

# LAB REPORTER

Science Innovations and Discoveries

NO. 3, 2022

# Keeping Your Water Pure and Your Results Reliable

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Science Innovations and Discoveries

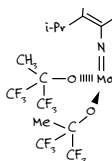
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# The Fisher Scientific Brand Turns 120

By Christina Hooton

From our inception in 1902 to becoming part of the world leader in serving science, the Fisher Scientific brand has had a prolific history that we're proud to celebrate. Keep reading to learn more about our legacy of partnering with scientists like you and how we'll continue to evolve to serve your needs now and into the future.

## A Brief History

Chester G. Fisher founded the Scientific Materials Company on May 6, 1902, in Pittsburgh, Pennsylvania, when he was only 20 years old. As a recent engineering graduate, he saw the need for a company that would supply the scientific tools for Pittsburgh's many industries, including the burgeoning steel business. Shortly after, in 1904, the company published its first catalog. The business was officially renamed the Fisher Scientific Company in 1925 to set it apart from the many new companies springing up with generic names. The Fisher Scientific catalog would become a staple in labs all over the world.

On May 8, 2006, Thermo Electron Corporation and Fisher Scientific International Inc. combined to form the company we know today, Thermo Fisher Scientific. It was described as an industry-transforming transaction, creating the leading provider of laboratory products and services in life, laboratory, and health sciences.

The Fisher Scientific brand, now part of Thermo Fisher, continues to complement the company's value proposition. Fred Lowery, senior vice president and president of Customer Channels for Thermo Fisher Scientific, said, "We accelerate innovation and provide our customers with productivity at the same time. The channel brings deep customer understanding and access, and the rest of the company brings deep scientific knowledge and service capabilities."

## Answering the Call

The Fisher Scientific brand has always responded to the challenges of the day.

Severe polio epidemics plagued the world between 1948 and 1955. Without a vaccine, many people avoided crowds and large gatherings. Jonas Salk, an American virologist and the son of Russian-Jewish immigrants, thought he could immunize patients with a vaccine composed of "killed" polio virus. In 1954, Salk developed his vaccine at the University of Pittsburgh using Fisher Scientific reagents. By 1961, the incidence of polio in the United States had dropped by 95 percent.

More recently, the Fisher Scientific brand responded to the COVID-19 pandemic by supplying the critical personal protective equipment, sanitization products, and testing supplies needed to combat the virus. As vaccine development and production ramped up, the brand supplied the products, resources, and expertise for every stage of the process, from virology research and vaccine development to surveillance testing and vaccine distribution.

## Sourcing Innovation

Throughout the years, the Fisher Scientific brand has been a trusted source for innovative scientific supplies and products. It was Chester's brother, Edwin Fisher, who developed the Meker-Fisher Burner, hailed as the most important improvement in burners since the original Bunsen burner was introduced circa 1888.

The Scientific Materials Company manufactured the first electric combustion furnace and combustion train for analyzing carbon levels in steel. And at the time, its thermostatically controlled laboratory incubator was considered superior to other models.

This legacy of sourcing innovation continues today as the Fisher Scientific brand supplies many top brands, including Thermo Fisher's leading offerings, the Thermo Scientific, Applied Biosystems, and Invitrogen brands.

"What Chester Fisher was after is still what we strive to accomplish today — deliver on our promise that we're going to give our customers what they want when they want it and provide them with the best products from the best supplier partners in the industry. It's pretty remarkable that a 120-year-old brand has a similar purpose and values that it was founded on."

### Fred Lowery

*Senior Vice President and President,  
Customer Channels, Thermo Fisher Scientific*

## Serving Science Today and Tomorrow

Today the Fisher Scientific brand offers more than 1.5 million products from over 9,000 suppliers globally through a leading e-commerce platform, powerful distribution network, and a trusted team of sales representatives, scientific specialists, and other experts. In addition to supplying the products needed to advance science, the team provides equipment and instrument services, stockroom management, production solutions, and so much more.

"We have a rich and extensive history of serving our customers. We're often the first experience for Thermo Fisher Scientific customers, so we have a team that's extremely customer-centric," said Lisa Witte, president of North America and emerging markets for the Fisher Scientific channel at Thermo Fisher Scientific. "As part of Thermo Fisher Scientific, we have extensive product breadth and can serve customers of all sizes and market segments. We can work with a customer from their first round of funding to production. As they grow, we can grow with them. We're the conduit that brings in various product solutions and services along that continuum."

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

# Connecting Laboratory Data to Accelerate Development

Cryopreservation is vital to cell and gene therapy (CGT) and biobanking facilities that modify, store, or distribute cells. Controlling the rate of specimen freezing can result in greater cellular viability when the sample is thawed. To safely prepare samples for cryogenic storage, a controlled-rate freezer can help move specimens through the latent heat of fusion threshold.

## Meeting Evolving Needs

For CGT and biobanks, collecting data about sample conditions supports the sample traceability, standardization, and documentation needed for successful collaboration. As researchers modernize their facilities and expand the connection of operations to building information management systems, laboratory equipment connectivity offers many advantages.

As CGT research moves into scale-up or production and cGMP processes are established, it becomes more important for information to be exchanged within equipment, between equipment, and from equipment to systems where data can be securely stored and accessed.

In a control system, there will always be rules between different levels to connect, find, and read data as information.

For laboratories, this can create a real advantage when scaling up for GMP production and turn manual methods into documented automatic outputs from multiple machines.

## What is OPC UA?

OPC UA stands for Open Platform Communications Unified Architecture, which allows for standardized information exchange. OPC UA is a well-organized and

defined protocol for interoperability of instruments and provides data security, scalability, and the flexibility to work across operating system platforms as data is transformed into information. In industrial settings, OPC UA offers end-users building blocks that fit into their control system workflows.

OPC UA is easily adopted, but requires the same consideration of future needs that we attribute to the potential of biosamples for use in discovery or therapies.

## Thermo Scientific CryoMed Controlled-Rate Freezers

The CryoMed Controlled-Rate Freezer has OPC UA functionality to improve connectivity and enable efficient and secure exchange of data. It was one of the first cryopreservation products to meet the FDA's 21 CFR Part 11 requirements for electronic records.



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**thermo**scientific

CryoMed freezers can integrate and communicate with your current programs to help enhance efficiency. The updated CryoMed user-interface firmware requests unique usernames with passwords, defines user roles, and retains audit and event logs. OPC UA also has security built into its protocols for access control, authentication, and encryption.

Use the CryoMed OPC UA Controlled-Rate Freezer with the CryoExtra and CryoPlus platforms for a complete system for preparing and storing samples and therapies at cryogenic temperatures.

## Supporting Today, Developing for Tomorrow

As expenses increase, we know that you're hoping to future-proof operations by incorporating sustainability planning into

your goals. We're also thinking ahead by adding OPC UA in more equipment and instruments to make it easier to exchange compliant and contextualized data, maintaining quality at lower costs.

Thermo Fisher Scientific strives to be at the forefront of innovation to help you succeed. We invest in research and

development and depend on your feedback to determine which updates to undertake to stay current with the fast pace of technology.

The labs of the future will be able to leverage this machine information for predictive analytics and modeling data to determine the best paths to success.



# Direct and Indirect Sonication

## Fisherbrand Sonic Dismembrators

Fisherbrand Sonic Dismembrators create energy that is transmitted through a titanium probe into a liquid sample to create cavitation (the implosion of micro-bubbles with high shear forces).

Sonic dismembrators can be used with various accessories to process small ( $\mu\text{L}$ ) to 1 L sample volumes.

- Use any of the four models to process samples smaller than 50 mL
- Choose a programmable unit for sample temperature control
- Use a 500w or 700w unit for samples larger than 50 mL
- The 700w model is required for high throughput, extended programming times, and sample temperature monitoring

For direct sonication, immerse the probe directly into the sample vessel. Indirect sonication (using the cup horn accessory) can be performed with sealed tubes or vials since there is no contact between the probe and the sample.

Each Fisherbrand Sonic Dismembrator includes a generator, converter, cables, wrench set, and one probe. Other probes and accessories, including the stand and clamp shown here, are sold separately.



Model 505

Model	Applications	Capacity	Power	Cat. No.
50	<ul style="list-style-type: none"> <li>• Basic Cell Disruption</li> </ul>	0.2 to 50 mL	50w	<b>FB50110</b>
120	<ul style="list-style-type: none"> <li>• Cell Disruption</li> <li>• Protein Extraction</li> <li>• DNA Shearing/ChIP</li> </ul>	0.2 to 50 mL	120w	<b>FB120110</b>
505	<ul style="list-style-type: none"> <li>• Cell Disruption</li> <li>• Nanoparticle Dispersion</li> <li>• Homogenization/Mixing</li> </ul>	0.2 to 1000 mL	500w	<b>FB505110</b>
705	<ul style="list-style-type: none"> <li>• Cell Disruption</li> <li>• Protein Extraction</li> <li>• DNA Shearing/ChIP</li> <li>• Nanoparticle Dispersion</li> <li>• Homogenization/Mixing</li> <li>• Sonochemistry</li> </ul>	0.2 to 1000 mL	700w	<b>FB705110</b>



# Filtration Flexibility and Counting Efficiency



MilliporeSigma filtration solutions feature high-performance membranes available in a wide variety of formats, including syringe filters, vacuum-driven filter units, bottle top filters, and more. Automated, handheld cell counters deliver accurate counts in seconds.

## Millipore Millex Syringe Filters

Millex syringe filters are well-suited to HPLC sample preparation, antibiotics and tissue culture additives filtration, dissolution testing, and many other applications. With minimal hold-up volume to reduce sample loss, low extractables, and low binding membranes, they are available in sterile and nonsterile options and in a range of diameters, membranes, and pore sizes.



## Millipore Stericup Filters

Stericup vacuum filtration devices have an ergonomic design to help optimize usability and streamline filtration, while protecting your cell cultures with the reliability of Millipore membranes. These devices have a quick release connection and include a sterile receiver flask or bottle and cap to contain and store your filtrates. They're available in 150 to 1,000 mL capacities, with Durapore PVDF or Express PLUS PES membranes, and in 0.1, 0.22, and 0.45  $\mu\text{m}$  pore sizes. Additional receiver flasks are sold separately.



## Steritop Bottle Top Vacuum Filter Units

Use Steritop bottle top filter units to produce sterile filtrations of aqueous fluids directly into narrow- (33 mm) or wide-mouth (45 mm) bottles. Their large filter areas provide for rapid flows and the units accommodate an optional prefilter. Bottle attachment threads are slightly recessed to help avoid accidental contact with a contaminated surface. Filter units are available in capacities from 150 to 1,000 mL with your choice of Durapore PVDF or Express PLUS PES membranes with 0.22  $\mu\text{m}$  pore sizes.

## Millipore Scepter 3.0 Cell Counter

The Millipore Scepter 3.0 is a portable automated cell counter that counts 7 to 10 times faster than a hemocytometer and helps to move your cell counting to the culture hood in less than 30 seconds. Produce data histograms from thousands of cells per sample for more reliable results. No sample prep, dedicated reagents, or hazardous dyes needed.



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# Vaccine Manufacturing

## Cleanroom Apparel to Protect Processes, Products, and Operators

Vaccine manufacturing has been of paramount importance during the COVID-19 pandemic and remains a fast-growing market sector. The manufacturing processes for vaccines are complex and consist of many steps. Most vaccine manufacturing processes depend on quality control at every step. Failures can be costly, dangerous, and may compromise compliance.

Cleanroom garments protect both processes and products from contamination while protecting operators from the hazardous substances involved in pharmaceutical manufacturing. Find out how DuPont Tyvek and Tyvek IsoClean coveralls and accessories can be beneficial to successful vaccine manufacturing.



### Operators and Cleanroom Contamination

Operators are the main source of contamination in cleanrooms. While contamination cannot be wholly eliminated, levels can be significantly reduced through training and impeccable hygiene.

The proper use of cleanroom garments can prevent particle contamination by acting as a barrier between operators and the production environment. The 2020 draft of the Good Manufacturing

Practice (GMP) guidelines Annex 1 states that “cleanroom garments should retain particulates shed by the body.” Sufficient cleanroom clothing is therefore required during most steps of the vaccine manufacturing process to prevent contamination, maintain patient safety, and protect employees.



### Advantages of Tyvek Fabric

For over 20 years, Tyvek and Tyvek IsoClean garments have been used extensively in vaccine manufacturing because of their fabric, design, and dependable performance. Tyvek is made from high-density polyethylene filaments that are thermally bonded into a tight, homogeneous, and soft breathable fabric with low-linting and strong barrier properties. This unique combination of barrier protection and breathability makes Tyvek suitable for cleanroom environments and meets GMP standards. Additionally, Tyvek fabric offers operator protection against chemicals and biological substances.

### Cleanroom and Production Protection

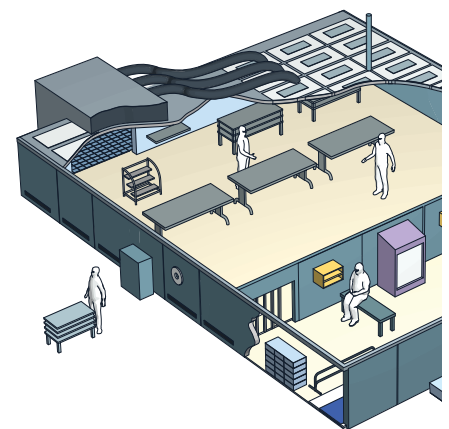
- Suitable for ISO Class 4-9, GMP A/B, C/D, and other cleanroom types
- Operator-generated contamination barriers (bacterial and particle filtration efficiency)
- Low particle release
- Available in clean-processed and sterile options

### Operator Protection

- Repels aqueous liquids and liquid aerosols
- Provides biological barrier protection
- Two-way particle barrier
- Tear- and abrasion-resistant

### Operator Comfort

- Lightweight and soft
- Breathable
- Apparel designed based on workplace demands
- Specific donning and doffing procedures



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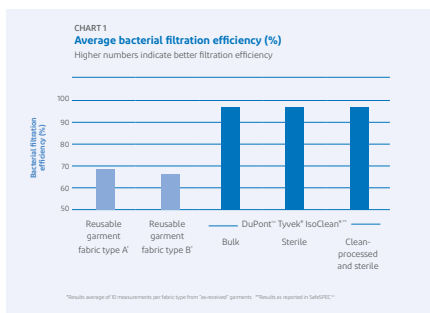


## Compliance with QRM and GMP Annex 1

GMP Annex 1 (2020 draft) anticipates that all pharmaceutical manufacturing activities will be governed by quality risk management (QRM) principles as documented in the contamination control strategy (CCS).

This proactive approach means it is not enough to simply react to and correct detected contamination. Manufacturers will be expected to identify potential quality risks and implement technical and procedural means to control risk and enact continuous improvements.

Cleanroom garment systems are a critical part of sterile and aseptic manufacturing. They must be managed under QRM principles to ensure GMP compliance and, ultimately, patient safety. Vaccine manufacturing involves a number of manual interventions that can result in a risk to operators. Manufacturers are required by the Occupational Safety and Health Administration (OSHA) to equip operators with appropriate PPE based on the assessment of risk to their health and safety.



## Consistent Performance

Regulators expect vaccine manufacturers to keep vaccines free from contaminants

at all times, and operators rely on the barrier performance of their cleanroom garments. Tyvek IsoClean sterile cleanroom garments make contamination control easier. Since IsoClean garments are used only once, they offer consistent performance in Helmke drum tests, particle filtration efficiency, and bacterial filtration efficiency. Reusable cleanroom garments that are washed, dried, and sterilized multiple times vary in performance, which can deteriorate with time and repeated use.

Also, the effects of gamma radiation on the polymer occurs just once for single-use garments, so their properties are more consistent. The average bacterial filtration efficiency of reusable garments is in the 64 to 69 percent range, while the average bacterial filtration efficiency of Tyvek IsoClean single-use garments is typically 98 to 99 percent.



## Peace of Mind

As the manufacturer of both the Tyvek material and sterile IsoClean garments, DuPont controls the supply chain and can provide test data and lot-based certificates of sterility, irradiation, and compliance at multiple points during apparel manufacturing. Qualification and subsequent quality audits can be easier

than with other cleanroom garments that involve several different PET filament manufacturers, fabric weavers, garment manufacturers, and laundries. Managing levels for single-use Tyvek IsoClean garments can also be easier than managing reusable garments that require washing, sterilizing, disinfecting, garment repair and replacement, multiple invoices, and other management steps.

## A Flexible Solution

Vaccine manufacturing companies continue to grow and expand, and manufacturing contracts are rarely synchronized with laundry contracts. Using disposable Tyvek coveralls can offer more flexibility, speed production, and eliminate laundry processes.

Single-use garments offer maximum flexibility and protection for start-ups, small-batch production, single-use reactor production, and manufacturing that requires frequent adaptation and changes. Additionally, Tyvek and IsoClean garments that have not been exposed to hazardous substances can be recycled using the DuPont Tyvek Protective Apparel Recycling Program.

Protect your processes, products, and operators through each step of vaccine manufacturing with single-use, GMP-compliant protective products that offer consistent and reliable performance.

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13-880 Series

Head Configuration	Capacity	Vacuum	Pressure	Motor	Dimensions (L x W x H)	Cat. No.
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Single Stage	40 L/min.	65 torr	15 psig	1/6 hp	13 x 6.5 x 8.5 in.	<b>13-880-16</b>
Two Stage	20 L/min.	6 torr	15 psig	1/6 hp	15 x 6.5 x 8.5 in.	<b>13-880-18</b>
Two Stage	35 L/min.	6 torr	15 psig	1/3 hp	16 x 7 x 9 in.	<b>13-880-20</b>
Two Stage	35 L/min.	1.5 torr	15 psig	1/3 hp	16 x 7 x 9 in.	<b>13-880-22</b>



# Organic Synthesis

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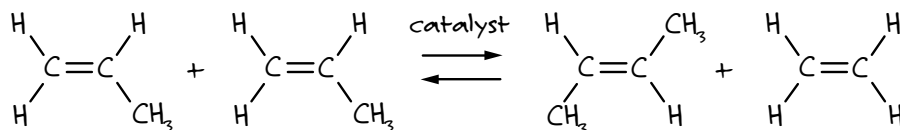


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# Metathesis Method in Organic Synthesis

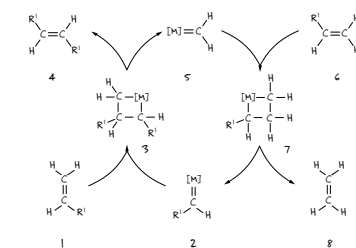
The term “metathesis” is used in linguistics and occurs when two sounds or syllables change place in a word. Why is this term now often heard in the scientific world? What is metathesis in chemistry, and why has it become so important?

Let’s start with the example reported below to explain it.



Scheme 1. Example of metathesis

Scheme 1 is one of the basic types of metathesis, where two double bonds are broken and two new ones are formed in the presence of a catalyst. Metathesis was first observed in the 1950s and was used in industry for the polymerization of olefins, but the catalyst’s function was uncertain. In the first hypothesis, a  $\pi$ -cyclobutane-metal intermediate was formed in the mechanism. Finally, in 1971, Yves Chauvin and Jean-Louis Hérisson proposed the role of a metal carbene to initiate the reaction.<sup>1</sup> After many years, we can now describe the mechanism as reported in Scheme 2. In the first step, alkene **1** reacts with the metal carbene **2** to give cyclic intermediate **3**; single bonds are broken to form the product alkene **4** and the new metal carbene **5**. The latter reacts with the second alkene **6** to give the new metallocyclobutane **7** that will reform the starting metal carbene **2** and produce ethylene **8**.



Scheme 2. Mechanism proposed by Chauvin and Hérisson

The reaction shown in Scheme 2 is known as cross metathesis (CM) when two different olefins are involved. Other types of metathesis are:

- Ring Opening Metathesis Polymerization (ROMP), where cyclic olefins are opened to give a corresponding polymer
- Ring Closing Metathesis (RCM), the opposite of ROMP, where two double bonds in the same molecule react to give a cyclic olefin and ethylene
- Acyclic Diene Metathesis Polymerization (ADMET), where acyclic dienes polymerize to give a polyene

Over the years, many researchers were actively involved in the study of metathesis reactions, and in 2005, Yves Chauvin, Richard R. Schrock, and Robert H. Grubbs were recognized for their

important contributions with the Nobel Prize in Chemistry “for the development of the metathesis method in organic synthesis.”<sup>2</sup>

Firstly, Schrock tried different metal catalysts and, in 1990, proposed a molybdenum catalyst **9** for olefin metathesis.<sup>3</sup> Schrock worked later with A. H. Hoveyda to synthesize a chiral catalyst for catalytic asymmetric metathesis.<sup>4</sup> Then, in 1992, Robert Grubbs discovered the first ruthenium-based catalyst **10** with a higher selectivity but a lower reactivity than molybdenum catalyst **9**.<sup>5</sup> Subsequently, Grubbs developed the air-stable catalyst **11**, which became known as the first generation Grubbs catalyst, a real milestone in the development of this type of chemistry.<sup>6</sup>

The first stage of the proposed reaction mechanism (for catalyst **11**) involves the dissociation of one of the phosphine ligands to give a 14-electron intermediate.<sup>7</sup> In general, the faster the rate of phosphine dissociation, the higher the catalyst activity. This is an important consideration when designing new ruthenium-based metathesis catalysts. Two factors that promote phosphine dissociation are:

- Using electron-donating (non-halide) ligands that stabilize the 14-electron intermediate
- Use of bulky ligands that crowd and destabilize the complex

These characteristics are typical of the N-heterocyclic ligands that were used in the second generation Grubbs catalyst

to replace one tricyclohexylphosphine (compound 12).<sup>8</sup> Although compound 12 demonstrated a significantly higher metathesis activity, it was observed that phosphine dissociation was slower than for compound 11. The improvement in the activity of 12 was attributed to a higher affinity for the olefin substrate compared to catalyst 11 after dissociation had occurred.

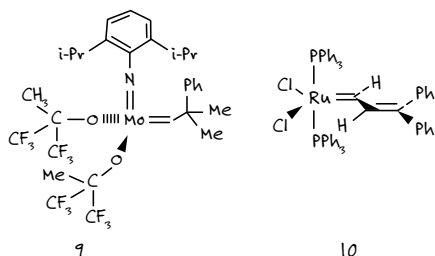


Image 1. Schrock (9) and Grubbs (10,11,12) catalysts.

Grubbs' research continued with the development of further ruthenium-based catalysts that established metathesis chemistry's role in several commercial applications.

The second Generation Hoveyda-Grubbs Catalyst, for example, has similar activity to the second Generation Grubbs Catalyst, but it initiates the reaction at lower temperatures and is easier to store.

Metathesis has played and continues to play an important role in academic research and is used in pharmaceuticals and biotechnology applications and in developing polymeric materials. Because the literature describes so many metathesis applications, it is not possible to list all of them here (some examples are the coupling of olefins with  $\alpha,\beta$ -unsaturated carbonyls, or the synthesis of  $\alpha,\beta$ -unsaturated amides).<sup>9, 10</sup>

An interesting example is the synthesis of bottlebrush copolymers using the ROMP method and the Grubbs third generation catalyst (Image 2).

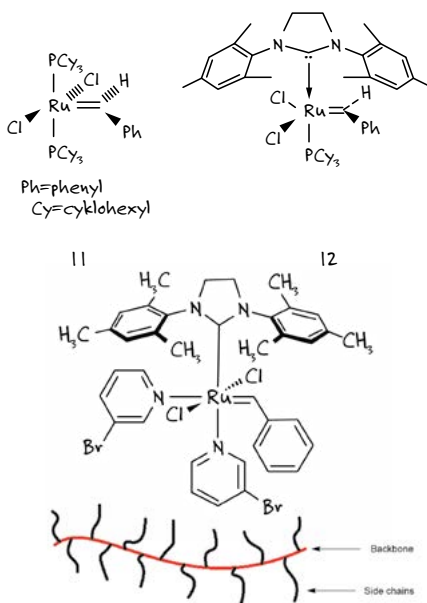


Image 2. Grubbs third generation catalyst (on the left) and a scheme of a bottlebrush (on the right)

A bottlebrush polymer consists of a main polymeric chain (backbone) containing polymeric side branches.<sup>11</sup> Two, or more, different side chains can be attached to a backbone providing access to copolymers with unique architectures that possess novel and potentially useful properties. The main chains are usually norbornene polymers due to the high polymerization rate and commercial availability of the monomers. Poly(ethylene oxide) side chains have been used for drug delivery studies, tumor targeting, and in battery research.

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# Modernizing Benchtop Centrifugation

Centrifugation has come a long way since the 19th century, when the first centrifuge-type machine was invented to separate cream from milk in dairies. Scientists quickly found other uses for centrifuges in the laboratory and innovations occurred rapidly. In 1964, Eppendorf launched the first microcentrifuge — the Centrifuge 3200 — as part of the Eppendorf Microliter System, which revolutionized global life sciences research.

## Modern Centrifuge Operation

In modern labs, large benchtop centrifuges are often shared among

users with different applications and requirements. They can also require multiple rotors, buckets, and adapters to handle various vessels. Valuable time may be spent changing rotors and other accessories, and these extra components also consume valuable storage space.

Shared centrifuges means that parameters must be reset or checked before every run. User inexperience and fast-paced environments can lead to mistakes, like incorrect speed settings or braking ramps. Such errors can result in sample loss or the need to repeat the run.

Labs are also becoming increasingly digital — paper lab notebooks and other forms of manual documentation are being

replaced with software systems that track data electronically. Users can now filter information and export only the data that's relevant to them. Data can often be downloaded via USB (in PDF or CSV format) or run through a software like eLabJournal, an integrated solution for data, sample, and protocol management.

## The Eppendorf 5910 Ri Centrifuge Option

The unique universal rotor concept of the Centrifuge 5910 Ri greatly reduces the need for extra buckets and adapters. The swinging-bucket rotor accommodates conical tubes, microplates, and 250 mL



The Eppendorf Microliter System in 1964 included the Centrifuge 3200 (shown on the left).



The unique favorites function of the Eppendorf Centrifuge 5910 Ri enables programming in just three clicks.

bottles without the need to change rotors, buckets, or adapters. Choose optional fixed angle rotors for applications that require speeds up to 22,132 x g.

When developing the 5910 Ri model, Eppendorf focused on operation practicalities and incorporated customer feedback, including a System Usability Scale (SUS) to assess overall ease of use. The SUS (<https://measuringu.com/sus>) questionnaire rates usability on a scale of zero to 100. The average SUS score for centrifuges is around 68, but the 5910 Ri had a final score of 93, which is well above average.

The four most frequently used values for time, speed, and temperature are

saved in a single screen, which lets you program your run with just three clicks. Save protocols using specific names, like “Pelleting E. coli” to help avoid errors and save time.

The 5910 Ri offers three-level user management and documentation options for GxP/GLP compliance. It automatically captures run details: time, temperature, speed, whether the run was stopped manually, program used, user ID, and much more for up to 1,000 protocols. Data can be exported via USB in PDF or CSV format.

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## Fit for the Future

The Eppendorf 5910 Ri Centrifuge combines versatility and a range of applications with easy and efficient operation. Detailed onboard run documentation supports GxP/GLP compliance and easily exportable data integrates seamlessly with your lab management software.

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The Eppendorf Centrifuge 5910 Ri benchtop centrifuge provides the versatility and efficiency needed in modern labs.



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- Conventional Mass Value
- True Mass Value in Vacuum
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# Reducing the Sugar in Packaged Foods Could Save Lives

By Iva Fedorka

According to a study published in the journal *Circulation* in 2021, reducing the sugar content of packaged foods by one-fifth and in beverages by 40 percent could prevent 2,480,000 strokes, heart attacks, and cardiac arrests; 490,000 cardiovascular deaths; and 750,000 cases of diabetes in the United States over the lifetime of living adults (ages 35 to 79).

## About the Study

Researchers from Massachusetts General Hospital (MGH), the Tufts University Friedman School of Nutrition Science & Policy, T.H. Chan School of Public Health at Harvard, and the New York City Department of Health and Mental Hygiene (NYC DOH) collaborated to create a simulation model to explore the effects of these changes.

The model was designed to quantify the health, economic, and equity impacts of a sugar-reduction policy proposed by the U.S. National Salt and Sugar Reduction Initiative (NSSRI). In 2018, this partnership of over 100 local, state, and national health organizations released targets for reducing sugar in 15 categories of packaged foods and beverages.

## Voluntary Compliance or Policy

In February 2021, the policy for voluntary product reformulations by manufacturers was finalized. The study participants hope that the model will help create more awareness of and lay the groundwork for the production of foods and beverages that contain significantly less sugar.

Of course, an official national policy would require legislation that specified ways to monitor and report on the progress of food and beverage companies. Nevertheless, reducing sugar in commercially prepared foods and drinks is expected to have more health impact than a tax on sugar, sugar content labeling, or even barring sugary drinks in schools.

## Potential Outcomes and Benefits

If the NSSRI policy remains in effect for 10 years, the model projects savings of \$4.28 billion in total net healthcare costs and \$118.04 billion over the adult population's lifetime. Add in the costs of lost productivity from sugar-related diseases, the savings rise to \$160.88 billion.

Achieving the NSSRI targets could increase quality-of-life years (QALYs) by 6.67 million and save \$160.88 billion in societal net costs. Projections predict cost-effectiveness in six years and cost-savings starting at nine years. In fact, the use of more

conservative figures may be underestimating the potential financial benefits.

## Conclusions

The regular consumption of high-sugar foods and beverages is linked to weight gain, obesity, Type 2 diabetes, heart disease, and other cardiovascular issues. Almost a third of U.S. adults are obese, half are diabetic or prediabetic, and almost half have some type of cardiovascular disease.

The United Kingdom, Norway, and Singapore have led the sugar-reformulation efforts to date. Product changes in the U.S. have successfully reduced trans fats, sodium, and other harmful ingredients from foods, but no specific sugar-reduction efforts have been made.

Implementing and achieving the NSSRI sugar reformation targets could produce substantial health gains, equity gains, and cost-savings in less than a decade.

*Iva Fedorka is a Thermo Fisher Scientific staff writer.*



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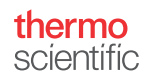
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FEATURED ARTICLE

# Keeping Your Water Pure and Your Results Reliable

By Kylie Wolfe

What's the one thing you can't live without? Water and its simple chemical formula aids our body's complex systems. It keeps our cells alive and internal temperature in check. It's a large part of what makes Earth inhabitable — because without it, we couldn't survive more than a few days.

“We drink it, we bathe in it, we use it to clean,” said Kim Knepper, water service product specialist at Thermo Fisher Scientific. “It's a staple in our lives and very universal for laboratory work as well.”

Water is an essential part of the lab, but it can be a source of contamination, too. Catching contamination early and maintaining your water's purity can help you achieve the most accurate results. Whether your water is used for general purposes, analytical testing, or life sciences applications, it's important to remove impurities before they become problems.

## Setting Standards

While there are many sources of error in a lab experiment, there's one you can control from the start. Don't let water negatively affect your work — use the following information to help you set standards for water purification and use.

**Run water through your system first.** When you dispense water from your purification system, make sure it's displaying the proper purity for your application. You should also discard the first water dispensed from the system and avoid adding additional tubing to the filter. Ideally, the water you use should come directly from the system.

Knepper recommends discarding the first liter of water, especially if it hasn't been in use for eight or more hours, to “flush the point-of-use filter [and get rid of] any potential impurities that have collected from the atmosphere.” Throughout the day, you only need to dispose of the first 50 to 100 milliliters.

**Always empty water that's been sitting.** If you refill a container with purified water, always empty it before adding new water. Do not top it off. Contaminants can accumulate in water that's been exposed to the air.

“Think about your drinking water bottle,” said Knepper. “When you're constantly drinking out of it, and you leave some water behind, then you refill it again, you have a little bit of stale water still in there. Eventually the water does not taste as fresh. As a best practice, people should dump out

their old water before they refill with fresh drinking water — same thing with the water in a container in the lab.”

**Use the right kind of bottle.** There are different bottle materials, and they serve different purposes. Depending on your application, make an informed decision between plastic and glass before beginning a new experiment.

“Pure water is not its natural state, and it will absorb anything it can back into it — including CO<sub>2</sub> from the air, vapors, and anything that can be leached from the bottle,” said Knepper. “Therefore, if the application is sensitive to organics, use a glass bottle for storage. If the application is sensitive to ions, use a plastic bottle made of inert materials.”

**Maintain your water system.** Replace filters and cartridges regularly to make sure you're dispensing water at the level of quality you expect. This will help ensure that water is not a source of error in your experiments.

“It's no different than changing an oil filter in your car and checking your belts. You want to do the same thing with your water system to ensure it's able to give you purified water when you need it,” said Knepper.

## Acknowledging Impurities

Impurities can range from undesired chemicals to microbial contaminants. Some of the most common include suspended particles, colloids, and inorganic ions. The presence of these contaminants can interfere with instrument operation, clog filters, disrupt ion exchange, and affect cartridge life.

These impurities also come from a variety of places. In the lab, cleaning supplies, gloves, furniture, and even skin can contribute. That's why it's especially important to evaluate the quality of your water before you begin an experiment. This requires the right water purification system and proper maintenance — critical steps for your scientific research.



## Keeping Your Water Pure and Your Results Reliable

### Selecting a Water Purification System

When selecting a water purification system or method, it's helpful to understand your water source, its contents, and how its impurities can impact your experiments. Consider the amount of water you use and how you'll be using it. The acronym FAVOR can help you make this assessment.

**F – Feed:** What is your water source? There are varying levels of water quality, so you should understand what you're feeding your system, including the types of impurities you need to address.

**A – Application:** What will you be doing with the water? List your most critical applications and determine which impurities they'll be most sensitive to. The system you choose should be able to address those concerns.

**V – Volume:** How much water do you use each day or week? Knowing this answer will help you determine the size of the system needed to keep up with your demand. It'll also save you from waiting to purify additional water.

**O – Orientation:** Where do you plan to set up your system? There are different kinds of units, some that can hang on the wall and others that can sit on your benchtop. Knowing where you'd like to place your unit is a great next step.

**R – Replacement:** What works well for your lab and what doesn't? If you've used water systems in the past, you might have an idea of what you liked or did not like. This will help you zero in on your new system.

### Understanding Types of Water

There are so many ways to use water in the lab. Maybe you use it to dilute samples, provide a baseline for analyses, rinse glassware, or fill water baths and incubators. Because of this, there are varying levels of purity to keep in mind.

According to the American Society for Testing and Materials (ASTM), there are three main classifications of water: Type I, Type II, and Type III. They are distinct because of varying levels of resistivity, total organic carbon, sodium, chloride, and silica. Based on these values, each water type is suited for a particular application.

**Type I** water systems remove a large range of impurities, resulting in the highest purity water. It's best to use Type I water, also known as ultrapure, for critical analytical and molecular applications like cell culture, chromatography, and mass spectrometry.

**Type II** water is often used in clinical analyzers, instrument feeds, electrochemistry applications, and sample dilution. It can be added to buffers, media, and reagents and used as a source for Type I systems. Although it isn't considered ultrapure, it's still pure enough for routine applications.

**Type III** water is less pure but the most common. It can be used to feed Type I and Type II water sources or prepare for other lab tasks. Type III water serves a much more general purpose and should be reserved for non-critical applications like glassware washers and autoclaves.

### Taking Action

Prioritizing water quality can help you take your results to a new level of accuracy. Make sure to set and follow standards for water purification and use in your lab. This can include rinsing your point-of-use filters and containers and scheduling preventative maintenance. Keep track of the types of impurities you see in your water source and understand which ones need to be filtered out for your applications.

Knowing this information will help you choose the water system that's right for your research. Even though water can be a source of contamination, it's also an essential component of your work. Have confidence in its purity with the right systems and standards, keeping water at the center of your science every day.

*This content was inspired, in part, by "Contamination in a Microbiological Laboratory," International Journal of Research Studies in Biosciences, 2018; "Detecting and Managing Water Contaminants in the Laboratory," Labcompare, October 2014; "There is Something in the Water," Life in the Lab, August 2018; and "Review of The Impact of Water Quality on Reliable Laboratory Testing and Correlation with Purification Techniques," Laboratory Medicine, November 2014.*

*Kylie Wolfe is a Thermo Fisher Scientific staff writer.*

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# Managing and Growing Supplier Diversity Spending

## Meet Your Funding Objectives and Help Build a Better World

By Mark Miller

A robust supplier diversity program that includes best practices for meeting diverse spending goals is critical to complying with U.S. federal subcontracting requirements and securing contracts and FDA approvals. But an effective program and spending plan can do more — a lot more.

### Understanding Requirements

If your lab or research facility has a contract with the U.S. federal government that exceeds \$750,000, you are required to subcontract with small, diverse-owned businesses. Subcontracting plans are approved by agencies such as the General Services Administration (GSA), the United States Department of Veterans Affairs (VA), and the Food and Drug Administration (FDA). Failure to make good faith efforts of an approved plan can result in the termination of current contracts and loss of opportunities for future contracts. Certain state and local government agencies may also have subcontracting requirements.

In Canada, the national government has launched a Supplier Diversity Action plan that outlines concrete steps to increase the participation of businesses from underrepresented groups in federal procurement.

### Defining Diverse

In the U.S., diverse-owned businesses, or diverse suppliers, are defined as at least 51 percent owned by a person from a diverse category. This includes ethnic minorities, Native Americans, women, LGBTQ, disabled persons, veterans and service-disabled veterans, businesses in historically underutilized business (HUB) zones, and small business enterprises. Because many of these are small businesses, federal agencies work through the Small Business Administration (SBA) or their own small business offices to help ensure that diverse suppliers receive contracts and spending targets are met.

#### **Diverse suppliers are grouped into two tiers:**

- Tier 1 suppliers are those with whom you work directly
- Tier 2 suppliers supply the Tier 1 suppliers — in other words, they are two steps removed from your purchasing organization

### Tracking Your Spending

Key to developing an effective, sustainable program is tracking and measuring your diversity spending. By following some proven procedures and practices, you can manage and grow your diversity supply chain to help secure federal funding and approvals.

**Create Cross-Functional Teams:** Connect and communicate with management, procurement, and other related departments about your spending goals. Gain agreement across teams for spending targets and align them with the overall diversity and inclusion initiatives of your organization.

**Capture Data:** Put systems in place to identify and categorize Tier 1 and Tier 2 suppliers and capture spending associated with each. Keep the data current and make information available to cross-functional teams.

**Observe and Report:** Use your data to generate quarterly reports and review them with the appropriate teams. Reports should, at minimum, tell you whether spending is below, on target with, or above your goals.

**Look Forward:** Communicate with and receive updates from the contacts and agencies involved in your program. Join and participate in business resource groups representing diversity categories to gain insights and forecast trends.

**Pick the Right Partners:** Your Tier 1 suppliers should understand your diversity spending objectives and be able to recommend Tier 2 vendors aligned with your goals. This relationship is vital to growing your diversity spending and staying compliant.

### Greater Good

Diversifying your supply chain is good for diverse-owned businesses, but it's also good for your organization, the business community, and society as a whole.

An effective program can help you embrace innovation faster through new ideas from small, agile businesses. You can also broaden your sources for distinct needs to improve quality and lower costs.

Most importantly, a more diverse supply chain contributes to the success of more businesses and improves the financial health of underserved communities. It creates jobs and acts as a powerful tool for developing more diverse business ecosystems. These effects ultimately make for stronger, more inclusive societies whose members and businesses enjoy greater economic equity.

*At Thermo Fisher Scientific, diversity is part of how we work with our suppliers every day. It's a source of innovation and competitive advantage and a central part of our Mission: to enable our customers to make the world healthier, cleaner and safer.*

*In the U.S., visit [fishersci.com/supplier-diversity](https://fishersci.com/supplier-diversity) to learn how the Fisher Scientific channel can help customize a diversity spending plan for you.*

*Mark Miller is a Thermo Fisher Scientific staff writer.*

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N 96	Filtration, SPE, Aspiration	97.5 torr, 130 mbar	7 L/min.	No	No	<b>13-880-904</b>
N 820 G	Rotary Evaporation, Degassing, Fluid Aspiration, Centrifugal Concentration, Vacuum Oven, Gel Drying	4.5 torr, 6 mbar	20 L/min.	Yes	Yes	<b>13-880-905</b>
N 840 G	Rotary Evaporation, Filtration, Centrifugal Concentration, Vacuum Oven	4.5 torr, 6 mbar	34 L/min.	Yes	Yes	<b>13-880-906</b>

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## Invitrogen Transfection Reagents

Expertise in cellular and molecular biology is behind the Invitrogen product portfolio, the most cited and trusted transfection and selection systems available. To address the expanding demands of researchers, Thermo Fisher Scientific designed the family of lipid-based Invitrogen Lipofectamine transfection reagent solutions for effective and efficient nucleic acid delivery into both traditional and difficult-to-transfect cell lines and transient transfection in suspension cultures. Similarly, the Invitrogen Neon Transfection System has been shown to successfully electroporate over 140 different cell types, offering an efficient, flexible, and simple alternative to lipid-based reagents when needed.

# Safer Laboratory Glassware Handling

We all share the common experience of breaking a wine glass or a coffee cup. But in the lab, damage from broken glass can have much greater consequences than spilling your favorite merlot on your new shoes.

For example, if a flask breaks, there's a risk of getting cut. And if the flask contains dangerous contents, that risk extends to nearby personnel through splash, vapors, fire risk, equipment damage, and more.

You can better address these risks by understanding the various types of glass and their use, care, and safe disposal practices. It is recommended that you implement a proper glass safety standard operating procedure (SOP) to strengthen lab safety, mitigate risk, and help avoid financial loss. Unfortunately, consideration of financial loss sometimes occurs only after an accident occurs. So how do you get started?

## Regulatory Standards

A major difference between consumer and laboratory glassware involves standards, regulations, and practices for manufacture and use. Lab glassware has purity and calibration requirements, should be handled to reduce thermal stress, and requires proper cleaning. In regulated labs, your records of the physical inspection of glassware for proper function and conformance will be reviewed by inspectors.

ASTM International (formerly the American Society of Testing & Materials) is a global organization that helps establish standards for the manufacture of laboratory glassware, including materials, testing, calibration, and other manufacturing procedures. For example, ASTM Method E671 sets limits on acceptable thermal stress levels for annealed glass and offers guidelines for testing, calibration, and maintenance.

Regulatory authorities that follow ASTM standards include the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the U.S. Food and Drug Administration (FDA), the AOAC (formerly the Association of Official Agricultural Chemists), and the U.S. National Institute of Standards and Technology (NIST), among others.

Make sure the manufacturer of your lab glassware complies with these standards for safety, purity, and performance.

## Types of Laboratory Glass

In the laboratory, soda lime and borosilicate glass predominate. Soda lime glass is used mostly for jars and containers and cannot be autoclaved (sterilized). Borosilicate glass is formulated to withstand thermal shock, can be autoclaved, and resists breakage.

Awareness and understanding of glass differences are critical. Analytical and chromatography glassware should be either Type 33 or 51 borosilicate

glass. Never autoclave glass unless the manufacturer indicates it is safe to do so.

## Application Considerations

Factors such as a chemical attack, sample-glass interactions, thickness, content photosensitivity, washing solvents, and calibration are also important when choosing the right glass type for a procedure.

## Life Cycle Management

Life cycle management includes the regular inspection and proper maintenance of reusable glassware. The human eye cannot detect some indications of stress — by the time scratches, scrapes, and damage are visible, it's too late.

Alan Arnold Griffith, an English engineer, studied glass stress and fracture. In the 1920s, he discovered what are known as Griffith Flaws, which are introduced by the mechanical stress of day-to-day laboratory use and improper uses like scratching, flexing, bending, and dropping.

Use a polariscope periodically to inspect your glassware for signs of damage. Inspect and dispose of stressed glass to help prevent injuries and collateral damage.

You may also opt to simply replace your glassware on a scheduled basis. If you use serialized or color-coded glassware, you can track usage, or change colors after a span

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of two or three years. For maximum risk prevention, use safety-coated bottles that help contain the contents if the glass breaks.

## Glassware Safety Innovations

DWK continues to improve the performance and safe handling of laboratory glassware by making modifications to strength, handling ease, spill protection, and protecting samples from ultraviolet light exposure.

**Kimble KimCote:** Made from borosilicate glass and coated on the outside with clear or amber-colored steam-autoclavable plastic. The plastic layer helps to temporarily protect you from broken glass and hazardous liquids if the glass vessel breaks and provides a non-slip surface for wet or dry handling.

**Kimble ULTRA-WARE:** HPLC reservoirs and caps for chromatography mobile phases, with glassware adaptations for separation applications.\*

**DURAN pressure plus+:** Bottles designed using a modified geometry to withstand the pressure differentials of vacuum or pressure applications.\*

**Kimble RAY-SORB:** Glassware with a consistent, durable, and uniform external coating that provides UV protection for photolabile and photosensitive materials. Protects contents from short-length light waves — less than 1% transmission below 400 nm and approximately 5% transmission from 400 to 600 nm.

\*Also available with KimCote

## Before an Accident Occurs

Ask yourself these questions now, before accidents happen:

- What issues are we experiencing with routine daily use or improper cleaning or handling?
- How are we reducing or increasing Griffith Flaws during use?
- Do our SOPs for glass usage include calibration, replacement, and disposal?

A well-designed and implemented SOP helps limit your financial loss, improve lab

operations, mitigate injuries, and avoid regulatory discretions.

Now that you understand more about the risks, take action. Try the free DWK Life Sciences on-site or webinar-based Glassware Safety Training. Contact your Fisher Scientific sales representative to schedule your training session.

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- Modes: normal, pulse, sweep, and de-gas
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Model	Capacity	Cat. No.
FB-11201	2.75 L (0.7 gal.)	<b>FB11201</b>
FB-11203	5.75 L (1.5 gal.)	<b>FB11203</b>
FB-11206	6.9 L (1.8 gal.)	<b>FB11205</b>
FB-11207	12.75 L (3.3 gal.)	<b>FB11207</b>
FB-11209	18 L (4.75 gal.)	<b>FB11209</b>
FB-11211	29 L (7.3 gal.)	<b>FB11211</b>

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







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# The Air We Breathe in the Office May Be Affecting Our Productivity

By Gina Wynn

Among other things, the COVID-19 pandemic has caused us to pay more attention to the air we breathe. Although recent concerns have been focused primarily on stopping the spread of COVID-19 throughout indoor spaces, what many don't realize is that there are other toxins that circulate through indoor air that can be just as dangerous, including emissions from drywall, carpet, and paint, flame-retardant chemicals on furniture fabrics, and CO<sub>2</sub> exhaled by building occupants.

A group of researchers from the Harvard T.H. Chan School of Public Health led a study to learn the effects such indoor pollutants have on office workers. They found that poor air quality impacted their cognitive function, reducing participants' response times, their ability to focus, and most likely, their productivity. The results were published in *Environmental Research Letters* on September 9, 2021, in the article "Associations between acute exposures to PM<sub>2.5</sub> and carbon dioxide indoors and cognitive function in office workers: a multicountry longitudinal prospective observational study."

"The world is rightly focused on COVID-19, and strategies like better ventilation and filtration are key to slowing infectious disease transmission indoors," said Joseph Allen, according to a Harvard School of Public Health press release. Allen is an associate professor of exposure assessment science and senior author on the study. "Our research consistently finds that the value proposition of these strategies extends to cognitive function and productivity of workers, making healthy buildings foundational to public health and business strategy moving forward."

## Real-World Analysis

For their study, the researchers gathered data from 300 office workers in urban commercial buildings in the United Kingdom, the United States, China, India, Mexico, and Thailand. Ranging in age from 18 to 65, the participants represented a variety of fields, including engineering, real estate investment, architecture, and technology. They all worked at least three days a week in the office at a permanent workstation.

Using environmental sensors placed in each participant's workspace, the team was able to monitor the concentrations of fine particulate matter — less than 2.5 microns or PM<sub>2.5</sub> — temperature, CO<sub>2</sub>, and relative humidity in those areas. At scheduled times or when the sensors detected levels of PM<sub>2.5</sub> and CO<sub>2</sub> higher or lower than predetermined thresholds, participants took cognitive tests and completed surveys through custom-designed apps on their phones.

After a year of evaluation, the results revealed that response times and accuracy typically decreased when concentrations of PM<sub>2.5</sub> and CO<sub>2</sub> levels increased. The researchers pointed out that participant scores showed impaired cognitive function when PM<sub>2.5</sub> and CO<sub>2</sub> reached levels that are commonly recorded in the workplace.

## Implications for Public Health

For office workers, these findings mean that their well-being could be in jeopardy. Many spend more than 90 percent of their time indoors, according to the *Journal of Environmental Health Science and Engineering* article "The effect of indoor office environment on the work performance, health and well-being of office workers."

When toxins get circulated through ventilation systems in modern airtight, energy-efficient buildings, inhabitants can experience "sick building syndrome" that includes symptoms like headaches, itchy eyes, and fatigue. If you have ever struggled to pay attention during meetings in stuffy conference rooms with no windows and ventilation, you were most likely exposed to high levels of CO<sub>2</sub>.

We can do away with these scenarios and make buildings healthier by improving ventilation that brings in outside air, filtering pollutants from indoor and outdoor air, and choosing to purchase non-toxic furnishings, paints, carpets, and cleaning supplies. By prioritizing occupant health, higher rates of productivity are likely to follow.

"A tiny sacrifice in energy efficiency through improved ventilation could increase a business's bottom line by as much as 10 percent by decreasing absenteeism and boosting worker productivity," according to the *Science* article "The Air Investigator" by Douglas Starr that was citing a statistic from Allen's research.

## Air Purifiers for Filtration

Air filtration is also important for maintaining healthy buildings. It can help remove harmful particulates from recirculated interior air. For removing particulates 2.5 microns or smaller, choose a unit with a Minimum Efficiency Reporting Value (MERV) rating of at least 8, which can remove up to 20 percent of PM<sub>2.5</sub>. To remove up to 90 percent of PM<sub>2.5</sub>, the filter should have a MERV rating of at least 14, according to the MERV rating chart on the U.S. Environmental Protection Agency website.

HEPA filters are also popular and can remove particulates larger than 3 microns that cause asthma and allergies, including pollen, dust mites, and pet dander. They can also help reduce exposure to some bacteria and airborne viruses such as the flu and SARS-CoV-2 (but won't completely remove them from the air). For removing chemical contaminants found in cleaning agents, air purifiers with activated carbon can help trap chemical pollutants.

The Parker CRYSTAL-AIRE™<sub>uv</sub> Air Purifier is an example of an indoor air filtration system that includes a MERV 8 pre-filter and a HEPA filter.

An unexpected result of the pandemic is that it has already prompted more businesses and property owners to purchase and upgrade their air filtration systems. Perhaps they have realized that by improving office air quality, they will have a better chance of attracting and retaining workers in a post-pandemic world.

Gina Wynn is a Thermo Fisher Scientific staff writer.

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For more than 30 years, scientists from top labs around the world have counted on BTX, a division of Harvard Bioscience, for cutting-edge electroporation research tools for work in high-throughput cloning, in vivo/in ovo and in utero/ex utero gene delivery as well as for studies involving difficult-to-transfect cells. And BTX is more than just reliable and easy-to-use equipment. We are renowned for our outstanding protocols, application notes and PhD-level technical support.

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# Improved Cellular Analysis Workflows

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Agilent BioTek Lionheart Automated Microscopes offer a compact benchtop platform for fixed and live cell microplate-based assays as well as microscope slides, microfluidic device imaging, and other cell imaging applications and workflows.

Reduce hands-on time and streamline your cell imaging workflows with the Agilent BioTek Lionheart FX automated microscope. The FX offers up to 60x air and 60x and 100x oil immersion magnification and fluorescence, brightfield, color brightfield, and phase contrast illumination.

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## Agilent BioTek Lionheart LX Automated Microscope

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# Successfully Storing Dry Ice

## Sonoco ThermoSafe 2-Cube Containers

### The Challenge

Maintaining a supply of frozen carbon dioxide (CO<sub>2</sub>), or dry ice, is difficult. Dry ice sublimates quickly at ambient or room temperature (+20°C), which is 100 degrees warmer than the temperature of frozen carbon dioxide (-80°C).

Benchtop coolers insulated with expanded polystyrene (EPS) may help but cannot maintain lower temperatures for long, becoming too brittle after only a few uses. Older polyurethane coolers typically lack gaskets and tightly fitting lids, so they also perform poorly. In addition, any humidity inside the coolers quickly condenses on the dry ice, creating an inseparable mass of frozen CO<sub>2</sub> and frozen water (H<sub>2</sub>O).

Since CO<sub>2</sub> sublimates at -80°C and H<sub>2</sub>O changes phases at 0°C, you will likely be holding product at a temperature somewhere and often significantly warmer than -80°C. Depending on the application, the actual dry ice temperature may not be critical but not knowing the temperature can be a problem.

Since current supply chain issues have resulted in long lead times and much higher prices for dry ice, better storage solutions are needed now.

### The ThermoSafe 2-Cube

Sonoco ThermoSafe, a leader in cold chain shipping packaging, has developed a durable insulated container to effectively hold dry ice. Called the “2-cube” because of its 2.0 cubic foot capacity, it can hold approximately 100 pounds of pelleted or two 50-pound blocks of dry ice. Its one-way gasketed lid, combined with a flex draw latch, lets any sublimated CO<sub>2</sub> gas escape while keeping warm air out.

The 2-Cube has a one-piece molded body made from specially formulated, high-impact polyethylene. This material provides enough strength to safely

stack units even when they're full. The polyethylene is easy to clean and maintain and designed to last for at least 10 years. A proprietary blend of polyurethane developed for maximum adhesion to the polyethylene provides high-performance insulation and has an R-value to keep dry ice frozen for a significant time period.

The reusable nature of the 2-Cube and its design help create a more sustainable solution, ultimately saving you money and maintaining the quality of your dry ice.

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# Grind, Lyse, and Homogenize

## Fisherbrand Bead Mill Homogenizers and Tubes

Use Fisherbrand Bead Mill 24 Homogenizers to lyse, pulverize, grind, and homogenize biological samples to prepare them for molecular extraction or protein purification.

- Process up to 24 bead mill tubes simultaneously
- Non-stop processing — no cool-down between runs
- Timed runs from 1 to 99 seconds
- Accessible front-loading tube holder



Find an assortment of pre-filled Fisherbrand tubes that contain bead materials to process softer tissues (brain, liver, kidney, lung, and spleen), plant tissue (leaves, roots, and fruits), whole insects, or cultured cells.

Create your own working bead mill tubes by buying Fisherbrand bulk ceramic or metal beads and reinforced or non-reinforced tubes. Tubes are RNase/DNase free and the attached screw caps have O-rings to help create a tight seal.

Description	Quantity	Cat. No.
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Hard Tissue Grinding Metal Bead Mill Tubes, 2 mL, 2.4 mm Metal Beads	50/Pack	15-340-151
Tough Microorganism Lysing Bead Mill Tubes, 2 mL, 0.5 mm Glass Beads	50/Pack	15-340-152
Soft Tissue Homogenizing Bead Mill Tubes, 2 mL, 1.4 mm Ceramic Beads	50/Pack	15-340-153
Hard Tissue Homogenizing Bead Mill Tubes, 2 mL, 2.8 mm Ceramic Beads	50/Pack	15-340-154
Zirconium Ceramic Oxide Beads, Dia.: 2.8 mm	325 g	15-340-160
Metal Beads, Dia.: 2.4 mm	500 g	15-340-158
Non-Reinforced Bead Mill Tubes, 2 mL, Attached Screw Caps	500/Pack	15-340-161
Reinforced Bead Mill Tubes, 2 mL, Attached Screw Caps	500/Pack	15-340-162



## Sartorius Balance Calibration Services

Get expert laboratory balance calibrations for any brand, make, or model. The Sartorius nationwide field service network and factory-trained technicians can regularly calibrate your instruments to maintain their reliability and help you meet your regulatory requirements.

For a limited time, take advantage of special pricing on Sartorius balance calibration services:

- Basic cleaning
- Calibration performed to Handbook 44 and/or ISO 17025 standards

NOTE: Travel fees may apply. Please contact your Fisher Scientific sales representative for details.

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Offers available in the U.S. only. Restrictions may apply.



Number of Balances	Cat. No.
1 to 5	14557651PM
5 to 20	14557658PM
21 or more	14557659PM
30 (minimum)	14557998PM



## The Electronic Mortar & Pestle

German-engineered mixing machines and jars designed for precision and reliability.

Save time when mixing semi-solids with Samix Machines.

Model	Capacity	Cat. No.
ES500	15 mL to 500 mL	01-184-118
U1000	15 mL to 1,000 mL	01-184-119

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An Exclusive Brand by Medisca



# Full-Range Viscosity Testing



## IKA Works ROTAVISC Viscometers

Use the IKA Works ROTAVISC to measure a range of viscosities from juice drinks to highly viscous pastes. It's available in four versions — lo-vi, me-vi, hi-vi I, and hi-vi II — to measure from 1 to 320,000,000 cSt.

All viscometer packages include an ISO standard spindle set, a protective bracket, and temperature sensor. Choose models with a manual ROTASTAND or the motorized HELISTAND and opt for classic jewel bearings or the more durable SBS steel ball bearing technology.\*

Additional spindles, stands, sensors, and software to help meet your testing and quality control needs are sold separately.

\*No SBS on lo-vi models



Model	Viscosity Range (Cst)	Stand	Cat. No.	Stand	Cat. No.
<b>Jewel Bearings</b>					
lo-vi	1 to 6,000,000	ROTASTAND	<b>01-183-118</b>	HELISTAND	<b>01-183-122</b>
me-vi	100 to 40,000,000	ROTASTAND	<b>01-183-119</b>	HELISTAND	<b>01-183-123</b>
hi-vi I	200 to 80,000,000	ROTASTAND	<b>01-183-120</b>	HELISTAND	<b>01-183-124</b>
hi-vi II	800 to 320,000,000	ROTASTAND	<b>01-183-121</b>	HELISTAND	<b>01-183-125</b>
<b>SBS Bearings</b>					
me-vi	100 to 40,000,000	ROTASTAND	<b>01-183-114</b>	HELISTAND	<b>01-183-117</b>
hi-vi I	200 to 80,000,000	ROTASTAND	<b>01-183-112</b>	HELISTAND	<b>01-183-115</b>
hi-vi II	800 to 320,000,000	ROTASTAND	<b>01-183-113</b>	HELISTAND	<b>01-183-116</b>



## NovaSnap Mop Head

A snap-on, step-release clip action mop head. Simply align and push into place.



Description	Mfr. No.	Cat. No.
Mop Head, Nonsterile	MZNS6-14	<b>19-142-680</b>
Mop Head, Sterile	MZNS6-14IR	<b>19-142-681</b>
Mop Frame Adapter, 360° Swivel, L: 14 in.	QPSL-14	<b>19-035-241</b>
Mop Handle, Plastic-Coated Fiberglass, L: 60 in.	STAH-60WH	<b>18-000-403</b>





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IsoClean<sup>®</sup>

# Superior protection against contamination

Vaccine manufacturing is a challenging and complex process, but choosing the right cleanroom apparel doesn't have to be. DuPont Tyvek IsoClean delivers consistent performance that keeps your processes, products, and operators protected and free from contamination. Lightweight and breathable, Tyvek IsoClean is also designed for comfort in a flexible, single-use garment.

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