LAB REPORTER

Science Innovations and Discoveries

NO. 1, 2022

Science Could Bring Sustainability to Your Table

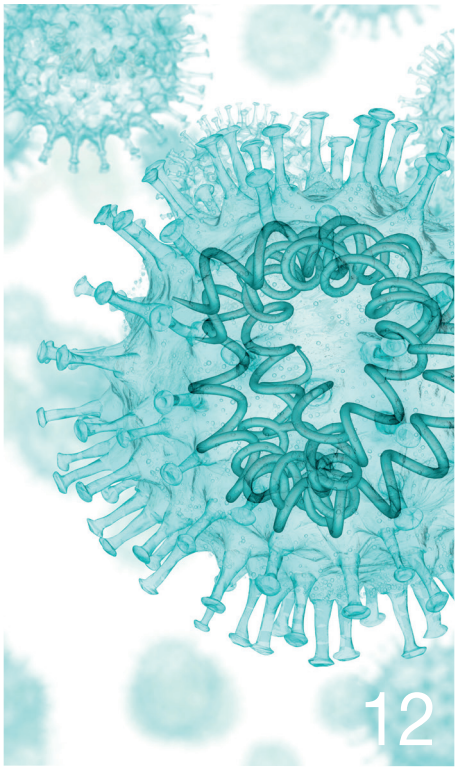
Also Featured:

A **Brighter Future** for Farming and Renewable Energy

A Path Toward a **Universal Coronavirus Vaccine**

Who to Hire? **Labs Staff** Can Affect Publication Output

CONTENTS



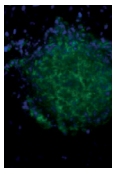
Note: To check pricing, please sign in to your account.

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**

A Brighter Future for Farming and Renewable Energy

By Gina Wynn

Climate change, globalization, and a generation of farmers nearing retirement age are just some of the trends that have driven many farms out of business in recent years. But the increasing use of agrivoltaics is at least one development that more and more farmers view as trending in their favor. The technology could light the way for a new era of renewable energy use, improved water conservation, and the creation of a more sustainable food system.

Agrivoltaics involves growing agricultural crops underneath photovoltaic solar installations. It's a type of low-impact solar development, among others, that the U.S. Department of Energy's National Renewable Energy Lab (NREL) has been studying over the past 10 years. Through its Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE) project, NREL has been investigating the economic and ecological impact of dual land use practices, including pairing solar installations with agricultural crops, native vegetation growth, and pollinator habitats, according to nrel.gov.

A Model for Small Farms

One of about a dozen NREL agrivoltaic sites in the U.S., Jack's Solar Garden in Boulder County, Colorado, has installed rows of 3,200 solar panels on a four-acre field. Around 40 types of plants, including tomatoes, garlic, lettuce, radishes, peppers, beets, and kale grow beneath the panels that are mounted on six- to eight-foot-high posts spaced far enough apart for a tractor to navigate between them.

Former Peace Corps volunteer and U.S. Agency for International Development Natural Resources Officer Byron Kominek owns the 24-acre family farm that had been producing alfalfa and hay for nearly fifty years. When these crops had stopped turning a profit, Kominek saw agrivoltaics as a means of supporting his family while helping the environment. He worked with NREL and researchers from Colorado State University (CSU) to build "a model for other small farms that want to keep their soils productive while taking advantage of the economic benefits that clean energy production can provide," according to the *Solar Power World* article, "Largest agrivoltaic research project in U.S. advances renewable energy while empowering local farmers" by HansenRE.

Worth the Challenge

Switching to agrivoltaics wasn't easy, however. CSU and NREL helped Kominek work with county regulators to change the designation of his land so that he would have approval to install the solar array. Then, to finance the $2 million panels, Kominek had to put his farm and the array up for collateral. But so far, his investment has been paying off, according to the npr.org article "This Colorado 'solar garden' is literally a farm under solar panels."

Kominek and the researchers found that many of the plants under the panels were thriving because of the intermittent shade the structures provided. That shade also helped reduce evaporation of the irrigation water. The water that did evaporate helped cool the baking solar panels and made them work more efficiently.

Because other agrivoltaic farms have recorded the same reduction of water use, western states that have been battling drought have become particularly interested in agrivoltaics. A University of Arizona study showed that some crops grown beneath solar panels needed 50 percent less water. Using less water benefits the environment and also cuts irrigation expenses.

A Cleaner, Greener Energy Source

As for economics, Kominek sells 1.2 megawatts of power back to the local grid, enough to power 300 homes for a year. The ability to generate and sell power provides farmers like Kominek a stable, additional source of income in an unpredictable agriculture industry. In addition, by using solar power to create energy rather than fossil fuels, Kominek is contributing to meeting the country's renewable energy targets.

Now with close to two billion dollars allocated for renewable power through the Bipartisan Infrastructure Deal, the U.S. is aiming to expand renewable energy use, including solar. A recent Oregon State University (OSU) study found that farms could generate 20 percent of U.S. electricity if 1 percent or 13,000 square miles of agricultural land (an area about the size of Maryland) were converted to agrivoltaics, according to today.oregonstate.edu/news.

Also, non-agricultural land for solar development is becoming scarce. By 2030, utility-scale solar could cover almost 2 million acres of land in the U.S., according to NREL.

The advantages of agrivoltaics are clear to researchers. In addition to providing a practical alternative to monopolizing land solely for energy creation or food production, it offers a ray of hope for small to mid-sized farms looking to grow profits.

Gina Wynn is a Thermo Fisher Scientific staff writer.

Optical Clearing for Improved Confocal Imaging of Thick Specimens

Developed almost 70 years ago, confocal microscopy has become a mainstay for imaging fluorescently labeled biological samples. Widefield microscopy illuminates biological samples with a diffuse field of light that excites fluorophores above and below the focal plane of interest, resulting in a blurry, less resolved image. By placing a pinhole in a conjugate focal plane between the sample and the light detector (camera or PMT), confocal microscopy blocks contaminating out-of-focus light, thus improving axial (z) resolution (Figure 1). This improved resolution means that finer z-sections can be taken deeper within thick samples, such as spheroids and resected tissue, and three-dimensional biological relationships can be better elucidated.

Poor image quality and resolution (e.g. signal-to-noise ratio) can result not only from excited out-of-focus fluorophores but also from biological matter such as lipids and proteins. In the latter case, in-focus light diffracts as it travels through the sample, reducing the amount of signal that is detected. This diffractive effect is quantified by the refractive index, which is a measure of how the speed of light is influenced as it passes through a material. Matching the refractive index of the mounting medium and the sample with the microscope optics as close as possible will aid in minimizing diffracted light, which in turn will improve the quality of the image.

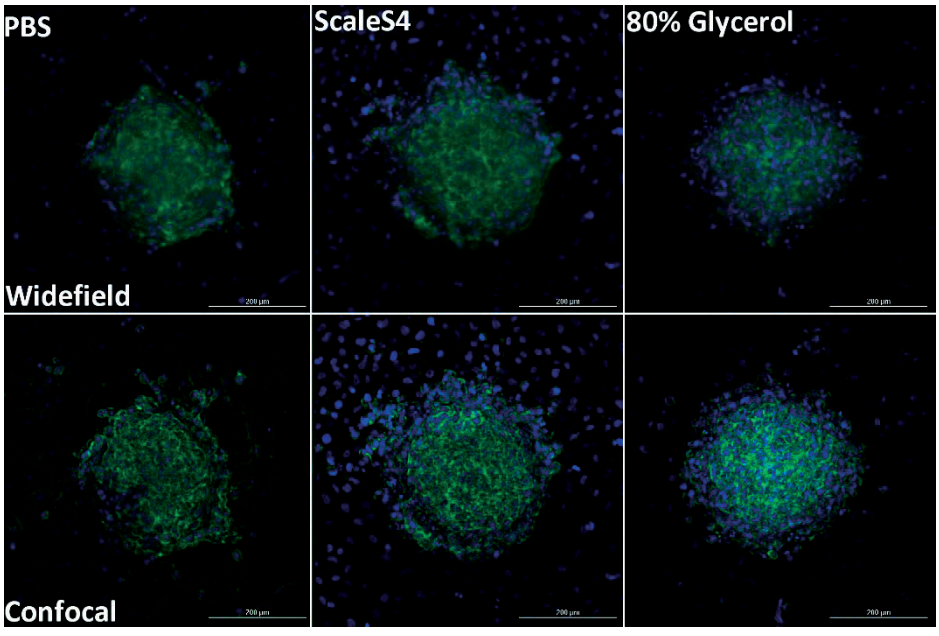


Figure 1. Adhered HT-1080 spheroids. Adhered 1000-cell HT-1080 spheroids were fixed and stained with Hoechst 33342 and Alexa Fluor 488-phalloidin, then buffer (PBS) was either maintained or exchanged for ScaleS4 clearing agent or 80% glycerol. Z-stacks were then captured at 20x (0.45NA) in either widefield or confocal (60 µm disc) mode. Maximum intensity projections of the entire z-stack were then generated.

Many clearing agents and mounting media have been developed to help reduce diffracted light by altering the refractive index of the sample so that they better match the refractive index of the microscope optics. Selecting the most appropriate clearing agent requires consideration of multiple factors, including sample thickness, imaging depth, fluorophore type, and vessel format and material. Some clearing agents function by simply exchanging the primarily water-based intracellular environment with a liquid that has a better-matched refractive index, such as glycerol. Alternatively, some clearing agents improve sample clarity by extracting lipids (delipidation). Clearing agents that simply exchange the intracellular aqueous environment are minimally invasive and tend to favor smaller samples and those where fluorescent proteins are used. While clearing agents that delipidate may improve imaging depth to a greater degree, these agents typically employ harsh detergents and electrophoretic devices to draw lipids away from the sample. Some delipidating clearing agents use organic solvents, which may be incompatible with fluorescent protein-based samples. Additionally, organic solvent-based clearing agents may not be compatible with imaging vessels that use glass alternatives as the imaging window, such as cycloolefin. This technical note describes the use of a refractive index-correcting clearing agent (Figure 2) to improve imaging depth of thick samples such as HT-1080 spheroids.

Sample Preparation for Imaging HT1080 Spheroids

HT-1080 spheroids were formed by seeding 1,000 cells into ultra-low-

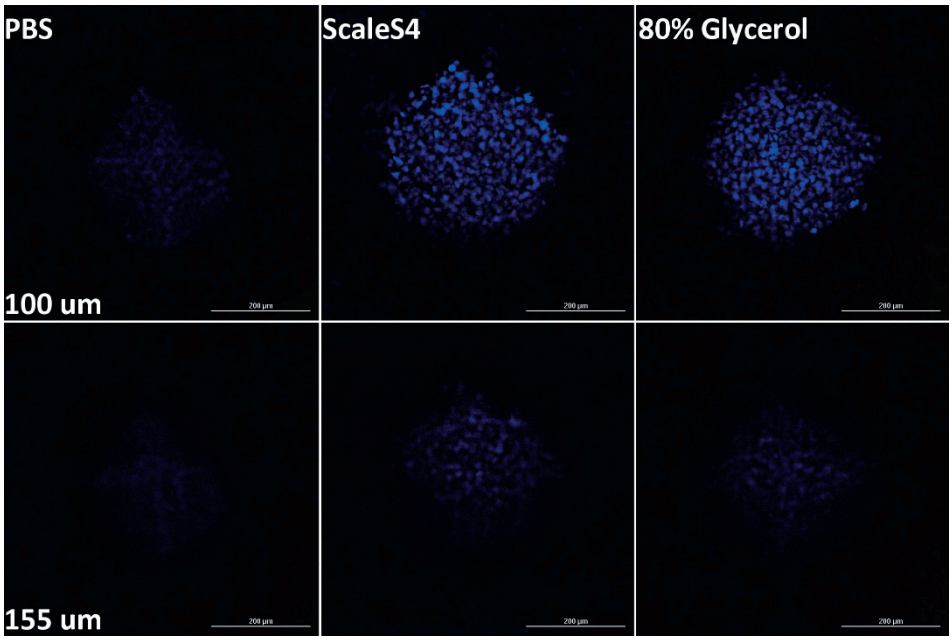


Figure 2. Imaging depth limits of adhered HT-1080 spheroids in different imaging media. Z-slices from each adhered spheroid in Figure 1 were selected when nuclei become unresolvable for PBS (upper panels), or for ScaleS4 or 80% glycerol (lower panels).

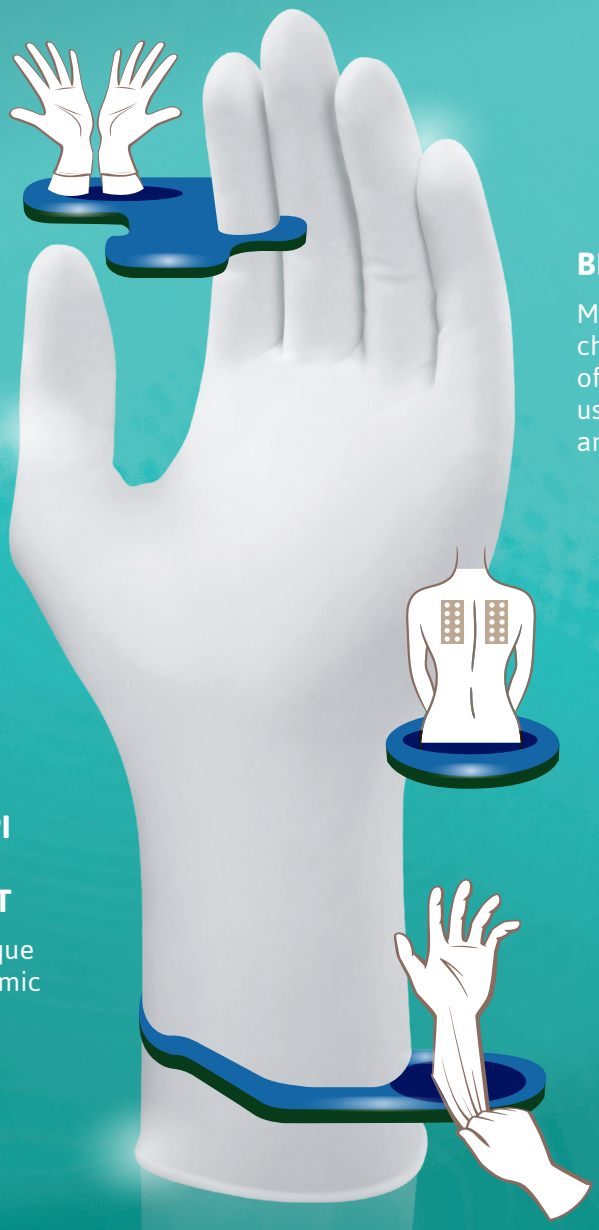
attachment (ULA) U-bottom 96-well plates, #4520, from Corning and allowed to coalesce for 24 hours in Gibco Advanced DMEM from Thermo Fisher Scientific at 37°C. Spheroids were then transferred to clear, flat-bottom 96-well plates, #204626, from Agilent Technologies (1 spheroid per well) and allowed to settle and establish adhesion at RT for one hour. Plates containing spheroids were then transferred back to the 37°C incubator and allowed to attach to the culture area and spread overnight. Attached spheroids with migrating cell regions were fixed with 4% PFA for 30 minutes, then permeabilized with 0.5% for one hour. To achieve full penetration of dyes, spheroids were stained with Hoechst 34580 and Alexa Fluor 488-phalloidin overnight at 4°C. Spheroids were then washed, and PBS was either maintained or exchanged for either a homemade mounting medium (80% glycerol, 20 mM tris, pH 8.0, 0.5% n-propyl gallate, 0.05% NaN3) or the ScaleS4 (40% D-sorbitol, 10% glycerol, 4M urea, 15% DMSO, 0.5% n-propyl gallate, 0.05% NaN3) (Figure 1).

Imaging Procedure and Processing

Confocal and widefield z-stack images of attached HT-1080 spheroids were captured at 40x using the Cytation C10 confocal imaging reader and Gen5 software in Manual Mode (IMM). The dynamic range of each channel was maximized by selecting the "show saturated pixels" button. The exposure settings for each channel were adjusted such that they were within range, and there were no saturated pixels. The z-range was determined by toggling below and above the sample until the structure of interest (in this example, a spheroid) faded in intensity. The z-step size was set using Nyquist sampling recommendations; for imaging Alexa Fluor 488 using the 40x air objective (NA = 0.6), steps sizes were determined to be 1 µm for widefield and 0.6 µm for confocal. Images were then subjected to five iterations of deconvolution using a point spread function based on the objective. Deconvolved images were then pre-processed to reduce background signal. The rolling ball size for background reduction for Hoechst 34580 (DAPI channel) and Alexa Fluor 488-phalloidin was set to 25 and 50 µm, respectively. Equivalent z-heights for all three conditions (PBS, 80% glycerol, ScaleS4) was compared to determine imaging depth limits (Figure 2).

Confocal microscopy is a powerful mode of imaging that improves image quality by removing out-of-focus light. However, sources of diffracted fluorescent light inherent to the sample prevent this improvement from being truly realized. Use of clearing agents allows matching the refractive index of the sample, in this case HT-1080 spheroids, with the refractive index of the optical system allowing imaging depth and resolution to be improved.

Ansell



CHEMICAL ACCELERATORS REMOVED

5 chemical accelerators known to cause allergic contact dermatitis have been eliminated

BIOLOGICALLY SAFER

Made using biologically safer chemical accelerators. One of which is recommended for use in the manufacture of toys and baby teats[1]

INDEPENDENTLY TESTED FOR SENSITIZATION

Human Repeat Insult Patch Test (HRIPT as per modified Draize Test) showed no evidence of contact sensitization*

FEATURES THE ONLY PI GLOVE CERTIFIED FOR ERGONOMIC COMFORT

Softer formulations and unique Ansell PI formers for ergonomic comfort superior to that of bare hand performance

UNSURPASSED DURABILITY COMBINED WITH SENSITIVITY

Optimised thickness for comfort while delivering high tear strength and tear resistance

TUFF ON THE OUTSIDE, SOFT ON THE INSIDE

TouchNTuff® 83-300/83-500 Non-Latex Polyisoprene (PI) Gloves: Ultra-soft, comfortable protection for clean and sterile environment

Using **TouchNTuff® PI gloves** will ensure you minimize the risk of personnel developing allergic contact dermatitis **thanks to Ansell's unique skin-friendly, non-sensitizing PI-KARE™ Technology**.

PI-KARE™
Skin-friendly, non-sensitizing PI Technology

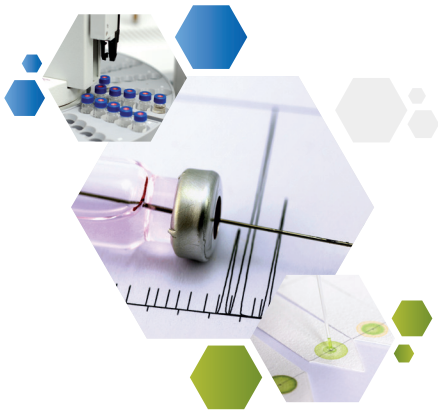
SUREFIT™
Cuff Roll-down Technology

TouchNTuff®

Reference

1. Recommended by Germany's Federal Institute for Risk Assessment.

** Data on file.*



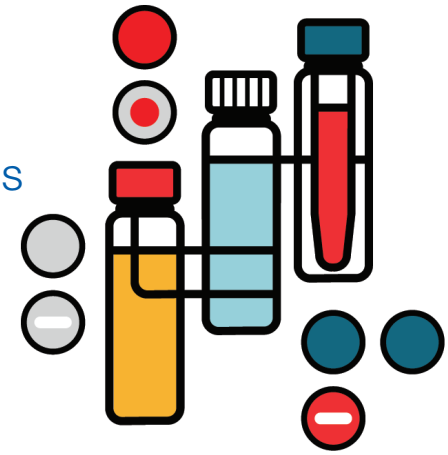
Sample Handling Solutions

Thermo Scientific SureSTART

The **Thermo Scientific SureSTART** collection of vials, caps, well plates, and accessories helps ensure the sample security and integrity to deliver excellent results. No HPLC/UHPLC or GC instrument has been left behind, our vials and well plates are suitable for all vendors' instruments.

Three distinct **SureSTART** performance levels — distinguished by performance, reproducibility, quality, and value — make selecting the right product simple, clear, and easy.

Tiered for Simplicity.
Trusted for Quality.



Performance Level 1: Everyday Analysis

Achieve your results with our accessible range of vials and caps.

Performance Level 2: High-Throughput Analysis

Help facilitate compliance in regulated environments.

Performance Level 3: High Performance

Protect valuable samples for challenging analyses.

Visit **fishersci.com/surestart** or **fishersci.ca/surestart** to learn more about Thermo Scientific SureSTART performance levels and products.

Chromatography

Syringe Filters, Cartridges, Well Plates, Vials, Closures, and Columns

Let Thermo Scientific chromatography consumable technologies remove uncertainty from your results. From sample preparation and sample handling to column options — and for both UHPLC/HPLC and GC applications — you can improve efficiencies and reduce the risk of contamination.

Visit **fishersci.com/thermochrom** or **fishersci.ca/thermochrom** to learn more and shop products.

fisher scientific
part of Thermo Fisher Scientific

How the ACT Label Supports Your Sustainability Goals

For many scientists who see themselves as environmentally conscious, the scale of their total carbon footprint can be a wake-up call. Laboratories are under increasing pressure to adopt more sustainable practices, lower their environmental impact, and contribute to a cleaner and safer society. But what can be done to make scientific research and industry more eco-friendly?

Updated laboratory equipment can play a significant role in increasing the sustainability of science. Manufacturers and equipment providers are turning to new methods to help reduce their carbon footprint. The latest technologies are enabling the development of reusable labware made from non-toxic materials, and sustainable manufacturing processes have led to more energy-efficient cold storage products, like ultra-low-temperature freezers.

Coupled with these technological advances, important initiatives such as the Accountability, Consistency and Transparency (ACT) program from My Green Lab empower laboratory managers to make better informed decisions when purchasing products. ACT and programs like it aim to help laboratories develop more environmentally conscious purchasing habits and adopt greener measures that will make the scientific sector more sustainable.

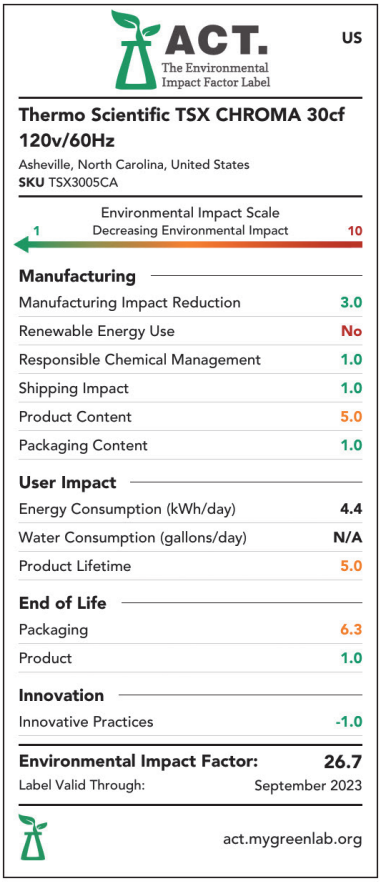
The ACT Label

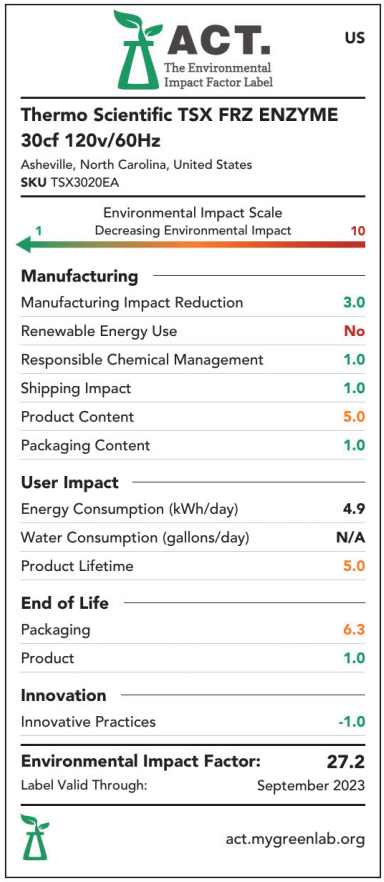
The ACT label contains several environmental impact scores for lab products, instruments, and reagents, much like an eco-nutrition label. It breaks down each product into several categories, including information about manufacturing (shipping impact and renewable energy use), user impact (water consumption and product lifetime), and end of life (how recyclable, compostable, or biodegradable the product is after disposal). By emphasizing the accountability (A), consistency (C), and transparency (T) of the environmental impact of laboratory products, it helps labs easily compare options and enables users to make more environmentally sustainable choices. The ACT label also gives manufacturers the opportunity to promote their commitment to sustainability by highlighting the areas in which their manufacturing processes are more efficient and sustainable.

While participation in the ACT program is not compulsory, it benefits the industry by encouraging manufacturers to improve the sustainability of their products, helping them understand how customers might value, for example, manufacturing using renewable energy or more recyclable packaging materials. The hope is that this sets a precedent for the sector and helps customers make environmentally informed selections of hardware and services. The goal is to motivate companies across the equipment, reagent, and services supply chain to champion and participate in driving to make science more sustainable.

Partners in Sustainability

Thermo Fisher Scientific has partnered with My Green Lab to highlight products that meet the ACT label criteria for sustainable manufacturing. Thermo Fisher's entire cold storage portfolio





Content provided by:

thermoscientific

of more than 1,200 products will be ACT label-certified, enabling research, pharmaceutical, and clinical laboratories using these instruments to meet their sustainability objectives while preserving the integrity and viability of stored materials.

The first Thermo Fisher cold storage solutions to receive the ACT label were Thermo Scientific TSX Series Ultra-Low-Temperature (ULT) Freezers and Thermo Scientific Standard-Performance (STP) Ultra-Low-Temperature Freezers, with more than 200 models receiving certification. These state-of-the-art ULTs reduce energy usage up to 70 percent compared with conventional options. Thermo Fisher's ULT freezers were also among the first to receive ENERGY STAR certification from the U.S. Environmental Protection Agency (EPA). The systems are powered by Thermo Fisher's unique V-drive technology, which detects and adapts to changing usage patterns and adjusts compressor speed as needed, offering significant energy savings without compromising performance.

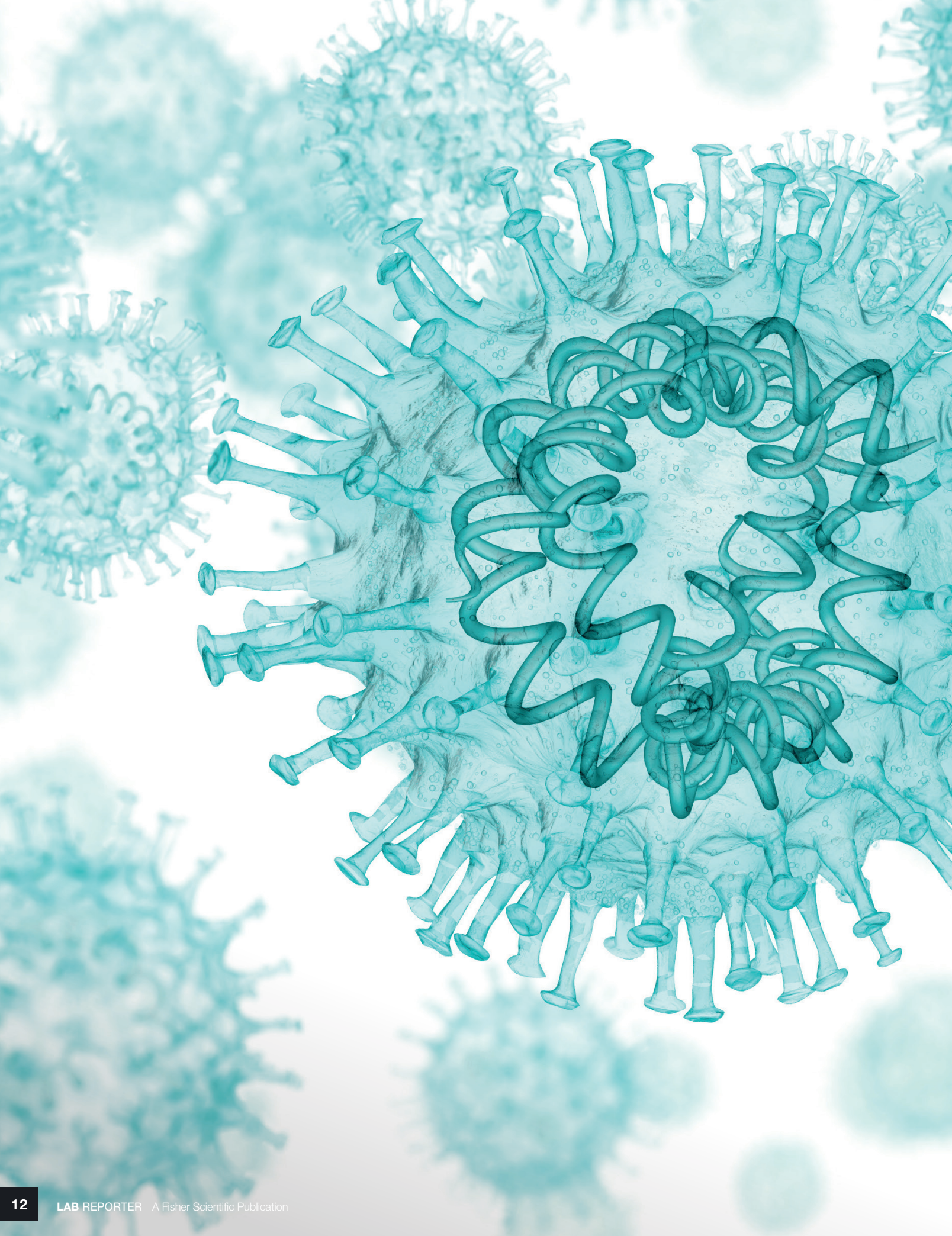
In addition to ULTs, Thermo Scientific TSX Series High-Performance Laboratory Refrigerators and Freezers were the first cold storage units in the industry to receive ACT label certification. The new ACT label certification covers all models and sizes of TSX Series High-Performance Refrigerators and Freezers, including those designed for chromatography, blood banking, plasma storage, vaccine storage, and general-purpose laboratory use. TSX Series High-Performance Refrigerators and Freezers, which also use V-drive technology, are ENERGY STAR certified and offer similar performance and energy saving capabilities.

Our Commitment

Thermo Fisher Scientific is committed to sustainable manufacturing for the entire TSX and STP product lines. In addition to using natural hydrocarbon refrigerants, Thermo Scientific cold storage products use SNAP-compliant, water-blown foam insulation that helps minimize heat emissions, allowing for considerably lower heating, ventilation, and air conditioning (HVAC) costs. The equipment is also manufactured in an award-winning, zero waste-to-landfill facility and care is taken to maintain eco-friendly supply chains, with raw materials purchased from sustainable sources. For example, TSX Series Refrigerators and Freezers are manufactured with increasingly long lifespans and shipped in packaging with high recycled and recyclable content and include recycling instructions for the recipient. At the end of a product's life, we can also help with repurposing and recycling.

New drives in the industry and a greater emphasis on sustainable manufacturing are helping scientists reduce the carbon footprint of their work. Moreover, initiatives like My Green Lab's ACT standard help customers make purchasing decisions based on a product's environmental impact and provide access to greener products and manufacturers. Together, manufacturing more eco-friendly equipment, greener supply chains, and environmentally conscious purchasing decisions can and must make a difference to the sector's record on carbon dioxide emissions.

Visit **fishersci.com/thermo-scientific-cold-storage** or **fishersci.ca/thermo-scientific-cold-storage** to learn more.



Structure-Based Design: A Path Toward a Universal Coronavirus Vaccine

By Mark Miller

On January 3, 2020, the cause of several pneumonia-like cases in Wuhan City, China, was confirmed to be a novel *Betacoronavirus*. Three days later, Jason McLellan, PhD, a professor of molecular biosciences at the University of Texas, Barney Graham, PhD, an immunologist and virologist with the National Institutes of Health (NIH), and their colleagues agreed to determine the structure of the virus and help develop a vaccine. According to the article "Jason McLellan: the scientist stopping coronavirus in its tracks" written by Rebecca Pool, PhD and published in *Wiley Analytical Science*, the virus genome was sequenced and the researchers knew their next steps in just four days.

McLellan and his colleagues were in a position to respond so rapidly as the result of years of work developing structure-based vaccines to fight diseases like COVID-19. Here is a look at how they got there and what may be coming next.

Locking the Protein

Around 2008, McLellan began working on the structures of HIV proteins. He then teamed up with Graham at the NIH Vaccine Research Center to apply a structure-based approach to the respiratory syncytial virus (RSV). By 2013, they had used X-ray crystallography to understand the structure of RSV's fusion protein and how it changed states to infect cells. They were able to lock the protein in its prefusion state to prevent transmission and develop an initial vaccine.

"We were all so excited," McLellan said. "We had used structural information to create a vaccine antigen that was superior to anything else ever created." It was this breakthrough, according to Pool's article, that laid the foundation for the work that would be done on the SARS-CoV-2 virus.

2P Mutation

McLellan departed NIH to run a lab at Dartmouth College. There, he and his team encountered the Middle East Respiratory Syndrome (MERS), a *Betacoronavirus* similar to SARS.

"The RSV and MERS fusion proteins are ancestrally related and have a similar fold in one part so we thought, 'let's give this a try,'" McLellan recalled. "I guess at the time of MERS we had been anticipating another coronavirus outbreak and so started work on this quickly. Like RSV, we knew we wanted to stabilize that spike protein, make vaccine antigens, and isolate the antibodies."

But there was a problem. The MERS spike proteins would not crystallize, which excluded X-ray crystallography studies. The team turned instead to cryo-electron microscopy with the help of specialist Andrew Ward from Scripps Research Institute.

Applying the new technique along with knowledge about the human coronavirus HKU1, McLellan and team became the first to resolve a human coronavirus spike protein with HKU1. From there, they stabilized the MERS spike protein by using proline to replace two of the protein's residues, an amino acid substitution known as a 2P mutation.

The Road Ahead

2P mutation proved a critical advancement when McLellan, now at the University of Texas, and the other researchers took on SARS-CoV-2.

"The SARS-CoV-2 was a *Betacoronavirus* and was very similar to the first SARS coronavirus, which was great in terms of rapidly developing a vaccine," said McLellan. In a little over a month the team reported the results researchers needed to develop a vaccine based on the 2P mutation.

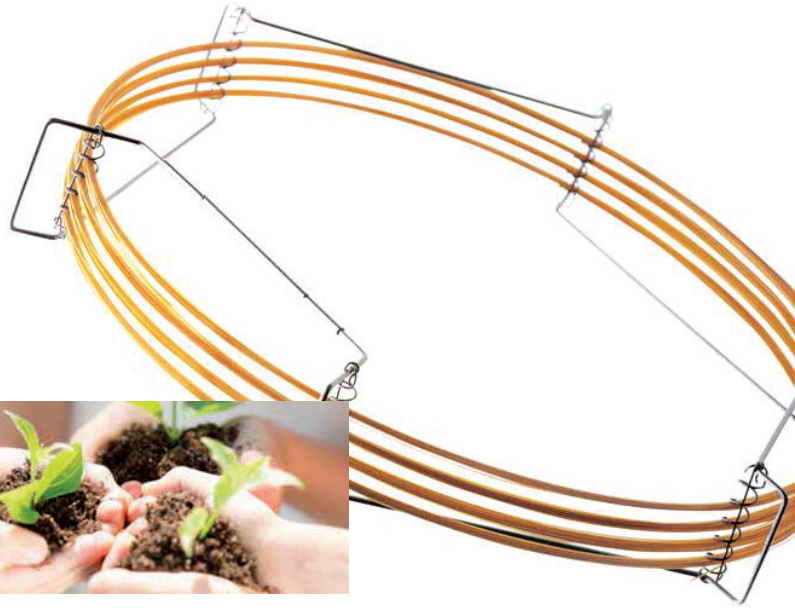
They had also discovered that proline could be added to the protein spikes of other coronaviruses, offering the potential for a universal vaccine — a single vaccine that could protect against many SARS-CoV-2 variants and emerging coronaviruses.

Since their initial work, four more proline molecules have been added to the structure to bring about a more stable spike protein known as a HexaPro. It's in use in over 100 laboratories worldwide doing COVID-19 research, including vaccine development.

McLellan and his team continue to study coronaviruses and pursue a universal vaccine. In particular, they are investigating the virus's S2 subunit, a strong target for vaccine development that's shared across a range of coronaviruses.

Mark Miller is a Thermo Fisher Scientific staff writer.

SGE® GC columns



GC columns for your application needs

TRAJAN

Visit fishersci.com/trajanscimed or fishersci.ca/trajanscimed to learn more.

Millipore®

Preparation, Separation, Filtration & Monitoring Products

MilliporeSigma

REDESIGNED WITH ALL OF US IN MIND

Introducing the Stericup® E and Steritop® E sterile filtration devices—**evolved with an eco-conscience**.

This progressive rethinking of filter design reduces your lab's environmental impact by eliminating the need for a receiver funnel, significantly decreasing packaging and biohazardous waste.

Expect the same faultless filtration you trust from Stericup® devices—and leave a smaller footprint.

Stericup® E family of sterile filters thread directly onto virtually any media bottle

Rely on Honeywell Solvents for Demanding Applications

Honeywell Burdick & Jackson, Riedel-de Haën, and Chromasolv Solvents are engineered to exacting, industry-certified standards for consistent reliability and accuracy.

Honeywell LC-MS and UHPLC Solvents

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

Catalog Numbers: 60-002-62, 60-001-40, 60-009-61, 60-030-78, 60-001-36, 60-009-55, 60-002-65, 60-009-64

Honeywell Burdick & Jackson Riedel-de Haën GC and GC Headspace Solvents

- Extremely low contaminant concentrations
- Verified using special, state-of-the-art production and application tests
- Pesticide residue analysis
- Identification and quantification of residual solvents in pharmaceuticals

Catalog Numbers: 60-005-06, 60-004-89, 60-011-24, 60-011-11, 60-027-08, 60-027-31, 60-010-03, 60-090-425

Create a Safer Work Environment

Eliminate manual blending to help avoid mistakes and the potential for accidents. Honeywell LabReady Solvent Blends are made using a proprietary, closed-loop blending technology to help remove variations and provide reproducible and accurate results lot after lot.

Catalog Numbers: 60-000-56, 60-000-64, 60-048-265, 60-030-79, 60-048-270, 60-048-249, 60-000-58, 60-048-271

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

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

Catalog Numbers: 60-046-852, 60-048-227, 60-046-824, 60-000-14, 60-027-39, 60-020-13, 60-048-600

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

fisher scientific
part of Thermo Fisher Scientific

BioClean Nitrile Isolator Gloves

Greater Protection and Increased Longevity

BioClean Isolator Gloves are manufactured from nitrile with incredibly low levels of particles and excellent electrostatic discharge (ESD) properties. Designed for use in injectable manufacturing and pharmaceutical production areas, our clean or clean and sterile isolator gloves are cleanroom processed and packed and available to fit a range of port sizes.

Advanced Protection and Dexterity for Workers in Pharmaceutical Manufacturing

Gloveboxes play a vital role in protecting products from human or environmental contamination as well as protecting individuals from workplace hazards. They're designed to provide a controlled, enclosed work environment that is separated from workers by a barrier, ensuring the containment of these sensitive and critical materials.

Every worker has the right to a safe workplace. When manufacturing specialized products in a pharmaceutical manufacturing environment, there are specific requirements for hand protection. Production and handling of these types of products typically happens in a clean or controlled environment and quite often in a sterile environment as well.

Due to the propensity of sensitive materials to be used in the life sciences, three types of gloveboxes may be used. Each is designed for the specific hazards present or level of cleanliness required.

Containment gloveboxes are designed to protect the operator and ambient environment from the material being processed. They are commonly found in pharmaceutical compounds relating to the development of oral treatments, neurological pain drugs, enhancing drugs, nuclear medicine, and other potent drugs.

Isolation gloveboxes protect the material being processed from the operator and the environment. Isolation gloveboxes are used in applications such as aseptic drug manufacturing and filling and parenteral (injectable) drug development.

Isolators combine features of containment and isolation gloveboxes and are used in the manufacture of cytotoxic parenteral drugs, some chemotherapy drugs, and biopharmaceutical cancer drugs.

Glovebox gloves provide a vital interface between the worker and the interior glovebox environment and must maintain a clean, reliable barrier while allowing the worker to effectively conduct manual tasks.[1] The gloves' integrity is crucial, as any breach in containment puts workers and products at risk of contamination.

Materials

While these gloves have traditionally been manufactured with natural rubber latex and chorosulfonated polyethylene (CSM), recent advances in nitrile and other materials offer significantly improved protection, reliability, and longevity.

Nitrile is a synthetic, non-solvent based, FDA-compliant polymer with excellent anti-static properties that is ideal for use with solvents and powders. Nitrile can withstand temperatures of up to 248°F (120°C) and is autoclavable. It can also be sterilized by gamma irradiation and sanitized with vaporized hydrogen peroxide (VHP) and isopropyl alcohol (IPA). Nitrile gloves can also be washed, processed, and packaged within a cleanroom environment, ensuring the gloves are an ultra-low contamination risk before being introduced into the isolator glove box.

Nitrile has superior puncture resistance, dexterity, and user comfort and offers

Content provided by:

Ansell

excellent chemical resistance, providing extended permeation protection against many cytotoxins and the ability to maintain its properties even after gamma irradiation.

BioClean RABS and Isolator Gloves are manufactured from nitrile with incredibly low levels of particles and excellent ESD properties, offering safety to both the worker and the products being handled. The gloves are made with accelerator-free biodegradable nitrile and individually triple bagged in easy-open low-density polyethylene (LDPE) for convenient access.

BioClean gloves are 100% inspected and water leak tested and can be gamma irradiated, providing a Sterility Assurance Level of 10^{-6}. They meet ASTM D6978-05 standards for handling chemotherapy drugs and offer an excellent resistance to VHP and IPA.

At Ansell, we are committed to delivering cutting-edge protection, enabling workers to increase quality and productivity without putting their health at risk. BioClean Nitrile Isolator Gloves are an excellent choice for improved comfort, protection, and performance.

1. American Glovebox Society AGS-G001-2007, *http://www.gloveboxsociety.org/index.asp*

Minimize Risk for Your Products, Facilities, and People

Featured Suppliers: Ansell DUPONT

As you work to meet the exact specifications and requirements of your critical environment, lean on our broad collection of contamination control products for efficiency and compliance. From apparel to cleaners and disinfectants, you'll find the products you need to minimize contamination.

We have safety down to a science.

Visit **fishersci.com/contamination-control** or **fishersci.ca/contamination-control** to explore contamination control and controlled environments products.

Safety | Protecting What Matters Most

fisher scientific
part of Thermo Fisher Scientific

Smart Purification in a Small Footprint

Perform flash or prep HPLC applications easily and safely with compact BUCHI Pure Chromatography Systems. The Pure platform fits your needs and environment and offers maximal user and sample safety while using minimal space.

These systems feature:

- Fast isolation of basic to complex chemical mixtures, synthetic compounds, natural products, and peptides on a milligram to kilogram scale

High-Quality and Convenient Laboratory Evaporation

A rotary evaporator is an essential tool for concentrating samples from your reaction mixture, extraction, or purified chromatography fractions. A modular and fully integrated system's central interface controls each component for efficient and optimized distillation of simple to complex mixtures.

BUCHI Rotavapor Rotary Evaporator Systems offer:

- Flexibility for differing applications and lab conditions as well as adapting for future needs

Infinite Control and Capacity in Freeze Drying

Gently dry reverse phase chromatography fractions, aqueous extracts, or biological samples with unparalleled automation. Easily install the BUCHI Lyovapor Freeze Dryer on a trolley, bench, or in a fume hood for use in any lab location. Upgrade to the Pro Interface for access to the most advanced features in freeze drying.

These freeze dryers include:

- Gentle drying of reverse phase (aqueous) chromatography fractions or extracts with options for end-point determination

FEATURED ARTICLE

Science Could Bring Sustainability to Your Table

By Kylie Wolfe

Meat is a staple in global diets. Whether you prefer chicken, beef, seafood, or no meat at all, you'll find it in most freezers, grocery stores, and lunch boxes. But with demand so high, the environmental consequences of meat production are causing concern.

That's why scientists have been looking for more sustainable ways to bring meat to the dinner table: some are turning to plant-based options and others to cultivated meats. The latter, an up-and-coming innovation, is a genuine meat product grown from real animal cells.

"While animals may have worked in the past as the chosen technology for producing meat, in the modern world it's really becoming a problem and it's only going to become more of a problem," said Claire Bomkamp, a senior scientist at the Good Food Institute, referring to issues ranging from climate change to antibiotic resistance. The goal is for alternative proteins to help restore balance. Instead of changing the way we eat and what we eat, scientists are working on viable stand-ins.

Modernizing Meat Production

Environmental concerns regarding conventional meat are, in part, linked to greenhouse gas emissions. Livestock, for example, accounts for nearly 14.5 percent of these emissions globally.[1] Therefore, as population and demand continue to rise, sustainability concerns surface.

Resource use is another issue of traditional meat production and a piece of the climate change conversation. Cattle need large amounts of land to roam, plus ample food and water, to produce a finite assortment of meat. Chickens also need significant amounts of water to produce a single egg, 53 gallons, to be exact. To help, a company called Eat JUST is making plant-based eggs using 98 percent less water, 86 percent less land, and emitting 93 percent less carbon dioxide.[2]

"Meat is not going anywhere, so how can we make the same products that people love without the externalities that come with conventionally produced animal meat?" said Bomkamp. Nonprofits like the Good Food Institute and companies like Eat JUST are working on that answer, bringing science to the table.

Bomkamp explained that if cultivated meat is produced using sustainable energy sources, like solar and wind power, its environmental impact in terms of greenhouse gas emissions is likely similar to that of tofu or chicken. Even when produced using conventional energy, cultivated meat might be more of a friend to the environment than beef.[3]

Creating Greener Alternatives

Cultivated meat production begins with a collection of animal cells. Scientists use these cells to establish cell lines that can be added to a nutrient-dense medium containing amino acids, vitamins, and other growth factors. This combination is ultimately placed in a bioreactor where, under the right conditions, the cells grow and multiply until they're harvested.[4] The resulting edible muscle and fat tissue can be made into hamburgers, sausages, and other meat products.

Bomkamp said this method is like plant cutting, taking a piece of one plant to grow a second. Even though this propagation technique differs from cell culture, it's a simplistic representation of what it means to cultivate meat. On a cellular level, cultivated and conventional meat are identical. With more research, taste, texture, and hopefully, consumer cost can be too.

> "Meat is not going anywhere, so how can we make the same products that people love without the externalities that come with conventionally produced animal meat?"

Depending on the type of meat a company produces, the overall process, from cell sample to finished product, takes anywhere from two to eight weeks. It's thought to be more efficient and environmentally friendly than agriculture in the traditional sense, but more studies are needed to determine the extent. Scientists also believe that cultivated meat could help lower cases of foodborne illness because it will be raised in sterile conditions where contamination risk is kept to a minimum.

In March 2019, the Food and Drug Administration (FDA) and United States Department of Agriculture (USDA) agreed to oversee certain steps of the cultivated meat production process.

continued from page 21

Science Could Bring Sustainability to Your Table

For livestock and poultry, the FDA oversees cell collection, growth, and differentiation, and the USDA oversees harvesting, processing, packaging, and labeling. For other meat products, the FDA manages each step.[5] Their joint goal is to implement food safety regulations and provide accurate labeling for the public.

As of December 2020, the Singapore Food Agency approved a cell-cultured chicken product that became the world's first cultivated meat approved for sale.[6]

Gauging Sustainability and Success

Bomkamp says that the short-term success of this industry means giving those who love meat, but don't love its environmental consequences, access to an alternative. This also means creating a product with the same taste and texture as traditional meat — with a smaller environmental footprint. As we enter the future of meat production, scientists want to find a balance between what's good for people and the planet. But that may take time.

"Do we get to the point where you can go to the grocery store and buy these products? That's certainly the hope," said Bomkamp. "But predicting timelines from the beginning is a little bit of a crystal ball situation."

Aside from solidifying the science and scaling production to generate tasty, environmentally friendly, and cost-effective meats, public acceptance may also hinder the reach of alternative proteins and the time it takes for them to become mainstream.

According to a study published in *Frontiers*, 29.8 percent of survey participants said they were likely to purchase cell-cultured meat. The remaining 70.2 percent of participants were either unlikely or only somewhat likely to do so.[7] Greater transparency from companies and government agencies can help raise awareness for cultivated meat, but it's up to consumers to decide whether alternative proteins are welcome or unwelcome on their plates.

Deciding the Future of Meat

It's possible to reallocate resources and potentially curb the meat industry's contributions to climate change, but the path forward is to be determined. Scientists, legislators, and regulators are hoping to find an approach that's better for the environment and meets public demand, even if it means changing the way we define our proteins.

"What if we not only switched to cultivated meat but were also really intentional with the land that's freed up and no longer used for the production of food? What if we used that land for rewilding or other climate-positive activities?" Bomkamp said. "We should really be thinking about how to take advantage of those sorts of synergies."

More research is needed to understand the environmental significance of cultivated meat production. Studies about water, energy, and land use will help tell a clearer story about alternative proteins and their role in the future of the food industry.

Kylie Wolfe is a Thermo Fisher Scientific staff writer.

References

1. Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. and Tempio, G. (2013). Tackling climate change through livestock. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/i3437e/i3437e.pdf

2. No author listed. (2021). How do we make eggs from plants? Eat JUST. https://www.ju.st/learn

3. Odegard, I., Sinke, P. (2021). LCA of cultivated meat. Future projections for different scenarios. CE Delft. https://www.cedelft.eu/en/publications/2610/lca-of-cultivated-meat-future-projections-for-different-scenarios

4. Bomkamp, C., Swartz, E. (2022). The science of cultivated meat. Good Food Institute. https://gfi.org/science/the-science-of-cultivated-meat/

5. No author listed. (2020). Food Made with Cultured Animal Cells. Food and Drug Administration. https://www.fda.gov/food/food-ingredients-packaging/food-made-cultured-animal-cells

6. Huling, R. (2020). World's first approval of cultivated meat sales. Good Food Institute. https://gfi.org/blog/cultivated-meat-singapore/

7. Bryant, C., Szejda, K., Parekh, N., Deshpande, V., and Tse, B. (2019). A Survey of Consumer Perceptions of Plant-Based and Clean Meat in the USA, India, and China. Frontiers. https://www.frontiersin.org/articles/10.3389/fsufs.2019.00011/full

Digital Imaging Solutions

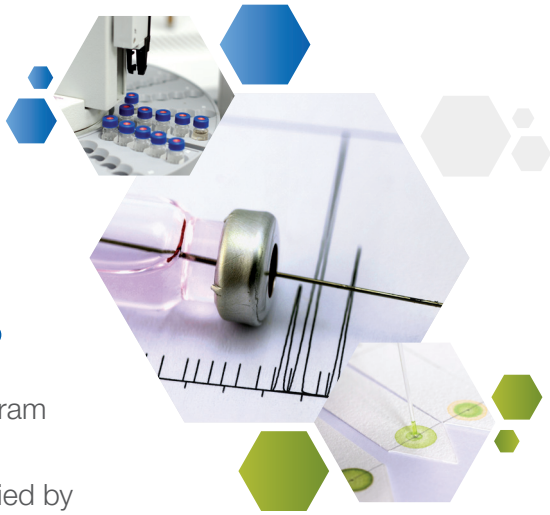
Synoptics Syngene and Synbiosis Products

Synoptics offers products that support your gel documentation and microbiology culture and susceptibility needs.

Chemiluminescence and Fluorescence | Sample Preparation | Colony Counting and Zone Measuring

Product Name	Description	Mfg. No.	Cat. No.
Chemiluminescence and Fluorescence Gel Documentation Systems			
G:BOX mini 6	For mini and midi fluorescence and visible gels, multiplex fluorescence westerns, stain free gels, and chemiluminescent blots	GBOX-MINI-6-A	**01-257-163**
G:BOX mini 9		GBOX-MINI-9-A	**01-257-165**
G:BOX Chemi XRQ	With high-resolution cameras for imaging multiple sample types and sizes, including fluorescence 1D and 2D gels and chemiluminescent blots	GBOX-CHEMI-XRQ	**01-257-162**
G:BOX Chemi XX6		GBOX-CHEMI-XX6-A	**01-257-167**
G:BOX Chemi XX9		GBOX-CHEMI-XX9-A	**01-257-171**
Fluorescence and Visible Light Gel Documentation Systems			
NuGenius	For DNA and protein analysis and gel documentation	NuGENIUS	**01-257-159**
InGenius3	For standard fluorescence applications; features a 3-million pixel camera	IG3	**01-257-158**
G:BOX F3	Entry-level fluorescence system; with high-resolution camera	GBOX-F3-LFB	**01-257-160**
Chemiluminescence			
GeneGnome XRQ	For western blot and other chemiluminescence images	GGNOME-XRQ-NPC	**01-257-161**
Colony Counting and Zone Measurement			
ProtoCOL 3	Reads plates up to 150 mm and zone measurements to 0.5 mm; full GLP and GMP traceability and CFR compliance	PROC3	**01-257-312**
Protos 3	Automated counter and chromogenic identification system; medium throughput (75 plates in 5 minutes); GLP compliance and full traceability	PROTOS3	**01-257-326**
aCOLyte 3 HD	For 90 mm plates; automated colony counting; generates and displays plate images	ACOL3-HD	**01-257-334**
ProcScan	Colony counting and zone measurement; for plates up to 300 mm; fully traceable results	PROCSCAN	**01-257-329**
aCOLyte 2	For manual colony counting plates from 50 to 90 mm; works with any marking pen	ACOLAD 2	**01-257-341**
ChromaZona	For automated antibiotic susceptibility testing and microbial ID; IVD certified; includes eAST, MIC Strip, and Chromogenic ID software	CHROMAZONA	**01-257-306**
Sample Preparation			
ProBlend	Powerful blending motions; with stainless-steel chamber, removable paddles, built-in waste drawer	PROBLEND	**01-000-822**
ProDilute	Automatic gravimetric diluter; ergonomic and ambidextrous design	PRODILUTE	**01-000-823**

spex certiprep



Unlock Analytical Methods and Produce Accurate Results

Spex CertiPrep standards are an integral part of a laboratory's quality program and a key to unlocking analytical methods and obtaining accurate results.

Certified reference materials (CRM), manufactured by Spex, are accompanied by a detailed certificate of required information.

Ion Chromatography Standards

Ion chromatography (IC) is a form of liquid chromatography that separates ions and some polar compounds by ion exchange chromatography.

- Cation-exchange standards are for positively charged molecules and anion-exchange is used for negatively charged targets
- Spex CertiPrep provides a full line of cation and anion IC standards that are all certified for the highest assurance of quality

Catalog Numbers: ICMIX6-100, ASCL9-2Y, ASCL9-2X, ASF9-2Y, ASSO49-2Y, ASSO49-2X

Gas Chromatography Standards

All Spex CertiPrep GC and GCMS standards are a critical key to accurate results and the ability to validate or verify analytical methods.

- Spex CertiPrep provides certified reference materials for use as either external or internal GC and GCMS standards for analyses

Catalog Numbers: 52-42V-CX, 76BIGMIX, BD3514, BD3515, CLPS-B, CLPSI90

Custom Standards

Since 1954, Spex CertiPrep has provided certified reference materials for the analytical laboratory. Spex CertiPrep can create your standard with your list of components, matrix, concentration, and size with our same degree of accuracy complete with our comprehensive certificate.

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

fisher scientific
part of Thermo Fisher Scientific

Optimize Cell Growth with a Biological Shaker

For decades, shaking has been used to cultivate a variety of cells, including bacteria, fungi, and plant and animal cells in suspension. This agitation helps to increase the availability of nutrients and improve oxygen transfer, ultimately providing higher cell yields than static incubation.

Biological shakers help to automate and standardize this task. They're an easy-to-use and inexpensive choice for basic applications like organism screening, media design, inoculum preparation, and early process development. It's hard to imagine a biotechnology lab that doesn't use shakers, but how can you use them to maximum benefit?

Here are a few things to consider when using a shaker to grow cells.

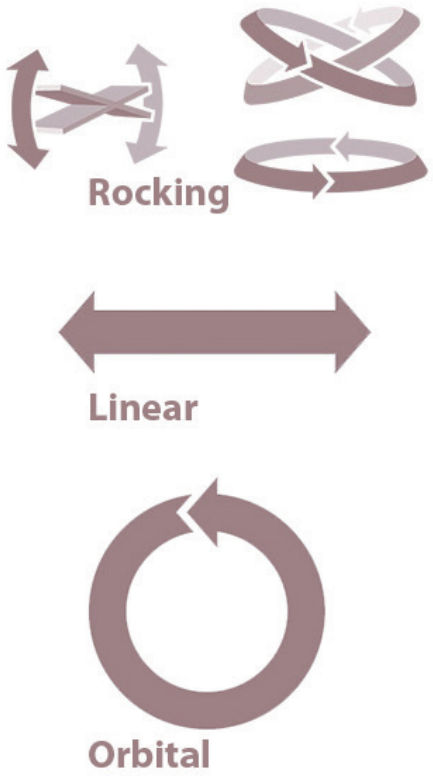
Agitation Modes

There are three different types of agitation to choose from: rocking, linear shaking, and orbital shaking. While these motions differ, they're similarly achieved: liquid in a vessel is placed on a platform that moves in a particular manner, which agitates the liquid.

Rocking shakers move in either a two- or three-dimensional see-saw motion about a central point. This motion creates a wave-like mixing process that's generally used for gentle mixing and incubation procedures, including DNA extraction, staining and de-staining, and washing blots and gels. For cell cultivation, you can even find specifically constructed rocking devices that allow mammalian cells to be cultivated in single-use bags.

Linear shakers, also known as reciprocating shakers, move the liquid back and forth in a single plane. These shakers have largely vanished from labs cultivating cells because of their primary drawback: While speeding up, linear shakers can cause unpredictable geyser-like eruptions that can wet the flask's closure, potentially contaminating the sample and decreasing aeration.

Orbital shakers are the most common choice for cell expansion. These shakers rotate the platform in a circular motion, creating a consistent "swirl" pattern. They're available with a variety of options for specific culturing demands, such as temperature control, photosynthetic lighting, and CO_2 control.



Shaking Speed

Agitation not only improves oxygen transfer but also maintains homogeneous conditions in the medium through continuous mixing. In general, higher agitation speeds (as well as larger orbits) increase surface area for gas exchange, providing better aeration and higher yields.

However, higher speeds also lead to shear forces that can negatively influence microorganisms, potentially causing changes in morphology, variations in growth, and even cell death. While bacterial and yeast cells can withstand and even benefit from higher speeds, mammalian cells are more sensitive and require lower agitation speeds.

Agitation Orbit

Orbital shakers have common diameters of 19, 25, and 50 mm. As a rule of thumb, 19- and 25-mm orbits are still the standard in microbiology.

Larger orbits can increase the surface area of samples at speeds of 150 rpm and slower, so they're useful when working with cells that are sensitive to shear forces. Larger orbits are also the best choice when working with vessels larger than two liters and wide vessels like Fernbach flasks.

Agitation Speed		100 rpm	200 rpm	300 rpm
OTR (mmol O_2/L/h)	25 mm orbit	10.3 ± 0.2	62.0 ± 1.1	186.1± 0.5
	50 mm orbit	12.0 ± 0.4	86.8 ± 7.8	214.0 ± 5.2

OTR measurements in a shaker with different set speeds in a 25 vs. 50 mm orbit shaker. Results shown were the average of duplicated experiments (Internal testing, Eppendorf, 2017)

Content provided by:

eppendorf

But larger orbits and higher speeds don't always lead to higher growth rates. Flask design, flask material, and filling volume are also important considerations.

Flask Design

Introduced at the beginning of the last century, shaker flasks have a variety of benefits. They're available in a wide range of sizes from 25 mL to 5 L, making them applicable for a variety of experiments from screening and expansion to media design and early process development. And they're affordable and suited to cultivation of bacteria, yeast, fungi, and plant and animal cells in suspension.

Typical Erlenmeyer flasks feature conical bodies, wider bases, and cylindrical necks. However, specialized designs can further improve gas exchange: Fernbach flasks offer wider bases that provide a large area for oxygen transfer, and Eppendorf Ultra Yield and Optimum Growth flasks feature optimized shapes that maximize surface-to-volume ratio.

Glass vs. Plastic

Both glass and plastic flasks have their benefits. For most classic microbiology applications, autoclavable glass Erlenmeyer flasks are a durable and reusable choice. But when contamination matters — as in production or handling sensitive cultures — sterile, single-use disposable flasks with 0.2 µm filter vented caps offer the most convenience and safety.

Filling Volumes

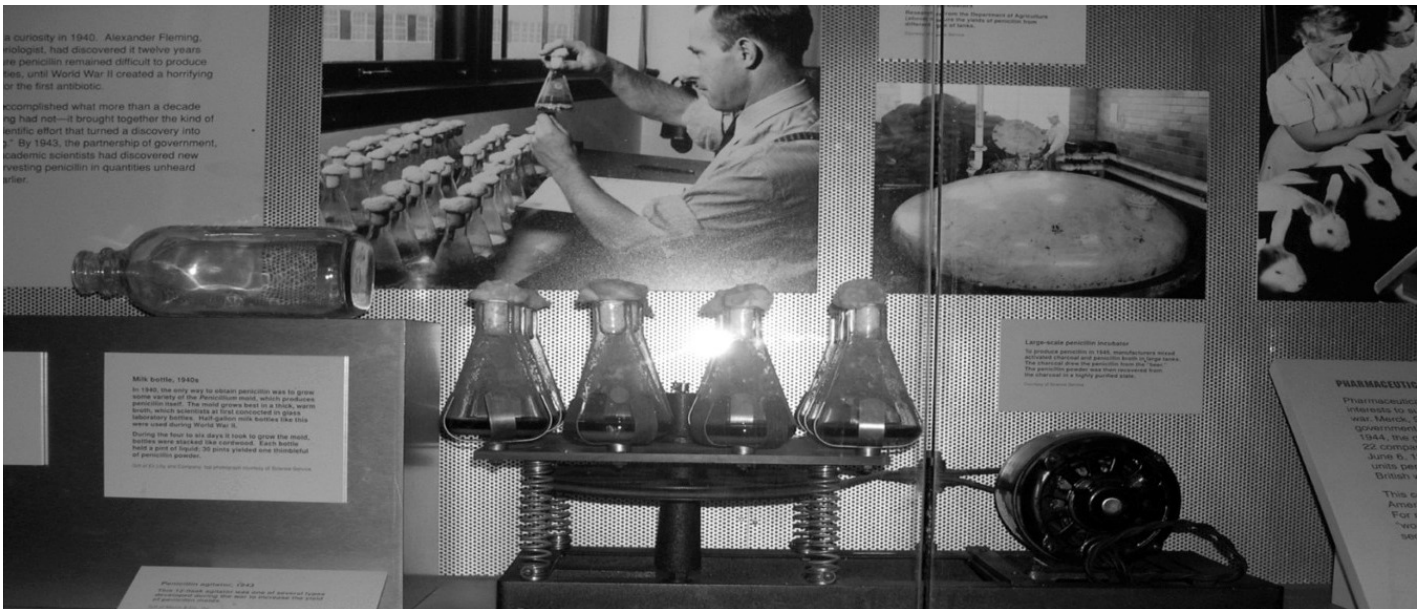
Lower filling volumes are best for cultures that have a greater need for aeration. By using a smaller percentage of a vessel's total volume, you can create a larger surface area for gas exchange, which leads to higher cell yields.

As a rule of thumb, don't exceed 20 percent of nominal flask capacity for microbial cultures. For maximum oxygen transfer, reduce filling volume to as little as 10 percent and increase rotational speed as much as your cells can withstand before succumbing to shear forces.

For mammalian cultures sensitive to shear forces, choose a fill volume between 30 and 40 percent and a shaking speed no higher than 150 rpm.

The Eppendorf Legacy

It all began in 1946 with the introduction of the first-ever orbital shaker by New Brunswick Scientific. Eppendorf has continued this tradition of innovation and reliability by also introducing new technologies. Manufactured with premium Eppendorf quality, New Brunswick lab shakers continue to take a leading position in virtually all global markets.



Earn Fisher Scientific Buck$

And Improve Food Safety and Quality

METTLER TOLEDO offers a full range of food and beverage solutions that produce extraordinary results to improve safety, quality and productivity in your labs. From pH meters to balances, each of our solutions is user-friendly and extremely accurate, providing you an experience which can only be defined as extraordinary.

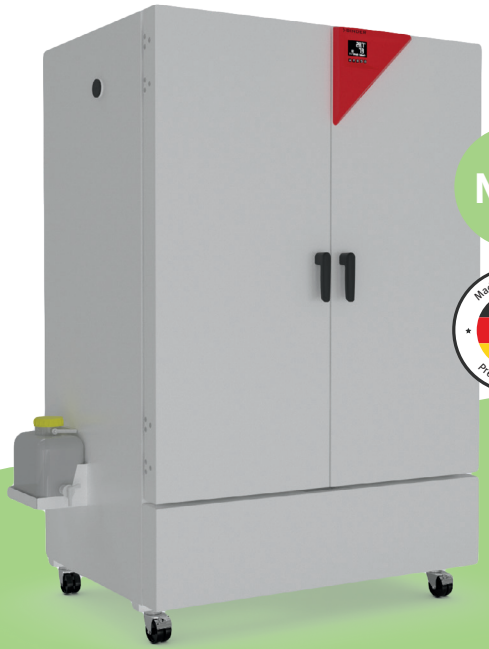
Find your customized solution and start earning today by visiting **fishersci.com/mettlertoledo** or **fishersci.ca/mettlertoledo**

METTLER TOLEDO

Ecological and Economic Solution for Standard Stability Tests

BINDER
Best conditions for your success

Constant climate chamber with Peltier technology



NEW

Made in Germany
Premium Quality

The best energy-saver on the market

KBF-S ECO Solid.Line

Safe thanks to standard-compliant testing according to ICH Q1A guidelines, even with full load
Reliable due to failsafe operation without compromise
Smart as it is highly compatible for adaptation to diverse installation conditions and specific customer requirements
Economical as energy consumption is minimal thanks to optimized thermoelectric cooling

Check Cultured Cell Health

Fisherbrand Research-Grade Inverted Microscope

With its light source and condenser on top and objectives below, use your Fisherbrand Research-Grade Inverted Microscope to observe living cells or organisms at the bottom of flasks and other vessels.

Optics

- Infinity optical system
- Eyepiece: 10X WF, 22 mm FOV
- Objectives: LWD 4X PL BF; 10X and 20X LWD PL PH

Illumination

- Full Koehler illumination
- 5 W LED with dimmer
- Phase contrast condenser (removeable)

Focus

- Coarse and fine focus: 24 mm range
- Rack stop adjustment

Other Features

- Trinocular head
- Coaxial stage: 240 x 210 mm
- Durable metal frame

Visit **fishersci.com** or **fishersci.ca** to learn about additional features and find other microscopes and related products.

Description	Cat. No.
Fisherbrand Entry-Level Research-Grade Inverted Microscope	**03-000-013**

bio CERTIFIED™

Quality Management System & Chemicals

100% Tested.
100% Transparent.
100% Trusted.

- Extensive product breadth and packaging flexibility
- cGMP-compliant with auditing and quality management controls
- Lot testing for bioburden, endotoxins and elemental impurities
- Change control, lot traceability and supply chain transparency to eliminate unpredictability
- Comprehensive regulatory and scientific documentation to ensure compliance

Search "bioCERTIFIED" on **fishersci.com** or **fishersci.ca** to shop.

spectrum® CHEMICAL MFG CORP

Supports Aseptic Handling

greiner BIO-ONE

Greiner Bio-One EASYstrainer

EASYstrainer Small: Cell Strainers that fit tubes from 1.5 mL to 15 mL

- Different vent sizes for cells and tissues
- Stackable for sequential filtration
- No liquid spill – venting gap feature
- Sterile single packed

Description	Case Qty.	Pack Qty.	Cat. No.
20 µM Red	1	50	**07-001-105**
40 µM Green	1	50	**07-001-106**
70 µM Blue	1	50	**07-001-107**
100 µM Yellow	1	50	**07-001-108**

Solutions for
EVERY SPACE
in Your Lab




Set Your Lab Up for Success

The Fisher Scientific channel is your definitive source for innovative, indispensable scientific products and services. We provide solutions for every space in your lab and support every aspect of your work with our:

- People — almost 3,000 experts working on your behalf
- Products — over 1.7 million products from 9,000+ suppliers
- eCommerce platform — powerful functionality for searching, ordering, tracking, and more
- Supply chain — an integrated network designed for next-day delivery

Find Solutions for Every Space in Your Lab

Equip your lab with the right products for your cold storage, bench, storeroom or shelves, and fume hood.

Visit **fishersci.com/everyspace** or **fishersci.ca/everyspace** to find what you need.

fisher scientific
part of **Thermo Fisher Scientific**

Wash Away Worry with an Automated Glassware Washer

By Jordan Henderson, Product Manager, Labconco

Today's laboratories require a steady supply of clean labware to operate efficiently. While cleaning glassware, plasticware, and other utensils is a relatively mundane task, it can have an enormous impact on the quality, accuracy, and precision of your lab's results.

Washing glassware by hand is common in many laboratories, but it inherently varies from person to person, which can cost your lab time, energy, and money if it negatively impacts your results. Automated glassware washers, on the other hand, can help you more consistently meet cleanliness goals for your labware.

Automated washers come with a variety of features, so find one that offers the efficiency, versatility, and reliability you need.

Efficiency

Glassware, plasticware, and utensils often require different methods of washing and rinsing. Whether your labware needs robust cleaning from consistent, efficient spray arms or more targeted cleaning from direct injection washing and rinsing with spindles, your glassware washer should be able to easily accommodate whatever approach best suits your laboratory.

Your washer should also provide sufficient water temperature to adequately clean your labware. Some glassware washers may heat water to a maximum temperature of only 70°C (158°F) and lack the ability to tackle the boiled, baked, and caked-on contaminants many labs see every day. Wash and rinse water temperature minimums of 93°C (199°F) soften and penetrate stubborn contaminants while providing thermal disinfection, further reducing potential carryover from one wash cycle to the next.

It's also important to find a washer that can keep up with high demand without sacrificing performance or cleaning ability. Choose a washer that's intentionally designed to do more in less time with fewer resources. For example, the time it takes a washer to heat wash and rinse water directly affects the length of wash programs. A washer that allows you to choose between single-phase and three-phase heating options can provide more robust heating for the shortest, most efficient wash cycles.

Because automated glassware washers are far more consistent than hand washing, they can also help you standardize consumption of resources like water and electricity — they can even help you save time and money. Implementing an automatic glassware washer will consistently provide an excellent level of glassware cleanliness from the first cycle to the last, helping you avoid the negative impact that dirty labware can have on results.

Versatility

Rack flexibility is key when assessing your glassware washer. Glassware and plasticware come in all shapes and sizes, and your washer racks should be flexible enough to tackle whatever combination of labware you throw at them. When selecting a washer, look for useful features like adjustable rack positions, removable components, and overall functionality with available inserts, like those that hold test tubes or trays.

Need to wash vials, pipettes, or other pieces of specialized glassware? Glassware washer accessories should complement not only the washer but also your atypical, difficult-to-clean flasks, pipettes, and other specialty glassware.

The user interface is also an important consideration. It should deliver an

Description	Cat. No.
SteamScrubber, 115V, 60Hz, 1-Phase	**40-100-1000**
SteamScrubber, 208/230V, 50/60Hz, 1-Phase	**40-100-1010**
SteamScrubber, 208/230V, 50/60Hz, 3-Phase	**10-100-1013**
FlaskScrubber, 115V, 50/60Hz, 1-Phase	**41-100-1000**
FlaskScrubber, 208/230V, 50/60Hz, 1-Phase	**41-100-1010**
FlaskScrubber, 208/230V, 50/60Hz, 3-Phase	**41-100-1013**
FlaskScrubber Vantage, 208/230V, 50/60Hz, 1-Phase	**42-210-1010**
FlaskScrubber Vantage, 208/230V, 50/60Hz, 3-Phase	**42-210-1013**

Content provided by:

LABCONCO

intuitive experience that allows a user to tailor wash programs for specific workflows. Some washers even offer onboard data logging, storage, and export via USB or a secured network connection, which can help you validate custom wash programs.

Reliability

Water quality can vary from region to region, so using pure-water rinses is a great way to further ensure that your labware is clean. Water qualities such as hardness and pH level, as well as the presence of silica, metals, chloride, or organic materials, can result in residues that have a significant impact on the quality of your results. However, pure-water pumps aren't standard on all automated glassware washers. Be sure to check for this — it can save you the headache of upgrading your current system or installing a new water purification system if the need for pure water rinses arises in the future.

The longevity and durability of a washer depends on the quality of its internal components. Underpowered components result in underpowered washers. When selecting a washer, be sure it uses robust pumps and quality valves and internal assemblies to minimize unscheduled down times.

In the unlikely event of mechanical issues, you should be able to quickly assess and identify component failures. A standard array of diagnostic tests can help identify potential component failures, and a warranty and post-installation support can help you quickly complete repairs. Similarly, support from knowledgeable service technicians can have a huge impact on getting your washer back up and running.

When considering an automated glassware washer, efficiency, versatility, and reliability should be standard on the model you choose. By focusing on these aspects, you can free scientists from the sink and help them get back to the lab.

SGE Inlet liners

SGE Inlet liners are color coded by geometry for ease of selection.

Choosing the right inlet liner and injection parameter can increase peak areas and reduce detection limits by up to 300%.

Easy to use, easy to choose, confidence in your analysis

TRAJAN

Visit fishersci.com/trajanscimed or fishersci.ca/trajanscimed to learn more.

METRO®

Metro products with Microban provide safety and confidence in your lab.

MetroMax Advanced Plastic Shelving

Super Erecta Shelving with Metroseal Gray

Metro Solutions include

Mobile
Stationary
High-Density
Security Units

All of Metro's plastic storage shelving offers removable shelf mats for easy cleaning, and comes with built-in Microban antimicrobial protection technology.

Each Metroseal unit contains Microban antimicrobial protection to inhibit the growth of mold, mildew, fungi, and bacteria.

PROTECTION THAT LIVES ON MICROBAN

CleanSpace®

RESPIRATORS

EVERY ANGEL DESERVES A HALO

CleanSpace HALO Power System NIOSH PAPR

PROTECTING FRONTLINE STAFF FROM AIRBORNE CONTAMINANTS

- High Protection (P100, APF 50, and 1000)
- Reusable and cost effective
- Comfortable and lightweight < 0.9 lb. (400 g)
- No belts or hoses
- IP Rated 66 water tolerant
- Smart AirSensit™ Technology
- NIOSH approved
- + STERI-PLUS exhalation filter for Source Control

CleanSpace HALO Power System NIOSH (Exc. Mask)

Cat. No. 17-800-646

Available in the U.S. only.

2021 OHS Industrial Hygiene Awards

reddot winner 2021
innovative product

NIOSH APPROVED CE IP66

Who to Hire?
Lab Staff Can Affect Publication Output

By Mike Howie

When asked to do more with less, how can you optimize productivity? How can you complete not just a large amount of work but effective, successful work with limited time, money, and resources? While these questions have been buzzing in many minds recently, they're not new.

Back in 2015, a pair of researchers — Annamaria Conti of the Georgia Institute of Technology and Christopher Liu of the University of Toronto — investigated how the composition of laboratory staff can affect publication output. They found that simply hiring more people doesn't necessarily help you get more done.

The Study

Conti and Liu focused their research on the biology department at the Massachusetts Institute of Technology, examining lab staffs and output from 1966 to 2000. Their dataset included 119 principal investigators and 5,694 laboratory members, who in total published 7,844 papers. About 15 percent of those papers were published in *Science, Nature,* or *Cell*.

The average laboratory in the study included about five postdocs, three graduate students, and two technicians. Using regression analysis, the researchers found that adding one member to a lab of this size correlated with an extra quarter publication. While adding even more members to the lab further increased productivity, it did so at slower and slower rates until lab size reached 25 people. After that, adding more staff decreased productivity.

What's perhaps more illuminating, however, is the fact that some employees seemed to have a greater impact than others. For example, adding a graduate student correlated to an extra 0.14 publications while adding a postdoc correlated to an extra 0.31. And even among postdocs, those with grant support were linked to 0.19 additional publications while those with fellowships were linked to an additional 0.29. Adding technicians, it seems, didn't make a difference.

The story is slightly different when only considering work published in *Science, Nature,* or *Cell*. While bigger labs still seemed to publish more often, the researchers found that adding a lab member of any position increased the likelihood of publication by eight percent. Once lab size reached 22 people, however, hiring more became counterproductive.

Position within the lab still had some effect on publishing in these high-impact journals, but it differed from other publications. This time, graduate students seemed to have increased the likelihood of publication just as much as postdocs, as did technicians. But postdocs without fellowships did not increase the probability of publication.

The study, *Bringing the lab back in: Personnel composition and scientific output at the MIT Department of Biology*, was published on *ScienceDirect*.

Remaining Questions

While the study found thought-provoking correlations, it didn't identify any specific causality. It didn't determine why, for example, postdocs with fellowships had more impact than those without fellowships, or why graduate students seemed more beneficial than technicians. Liu speculates that graduate students may be better positioned to work on long, risky projects.

"People at different training stages make different contributions," Liu explained, "but it's not that they're less productive. They just have different productivity in different projects."

There could be a variety of reasons why one employee has more impact on publication than another, and it's possible that the study's conclusions may not hold within other schools or disciplines. What remains consistent is that the people we hire are critical to our success.

Mike Howie is a Thermo Fisher Scientific staff writer.

It Stands Alone

The NEW accu-jet® S pipette controller stands alone as a versatile and well-balanced addition to your lab.

BRAND

New!

accu-jet® S pipette controller - (100-240 V/50-60 Hz)

Cat. No.		Color
13-689-549	anthracite	
13-689-546	berry	
13-689-547	petrol	
13-689-548	amethyst	

Universal AC adapter included

Learn more at **fishersci.com/accu-jet-s** or **fishersci.ca/accu-jet-s**

BRANDTECH® SCIENTIFIC, INC.

SARTORIUS

10-year limited warranty

Cubis® II Laboratory Balance

The ultimate in precision weighing. Now backed by a 10-year limited warranty.

The Cubis® II platform is a laboratory balance with fully customizable hardware, software, and connectivity. It offers modern user interfaces, pharmaceutical and GxP compliance, including data handling, data integrity and connectivity, ergonomic sample handling, easy process integration, and unlimited communication at a high level of accuracy and precision.

Visit fishersci.com/sartorius or fishersci.ca/sartorius to learn more.

Ultrasonic Cleaners for Cleaning, Mixing, and Degassing

State-of-the-art Fisherbrand Ultrasonic Cleaners are made in Germany and fully featured to allow maximum versatility for all your lab needs.

Fisherbrand 11200 Series Advanced Ultrasonic Cleaners are more powerful than conventional cleaners. They include a wide range of adjustable parameters for lab applications, including cleaning, mixing, and degassing.

- Maximum versatility: choose frequency, power level, time, temperature, and ultrasonic mode
- Modes: normal, pulse, sweep, and de-gas
- 6 tank sizes: 0.7 to 7.3 gallons

Model	Capacity		Cat. No.
FB-11201	2.75 L	(0.7 gal.)	**FB11201**
FB-11203	5.75 L	(1.5 gal.)	**FB11203**
FB-11206	6.9 L	(1.8 gal.)	**FB11205**
FB-11207	12.75 L	(3.3 gal.)	**FB11207**
FB-11209	18 L	(4.75 gal.)	**FB11209**
FB-11211	29 L	(7.3 gal.)	**FB11211**

Ultrasonic Cleaning for Safety and Efficiency

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 that quickly removes 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**

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

SWITCH FOR SUSTAINABILITY

WHIRL-PAK® HAS YOUR SMART SUBSTITUTE TO MEET SUSTAINABILITY TRANSFORMATION GOALS

REDUCE WASTE + ENVIRONMENTAL IMPACT

1 **WHIRL-PAK®** USES **5-10 TIMES LESS MATERIAL** THAN RIGID CONTAINERS

2 10X LESS WATER USE

3 5X LESS EMISSIONS

Join the journey to reduce waste! Make the switch from bottles to reduce waste and costs of storage, transportation, and disposal.

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.

Oil Free, Low Maintenance

Fisherbrand MaximaDry Pumps

No more downtime to add or change pump oil. Enjoy quiet, reliable operation without the mess of oil or the operating costs and environmental problems associated with water aspirators.

- **Corrosion-resistant materials** — The thick, solid PTFE resin heads will not peel or corrode when exposed to most aggressive solvents and the sturdy FFPM valve system handles occasional liquids without degrading performance
- **Quick and easy setup** — Be up and running in minutes; everything connects together without tools or fittings, just add 3/8 in. I.D. tubing
- **Compact, stylish design** — For convenient access, your MaximaDry Oil-Free Pump fits easily where you need it — on your bench or inside your fume hood

13-880 Series

Head Configuration	Capacity	Vacuum	Pressure	Motor	Dimensions (L x W x H)	Cat. No.
Single Stage	20 L/min.	75 torr	15 psig	1/6 hp	13 × 6.5 × 8.5 in.	**13-880-14**
Single Stage	40 L/min.	65 torr	15 psig	1/6 hp	13 x 6.5 x 8.5 in.	**13-880-16**
Two Stage	20 L/min.	6 torr	15 psig	1/6 hp	15 x 6.5 x 8.5 in.	**13-880-18**
Two Stage	35 L/min.	6 torr	15 psig	1/3 hp	16 x 7 x 9 in.	**13-880-20**
Two Stage	35 L/min.	1.5 torr	15 psig	1/3 hp	16 × 7 × 9 in.	**13-880-22**

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/labportvacuumpumps** or **fishersci.ca/labportvacuumpumps** 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**

LabChem
performance through chemistry

Chemical Solutions for Laboratory & Production

LabChem chemical solutions increase accuracy and consistency, reduce chemical handling, improve safety and are value priced.

Visit **fishersci.com/LabChem** or **fishersci.ca/LabChem** to shop.

Delivery + Quality = Dependability

*fisher*brand

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).

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	• Basic Cell Disruption	0.2 to 50 mL	50 w	**FB50110**
120	• Cell Disruption • Protein Extraction • DNA Shearing/ChIP	0.2 to 50 mL	120 w	**FB120110**
505	• Cell Disruption • Nanoparticle Dispersion • Homogenization/Mixing	0.2 to 1000 mL	500 w	**FB505110**
705	• Cell Disruption • Protein Extraction • DNA Shearing/ChIP • Nanoparticle Dispersion • Homogenization/Mixing • Sonochemistry	0.2 to 1000 mL	700 w	**FB705110**

fisher scientific
part of **Thermo Fisher Scientific**

300 Industry Drive
Pittsburgh, PA 15275

Setting science in motion to create a better world

avantor™

From breakthrough discovery to agile delivery of innovative laboratory products and services, Avantor is your trusted partner, committed to providing exceptional convenience, collaboration, and customization to enable your success.

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

J.T.Baker®

MACRON FINE CHEMICALS™

Distributed by Fisher Scientific

Promotion Terms and Conditions
These promotions are not available to our current or potential healthcare customers. Healthcare customers include any healthcare practitioner, other healthcare provider or any individual or organization authorized to prescribe, dispense, purchase or influence the acquisition or use of medical devices or supplies for clinical use. Healthcare customers include, without limitation, any "Health Care Practitioner" under the Massachusetts Marketing Code of Conduct Law (defined at 105 C.M.R §907.004) or a "Health Care Provider" under the Vermont Prescribed Products Gift Ban and Disclosure Law (defined at Vt. Stat. Ann. tit. 18, §4631a(8)). By participating in any of these promotions, you warrant that you are not a current or potential healthcare customer. Thermo Fisher Scientific reserves the right to determine your status in the event of a dispute.

Customer acknowledges that these offers may include a discount or other price reduction that must be properly and accurately accounted for and reported by customer in accordance with all federal and state laws, including without limitation the federal anti-kickback law (42 U.S.C. § 1320a-7b(b)(3)(A)) and regulations thereunder (42 C.F.R. §1001.952(h)).

The factual representations regarding the products accurately reflect the manufacturers' representations to Fisher Scientific. To the extent permissible, Fisher Scientific will make available to its customers the manufacturers' warranties. The sole and exclusive liability of Fisher Scientific shall be refund of the purchase price or replacement of the product. In no event shall Fisher Scientific be liable for incidental or consequential damages. **FISHER SCIENTIFIC EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.** Prices may change without notice. Prices are U.S. list prices — pricing may vary in Canada. Content and printed prices subject to confirmation by your Fisher Scientific Sales Representative. Telephone calls may be monitored as part of Fisher Scientific's quality process.

Litho in U.S.A. 21-618-2419 KP 12/21
BN20211258