab and Thermo Fisher Scientific" at fishersci.com/mygreenlab-lab-reporter.

Collectively Accelerating Environmental Consciousness

Through these and other initiatives, we hope to unlock opportunities to help you and businesses around the world advance your sustainability efforts so that together, we can build a brighter future for generations to come.

To learn more about the Trusted Sustainability Partner program and how to qualify, visit fishersci.com/trusted-sustainability-partner or fishersci.ca/trusted-sustainability-partner.

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M	62772	17-103-196C	100	1,000
L	62773	17-103-196D	100	1,000
XL	62774	17-103-196E	90	900

Kimtech Polaris™ Xtra Nitrile Exam Gloves | 12 in.

SIZE	KCP MFR. NO.	FISHER SCIENTIFIC CAT. NO.	BOX QTY.	CASE QTY.
XS	62760	17-103-191A	50	500
S	62761	17-103-191B	50	500
M	62762	17-103-191C	50	500
L	62763	17-103-191D	50	500
XL	62764	17-103-191E	50	500



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¹ Tested against 29 common chemicals, chemotherapy drug, Opioid Fentanyl Citrate, Simulated Gastric Acid and Fentanyl in Simulated Gastric Acid: Per ASTM D 6978-05.
² Based on a Global Preference Study conducted by Kimberly-Clark Professional in 2023 with 932 glove users.
³ When used in non-hazardous applications as classified by local regulations.

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01-672-984	R-80 Standalone, Cold Trap Condenser, SJ 24/40
01-672-976	R-80 System, V-Condenser, I-180 Interface, V-180 Vacuum Pump
01-672-981	R-80 System, C-Condenser, I-180 Interface, V-180 Vacuum Pump

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Cat. No.	Description
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- Environmental
- Quality control
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Model	Capacity	Cat. No.
FB-11201	2.75 L (0.7 gal.)	FB11201
FB-11203	5.75 L (1.5 gal.)	FB11203
FB-11206	6.9 L (1.8 gal.)	FB11205
FB-11207	12.75 L (3.3 gal.)	FB11207
FB-11209	18 L (4.75 gal.)	FB11209
FB-11211	28 L (7.3 gal.)	FB11211

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Description		Cat. No.
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	Includes Monochromator-Based Multimode Plate Reader	BTC10MIC2SN
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	Includes Monochromator-Based Multimode Plate Reader	BTC10MIWCSN
Cytation C10 Widefield Inverted Microscope for Fluorescence, Brightfield, Color Brightfield, Phase Contrast, and Water-Immersion Imaging with Sony CMOS Camera	Optional Upgrade: Add a Confocal Microscope	BTC10MIPWSN
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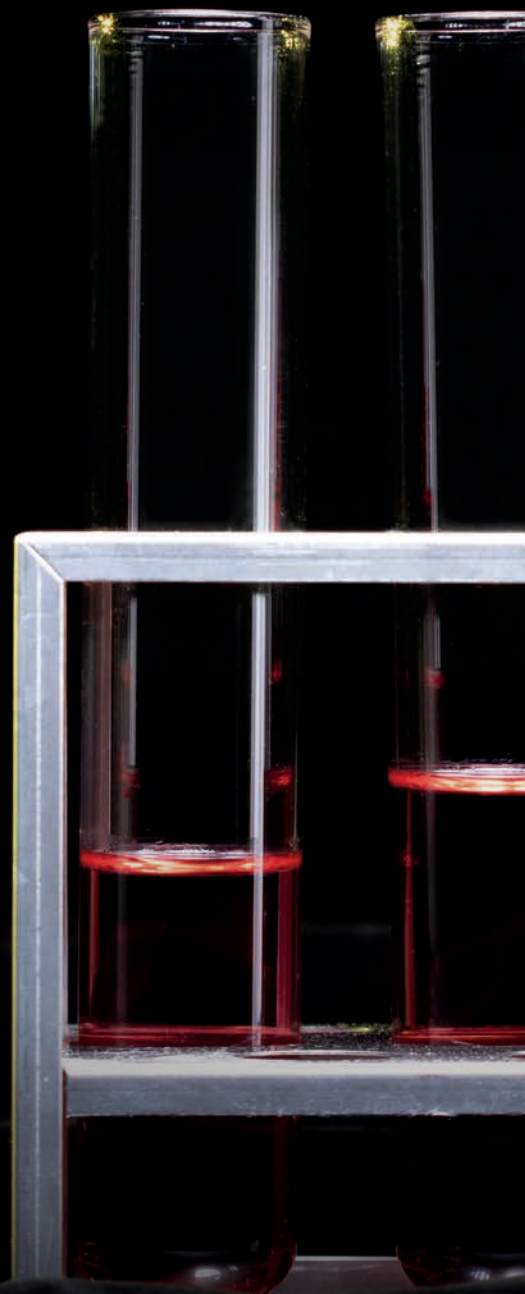
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Tips for Managing Your Lab Budget

By Iva Fedorka



Lab managers face many challenges and competing needs. They're expected to control expenses while maintaining lab functionality and safety and complying with various rules and regulations. They must also manage staffing and meet increased demands for productivity with limited time and resources.

If you want to better manage your lab and budget, here are some ideas to help you address the three largest components of most lab budgets: personnel, supplies, and equipment.

Personnel

Staffing costs can comprise as much as 60 percent of a lab's overall budget, but having a team you can rely on makes a big difference. People can be your greatest asset, but finding qualified, knowledgeable, and dependable staff takes effort.

Hire the most qualified people available. When you're responsible for staffing, especially if salaries are not negotiable, hire the most qualified people available. This may include postdoctoral researchers, graduate research assistants, students, and lab technicians in academic settings. If you can't find prospects already familiar with the type of procedures and sophisticated instruments you're working with, choose candidates who express a willingness to learn and offer on-the-job training.

Make daily tasks more convenient. Even small changes can have a significant effect over time. Make sure that specific assay supplies are readily available at each workstation. Adding under-counter refrigerators and personal centrifuges, mixers, and pipettes can make a difference. Organize your refrigerators and freezers to make sample retrieval easier, too.

Reduce or eliminate lower-skill tasks. Making solutions and dilutions, washing glassware, and preparing media can take significant amounts of time. Calculate the cost of performing these activities on site versus purchasing ready-to-use reagents and media. You may also improve your environmental footprint if you eliminate some disposable labware and install a glassware washer.

Staff appropriately. Assign people to tasks based on their experience and skills. If you're working in an academic setting, work-study options for basic, temporary support at affordable rates may be an option. Contract or temporary researchers can also help eliminate some overhead costs. Sequencing workflows, instrument calibration, and other tasks that require specialized knowledge and skills can be difficult or impractical to support through in-house staff.

Supplies

In a survey conducted by *Lab Manager* magazine, many labs spend over 60 percent of their non-personnel budget on disposable items like pipette tips, gloves, and reagents, an amount equivalent to about a quarter of the overall budget.

Buy consumables in bulk. Depending on your storage space limitations, keeping products in stock on site could make sense. Suppliers may provide a discount based on projected purchases and make deliveries at regular intervals if you know how much of each product you use annually.

Ask for samples. Try products before you switch to alternatives to confirm that they suit your workflow. Some packaging changes can affect how efficiently products can be used and may add time that offsets your anticipated savings.

Maintain a chemical inventory. Often, chemicals must be purchased in larger quantities than you need, resulting in containers of unused chemicals sitting on your shelves. Although many don't have true expiration dates, older chemicals may no longer be suitable for use. Determine which chemicals can and should be discarded and consult your health and safety manager and your local government to determine how this can be safely accomplished.

Share chemicals with colleagues. There may be ways to avoid duplicate orders or the need to purchase unique or expensive chemicals and reagents by agreeing to share your inventory with other researchers.

Equipment

Obtaining the right equipment and instruments takes time because these decisions require product comparisons, performance evaluations, and cost justification. Although these purchases generally consume the smallest portion of a typical lab budget, capital assets are usually more expensive and may require using funds from more than one fiscal budget.



continued from page 27

Tips for Managing Your Lab Budget

Ask for a demonstration or consult with a specialist.

Try the equipment or instrument virtually or in person to confirm that it will meet your requirements. Many manufacturers and suppliers employ specialty or technical sales personnel who can help you evaluate a product based on its intended use.

Get the best price on equipment. Identify your requirements, compare offerings, and request quotes from multiple vendors. Used instruments stored at your institution may also be an option when budgets are tight. Even if those products are not in working order, the cost of repairs may be much less than purchasing a new item. Leasing or financing could help you secure bigger ticket items, too.

Consider multi-functional products and accessories. Newer equipment and instruments may perform multiple functions or have accessories that extend their functionality. For example, some vortex mixers have adapters for microplates and flasks, and some stirring hotplates also rotate or mix.

Protect your equipment. Schedule and perform regular cleaning and preventive maintenance. Manufacturers often offer a service contract or extended warranty for purchase, which may be worthwhile if the product is used frequently. Use protective covers or shields to help prevent damage to new and expensive equipment. Teach employees about proper use and keep operating manuals readily accessible to reduce the risk of accidental damage.

Budget for maintenance and repairs. Manufacturers and distributors may offer maintenance contracts and repair services to help keep your lab in good working order. Although your staff can be taught to perform basic services, outsourcing may make more sense if staffing is limited or repairs require more expertise. Tasks like balance verifications, pH meter calibrations, and lab automation equipment checks must comply with the latest regulations, standards, and quality assurance processes.

Share equipment. Ask to share a colleague's tools if you have a common need for certain instruments. Find out if core facilities exist at your institution to avoid purchasing duplicates. If some equipment is used only occasionally, sharing or using shared tools can save thousands of dollars. Some universities may also contract with outside labs to let you use their equipment.

Take advantage of free software. Various free and purchased laboratory management software programs are available to help manage your lab's inventory and requests, while electronic laboratory notebooks can support collaboration.

Overall Budget Management

Keep a record of expenditures to maintain an awareness of changes in price or demand that need to be addressed. And perform quarterly reviews to stay on track, especially if your lab uses start-up or grant funds. Fund-tracking tools may also be available through your purchasing platform or supplier website.

If you have access to materials management, ask for help negotiating pricing, setting up recurring orders, providing regular reports, and otherwise managing your spending.

Efficient laboratory organization, optimal resource allocation and use, and quality and regulatory control will help you maintain productivity, reduce errors, contribute to regulatory compliance, and produce reliable results.

Iva Fedorka is a Thermo Fisher Scientific staff writer.



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Lab Star PH111 pH/mV Meter, Difficult Sample Kit	15-200-972
Lab Star EC112 Conductivity/Salinity/TDS Meter with Stand	15-200-972
Lab Star EC112 Conductivity/Salinity/TDS Meter, Standard Kit	15-200-973
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The demand for employees with strong science, technology, engineering, and math (STEM) backgrounds continues to grow, but today's students don't have equal access to high-quality STEM education. Since 2016, Thermo Fisher Scientific and Boys & Girls Clubs of America have partnered to support a 21st-century STEM workforce that reflects our society and leverages diversity to solve the world's most complex problems.

The programs include the expansion of Boys & Girls Clubs of America's DIY STEM Program and the launch of STEM learning and training experiences for Club staff to spark youth interest in STEM fields.

Meeting Needs with DIY STEM Digital Platform

DIY STEM is Boys & Girls Clubs of America's hands-on, activity-based STEM curriculum for young people from

ages nine through 12. Thermo Fisher Scientific has helped create and distribute DIY STEM kits with activities that demonstrate everyday science concepts and personal protective equipment (PPE) for safe scientific exploration. During the COVID-19 pandemic, the curriculum moved to MyFuture, the Clubs' digital platform, and Thermo Fisher Scientific pledged to develop and support content, events, and competitions to help connect youth to STEM professionals with similar backgrounds and relevant career experiences.

Creating Strong STEM Educators

Great STEM programming starts with great STEM educators. In 2021, Thermo Fisher Scientific sponsored Boys & Girls Clubs of America's participation in a training series, with targeted resources to build essential STEM knowledge and activity facilitation skills. This training

and engagement makes age-appropriate and culturally relevant programming accessible to all Club members.

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Innova S44i Incubated Shaker	230 V	05-400-167
Innova S44i Incubated/Refrigerated Shaker	230 V	05-400-168
Innova S44i Incubated/Refrigerated Shaker with Photosynthetic LED Light Bank	230 V	05-400-169

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AI

AI and the Future of Scientific Discovery

By Kylie Wolfe

From early computers like the Harvard Mark I to present-day programs like ChatGPT, artificial intelligence, or AI, has existed in one form or another for many decades. But it wasn't until recently that it became popular and accessible. Now, as you further your science, you can do so with a little help from AI.

Today, AI is being used to help scientists combat environmental concerns, boost lab productivity, and shape the future of discovery. As you find where AI fits into your science, learn how it's making progress possible and more efficient for others.

Understanding Climate Change

To help fight climate change, scientists at Dryad are using AI to train sensors that can detect forest fires before they intensify. These sensors detect gases released by organic material when it burns, essentially serving as nature's fire alarm. As of January 2024, the company had 50 sensors in place around the world.

Forest service experts are also using data science, powered by AI, to help determine where to set controlled burns, intentional fires meant to help eliminate excess vegetation that would otherwise fuel wildfires. AI helped scientists create a smart assistant that uses topography, vegetation, and weather information to recommend future controlled-burn locations.

Similarly, researchers at Climate TRACE are using a program that combines computer vision and machine learning to identify emissions from factories and other facilities. This helps corporations and policymakers collect data and maintain accountability in areas of interest.

Accelerating Lab Work

AI is also advancing science by looking at meaningful trends in large datasets, predicting outcomes based on data, and simulating complex scenarios before real-world experiments are conducted, according to Victor Dzau, National Academy of Medicine president, who spoke at the Artificial Intelligence for Scientific Discovery workshop hosted by the National Academies.

Basically, it's increasing productivity by making data science, a tedious part of the research process, more efficient. Self-operating labs, for example, are primarily run by robots and have the potential to aid in faster discoveries and processes. This may lead to advancements in electronics or pharmaceuticals that would otherwise have taken much longer.

AI is even helping scientists conduct literature reviews. Through PaperQA and Elicit, tools that use large language models (LLMs), you can scan and summarize articles to help inform a new hypothesis or approach. Letting AI translate significant amounts of information can be a time saver in the short term and a shortcut to much bigger ideas down the line.

Shaping Your Science

As technology continues to play a critical role in the advancement of science, it's helpful to understand the full picture to ensure that it's adding value to your process and not causing harm elsewhere.

For example, it's important to note that while AI is helping researchers fight climate change, it may also be contributing to it. Each type of AI—machine learning and LLMs alike—requires a different, and potentially large, amount of energy to complete a task. A study published in *Joule* found that, by 2027, AI could use over 85 terawatt hours of electricity each year. According to *Scientific American*, this is similar energy usage to that of a small country.

Today, AI is being used to help scientists combat environmental concerns, boost lab productivity, and shape the future of discovery.

Whether you use AI for simple daily tasks or to increase the productivity of complex workflows, this technology is undoubtedly making it easier for scientists like you to innovate and reach new heights.

Kylie Wolfe is a Thermo Fisher Scientific staff writer.

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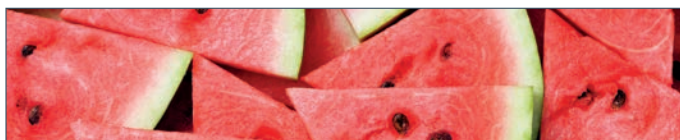
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Fisherbrand Analog Stirrer	Ceramic	7 x 7 in.	FB30786159
Fisherbrand Analog Hotplate Stirrer	Ceramic	7 x 7 in.	FB30786160
Fisherbrand Isotemp Digital Hotplate Stirrer	Ceramic	4 x 4 in.	FB30786162
Fisherbrand Isotemp Digital Hotplate Stirrer	Ceramic	7 x 7 in.	FB30786163
Fisherbrand Isotemp Digital Hotplate Stirrer	Aluminum	7 x 7 in.	FB30786164
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4.0 to 7.0	13-640-523	100/Vial
4.5 to 10.0	13-640-524	100/Vial
6.0 to 10.0	13-640-525	100/Vial
7.0 to 14.0	13-640-526	100/Vial



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Powering the Future Through Plants, Panels, and Pollinators

By Kelley Northam

From your first sip of morning coffee to your late-night bite of chocolate, pollinators such as bees and butterflies are crucial to the food we enjoy every day. In fact, one out of every three bites of food, such as fruits, vegetables, and nuts, was brought from the field to your plate by these insects. Across industries, busy bees bring in billions, as pollinators' annual ecological value is estimated at 200 billion dollars (USD).

Unfortunately, pollinator populations and overall biodiversity have decreased due to habitat loss, pesticide usage, and climate change. However, researchers have begun to restore these insects' homes and fight climate change by building photovoltaic solar arrays on rehabilitated farmland.

Harvesting Sunlight and Data

Photovoltaic solar cells, also known as solar panels, convert sunlight to electricity and are a carbon-neutral energy source. Aside from sunlight, the main requirement of these panels is land, and lots of it. The U.S. Department of Energy's (DOE) Solar Futures Study estimated that approximately 10 million acres of U.S. land is needed by 2050 to achieve solar development, decarbonization, and climate change goals. Research has also revealed that former farmland is ideal for housing solar panels. These insights have created a unique opportunity to study how agricultural practices and solar energy production interact, also known as agrivoltaics.

Described in a press release on [anl.gov](https://www.anl.gov), researchers at the DOE Argonne National Laboratory and National Renewable Energy Laboratory planted native grasses and wildflowers at two southern Minnesota solar sites in early 2018 to further understand agrivoltaics. Operated by Enel Green Power North America, both solar farms were built on retired agricultural land. They concluded their study in August 2022 and conducted a total of 358 observational surveys where they recorded and assessed changes in the abundance and biodiversity of flowering fauna and insects each visit.

Buzzworthy Breakthroughs

By the end of the study, all habitat and biodiversity metrics increased, including native plants and pollinators. There was also growth in the biodiversity of plants and insects such as honeybees, butterflies, beetles, and many more. Native bees increased 20-fold, and scientists observed these bees and other pollinators visiting nearby soybean fields, providing extra pollination.

These findings suggest a promising future for pollinators and restored farmland solar energy facilities and may even soothe concerns about the adverse effects of converting agricultural farms to solar farms. This study suggests that agrivoltaics can actually preserve farmland and make it more fruitful through additional pollination.

While more research is needed to confirm these conclusions, many scientists have already begun. In Georgia, land owned by former U.S. president and clean energy advocate Jimmy Carter has become a solar field that's also restoring pollinator habitats. While researchers have been focusing on stormwater runoff and soil types, the pollinator population has flourished. SolAmericia Energy currently owns the land, and its vice president, John Buffington, noted that pollinator-friendly solar energy could change the industry. In the "Pollinator-Friendly Solar in Plains, Georgia" case study published on [fresh-energy.org](https://www.fresh-energy.org), Buffington stated that these sustainable practices also "help contribute to better management of a site by reducing the amount of our budget that goes to mowing and other maintenance."

Although there is more to discover, these agrivoltaic studies have revealed new ways to restore environments, reduce emissions, and fight climate change. By protecting pollinators and creating habitat-friendly solar fields, we can create a brighter future for insect-kind and humankind.

Kelley Northam is a Thermo Fisher Scientific staff writer.



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Ship: Attach the pre-paid shipping label that was included with your case of pipette tips to the outside of the box. Then contact FedEx to pick up the box or drop it off for shipment.

Note: Pipette tips and racks are recycled into building materials, e.g., recycled plastic lumber, and not into new pipette tips.

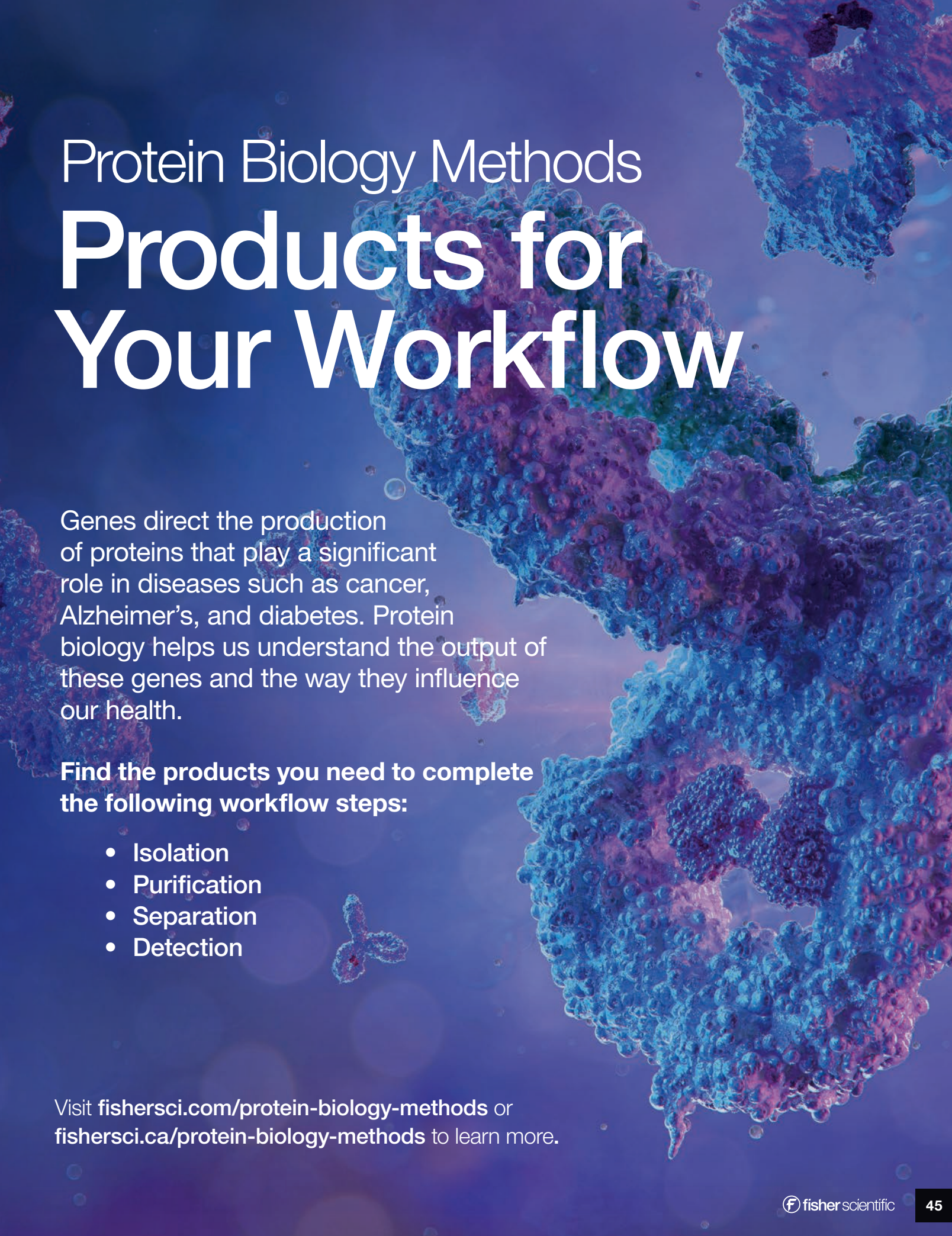
Thermo Scientific Sterile ART Tips with Recycle Kit*

Length	Capacity	Barrier	Low Retention Barrier	Nonfiltered	Low Retention, Nonfiltered
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Standard	20 µL	02-681-577	02-681-546		
Standard	100 µL	02-681-540	02-681-539		
Standard	200 µL	02-681-576	02-681-541	02-681-562	02-681-561
Standard	1,000 µL			02-681-554	02-681-553
Reach	10 µL	02-681-574	02-681-545	02-681-558	02-681-557
Reach	1,000 µL	02-681-543	02-681-542		
XL	20 µL			02-681-560	02-681-559
XL	1,000 µL	02-681-575	02-681-547		

Thermo Scientific SoftFit-L Tips with Recycle Kit*

Length	Capacity	Filtered, Sterile	Nonfiltered, Sterile	Nonfiltered, Nonsterile
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Standard	200 µL	02-681-550	02-681-569	02-681-570
Standard	300 µL	02-681-548	02-681-565	02-681-566
Standard	1,000 µL	02-681-551	02-681-571	02-681-572
Standard	1,200 µL	02-681-552	02-681-567	02-681-568

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The graphic features the text 'Temporary Price Reductions' in a large, black, sans-serif font. 'Temporary Price' is on the top line, and 'REDUCTIONS' is on the bottom line in a bold, all-caps font. The text is enclosed in a large, thin black bracket shape. To the right of the text is a yellow circular tag hanging from a string, with a white percentage sign inside. The background is white with several other yellow percentage signs scattered around.

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