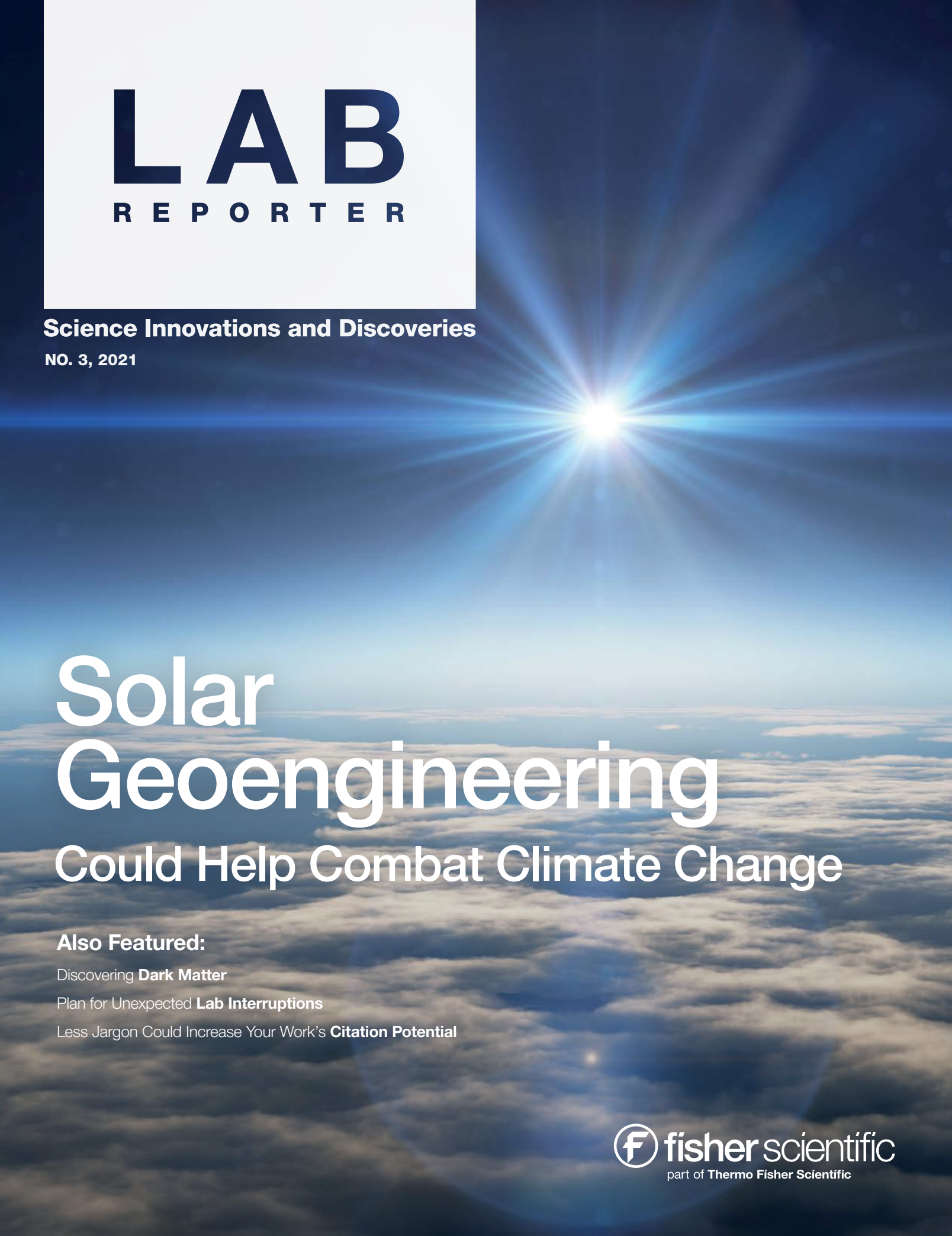


LAB REPORTER

Science Innovations and Discoveries

NO. 3, 2021

Solar Geoengineering

Could Help Combat Climate Change

Also Featured:

Discovering **Dark Matter**

Plan for Unexpected **Lab Interruptions**

Less Jargon Could Increase Your Work's **Citation Potential**

CONTENTS

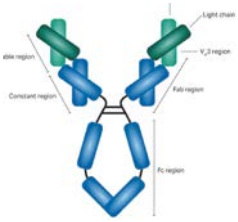
Note: To check pricing, please sign in to your account.

LAB REPORTER

Science Innovations and Discoveries

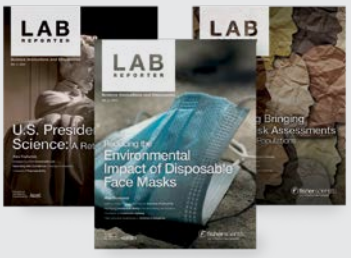
Lab Reporter provides quick and easy access to today's cutting-edge products and trusted solutions for all of your scientific research and applications.

SUPPLIER ARTICLES



SUPPLIER PRODUCT GUIDE

♻ This publication was printed on recycled paper.



Visit **fishersci.com/labreporter** or **fishersci.ca/labreporter** to subscribe for free.

fisher scientific
part of **Thermo Fisher Scientific**

Discovering Dark Matter

Two Experiments Get Closer to Finding What Makes Up Much of the Universe

By Mark Miller

Scientists believe that over a quarter of the universe is dark matter. But because it is composed of a substance that doesn't absorb, reflect, or emit light, dark matter is extremely difficult to find. In fact, the Standard Model — science's best theory of the universe's building blocks and how they interact — is mysteriously quiet on the topic.

Findings from two experiments, however, may shed new light: one by defying predictions of the Standard Model and the other by discovering potential dark matter particles as they collide with regular atoms.

Wobbling Muons

The Muon g-2 experiment conducted at Fermi National Accelerator Laboratory, or Fermilab, found further evidence that the behavior of subatomic particles called muons may not obey the predictions of the Standard Model.

A muon is like an electron, but about 200 times as massive. Also, like an electron, a muon acts as if it has an internal magnet. When traveling through a magnetic field, the muon spins and wobbles like the axis of a spinning top.

In the Muon g-2 experiment, muons travel around and around a 50-foot-wide ring — a sort of magnetic track. As they move through the magnetic field, their oscillations can be precisely measured. These results are compared to the predicted values. The experiment confirmed a standard deviation of 4.2 from Standard Model predictions. The discrepancy could mean the muon is interacting with particles or other energy not currently known to science — a discovery that could open a wider window into cosmic mysteries like dark matter.

Discovery by Deflection

At Gran Sasso National Laboratory in Italy, the XENONnT experiment is searching for dark particles by detecting the flashes of light they can create when deflected off xenon atoms.

The experiment uses more than eight tons of xenon contained in liquid. Should a dark particle bump into the xenon, it releases an electron. This event creates a flash of light that can be detected by an array of photomultipliers lining the liquid vat. The instruments can detect even a single photon unleashed by a dark particle deflection.

Researchers are using particle deflection to look for weakly interacting massive particles or WIMPs. Unfortunately, none have yet been discovered, but a payoff may lie in the elimination of dark particle candidates as well as their actual discovery.

> Muons could be interacting with dark particles or other energy not currently known to science.

"You do start to scratch your head and think maybe that was the wrong horse to bet on," said physicist Rafael Lang in *Scientific American* about the search for WIMPs. But he remains optimistic. "If you believed in WIMPs 10 years ago, only half of those WIMPs have been ruled out. The other half are still alive."[1]

Other Possibilities

WIMPs and the forces causing muon wobbles are just two dark particle possibilities. According to *Scientific American*, others include a theoretical particle called an axion. Dark matter may also be made of composite particles. Another possibility is that it might not consist of particles at all but be made of black holes. Whatever the answers, the Muon g-2, XENONnT, and similar experiments will continue to aid the search for mysterious matter.

Mark Miller is a Thermo Fisher Scientific staff writer.

1. Moskowitz, C. (2021, April 1). *Dark Matter's Last Stand*. Scientific American. https://www.scientificamerican.com/article/dark-matters-last-stand

Chemicals for LC-MS Biopharmaceutical Applications

LC-MS techniques, which couple liquid chromatography (LC) with mass spectrometry (MS), have increasingly become the method of choice for characterizing biopharmaceutical drugs. Mobile phase solvents and reagents must have low organic impurities to reduce interference with detection by electrospray (ESI) MS.

Analytical Methods

Biopharmaceutical drugs are therapeutic proteins with far more complex structures than small-molecule drugs. At the structural level, protein post-translational modifications (PTMs), which can arise at different stages of manufacturing and storage, can impact drug efficacy and safety. PTMs are therefore classified as critical quality attributes (CQA) and must be monitored and controlled.

LC-MS is used to understand the structure of protein-based drugs, including:

- Amino acid sequencing for peptides and proteins
- Profiles of host cell proteins (HCPs) and other process-related impurities
- Disulfide bond mapping
- N-glycan profiles of monoclonal antibodies (mAbs)
- Oligonucleotide sequencing

The combined power of LC separation and the sensitivity and specificity of MS detection makes LC-MS the best choice for mapping peptides to detect multiple PTMs, also called the multi-attribute method (MAM) workflow. Critical to the MAM workflow is the separation of various peptides from the digested therapeutic protein. This is typically achieved using a long LC gradient of water and acetonitrile, with formic acid added as a modifier. (See Figure 1.)

High-Purity Solvents and Reagents

Fisher Chemical Optima grade LC-MS solvents meet your purity needs for LC-MS analysis. Convenient, ready-to-use LC-MS blends are precisely mixed for lot-to-lot consistency and are quality tested using LC-MS. Thermo Scientific UHPLC-MS grade solvents meet even more stringent specifications for your most-demanding analyses. Both LC-MS and UHPLC-MS grade solvents and blends are tested to confirm low organic impurity levels to minimize interference and ion suppression.

These high-purity LC-MS reagents also have extremely low metal impurity levels. Trace metal impurities can cause poor peak shape, peak tailing, and diminished recovery when metal-ion mediated adsorption occurs with the column media. Sodium (Na^+), potassium (K^+), and other alkali metal ions are electrostatically attracted to the negative charges of carboxyl group of C-terminal amino acids in peptides and proteins or the polyanionic backbone of oligonucleotides. The Na^+ and K^+ adducts decrease overall sensitivity and compromise peptide identification.

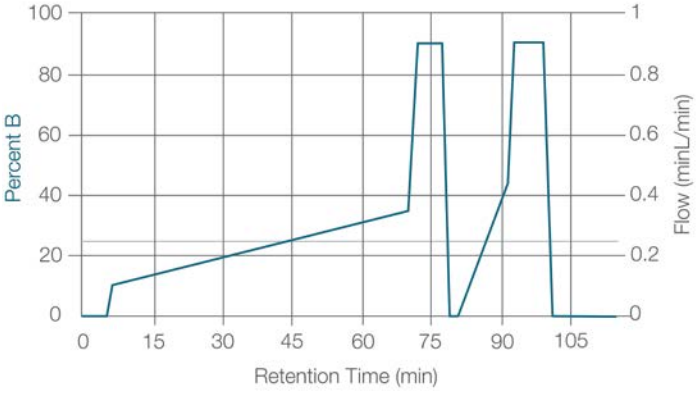
All Thermo Scientific LC-MS grade chemicals strictly control trace metal contamination during production, which is confirmed with ICP-MS testing. Table 1 displays a comparison of impurities in pre-blended LC-MS grade water (with 0.1% formic acid) among four competitive brands.

Purity grades for every LC-MS application are available through the Fisher Scientific channel. Visit the following pages to learn more:

Fisher Chemical Solvents
U.S.: fishersci.com/chemicals
CA: fishersci.ca/chemicals

Thermo Scientific Analytical Reagents
U.S.: fishersci.com/analyticalreagents
CA: fishersci.ca/analyticalreagents

Figure 1



Time	% B
0	1
5	1
6	10
70	35
72	90
77	90
79	1
81	1
83.5	10
91.5	45
93	90
99	0-
101	1
115	1

Typical LC gradient in a MAM workflow for the separation of NIST mAb peptides with a binary mobile phase: B: 0.1% formic acid in acetonitrile (Cat. No. LS120).

Content provided by:

thermo scientific fisher chemical

Table 1. Metal Ion Levels (ppb) in LC-MS Grade Water with 0.1% FA from Four Suppliers

Metal Ion	Cat. No. LS118	Competitor M	Competitor H	Competitor J
Na	≤50	≤700	≤5,000	≤50
K	≤50	≤40	≤2,000	≤50
Mg	≤10	≤40	≤500	≤50
Ca	≤50	≤50	≤500	≤50

Solvents and Blends

Grade	Description	Packaging	Quantity	Cat. No.
Optima LC-MS	Acetonitrile	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**A955**
	Methanol	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**A456**
	Water	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**W6**
	2-Propanol	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**A461**
UHPLC-MS	Acetonitrile	Clear Glass Bottles	1 L	**A956-1**
	Methanol	Clear Glass Bottles	1 L	**A458-1**
	Water	Clear Glass Bottles	1 L	**W8-1**
Optima LC-MS Blends	Acetonitrile with 0.1% FA	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**LS120**
	Acetonitrile with 20% Water and 0.1% FA	Amber Glass Bottles	500 mL	**LS122-500**
	Acetonitrile with 0.1% TFA	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**LS121**
	Acetonitrile with 0.05% TFA	Amber Glass Bottles	4 L	**LS11-4**
	Water with 0.1% FA	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**LS118**
	Water with 0.1% TFA	Amber Glass Bottles	500 mL, 1 L, 2.5 L, 4 L	**LS119**
	Water with 0.05% TFA	Amber Glass Bottles	4 L	**LS115-4**
Optima LC-MS Additives	Formic Acid	Poly Bottles	50 mL	**A117-50**
		Ampules	0.5, 1, 2, 10 × 1 mL	**A117**
	Acetic Acid	Poly Bottles	50 mL	**A113-50**
		Ampules	0.5, 1, 2, 10 × 1 mL	**A113**
	Trifluoroacetic Acid	Amber Glass Bottles	50 mL	**A116-50**
		Ampules	0.5, 1, 2, 10 × 1 mL	**A116**
	Ammonium Acetate	Glass Bottles	50 g	**A114-50**
	Ammonium Formate	Glass Bottles	50 g	**A115-50**

Installation Kit

Description	Cat. No.
UHPLC-MS Reagent Installation Kit for New LC-MS Systems, Includes: • Acetonitrile, 1 L (Cat. No. A956-1) • Methanol, 2 × 1 L (Cat. No. A458-1) • Water, 2 × 1 L (Cat. No. W8-1) • Thermo Scientific ChromaCare Instrument Flush Solution, 1 L (Cat. No. T111101000); 25% Each of Acetonitrile, Methanol, Water, and 2-Propanol	**UHPLCMSKIT**

Minimize Contaminants and Interference

fisher chemical

Fisher Chemical Chromatography Solvents

Fisher Chemical Optima LC-MS Grade Solvents

Leading the industry with an unprecedented LC-UV and LC-MS gradient suitability evaluation, Fisher Chemical Optima LC-MS Solvents are tested using advanced UHPLC technology and PDA detection optics. Each lot is screened for UV-absorbing contaminants that could otherwise create interferences between 200 and 400 nm.

- Exceptionally low metal ion content
- Fewer background peaks
- Higher signal intensity
- Tested for low UV-absorbing interference
- Filtered to 0.1 µm

Fisher Chemical Optima Grade Solvents

Manufactured for applications where performance is essential, Fisher Chemical Optima Solvents support HPLC, GC, spectrophotometry, environmental testing, and other applications.

- Screened for fluorescing and UV-absorbing contaminants
- Meet ACS specifications
- Filtered to 0.2 µm

Fisher Chemical GC Headspace Grade Solvents

Minimize the risk of contaminants and interference with Fisher Chemical GC Headspace Grade Solvents. These high-purity solvents allow for accurate and repeatable trace-level measurement of Class 1, Class 2, and Class 3 residual solvents in pharmaceuticals and meet ACS specifications.

- Tested by UV absorbance for organic contamination
- Packaged in an inert atmosphere

Fisher Chemical HPLC Grade Solvents

Choose Fisher Chemical HPLC Grade Solvents for use with high-performance liquid chromatography instruments.

- Submicron filtered
- Supplied in specially cleaned bottles
- Blanketed with inert gas to maintain purity
- Meet ACS specifications

Fisher Chemical Optima and HPLC Mobile Phase Blends

Select pre-blended Fisher Chemical Optima and HPLC Mobile Phase Blends and lower your risk of contamination.

- Ready to use
- Submicron filtered

Visit **fishersci.com/chemicals** or **fishersci.ca/chemicals** to learn more about these products.

Get an Extra Fisher Chemical Solvent with Purchase

Visit **fishersci.com/chromsolvents** or **fishersci.ca/chromsolvents** to learn more.

Excludes healthcare customers. See back cover for details.

Optimize Your Workflow

Thermo Scientific Chromatography Products

Today's bioanalytical and pharmaceutical research laboratories must produce high-quality analytical results from complex biological samples while maintaining a high-throughput environment that complies with strict regulations. But not every chromatography application requires the same vial and closure or sample handling container. The Thermo Scientific brand offers innovative options for every stage of your biological and pharmaceutical pipeline, starting with sample preparation and handling products.

To meet your unique needs, choose from a variety of Thermo Scientific sample handling solutions:

- **Thermo Scientific Chromacol GOLD-Grade Inert Vials and Inserts** — when sample quality, reproducibility, security, and integrity are of the utmost importance
- **Thermo Scientific Plastic Screw Thread Vials** — chemically inert and suitable for most chromatography applications
- **Thermo Scientific WebSeal Well Plates** — chemical resistance similar to glass and the handling advantages of polypropylene in a 96-well format for high-throughput analysis
- **Thermo Scientific SMART Digest Trypsin Kits** — easy and reproducible protein digestion in just a few minutes; apply these products to your HPLC and MS peptide mapping and quantitation workflows
- **Thermo Scientific HyperSep Filter Plates** — simple, effective purification and separation of proteins, peptides, DNA, RNA, and other biomolecules in small-scale, microgram-level samples

Visit **fishersci.com/thermochrom** or **fishersci.ca/thermochrom** for more information on SMART Digest trypsin kits, SOLAμ collection plates, HyperSep products, and other sample preparation solutions.

Visit **fishersci.com/thermovials** or **fishersci.ca/thermovials** for more information about Thermo Scientific well plates, vials, and other sample handling solutions.

High Purity for Maximum Performance

Honeywell

Honeywell Chromatography Solvents, Blends, and Additives

Honeywell LC-MS and UHPLC Solvents

Rely on Honeywell Burdick & Jackson and Chromasolv Solvents for your most demanding LC-MS and UHPLC applications.

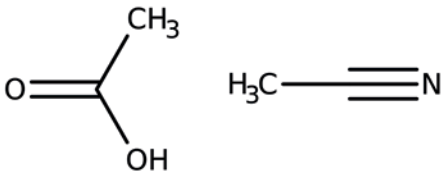
- Highest solvent purity for low detection limits
- Extremely low MS baseline noise
- Exemplary lot-to-lot reproducibility
- Tested for UHPLC-MS suitability

Honeywell Burdick & Jackson and Chromasolv GC and GC Headspace Solvents

Trust Honeywell Burdick & Jackson and Chromasolv GC and GC Headspace Solvents to deliver the reliability and accuracy you need. These solvents have extremely low contaminant concentrations verified using state-of-the-art production and application tests.

Honeywell LabReady Solvent Blends for LC-MS and HPLC

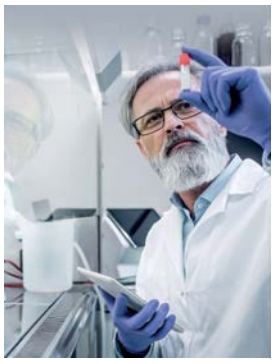
Eliminate manual blending to help avoid mistakes and create a safer work environment. Honeywell LabReady Solvent Blends are made using a proprietary, closed-loop blending technology to eliminate variation and provide reproducible and accurate results lot after lot. With less waste and fewer resources used, you can focus on other parts of your process.



Eluent Additives for LC-MS and UHPLC-MS

Choose Honeywell Fluka Eluent Additives for your most demanding LC-MS and UHPLC applications.

- Highest chemical purity for low detection limits
- Extremely low MS baseline noise
- Exemplary lot-to-lot reproducibility
- Tested for UHPLC-MS suitability



Visit **fishersci.com/honeywell-research-chemicals-applications** or **fishersci.ca/honeywell-research-chemicals-applications** to learn more.

Decon Labs' AquaPūr Purified Water

Water, water everywhere…but does it really meet USP spec?

Not all water is created equal! It's easy to make water that meets USP spec today. But what about after it sits on a shelf for 2 weeks, 2 months, or 12 months? We tested other major brands of packaged purified water and found microbial growth which can affect Total Organic Carbon (TOC) and other parameters. Our proprietary manufacturing process ensures that Decon AquaPur Purified Water meets spec when you use it.

AquaPūr

Purified Water

- Meets USP Specs
- Filtered to 0.2 µm
- Made in cGMP facility
- Validated system incorporating deionization, R/O, UV and ultrafiltration
- Maintains microbial spec through expiration date

AquaPūrST

Sterile Purified Water

- Meets USP Specs
- Filtered to 0.2 µm
- Double bagged and gamma irradiated
- Meets USP WFI spec for sterility and endotoxin
- For applications in lab or production environments that require sterile purified water
- Lot-specific document detailing testing shipped with each case

Description	Quantity	Cat. No.
AquaPur	4 x 1 gal.	**04-355-124**
AquaPur	5 gal.	**04-355-125**
AquaPur	55 gal.	**04-355-126**
AquaPur ST	4 x 1 gal.	**22-281-500**

Decon Labs, Inc.

Visit **fishersci.com/decon-labs** or **fishersci.ca/decon-labs** to shop.

Plan for Unexpected Lab Interruptions

By Iva Fedorka

Many of us have experienced how lab functions can be disrupted by extreme weather conditions, equipment failure, building damage, utility and communications failures, or civil disturbances. Planning for unexpected interruptions is your best chance to maintain laboratory operations during such a crisis.

What Is a COOP?

A continuity of operations plan (COOP), sometimes called a "disaster" plan, is an outline of actions to be taken in an emergency. A COOP may be partially or completely activated when the lab or its support systems aren't working.

COOPs can help maintain or restore laboratory operations during a crisis and mitigate the effects of internal or external events. Having a plan in place can help you resume core activities as quickly as possible, direct staff, and facilitate your recovery.

Why a Lab COOP?

As unique environments, laboratories should develop COOPs separately from their associated facilities. Laboratories usually have extensive instrumentation, use dedicated spaces, may require special air handling, and may be impossible to relocate quickly and easily.

Laboratories perform key functions in healthcare facilities, manufacturing sites, academic and research institutions, as well as local, state, and federal government agencies. Although operational interruptions may be infrequent, they can be devastating to the lab itself and the organizations and people it serves.

The Basics

Your COOP should provide for "worst case scenarios" while also addressing smaller disruptions. Ideally, a COOP addresses potential threats, crises, and natural or man-made emergencies. It should describe the infrastructure, resources, and other requirements to maintain or restore function within a specific time frame. An effective COOP establishes specific plans of action, identifies responsible personnel, and determines what additional training your employees will need.

Look Beyond the Lab

Review your organization's COOP to better coordinate communication and responses. If your lab is part of a larger academic institution, for example, you may not be able to fully control power supplies, air conditioning, and other systems.

Activating Your COOP

When it's time to put your plan into action, execution is key.

Engage Everyone
- Empower supervisors and managers
- Display and communicate initiatives, show progress

Train Everyone
- Train employees and set expectations
- Designate a point of contact (POC) for each lab section
- Conduct regular practices or mock emergencies

Use Checklists
- Create a checklist for each stage
- Base checklists on your lab's complexity and design
- Track progress and send reminders of next tasks

Communicate
- Include primary and back-up forms
- Maintain a contact list
- Identify issues and redirect activities

Track and Monitor
- Publish execution progress to avoid panic, keep everyone focused
- Create a dashboard for an overall view
- Collect performance metrics

Your COOP can make a significant difference in a crisis and may be the most important plan you create for your lab. And, although the plan is important, its proper execution is key to success. Annually review and update your COOP and share the updates with employees.

Multiple templates and other resources for COOPs are available online. For an example, see the Continuity of Operations Plan Improvement Tool for Public Health Laboratories from the Association of Public Health Laboratories (www.aphl.org).

Iva Fedorka is a staff writer for Thermo Fisher Scientific.

Versatile and Durable Labels

Rely on Fisherbrand Labeling Solutions for All Your Applications

Whether your laboratory is agricultural, biomedical, industrial, medical, pharmaceutical, or research, Fisherbrand labels will improve your everyday laboratory practices.

Fisherbrand labeling solutions let you to communicate highly critical information at a glance and have a wide range of uses and functions to ensure the best workflow for your lab.

Key Benefits

- Increase efficiency and reduce errors with proper labeling practices
- Keep everything organized and accounted for in your lab
- Come in multiple colors and configurations
- Withstand the rigors of laboratories

Visit **fishersci.com/fisherbrand** or **fishersci.ca/fisherbrand** to learn more.

Tamper Evident Labels

Printed Tape

Biohazard Labels

NFR Labels

Gas Cylinder Tags

Calibration Labels

High-Purity Products

Intermountain Life Sciences Purified Water

Find a full range of sterile and purified water that meets USP <1231> requirements. All products are manufactured according to GMP and ISO 13485 guidelines in an FDA-registered and validated facility.

Choose the best product for your application, available in a variety of packaging sizes and options.

	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
Quantity	**6 x 500 mL**	**6 x 1 L**	**4 x 4 L**	**10 L**	**20 L**	**100 L**	**200 L**
Purified Water, USP		WPW-USN-1X6			WPW-USN-20L		WPW-USN-2XL
Sterile Purified Water, USP		WPW-USP-1X6			WPW-USP-20L		
Molecular Grade Water					WFI-MGW-20L		
Cell and Molecular Ultra-Pure Water		WPW-CMG-1X6					
Sterile Water for Irrigation, USP	WIR-USP-5XM	WIR-USP-1X6	Z0304				WIR-USP-2XL
Sterile Water for Injection, USP	WFI-USP-5XM	WFI-USP-1X6		WFI-USP-10L	WFI-USP-20L	WFI-USP-1XL	WFI-USP-2XL
Sterile Water for Injection, EP/USP			Z0104		WFI-EPZ-20L		WFI-EPZ-2XL

5,000 solutions. 1 washer.

We hear you, keeping up with cleaning all of your labware is a challenge. Labconco's glassware washers are up for it, with the ability to wash over 5,000 different labware configurations. New software lets you store, customize, and protect programs and data. Labconco. Let us clean, so you don't have to.

Learn more at fishersci.com or fishersci.ca
Search: FlaskScrubber or SteamScrubber

LABCONCO®

Finding Cold Storage Solutions

Biological materials play a critical role in discovering novel therapeutics and managing public health. During the twentieth century, small chemical molecules were key to medical treatments. Now, advanced therapeutics include antibodies, cells, tissues, and other biological substances.

This shift from chemistry to biology represents a new era. However, biological materials can degrade — they may lose structure and function over time or with temperature exposures. Maintaining proper temperatures in the short and long terms is crucial to preserving biological functionality.

Laboratory Refrigerators and Freezers

Cold storage units built for laboratory or medical use are designed to limit temperature variation and maintain peak variation, temperature uniformity, and open-door temperature recovery. Commercial refrigerators and freezers are not designed with these same considerations.

While retail cold storage units may be less expensive, they may demonstrate temperature drift, have warm and cold areas within the cabinet, and return to temperature setpoints less rapidly after frequent opening. Internal temperature mapping performed on a 20 cu. ft. retail refrigerator showed a peak variation (the deviation from the lowest and highest temperature) of –5.5° to +5.5°C. In comparison, the peak variation of a 30 cu. ft. high-performance lab refrigerator was significantly less: –2° to +1.3°C.

Retail-grade refrigerators and freezers are not usually tested to meet laboratory safety standards like UL 61010. Because they are not recommended for laboratory use, insurance companies can deny claims for overt failure or damage to samples.

What Are Your Requirements?

There are many refrigerator and freezer options available in today's markets. Ask these questions to help determine the best cold storage equipment for your needs:

1. Which products will be stored? Are the products critical or temperature sensitive?
2. What temperature setpoint and performance will ensure sample or product stability?
3. How much room is needed to avoid overcrowding?
4. Does access to the samples or products require locks or security?
5. What regulatory or sustainability standards must be met?
6. Does the equipment need to be qualified or validated?

Performance data can also help you determine which unit is right for your application. Technical data sheets (TDS) include essential data about:

- Peak variation from setpoint — the difference between the highest and the lowest temperature observed during closed-door testing of the unit
- Uniformity — the maximum temperature difference between all measurements at a specific moment in time; typically published as the average uniformity
- Stability — the maximum temperature difference for a specific

location throughout the test cycle; typically published as the average stability

- One-minute door open recovery — the time needed to reach the original setpoints after keeping the door open for one minute

Find Your Cold Storage Solutions

Thermo Fisher Scientific offers several lines of biomedical refrigerators and freezers with different sets of features and performance levels.

Thermo Scientific TSG Series Refrigerators and Freezers are designed for general-purpose applications with semi-critical reagents, media, proteins, and other samples and products. TSG units are also Energy Star certified.

Energy Star certified Thermo Scientific TSX Series High-Performance Refrigerators and Freezers are essential for labs working with vaccines, enzymes, chemotherapy and pharmaceutical compounds, and other temperature-sensitive samples and products.

TSX freezers are available with manual or auto-defrost features. The auto-defrost versions use forced air circulation for better temperature uniformity and maintain temperatures near –30°C to minimize the impact of defrost cycles. Choose manual defrost freezers for storing enzymes and other biologics that do not tolerate temperature variations. Their refrigeration coils are located inside the cabinet walls to provide temperature control and stability throughout the chamber.

Every lab, workflow, and sample type has specific needs and requirements. The right refrigerators and freezers are critical for your samples, biological materials, and vaccines. Purpose-built laboratory refrigerators and freezers can offer you the precise temperature control needed for valuable research samples, vaccines, and other pharmaceutical development materials.

From preparation to storage and thawing, you can be confident and compliant both on paper and in practice. Thermo Fisher Scientific offers cold temperature storage ranging from –196°C to +4°C to help you find the right solutions for every stage of your workflow.

Visit **fishersci.com/acceleratingscience** or **fishersci.ca/acceleratingscience** to explore special offers on Thermo Scientific equipment and consumables.

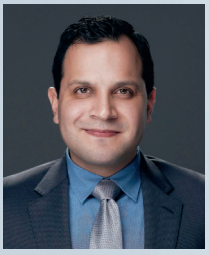
Product Line	TSX			TSG	
Type	Refrigerators	Auto-Defrost Freezers	Manual Defrost Freezers	Refrigerators	Auto-Defrost Freezers
Temperature Range	2° to 8°C, 5°C Setpoint	–35° to –15°C, –30°C Setpoint	–35° to –15°C, –20°C Setpoint	2° to 10°C	–12° to –30°C
Sizes	12, 23, 30, 45, 50 cu. ft.		23, 30 cu. ft.	12, 25, 30, 45, 49, 72 cu. ft.	25, 49 cu. ft.
Security	High/Low Alarms, Locks, Remote Contacts			High/Low Alarms, Locks, Remote Contacts	
Sustainability	Energy Star Certified, SNAP Compliant			Energy Star Certified, SNAP Compliant	
Applications	Biologics, Diagnostic Kits and Reagents, Enzymes, Industrial Testing, Molecular Biology, Vaccines and Pharmaceuticals, Clinical Applications, Columns, Cell and Gene Therapy			Biologics, Diagnostic Kits and Reagents, Industrial Testing, Molecular Biology, Clinical Applications, Columns	

Webinar

Biobanking Modernization and Sustainability

The COVID-19 pandemic has challenged everything we understand about effectively managing the risks posed to high-quality biological specimens.

Over the past year, facilities have heavily relied on standardized protocols to provide proven and successful directives. But what happens when there is no SOP for a sudden closure, an inability to physically access the facility, or operating with fewer, less experienced personnel?



Join **Wilfredo Martin**, Senior Product Application Specialist at Thermo Fisher Scientific, as he discusses how modernizing sample collection workflows to meet best practices and reassessing equipment needs to improve efficiency can help mitigate risks that impede collaborative research.

Visit **fishersci.com/biobanking-webinar** to learn more.

Improving Lab Efficiency and Accuracy

Brady Labels, Printers, and Applicators

Save time in the lab by automating your labeling process with Brady labels, printers, and applicators. Automation can help reduce the time it takes to create and apply a label from 10 seconds to 2 seconds. Over time, that adds up:

10 seconds x 80,000 tubes = 222 hours

- 2 seconds x 80,000 tubes = 44 hours

178 hours

What could your lab do with 178 extra hours?

Label Printers and Applicators

Description	Cat. No.
BradyPrinter i7100 Vial Label Applicator	**19-129-935**
BradyPrinter i7100 Industrial Label Printer, Peel Version, 300 dpi with Vial Label Applicator	**19-129-931**
BradyPrinter i7100 Industrial Label Printer, Peel Version, 600 dpi with Vial Label Applicator	**19-129-932**

Labels

Tube Capacity*	Dimensions (W x L)	Use Ribbon	Color	Quantity	Cat. No.
Brady Sterilization-Indicating Labels, PP, Withstand Temperatures from -196 to 121°C (-320.8 to 249.8°F)					
1.8 mL to 10 mL	1.5 x 1 in. (38.1 x 25.4 mm)	R4300	White	2,000/Roll	**11-878-544**
1.8 mL to 10 mL	2 x 1 in. (50.8 x 25.4 mm)	R4300	White	2,000/Roll	**11-878-541**
Brady Thermal Transfer Printer Labels, PP with Permanent Acrylic Adhesive					
1.8 mL to 10 mL	1.5 x 1 in. (38.1 x 25.4 mm)	R4302	White	2,000/Roll	**19-140-428**
0.5 mL to 2 mL	1 x 1 in. (25.4 x 25.4 mm)	R4302	White	2,000/Roll	**19-140-424**
1.8 mL to 10 mL	2 x 1 in. (50.8 x 25.4 mm)	R4302	White	2,000/Roll	**19-140-432**
1.8 mL to 10 mL	1.75 x 1.5 in. (44.5 x 38.1 mm)	R4302	White	2,000/Roll	**19-140-429**
1.8 mL to 10 mL	1.5 x 0.75 in. (38.1 x 19.1 mm)	R4302	White	2,000/Roll	**19-140-427**
0.5 mL to 2 mL	1.3 x 0.6 in. (33 x 15.2 mm)	R4302	White	2,000/Roll	**19-140-425**
1.8 mL to 10 mL	2 x 0.5 in. (50.8 x 12.7 mm)	R4302	White	2,000/Roll	**19-140-430**
Brady Thermal Transfer Labels, Polyamide-Coated Nylon Cloth with Permanent Acrylic Adhesive					
0.5 mL to 2 mL	0.9 x 0.5 in. (22.9 x 12.7 mm)	R6000	White	2,000/Roll	**11-877-79**
1.8 mL to 10 mL	1.75 x 1 in. (44.5 x 25.4 mm)	R6000	White	3,000/Roll	**19-109-270**
Brady Thermal Transfer General-Purpose Labels, for Indoor Use, Polyamide-Coated Nylon Cloth with Permanent Acrylic Adhesive					
1.8 mL to 10 mL	1.5 x 0.75 in. (38.1 x 19.1 mm)	R6000	White	3,000/Roll	**11-877-88**

*Tube dimensions may vary by brand

FEATURED ARTICLE

Solar Geoengineering

Could Help Combat Climate Change

By Kevin Ritchart

While some of us enjoy spending lazy summer days soaking up the sun, scientists are exploring ways to keep a fraction of those rays from ever reaching the Earth's atmosphere.

Earlier this year, the National Academies of Sciences, Engineering, and Medicine published a report urging the U.S. government to explore solar geoengineering as a means of combating climate change.

The report recommends that the federal government spend up to $200 million over the next five years to develop a national research program that will explore the viability of this technology as a means of helping cool the planet.

What Is Solar Geoengineering?

The idea behind solar geoengineering is to reflect more of the sun's energy back into space through various techniques, including the injection of aerosols into the atmosphere.

Scientists have done some computer modeling to predict what might happen to Earth's climate should solar geoengineering be accomplished successfully, but without more research, any potential conclusions drawn from the modeling studies are purely hypothetical.

How Does It Work?

The National Academies of Sciences, Engineering, and Medicine report outlined three solar geoengineering strategies that scientists consider viable options: stratospheric aerosol injection, marine cloud brightening, and cirrus cloud thinning.

Stratospheric aerosol injection (SAI) increases the number of small, reflective particles in the stratosphere to increase the reflection of incoming sunlight back into space. Modeling, using volcanic eruption as an analog, indicates that SAI can induce global cooling. But there's uncertainty about whether the aerosols used in solar geoengineering would have an adverse effect on atmospheric chemistry as well as climate.

Marine cloud brightening (MCB) adds particles to the lower atmosphere (nearer the Earth's surface) to increase the reflectivity of low-lying clouds over specific regions of our oceans. The potential drawback to this approach is a limited understanding of how aerosols and clouds will interact. Researchers have thus far been unable to perform MCB modeling because the key processes in need of observation are so small in scale that they cannot be observed in global climate models.

Cirrus cloud thinning (CCT) is a process of modifying the properties of high-altitude ice clouds, which increases the atmosphere's transparency to thermal radiation. Scientists have limited knowledge regarding the properties of cirrus clouds and what can be done to alter them. Data from existing CCT climate modeling has shown mixed results.

The Air Up There

A Harvard University research team is planning what they've dubbed the Stratospheric Controlled Perturbation Experiment (SCoPEx for short), which will serve as some of the first significant studies in the realm of geoengineering field work.

The aim of the project is to send a high-altitude balloon into the stratosphere, where it will release small amounts of mineral dust into the air. By observing how the small quantities of particles react when they leave the balloon, researchers believe they will gain a better understanding of how aerosols will behave high up in the atmosphere.

Though SCoPEx researchers have said repeatedly that the project is small in scale and the particles will be released in the safest possible way, their efforts have drawn some negative attention from environmental groups.

What Are the Risks?

The report acknowledges the risks involved in geoengineering, which has developed into one of the more contentious issues in the creation of climate change-related policy.

Chief among those risks is that a large-scale solar geoengineering effort could upset regional weather patterns, for example changing the behavior of a monsoon or hurricane.

Another concern is that the implementation of solar geoengineering would diminish public pressure to reduce greenhouse gas emissions. Experts caution that whether or not the research results in a plan to move forward, we still need to maintain focus on reducing our carbon footprint worldwide.

continued from page 21

Solar Geoengineering Could Help Combat Climate Change

Failing to follow through would jeopardize the goals of the 2016 Paris Agreement. Under the Paris Agreement, each of the countries involved must determine, plan, and regularly report on actions taken to mitigate the effects of global warming.

Lastly, if we started this effort of reflecting sunlight for a period of time, would we be able to stop? There's a concern that halting the process would create an unacceptable level of rapid warming that could pose a danger to both people and the environment.

Money Matters

Solar geoengineering has bipartisan support from the U.S. Congress, which allocated $4 million to the National Oceanic and Atmospheric Administration (NOAA) in 2019 to conduct research into the technology. The NOAA and National Aeronautics and Space Administration (NASA) both helped fund the 2021 report on solar geoengineering along with the U.S. Department of Energy.

Proponents of moving forward with the research outlined in the report feel that the use of public funds will add transparency and accountability by creating clear rules about how and when to perform tests and gather data.

Critics don't believe the safeguards detailed in the report will be enough, however. Some experts fear that the protections afforded to poorer regions could be pushed aside once the research begins.

A Measured Approach

The report also details a significant effort of transdisciplinary research, research governance, and robust stakeholder engagement, which is a departure from typical climate research programs. The following areas will be closely monitored as the research gets under way:

Context and goals. The hope is that all countries will engage meaningfully with the outcomes of the solar geoengineering research, weighing in with regard to social and environmental impact, aiding in the development of modeling scenarios, and outlining strategies for decision making when the best path forward might be unclear.

Impacts and technical dimensions. This includes gaining an enhanced understanding of the steps involved in successfully injecting particles into the atmosphere, the possible impact on the global climate and ecology, and the technical challenges associated with moving the solar geoengineering effort forward effectively.

Social dimensions. Researchers want to be sensitive to the public perception of their work while encouraging cooperation rather than conflict.

> Some experts fear that the protections afforded to poorer regions could be pushed aside once the research begins.

As research progresses, decisions will be made regarding the scope of the overall effort while helping to ensure that the process moves forward in an effective and societally responsible manner.

Where Do We Go from Here?

With the concept of solar geoengineering very much in its infancy, the questions that remain are how much information is needed to make an informed decision about implementing it on a large scale? And do the potential benefits to the world at large outweigh the risks?

Kevin Ritchart is a Thermo Fisher Scientific staff writer.

Improvements in Affinity Chromatography

Cytiva MabSelect PrismA is a next-generation protein A chromatography resin. It offers significantly enhanced alkaline stability and binding capacity for improved monoclonal antibody (mAb) processing.

The resin builds on the proven track record of MabSelect and MabSelect SuRe resins, but MabSelect PrismA has an optimized high-flow agarose base matrix and a genetically engineered protein A-derived ligand.

Key features include:

- Enhanced dynamic binding capacity (DBC) for high mass throughput of processed mAb per resin volume unit
- Alkaline stability enables efficient cleaning and sanitization using 0.5 to 1.0 M NaOH
- Dual sources for the agarose base matrix and protein A ligand for supply chain dependability

Since mAbs were first approved for commercial use in 1980s, they now represent the fastest growing segment of biopharmaceutical sales. Over the past 30 years, protein A chromatography resins and mAbs have seen annual productivity gains in the protein A step (more than 4.5 percent) and increased protein A binding capacity (more than 5.5 percent).[1]

Their high affinity for the antibody Fc region makes protein A resins an efficient mAb purification platform. The homology of the Fc region allows most mAbs to be purified using a standard approach, which significantly reduces process development time. This explains why nearly all commercially approved mAb manufacturing uses protein A capture as the first purification step.

Designed for High Productivity in mAb Capture

Most mAbs are sent for purification, which makes the protein A step very important. Increasing mAb titers means that cell culture feeds contain more impurities. The high nutrient load in the cell culture harvest, combined with the low alkaline resistance of protein A resin, creates an elevated risk of resin fouling and bioburden issues.

For efficient upstream batch purification, the resin capacity needs to match the mass of produced mAbs. Historically, the binding capacity of protein A resins has lagged behind ion exchange chromatography resins, requiring larger resin volumes and chromatography column sizes.

Due to the enhanced properties of both the protein A ligand and the base matrix design, MabSelect PrismA offers significantly increased binding capacity compared with its predecessor, MabSelect SuRe LX resin.[2] For similar process setups and column sizes, the improved binding capacity of MabSelect PrismA enables significantly increased mass throughput per purification cycle compared with MabSelect SuRe LX.

With the increased binding capacity, the productivity of current chromatography columns and systems can be improved without costly capital expenditures, making more efficient use of existing manufacturing footprints. Alternatively, the increased binding capacity can be used to decrease the resin volume (and concomitantly the buffer consumption) required to achieve a given mass throughput.

MabSelect PrismA and Binding to Non-Fc Regions

The binding of protein A mainly takes place between constant heavy chain domains — CH2 and CH3 — in the Fc region of the mAb. The protein A ligand in MabSelect PrismA has enhanced binding affinity for the VH3 sequence located on the variable heavy chain of the Fab region compared to its predecessors, MabSelect SuRe and MabSelect SuRe LX. MabSelect, MabSelect SuRe, and MabSelect PrismA interact to different degrees with VHH fragments.

These VHH fragments are unique to Camelids and are single-chain antibody mimics of the VH3 region of IgG with mutations at different positions. MabSelect PrismA has a similar binding pattern for the tested VHH sequences as the recombinant protein A ligand present in MabSelect and MabSelect Xtra resins, which provides new opportunities for purification of increasing molecular diversity of antibody fragments.

Improved Alkaline Stability Enables New Standards for Cleaning and Sanitization

Sodium hydroxide (NaOH) has gained popularity for bioprocessing, cleaning, and sanitization due to its efficacy, low cost, and ease of detection, removal, and disposal. Commonly, 1 M NaOH is used to clean and sanitize chromatography columns and resins. In addition to its ability to inactivate endotoxins and many microorganisms, NaOH can remove bound proteins, nucleic acids, and lipids from the resins. Fouled resins can increase cross-contamination risk, which my negatively impact DBC over time.[3] Historically, protein A chromatography resins have been sensitive to NaOH due to the limited alkaline stability of the protein ligand.

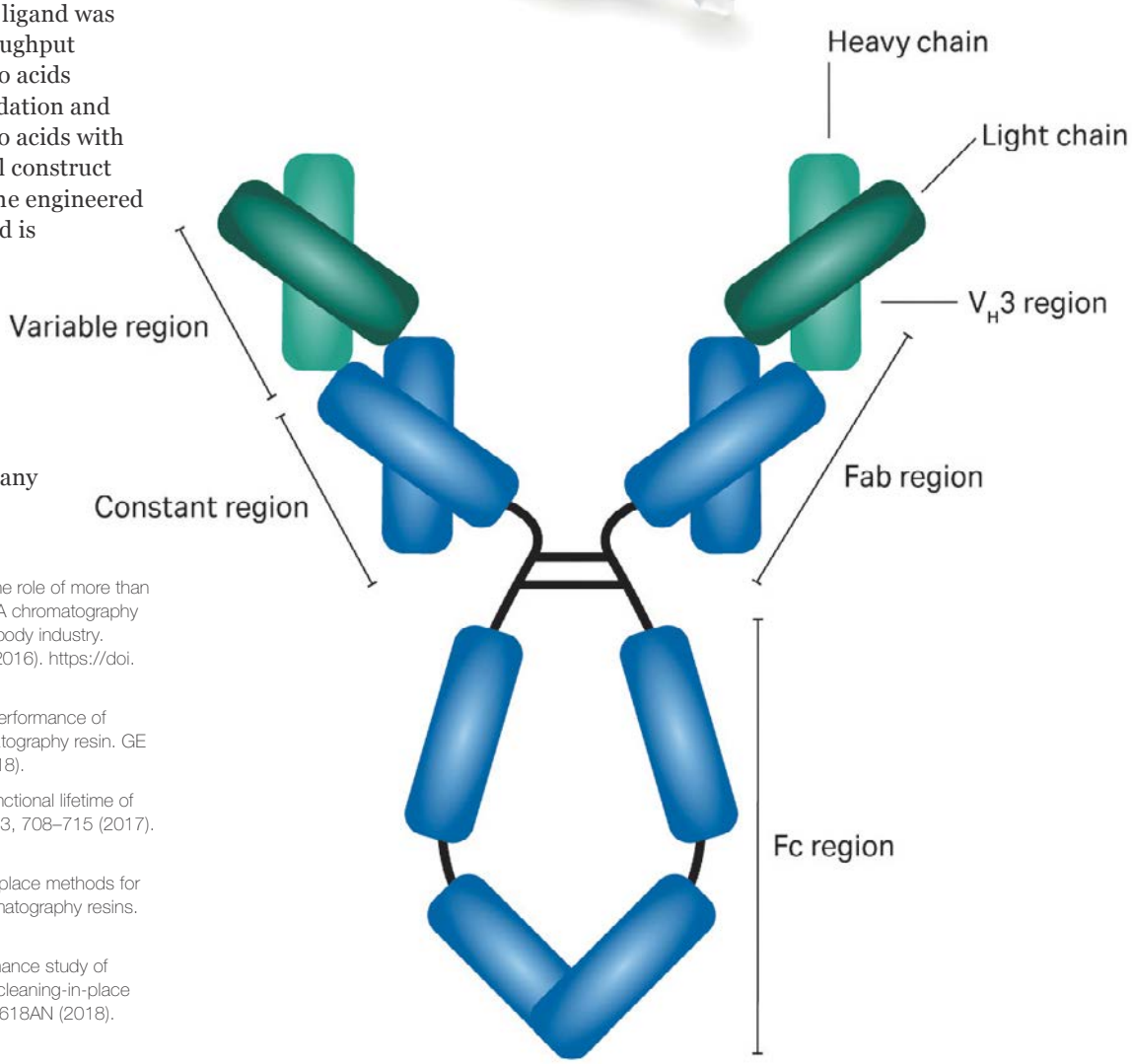
Later generations of protein A resins exhibit improved alkaline stability and

Content provided by:

cytiva

have recommended cleaning procedures using 0.1 M NaOH, with the option of occasionally using 0.5 M NaOH. Given that protein A capture is the first purification step and therefore exposed to the crudest feed and highest impurity loads, the use of weak CIP agents has been highlighted as a challenge and risk with using this technique.

With enhanced alkaline stability of its protein A ligand, MabSelect PrismA meets this challenge.[4] The ligand was developed using high-throughput screening to identify amino acids sensitive to alkaline degradation and substitution of these amino acids with more stable ones. The final construct constitutes a hexamer of the engineered domain. Highly pure ligand is immobilized to the agarose base matrix via a chemically stable thioether linkage. The enhanced alkaline stability enables efficient cleaning of the resin using 0.5 to 1.0 M NaOH over many purification cycles.[5]



1. Bolton G. R. and Mehta, K. K. The role of more than 40 years of improvement in Protein A chromatography in the growth of the therapeutic antibody industry. *Biotechnol*. Prog. 32, 1193–1202 (2016). https://doi.org/10.1002/btpr.2324

2. Application note: Capacity and performance of MabSelect PrismA protein A chromatography resin. GE Healthcare, KA1965231408AN (2018).

3. Zhang J. *et al.* Maximizing the functional lifetime of Protein A resins. *Biotechnol. Prog.* 33, 708–715 (2017). https://doi.org/10.1002/btpr.2448

4. Whitepaper: Efficient cleaning-in-place methods for protein based antibody affinity chromatography resins. Cytiva. KA1619220218WP (2018).

5. Application note: Lifetime performance study of MabSelect PrismA during repeated cleaning-in-place cycles. GE Healthcare, KA1061080618AN (2018).

Safe, Efficient Ultrasonic Cleaning

Elmasonic xtra ST
Ultrasonic Cleaners

Elma Industrial Ultrasonic Cleaners

Elmasonic xtra ST ultrasonic cleaners with high-capacity portable tanks offer very powerful cleaning. Portable, dual-frequency xtra ST ultrasonic cleaners handle tasks ranging from coarse preliminary cleaning to fine cleaning. A special feature of these rugged industrial ultrasonic cleaners is the dynamic Sweep/Pulse mode that alternates safe, even cleaning of sweep with a powerful pulse to quickly remove tenacious contaminants.

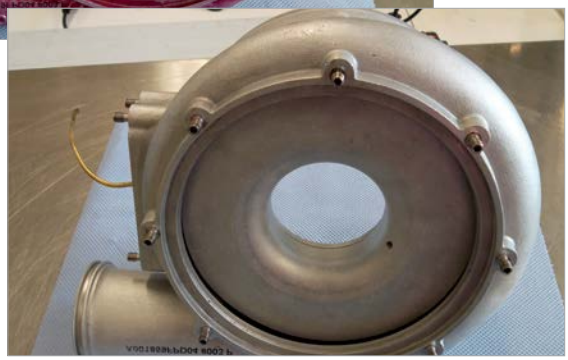
Key Features

- Powerful, dual-frequency cleaning at 25/45 kHz
- Heavy-duty tank for 8 hours/day operation
- Timer, drain, and heater up to 80°C
- Seven tank sizes from 30 to 255 L
- On casters for portability
- In-stock for quick delivery

Model	Capacity	Cat. No.
ST 300 H	30 L	08-000-100
ST 500 H	49 L	08-000-101
ST 600 H	57 L	08-000-102
ST 800 H	83 L	08-000-103
ST 1400 H	126 L	08-000-104
ST 1600 H	162 L	08-000-105
ST 2500 H	255 L	08-000-106

Avoid Harsh Chemicals and Reduce Waste
Elma Industrial Ultrasonic Cleaners allow you to clean parts and restore them to working condition without the use of harsh chemicals. With a mild solution, ultrasonic cleaners can clean a wide variety of items.

Before Cleaning



After Cleaning


note. ja
jar·gon
derstan
ly: On
langua

Less Jargon Could Increase Your Work's Citation Potential

By Kylie Wolfe

Words matter. They help us form and communicate new thoughts, shaping our interactions in person and on paper. Scientists, in particular, are challenged with relaying their findings in a way that promotes widespread understanding.

To convey a complex scientific idea, you might lean on words and phrases that are concise and precise. These trade-specific terms, known as jargon, might be effective in your field, but aren't necessarily accessible to all audiences. According to a new study, word choice may even affect how frequently a published paper is cited by other researchers.

Language Lessons

During a presentation or casual conversation with a coworker, a specific subset of vocabulary words might be suitable, but the same can't be said when trying to increase a manuscript's readability and reach.

A study conducted at the National Research Council in Pallanza, Italy, concluded that less jargon in a paper's title and abstract correlates to greater citations. These findings were published in the *Proceedings of the Royal Society B*.

To reach this consensus, Alejandro Martínez, evolutionary biologist, and Stefano Mammola, ecologist, generated a list of 1,500 cave-science terms and created a computer program to calculate how often these words were used in published research. They assessed 21,486 manuscripts, all of which were cave studies, and found that those without jargon in their titles were cited more than 450 times. The same set of papers used less than one percent jargon in their abstracts. The citation frequency dropped substantially when jargon was used more than one percent of the time.

Making Science Accessible

After months of research, you want readers to engage with your work: read it, remember it, and, ultimately, cite it. When citations are used as a measure of success or relevance, mastering the balance of word choice is critical.

To express an idea with fewer instances of jargon, consider your audience. Your readers might range from everyday people to experts in your field. And because specialized terms can remind readers of what they don't know instead of what they do, too much jargon can be discouraging.

Cast a wider net by defining terms and using simple phrases that explain concepts and processes. Strive for clarity, especially in the title and abstract of a piece. The reader's understanding of these sections will determine whether or not they continue reading.

> Strive for clarity, especially in the title and abstract of a piece.

Jargon isn't always undesirable though. A 2019 study evaluated nearly 20,000 grant proposals and found that it can actually help with funding. The fewer common words that were used, the greater the grant opportunities. No matter how you choose to express your ideas, know that word variation can lead to better communication. Jargon serves a purpose in each field, but only when it's used in the right context and with the appropriate audience.

Communication Goals

Don't let jargon limit your paper's citation potential. Create accessible content that readers can digest, keeping in mind what words they'll understand and how you can break down larger ideas.

When you're ready to publish your work, take a second look. Ask yourself how you can cut back on technical terms and broaden your audience. When these words are unavoidable, try restricting their use to later sections of the paper. It could not only improve the number of citations you receive, but help you communicate your work more effectively to anyone who clicks and scrolls.

Kylie Wolfe is a Thermo Fisher Scientific staff writer.

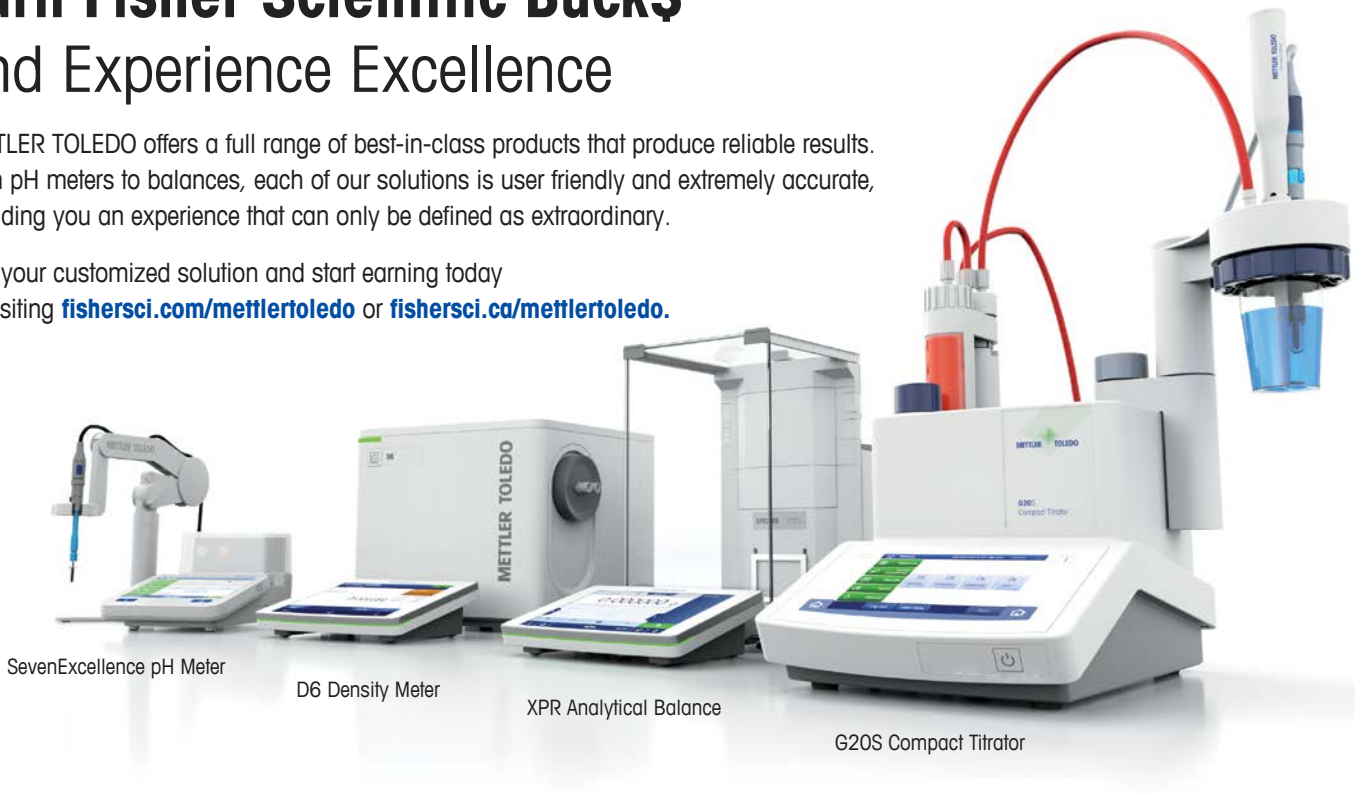
This content was inspired, in part, by "Are You Confused by Scientific Jargon? So Are Scientists," New York Times, April 9, 2021; and "Want other scientists to cite you? Drop the jargon," Science, April 6, 2021.

METTLER TOLEDO

Earn Fisher Scientific Buck$
And Experience Excellence

METTLER TOLEDO offers a full range of best-in-class products that produce reliable results. From pH meters to balances, each of our solutions is user friendly and extremely accurate, providing you an experience that can only be defined as extraordinary.

Find your customized solution and start earning today by visiting **fishersci.com/mettlertoledo** or **fishersci.ca/mettlertoledo.**



SevenExcellence pH Meter | D6 Density Meter | XPR Analytical Balance | G20S Compact Titrator

Protect Your **PEOPLE** and Your **PRODUCTS**

HandPRO™

9100 SERIES Cleanroom Nitrile Gloves

- **ISO 5 Compatible | 12" Length**
- **Consistently Low Endotoxin Levels** in a non-sterile glove with low bio-burden levels
- **Accelerator-Free LOW DERMA™ Technology Nitrile** reduces the risk of developing Type IV chemical allergies

LOW DERMA® Technology in Skin Protection

Patented Technology*

Size	Packaging	Mfr. No.	Cat. No.
XS	1,000/Case	9100	**19-423-100**
S	1,000/Case	9101	**19-423-101**
M	1,000/Case	9102	**19-423-102**
L	1,000/Case	9103	**19-423-103**
XL	1,000/Case	9104	**19-423-104**
XXL	1,000/Case	9105	**19-423-105**

*Patent *www.LowDerma.com/patents*

No Sulfur Added · Low Dye White Color
Anti-Slip Grip · Enhanced Strength · Ambidextrous

ALSO AVAILABLE

HandPRO

9300 SERIES ULTRA Clean Class 10 Nitrile Gloves

Same accelerator-free LOW DERMA™ Technology nitrile glove, suitable for ISO 4 and up environments.

"Your Protection Is Our Purpose"

HOURGLASS INTERNATIONAL INC

Medicom

Pride in Protection.

SafeMask®

Procedure Earloop Face Masks

Specialty masks made to fit you and your individual needs.

Premier

High-barrier protection in a variety of vibrant hues.

- Stretchy earloops minimize the risk of self-contamination
- High-quality materials ensure optimal breathability
- Provides ASTM F2100-rated protection

Cat. No. 19-910-721

SofSkin

Exceptional protection made especially for sensitive skin.

- Lightweight, breathable inner layer softens with wear and remains cool on skin
- Unique wicking technology keeps face dry and comfortable
- Provides ASTM F2100-rated protection

Cat. No. 19-910-707

FreeFlow

Air Space Technology creates extra breathing room.

- Integrated nose strip prevents fogging, ensuring clear vision when worn with eyewear
- Ideal for those who feel claustrophobic in ordinary masks
- Available in all 3 ASTM protection levels

Cat. No. 19-910-716

Prize-Winning Design

SARTORIUS

Sartorius Picus and Picus NxT Pipettes

Picus is Sartorius's most ergonomic pipette and the smallest and lightest electronic pipette that we offer.

- Unique electronic tip ejection
- One-, two-, or three-point calibration
- Charges in less than 60 minutes
- Autoclavable (lower parts, except for 1,200 µL sizes)

Picus NxT offers compliance advantages for regulated laboratories, including a three-point calibration certificate. The design, which is similar to the Picus, gives you maximum operating comfort and convenience.

	Picus Electronic Pipettes			Picus NxT Electronic Pipettes		
Channels	**1**	**8**	**12**	**1**	**8**	**12**
Volume Range	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**	**Cat. No.**
0.2 to 10 µL	**14-559-350**	**14-559-356**	**14-559-360**	**14-557-821**	**14-557-827**	**14-557-831**
5 to 120 µL	**14-559-351**	**14-559-357**	**14-559-361**	**14-557-822**	**14-557-828**	**14-557-832**
10 to 300 µL	**14-559-352**	**14-559-358**	**14-559-362**	**14-557-823**	**14-557-829**	**14-557-833**
50 to 1,000 µL	**14-559-353**	**14-559-359**	**14-559-363**	**14-557-824**	**14-557-830**	**14-557-834**
100 to 5,000 µL	**14-559-354**			**14-557-825**		
500 to 10,000 µL	**14-559-355**			**14-557-826**		

PARTICLE ANALYZERS

SIZE MATTERS WHEN EVERY PARTICLE COUNTS

A HIGHER STANDARD OF EXCELLENCE WITH ANSWERS YOU CAN TRUST

NEW

LS 13 320 XR LASER DIFFRACTION PARTICLE SIZE ANALYZER

DIFFERENCE YOU CAN MEASURE

- Particle size distribution
- Wet & dry (powder) analyses
- Wide dynamic range: (10 to 3,500 µm)
- Patented PIDS technology: direct detection of nanoparticle population
- Unique automodality solution ensures:
  - Correct sizing results over full range
  - No knowledge about particle size distribution needed prior to measurement

MULTISIZER 4E COULTER COUNTER

COUNT WITH CONFIDENCE

- High-resolution particle counting & sizing
- Independent of particle shape & optical properties
- Wet (electrolyte) analyses
- Sizing range from 200 to 1,600 µm diameter, with multitube overlap
- The Coulter method is the only "direct" method for studying particle volume
- Real-time detection of changes in the average cell size & determination of cell aggregates

Visit **fishersci.com/particleanalyzers** or **fishersci.ca/particleanalyzers** for more information.

BECKMAN COULTER *Life Sciences*

For Laboratory Use Only

21.04.1307.PCC

Introducing the J.T.Baker BAKERBOND PROchievA recombinant protein A affinity chromatography resin

Designed and manufactured by Avantor to the high standards established for our J.T.Baker® brand chemicals, reagents, and chromatography products, the J.T.Baker® BAKERBOND® PROchievA™ resin offers high performance in the critical affinity chromatography step of mAbs manufacturing and has demonstrated higher protein purity levels in more complex biopharmaceuticals such as Fc fusion proteins and bispecific antibodies.

Learn more at **fishersci.com/avantor** or **fishersci.ca/avantor**

- Proprietary protein A derived ligand developed by Avantor demonstrates excellent dynamic binding capacity for mAbs and improved protein purification capability in cutting-edge products.
- Traditional particle size allows for use of established column packing procedures and operating protocols.
- Conveniently packaged in a non-hazardous and non-flammable storage buffer, eliminating burdensome shipping, handling, and storage requirements.
- Available in pre-packaged 1 mL and 5 mL columns.

Ensure Traceability and Quality

Fisher Scientific SureTRACE Products

Find support for your research, development, and production.

Fisher Scientific SureTRACE products can help save you time and comply with regulatory requirements or manufacturing guidelines.

Look for the **SureTRACE** icon for products that offer full traceability, lot visibility, and access to all product certificates.

Start benefitting from our traceability and quality assurance today.

Visit **fishersci.com/suretrace** to learn more.

fisher scientific
part of Thermo Fisher Scientific

LAB *purified*

Our sterilizers provide a fast, safe, dependable, and convenient means of sterilizing liquids, media, instruments, glassware, clothing, and waste.

SPECIAL OFFER

Purchase a qualifying Heidolph Sterilizer or Autoclave and get a Platform Shaker or Vortexer at no additional cost.

Excludes healthcare customers.

Visit **fishersci.com/heidolphautoclave** or **fishersci.ca/heidolphautoclave** to save.

heidolph
Life Science

Multiple Options and Configurations

BioTek Cytation C10 Confocal Imaging Reader

The Cytation C10 Reader combines automated digital confocal and widefield microscopy with conventional multi-mode microplate reading in a unique, patented design. The spinning disk confocal module provides exquisite resolution and optical sectioning capabilities in a wide variety of sample types. High-quality components are used for excellent image quality at a lower price than similar systems.

Cytation C10 also includes widefield fluorescence, brightfield, and phase contrast optics. Its variable bandwidth monochromator-based plate reading provides fluorophore specificity and sensitivity. Environmental controls enable live cell assays, and Gen5 software is designed to make sample detection and image capture effortless.

Mfg. No.	C10PHC2	C10MPHC2	C10PWC	C10MPWC	C10PW	C10MPW
Cat. No.	**BTC10PHC2**	**BTC10MPHC2**	**BTC10PWC**	**BTC10MPWC**	**BTC10PW**	**BTC10MPW**
Confocal 60 µm Spinning Disk	•	•	•	•		
Confocal 40 µm Spinning Disk	•	•				
Hamamatsu sCMOS Camera	•	•				
Sony CMOS Camera			•	•	•	•
Multi-Mode Reading		•		•		•
Phase Contrast	•	•	•	•	•	•

Replaces Up to Five Liquid Handlers

MultiFlo FX Multi-Mode Dispenser

The MultiFlo FX is an automated multi-mode reagent dispenser for 6- to 1536-well microplates. It incorporates several unique technologies in its modular design:

- Parallel dispense
- Random access dispense
- Automated gentle media exchange

These modules facilitate various liquid handling applications from 2D and 3D cell culture to concentration normalization assays, ELISA, bead-based assays, and more. A fully configured MultiFlo FX replaces up to five liquid handlers, saving space, time, and instrumentation budgets.

Description	Mfg. No.	Cat. No.
MultiFlo FX with 2 Module Arms, 1 Dispense Pump, 1 Peri Pump Cassette	MFXP2	**BTMFXP2**
MultiFlo FX with 1 Module Arm, 1 Dispense Pump, 1 Peri Pump Cassette	MFXP1	**BTMFXP1**

BOEKEL
Boekel Scientific

Boekel Scientific Refrigerated Incubator

Large Color Touchscreen with Intuitive Navigation and Advanced Functionality

Single Piece Internal Chamber Construction

Efficient Solid-State Peltier Cooling

Cat. No.: 13-245-235

Visit **fishersci.com** or contact your Fisher Scientific sales representative to learn more.

COMFORT AIR NX MD

Introducing an elastomeric rubber reusable respirator WITHOUT an exhalation valve!

- More comfortable than wearing disposable style
- Two-way filtration when you breathe in and out
- Two sizes
- NIOSH approved N95 or P100 filters
- Protects the patient and HCP
- Creates an air-tight seal against the face
- Safer than using a disposable respirator or surgical mask — you can conduct a seal check each time
- 8-point adjustable harness, no earloops, no discomfort
- White allows you to write your name or a compassionate message
- Filters and masks can be disinfected between patient interaction
- Filters can be replaced, reducing waste versus disposable style respirators
- Immediate and long-term cost savings
- Will not fog glasses
- Fits under medical style faceshields
- Compact design reduces interference with other medical equipment during patient interaction

DENTEC SAFETY SPECIALISTS

PROTECTING THOSE WHO PROTECT OTHERS

Contact your Fisher Scientific sales representative to order.

Protecting What Matters Most

Safety

Trust us to help keep your people, processes, and facilities safe. With our expert specialists, industry-leading products, and innovative services, **we have safety down to a science.**

Your Partners in Safety

Safety is fundamental to everything we do because it's the foundation for everything you do – from protecting your people and ensuring compliance to reinforcing the integrity of your work.

That's why we've established one of the largest, most experienced teams of safety specialists to help you select the right solutions for every application.

Combined with our broad product portfolio, procurement services, and best-in-class distribution, we serve as a single source for all your safety and production needs.

Key Product Categories

Quickly and easily find the solutions you need with our wide range of industry-leading products in these key safety categories.

- Cleaning and validation
- Controlled environments
- Environmental monitoring
- Facility safety and maintenance
- Fall and confined space protection
- Fire and emergency response
- First aid and medical
- Hand sanitization
- Hazardous materials storage
- Personal protective equipment
- Respiratory protection
- Spill control and containment
- Traffic safety
- And more

Key Focus Areas

Rest easy knowing we offer the expertise, products, and services you need for each of these key focus areas.

- Occupational and facility safety
- Clean room
- First responder
- Production – certificates, lot management, and change notifications

Visit **fishersci.com/safety** or **fishersci.ca/safety** to learn more.

fisher scientific
part of Thermo Fisher Scientific

Next-Generation Vacuum Pumps

KNF Neuberger LABOPORT Vacuum Pumps

New oil-free and chemically resistant LABOPORT diaphragm vacuum pumps improve everyday laboratory practices with integrated speed control, three-color status display, and exceptionally small footprints.

Compact LABOPORT vacuum pumps are easy to use, durable, and useful for rotary evaporation, degassing, filtration, SPE, fluid aspiration, gel drying, centrifugal concentration, vacuum ovens, and many other applications.

Visit **fishersci.com/laboportvacuumpumps** to shop.

Model	Application	Ultimate Vacuum	Flow Rate	ATEX Compliant	Integral Gas Ballast Valves	Cat. No.
N 96	Filtration, SPE, Aspiration	97.5 torr, 130 mbar	7 L/min.	No	No	**13-880-904**
N 820 G	Rotary Evaporation, Degassing, Fluid Aspiration, Centrifugal Concentration, Vacuum Oven, Gel Drying	4.5 torr, 6 mbar	20 L/min.	Yes	Yes	**13-880-905**
N 840 G	Rotary Evaporation, Filtration, Centrifugal Concentration, Vacuum Oven	4.5 torr, 6 mbar	34 L/min.	Yes	Yes	**13-880-906**

New Offers Every Month

The Fisherbrand Collection

Get special, limited-time savings on Fisherbrand™ products throughout the year. Don't forget to check in every month to see what's new.

Visit fishersci.com/fisherbrand-savings to explore the latest deals.

Offers valid in the U.S. only.

fisher scientific
part of Thermo Fisher Scientific

fisher scientific
part of Thermo Fisher Scientific

300 Industry Drive
Pittsburgh, PA 15275

Redesigned for Your Safety

BRANDTECH® SCIENTIFIC, INC.

BrandTech Dispensette S Bottletop Dispensers

Redesigned BRAND Dispensette S Bottletop Dispensers offer additional safety features and convenience for your laboratory reagent dispensing.

- Updated safety valve system: Easier volume selection, faster priming, lower operation force
- No seals — greater reliability
- Includes adapters for common bottle sizes; other accessories sold separately

Other available models:

- Dispensette S Organic for organic solvents and concentrated acids
- Dispensette S Trace Analysis for high-purity reagents
- Dispensette S Trace Analysis with platinum-iridium valve springs for hydrofluoric acid (HA)
- Fixed-volume models (limited selection)

Description	Cat. No.	Cat. No.	Description	Cat. No.	Cat. No.
Analog Adjustable	**Standard Valve**	**Recirculation Valve**	**Digital Adjustable**	**Standard Valve**	**Recirculation Valve**
0.1 to 1 mL	**13-689-019**	**13-689-012**	0.1 to 1 mL	**13-689-006**	**13-689-000**
0.2 to 2 mL	**13-689-020**	**13-689-013**	0.2 to 2 mL	**13-689-007**	**13-689-001**
0.5 to 5 mL	**13-689-021**	**13-689-014**	0.5 to 5 mL	**13-689-008**	**13-689-002**
1 to 10 mL	**13-689-022**	**13-689-015**	1 to 10 mL	**13-689-009**	**13-689-003**
2.5 to 25 mL	**13-689-023**	**13-689-016**	2.5 to 25 mL	**13-689-010**	**13-689-004**
5 to 50 mL	**13-689-024**	**13-689-017**	5 to 50 mL	**13-689-011**	**13-689-005**
10 to 100 mL	**13-689-025**	**13-689-018**			

Distributed by Fisher Scientific

Litho in U.S.A. 21-543-0723 KP 8/21
BN20211220