

LAB

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Innovative Products and Science News
NO. 5, 2018

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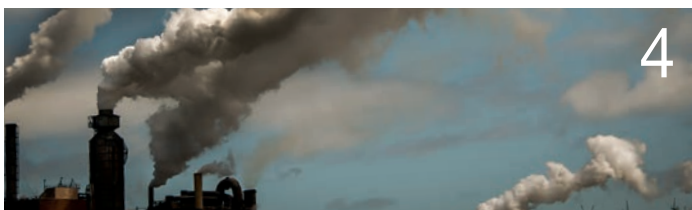


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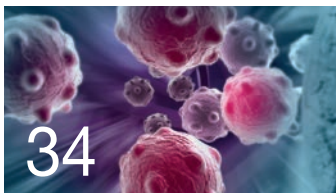
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Direct Air Capture: A Cheaper Way to Combat Climate Change

By Mae Pyer

A new approach to slowing climate change is offering promising results. Using a method to capture carbon dioxide (CO₂) from the air, scientists now have the potential to recycle large quantities of this greenhouse gas to hopefully minimize the warming trend.

Damage Control

With CO₂ levels, global temperatures, and ocean waters on the rise, scientists continue to warn about the implications of climate change for the future of our planet. To prevent an overall warming of 2°C, experts estimate that every country needs to have a near-zero carbon footprint by midcentury. In other words, they'll need to remove roughly the same amount of carbon dioxide as they're emitting. But even that won't be enough: every country will need to remove from the atmosphere more of the gas than they produce in the years that follow.

To help reverse the harsh reality of climate change, Harvard University physicist and co-founder of Carbon Engineering David Keith has released his company's

findings about a method called Direct Air Capture (DAC). To begin the process, air is directed through large grids of fans to a solution containing a CO₂-capturing chemical. This chemical traps the CO₂ so that it can be stored underground or used to make products and synthetic fuels.

The opportunity to recycle this gas actually sparked another project in which scientists determined that low-carbon fuels could be produced for roughly one dollar per liter. With sufficient demand, the market for DAC plants could increase, lowering the cost for both the plant and the fuel.

The Cost of Climate Change

In 2011, DAC appeared to be a desirable solution with an undesirable cost. Based on projections from the American Physical Society, it costs roughly 600 USD to capture one ton of CO₂. To put that in perspective, in 2017 we produced 35.8 billion tons of CO₂ globally.

More accurate cost figures for DAC became available with the opening of a

pilot plant in 2015. Using three years of operational data, including information about plant efficiency and the cost of building a commercial size facility, Keith and his team reported that it's possible to capture CO₂ at a cost of 94 USD to 232 USD per ton.

While initial results are promising, scientists can't predict how rapidly these plants could spread or if they'll be able to unravel climate change trends quickly enough.

Facing Our Future

Carbon Engineering states that the process of DAC can be scaled up to ultimately trap one million tons of CO₂ per commercial facility each year. While an expensive undertaking, scientists hope that using this technology to recycle such a key greenhouse gas will at least provide a viable answer to a daunting problem that is only growing more urgent.

Maximum Sensitivity, Minimum Downtime Flush Solutions and Ultrapure Solvents

Finding a reliable way to maximize instrument sensitivity and uptime is a top priority for most laboratory managers. While the latest liquid chromatography-mass spectrometry (LC/MS) systems can achieve highly sensitive analyses, regular use can take its toll. Without proper care and maintenance, LC/MS systems can drift from optimal performance, leading to inaccurate results and instrument downtime.

The Importance of High-Purity UHPLC/MS Reagents

Using the right consumables is one of the easiest ways to maintain LC/MS performance throughout an instrument's lifetime. High-purity solvents and flush solutions can help minimize result interference and maximize uptime, which is especially important for highly sensitive techniques like ultra-high performance liquid chromatography-mass spectrometry (UHPLC/MS).

The development of UHPLC and other high-efficiency liquid chromatography techniques has set new standards for analytical sensitivity, efficiency, and throughput. Modern instruments can support high-throughput testing for trace analytes in complex sample matrices, but the sensitivity of UHPLC/MS systems can be dramatically reduced by the presence of even small amounts of impurities in solvents. For complex samples, regular cleaning helps reduce the buildup of matrix components and ensures consistent analyses.

Regularly using high-purity solvents and flush solutions can help you consistently achieve high performance, reliable data, and minimal downtime with your UHPLC/MS system. This practice can also maximize peak resolution and contributes to higher instrument efficiency.

UHPLC/MS Solvents Designed to Improve Instrument Performance

The Thermo Scientific family of products now includes new ChromaCare UHPLC/MS Solvents that help raise the bar in instrument performance and laboratory productivity. Designed for use with Thermo Scientific analytical instruments, new ChromaCare Flush Solutions help maximize system uptime and accelerate groundbreaking research.

Specially filtered acetonitrile, methanol, and water solvents for UHPLC/MS can be used to maximize sensitivity and productivity in pharmaceutical, biotech, clinical, and academic laboratories. These new ultrapure solvents, designed specifically for UHPLC/MS applications, reduce background noise and prevent protein precipitation for high-quality chromatograms.

Thermo Scientific UHPLC/MS solvents can help laboratories achieve high-quality separation results by enhancing mass sensitivity and resolution, reducing the formation of metal ion adducts, and improving peak profiles. They also support optimal signal-to-noise ratios

while keeping UV-absorbing and MS-ionizing impurities to a minimum, resulting in baselines with an extremely low level of background interference regardless of the type of detector used.

ChromaCare Solvents are ultra-filtered to reduce downtime due to obstructed columns and check valves, helping you meet lab workflow demands. And because the chemicals are packaged in borosilicate glass bottles, fewer metal cations (Ca⁺ and K⁺) leach into the solvents, further minimizing sample contamination.

ChromaCare Flush Solutions for Increased Instrument Uptime

Robust flushing procedures can help optimize peak shapes, keep baselines smooth, prevent precipitation, and



eliminate the need to use toxic chlorinated solvents that can degrade seals. Washing your LC/MS system with aqueous solutions before and after using organic solvents can also help prevent the precipitation of proteins that can clog your instrument, contaminate your samples, and potentially require premature column replacement. Without regular cleaning protocols, buffers can be retained in the column pores and cause retention time alterations, peak trailing, and baseline drift.

New ChromaCare Flush Solution products were developed for both start-up and maintenance of your LC/MS columns and instruments, and are designed to

ensure the seamless function of Thermo Scientific LC/MS Systems. For example, the LC/MS Instrument Flush Solution reduces background noise and facilitates optimal instrument performance. If you're working with biological reagents, the LC/MS Biologics Flush Solution prevents proteins from clogging probes to minimize instrument downtime and preserve the integrity of your samples.

Setting the Bar Ultra High

Thermo Scientific UHPLC/MS Solvents and ChromaCare Flush Solutions are designed to optimize analytical sensitivity and help preserve the integrity of every

sample. Developed in conjunction with chromatography and mass spectrometry experts, our solvents and solutions work seamlessly with Thermo Scientific instruments to deliver ultra-high performance, reduce maintenance costs, and help your instruments run longer — all to keep your research on track.

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In-Depth Look

Arsenic Speciation in Rice Products

Arsenic is unique in that its inorganic species presents significantly higher levels of toxicity than its organic variants. While it was previously believed that human overexposure to arsenic largely stemmed from contaminated ground water, recent studies have uncovered high levels of arsenic accumulation in rice, which is unique among grains in exhibiting this kind of bioaccumulation. While the biological mechanisms behind this are just beginning to be explored and understood, the discovery has led to many changes in regulation, especially concerning exposure of infants and children under the age of three.

Pediatricians have traditionally recommended rice products such as cereals and puffs as “first foods” — safe introductions to solid food. Since the “blacklisting” of high-fructose corn syrup, organic brown rice syrup (OBRS) has become the preferred sweetener for these products. But OBRS is the most problematic of pathways to potential arsenic exposure because brown rice contains disproportionately higher levels of inorganic arsenic than white rice. Effectively, this results in children under the age of three consuming higher than average amounts of rice and rice-based products.

Compounding this problem is the issue of increased relative exposure. Inorganic arsenic exposure limits are based on the amount of arsenic consumed per kilogram of body weight (currently 0.17µg/kg per EPA drinking water regulation). This means that infants and young children, due to their small size, are exposed to arsenic levels two to three times higher than adults when they consume the same portion (EFSA 2009).

While the levels of exposure required to cause harm have been a recent point of contention and discussion, numerous studies have clearly characterized the hazards of arsenic overexposure in young children, including:

- Delays in physical and mental development (Wasserman et al., 2004)
- Suppressed immune response (Nadeau et al., 2014)
- Higher instance of childhood cancers (Moore et al., 2002)
- Higher likelihood of developing certain cancers later in life (Smith et al., 1998)

The U.S. Food and Drug Administration (FDA) is still reviewing the effects of various arsenic concentrations in rice

and rice products and has yet to publish any regulations. A “proposed action level” of inorganic arsenic in baby food was proposed in April 2016, but concrete regulatory steps are still pending. In contrast, the European Union (EU) passed and ratified Commission Regulation 2015/1006 on June 25, 2015, amending existing regulation regarding contaminant limits in food. The amendment took effect on January 1, 2016, and today all food manufacturers, distributors, and resellers must meet its requirements to be able to sell within EU member states.

The amendment itself is short and straightforward — it adds arsenic regulation to an existing list of known adulterants, establishes the need to test for total and inorganic arsenic levels in rice products, breaks down the overarching “rice products” category into four sub-categories (key among which is “rice destined for the production of food for infants and young children”), and institutes maximum allowable inorganic arsenic limits for each category (see Table 1).

The new testing guidelines and limits will prove especially valuable for foods destined for infant consumption. One

Subsections	Foodstuffs	Maximum Allowable Levels
3.5	Arsenic (inorganic) (50) (51)	N/A
3.5.1	Non-parboiled milled rice (polished or white rice)	0.20µg/kg
3.5.2	Parboiled rice and husked rice	0.25µg/kg
3.5.3	Rice waffles, rice wafers, rice crackers, and rice cakes	0.30µg/kg
3.5.4	Rice destined for the production of food for infants and young children	0.10µg/kg

(50) Sum of As(III) and As(V)

(51) Rice, husked rice, milled rice, and parboiled rice as defined in Codex Standard 198-1995

study that specifically examined arsenic concentration in infant formulas found that the total concentration of arsenic was acceptable across most (all but three) of the brands surveyed. But speciation (which measures the chemical form and oxidation state of the arsenic present) in the products containing arsenic demonstrated a ratio of organic to inorganic arsenic that ranged from 3:7 to 1:9 (Jackson et al., 2012). In other words, most of these brands did not meet the new regulations.

As we develop more accurate and sensitive testing methods, it's inevitable that our knowledge and understanding of the health effects of various substances will expand. Fast and easy speciation by LC/ICP-MS and IC/ICP-MS has allowed us to look past the total arsenic mantra and focus on the truly harmful and dangerous factors present in our food and water. Manufacturers who invest in these new testing methods will be rewarded with higher consumer confidence and less waste because products previously deemed unsellable under the "total

arsenic" regulations will be safe following speciation. And as consumers, we can breathe a sigh of relief knowing that the food we feed our children meets all the latest safety standards and reflects current scientific understanding.

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Acetonitrile, HPLC Grade	RSOA00204C	4L
HydroSpec Coulometric AG Analyte Solution	RK1000001C	1L
Reference Standard Buffer, pH 7.00, Yellow	1551-32	1L
Sodium Hydroxide Pellets, ACS Reagent Grade	RDOS053025	2.5kg
DPD Indicator Solution for Residual Chlorine Analysis	2655-32	1L
Sulfuric Acid, 1N	8300-1	4L
ProteoSpec Acetic Acid, LCMS Grade	RMB11201101	10 x 1mL
Conductivity/TDS Standard: 100 μ S/cm at 25°C	2237-32	1L
Potassium Chloride Conductivity Standard, 1mS/cm at 25°C	588801-32	1L

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Description	Mfr. No.	Cat. No.	Quantity
Water Sampling Octagonal PET Bottle, 250mL, Graduated, 160mg/L Sodium Thiosulfate, 31mm Tamper-Evident Cap, Sterile	HP250B-55	07-202-060	144/Case

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Description	Mfr. No.	Cat. No.	Quantity
Petri Dishes, Polystyrene, with Traceability Labels			
Dia. x H: 60 x 15mm, 6 Vents, Sterile (Double Outer Bag)	BP53-03	07-202-050	1,620/Case
Dia. x H: 60 x 15mm, 6 Vents, Aseptic (Double Outer Bag)	BP53-06	07-202-055	1,620/Case
Dia. x H: 150 x 15mm, 6 Vents, Sterile	BP143-06	07-202-550	176/Case
Autoclavable Bags, Polypropylene, Thickness: 4mil			
Capacity: 3L, Plain	SA03-01	07-201-961	500/Case
Capacity: 9L, Plain	SA09-01	07-201-963	500/Case
Capacity: 14L, Plain	SA14-01	07-201-965	500/Case
Capacity: 21L, Plain	SA21-01	07-201-967	500/Case
Capacity: 33L, Plain	SA33-01	07-201-969	500/Case
Capacity: 3L, with Biohazard Symbol	SA03-10	07-202-043	500/Case
Capacity: 9L, with Biohazard Symbol	SA09-10	07-202-044	500/Case
Capacity: 14L, with Biohazard Symbol	SA14-10	07-202-045	500/Case
Capacity: 21L, with Biohazard Symbol	SA21-10	07-202-046	500/Case
Capacity: 33L, with Biohazard Symbol	SA33-10	07-202-047	500/Case
Inoculating Loops with Needle End, Polystyrene			
Capacity: 10µL, Blue, 20/Bag	OS10-02	07-901-946	9,000/Case
Capacity: 1µL, Green, 20/Bag	OS1-01	07-901-947	9,000/Case



Copper-Coated Uniforms Could Reduce Infection

By Gina Wynn

According to a recent study, hospitals could soon reduce the number of infection outbreaks among patients by switching to copper-coated uniforms.

Bacterial infection is a major issue in hospitals around the world, and because infections from organisms like *Escherichia coli* and *Staphylococcus aureus* are easily spread via surfaces and clothing, University of Manchester researchers are concerned the number of outbreaks could increase. Statistics from the United Kingdom National Health Service (NHS) show more than 5,500 patient deaths from *E. coli* infections alone in 2015. High infection rates also have financial implications: the NHS projected these infections could cost £2.3 billion (\$2.93 billion) by 2018.

Binding Breakthrough

Material scientists at the University of Manchester, in collaboration with universities in China, have reportedly developed and tested a “durable and washable, concrete-like” composite

material made from antibacterial copper nanoparticles. They also discovered how to bind the composite to wearable materials like cotton and polyester, which are commonly used for hospital attire. Before this discovery, scientists struggled with various techniques for binding copper to textile materials.

To bond the copper to the textiles, the research team used a process called polymer surface grafting. This method employs a polymer brush to affix copper nanoparticles to the cotton and polyester to create a strong chemical bond. According to the team, the bond contributes to the fabric’s durability and its ability to withstand laundering. Even after 30 washes, the team’s copper-coated textiles maintained their antibacterial resistance.

Real-World Potential

Because copper-coated uniforms could potentially save lives and money, the research team believes that a sizable market exists for their product. The

study’s lead author, Xuqing Liu, PhD, hopes to see it commercialized in a couple of years. He and his colleagues are working to simplify the coating process and make it more cost effective.

Cost also played a role in the team’s choice of copper as a coating material. As precious metals, gold, silver, and copper all have antibacterial and antimicrobial properties, because of its much lower cost, copper was the obvious choice of the three for widespread use.

So far the results of the study have been positive, according to Dr. Liu, and companies are already showing interest in developing the polymer surface grafting technology. He believes it shows significant promise for modern medical and healthcare applications.



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P10	Red	0.5 – 10µL	FA10002MTG*	F144055MTG*	F144802TG*
P20	Yellow	2 – 20µL	FA10003MTG*	F144056MTG*	F123600T*
P100	Salmon	10 – 100µL	FA10004MTG*	F144057MTG*	F123615T*
P200	Yellow	20 – 200µL	FA10005MTG*	F144058MTG*	F123601TG*
P1000	Blue	100 – 1000µL	FA10006MTG*	F144059MTG*	F123602TG*
P5000	Purple	500 – 5000µL	FA10007TG**	F144066TG**	F123603TG**
P10M	Blue	1 – 10mL	FA10008TG**	F144067TG**	F161201T**

*Metal tip ejector

**No tip ejector

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Airborne Microchips Detect Chemicals

By Mike Howie

As our technological know-how advances, new devices simultaneously shrink in size and grow in power. We see this in the technology we use every day: laptops are continuously getting smaller and lighter, smartphones can easily accomplish tasks that once required a computer, and the latest smartwatches are packed with GPS, cellular connectivity and voice assistants. The simpler a device is, the smaller it can be. But many consumers may not realize how truly microscopic electronics are becoming.

Case in point: researchers at MIT have recently created sensors small enough to be sprayed in an aerosol mist. Detailed in a paper titled “Colloidal nanoelectronic state machines based on 2D materials for aerosolizable electronics” published in *Nature Nanotechnology*, the new chips are about as wide as a human hair — one micrometer thick and 100 micrometers across — and made by grafting 2D electronic materials onto colloidal particles. This results in tiny, functional electronic circuits, transistors, memory and sensors dubbed colloidal state machines (CSMs) that are capable of autonomously collecting, manipulating and storing information.

How do they work?

Each CSM has three parts: a photodiode that detects light to power the device, a chemiresistor that boosts conductance after binding with a specific analyte, and a memristor that turns on when the current surpasses a given threshold.

In use, the CSMs would be sprayed into an environment and given time to bind with the analyte of choice. They would then be collected and examined to see how many are “on” (meaning they detected the analyte) and how many remained “off”

(meaning they did not detect the analyte). Using that information, the researcher could determine how much of the analyte is present in the tested environment.

While the researchers currently need to collect the CSMs and connect them to electrodes to determine whether or not they came in contact with certain particles, this method may not always be necessary. Future CSMs could illuminate when bound to target particles, and the team is researching ways to power the chips without ambient light and how to detect multiple analytes from a single chip.

Where could they be applied?

Most obviously, CSMs could be useful in confined environments that are too small for traditional probes, including everything from oil and gas conduits and chemical and biosynthetic reactors to the human digestive tract. To prove this, the researchers created a model pipeline, injected the chips, then filled the pipeline with gaseous ammonia — a highly toxic gas used in fertilizers and refrigerants, and one of the most dangerous compounds to transport through pipelines. After 30 minutes, the researchers shut off the ammonia and successfully retrieved and examined the CSMs.

Medical applications have yet to be tested, but the researchers predict that CSMs could be injected into a patient’s bloodstream to monitor chemical composition without needing to draw any blood, or taken as a pill or nasal spray to track digestive health.

The CSMs could also be used for environmental monitoring, detecting soot, bacteria, spores, volatile organic compounds and other particles over large areas. Soot,

for example, is emitted from power plants and diesel engines, can travel upwards of 1,000 miles before settling and poses health, climate and environmental risks. It’s challenging to predict the distribution and impact of soot, and monitoring it over a wide area by traditional means is not economically viable.

Environmental monitoring is commonly conducted with satellites or unmanned aerial drones, which are costly and indirect, as well as sensors on the ground, which are labor intensive and slow to deploy. These aerosolizable electronics, on the other hand, can easily be dispersed as autonomously powered devices, reducing costs and labor and offering more rapid results.

How do you find them?

Collecting CSMs from a confined system like the model pipeline is relatively simple: the researchers simply stretched a piece of cheesecloth over the end of the pipe to collect the chips. But collecting CSMs dispersed over a large area would be much more difficult. To solve this issue, the researchers created a batch of chips designed as retroreflectors. These chips reflect low-intensity lasers back to the source and work from up to one kilometer away, even when the light hits them at a steep angle. With a custom laser-scanning system, the researchers can quickly detect the CSMs.

Though the chips are small and simple, they are mighty. They provide unprecedented access to confined environments and gather reliable data, making it easy for researchers, technicians and medical professionals across myriad industries to make more informed decisions in their critical work.

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Fisherbrand Pipette Tip Box Recycle Boxes

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- Use a 500w or 700w unit for samples larger than 50mL
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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 because 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"> • Basic Cell Disruption 	0.2 to 50mL	50w	FB50110
120	<ul style="list-style-type: none"> • Cell Disruption • Protein Extraction • DNA Shearing/ChIP 	0.2 to 50mL	120w	FB120110
505	<ul style="list-style-type: none"> • Cell Disruption • Nanoparticle Dispersion • Homogenization/Mixing 	0.2 to 1000mL	500w	FB505110
705	<ul style="list-style-type: none"> • Cell Disruption • Protein Extraction • DNA Shearing/ChIP • Nanoparticle Dispersion • Homogenization/Mixing • Sonochemistry 	0.2 to 1000mL	700w	FB705110

Rapid Tissue Homogenization

Fisherbrand Bead Mills and Tubes

Fisherbrand Bead Mills and Tubes are designed for grinding, lysing, and homogenizing biological samples in preparation for molecular extraction. Their unique tube carriage motion, coupled with tissue-specific abrasive materials, helps to achieve complete homogenates for DNA/RNA extraction, enzyme isolation, and protein purification.

Bead Mill 4 Homogenizer

- Simultaneously processes 4 x 0.5mL, 4 x 1.5mL, 4 x 2mL, or 1 x 7mL samples
- Offers everything from gentle mixing to high-force homogenization
- Saves space with its small footprint
- Includes Bead Mill 4 Motor Drive; integrated 0.5mL, 1.5mL, and 2mL tube carriage; 7mL tube carriage; tool kit; and instruction manual

Bead Mill 24 Homogenizer

- Simultaneously homogenizes up to 24 x 0.5mL or 24 x 2mL tubes
- Saves space with its small footprint
- Includes convenient front-loading tube holder
- Offers non-stop processing with no cooldown required between runs
- Features run times from 1 to 99 seconds

Bead Mill Tubes

- Disposable, helping to reduce the risk of cross-contamination
- Reinforced to prevent breaking
- Paired with screw caps
- Free of RNase and DNase



Fisherbrand Bead Mills

Description	Cat. No.
Bead Mill 4 Homogenizer	15-340-164
Bead Mill 24 Homogenizer	15-340-163

Fisherbrand Bead Mill Tubes

Application	Capacity	Bead Size (Material)	Cat. No.	Quantity
Hard Tissue Grinding	2mL	2.4mm (Metal)	15-340-151	50/Pack
Soft Tissue Homogenizing	2mL	1.4mm (Ceramic)	15-340-153	50/Pack
Hard Tissue Homogenizing	2mL	2.8mm (Ceramic)	15-340-154	50/Pack
Hard Tissue Grinding	7mL	2.4mm (Metal)	15-340-155	50/Pack
Soft Tissue Homogenizing	7mL	1.4mm (Ceramic)	15-340-156	50/Pack
Hard Tissue Homogenizing	7mL	2.8mm (Ceramic)	15-340-157	50/Pack

Flexible Lab Seating

Fisherbrand Polyurethane Chairs and Stools

Robust Fisherbrand Polyurethane Chairs can be easily cleaned, making them ideal for almost any environment, and they adjust to fit most body types and workstations.

Every ergonomic Fisherbrand Polyurethane Chair is backed by our 15-year warranty and a lifetime warranty on the pneumatic lift.



Description	Casters	Foot Ring	Height	Color	Cat. No.
Chair, Armless	No	Yes	High Form	Blue	14-000-691
Chair, Armless, Adjustable Back	Yes	No	Desk	Blue	14-000-630
Chair, Adjustable Arms and Back	Yes	Yes	Medium	Blue	14-000-604
Stool, Tractor Seat	Yes	No	Medium	Blue	14-000-767
Stool, Tractor Seat	Yes	Yes	Medium	Black	14-000-788



New Technology Sheds Light on Concussions

By Kylie Wolfe

Researchers have created a portable brain imaging system that lets them more closely examine patient injuries after a concussion. Using near-infrared spectroscopy (NIRS) and a cap filled with lights, scientists can monitor and measure different aspects of brain activity.

Current Methods

Every year, 1.6 million people visit the emergency room after experiencing a mild traumatic brain injury (mTBI) or concussion. Though more prevalent in sports, people of all ages and activity levels can experience a head injury from a car crash, fall or other accident.

The severity of a concussion is currently based on the results of a computerized assessment test and patient-described symptoms. While helpful, these methods do not give physicians a complete understanding of the brain at a cellular level, and symptoms can vary from patient to patient. Standard tests like computerized tomography (CT) scans and magnetic resonance imaging (MRI) provide more detailed information,

including signs of bleeding, swelling, bruising and scarring, but still not to the level needed.

New Technologies

A new, non-invasive brain imaging system, developed at the University of Calgary, closely resembles a swim cap that fits snugly on a patient's head. The cap contains small lights and sensors that connect to a computer, and when the lights are turned on, the transmitted data can give doctors a closer look at microscopic-level interactions in the brain.

A healthy brain will exhibit similar blood flow and blood oxygen levels on both sides, but concussion patients show different patterns both immediately following the trauma and throughout the healing process. Physicians can now monitor these attributes with the benefit of more detailed information as provided by the new imaging system, which allows them to make more accurate diagnoses and provide better estimates of recovery time and release.

A study published in the *Journal of Neurotrauma* used this technology to test patients with mTBI who were experiencing post-concussion symptoms. Examining 12 mTBI patients and 12 healthy controls, researchers found that the imaging system provided insight on differences in the brain, including changes that indirectly affect neuronal activity in concussion patients.

Future Applications

A future study at the Alberta Children's Hospital will use this technology to track patient progress. Researchers hope that this system will provide an easy, affordable way to monitor head injuries and that it can one day be used in concussion treatment clinics and sports facilities to help doctors not only determine the extent of an injury, but also observe patient progress.

Filtered Laboratory Safety Solutions

MYSTAIRE®

Mystaire manufactures fume hoods and laminar flow hoods to provide operator or process protection from toxic fumes, vapors and particulates.



Latitude Series C Filtered Hood

Latitude Series C Filtered Hoods are designed for safe, effective weighing and containment of particulates and gases.

Standard Features:

- Safe-T-Zone HEPA filtration technology
- EverSafe microprocessor controller
- Thermally fused polypropylene construction with dark-blue base

Model	Width	Mfr. No.	Cat. No.
Latitude	48 in.	MY-LBE48	15-338-965
Latitude	72 in.	MY-LBE72	15-338-966

Isola Vue Filtered Chemical Workstation

Isola Series Filtered Workstations provide chemical and particulate containment. Advanced monitoring and control are key components of each Isola Filtered Workstation.

Standard Features:

- EverSafe III Touch Control with electronic monitoring of face velocity, filter saturation, temperature and humidity with audible and visible alarms
- Polycarbonate construction for 360-degree visibility — excellent for demonstrations
- Solid-state gas detection with three sensitivity set points

Model	Width	Mfr. No.	Cat. No.
Isola Vue	36 in.	MY-ISL36	15-338-900
Isola Vue	48 in.	MY-ISL48	15-338-901
Isola Vue	72 in.	MY-ISL72	15-338-902

Isola filters sold separately; application dependent



MY-PCR Workstations

Mystaire MY-PCR workstations establish an ISO5 clean work area with timed UV light. MY-PCR workstations create a "personal" clean work zone.

Standard Features:

- Combines vertical ISO5 air with UV light sterilization
- Safety switch to eliminate UV light exposure
- Polycarbonate construction with polypropylene base

Model	Width	Mfr. No.	Cat. No.
MY-PCR	24 in.	MY-PCR24	15-338-365
MY-PCR	32 in.	MY-PCR32	15-338-366
MY-PCR	48 in.	MY-PCR48	15-338-367

MY-PCR filters included in the purchase price





Convenient and Efficient Rotary Evaporation

BUCHI Rotavapor Rotary Evaporators

The Buchi Rotavapor R-300 Rotary Evaporator meets the highest expectations in convenience and versatility, and its modular design lets you expand it to a fully integrated system with a central regulating interface.

Easy plug-and-play extensions create a fully integrated system:

- Central interface controls all components and programs and sends push notifications
- Chemically resistant, speed-regulated vacuum pump runs only when needed
- Recirculating chiller designed specifically for the lab with energy-saving ECO mode

Choose the configuration to meet your needs:

- Electronic and manual lifts available
- Eight condenser configurations for different applications
- High-temperature (220°C, 5L) and fast-heating (1L) baths

Contact your **Fisher Scientific sales representative** for more information about BUCHI rotary evaporators, vacuum pumps, and chillers.

All R-300 models with a 5L bath have a temperature range of 20° to 220°C and operate at speeds between 10 and 280rpm.

Choose from vertical condensers (for standard distillation with cold water or a chiller) or cold trap condensers (for distillation of solvents with low boiling points; use with dry ice).



Condenser (Glassware*)	Lift	Bath (Capacity)	Controller	Chiller	Vacuum Pump	Mfr. No.	Cat. No.
Cold Trap	Manual	B-305 (5L)				11R300152C002	05-000-455
Cold Trap (P+G)	Manual	B-305 (5L)				11R300152C102	05-000-461
Vertical	Manual	B-305 (5L)				11R300152V002	05-000-485
Vertical (P+G)	Manual	B-305 (5L)				11R300152V102	05-000-491
Cold Trap	Manual	B-305 (5L)	I-300			11R300152C122	05-000-463†
Cold Trap	Manual	B-305 (5L)	I-300 Pro			11R300152C132	05-000-464†
Cold Trap	Manual	B-305 (5L)	I-300			11R300152C142	05-000-465**
Cold Trap	Manual	B-305 (5L)	I-300 Pro			11R300152C152	05-000-466
Vertical	Manual	B-305 (5L)	I-300			11R300152V122	05-000-493†
Vertical	Manual	B-305 (5L)	I-300 Pro			11R300152V132	05-000-494†
Vertical	Manual	B-305 (5L)	I-300			11R300152V142	05-000-495
Vertical	Manual	B-305 (5L)	I-300 Pro			11R300152V152	05-000-496**
Cold Trap (P+G)	Manual	B-305 (5L)	I-300		V-300	11SR300152CS02	05-001-022
Vertical (P+G)	Manual	B-305 (5L)	I-300		V-300	11SR300152VS02	05-001-028
Cold Trap	Electronic	B-305 (5L)				11R300252C002	05-000-941
Cold Trap (P+G)	Electronic	B-305 (5L)				11R300252C102	05-000-947
Vertical (P+G)	Electronic	B-305 (5L)				11R300252V102	05-000-977
Cold Trap (P+G)	Electronic	B-305 (5L)	I-300			11R300252C122	05-000-949
Cold Trap (P+G)	Electronic	B-305 (5L)	I-300			11R300252C142	05-000-951
Vertical (P+G)	Electronic	B-305 (5L)	I-300			11R300252V122	05-000-979
Vertical (P+G)	Electronic	B-305 (5L)	I-300 Pro			11R300252V152	05-000-982
Cold Trap (P+G)	Electronic	B-305 (5L)	I-300		V-300	11SR300252CS02	05-001-070
Vertical (P+G)	Electronic	B-305 (5L)	I-300		V-300	11SR300252VS02	05-001-076
Vertical (P+G)	Electronic	B-305 (5L)	I-300	F-305	V-300	11SR300252VS12	05-001-077
Cold Trap (P+G)	Electronic	B-305 (5L)	I-300 Pro		V-300	11SR300252CP02	05-001-067
Vertical (P+G)	Electronic	B-305 (5L)	I-300 Pro	F-305	V-300	11SR300252VP12	05-001-074

*PLASTIC+GLASS (P+G) or safety coating

**With valve unit

†Includes Wouff bottle

Transform Your Lab with Digital Connectivity

As a variety of industries and professions strive to increase productivity and enable transparency, they're making a digital transformation to achieve top priorities. The music industry is a prime example of this, using digital technology to give customers higher-quality files, real-time access to new music, and a greater selection of music. Digital technology is changing the world of consumer products as well, with connected light bulbs, air conditioners, locks, and much more becoming common staples in homes around the world. And in the world of science, researchers are digitally transforming their labs to add greater flexibility — and peace of mind — to their work.

The evolution of modern lab workflows is similar to the evolution that's already taken place in the music industry: there's an emphasis on increased productivity, efficiency, convenience, and visibility, all of which are necessary for researchers to be successful. Their focus on the next big breakthrough or key discovery requires them to be closely connected to the lab.

In a recent survey, 60% of respondents said they were already reaping the benefits of using digital technology in the lab, including connected liquid handling products, freezers, refrigerators, and incubators. This equipment allows them to expand the way they work by:

- Simplifying their setup
- Allowing them to monitor their lab from any location
- Providing advanced notifications that help increase productivity and avoid downtime
- Delivering alerts and predictive notifications that allow them to quickly respond to problems
- Keeping data safe with secure storage
- Automatically updating with the newest software

It's clear that the digital transformation of labs has already started, and it will continue to evolve in exciting ways. By getting ahead of the curve, you'll be able to bring the benefits of this evolution to your own research and operations. But before you get started, it's important to understand the available options and how they fit your needs.

With powerful tools and multiple connectivity options, Thermo Fisher Connectivity makes it easy to keep track of your data by allowing you to:

- Automatically upload and store data in your private cloud account from cloud-enabled instruments or your desktop computer
- Remotely monitor instruments and benchtop devices from any location and with any mobile device
- Perform primary and secondary analysis across all your data and projects with a robust toolkit of fast, powerful, intuitive analysis software
- Securely share your work with colleagues and collaborators using group permissions and custom sharing options
- Easily save and synchronize your files to your secure cloud account, scaling your storage as needed

Thermo Fisher Connectivity is available through the DeviceLink Hub and embedded options. The easy-to-install DeviceLink Hub brings cloud technology to your existing refrigerators, freezers, ultra-low-temperature freezers, and CO₂ incubators* to help you save time and effort and stay focused on science. And for a more streamlined approach, select equipment is preconfigured with embedded technology that's ready to use. Both options continuously monitor conditions and provide immediate alerts by email and mobile notifications.

Digital transformation is vital to the future of lab workflows, and labs that don't adopt new technology may miss key opportunities or work less efficiently than they could while other labs thrive. Digital solutions can help address your lab's daily challenges while:

- Improving productivity with mobile access to automatically collected and stored data
- Accelerating your science by helping you focus on strategic priorities
- Ensuring peace of mind with remote monitoring and alerts
- Providing easy access to assistance for regulatory compliance, preventative maintenance, and workflow automation

Digital transformation is here to stay, and taking advantage of it can truly change the way your lab operates.

Content provided by:

thermoscientific

Transform
your lab
equipment...



... into an
appreciating
asset

Thermo Scientific DeviceLink

Continually pursuing what's **Essential to Science.**

You're at the forefront of scientific discovery. And that's what inspires Thermo Fisher Scientific to stay at the forefront of lab equipment technology. Therefore, we've brought the Thermo Scientific DeviceLink Hub monitoring solution, which harnesses the power of the web, to help you save time and effort and allow you to focus on science. Our easy-to-install solution works with the Thermo Fisher Cloud to monitor conditions inside your lab's refrigerators, freezers, ultra-low-temperature freezers, and CO₂ incubators.* Also available is embedded connectivity in new equipment like Thermo Scientific Ultra-Low-Temperature Freezers with Thermo Scientific DeviceLink.

Digital connectivity designed to help streamline productivity and empower your lab now and into the future.

*Available in select ultra-low-temperature freezers, high-performance refrigerators, and CO₂ incubators

Learn more at thermofisher.com/connectedlabequipment

ThermoFisher
SCIENTIFIC

Limited-Time Offers on BioTek Instruments



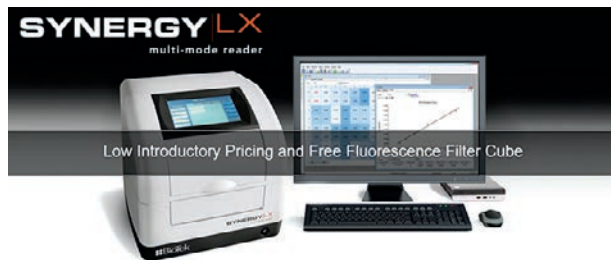
BioTek Microplate Readers, Washers, and Imagers

Get a Fluorescence Filter Cube with Purchase

When you purchase a BioTek Synergy LX Multi-Mode Reader at the low introductory price, you'll get a fluorescence filter cube at no additional cost.

- Support for the most common assays
- Easily accessible filter cubes
- Optional microvolume sample detection

Excludes healthcare customers. See page 44 and contact your Fisher Scientific sales representative for details.



Model	Description	Cat. No.
Synergy LX	Absorbance, Fluorescence, and Luminescence; Touchscreen UI; Includes Gen5 Software	BTSLXFATS

Save \$5,000 on a Microplate Washer

When you trade in any old BioTek ELx405 Washer, you'll save over \$5,000 on the best-selling 405 TS Microplate Washer.

- Fast 96- and 384-well plate washing
- Cell-friendly angled dispense tubes and low flow rates
- Automated four-buffer switching facilitates complex wash processes
- Patented Ultrasonic Advantage automatically and thoroughly cleans manifolds

Restrictions apply. See page 44 for details.

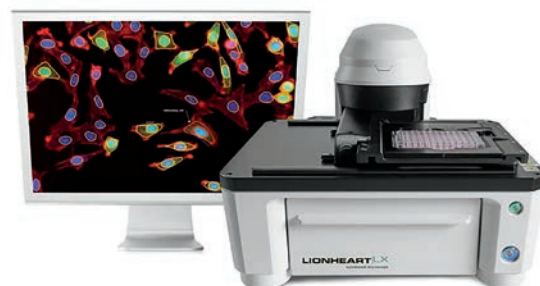


Model	Description	Cat. No.
405 TS	96-/384-Well Microplate Washing, Ultrasonic Advantage, Buffer Switching	BT405TSUVSP

Affordable, Automated Microscopy

BioTek Lionheart LX Automated Microscope

- 1.25x to 60x air plus 60x and 100x oil immersion magnification
- Fluorescence, high-contrast brightfield, and color brightfield imaging
- Automated image capture, processing, and analysis for publication-ready images
- Quick analysis: instant cell count and confluence measurement
- Integrated, compact design offers quick installation and setup
- Available wound-making tool for automated cell migration/invasion protocols



Model	Description	Cat. No.
Lionheart LX	Fluorescence, High-Contrast Brightfield, and Color Brightfield Imaging; Includes Gen5 Software	BTLX



Durably Constructed

Explorer Series Balances

Featuring readabilities from 0.01mg to 0.1g and capacities up to 35kg, the OHAUS Explorer Series is a robust family of durably constructed balances specifically designed to offer outstanding accuracy and weighing performance. Fully featured to meet all of your weighing needs, the Explorer Series is outfitted with:

- A large color graphic touchscreen and intuitive user interface, available in 14 operating languages
- Measurement traceability for easy compliance with GLP and GMP standards
- 14 specialized applications, including formulation, dynamic (animal) weighing, and pipette adjustment
- RS-232, USB, and ethernet interfaces for printer or PC connectivity and system integration



Explorer Precision

Explorer Analytical

Description	Capacity	Readability	Cat. No.
Model EX125D Semi-Micro Balance	52g/120g	0.01mg	01-919-370
Model EX225D Semi-Micro Balance	120g/220g	0.015mg	01-919-372
Model EX124 Analytical Balance	120g	0.0001g	01-920-232
Model EX324 Analytical Balance	320g	0.0001g	01-920-234
Model EX223 Precision Balance	2200g	0.001g	01-920-235
Model EX623 Precision Balance	620g	0.001g	01-920-237
Model EX2202 Precision Balance	2200g	0.01g	01-920-239
Model EX6202 Precision Balance	6200g	0.01g	01-920-241
Model EX6201 Precision Balance	6200g	0.1g	01-920-243
Model EX12001 High-Capacity Precision Balance	12000g	0.1g	02-112-245

Bleach Resistant for Cell Culture



VACUUBRAND BVC Fluid Aspiration Systems

VACUUBRAND BVC Compact Aspiration Systems provide safe, sensitive, and efficient cell culture biofluid aspirations.

Choose from six different models, ranging from unpowered to fully featured, with vacuum control and contact-free liquid level sensing. Models with components that are resistant to chlorine bleach are also available for decontamination protocols.

- All models include a 2L glass or 4L polypropylene bottle for safe biological waste collection and disposal
- The autoclavable hydrophobic biofilter protects the pump or other vacuum supply
- A VHC^{PRO} hand controller keeps all of the fluids in the aspiration tube for convenient containment and cleaning
- VACUUBRAND chemistry-design vacuum pumps are included with the *control* and *professional* models
- The pumps have a long service life and enough power for two users



Model	Bottle Capacity	Bottle Material	Mfr. No.	Cat. No.
BVC <i>basic</i>	4L	Polypropylene	727000	13-688-005
BVC <i>basic</i> G	2L	Glass	727100	13-688-006
BVC <i>control</i>	4L	Polypropylene	727203	13-688-008
BVC <i>control</i> G	2L	Glass	727303	13-688-010
BVC <i>professional</i>	4L	Polypropylene	727403	13-688-012
BVC <i>professional</i>	2L	Glass	727503	13-688-014

HPLC Quality Depends on the Quality of Sample Prep

HPLC is a common analytical method, and samples must be free of interfering particles that can compromise detection and block the flow of solvents through the column.

Sample prep is labor intensive, time consuming, and often tedious, but it's a key factor in achieving accurate results. Problems with sample prep can immediately manifest themselves on the chromatogram, and the entire run may have to be repeated.

Sartorius products can help you address these problems to achieve higher analytical accuracy.

Water Quality

The HPLC mobile phase must be especially pure in physical and chemical properties and should not contain organic impurities or particles. Approximately 80% of HPLC problems can be attributed to inadequate water quality, and even water sold as "HPLC grade" may have high total organic carbon (TOC) levels.

An arium mini plus UV Ultrapure Lab Water System can help deliver consistently high water quality. The unique, closed Bagtank feature reliably protects the purified water from secondary contamination by atmospheric components and prevents the formation of a permanent biofilm. The arium mini plus can produce Type 1 or Type 3 water for use with SPE, IC, LC-MS, GS-MS, and HPLC testing methods.

Accurate Weights

Standards for quantitative HPLC must be prepared in accurate, defined

concentrations. Some solids can be difficult to weigh, and the time-consuming task of calculating the correct dilution can be another source of error.

Add the Q-Apps applications to your Cubis MSA laboratory balance to enhance your weighing capabilities. The apps are integrated into the balance software to guide you step-by-step through the selected weighing process. Simply select the Q-App for HPLC Standards (or choose from other options) to increase efficiency and reliability and eliminate the need for other middleware.

Repeatable Pipetting

Pipetting is a key step in preparing solvents for filtration, and even this routine aspect of sample prep can be improved by using equipment that positively impacts your lab budget and provides a perfect balance of convenience, dependability, and intelligence.

Lightweight, ergonomically designed Tacta Pipettes make handling easy and convenient, and their Optilock feature offers flexible volume adjustments while protecting against accidental changes during pipetting. Further simplify pipetting with Sartorius low-retention tips, which feature a repellent surface to minimize residual liquid retention.

Reliable Filtration

Filtration clarifies or removes particles from samples, and is typically performed using syringe filters. But if you have to filter more than just a few samples, the process can quickly turn into a hand-straining and strenuous chore.

Use the Claristep Filtration System to simultaneously filter multiple HPLC samples. The patented station can filter up to eight 60 to 600µL HPLC samples without the need for power, pumps, or syringes — with only one hand. Simply add your samples to the filter reservoirs, press to close the station lid, and the samples pass directly into your HPLC sample vials.

Claristep filters have regenerated cellulose membranes (in 0.2 or 0.45µm pore sizes), are optimized for organic and aqueous solutions, and provide maximum chemical resistance and compatibility.

Clean Sample, Clean Results

These and other Sartorius products can help to improve your HPLC sample prep and offer:

- Reduced HPLC column blockage
- Improved HPLC column sensitivity
- Better accuracy
- Fewer false-positive peaks
- Less background noise
- No leachables

Content provided by:



Everything You Need for HPLC Sample Prep



Sartorius Chromatography Products

From balances and pipettes to filtration and water systems, trust Sartorius for all your HPLC sample prep needs.

Cubis MSA Balances

Description	Capacity (Readability)	Mfr. No.	Cat. No.
Top Loading Balances			
Model 4202S	4200g (10mg)	MSA4202S100D0	14-557-027
Model 8202S	8200g (10mg)	MSA8202S000D0	14-557-029
Analytical Balances			
Model 124S, Manual Doors	120g (0.1mg)	MSA124S100DU	14-557-254
Model 224S, Manual Doors	220g (0.1mg)	MSA224S100DU	14-557-021
Model 224S, Automatic Doors	220g (0.1mg)	MSA224S100DI	14-557-014
Model 324S, Manual Doors	320g (0.1mg)	MSA324S100DU	14-557-022
Model 524S, Automatic Doors	520g (0.1mg)	MSA524S100DI	14-557-018
Precision Balances			
Model 623S, Short Draft Shield	620g (0.001mg)	MSA623S100DE	14-557-023
Semi-Micro Balances			
Model 225S, Manual Doors	220g (0.01mg)	MSA225S100DU	14-557-019
Model 225S, Automatic Doors	220g (0.01mg)	MSA225S100DI	14-557-010
Microbalances			
Model 2.7, Automatic Glass Draft Shield	2.1g (0.1µg)	MSA2.7S0TRDM	14-557-804
Model 6.6S, Automatic Glass Draft Shield	6.1g (1.0µg)	MSA6.6S0TRDM	14-557-811
Ultra Micro Balances			
Model 2.7S, Manual SS Draft Shield	2.1g (0.1µg)	MSA2.7S0TRDF	14-558-123

Claristep Filtration Products

Description	Mfr. No.	Cat. No.	Quantity
Claristep Filters, 9.7mm Dia., Cellulose Membrane, Pore Size: 0.2µm, Nonsterile	17C07FT96	14-556-010	96/Pack
	17C07FT480	14-556-011	480/Pack
Claristep Filters, 9.7mm Dia., Cellulose Membrane, Pore Size: 0.45µm, Nonsterile	17C06FT96	14-556-012	96/Pack
	17C06FT480	14-556-013	480/Pack
Claristep Filtration Station and Tray	17CM8	14-556-014	Each
Claristep Single Tray	17CS1	14-556-015	96/Pack

arium Ultrapure Water System

Description	Mfr. No.	Cat. No.
arium mini plus System	H2OMATUS	14-559-042
arium mini plus System with Integrated UV Lamp	H2OMAUVTUS	14-559-043
arium mini Compact System	H2OMMTUS	14-559-040
arium mini Compact System with Integrated UV Lamp	H2OMMUVTUS	14-559-041
Accessories for arium mini plus System		
Storage Bag	H2OCBS5S	14-559-047
Scientific Kit (Deionization Cartridge)	H2OSPACK	14-559-045
Pre-Treatment Cartridge	H2OCPR	14-559-044
UV Lamp	H2OCEL1	14-559-046

Tacta Mechanical Pipettes

Volumes	Channels	Mfr. No.	Cat. No.
0.1 to 3µL	1	LH729010	14-577-793
0.5 to 10µL	1	LH729020	14-577-794
2 to 20µL	1	LH729030	14-577-795
10 to 100µL	1	LH729050	14-577-796
20 to 200µL	1	LH729060	14-577-797
100 to 1000µL	1	LH729070	14-577-798
500 to 5000µL	1	LH729080	14-577-799
1000 to 10000µL	1	LH729090	14-577-800
0.5 to 10µL	8	LH729120	14-577-801
5 to 100µL	8	LH729130	14-577-802
30 to 300µL	8	LH729140	14-577-803
0.5 to 10µL	12	LH729220	14-577-804
5 to 100µL	12	LH729230	14-577-805
30 to 300µL	12	LH729240	14-577-806

Laboratory Safety Solutions



AC600 Series Ductless Chemical Workstation

The AC600 Series Ductless Chemical Workstation is an economical solution for protecting operators and the environment from toxic vapors, gases, fumes, and particulates. It ships fully assembled and can be configured for a variety of common applications.

Standard Features:

- Microprocessor controller with audible and visible alarms for both airflow velocity and filter change
- 360° visibility
- Ideal for low-volume chemical applications

Model	Width	Mfr. No.	Cat. No.
Workstation	32 in.	AC632A	36-100-4271
Workstation, Tall Version	32 in.	AC632TA	36-100-4272
Workstation	48 in.	AC648A	36-100-4274
Workstation, Tall Version	48 in.	AC648TA	36-100-4275

Endeavour Ductless Fume Hood

The Endeavour Ductless Fume Hood is designed to provide superior operator protection from potential toxic fumes, vapors, and particulates. AirSafe NXT provides simple and effective user interaction within fume hood operational parameters.

Standard Features:

- Microprocessor controller has audible and visible alarms for both airflow velocity and filter change
- Bonded carbon filters — no dust
- Polypropylene construction — excellent chemical resistance

Model	Width	Mfr. No.	Cat. No.
Ductless Fume Hood*	48 in.	ACPT4000	36-100-0063
Ductless Fume Hood*	60 in.	ACPT5000	36-100-0067
Ductless Fume Hood*	72 in.	ACPT6000	36-100-0069

*Filters sold separately; application worksheet required



PowderSafe Type B Enclosure

Seamless polypropylene construction provides vibration resistance crucial for accurate powder weighing, while the AirSafe automatic safety controller monitors airflow and filter condition. HEPASafe technology allows filters to be safely and easily changed under negative pressure.

Standard Features:

- Horizontal, HEPA-filtered airflow pattern
- HEPASafe filtration system for simple and easy maintenance
- Thermally fused design for vibration reduction and balance stability

Model	Width	Mfr. No.	Cat. No.
Type B Enclosure	32 in.	AC730C	36-100-4292
Type C Enclosure	48 in.	AC740C	36-100-4293





Horizontal Clean Bench

AirClean Systems manufactures a complete range of horizontal and vertical ISO 5/Class 100 laminar flow clean benches. Application-specific plastics allow for easy cleaning and sterilization, which helps prevent cross contamination.

Standard Features:

- Seamless polypropylene construction
- ISO 5 or better air quality
- Microprocessor controlled
- Available in widths of 4, 5, 6, and 8 feet

Model	Width	Mfr. No.	Cat. No.
Horizontal Clean Bench	48 in.	AC4000HLF	36-100-4381
Horizontal Clean Bench	60 in.	AC5000HLF	36-100-4382
Horizontal Clean Bench	72 in.	AC6000HLF	36-100-4383
Horizontal Clean Bench	96 in.	AC8000HLF	36-100-4384

Combination PCR Workstation

The AirClean Systems Combination PCR Workstation combines an ISO 5/Class 100 clean air environment with UV light sterilization for optimal protection from sample contamination. The UVtect microprocessor constantly monitors workstation functions.

Standard Features:

- Class 100 clean vertical laminar flow air
- Polycarbonate and polypropylene design to reflect UV energy
- Digital UV light time from 0 to 59 minutes
- UV shelf with integrated pipette holder

Model	Width	Mfr. No.	Cat. No.
PCR Workstation	32 in.	AC632LFUVC	36-101-8894
PCR Workstation	48 in.	AC648LFUVC	36-101-8897



PowderSafe Type C Enclosure

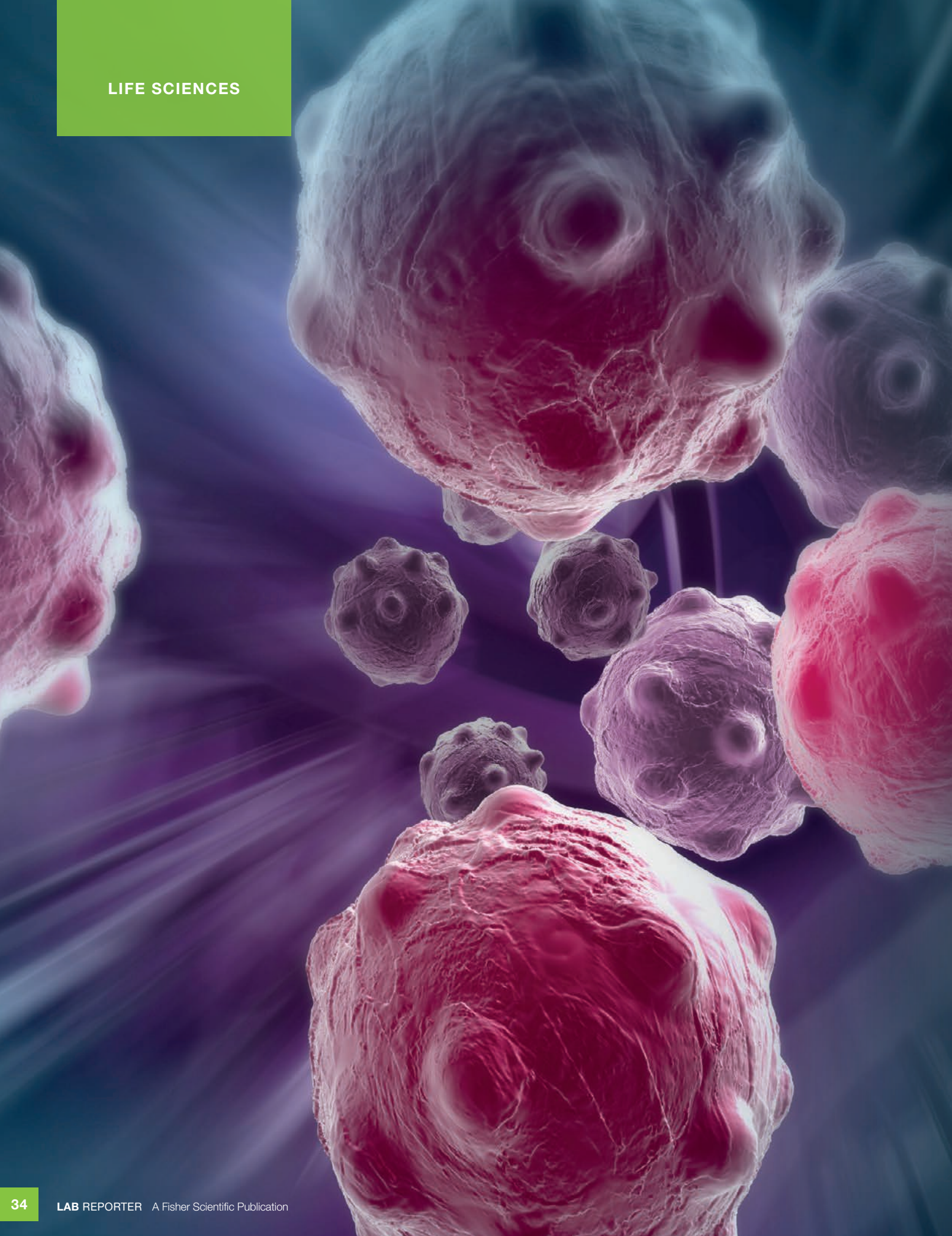
The PowderSafe Type C Balance Enclosure incorporates the airflow dynamics and HEPASafe features of the PowderSafe Type B Enclosure with the user-friendly features and chemical fume containment capabilities of the ductless fume hood. Thermally fused polypropylene makes the PowderSafe Type C Enclosure perfect for weighing powders or solvents.

Standard Features:

- Horizontal, HEPA-filtered airflow pattern
- HEPASafe filtration system for simple and easy maintenance
- Thermally fused design for vibration reduction and balance stability

Model	Width	Mfr. No.	Cat. No.
Type C Enclosure	36 in.	AC760C	36-101-8906
Type C Enclosure	48 in.	AC770C	36-101-8908
Type C Enclosure	72 in.	AC780C	36-101-8910





Fighting Cancer with Cancer

By Gina Wynn

Scientists have discovered a new way to fight cancer by developing cancer cells that destroy other cancer cells.

In recent studies, researchers have been able to reduce the size of tumors in mice by engineering their cancer cells with a gene-editing technology called clustered regulatory interspaced short palindromic repeats (CRISPR). In conjunction with its associated protein Cas9, CRISPR uses RNA as a guide to locate a specific section of DNA. When the target section has been identified, an enzyme binds to the DNA and either removes or replaces the undesired gene.

Cancer Cell “Weapons”

For the studies at Brigham and Women’s Hospital, researchers at Harvard Medical School in Boston used their knowledge of cancer cell behavior to turn cancer cells into weapons. They took advantage of a cancer cell instinct to return to its tumor of origin when introduced into a person’s bloodstream.

Using the CRISPR/Cas9 technology, scientists altered the cancer cells so they

would secrete a toxic protein when they encountered other cancer cells within a tumor. The protein, called S-TRAIL, is effective at destroying a variety of cancer cells without being particularly harmful to healthy cells, which made it a good choice for the experiments.

Secret Super Power

Although other scientists have experimented with the use of cancer cells to destroy other cancer cells, the CRISPR/Cas9 method has a differentiating feature — it causes cancer cells to self-destruct before they begin to produce new tumors. According to Renata Pasqualini, PhD, a cancer biologist at Rutgers Cancer Institute of New Jersey in Newark, the self-destruction occurs because the CRISPR-based technology adds resistance or sensitivity features to the parental cells.

In the study, scientists used glioblastoma (brain cancer) cells that were both resistant and sensitive to S-TRAIL. In the sensitive cells, they removed the genes that trigger sensitivity before injecting the protein-producing genes. Both types of cells produced similar results.

Encouraging Results

In each case, the engineered cells shrunk the tumors in the mice that received the treatment, and the mice lived longer. The tumor size stayed the same in mice that weren’t treated.

But scientists have more work to do before the CRISPR/Cas9 approach can be introduced into a clinical setting, says study coauthor Khalid Shah, MS, PhD, stem cell researcher at Brigham and Women’s Hospital in Boston.

For instance, extremely sick patients might not have the time currently required for their cancer cells to be genetically engineered and used as a therapy. And while the use of stored standard cells might allow for more prompt treatment, the possibility that a patient’s body could reject those cells as foreign may present another hurdle to be overcome.

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mutaFISH (mutation-specific Fluorescence *In Situ* Hybridization)

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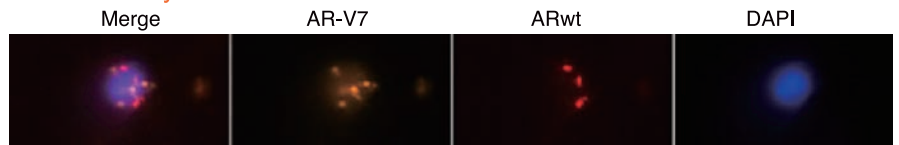
Advantages

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- Single Nucleotide Resolution
- Higher Sensitivity than dPCR and NGS
- Multiplexing Capability
- Cross Analytical Platforms
- No DNA or RNA Extraction

Point Mutations,
Gene Amplification,
and Translocation mutaFISH
Probes and Accessory Kits

Applications

Cell *In Situ* Hybridization



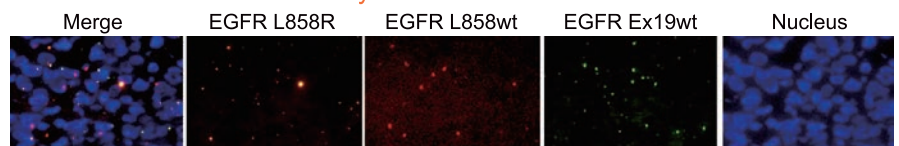
mutaFISH staining was performed *in situ* in human CWR22Rv1 cells captured by CytoQuest CR. AR-V7 was detected via orange signal (Cy3) and ARwt was detected via red signal (Cy5).

Circulating Tumor Cell *In Situ* Hybridization



mutaFISH staining was performed *in situ* in CTCs from NSCLC patient. CTCs were detected by using immunofluorescence staining for CSV (FITC, green). EGFR L858R point mutation was detected via orange signal (Cy3) and EGFR Ex19wt was detected via purple signal (Texas Red).

Fresh Frozen Tissue *In Situ* Hybridization



mutaFISH staining was performed *in situ* in human frozen lung adenocarcinoma tissue. EGFR L858R point mutation was detected via orange signal (Cy3), EGFR L858wt was detected via red signal (Cy5), and EGFR Ex19wt was detected via green signal (Texas Red).

Formalin-Fixed Paraffin-Embedded Tissue *In Situ* Hybridization
Flow Cytometry Mutation-Based Cell Sorting

Description	Mfr. No.	Cat. No.
mutaFISH ACTBwt RNA Probes	FP0013	89-333-456
mutaFISH AR-V7 ARwt RNA Probes	FP0004	89-333-034
mutaFISH CEP1wt CEP7wt CEP8wt CEP17wt DNA Probes	FP0009	89-333-039
mutaFISH CEP1wt DNA Probes	FP0008	89-333-038
mutaFISH CEP7wt DNA Probes	FP0006	89-333-036
mutaFISH CEP8wt DNA Probes	FP0005	89-333-035
mutaFISH CEP17wt DNA Probes	FP0007	89-333-037
mutaFISH c-Mycwt RNA Probes	FP0015	89-334-094
mutaFISH EGFR T790M T790wt RNA Probes	FP0001	89-333-031
mutaFISH EGFR L858R L858wt Ex19wt RNA Probes	FP0002	89-333-032
mutaFISH EML4wt ALKwt RNA Probes	FP0014	89-333-861
mutaFISH HER2wt DNA Probes	FP0010	89-333-040
mutaFISH IDH1 R132H R132wt IDH2 R172K R172wt RNA Probes	FP0012	89-333-455
mutaFISH KRAS G12wt G13wt RNA Probes	FP0017	89-334-093
mutaFISH MYCNwt DNA Probes	FP0003	89-333-033
mutaFISH PSAwt RNA Probes	FP0018	89-334-282
mutaFISH TERTwt RNA Probes	FP0016	89-334-095
mutaFISH RNA Accessory Kit	KA4915	89-333-041
mutaFISH DNA Accessory Kit 1 for Cells	KA4916	89-333-042
mutaFISH DNA Accessory Kit 2 for Cells	KA4928	89-333-043

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Description	Mfr. No.	Cat. No.
Arcos Block Management System, Includes Scanner, PC, Monitor, PDA, and Label Printer	B84700001	B84700001

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Description	Individually Wrapped	Mfr. No.	Cat. No.	Quantity
Macro Cuvettes, Capacity: 2.5 to 4.5mL	No	759170	14-377-009	100/Pack
Semi-Micro Cuvettes, Capacity: 1.5 to 3mL	No	759150	13-688-74	100/Pack
	No	759165	13-688-73	500/Pack
Ultra-Micro Cuvettes, Capacity: 70 to 850µL	No	759200	13-878-121	100/Pack
	No	759210	13-878-122	500/Pack
	Yes	759215	03-840-300	100/Pack
	No	759220	13-878-123	100/Pack
Ultra-Micro Cuvettes, Capacity: 70 to 500µL	No	759230	13-878-124	500/Pack
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- ◆ 0.2µm Monitor for Sample Culturing and Analyses



Description	Mfr. No.	Cat. No.	Quantity
Listeria SwabCheck, ind, packed	10498408	10-486-193	25/Pack
Cetrimide Broth, 2mL ampule	10496146	10-486-154	50/Pack
MI-Broth Media, 2mL ampule	10496192	10-486-158	50/Pack
Monitor, NC, 0.2µm, 56mm, Gridded	10497603	10-486-182	50/Pack
Monitor, NC, 0.2µm, 47mm, Gridded	10497511	10-486-178	50/Pack
Abluo Syringe Filter, 33mm, PES, 0.2µm	FJ25BNPPS002AD01	09-977-766	500/Pack
Abluo Syringe Filter, 13mm, PES, 0.2µm	FJ13BNPPS002AD01	09-977-728	500/Pack

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SAFETY



Air Pollution Intensifies Amid Wildfires

By Christina Phillis

Air quality in the Northwestern United States is worse now than it was 30 years ago, according to researchers from the University of Washington in Bothell. In a new report, they explain that wildfires, which have become more frequent in that region since the mid-1980s, are the culprits.

Wildfires to Blame

Wildfires are known for the outright death and destruction they can cause in just a few hours. Another less immediate effect is a decline in air quality, which occurs when the smoke and ash from wildfires fills the sky. Researchers focused on this latter aspect of wildfires and the fine particulate matter produced as a result. These particulates, typically with diameters of less than $2.5\mu\text{m}$, can aggravate breathing problems and pose a risk to children, the elderly and people with asthma.

The team of authors examined data from more than 100 rural monitoring sites around the country and calculated the daily amounts of fine particulate matter in the air. The report revealed a positive trend in particulate matter stretching from

California to Montana from 1988 to 2016, while declining trends were seen in the rest of the country during that same period.

To help determine the causes of the increased air pollution in this region, researchers analyzed both sulfate and particulate carbon levels. Sulfate is a byproduct of burning fossil fuels, while particulate carbon is the result of fire emissions. Their results showed that sulfate in the Northwest did not increase over time, but particulate carbon levels did, so wildfires are more likely to blame for the poor air quality.

Additionally, they discovered that wildfires do not negatively impact air pollution on an average day in the Northwest. It's only on the "bad days," which typically occur during peak wildfire season, that air quality is getting worse over time. Every year during the study period, levels of fine particulates on the days with the worst air quality have increased at an average rate of $0.21\mu\text{g}$ per cubic meter.

Measuring the wide-scale impact of wildfires is not easy. The fires are sporadic and occur in a variety of different places

over time. Atmospheric scientist and study coauthor Daniel Jaffe, PhD, further explained the challenge, saying, "Most of the year, wildfires aren't impacting air quality."

The Aftermath

Although the fires typically occur over a matter of days or weeks, the health effects can be long lasting. Chronic health conditions, such as heart disease and diabetes, have been linked to regular exposure to fine particulate matter. And extensive exposure to the smoke from active wildfires can be dangerous for the general population.

Regulations have been effective in curbing the amount of human-caused pollution and fossil-fuel emissions, but wildfires are different. Although often the result of human carelessness, fire risk and spread can be increased by high winds, heat and other weather conditions caused by climate change. The ongoing challenge of dealing with natural disasters is being exacerbated by climate change — a factor that is unfortunately here to stay.

Lens Technologies

for Safety and Productivity

Protective eyewear offers impact protection, but that is not its sole function. Varied work environments may warrant different lens tints to enhance visual perception and relieve eyestrain, and the ability to see clearly under changing environmental conditions is essential.

Anti-Fog Treatments

Fogging is a significant challenge faced by safety eyewear users. Lenses can fog in heat and humidity, when transitioning between cool and warm workspaces, and with physical exertion.

When fogging occurs, the individual must either remove and clean the lenses or continue to work with obscured vision. And when the eyewear must be removed, the worker can become vulnerable to workplace hazards that can lead to injury. If the worker exits the site to wipe the lenses, productivity is undermined.

Uvex anti-fog coatings are offered in two levels of protection on a wide variety of eyewear styles to help deliver safe, clear views, even in extreme heat and humidity. Honeywell Uvex HydroShield Anti-Fog technology has been tested under the stringent European EN166/168 standard.

For this test, a lens is soaked in water for two hours to simulate the cumulative effects of washing, sweat, and other extreme work conditions. After drying, the lens is exposed to steam and the time that it remains fog-free is recorded. When tested, HydroShield lenses consistently remained fog-free 90 times longer than the majority of lenses treated with other anti-fog products. And because this technology requires no application or maintenance, it also reduces downtime.

Other UVEX anti-fog coatings include Uvextra, which offers basic anti-fog

coating performance, Uvextreme for great, dual-action performance, and Uvextreme Plus, which has the same anti-fog performance of Uvextreme but lasts longer and retains its anti-scratch, anti-static, and UV protection properties.

Anti-Scratch Treatments

Scratches on protective lenses can directly impact worker safety and productivity when vision is obscured and workers are exposed to workplace hazards and injury. Marred lenses may also cause headaches and fatigue. In high-particulate environments, the value of superior scratch-resistant safety glasses or goggles is significant: not only do they improve worker safety and performance, they also significantly extend the life of the lens.

Uvex anti-scratch coatings include Supra-Dura, an advanced anti-scratch coating for high-particulate environments that lasts five times longer than other similar coatings, and Ultra-dura, a hard coat that is permanently bonded to the lens to provide both scratch and chemical resistance.

Lens Tinting

Your workforce may also require lens tints for indoor, outdoor, or special operations use. Optical hazards may include visible light and invisible rays that can cause serious or even permanent eye damage (including cataracts or corneal burns) with repeated or extended exposure.

Uvex eyewear offers an extensive range of lens tints to meet the demands of nearly any lighting task or environment. All Uvex eyewear is available with an assortment of standard clear and sunglass shades, and many styles are also offered with specialized tints for task-specific lighting applications. The proprietary Spectrum

Control Technology lens tints absorb select wavelengths to enhance and protect vision against radiation hazards.

When outfitted with the proper lens tint, workers benefit from reduced eye strain, enhanced visual perception, and increased safety and productivity. Lens tint options are vast, and safety lens tints should be considered carefully for the best performance. Refer to the resources at the end of this article for guidance on which Uvex lens tints are best suited for your application and see for yourself how they can benefit the workforce and support your organization's culture of safety.

Unparalleled Eyewear

Uvex is a leading brand in lens coating technology for long-lasting anti-fog and anti-scratch performance. Because the coatings are permanently bonded to the lens materials, they do not wash or wear off, even after extended wear or repeated cleanings.

Uvex Dura-streme combines the benefits of industry-leading Uvextreme anti-fog and Ultra-dura anti-scratch coatings. The anti-fog properties help keep the interior of the lens clear from fogging while the exterior is protected from scuffs and scratches, increasing lens life threefold.

The value and protection of long-lasting Uvex fog-free, scratch-free lenses are unsurpassed in today's industrial workplaces. Employers have peace of mind and workers can conduct tasks without the distraction and risk of obscured vision.

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