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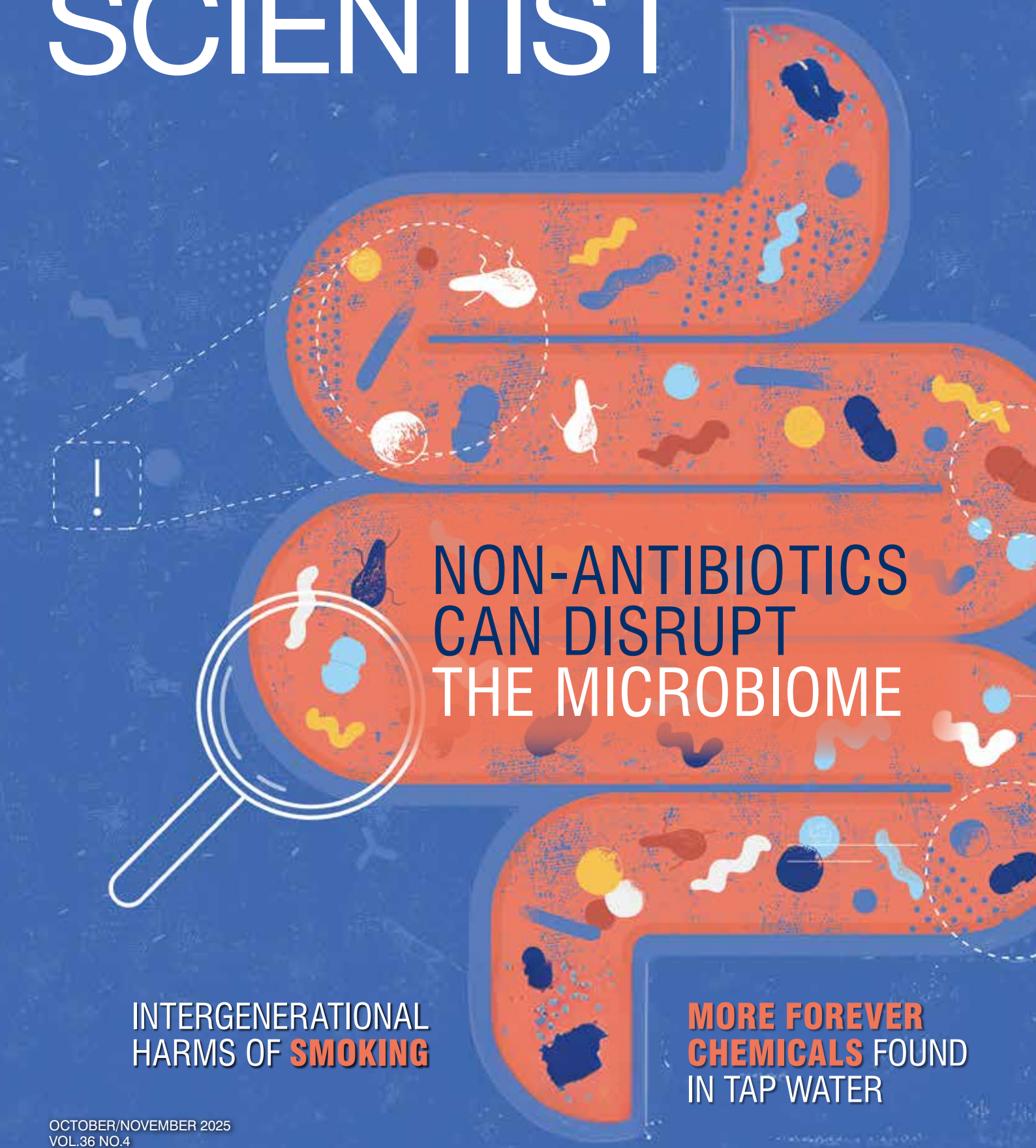

NON-ANTIBIOTICS CAN DISRUPT THE MICROBIOME

INTERGENERATIONAL HARMS OF **SMOKING**

MORE FOREVER CHEMICALS FOUND IN TAP WATER

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People whose fathers smoked during puberty seem to age faster than expected — and even passive smokers are putting their future children at risk.

Cover image: iStock.com/DrAfter123

Watch this space

At the time of writing, the 76th International Astronautical Congress (IAC 2025) has just concluded in Sydney — and what a week it was!

Organised by the International Astronautical Federation and hosted by the Space Industry Association of Australia (with the Australian Space Agency and NSW Government acting as co-hosts), the congress was attended by close to 8000 delegates from 99 countries; featured 3500 speakers across over 40 plenary and panel sessions alongside 200 technical sessions; and included a bustling exhibition with nearly 200 booths. Topics discussed ranged from Indigenous knowledge in space to future human long-duration spaceflight, while the theme 'Sustainable Space: Resilient Earth' was ever-present — expanding beyond planetary sustainability to include the sustainability of life beyond Earth.

There were also plenty of significant announcements made as part of the event. The Australian Government confirmed a mandate to begin negotiations on a Cooperative Agreement between the European Space Agency (ESA) and Australia; this would establish a formal mechanism for Australian businesses and researchers to access ESA's space science program and missions, as well as for further European activity here in Australia. Incidentally, the day after the event saw the inauguration of the ESA's New Norcia deep space antenna in Western Australia, which is set to support the agency's current and upcoming missions while also serving its efforts towards international collaboration.

A treaty-level Space Framework Agreement between Australia and the United States was also agreed at the congress, opening the door to new opportunities to collaborate on joint projects with NASA and other American partners. Meanwhile, the Australian and UK Space Agencies formally re-signed the AU-UK Space Bridge Framework Arrangement, extending their shared commitment to deepening bilateral cooperation in space science, technology and innovation. And there was the launch of the Australasian Space Innovation Institute — an independent, not-for-profit innovation engine that will harness existing space technologies to support national priorities and challenges, including environmental protection, disaster response and food security, when it commences operations in January 2026.

Speaking of food security, our lead article on page 6 of this issue provides a deep dive into how lab equipment can be used for optimal food and beverage testing, providing analyses of pathogens and pesticides, nutrient levels and product consistency. In other testing news, the article on page 20 reveals how 21 new per- and polyfluoroalkyl substances were recently discovered in Sydney's tap water, reinforcing the need for broader PFAS monitoring.

You can also flip to page 17 for a look at how New Zealand scientists are using genomics to breed varieties of grapevines and hops that are tolerant and resistant to pests and diseases, thus reducing fungicide use across the country's NZ$2.1 billion wine export industry, or see page 5 to learn about how the NSW Government has supported the creation of a foot-and-mouth vaccine to protect Australia's livestock and meat export industry. Of course there's also plenty of non-food and beverage content just waiting to be, er, consumed, so feel free to browse the mag for the stories of most interest to you.

Till next time!

Regards,
Lauren Davis
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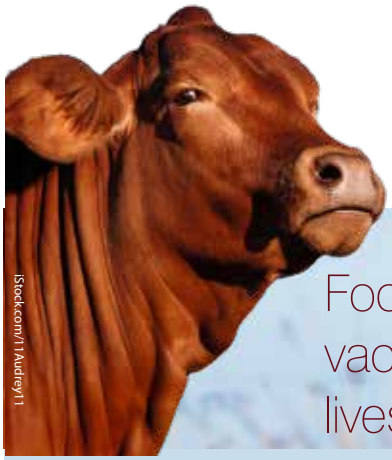
Lauren Davis



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Foot-and-mouth vaccine to protect livestock

A groundbreaking biodegradable vaccine to protect livestock from foot-and-mouth disease (FMD) has been developed as part of a five-year research partnership between Meat & Livestock Australia (MLA), Tiba Biotech and the NSW Government.

FMD is a highly infectious viral disease that affects cattle, sheep, goats and pigs and is endemic in many countries, particularly in Africa, Asia and the Middle East. Australia is one of the few countries free of FMD, but if a widespread outbreak were to occur, it would have a catastrophic impact on meat supply and exports.

Created as part of the NSW Government's biosecurity plan to protect the state's livestock industry and Australia's food security, the vaccine was developed by Tiba scientists as part of an international research collaboration with the Elizabeth Macarthur Agricultural Institute and the UNSW RNA Institute, with support from the NSW Department of Primary Industries and Regional Development and MLA. The vaccine has taken less than 18 months to develop, cost about $2.5 million, and makes Australia one of only a handful of countries with the local capacity to produce a FMD vaccine (through the UNSW RNA Institute).

The new mRNA vaccine allows the vaccinated animal to create proteins and antibodies to trigger an immune response. It does this without entering the nucleus of cells and disappears from the animal within days, leaving antibodies behind for protection against the virus. As the vaccine can be manufactured without the use of infectious material, this makes it safer and much faster to produce.

A challenge study evaluating the efficacy of the FMD vaccine was recently conducted by Germany's Friedrich-Loeffler-Institut. Researchers found that the vaccine demonstrated strong, effective immune response and safety — vaccinated cattle did not contract FMD when exposed to the disease and, importantly, they did not shed the virus.

Unlike current mRNA delivery technologies, Tiba's vaccines can be stored long-term at standard refrigeration temperatures and at room temperature for at least one month — a critical advantage in livestock applications. Furthermore, an extensive safety evaluation of Tiba's vaccines has found they are safe at very high doses — much larger than would ever be administered.

Following the preliminary trials, the FMD vaccine must now undergo a rigorous evaluation process with the Australian Pesticides and Veterinary Medicines Authority (APVMA) before approval for use on livestock. Australian-based Tiba co-founder Peter McGrath said the company is focused on working with regulators to ensure vaccine safety and effectiveness.

'Anti-reward' brain network helps explain cocaine addiction

Cocaine addiction has long been understood as a tug of war between reward and restraint — the rush of dopamine keeps users hooked, while withdrawal triggers anxiety, depression and despair. Now researchers at The Hebrew University of Jerusalem have revealed that it's not just the craving for pleasure that plays a powerful role in relapse — it's also the brain's aversion to pain.

Led by Professor Yonatan M Kupchik and PhD student Liran Levi, and published in the journal *Science Advances*, the new study identifies a specific 'anti-reward' network deep in the brain that undergoes lasting changes during cocaine use, withdrawal and re-exposure. This glutamatergic network, located in the ventral pallidum, is emerging as a key player in addiction — and a promising target for future therapies.

While the ventral pallidum is known for regulating pleasure and reward, the team's research highlights a lesser-known group of neurons that suppress dopamine release and amplify negative emotions. During abstinence, this anti-reward network ramps up its activity — intensifying discomfort and emotional distress. When cocaine is reintroduced, the network quickly quiets, reinforcing the cycle of relief-seeking and relapse.

"It's a switch," Kupchik said. "This network tracks the emotional cost of abstinence. When it's highly active, it can drive someone to seek out the drug again — just to escape the negative feelings."

The study also shows that this brain circuit connects with other key centres involved in emotional regulation and reward processing. During withdrawal, these connections become stronger, increasing sensitivity to negative emotional states. When the drug returns, the system resets, temporarily easing distress.

In a surprising finding, the researchers discovered that when this anti-reward circuit was inhibited, drug preference and motivation actually increased. This suggests that the brain's negative signals may serve a protective role, creating an internal brake that discourages excessive drug use by making it emotionally costly.

While most current addiction therapies aim to dampen the brain's reward system, this study points to a different path: targeting the emotional pain of withdrawal. By understanding and potentially modulating the brain's aversive signals, future treatments may better address the root causes of relapse.

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Optimising food and beverage testing with laboratory equipment

OHAUS and Capella Science

In the food and beverage industry, laboratories must balance precision, speed and compliance to meet stringent safety and quality standards.

As the food industry moves towards a more sustainable future, initiatives like the European Green Deal, Food 2030, and the Farm to Fork Strategy are redefining standards for food safety, quality and innovation. They are designed to pave the way for a climate-neutral Europe by 2050, emphasising sustainable production, improved nutrition and enhanced food security. While these European initiatives set ambitious goals for sustainability and food system transformation within Europe, similar initiatives in the MEA region such as the Africa Union's AGENDA 2063, the Comprehensive Africa Agriculture Development Program (CAADP), National Food Security Strategy 2051 in the UAE, and Saudi Vision 2030 address local challenges related to food security, climate resilience and economic development.

All of the above-mentioned initiatives are aiming to help reach the Sustainable Development Goals (SDG) defined by the United Nations, among which the food industry has its role in at least 11 goals (No Poverty, Zero Hunger, Good Health and Well-Being, Clean Water and Sanitation, Decent Work and Economic Growth, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, and Partnerships for the Goals). To support these ambitious goals within the food and beverage market, accurate and efficient testing throughout the food supply chain is essential.

Laboratories play an indispensable role in this effort, providing reliable analyses for pathogens, nutrient levels and product consistency. By leveraging laboratory equipment, companies not only comply with regulatory requirements, but also enhance quality control, improve workplace safety, streamline operations and boost overall productivity.

The importance of pathogen detection in food safety

One of the fundamental tests in food production is pathogen detection and microbial analysis. Researchers have revealed that nearly 600 million people fall ill, and 420,000 people die, from foodborne illnesses annually. Therefore, accurate pathogen detection is essential to provide reliable findings and prevent any further growth of these numbers. It is very common to perform tests detecting the presence of *E. coli*, *Listeria* and *Salmonella*. An effective pathogen test not only includes the preparation of the sample itself, but also the media dissolution or broth preparation. The consistent agitation provided by laboratory shakers ensure that microorganisms grow uniformly, minimising false negatives and improving lab efficiency, while using hotplate stirrers may also be beneficial during media preparation.

OHAUS's laboratory protocol for isolating bacteria presents one method of preparing bacteria colonies for tests, during which sample mixing is done on the Extreme Environment Shaker within specific conditions (37°C, 200 rpm). However, the preparation of microbial


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samples is not only about mixing. It also involves an incubating step, for example in a dry block heater; homogenisation of food samples with a vortex mixer; or concentrating or separating microbial colonies with a centrifuge for further analysis. Furthermore, control of the pH value is very important for pathogen detection, both in the laboratory as well as in the production line. Close monitoring of pH values helps to eliminate the introduction of dangerous microorganisms that can grow in food or beverages. On the production line, microbial control is required to maintain a hygienic environment. During cleaning, strong chemicals (acids or bases) are used to provide the correct level of hygiene. Before production is restarted, pH values must be checked to test for any residual cleaning agents. Thus, pH meters are ideal for assessing whether the cleaning procedure has been completed or not.

Ensuring compliance with pesticide residue testing

Pathogens are not the only harmful components within food samples; pesticide residue testing is also crucial in ensuring that food products meet regulatory standards and are safe for consumption. The 2022 EU report on pesticide residues in food performed by EFSA (European Food Safety Authority) indicates that 96.3% of over 110,000 samples analysed were within legal limits, with a slight decrease in the legally allowed maximum levels (maximum residue limit, MRL) from previous years, showing improvement in compliance with regulations. EFSA recommends a focus on specific compounds, which are significant contributors to non-compliance. Laboratories need to detect trace amounts of chemicals in fruits, vegetables, grains and other food products.

Testing laboratory WESSLING dedicates efforts for pesticide testing with the support of OHAUS equipment. Pesticide residue testing requires solvent extraction, sample concentration and precise heating during the preparation step before using analytical methods and techniques like chromatography or mass spectrometry. A well-known pesticide residue test is QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe), a sample preparation and clean-up technique. Protocols for pesticide tests involve laboratory equipment such as shakers (reciprocating or orbital) and vortex mixers or stirrers to thoroughly mix food samples with solvents during the extraction phase. A homogeniser is also frequently used for the first step in sample preparation, grinding for pesticide testing, as well as a centrifuge for sample extraction and clean-up during the process. It is worth noting that moisture content should also be checked using a moisture balance, as it may affect the pesticide extraction step. During the preparation of grain samples for multi-residue pesticide testing in cereals and flours, assessing moisture content is essential.

The OHAUS pesticide analysis laboratory protocol for food/plant samples offers a guide of which laboratory equipment should be chosen for the most effective outcomes.

Food allergen testing: protecting consumers

Food allergy-related diseases are a major worldwide public health concern. In developing countries, food allergies affect the lives of 8% of children and 10% of adults. Therefore, food allergen testing is critical to prevent cross-contamination of food and beverage products and protect consumers with food allergies. Laboratories are challenged to develop efficient analytical methods to ensure detection of hidden allergens which cause severe adverse reactions.

Laboratories perform enzyme- or DNA-based allergen detection assays for allergens such as peanuts, gluten, shellfish, dairy and soy using techniques such as ELISA (enzyme-linked immunosorbent assay — see the OHAUS sandwich ELISA laboratory protocol) and PCR (polymerase chain reaction) or chromatographic-methods. There are at least two crucial aspects of handling these kind of small samples: maintaining the right temperature and efficient mixing (and homogenisation). The first can be assured by incubating food samples in dry block heaters, which provide precise temperature control. Second, quick and efficient homogenisation and mixing of food samples with reagents and buffers can be done with vortex mixers. Dry block heaters, together with hotplate stirrers and centrifuges, >

can also be used during sample preparation for testing baked goods for milk traces, for example.

Nutritional analysis and quality control

Before a food product reaches the store shelf, it also needs to be verified for nutrient content (fat, protein, carbohydrates, vitamins, minerals) and to ensure the product meets the respective industry standards such as fat content in milk. During the sample preparation step, centrifuges are often utilised as a simple clean-up, high-throughput technique, helping to separate analytes from the sample matrix. This is common in applications such as protein isolation/precipitation for nutritional analysis or fat content analysis in meat or milk samples.

Dry block heaters enable precise temperature control during vitamin assays in fortified beverages and hotplate stirrers assist in fat hydrolysis testing for meat samples. For production of fresh food products like fruits or vegetables and meat or seafood, pH meters play an important role in assessing freshness and the quality of the production. Measuring pH of raw ingredients or final products helps to define if all necessary requirements are being met.

The role of fermentation in food production

The fermentation process is an important one in the food industry for products such as beer or bread. Fermentation relies on the action of specific microorganisms, such as bacteria, yeasts and moulds. Each type of microorganism has an optimal pH range for growth and activity. The first step of this process is to obtain yeast cultures. Incubating shakers can be used to grow starter cultures of yeast under controlled conditions, promoting consistent fermentation characteristics. To obtain a homogenous mixture, effective mixing is required whether distributing yeast cultures for fermentation of sugars to produce wine or beer or fermenting bacteria in dairy products. Effective mixing can be obtained with using efficient shakers or hotplate stirrers.

pH is a critical parameter for wine or beer fermentation or wine aging. For best yeast activity, it is essential to achieve an accurate pH level. When the pH level is too low, it can deactivate good microbial activity; when it is too high, the pH value can contribute to growth of spoilage bacteria. pH meters are essential for any fermentation process. Even in the areas of sustainability and recycling, the fermentation process is also important, where yeast cells can be separated from products with use of a centrifuge and reused in another fermentation cycle.

Food consistency and stability for good quality

Ensuring ingredient consistency and product stability is paramount to maintaining quality and consumer trust. Laboratory equipment such as incubating shakers and hotplate stirrers allow controlled mixing and temperature regulation during formulation and stability testing. Procedures like dissolution of sugars or stabilisers in beverages require sugar content analysis or thermal stability tests for consistent temperature can be performed using hotplate stirrers. Among quality factors is also flavour consistency, which can be achieved by uniform blending of ingredients, such as in seasonings and marinades. When testing products for flavour consistency, mixing can be performed using shakers and vortex mixers. Incubating shakers provide optimal conditions for microbial growth studies and fermentation processes, ensuring consistent results across batches. Hotplate stirrers, on the other hand, enable precise temperature control while mixing solutions, essential for achieving uniformity in product formulations.

Beverage development company MetaBev uses OHAUS hotplate stirrers for precise temperature control to keep flavour integrity. pH is another important factor that influences flavour; by maintaining consistent pH levels, food producers can ensure that the flavour profile remains stable and predictable. For example, in products like pickles, sauces and dairy items, precise pH control is crucial for achieving the intended flavour that consumers expect. Centrifuges are meanwhile invaluable for separating components in mixtures, helping to assess stability and clarity. One common example is removal of sediments from juices and wine to ensure product clarity, while vortex mixers offer rapid and thorough mixing for sample preparation. Ultimately, food quality control stretches beyond R&D and QC laboratories into labelling, packaging and production.

Sustainability within the food industry

As with many other industries, the increased importance for finding sustainable solutions is prevalent in the food industry as well, ranging from food production to food waste management. Solutions such as applications for selling discounted products with shortened shelf lives or imperfect vegetables and fruits (especially in terms of size or shape) can easily be found. In terms of food waste management, companies are recycling bio-wastes into biogas and compost or fertilisers. Within the food industry, one company leading the way is EcoBean, a company from Poland who is reinventing coffee grounds into sustainable chemicals.

Conclusion

In the food and beverage industry, laboratories must balance precision, speed and compliance to meet stringent safety and quality standards. Whether it's pathogen detection, DNA-based testing, ingredient consistency analysis or nutritional separation, the choice of laboratory equipment directly impacts accuracy and efficiency.

Equipment such as shakers, vortex mixers, dry block heaters, hotplate stirrers, centrifuges, balances, moisture balances and pH meters — all available from OHAUS — enables labs to perform a wide variety of critical applications with confidence. By focusing on advanced equipment for specific applications, laboratories can improve compliance while elevating productivity, precision and overall product quality — key factors in meeting the ambitious goals of initiatives like Food 2030.

DNA analysis device built with a basic 3D printer

Researchers at The University of Queensland (UQ) have developed an affordable, open-source fluorometer, used for DNA measurement, that can be built using a home 3D printer.

Determining DNA levels in a sample is a crucial early step in techniques like DNA sequencing, which itself is essential for disease detection, therapeutic innovation and species identification. But commercial fluorometers can be expensive and out of reach for emerging researchers, as noted by Dr Will Anderson from UQ's Australian Institute for Bioengineering and Nanotechnology (AIBN).

"We're talking thousands of dollars for just one device," Dr Anderson said.

"Many labs can't afford that sort of outlay, especially in eDNA where many researchers have limited resources."

To help level the playing field, Anderson and his colleagues collaborated to create a simple fluorometer that can be built at home. The Do-It-Yourself Nucleic Acid Fluorometer, or DIYNAFLUOR, is a portable device that measures the amount of genetic material extracted from biological samples.

"The DIYNAFLUOR can be made within a day using about $60 of off-the-shelf electrical components, simple 3D-printed parts, and design files and build instructions we've made freely available online," Anderson said.

"You don't need any specialised tools — just access to a basic 3D printer, a screwdriver and some Allen keys.

"Once it's assembled, users simply mix DNA samples with a DNA-binding fluorescent dye and place into a small well on the top of the device.

Dr Will Anderson with the DIYNAFLUOR.

The University of Queensland.

"The DIYNAFLUOR then uses a light beam to produce a fluorescent response from the dyed DNA present in the sample and reports the findings to a connect PC or laptop."

The stronger the fluorescent response, the higher the DNA concentration in the sample. Anderson explained, "This is crucial information that can tell you whether you can proceed with more expensive tests and sequencing."

Anderson said he "wanted to make something that anyone could access — whether you're a researcher in a resource-limited lab, someone working in the regions or remote areas, or a student just starting out" — and he appears to have succeeded, with the DIYNAFLUOR having demonstrated accuracy, precision, sensitivity and reproducibility on par with similar commercial models at a fraction of the cost.

The DIYNAFLOUOR build guide and operating files are now available to download at https://github.com/traulab/DIYNAFLUOR.

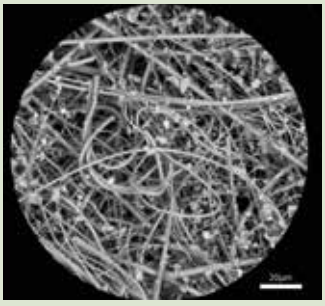
We may be inhaling 68,000 microplastics every day

New measurements of fine microplastic particles suspended in the air in homes and cars suggest that humans may be inhaling far greater amounts of lung-penetrating microplastics than previously thought, according to a study published in the journal *PLOS One*.

Prior research has detected tiny fragments of plastic known as microplastics suspended in the air across a wide variety of outdoor and indoor environments worldwide. The ubiquity of these airborne pollutants has raised concerns about their potential health effects, as small-sized inhaled microplastic particles may penetrate the lungs and release toxic additives that pose risks of oxidative stress, immune-system effects and organ damage. However, prior research on airborne microplastics has mostly focused on larger particles ranging from 20–200 µm in diameter, which are less likely to penetrate the lungs than particles of 10 µm across or less.

To help improve understanding of the risk of microplastic inhalation, Nadiia Yakovenko and colleagues at the Université de Toulouse collected air samples from their own apartments, as well as from their own cars in realistic driving conditions. They used Raman spectroscopy to measure concentrations of microplastics, including those from 1–10 µm across, in 16 air samples.

The researchers found that the median concentration of detected microplastics in the apartment air samples was 528 particles/m^3, while in the cars it was 2238 particles/m^3 (the researchers acknowledge that there was high variability of microplastic concentration in both environments). Furthermore, 94% of the detected particles were smaller than 10 µm.



Electron microscope image of a quartz fibre filter with numerous micrometre-sized microplastic indoor dust particles. Image background has been altered from the original, which is credited to Nadiia Yakovenko under CC-BY 4.0

The researchers then combined their results with previously published data on exposure to indoor microplastics, estimating that adults inhale about 3200 microplastic particles per day in the range of 10–300 µm across, and 68,000 particles of 1–10 µm per day — 100 times more than prior estimates for small-diameter exposures. The authors thus suggest that the health risks posed by inhalation of lung-penetrating microplastics may be higher than previously thought, although further research will be needed to confirm and expand on these results.

"We found that over 90% of the microplastic particles in indoor air across both homes and cars were smaller than 10 µm, small enough to be inhaled deep into the lungs," the authors said. "This was also the first study to measure microplastics in the car cabin environment, and overall, we detected indoor concentrations up to 100 times higher than previous extrapolated estimates, revealing indoor air as a major and previously underestimated exposure route of fine particulate microplastic inhalation."

Seaweed on sandy coastlines contributes to methane emissions

New research led by Monash University has revealed that sandy coastlines, which make up half the world's continental margins, are a previously overlooked source of methane. Principal investigator Professor Perran Cook said the research challenges the accepted role of coastal vegetation as carbon storage.

The research identified two new strains of methanogens, or methane-producing microbes, at field sites across Port Phillip Bay and Westernport Bay in Victoria, as well as in Denmark. These microbes metabolise compounds released from decaying seaweed and seagrass, producing methane as a byproduct.

It was previously understood these microbes couldn't survive when exposed to oxygen in coastal ecosystems. But the new research, published in the journal *Nature Geoscience*, proves they are capable of rapid recovery and methane production following oxygen exposure.

"This new finding not only challenges a fundamental assumption in marine science, but calls into question what we thought we knew about the role of sandy coastline ecosystems in greenhouse gas production," Cook said.

"Our work contributes to the growing body of evidence that shows methane emissions from decaying biomass like seaweed may offset much of the carbon dioxide removal attributed to coastal ecosystems.

"Understanding how much naturally occurring methane emissions are coming from coastal areas is also important for the climate models we rely on to understand the impacts of climate change and determine climate action."

Cook said several outbreaks of algal blooms, such as the recent occurrence that has plagued parts of coastal South Australia this year, may also be enhancing methane emissions in instances where they are washed up on the beach.

"With rising sea temperatures, species invasions and increasing nutrient pollution, we're seeing more frequent algal blooms and biomass accumulation on beaches," he said.

"This could lead to larger and more frequent pulses of methane to the atmosphere, which in turn contributes to rising sea temperatures."

First author and Monash PhD candidate Ning Hall said the team will continue its work to understand the implications of methane production in coastal ecosystems, examining how widespread it is and the chemical compounds produced.

"From here, we need to understand this process in more detail," Hall said.

"Our research will look at how different species of seaweeds and ocean conditions affect these microbes.

"This will then allow us to reassess and better predict how much methane is being produced in the coastal zone."

Ning Hall, Monash University.

Field work was conducted at St Kilda as part of the new study.

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Oral drug shows promise for treating Barth syndrome

Tohoku University researchers have discovered that an oral drug called MA-5 can improve both heart and muscle problems in Barth syndrome, a rare genetic disorder affecting one in 300,000 births worldwide. Their work has been published in *The FASEB Journal*.

Barth syndrome is caused by mutations in the *TAZ* gene that leave patients — mostly young boys — with weakened hearts, muscle fatigue and increased rates of infection. Many require heart transplants, and current treatments only manage symptoms without addressing the underlying cause.

The research team, led by Professor Takaaki Abe, Professor Takafumi Toyohara and Yoshiyasu Tongu, tested MA-5 on cells from four Barth syndrome patients and in fruit fly (*Drosophila*) models of the disease. MA-5 was chosen as a treatment because it enhances interactions between two crucial mitochondrial proteins — mitofilin and ATP synthase — leading to more efficient energy production. As such, this mechanism directly addresses the cause of cellular dysfunction in Barth syndrome.

"What excites us most is that MA-5 works by targeting the fundamental problem in Barth syndrome — defective energy production in mitochondria," Abe explained. "Unlike current treatments that only manage symptoms, MA-5 actually improves the root cause of how cells generate energy."

The team's findings reveal that MA-5 boosted cellular energy (ATP) production by up to 50% and protected cells from oxidative stress-induced death. In human muscle cells derived from Barth syndrome iPS cell models, MA-5 corrected abnormal mitochondrial structures and reduced cellular stress markers.

When tested in *Drosophila* with Barth syndrome, the drug dramatically improved their climbing ability (capacity for physical exertion) and normalised their elevated heart rates — two key symptoms that mirror how the disease affects humans. Furthermore, MA-5 restored normal mitochondrial structure in the *Drosophila* muscle tissue.

These promising results suggest that MA-5 addresses the largest challenges faced by patients with Barth syndrome, which would significantly improve their quality of life. Phase I clinical trials in Japan have been completed successfully, and the research team is preparing to start Phase II trials soon.

"We've validated MA-5 using patient cells, iPS cell models and a *Drosophila* model of Barth syndrome," Abe said. "The evidence from all of these studies supports its potential effectiveness in patients with Barth syndrome, which we hope to examine more in the next clinical trial."

Critically, MA-5 can be taken orally, which makes administration significantly easier for paediatric patients. It is understood to be the first oral medication for Barth syndrome to progress to the clinical trial stage, and could very well become the first disease-modifying treatment for Barth syndrome.

COVID infection ages blood vessels, particularly in women

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Blood vessels gradually become stiffer with age, but a new study by international researchers suggests that COVID-19 could accelerate this process. The researchers say this is important since people with stiffer blood vessels face a higher risk of cardiovascular disease, including stroke and heart attack.

The study was published in the *European Heart Journal* and led by Professor Rosa Maria Bruno from Université Paris Cité. She said: "Since the pandemic, we have learned that many people who have had COVID are left with symptoms that can last for months or even years. However, we are still learning what's happening in the body to create these symptoms.

"We know that COVID can directly affect blood vessels. We believe that this may result in what we call early vascular aging, meaning that your blood vessels are older than your chronological age and you are more susceptible to heart disease. If that is happening, we need to identify who is at risk at an early stage to prevent heart attacks and strokes."

The study included 2390 people from 16 different countries, including Australia, who were recruited between September 2020 and February 2022. They were categorised according to whether they had never had COVID, had recent COVID but were not hospitalised, hospitalised for COVID on a general ward, or hospitalised for COVID in an intensive care unit.

Researchers assessed each person's vascular age with a device that measures how quickly a wave of blood pressure travels between the carotid artery (in the neck) and femoral arteries (in the legs), a measure called carotid-femoral pulse wave velocity (PWV). The higher this measurement, the stiffer the blood vessels and the higher the vascular age of a person. Measurements were taken six months after COVID infection and again after 12 months. The researchers also recorded demographic information such as patient's sex, age and other factors that can influence cardiovascular health. After taking these factors into consideration, the researchers found that all three groups of patients who had been infected with COVID, including those with mild COVID, had stiffer arteries compared to those who had not been infected. The effect was greater in women than in men and in people who experienced the persistent symptoms of long COVID, such as shortness of breath and fatigue.

The average increase in PWV in women who had mild COVID was 0.55 m/s, 0.60 in women hospitalised with COVID, and 1.09 for women treated in intensive care. The researchers say an increase of around 0.5 m/s is "clinically relevant" and equivalent to aging around five years, with a 3% increased risk of cardiovascular disease, in a 60-year-old woman.

People who had been vaccinated against COVID generally had arteries that were less stiff than people who were unvaccinated. Over the longer term, the vascular aging associated with COVID infection seemed to stabilise or improve slightly.

"There are several possible explanations for the vascular effects of COVID," Bruno said. "The COVID-19 virus acts on specific receptors in the body, called the angiotensin-converting enzyme 2 receptors, that are present on the lining of the blood vessels. The virus uses these receptors to enter and infect cells. This may result in vascular dysfunction and accelerated vascular aging. Our body's inflammation and immune responses, which defend against infections, may be also involved.

"One of the reasons for the difference between women and men could be differences in the function of the immune system. Women mount a more rapid and robust immune response, which can protect them from infection. However, this same response can also increase damage to blood vessels after the initial infection.

"Vascular aging is easy to measure and can be addressed with widely available treatments, such as lifestyle changes, blood pressure-lowering and cholesterol-lowering drugs. For people with accelerated vascular aging, it is important to do whatever possible to reduce the risk of heart attacks and strokes."

Bruno and her colleagues plan to follow the participants over the coming years to establish whether the accelerated vascular aging they have found leads to an increased risk of heart attacks and strokes in the future.

Cutting turnaround times

without cutting corners

iStock.com/Zephyr18

Andrew Wyatt, Chief Growth Officer at Sapio Sciences*, discusses how laboratory information management systems can improve a lab's turnaround time.

According to the US Centers for Disease Control and Prevention (CDC), 70% of today's medical decisions rely on lab test results. However, nearly 80% of labs report receiving complaints about their turnaround time (TAT).

The complexity behind TAT in NGS labs

Today's clinical labs specialising in next-generation sequencing (NGS) — a discipline that analyses data to identify genetic information, mutations and biomarkers for research and diagnostics — could be managing a 10- to 12-step process that includes sample recording to test ordering and sample prep. This is often done alongside sequencing, data collection, processing and analysis, and report generation.

With so much activity, any delay, at any step in the process, can significantly impact samples processing and results reporting, and extend a lab's TAT. Ultimately, this can lead to potentially dangerous outcomes, including delayed patient treatment.

Four key factors affecting TAT

TAT can be affected by a host of factors, but these can generally be categorised into four key components: pre-testing errors, sample volumes, data complexity and lab resourcing.

1. Pre-testing errors

Errors during the 'pre-analytical phase' can account for 60–70% of TAT delays in clinical labs. These issues, which often happen before the sample is even in the possession of the testing facility, include paper requisitions or disparate online ordering processes, incorrect patient and specimen collection, identification, transport or receipt.

2. Sample volumes and workflow management

The average clinical lab processes thousands of samples every day, with larger commercial labs handling significantly more. Dealing with this scale of samples requires highly effective process management, with even minor errors leading to significant delays, which can have serious ramifications for patients.

3. Data complexity

All samples bring unique challenges, but labs specialising in NGS are dealing with specific demands, including complex sample management, continuous monitoring and instrument integration. Managing sample processing while carefully and accurately deciphering the data generated

requires extraordinary attention to detail. The smallest disruption often leads to a dramatic impact on overall TAT.

4. Lab resourcing

A shortage of skilled technicians, coupled with unsustainable workloads and/or staff burnout, can seriously impact the efficiency and accuracy of an NGS lab. With few technicians available, work becomes harder to manage, often leading to increased errors and extended TAT.

Solving the TAT challenge with modern LIMS

Modern, cloud-based laboratory information management systems (LIMS) can help avoid many of the causes of increased TAT, helping to improve the overall operational efficiency, accuracy and reliability of the testing facility. Such a system, when deployed across the entire testing workflow, enables key process improvements.

For example, a physician portal extends the testing workflow right into the doctor's office, allowing clinicians to create orders, track status and receive results without the risk of losing data or missing information. By extending the testing workflow directly to relevant stakeholders, labs can improve communication, reduce frustration and streamline the process from order placement to report delivery.

Benefits of a modern LIMS include:

- Digitising sample accessioning and order processing ensures a smooth and rapid transition from order placement to specimen processing and assignment to the appropriate internal workflows.
- Methods of identifying samples, such as barcodes and QR codes, remove errors that could arise from registering samples manually.
- Using a modern platform that integrates data from across an existing IT system, and includes data from legacy systems and disparate instruments, enables clinical reports to be generated automatically based on results from various diagnostic processes or departments.
- This significantly accelerates the reporting process. Again, via a physician's portal, these reports can be automatically delivered back to the doctor, further improving the TAT of the lab.

Enabling better outcomes with faster, smarter testing

High sample volumes, pre-analytical mistakes and complex workflows are only some of the many hurdles that diagnostic labs must overcome to maintain an acceptable TAT and ensure patients receive the correct diagnosis and treatment in a reasonable time frame.

Implementing a modern, configurable LIMS can have a positive impact on every aspect of a laboratory by orchestrating the different components of the diagnostics process. As such, the LIMS can expand and automate processes, guarantee precise sample management, data integration and analysis, increase operational efficiency, and drive down TAT.

To find out more, visit www.sapiosciences.com.

**As Chief Growth Officer for Strategic Partnerships at Sapio Sciences, Andrew Wyatt is responsible for growing the company's international operations. With his deep understanding of the life sciences industry and proven ability to navigate the complexities of scaling operations, Andrew has consistently built organisations that delight customers while maximising shareholder value.*

Blotting accelerator

Proteintech's ready-to-use blotting accelerator is specifically used for membrane blocking and antibody dilution in western blot experiments, and designed to shorten the blotting workflow to around 40 min or less. It contains special organic compounds which can significantly shorten the reaction time of experiments and thus improve experimental efficiency.

The product contains inert proteins of different molecular weight ranges, which can effectively reduce the background and protect the activity of the antibody. Antibody working solutions diluted with the product can usually be stored at 4°C for more than three months.

The product contains pathology-grade preservatives and is compatible with HRP, so it can dilute primary antibodies (including phosphorylated primary antibodies), HRP-labelled primary antibodies or secondary antibodies. It is also possible to dilute fluorescently labelled primary and secondary antibodies.

United Bioresearch Products Pty Ltd
www.unitedbioresearch.com.au

Digital displays for weighing applications

In industrial and commercial environments, accurate and dependable weighing is a necessity. London Electronics has now developed the FUSION series of digital displays — a powerful solution designed to deliver real-time, precision measurements. Built for seamless integration into new or existing systems, the displays are used internationally in applications where failure is not an option.

From vessel monitoring to process control on the factory floor, the digital indicators are engineered for performance, longevity and ease of use. The series offers a clear visual interface, robust construction and flexible input/output options, making it suitable for a wide range of industrial weighing tasks — whether the user is upgrading their existing weighing infrastructure or building something new.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

Compact holotomography platform

Scitech together with Tomocube is excited to announce the launch of the HT-X1 mini — Tomocube's compact holotomography platform.

The product features a compact design with flexible configuration, delivering high quality and making advanced holotomographic, label-free imaging accessible to more laboratories. Applications include 3D biology, live cell imaging, high-content 3D imaging, immunology, regenerative medicine, cell biology and much more.

The HT-X1 mini is compact (weighing a mere 30 kg), intuitive and ready for any lab bench as it transforms everyday research into breakthrough 3D imaging. Its portable, space-saving design allows effortless installation even in limited environments such as cell culture rooms, clinical labs or field labs.

Powered by the same second-generation holotomography technology as the HT-X1 series, the device delivers high-resolution, label-free 3D imaging of live cells. Fully compatible with TomoAnalysis, the HT-X1 mini enables the same high-quality image analysis as the HT-X1 series, providing seamless continuity in research.

The product is built to grow with the user's research. Start with the essentials, then expand capabilities with four upgrade modules — fluorescence imaging, environmental incubation, laser-based autofocus, and multi-wavelength illumination. This modular flexibility lowers initial investment barriers while enabling the system to adapt to new experimental needs — supporting everything from routine cell culture checks to complex, high-content 3D imaging.

The HT-X1 mini main unit consists of an objective lens 40x NA 0.75 air, image sensor 2.8 MP CMOS, illumination LED 444 nm (520/660 nm optional), a motorised stage, fluorescence light engine (three-channel, optional), laser-based consistent focus (optional) and environmental controller (optional).

SciTech Pty Ltd
www.scitech.com.au

NIR systems for the food and feed industry

BUCHI offers two innovative NIR systems for the food and feed industry: ProxiMate and ProxiScout.

ProxiMate is an at-line NIR instrument specifically designed for the food and feed industry, focusing on improved process efficiency and quality control. Its compact and robust design reduces downtime during production and offers quick quality assessments for batch samples. The intuitive touchscreen interface allows anyone to easily operate the unit, simplifying the set-up of applications and sample testing.

ProxiScout is a portable NIR analyser that enables field operators to conduct rapid analyses onsite. It is designed for ease of use and integration across various workflows, making it versatile for determining the composition of raw materials or verifying their conformity. This handheld device is design for immediate measurements, a wide selection of accessories for different sample types, and mobile applications for intuitive control and instant results. Additionally, it incorporates a cloud portal for data management and collaboration.

With a spectral range of 1350–2550 nm, ProxiScout provides high levels of sensitivity and precision, offering the capability to quantify multiple key parameters in a single measurement. It delivers results across diverse materials and applications.

Bio-Strategy - Part of DKSH Group
www.bio-strategy.com

Powder rheometer for predicting powder flow behaviour

Predicting powder flow behaviour is essential for optimising manufacturing processes, yet powder behaviour is notoriously difficult to predict as it can shift dramatically — flowing like a liquid or compacting like a solid — depending on the forces applied during different stages of processing. In pharmaceutical manufacturing, achieving consistent blend uniformity is essential to ensure each tablet contains the correct amount of active pharmaceutical ingredient (API). Traditional manual methods — such as angle of repose, flow through an orifice, or avalanche testing — can offer basic insights but are often limited by operator variability and poor reproducibility.

The Malvern Panalytical FT4 Powder Rheometer offers a more comprehensive and reproducible approach. It enables direct measurement of dynamic flow, bulk and shear properties, delivering deeper insight into how powders behave under conditions that mimic real-world processes — such as mixing, shearing, aeration and compaction.

In dynamic testing, the FT4 uses a rotating blade within a cylindrical vessel to determine how much energy is required to move through the powder at varying speeds. This reveals key behavioural traits, such as agglomeration, flow sensitivity, friction and friability. The instrument can also assess air permeability — the ability of air to flow through the powder bed — which is a critical factor in fluidised processes. Shear testing meanwhile provides insight into powder cohesion and wall friction — two factors that affect flow through hoppers and feeders. Importantly, FT4 methods are referenced in ASTM 7891, underlining their regulatory relevance.

The FT4 is designed to provide valuable information that will help users address their powder flow challenges — whether their objective is to optimise a formulation in a development environment, predict in-process performance, understand cohesive forces and batch differences, or ensure the quality of raw materials or intermediates.

ATA Scientific Pty Ltd
www.atascientific.com.au

Transcriptome profiling library preparation kit

Alithea Genomics has launched MERCURIUS Total DRUG-seq — an extraction-free, full-length transcriptome profiling library preparation kit designed to push the boundaries of high-throughput drug screens, toxicology screens and target validation by enabling the creation of large-scale data generation for machine learning and AI.

Building on the MERCURIUS 3' DRUG-seq, MERCURIUS Total DRUG-seq captures the complete transcriptome — including lncRNAs and other non-coding RNAs — with greater sensitivity, full-length coverage and high multiplexing capacity, enabling researchers to screen over 50,000 samples.

The product is available in 96-well (1000–25,000 cells) and 384-well (500–10,000 cells) formats and features a streamlined, extraction-free protocol that delivers fast turnaround and low input requirements, without sacrificing scalability or reproducibility. It is available to order as a standalone kit or as part of Alithea's in-house services.

Alithea Genomics
alitheagenomics.com

Sequencing tech could transform NZ viticulture

Life science company MGI Tech Co has partnered with Lincoln University in Canterbury, New Zealand, to address sustainable challenges in viticulture through advanced sequencing technology. The initiative aims to utilise genomics to breed better varieties of grapevines and hops that are tolerant and resistant to pests and diseases, thus reducing fungicide use across New Zealand's NZ$2.1 billion wine export industry.

Viticulture is a significant economic source of revenue for New Zealand, ranking as the nation's sixth-largest export earner. But the country's vineyards are particularly vulnerable to fungal diseases, often requiring frequent and broad-spectrum spraying to maintain vine health and grape quality. As a result, New Zealand farmers apply approximately 3400 tonnes of pesticides every year — despite the fact that, under US Environmental Protection Agency classification, 60% of fungicides and 72% of plant growth regulators used locally are considered potential carcinogens. This has placed the sector in the crosshairs of consumer and environmental scrutiny, particularly as climate change drives more volatile weather conditions that heighten disease risk and see traditional spraying schedules prove less effective.

To address these challenges, New Zealand scientists have started a genomic study to reduce the wine sector's reliance on chemical sprays. By using advanced sequencing technology, researchers can now rapidly scan thousands of grapevine samples to identify those with natural resistance to disease and environmental stress. This approach not only opens a pathway to breed more resilient grape varieties, it also enables real-time monitoring of vineyard conditions, laying the foundation for more targeted, sustainable and cost-effective vineyard management.

The genomics practices allow scientists to map the natural genetic diversity within thousands of grapevines, identifying those with inherent disease resistance. Early findings suggest that, with targeted intervention informed by this data, chemical spray use could be reduced by up to 80% in some vineyards — resulting in lower costs, less residue in the wine, and reduced pressure on soil health and the environment.

Associate Professor Christopher Winefield from Lincoln University's Department of Wine, Food and Molecular Biosciences, who first introduced genomics into his research to explore traits like fungal tolerance and soil health response, is now scaling the project significantly through the use of the MGI DNBSEQ-G400 genome sequencer — a next-generation sequencing platform designed to enable unprecedented scale and speed in genomics with economic cost. Traditionally, testing a few hundred grapevine samples per year was considered standard; now, the lab can process over 50,000 annually — a 100-fold increase in volume.

"The introduction of MGI sequencing tools has really helped democratise sequencing for small teams like myself," Winefield said. "The cost of that sequencing is highly competitive. We're now looking to process up to 50,000 samples a year — we simply couldn't do that without MGI's support."

The genomic data is helping scientists identify vines that are more resilient under water stress or nutrient limitations — a key consideration as climate volatility increases. Additionally, the platform can support real-time sequencing to detect pathogens like powdery mildew and mealybug; this enables precision agriculture approaches, where interventions are localised rather than applied uniformly.

"Instead of scheduled spraying, farmers can move to evidence-based treatment," Winefield said. "It's a shift from blanket coverage to pinpoint accuracy. That means fewer chemicals in the environment and better resistance management."

Winefield and his colleagues are now looking to form a standalone venture to bring affordable genomic testing to the country's broader agriculture sector; the startup will serve viticulture, horticulture and dairy farms, giving producers access to real-time insights previously confined to high-cost labs. This data-driven model would enable even small-scale producers to detect early signs of disease, make proactive crop management decisions and cut down on unnecessary chemical inputs.

"This is about getting world-class science into farmers' hands," Winefield said. "Our goal is to process a million samples annually at launch and grow to 10 million within five years."

Furthermore, with international viticulture facing similar challenges, the research could become a blueprint for sustainable production globally. Indeed, Winefield envisions a future where genomic diagnostics is as routine in farming as soil testing or weather tracking.

"This isn't just about grapevines," he said. "Whether it's hops, kiwifruit, apples or livestock, we can use this data to reduce disease pressure, improve yields and make smarter input decisions."

"This is a powerful example of how cutting-edge technology supports the future of agriculture," concluded Dr Bicheng Yang, Director of MGI Australia. "By helping researchers uncover the genetic drivers of disease resistance, we're enabling the industry to move away from chemical dependency and toward natural plant resilience."

MGI Australia Pty. Ltd.
en.mgi-tech.com

OTR measurement system for microtitre plates

The Kuhner microTOM (micro-scale Transfer-Rate Online Measurement) is a next-generation online monitoring system for analysing cellular respiration in microbial and cell culture applications directly in 96- or 24-well microtitre plates. Using oxygen transfer rate (OTR) as a precise and scalable indicator, the product offers automated, label-free screening without manual sampling, offline analysis and interruptions.

The Kuhner microTOM stands apart due to the use of 96 parallel OTR measurements, resulting in high throughput for microplate-based cultivation. With low running costs, compact design and high sensitivity, it is suitable for microbial and mammalian cultures, offering robust, scalable data and full compatibility with all Kuhner shakers and FeedPlate.

Two application-specific modules are available: the Kuhner microTOM Type M (microbial) for non-humidified incubators, featuring integrated humidification and aeration, and the Kuhner microTOM Type C (cell culture) for humidified incubators with or without CO_2 control, using incubator air for aeration.

The product quantifies cellular activity every 20 min via OTR. It is non-invasive, probe-free, and unaffected by turbidity or morphology. Independent of shaking conditions and oxygen solubility, it correlates directly with substrate consumption and viable cell count, making it suitable for clone screening, media optimisation, toxicity studies, process development and scale-up validation.

The Kuhner microTOM is designed to offer precise, high-throughput OTR monitoring in standard microtitre plates with low costs, no manual labour, and full compatibility with existing Kuhner set-ups.

Capella Science
www.capellascience.com.au

Laboratory external quality assurance software

X-Lab's LabgnosticEQA is a software solution that digitises and automates laboratory external quality assurance (EQA) processes to improve compliance and save staff time.

The solution delivers eOrders for EQA surveys into the laboratory information system and automatically uploads results to the EQA supplier portal. By eliminating manual data entry and replicating the electronic patient process, it is designed to meet accreditation guidelines, provide a more accurate assessment of normal laboratory processes, and free up staff for other high-value work.

The solution has recently been upgraded to include Magic AI analyte mapping, auto conversion of units of measurement, and the ability to automate unlimited EQA surveys from suppliers across Australia, the UK and the USA.

X-Lab
x-labsystems.com

Light-sheet microscope for large cleared samples

The Bruker Luxendo LCS SPIM is a compact, benchtop light-sheet microscope using selective plane illumination microscopy (SPIM) and designed for fast and gentle 3D imaging of large cleared samples (LCS). The product is optimised for 3D imaging of large tissue structures, crucial when studying nervous system networks, when analysing organ development or when investigating tumour structure and tumorigenesis in oncology.

Typical applications of the microscope include imaging of large cleared-tissue samples, eg, whole mouse brains to visualise complete neuronal and vascular networks, and organs. It combines two-sided illumination and single detection with a novel optical concept for high-throughput imaging of large cleared samples and resolution down to 1 μm in 3D.

The modular LCS SPIM has been designed to be compatible with a broad variety of clearing solutions and sample sizes. The novel sample mounting approach and innovative optical design enable ultrafast acquisition times and minimise sample distortions while seamlessly integrating into existing clearing and sample preparation pipelines.

The product features a removable standard quartz crystal cuvette for gentle sample mounting, easy access and compatibility to all types of clearing solutions. A motorised sample stage and a programmable optics concept for fast 3D scanning of the light-sheet through the sample minimises the mechanical stress imposed on the sample. A cuvette filled with the clearing solution holds the specimen and is positioned on the sample stage.

The typical dimensions of the cuvette (20 x 20 x 20 mm) can be selected to accommodate specimens of different sizes, enabling sample imaging up to 40 mm long. This design minimises motion-induced sample distortions, while its novel optical configuration enables high acquisition speed.

SciTech Pty Ltd
www.scitech.com.au

Particle characterisation system with automated imaging

Understanding both particle size and shape is essential in R&D and manufacturing across many industries, as these parameters can influence how materials flow, pack, dissolve and interact with their environment. In pharmaceuticals, particle size affects dissolution rate and bioavailability, while shape influences packing density and blend uniformity. In powders for manufacturing, size impacts flow, but irregular shapes can cause segregation or blockages. In environmental science, where microplastics research is growing, shape can reveal degradation patterns or contamination sources that size alone might miss.

The Morphologi 4 from Malvern Panalytical delivers both size and shape analysis in a single, automated platform. Unlike manual microscopy methods that can be subjective and time-consuming, the product automatically captures and analyses thousands of particles, providing statistically robust datasets with minimal operator input. A built-in sample dispersion unit provides optimal particle dispersion with compressed air, automating the whole process.

Captured high-quality images of dry powders, suspensions and particles on filters enable particle size measurement from around 0.5 μm to over >1300 μm. A complete morphological profile is generated, which includes over 20 size and shape parameters for every particle, like aspect ratio, circularity, elongation and more. With intuitive software, it pinpoints the most significant shape differences between samples, providing clear insights. The Morphologi 4-ID includes a Raman microprobe, which gains the additional ability to chemically identify particles and foreign contaminants.

Morphologi 4 empowers scientists and engineers to optimise products, troubleshoot processes and meet stringent quality requirements. For any laboratory seeking to go beyond size into the rich detail of particle shape, the product represents a powerful, future-ready characterisation tool.

ATA Scientific Pty Ltd
www.atascientific.com.au

More PFAS found in Sydney tap water

Researchers from UNSW Sydney have identified 21 new per- and polyfluoroalkyl substances (PFAS) in Sydney's tap water, bringing the known total to 31 types. The researchers say their findings, published in the journal ***Chemosphere***, reinforce the need for broader PFAS monitoring.

PFAS compounds — which have been widely used in firefighting foams, non-stick cookware, waterproof materials and industrial manufacturing — are often dubbed 'forever chemicals' because they don't break down naturally and persist in the environment and human body for decades. While official health guidance says there is currently limited evidence of human disease or other clinically significant harm resulting from PFAS exposure, Australian guidelines are designed to minimise risk over a lifetime.

The UNSW researchers analysed 32 tap water and 10 bottled water samples taken from the Sydney water catchment areas in early 2024, including 10 sites in the Ryde catchment, 13 in Potts Hill, four in Prospect and five in North Richmond. Leading the laboratory analysis was Dr Lisa Hua, who used specialised resins that were able to extract PFAS compounds from water samples brought back to the lab. She then utilised a technique called mass spectrometry that identifies chemicals by measuring the weight of their molecules — and is so sensitive it can pick up PFAS at parts per trillion (ppt).

According to lead author Professor William Alexander Donald, the PFAS profiles detected depended on catchment, with higher concentrations near likely contamination sites. For example, the team found PFOS — a legacy firefighting foam chemical and known carcinogen — in some North Richmond samples with a reading of 6 ppt, which is 2 ppt below Australia's guidelines of 8 ppt but higher than the US EPA's advisory limit of 4 ppt.

"Sydney's water meets current Australian standards, but when considering health benchmarks used in other countries, some samples were near or above safety limits," Donald said.

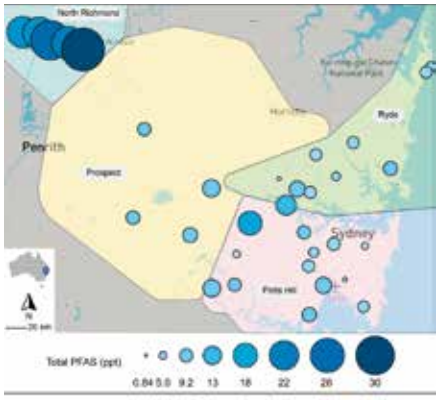
Another finding was the first ever detection in Australian tap water of 3:3 FTCA, a short-chain breakdown product from firefighting foams which has only once before been reported in a drinking water supply worldwide. There is currently no established toxicity data or regulatory limit for this specific compound in drinking water, although its presence raises concern due to its chemical similarity to other PFAS known to pose health risks.

Another detected compound, 6:2â€¯diPAP, had previously been found in bottled water and other consumer environments but not in tap water. According to the researchers, limited evidence from early studies suggests 6:2 diPAP may affect thyroid and reproductive systems, but further research is needed.

"This study reports the first detection of this PFAS in tap water globally," Donald said.

"Detecting PFAS not previously reported in tap water highlights that our monitoring programs are now uncovering more of the chemicals present in our supply."

The most abundant compound detected on average — present in every tap water sample — was PFBA, a short-chain PFAS. It's a common breakdown product of other PFAS and is now attracting scientific attention because it's increasingly used as a replacement for regulated long-chain PFAS, yet remains highly mobile in



A map showing the concentration of PFAS chemicals in Sydney drinking water supply. The darker the blue and larger the circle, the larger the concentration of PFAS. Different colour shades in the background represent different catchments.

Image credit: UNSW Sydney.

water and environmentally persistent. While PFBA builds up in the body less than longer-chain PFAS, the researchers noted that some early studies suggest potential effects on liver, thyroid and developmental health.

"This highlights that we are stuck in a whack-a-mole situation with PFAS," Donald said.

"Tiny tweaks to the chemical structure create a 'new' compound, but the toxicology research and regulatory work has to start all over again every time a PFAS is tweaked."

Where to now?

While Hua said it "should be reassuring" that the detected PFAS concentrations were low, she added that we "should explore new technologies that remove PFAS before their release into our ecosystems and drinking water supply". The good news is, Hua, Donald and colleagues recently published a study in the *Journal of Hazardous Materials* identifying a material that, when added to water at trace levels, can remove more than 99% of PFAS at environmentally relevant concentrations. They are now also working on materials designed to absorb PFAS from water and break it down entirely.

Other proposed next steps include expanding PFAS monitoring across Australia, which could involve a nationwide survey to assess PFAS levels in both urban and remote areas. The researchers recommend that monitoring be broadened to include more PFAS compounds, which would help generate more comprehensive data tracking over time.

"Expanding the current monitoring of PFAS could be beneficial to gain a greater understanding of seasonal variations of PFAS in drinking water supply," Hua said.

Cell imager

Millennium Science introduces the Atlas imaging platform from LICORbio to researchers across Australia and New Zealand. Designed for both 2D and 3D assays, the product delivers high-content, high-throughput imaging in a fraction of the time required by conventional systems.

The device scans a full plate in under 1 min, combining imaging and measurement in a single platform to streamline laboratory workflows. Its patented optical system delivers high sensitivity and dynamic range, enabling quantitative multiplexing for drug discovery and translational research.

Researchers can acquire entire wells for rapid screening and perform high-resolution analysis of regions of interest without the need for stitching or illumination correction. With its expansive focus depth, the product is suitable for imaging 3D models such as spheroids, organoids and organ-on-a-chip systems, providing insights into tissue-like biology.

Featuring over 30 imaging channels, six lasers, brightfield and epi-illumination, plus a built-in luminescent imager, the product offers flexibility for a wide range of assays.

Millennium Science Pty Ltd
www.mscience.com.au

Functional ultrasound system

Iconeus's functional ultrasound (fUS) technology affords neuroscience and preclinical researchers the ability to non-invasively image the blood vessels in the brain and observe brain activity in real time. Embodied in the Iconeus One system, it is designed to combine sensitivity, speed and high resolution, producing detailed vascular maps of the brain. The direct correlation between brain activity and blood flow allows the technology to be used to study such things as neuropharmacology, neurovascular imaging, resting state functional connectivity and functional neuroimaging, as well as drug and treatment therapies.

Functional ultrasound uses high-frequency soundwaves similar to conventional ultrasound except that it uses plane waves as opposed to point focused waves; thus, a full 2D image can be generated with every pulse. By sending a sequence of plane waves from different angles, it improves signal-to-noise ratio, allowing visualisation of the brain vasculature at a fine scale and the detection of subtle changes in blood flow with high sensitivity. Higher-resolution studies are also possible by performing Ultrasound Localised Microscopy (ULM). The Iconeus One can track microbubbles that are injected into the subject, providing detailed images of the brain vasculature down to the capillary scale.

AXT Pty Ltd
www.axt.com.au

Multiomic genomics platform

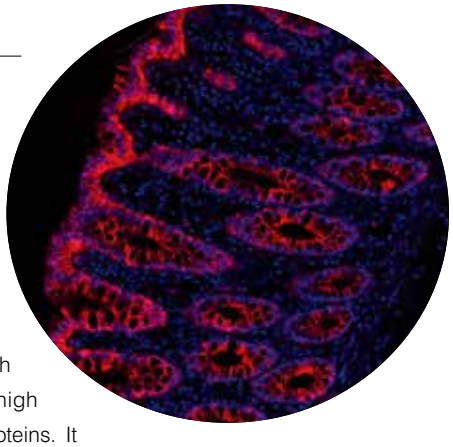
EpiCypher has announced the launch of CUTANA Fiber-seq — a multiomic genomics platform that captures both genomic and epigenomic information in a single long-read sequencing assay. The technology delivers high resolution of DNA sequence and chromatin features along with individual DNA molecules, with the potential to advance research and precision medicine in ways that were not possible using current short-read workflows.

The Fiber-seq workflow begins with nuclei treated with the Hia5 methyltransferase, which deposits 6mA marks at regions of accessible DNA. Chromatin fibres are then extracted and subjected to long-read sequencing (PacBio or Oxford Nanopore Technologies), where both the Hia5-incorporated 6mA modifications and the underlying DNA sequence are directly detected. This generates a single-molecule, multiomic readout that integrates genetic information, endogenous DNA methylation, and chromatin accessibility across long, continuous DNA molecules.

Unlike conventional ATAC-seq, the platform provides base-pair resolution of transcription factor footprints along individual DNA fibres, which should enable precise detection of protein–DNA interactions that regulate gene expression. It is designed to provide a clear view of the genome — not just the sequence, but the epigenomic states of individual DNA molecules — with potentially transformative implications for fundamental research and translational science.

The technology addresses critical challenges across diverse fields. For basic and translational research, it can be used to map genetic and epigenetic landscapes on individual molecules to uncover complex mechanisms of genome regulation. For drug discovery and development, users can identify and validate novel therapeutic targets by resolving chromatin states and DNA modifications at high resolution. For clinical research and diagnostics, it enables precision medicine applications, including the diagnosis of rare diseases.

Integrated Sciences Pty Ltd
www.integratedsci.com.au



Proximity ligation assay kit

Navinci's NaveniFlex Tissue Red is an in situ proximity ligation assay kit optimised for tissue samples. The kit enables fluorescence visualisation of protein–protein interactions or post-translational modifications such as phosphorylation and enables high specificity when localising single proteins. It should be used with the user's primary antibodies of choice (raised in mouse and rabbit).

The product has been validated on FFPE and fresh frozen human and mouse tissue sections. It has been validated on several types of tissues, both healthy and cancerous, eg, colon, tonsil, ovary, kidney, breast, spleen, brain and skin.

Compatible with traditional immunostaining equipment, the kit uses secondary antibody detection to produce an amplified signal in the form of a fluorescent dot, thus facilitating the quantification of the readout. It is based on Navinci Diagnostics' Naveni in situ proximity ligation technology, with two Navenibodies conjugated to proprietary oligo arms.

Sapphire Bioscience
www.sapphirebioscience.com

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Burkert Microsensors:

Precision and Partnership for Critical Laboratory and Medical Applications

In the life sciences, precision isn't just a feature, it's a necessity. Whether developing devices for clinical chemistry, hematology, dialysis, or endoscope reprocessing, manufacturers face the challenge of delivering accurate, repeatable results that directly impact patient care and scientific advancement.

Burkert's innovative microsensors are designed to meet these demands, providing miniature, space-saving solutions that deliver reliable measurement and control for the most critical applications.

Compact, Adaptable, and Highly Accurate

Burkert microsensors are engineered for seamless integration into laboratory and medical devices, from stationary analysers to point-of-care systems. Their compact design offers manufacturers greater freedom in device architecture, while their robust construction ensures resistance to aggressive chemicals and the highest reliability, even under demanding operating conditions.

These microsensors precisely measure and monitor key parameters, conductivity, pH, free chlorine, ORP, turbidity, and specific ions ($Na+$, $K+$, Ca^{2+}, Mg^{2+}), enabling accurate control of fluid processes. They also measure pressure and ultra-low flow rates, supporting advanced diagnostics and process safety across a range of device types.

Application Highlights

Clinical Chemistry: In clinical chemistry devices, Burkert microsensors ensure the correct composition and mixing of reagents, supporting accurate sample analysis and reliable results. Continuous monitoring and documentation help laboratories meet regulatory standards and maintain traceability.

Hematology: Precise measurement of conductivity and pH is vital for hematology analysers, where sample integrity and process reproducibility are critical. Burkert's microsensors deliver high accuracy in small footprints, enabling efficient, reliable analysis and faster turnaround times.

Endoscope Reprocessing: Effective cleaning and disinfection are paramount in medical device reprocessing. Burkert's sensors continuously monitor cleaning solution composition, ensuring the correct mixing ratio and preventing cross-contamination. Their adaptability allows integration into compact reprocessing units, supporting both process efficiency and patient safety.

Peritoneal Dialysis & Haemodialysis: Dialysis devices require precise mixing and monitoring of dialysate solutions. Burkert microsensors measure electrolyte composition and maintain the required purity, helping optimise treatment and increase patient safety. Their small size allows for flexible device design, while real-time monitoring ensures compliance with stringent medical standards.

Partnership from Development to Deployment

Burkert supports manufacturers throughout the device development journey. From initial concept and prototyping to series production, Burkert's experts collaborate closely with R&D teams to tailor microsensor solutions to specific application requirements. This partnership guarantees that every component is optimised for performance, reliability, and regulatory compliance.

Did You Know?

In addition to microsensors, Burkert offers a comprehensive portfolio of flow sensors, valves, and pumps. Combined with advanced manufacturing and injection moulding expertise, Burkert can help you develop compact, integrated systems, fully adapted to your device's unique needs.

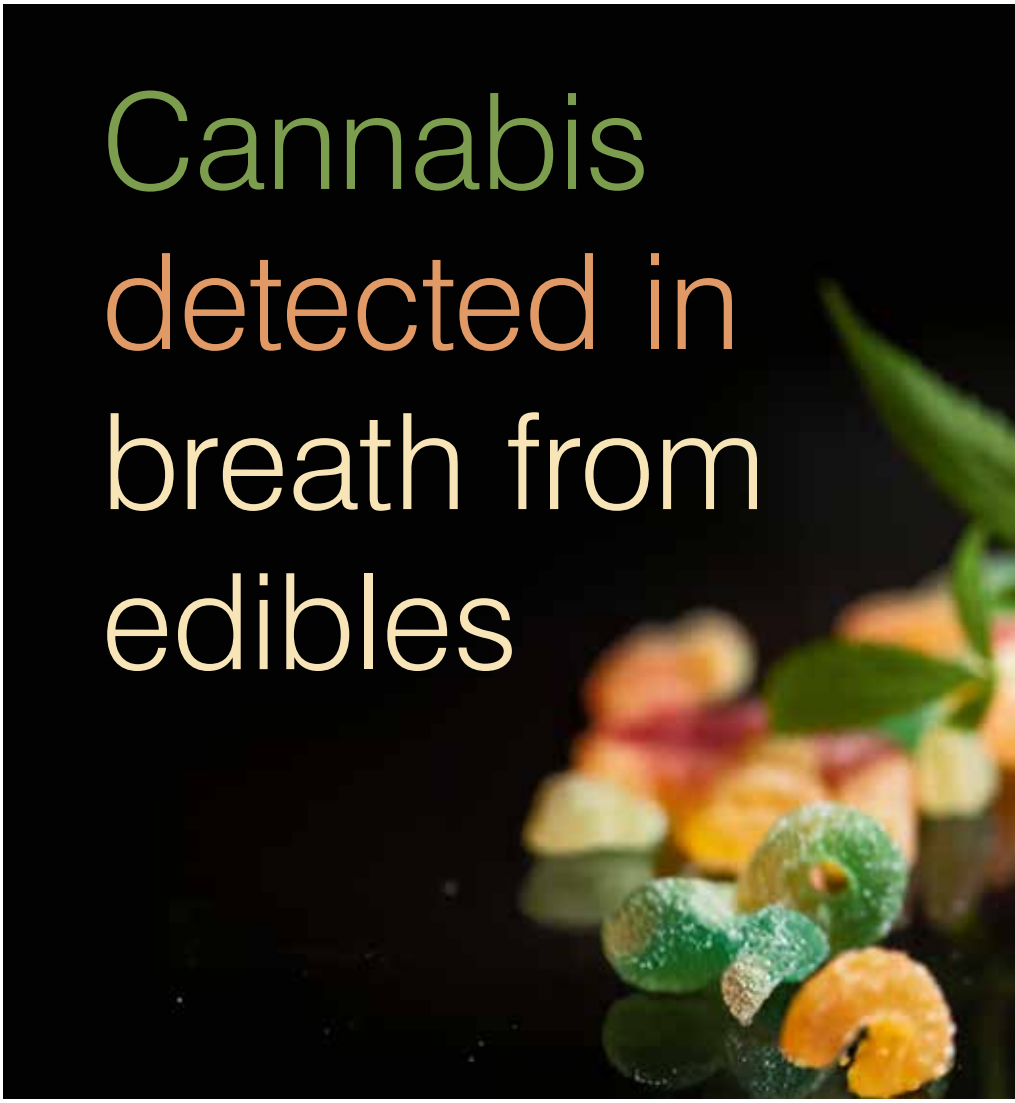
Ready to Elevate Your Device Design?

With Burkert microsensors, you gain precision, reliability, and a partnership focused on your success. Discover how Burkert can help you deliver breakthrough laboratory and medical devices — visit burkert.com.au or contact our team to discuss your project.

Burkert Fluid Control Systems
www.burkert.com.au

Cannabis detected in breath from edibles

Researchers at the US National Institute of Standards and Technology (NIST) and their partners say they have made the first measurement of tetrahydrocannabinol (THC) in breath from edible cannabis, in a breakthrough that supports public safety and law enforcement as consumption of cannabis rises across the US. Their work has been published in the *Journal of Analytical Toxicology*.



With cannabis now outpacing alcohol as Americans' daily recreational drug of choice, nearly 20% of users admit to driving after using the drug. But reliable roadside tests for cannabis do not exist — even blood tests can't determine when a person used cannabis, leaving law enforcement without a way to determine a person's recent use, much less how intoxicated they are.

To make things more complicated, there are multiple ways to consume cannabis, such as smoking, vaping, ingestion and dabbing (inhaling a concentrated form of cannabis extracts). Scientists know that the psychoactive component THC shows up in breath after smoking, but now they have shown that it can also be measured after the consumption of edibles.

Making a breathalyser for cannabis is harder than making a breathalyser for alcohol. Alcohol is a relatively simple and highly volatile molecule: it easily travels through the lungs and evaporates when it contacts air. But THC is a larger, more complicated molecule with very low volatility, and consumption is typically hundreds of times less than alcohol. It shows up in very small concentrations in breath, making THC detection much more challenging. Regular users of cannabis can have THC in their breath for at least eight hours and in their blood for potentially weeks after stopping use, meaning that a single measurement is insufficient to learn when a person last used it.

In the new study, NIST's partners at the University of Colorado Anschutz Medical Campus observed 29 participants who each brought a cannabis-infused gummy to the lab with them; the edibles contained anywhere from 5 to 100 mg of THC. Researchers first took a breath sample from the participants before they ingested the product. Then they observed each participant for three hours, obtaining breath samples approximately every hour.

NIST researchers measured the concentration of THC and other cannabinoids in breath at those intervals. They detected THC in most of the participants before they took the edible, even though they had been asked to abstain for eight hours before the study. This wasn't considered surprising, as our bodies process cannabinoids slowly — taking weeks to get them out of our systems compared with hours for alcohol.

The researchers found that 19 of the participants showed significant increases in THC in the three-hour period after ingesting the edible, with many exhibiting a peak and then a decline in THC concentration during that time. Four of the participants did not show any change in THC, and six showed only a decrease from their first breath sample. However, it is possible that the measurements may have missed the time window in which a jump in THC could have occurred.

"This is an important step forward; that we can detect THC increases in breath after the ingestion of cannabis," said lead author Jennifer Berry, a research chemist at NIST.

The observed spikes and dips in THC levels clear up some questions about how cannabinoids distribute in our bodies and leave our systems after use. There is a common misconception that THC in breath is from leftover smoke in the lungs after smoking cannabis, but Berry said this study shows that THC that is swallowed in edibles can make it through the digestive system and be exhaled back out through the lungs. This matches something else that stood out to the NIST team: the fact that edible cannabis takes time to show up in breath.

"Edibles aren't that different from smoked cannabis and alcohol in that way," Berry said. "Whether you inhale it or ingest it, it will show up in breath, but it may take some time before doing so."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According to Kavita Jeerage, a NIST research chemical engineer leading the cannabis breath research, this study provides just the first steps of understanding how edible cannabis shows up in breath. But this first detection of THC from edibles in breath provides encouraging signs that future instruments will be able to measure THC from ingested cannabis — with toxicologists set to determine what those measurements say about impairment.

"Our partners at Anschutz [have] conducted a variety of assessments to probe impairment after participants ingested their cannabis gummies, including observing participants' driving abilities with a driving simulator," Jeerage said. "The breath samples were a bonus that allowed us to gather first-ever data to explore whether THC increases in breath after edible ingestion.

"Looking forward, we can now tackle the question of when THC increases after edible ingestion, when it goes back to baseline, and how to analyse breathalyser data to get the information needed."

Tara Lovestead, a NIST chemical engineer on the cannabis breath research project, concluded, "This study supports the idea that multiple breath measurements over a period of time could be a way to use a breathalyser to detect cannabis use, regardless of how it's ingested. However, devices will still need standards to ensure that they are accurate and used correctly — standards that don't yet exist."

Dyes for spectral flow cytometry

Bio-Rad Laboratories is releasing its latest range of StarBright Dyes, designed to provide greater choice and flexibility for spectral flow cytometry in immunology research.

Conjugated to highly validated immunology antibodies against 46 markers found in common immunological samples, including 13 brand new markers, the dye range has been developed specifically for use in spectral flow cytometry. The dyes are said to exhibit unique spectra and maximal emission peaks, making them suitable for multiplexing panels.

The dyes are designed to provide high brightness and feature narrow excitation and emission profiles, offering researchers more options for panel design with minimised spreading and increased resolution. They can be easily incorporated into new and existing experiments and are compatible with the Bio-Rad ZE5 Cell Analyzer, as well as most other flow cytometers, cell sorters and spectral instruments.

The range provides users with more options when designing spectral flow cytometry panels, allowing for novel dye combinations and the creation of larger multicolour panels of increased complexity. The first dye in the series, StarBright UltraViolet700 (SBUV700), is now available, marking the start of a broader rollout over the coming months.

Bio-Rad Laboratories Pty Ltd
www.bio-rad.com

HIV drugs suppress transmission

of a different virus

A landmark study from the Walter and Eliza Hall Institute (WEHI) and The Peter Doherty Institute for Infection and Immunity has found that existing HIV drugs can suppress transmission of the life-threatening HTLV-1 virus in mice. Published in the journal *Cell*, the work could lead to the first treatments to prevent the spread of a virus that is endemic among many First Nations communities around the world.

Human T-cell leukaemia virus type 1 (HTLV-1) is a virus that infects the same cell type as HIV — T cells, a type of blood immune cell that helps the body fight off infections. A small proportion of people infected with HTLV-1 after a long duration of infection develop serious diseases, such as adult T-cell leukaemia and spinal cord inflammation. But while around 10 million people globally live with the virus, it remains a poorly understood disease that currently has no preventative treatments and no cure.

"As HTLV-1 symptoms can take decades to appear, by the time a person knows they have the infection the immune damage is already in full swing," said WEHI Laboratory Head Dr Marcel Doerflinger, co-lead author on the new study.

"Suppressing the virus at transmission would allow us to stop it before it has the chance to cause irreversible damage to immune function, leading to disease and a premature death."

In a research effort spanning 10 years, the collaborative team isolated the virus and developed a humanised mouse model for HTLV-1 that enabled them to study how the virus behave in a living organism with a human-like immune system. The mice were transplanted with human immune cells that are susceptible to HTLV-1 infections, including Australia's genetically novel HTLV-1c strain.

Research by co-lead author Professor Damian Purcell, Head of Molecular Virology at the Doherty Institute, isolated the virus from First

Nations donors and identified significant genetic differences between the HTLV-1c strains from Central Australia compared to the HTLV-1a strains found internationally. The findings show that both strains caused leukaemia and inflammatory lung disease in the mice, with HTLV-1c showing more aggressive features.

The mice were then treated with tenofovir and dolutegravir — two antiviral therapies currently approved to silence HIV and prevent AIDS. The team discovered both drugs could powerfully suppress HTLV-1, and were equally effective against both strains.

"Our study marks the first time any research group has been able to suppress this virus in a living organism," Doerflinger said.

"What's most exciting is that these antivirals are already in use for millions of HIV patients, meaning there's a direct path for the clinical translation of our findings.

"We won't have to start from scratch because we already know these drugs are safe and effective. And now we've shown that their use can very likely be extended to HTLV-1."

Furthermore, the team discovered that human cells containing HTLV-1 could be selectively killed when mice were treated with HIV drugs in combination with another therapy inhibiting a protein (MCL-1) known to help rogue cells stay alive. The team is now leveraging precision RNA therapies to develop new ways to target MCL-1 and establish combination treatments that can be clinically tested, which they believe could offer a promising curative strategy for HTLV-1.

The development of the humanised mouse models was spearheaded by lead author Professor Marc Pellegrini, WEHI Honorary Fellow and Executive Director at the Centenary Institute. Pellegrini said the mouse models were not only critical in identifying potential therapeutic targets, they also allowed researchers to understand how different strains of the HTLV-1 virus can alter disease symptoms and outcomes.

"It's long been hypothesised that differences in viral subtype may influence disease outcomes, but a lack of research into HTLV-1 has made it difficult for us to find the evidence needed to support this claim — until now," he said.

"Our study provides critical insights that enable us to better understand the consequences of the distinct molecular make-up of the virus affecting our First Nations communities. This will further help us to investigate ways to create the tools needed to control the spread of this virus subtype."

The research team is currently in talks with the companies behind the HIV antivirals used in this study, to see if HTLV-1 patients can be included in their ongoing clinical trials. If successful, this would pave the way for these drugs to become the first approved pre-exposure prophylaxis against HTLV-1 acquisition.

"Despite Australia's high burden of HTLV-1, the virus and its associated diseases are still not notifiable in most states and true infection rates in the nation remain unknown," Purcell said.

"People at risk from HTLV-1 deserve biomedical tools like those that provide game-changing therapeutic and prevention options for other blood-borne persistent viral infections, such as HIV.

"There is a real opportunity to prevent the transmission of HTLV-1 and end the diseases caused by these infections. Our research findings are a major leap forward in this."

Genetic sequencer

MGI Tech has announced the DNBSEQ-T7+, its latest high-throughput sequencer. Designed to meet the rising demand for large-scale genomic research, the product delivers more than 14 Tb of data in just 24 h while offering a small footprint of just 1 m^2, flexible run configurations and end-to-end automation. It combines high daily output with ease of use and multi-omics versatility.

As sequencing becomes increasingly affordable, researchers are demanding instruments that deliver faster results as well as higher throughput, accuracy and quality. That's why MGI developed the T7+ as a continuation of its T7, designed to deliver greater speed, scalability, flexibility and performance to meet the evolving demands of clinical research, population genomics and large-scale sequencing projects.

The device integrates MGI's DNBSEQ technology with next-generation fluidics, optics and bioinformatics, creating a platform that is faster, smarter and more versatile than its predecessor. The compact system supports 1–4 flow cells per run, adapts to projects of any scale, and integrates every step — from DNB preparation to bioinformatics analysis — into a fully automated workflow.

Key technical highlights include: throughput of more than 14 Tb/day (vs 7 Tb/day on the T7); annual whole-genome sequencing capacity of up to 35,000 samples; >90% Q40 quality scores, validated in beta testing by leading labs; PE150 reads in under 24 h; 50% lower scanning time with the TDI (Time-Delay Integration) camera; and reduced energy consumption, with over 90% of transport links and certain reagents requiring no cold chain.

By integrating seven-in-one hardware, smartphone-like software and modular-designed consumables, the unit makes sequencing as intuitive as using a smartphone. Its ability to support multi-omics applications — including spatial omics, single-cell, proteomics and methylation — in one run enables concurrent data streams for large cohorts. It enables researchers to sequence 144 human genomes in a single day, accelerating breakthroughs in cancer genomics, rare disease research and precision medicine.

MGI Australia Pty. Ltd.
en.mgi-tech.com

Infrared dye antibody conjugates

Beckman Coulter Life Sciences, a Danaher company, has launched its IR820 and IR870 infrared dye antibody conjugates. The products provide research flow cytometry labs with a low-noise solution, including single laser excitation, no dye interference, negligible overlap with other fluorochrome emissions and ultralow autofluorescence background.

The IR820 and IR870 reagents are claimed to be the industry's first directly conjugated antibodies for infrared excitation. They are suitable for lineage marker staining, offering high brightness to clearly identify respective gating antigens, while leaving detection of non-infrared dyes uncompromised due to near-to-complete absence of spectral overlap. Lineage gating markers now can be added or, if already existing in the antibody panel, moved far away from commonly used spectral ranges where typically the most precious dim signals reside.

Current flow cytometry fluorochrome conjugates do not cover the infrared range. Lineage markers used for identification of major subpopulations typically reside in the same spectral ranges as probes for weak co-expressed antigens, enabling characterisation of subpopulations and their functional status. By this spectral colocalisation, typically bright lineage markers may compromise resolution and sensitive detection of their dimmer co-expressed companions.

The infrared dye conjugates, with their low-noise design, remove complexities and allow for a more flexible antibody panel design. The products are suitable for users of IR-equipped CytoFLEX LX and S instruments, helping to extend human phenotyping experiments into an easy-to-navigate spectral range by enabling greater clarity.

IR820 and IR870 are non-tandem dyes which can be excited at 808 nm and emit with maximal intensity at 835 and 896 nm, corresponding to the 840/20 nm and 885/40 nm or similar bandpass filters. The Research Use Only reagents comprise CD3, CD4, CD8, CD14, CD20 and CD45 specificities, and are manufactured under current Good Manufacturing Practices.

Beckman Coulter Australia
www.beckman.com.au

NGS panels with tertiary analysis software

A new partnership between OGT and QIAGEN Digital Insights (QDI) expands OGT's bioinformatics capabilities by integrating QIAGEN's advanced tertiary analysis solution, QCI Interpret, with the former's SureSeq NGS panels. Purpose-built for variant interpretation and clinical reporting, QCI Interpret delivers AI-powered, expert-curated classifications along with oncologist-reviewed summaries and transparent evidence links. Through this collaboration, SureSeq NGS panel users gain access to streamlined, high-confidence genomic insights and efficient, scalable reporting from sample to result.

QDI has built an expert-curated knowledge base of genomic and bioinformatic content, serving as the foundation of QCI Interpret. By combining the clinical precision of expert (MD/PhD) curation with the speed and scalability of AI-powered automation, QCI Interpret enables labs to deliver high-confidence variant interpretation and reporting. It empowers SureSeq users with transparent variant classifications, oncologist-reviewed summaries and on-demand interpretations — streamlining the path from sequencing to final report.

OGT's SureSeq NGS products have been developed with hybridisation-based detection capabilities that enable clinical research labs to effortlessly achieve comprehensive genomic profiling of their samples and minimise the risk of missing variants. Combined with the consistency of QIAGEN's software, labs gain access to an end-to-end workflow for fast, well-informed and confident insights, increasing users' confidence in variant classification. Supporting SureSeq workflows with transparent variant classifications, oncologist-reviewed insights and flexible reporting helps users to scale confidently, reduce turnaround times, and improve outcomes for patients.

Sysmex Australia Pty Ltd
www.sysmex.com.au

Platelet storage device

Platelets are the most sensitive cells in blood and require careful storage. They are normally used as platelet-rich plasma (PRP) for cosmetic and therapeutic procedures. Pplus Medical's Digital Storage Device (DSD) provides platelets with optimal storage and transport conditions at room temperature, allowing them to remain functional for up to seven days and leaving them capable of releasing high levels of growth factors when activated.

The product is suitable for storing PRP, PRF and isolated platelets from both human and murine sources. It streamlines processes and saves time by keeping multiple aliquots of PRP in suspension and ready for use prior to analysis. Clinical applications include wherever PRP treatment is offered, such as skin rejuvenation, alopecia treatments and dentistry. It can also be used to accelerate post-operative and wound healing.

The device gently agitates platelets to simulate their natural movement in the bloodstream. Its built-in battery allows for easy transport of samples without reliance on a main power supply. Researchers can maintain strong platelet activation and growth factor release while minimising delays and reduce waste from frequent fresh sample collection.

Haematex Research Pty Ltd
www.haematex.com

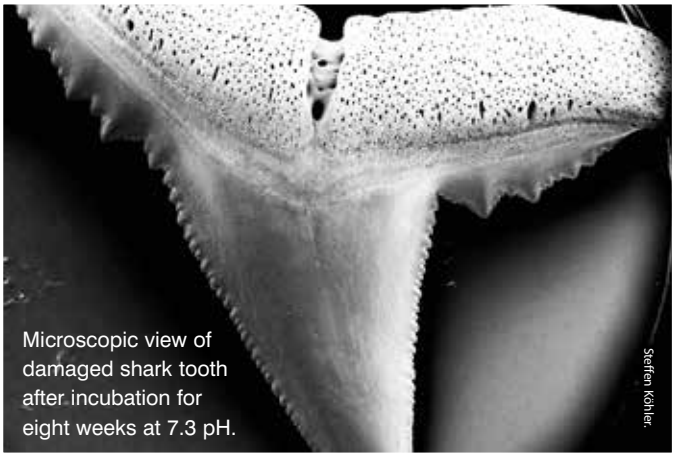
Ocean acidification may be damaging sharks' teeth

Max Baum.

Blacktip reef shark at SEA LIFE Oberhausen, where teeth used in the study were collected.

Sharks can famously replace their teeth, with new ones always growing as they're using up the current set. But the ability to regrow teeth might not be enough to ensure they can withstand the pressures of a warming world where oceans are getting more acidic, with a new study published in the journal *Frontiers in Marine Science* revealing that more acidic oceans lead to more brittle and weaker teeth.

"Shark teeth, despite being composed of highly mineralised phosphates, are still vulnerable to corrosion under future ocean acidification scenarios," said Maximilian Baum, a biologist at Heinrich Heine University Düsseldorf (HHU) and first author on the study. "They are high developed weapons built for cutting flesh, not resisting ocean acid. Our results show just how vulnerable even nature's sharpest weapons can be."



Steffen Köhler.

Microscopic view of damaged shark tooth after incubation for eight weeks at 7.3 pH.

Ocean acidification is a process during which the ocean's pH value keeps decreasing, resulting in more acidic water, and is mostly driven by the release of human-generated carbon dioxide (CO_2). Currently, the average pH of the world's oceans is 8.1 — but by 2300, it is expected to be 7.3, making it almost 10 times more acidic than it currently is.

For their study, the researchers used these two pH values to examine the effects of more and less acidic water on the teeth of blacktip reef sharks. Divers collected more than 600 discarded teeth from an aquarium housing the sharks. 16 teeth — those that were completely intact and undamaged — were used for the pH experiment, while 36 more teeth were used to measure before and after circumference. The teeth were incubated for eight weeks in separate 20 L tanks, with the teeth exposed to more acidic water found to be significantly more damaged.

"We observed visible surface damage, such as cracks and holes, increased root corrosion, and structural degradation," said senior author Professor Sebastian Fraune, who heads the Zoology and Organismic Interactions institute at HHU. Tooth circumference was also greater at lower pH levels, but this does not mean the teeth actually grew; rather, the surface structure became more irregular, resulting in it appearing larger on 2D images. While an altered tooth surface may improve cutting efficiency, it potentially also makes teeth structurally weaker and more prone to break.

Blacktip reef sharks must swim with their mouths permanently open to be able to breathe, so their teeth are constantly exposed to water. If the water is too acidic, the teeth automatically take damage, especially if acidification intensifies, the researchers said.

"Even moderate drops in pH could affect more sensitive species with slow tooth replication circles or have cumulative impacts over time," Baum said. "Maintaining ocean pH near the current average of 8.1 could be critical for the physical integrity of predators' tools."

That said, the study only looked at discarded teeth of non-living mineralised tissue, which means repair processes that may happen in living organisms could not be considered. Fraune explained, "In living sharks, the situation may be more complex. They could potentially remineralise or replace damaged teeth faster, but the energy costs of this would be probably higher in acidified waters."

The researchers thus acknowledge that future studies should examine changes to teeth, their chemical structure, and mechanical resilience in live sharks. Nevertheless, the current study shows that microscopic damage might be enough to pose a serious problem for animals depending on their teeth for survival.

"It's a reminder that climate change impacts cascade through entire food webs and ecosystems," Baum concluded.

Even non-antibiotics can disrupt the microbiome, drive antibiotic resistance

The human intestine is home to a dense network of microorganisms, known collectively as the gut microbiome, which shape our health by helping with digestion, training the immune system and protecting against dangerous intruders.

It is well known that the use of antibiotics can disrupt this protection, but now it turns out that even non-antibiotic medications can change the microbiome so that pathogens can colonise the gut more easily and cause infections.

A research team led by the University of Tübingen studied 53 common non-antibiotics, including allergy remedies, antidepressants and hormone drugs. Their effects were tested in the laboratory in synthetic and real human gut microbial communities, with the results published in the journal *Nature*. It turns out that that about one-third of these medications promoted the growth of *Salmonella* — bacteria that can cause severe diarrhoea.

"The scale of it was utterly unexpected," said study leader and senior author Professor Lisa Maier. "Many of these non-antibiotics inhibit useful gut bacteria, while pathogenic microbes such as *Salmonella* Typhimurium are impervious. This gives rise to an imbalance in the microbiome, which gives an advantage to the pathogens."

The researchers observed a similar effect in mice, where certain medications led to greater growth of *Salmonella*. The consequence was severe disease progression of a salmonellosis, marked by rapid onset and severe inflammations. This involved many layers of molecular and ecological interactions: medications reduced the total biomass of the gut microbiota, harmed biodiversity or specifically eliminated microbes that normally compete for nutrients with the pathogens. This resulted in a change in the microbiome creating a more favourable environment for pathogenic microbes such as *Salmonella*, which were then able to proliferate unimpeded.

"Our results show that when taking medications, we need to observe not only the desired therapeutic effect but also the influence on the microbiome," said co-lead author Anne Grießhammer. "While the necessity of drugs is unnegotiable, even drugs with supposedly few side effects can, so to speak, cause the microbial firewall in the intestine to collapse."

"It's already known that antibiotics can damage the gut microbiota," Maier added. "Now we have strong signs that many other medications can also harm this natural protective barrier unseen. This can be dangerous to frail or elderly people."

Maier's team has now developed a high-throughput technology which allows testing of how medications influence the resilience of the microbiome under standard conditions. They also recommend that in the future, medications should be assessed not only pharmacologically but also microbiologically — especially for drug classes such as antihistamines, antipsychotics or

Scanning electron microscopy image of a gut bacterial community. Medications can eliminate beneficial bacteria and thereby promote the growth of harmful species. Image produced by the Maier Lab (Lisa Maier, Anne Grießhammer, Leonardo Boldt) together with the Tübingen Structural Microscopy Core Facility (Michaela Wilsch-Bräuninger, Stefan Fischer). Colouring: Elke Neudert.

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selective oestrogen-receptor modulators as well as for combinations of several medications.

"If you disrupt the microbiome, you open the door to pathogens — it is an integral component of our health and must be considered as such in medicine," Maier concluded.

Meanwhile, separate research from the University of South Australia (UniSA) has found that over-the-counter medications such as ibuprofen and paracetamol are quietly driving antibiotic resistance — what's more, they are amplifying it when used together.

Assessing the interaction between non-antibiotic medications, the broad-spectrum antibiotic ciprofloxacin (used to treat common skin, gut or urinary tract infections) and *E. coli* bacteria (which causes gut and urinary tract infections), the researchers found that ibuprofen and paracetamol significantly increased bacterial mutations, making *E. coli* highly resistant to the antibiotic. Published in *npj Antimicrobials and Resistance*, their findings have serious health implications — particularly for residents of aged care homes.

"Antibiotics have long been vital in treating infectious diseases, but their widespread overuse and misuse have driven a global rise in antibiotic-resistant bacteria," said UniSA's Associate Professor Rietie Venter, lead researcher on the study.

"This is especially prevalent in residential aged care facilities, where older people are more likely to be prescribed multiple medications — not just antibiotics, but also drugs for pain, sleep, or blood pressure — making it an ideal breeding ground for gut bacteria to become resistant to antibiotics."

The study assessed nine medications commonly used in residential aged care: ibuprofen (an anti-inflammatory pain relief), diclofenac (an anti-inflammatory to treat arthritis), acetaminophen (paracetamol for pain and fever), furosemide (for high blood pressure), metformin (for high sugar levels linked to diabetes), atorvastatin (to help lower cholesterol and fats in the blood), tramadol (a stronger pain medication post-surgery), temazepam (used to treat sleeping problems), and pseudoephedrine (a decongestant).

"When bacteria were exposed to ciprofloxacin alongside ibuprofen and paracetamol, they developed more genetic mutations than with the antibiotic alone, helping them grow faster and become highly resistant," Venter said. "Worryingly, the bacteria were not only resistant to the antibiotic ciprofloxacin, but increased resistance was also observed to multiple other antibiotics from different classes.

"We also uncovered the genetic mechanisms behind this resistance, with ibuprofen and paracetamol both activating the bacteria's defences to expel antibiotics and render them less effective."

Venter said the study shows how antibiotic resistance is a more complex challenge than previously understood, with common non-antibiotic medications also playing a role.

"Antibiotic resistance isn't just about antibiotics anymore," she said.

"This study is a clear reminder that we need to carefully consider the risks of using multiple medications — particularly in aged care where residents are often prescribed a mix of long-term treatments.

"This doesn't mean we should stop using these medications, but we do need to be more mindful about how they interact with antibiotics — and that includes looking beyond just two-drug combinations."

The researchers are calling for further studies into drug interactions among anyone on long-term medication treatment regimes, in order to gain a greater awareness of how common medications may impact antibiotic effectiveness.

Intergenerational harms of smoking revealed

People whose fathers smoked during puberty seem to age faster than expected, according to research featured at the 2025 European Respiratory Society (ERS) Congress in September.

"Our research group has previously shown that smoking during puberty may harm not only the person who smokes, but also their future children," said Dr Juan Pablo López-Cervantes from the University of Bergen, who presented the research. "In this new study, we wanted to explore whether parental smoking in puberty may also influence the biological aging of their future children."

The researchers did this using a well-established measure of biological aging known as epigenetic clocks. As we age, extra molecules accumulate on the DNA in our cells. This does not alter the DNA code, but it does influence how our genes behave. These so-called epigenetic changes are not only a sign of aging, they are also linked to diseases of older age such as cancer and dementia.

The research included a group of 892 people, ranging in chronological age from seven to 50 years and with an average age of 28, who were taking part in the international RHINESSA study and provided blood samples for testing. Their blood samples were analysed for epigenetic changes, then researchers applied three different scores of biological aging. They were also asked a series of questions, including whether they or their parents had ever smoked and at what age.

The researchers found that people whose fathers began smoking during puberty (at age 15 or younger) were around nine months to a year older than their chronological age on average. When researchers took into account whether the people themselves had ever smoked, this gap between biological and chronological age was greater (14 to 15 months).

In people whose fathers began smoking later in life, researchers found only a small increase in biological age. They found no clear pattern in biological aging in people whose mothers smoked before pregnancy.

"This accelerated biological aging is important as it has been linked to a higher risk of diseases such as cancer, arthritis and dementia in previous research," López-Cervantes said. "Our results suggest that boys who smoke during puberty may be unknowingly creating harm for the children they go on to have.

"This research does not fully explain why smoking in puberty is linked to faster aging, but we think that when fathers start smoking during puberty, it may alter the epigenetic material of their sperm cells, and that these changes may be passed on to the next generation.

"Although this research is still in its early days, we believe our findings are important for young boys who smoke or consume other types of nicotine products. Stronger efforts to prevent


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> The period before puberty is especially critical for boys, when exposure to harmful substances may change gene expression and modify repair mechanisms, which may then become heritable

tobacco use in adolescence should be a priority for policymakers. Such efforts could benefit not only the current generations but also those in the future."

Even passive smoking causes damage

But that's not all, as a separate study has found that a father's exposure to passive smoking as a child may go on to impair the lifelong lung function of his children, putting them at risk of chronic obstructive pulmonary disease (COPD) — a risk that is heightened further if they are childhood passive smokers themselves. The study was published in the journal *Thorax* and led by University of Melbourne researchers, who urge fathers to intercept this harmful legacy by avoiding smoking around their children.

COPD, which includes chronic bronchitis and emphysema, is the third leading cause of death around the world, killing around 3 million people every year. The researchers explained that several factors throughout one's life may increase the risk of poor lung function and subsequent COPD, and attention is now beginning to focus on the potential role of intergenerational factors.

While previously published research showed that passive smoking during a father's childhood may be linked to a heightened risk of asthma in his children by the time they are seven, it was not clear if compromised lung function extended into middle age and beyond. To explore this further, the researchers drew on 8022 child participants in the Tasmanian Longitudinal Health Study (TAHS), all of whom had tests to assess their lung function (spirometry).

The children's parents completed an initial comprehensive survey on their and their children's respiratory health. Further check-ups ensued when those children were 13, 18, 43, 50 and 53. These included spirometry to assess two measures of lung function (FEV_1 and FVC), as well as questionnaires on demographics and respiratory symptoms/disease.

Of the 7243 parents who were alive and could be traced in 2010, 5111 were resurveyed about whether either of their own parents had smoked when they were under the age of five and/or up to when they were 15. The final analysis included 890 father–child pairs with data on the father's passive smoke exposure before puberty and lung function data for their children up to the age of 53.

More than two-thirds of the fathers (nearly 69%) and more than half of their children (56.5%) had been exposed to passive smoking during their childhoods. Around half of the children (49%) had a history of active smoking by middle age, and just over 5% of them had developed COPD by this time point, as assessed by spirometry.

After adjusting for potentially influential factors, including the father's lifetime history of asthma/wheeze and his age, his passive smoke exposure as a child was associated with 56% higher odds of below average FEV_1, but not FVC, across the lifespan of his children. Fathers' childhood passive smoke exposure was also associated with a doubling in the odds of an early low-rapid decline in FEV_1/FVC in their children; this was statistically significant even after adjusting for potentially influential factors.

Paternal exposure to passive smoking as a child was also associated with a doubling in the risk of COPD by the age of 53 in his children, although this was no longer statistically significant after adjusting for potentially influential factors. But children whose fathers had been exposed to passive smoking as a child were twice as likely to have below-average FEV_1 if they, too, had been exposed to passive smoking during their childhood.

The researchers acknowledged the limitations of their research, including the fact that it was an observational study, so no firm conclusions can be drawn about cause and effect; that TAHS lacks data on paternal lung function and genetics, preventing assessment of familial aggregation as a potential mechanism; and that childhood passive smoke exposure was defined as at least one parent smoking six days a week, which might have misclassified moderate/light smokers as non-smokers. Nevertheless, they claimed that the period before puberty is especially critical for boys, when exposure to harmful substances may change gene expression and modify repair mechanisms, which may then become heritable.

"Our findings are novel as this is the first study to investigate and provide evidence for an adverse association of paternal prepubertal passive smoke exposure, rather than just active smoking, on impaired lung function of offspring by middle age," the researchers wrote.

"This is of importance from a public health perspective, as passive smoke exposure affects about 63% of adolescents, which is significantly higher than the approximately 7% affected by active smoking.

"These findings suggest that smoking may adversely affect lung function not only in smokers but also in their children and grandchildren … Fathers exposed to tobacco smoke during prepuberty may still reduce risk for future generations by avoiding smoking around their children."

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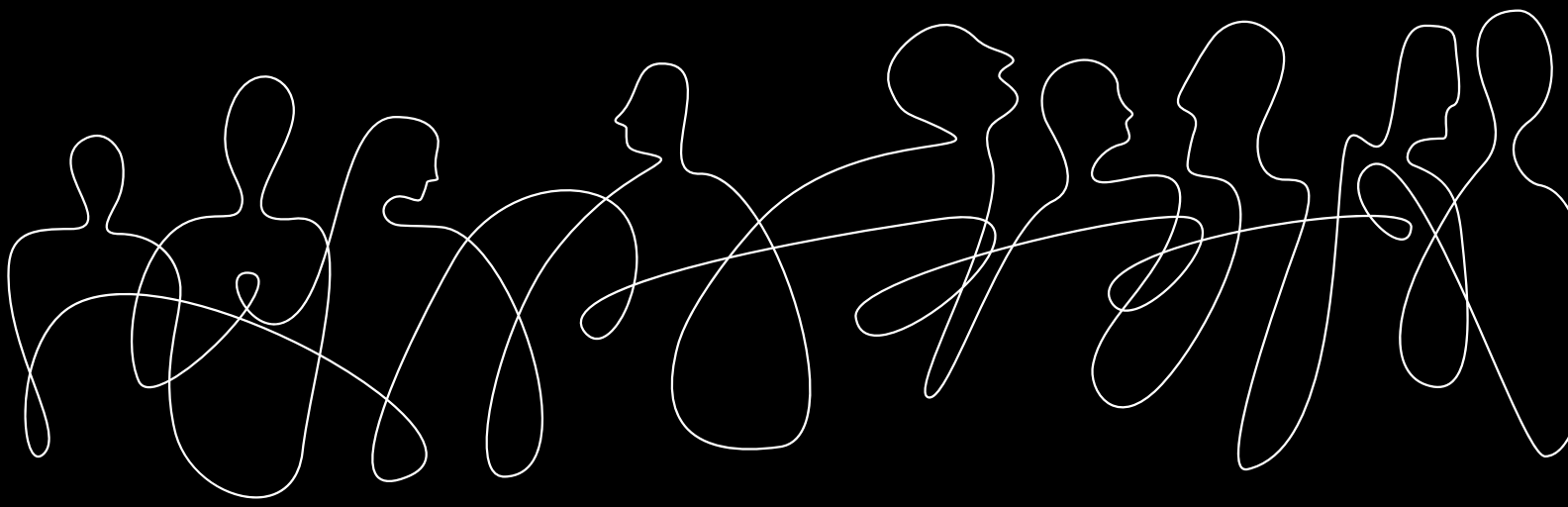

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