Lab+Life SCIENTIST

MITOCHONDRIAL GENOME EDITING MILESTONE

PLANT PROTEINS AND SILVER VS BACTERIA

CLINICAL TRIALS IN THE HOME

JUN/JUL 2022
VOL.33 NO.2
PP100009671

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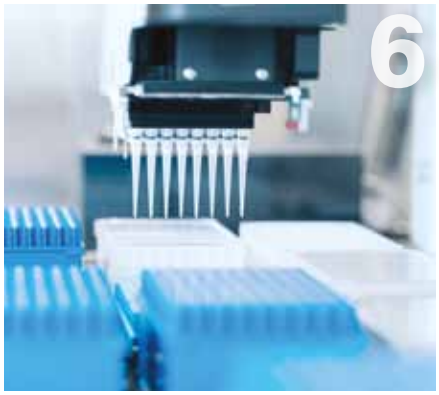

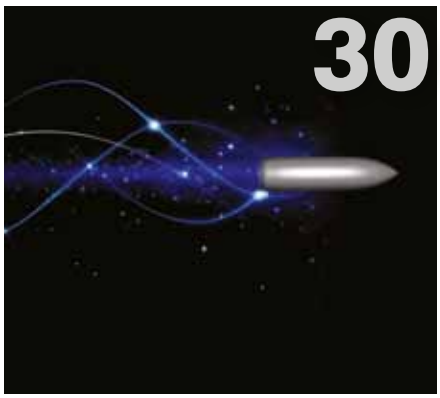

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A brave new world

As I write this editor's comment, the ministry of the Albanese government is being officially sworn in. Of particular note is the appointment of Ed Husic as Minister for Industry and Science, as well as Jason Clare as Minister for Education, Chris Bowen as Minister for Climate Change and Energy, Mark Butler as Minister for Health and Aged Care, and Tanya Plibersek as Minister for Environment and Water.

The new ministers have already been warmly welcomed by the industry, with the President of the Australian Academy of Science, Professor Chennupati Jagadish, saying the Academy "looks forward to working with the newly elected government to assist in securing Australia's future economic and social prosperity through a stronger focus on and investment in science".

"As Australia looks for solutions to decarbonise our economy and transform traditional industries, science will play a vital role in developing the ideas, technologies, systems and processes needed," Jagadish said.

"This government can also look to science to deal with future risks — like national security threats, major health challenges such as antimicrobial resistance, climate adaptation, advanced digital technologies like AI and quantum computing, and future pandemics."

Science & Technology Australia (STA) is meanwhile looking forward to working with the ministry to advance the STEM sector's key policy priorities and use the power of science and technology across all of government to enhance Australia's society and economy. According to STA CEO Misha Schubert, the new government has already stated its commitment to working towards Australia becoming a global STEM superpower through raising investment in research and development closer to 3% of GDP.

"It has also committed to passing legislation for the new $1.6 billion research commercialisation fund, and adopting a fixed timetable for research grant announcements to bring greater security and certainty to Australia's research community and industry partners," she said.

Of course there will be plenty of challenges in store for the Labor government, with COVID-19 and now influenza currently making their mark across the country. Fortunately Australian scientists have been hard at work to combat these and other diseases in recent times: researchers from Monash University are collaborating with the National University of Singapore on a novel vaccine platform that could protect against multiple strains of influenza; The University of Sydney has joined an international consortium looking to develop a 'variant-proof' SARS-CoV-2 vaccine candidate; and Melbourne's Burnet Institute has partnered with Moderna to develop novel mRNA vaccines for a range of emerging and neglected infectious diseases — the latter having recently announced it will establish an mRNA therapeutics manufacturing facility in Victoria.

In this issue of *Lab+Life Scientist*, we're looking at some of the ways in which the emergence of COVID-19 has resulted in some alterations to the drug development process. Our lead article, on page 6, highlights the increasingly important role being played by automation in the laboratory, while the story on page 26 details the benefits of moving clinical trials into the home. You can also read on page 12 about the latest breakthrough in mitochondrial genome editing, and on page 20 about a plant protein that has a surprisingly lethal effect on bacteria.

Regards,
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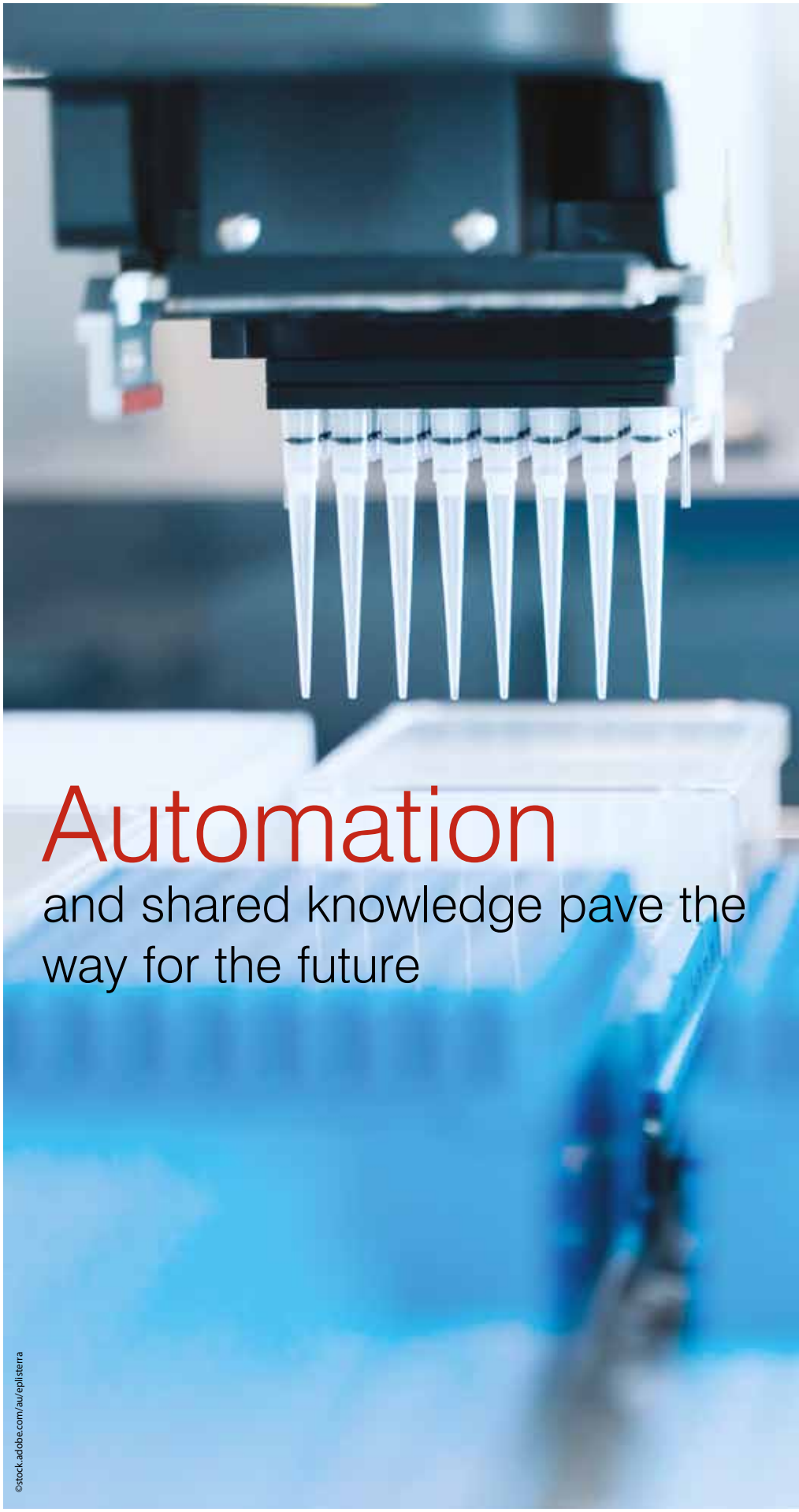
Luca Valeggia, Senior Vice President, Laboratory Automation, Tecan

Automation and shared knowledge pave the way for the future



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Automation is a vital component to fuel the labs of tomorrow, and to ensure that drug development continues at the rapid pace seen in response to the COVID-19 pandemic.

By no means is automation a novel concept for most research labs, but its swift advancement and expansion into new fields — such as synthetic biology — have shown us that we are only witnessing the start of what is possible. Together with open access data, which allows scientists around the globe to benefit from each other's findings, it paints a bright picture of a future that is full of exciting new possibilities.

Laboratories all over the world have been shaken by the COVID-19 pandemic. This global event forced them to step up to the challenge, finding ways to handle unprecedented sample volumes quickly and efficiently for both research and diagnostics. This put automation in the spotlight, not only as a convenient tool, but a necessity, as obtaining accurate results with such speed would not have been possible if every sample was handled manually.

Alongside the need for rapid diagnostic testing, it was crucial to develop a vaccine as fast as possible, to curb rampaging infection rates and help the world recover both medically and economically. Laboratories came together, sharing their discoveries through open access (OA) data portals to ensure that breakthroughs would not only benefit one organisation or country, but the entire world. This shines light on another important point — how much more we can accomplish by sharing our knowledge, instead of guarding it.

Synthetic biology has also played a major role in winning ground against the pandemic, allowing the creation of a candidate vaccine a mere 66 days after the viral genome was released.[1] This vaccine was created using synthetic genes — an approach that is not only useful for developing vaccines, but

might also be helpful in combating cancer, making it a powerful tool for drug discovery.

Synthetic is the new natural

Synthetic biology is based on metabolic engineering, but takes this concept a step further to encompass non-metabolic applications, with the aim of creating new biological building blocks and systems, or improving on those found in nature. In contrast to metabolic engineering, this discipline uses a systematic approach based on generalisable methods, making synthesis and sequencing of DNA more accessible and less costly.

One of the principles of synthetic biology is the 'design-build-test-learn' (DBTL) cycle, which helps to achieve a design that fulfils certain requirements through multiple iterations, learning by doing.[2] The first step is designing a biological system that is expected to be able to perform the task. This is followed by building that design using DNA parts, and integrating them into a microbial chassis. Once this is done, the system can be tested — using a variety of assays — to see if it is indeed suitable for the desired application. During this phase, a lot of data is collected through production- and omics-profiling. This is then used during the learn phase to influence the next design, as it is unlikely that the optimal system, demonstrating the right properties, is obtained the first time. Multiple iterations are usually required, and so the learning phase relies on the ability to predict the biological systems behaviour in response to a design change. Machine learning can be of great help here, statistically linking an input to an output, to predict the result for completely new scenarios.

Making the complex easy

Synthetic biology opens up many new possibilities, and its structured nature makes it easier to move forward towards new discoveries. However, although the principles are straightforward, the synthetic biology workflows are generally complex, and rely heavily on automation to achieve rapid and reproducible results. Without it, this new and exciting discipline would not be able to progress at a sufficient rate.

Higher and higher levels of automation can be seen in many labs all over the world, from handheld electronic pipettes that can aspirate and dispense several channels simultaneously, to fully automatic liquid handling workstations powered by intelligent software that can follow the most complex protocols. Many laboratories that perform high throughput screening or clinical and analytical testing — as well as large-scale biorepositories — simply would not exist without this technology.

In addition, automation all but removes the human variability factor, increasing reproducibility and ensuring productivity through staff absences, labour issues and a variety of other challenges.

The 3D puzzle

3D cellular models are becoming increasingly popular in drug discovery, providing more physiologically relevant results than 2D cell cultures or animal models. These microenvironments can more accurately mimic the complex immune response of human tissues, which is of great importance, helping to avoid costly late-stage failures of drugs in clinical trials. Grown using a variety of approaches, 3D cell culture workflows are another example of research benefiting from automation.[3] Automated solutions are required both for consistent growth of 3D cell cultures, and to support cell imaging and real-time cytometry assays for drug discovery, since manually examining cells under a microscope is both labour-intensive and time-consuming. Automated culture maintenance and imaging improves reproducibility and throughput, as well as removing the risk of missing a key cellular event when leaving the lab — an important consideration for any cell-based study.

Collective knowledge

Many biological studies produce a tremendous amount of data, with thousands of genetic sequences produced daily. If not reused, this data will go to waste, together with all the possible insights that it could have provided.[4] Considering that the entire human genomic sequence only requires 1 GB of storage space, this is truly a shame. Fortunately, it is becoming more and more common for researchers to upload their data, providing open access to anyone who is interested. If shared in an effective and comprehensive way, this data can greatly increase the impact of the original experiments, making the most of something that took significant funding and research time to produce. By sharing sequencing data globally, initiatives such as the 'Darwin Tree of Life' and the '100,000 Genomes' projects are made possible.[5] The former is a tribute to biodiversity, aiming to sequence the genomes of 70,000 species of eukaryotic organisms found in the UK, while the latter project uses data from

patients affected by a rare disease or cancer, with the goal of advancing diagnosis and personalised treatment. Furthermore, giving open access to data also provides other benefits, such as increased credibility; if the research data is made available and possible to reproduce, it becomes more believable.

However, for others to make use of data, it needs to be organised and documented properly. This type of careful cataloguing of results is equally beneficial to groups that do not plan to upload their data, since it promotes traceability and repeatability. There are many software platforms that work well with automated workflows to offer scientists a convenient way to plan experiments and manage results, as well as receive feedback on the outcomes. For example, the Synthace Life Sciences R&D Cloud allows scientists to automate experimentation and share insights. Berlin-based Labforward is another company offering increased lab connectivity, enabling scientists to effectively connect their devices to make research data more manageable and easily accessible. On the same note, a company in San Francisco called Benchling had developed a platform that helps standardise and centralise R&D data, accelerating and improving research while working seamlessly with third-party hardware. Software company Titian offers similar services, driving digitalisation of research and advancing management and traceability in every step of the sample life cycle. Many of these advances are being made possible through the work of the SiLA Consortium, a non-profit industry body working to develop free and open system communication and data standards, providing researchers with an opportunity to connect, interface with their instruments and merge data across the laboratories. These are only a few examples and, as more and more scientists grasp the benefits of laboratory digitalisation, an even greater choice of solutions will become available.

Summary

Automation is a great way to catapult laboratories into the future, speeding up sample preparation and establishing high-throughput versions of complex workflows while minimising the risk of cross-contamination, eliminating human errors, and saving time and resources. Automated solutions are particularly important to fields such as synthetic biology, allowing the development of a more structured approach. This has enabled synthetic biology to become a powerful tool in drug discovery, replacing the hit-and-miss strategies commonly employed in many laboratories with the design-build-test-learn principle. This relatively new field is empowered by powerful machine learning software, which can make predictions based on large datasets that are beyond the capabilities of the human mind to quickly and easily comprehend. Driving science forward in such a structured manner helps to speed up new discoveries and reduce the number of failed experiments.

Learning from our own mistakes can be of great help, but learning from the mistakes of others performing similar research in parallel is a far more powerful tool, as many laboratories around the world are currently discovering. There are several software platforms that have been developed especially for this purpose, helping scientists to document, store and share their data with others, as well as streamlining workflows through connectivity between programs and hardware. With so many tools available, digitalising and immortalising your research has never been easier, bringing about the laboratory of the future, which is not only fully digitalised, but connected to research centres around the globe, letting everyone reap the benefits of hard-won knowledge.

Tecan is a global provider of laboratory instruments and solutions for pharma, biopharma, academia and clinical diagnostics. Visit the website to find out more.

References

1. Synthetic biology speeds vaccine development, 28 September 2020 https://www.nature.com/articles/d42859-020-00025-4
2. A machine learning Automated Recommendation Tool for synthetic biology, Nature Communications, 25 September 2020 https://www.nature.com/articles/s41467-020-18008-4
3. Don't miss a beat with live cell imaging, Tecan Journal, 2021 https://www.tecan.com/tecan-journal/dont-miss-a-beat-with-live-cell-imaging
4. Sharing biological data: why, when, and how, FEBS Letters, 11 April 2021 https://febs.onlinelibrary.wiley.com/doi/10.1002/1873-3468.14067
5. Open access data benefits millions of scientists around the world and is essential for a rapid response to the COVID-19 pandemic, EMBL Communication, 20 October 2020 https://www.embl.org/news/science/open-data-sharing-accelerates-covid-19-research/

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CRISPR gene editing now possible in cockroaches

Japanese and Spanish researchers have developed a CRISPR-Cas9 approach to enable gene editing in cockroaches, according to a new study published in *Cell Reports Methods*. The simple and efficient technique, named 'direct parental CRISPR' (DIPA-CRISPR), involves the injection of materials into female adults where eggs are developing, rather than into the embryos themselves.

Current approaches for insect gene editing typically require microinjection of materials into early embryos, limiting their application in many species; for example, past studies have not achieved genetic manipulation of cockroaches due to their unique reproductive system. In addition, insect gene editing often requires expensive equipment, a specific experimental set-up for each species and highly skilled laboratory personnel.

To overcome these limitations, researchers injected Cas9 ribonucleoproteins (RNPs) into the main body cavity of adult female cockroaches to introduce heritable mutations in developing egg cells. The results demonstrated that gene editing efficiency — the proportion of edited individuals out of the total number hatched — could reach as high as 22%. Meanwhile, in the red flour beetle, DIPA-CRISPR achieved an efficiency of more than 50%. Moreover, the researchers generated gene knockin beetles by co-injecting single-stranded oligonucleotides and Cas9 RNPs, though efficiency here needs to be further improved.

"We can now edit insect genomes more freely and at will," said senior study author Takaaki Daimon of Kyoto University. "In principle, this method should work for more than 90% of insect species."

The successful application of DIPA-CRISPR in two evolutionarily distant species demonstrates its potential for broad use, though the approach is not directly applicable to all insect species. In addition, the experiments showed that the most critical parameter for success is the stage of the adult females injected. As a result, DIPA-CRISPR requires good knowledge of ovary development, which can be challenging in some species.

Nevertheless, the researchers say that DIPA-CRISPR is accessible, highly practical and could be readily implemented in laboratories, extending the application of gene editing to a range of model and non-model insect species. The technique requires minimal equipment for adult injection, and only two components — Cas9 protein and single-guide RNA — simplifying procedures for gene editing. Moreover, commercially available, standard Cas9 can be used for adult injection, eliminating the need for custom engineering of the protein.

Daimon said the method may eventually enable genome editing in almost all of the more than 1.5 million species of insects, with a similar approach potentially used in other arthropods.

Wireless neurostimulator like a pacemaker for the brain

Neurological disorders like Parkinson's, chronic depression and other psychiatric conditions can now be managed at home, thanks to the development of a remote care platform by researchers at The University of Queensland (UQ), Neurosciences Queensland and Abbott Neuromodulation.

Electrodes are surgically inserted into the brain and electrical stimulation is delivered by a pacemaker that alters brain function, providing therapeutic relief and improving quality of life. The digital platform allows clinicians to monitor patients remotely, as well as adjust the device to treat and alleviate symptoms in real time.

"By creating the world's first integrated and completely wireless remote care platform, we have removed the need for patients to see their doctor in person to have their device adjusted," said Professor Peter Silburn from UQ's Queensland Brain Institute (QBI). "There are no cures for many of these conditions, which often require lifelong treatment and care, so for those people the device would be a game changer."

While the team started working on this digital health solution before COVID-19, the pandemic elevated the need for remote care platforms, particularly for older people and those living in remote areas with increased travel difficulties. Silburn said the system also fosters increasingly personalised treatment and data-driven clinical decisions, which could improve patient care.

"During the study, we established the platform safety, security, usability and effectiveness, and optimised its features using patient feedback in a biodesign process," Silburn said. "In the initial weeks of a limited market release, we conducted 858 remote care sessions and maintained a robust and high success rate."

The researchers are confident the technology could be adapted for many other conditions in the future. Silburn said, "As we discover more about the biomarkers in brain-related disorders, we will refine neuromodulation systems to improve treatment for neuropsychiatric disorders like depression, obsessive-compulsive disorder, anorexia and Tourette's syndrome, to name a just a few."

Having been described in the journal *Scientific Reports*, the digital health platform for remote neuromodulation systems now has regulatory approval and launched in Australia in October 2021. It has also been adopted in the United States by the FDA and received the European CE mark.

Drug reduces breathing pauses in sleep apnoea

A new study at the University of Gothenburg's Sahlgrenska Academy has paved the way for a potential drug treatment for sleep apnoea — a condition whereby patients experience brief, recurrent pauses in breathing during sleep.

Besides impairing sleep, sleep apnoea is a risk factor for both high blood pressure (hypertension) and stroke, and has been linked to an increased cancer risk. Current treatment involves either oral appliance therapy or a CPAP (continuous positive airway pressure mask) to help to maintain airway patency during sleep, but these therapy options take time to get used to and are frequently perceived as intrusive or bulky. Insufficient user time is therefore common.

The researchers set out to treat sleep apnoea via carbonic anhydrase (CA) inhibition, CA being an enzyme that serves to maintain a balance between carbonic acid and carbon dioxide in the body. Several drugs with CA inhibitory properties are already available on the market, and used for treatment of glaucoma, epilepsy and other disorders. The drug used in this clinical trial was sulthiame, which is sometimes used to treat epilepsy in children.

The study was a randomised double-blind clinical trial, completed by 59 patients with moderate or severe sleep apnoea. Patients were randomly assigned to two groups receiving either 400 or 200 mg of the CA inhibitor and a third group (the control group) that received a placebo. The study lasted for four weeks, with the results published in the *American Journal of Respiratory and Critical Care Medicine*.

Overall, the treatment reduced the number of breathing pauses and promoted oxygenation during the night. A few patients experienced side effects, such as headache and breathlessness, which were more common in those receiving the highest dose.

"Among the patients who received the higher dosage of the drug, the number of breathing pauses decreased by approximately 20 per hour," said Jan Hedner, Professor of Pulmonary Medicine. "For just over a third of patients in the study, only half of their breathing pauses were left, and in one in five the number fell by at least 60%."

The study results, together with established safety data for sulthiame, provide support for continued research on CA inhibition as a new potential treatment for obstructive sleep apnoea. Indeed, the fact that several approved drugs in the CA inhibitor category are available on the market makes fast-tracking development of an approved drug for sleep apnoea practicable.

Antimicrobial resistance is making UTIs more deadly

A new study led by CSIRO has found the spread of drug-resistant bacteria in the community is increasing the risk of death for common infections such as urinary tract infections (UTIs), which affect around one in two women and one in 20 men in their lifetime.

Antimicrobial resistance (AMR) occurs when bacteria and other microbes become resistant to the drugs designed to kill them, generally through misuse or overuse of the drugs. Hospital-acquired resistance is well researched, but the current study, published in *Open Forum Infectious Diseases*, is one of the few that looks at the burden of community transmission.

Researchers from CSIRO, Queensland University of Technology and The University of Queensland analysed data from 21,268 patients across 134 Queensland hospitals who acquired their infections in the community. It found patients were 2.43 times more likely to die from community-acquired drug-resistant UTIs caused by *Pseudomonas aeruginosa* and 3.28 times more likely to die from community-acquired drug-resistant bloodstream infections caused by *Enterobacteriaceae* than those with drug-sensitive infections.

CSIRO research scientist Dr Teresa Wozniak said the high prevalence of UTIs makes them a major contributor to antibiotic use in Australia.

"Without effective antibiotics, many standard medical procedures and life-saving surgeries will become increasingly life-threatening," Dr Wozniak said.

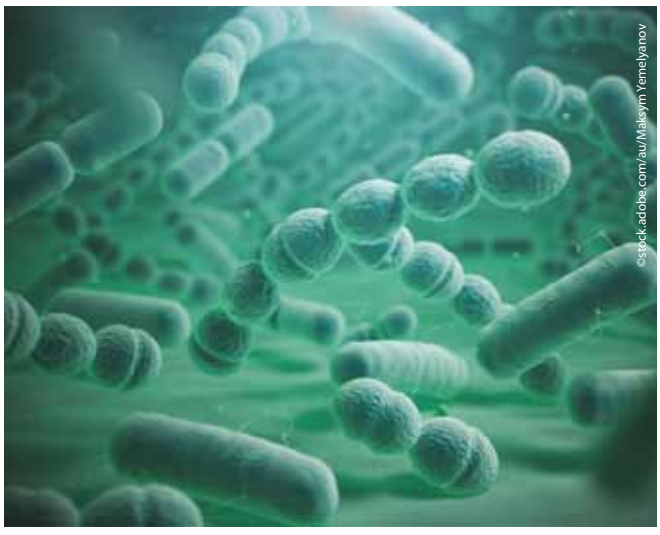
"Tracking the burden of drug-resistant infections in the community is critical to understanding how far antimicrobial resistance is spreading and how best to mitigate it."

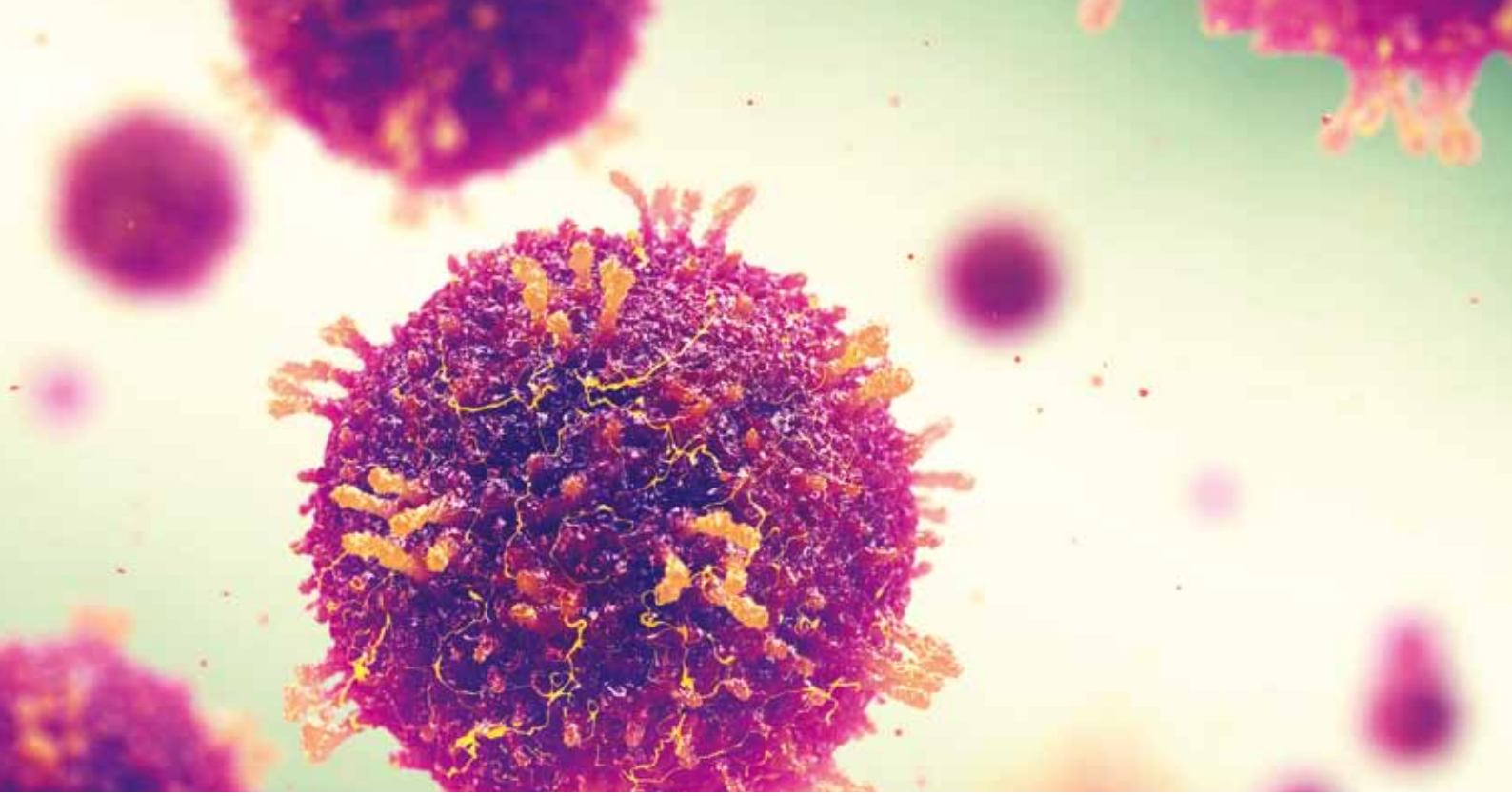
The study's findings should provide further guidance for managing AMR in the community, such as developing AMR stewardship programs that draw on data from the population being treated. The CEO of CSIRO's Australian e-Health Research Centre, Dr David Hansen, said the magnitude of the AMR problem needs to be understood in order to mitigate it.

"Tracking community resistance is difficult because it involves not just one pathogen or disease but multiple strains of bacteria," Dr Hansen said.

"Until now, we haven't been using the best data to support decision-making in our fight against AMR. Data on community-acquired resistance is a significant missing piece of the puzzle."

CSIRO is conducting further research to understand the clinical implications of AMR, its health and economic burden, and improving surveillance of AMR in blind spots like rural and remote communities.





It's time to think differently.

Find out how NEB can support your infectious disease research and development.

Gaining a better understanding of infectious diseases, including their characterisation, evolution and transmission, continues to be a priority, both from and R&D standpoint and as a public health issue. The COVID-19 pandemic has demonstrated the need for a wide range of tools to research infectious diseases, and has highlighted the importance of speed and the ability to pivot as new problems arise. This has emphasised the need for innovation and thinking differently about where to access those critical materials, including genomics reagents.

Many scientists know NEB as a trusted reagent supplier to the life science community, but what you may not know is we also offer a portfolio of products that can be used in infectious disease research, development of diagnostics and therapies, and in epidemiological studies and disease surveillance. In fact, many of our products have supported the development of COVID-19 diagnostics and vaccines, and can also be utilised with other infectious diseases, such as influenza and malaria.

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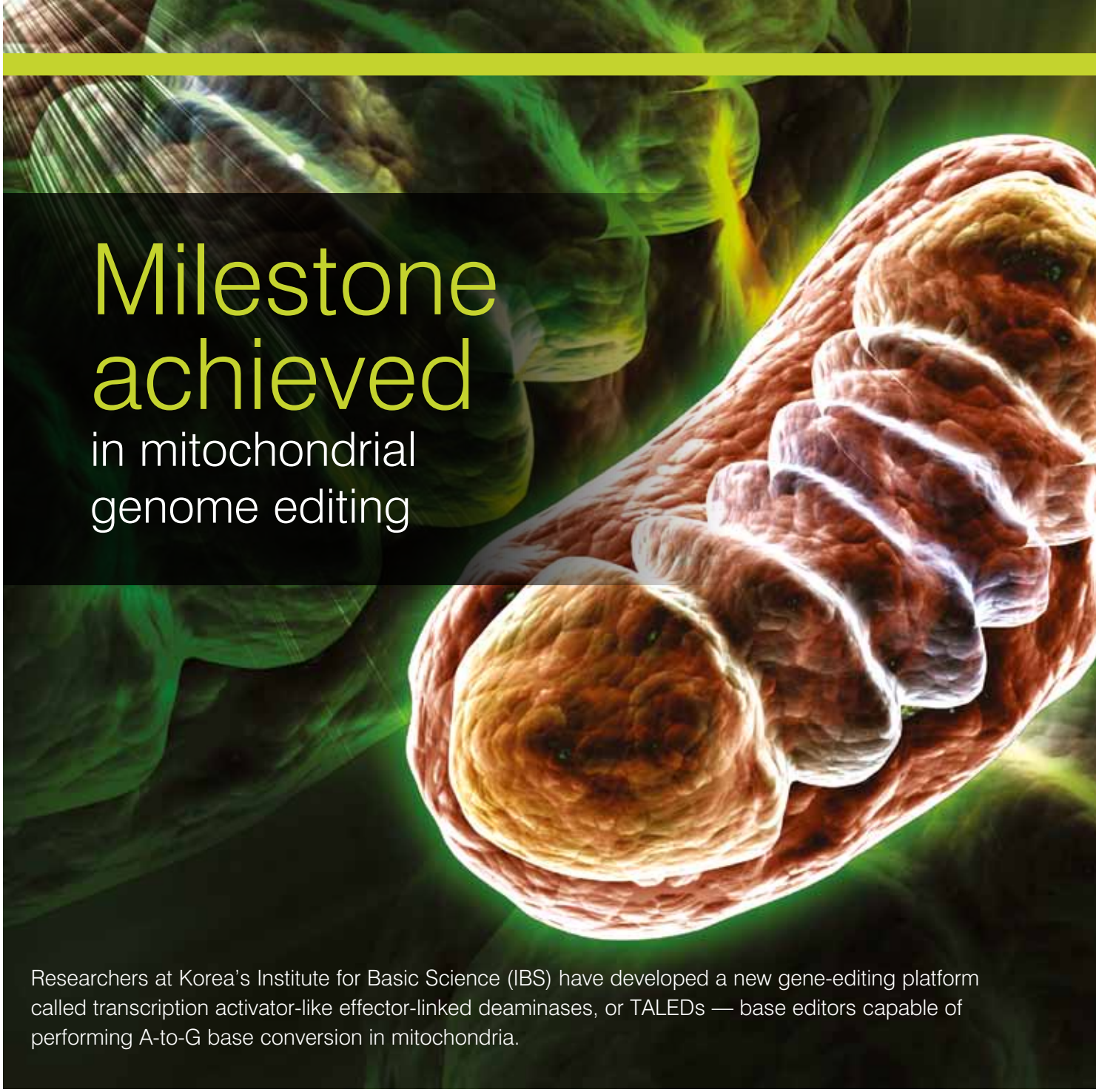


Researchers at Korea's Institute for Basic Science (IBS) have developed a new gene-editing platform called transcription activator-like effector-linked deaminases, or TALEDs — base editors capable of performing A-to-G base conversion in mitochondria.

The team's discovery was the culmination of a decades-long journey to cure human genetic diseases, and could be considered to be the final missing piece of the puzzle in gene-editing technology. It has been published in the journal *Cell*.

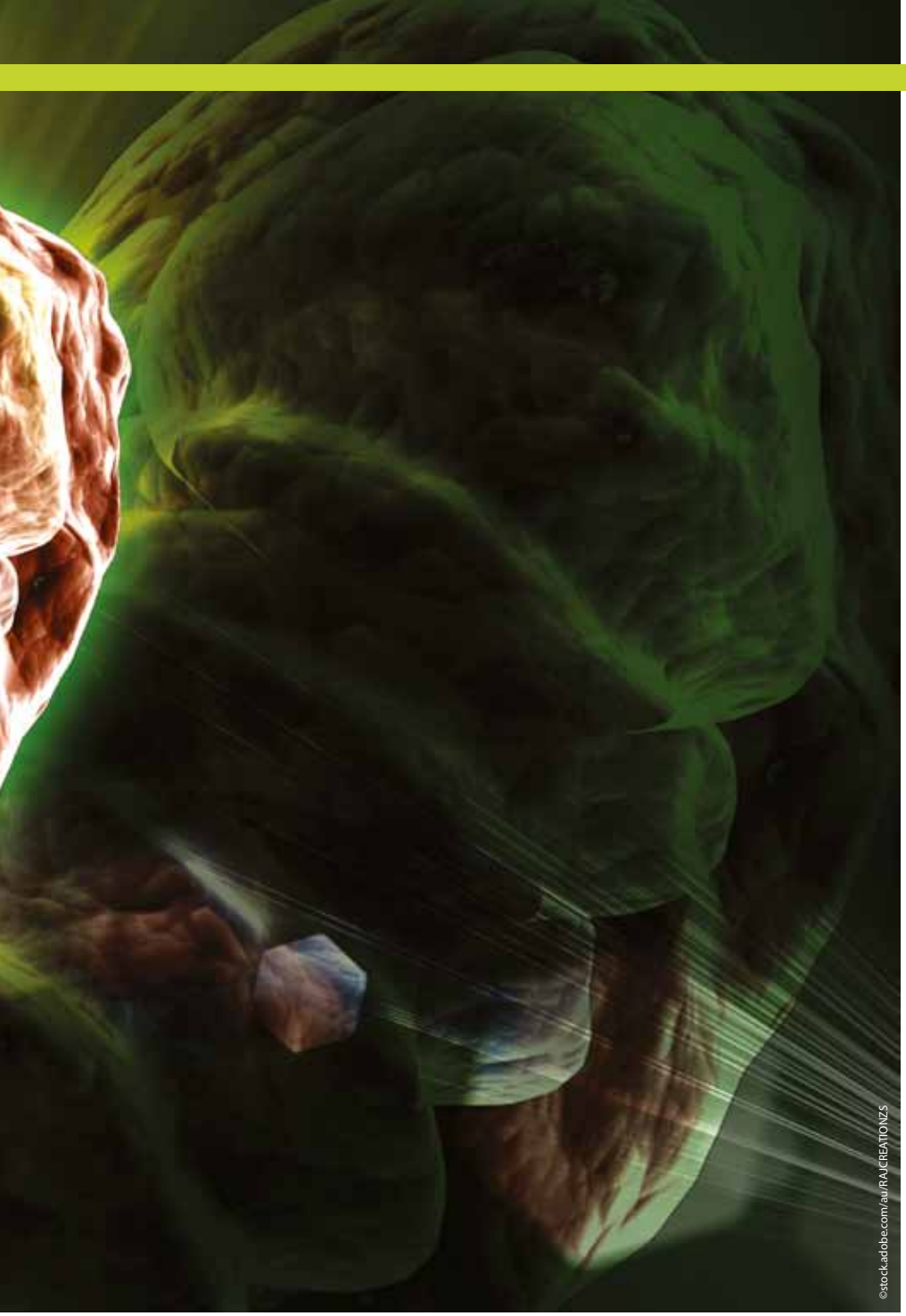
From the identification of the first restriction enzyme in 1968, to the invention of polymerase chain reaction (PCR) in 1985 and the demonstration of CRISPR-mediated genome editing in 2013, each new breakthrough discovery in biotechnology further improved our ability to manipulate DNA, the blueprint of life. In particular, the recent development of the CRISPR-Cas system, or 'genetic scissors', has allowed for comprehensive genome editing of living cells. This opened new possibilities for treating previously incurable genetic diseases by editing the mutations out of our genome.

However, while gene editing has been largely successful in the nuclear genome of the cells, scientists have been unsuccessful in editing the mitochondria, which also have their own genome. Mitochondria, the so-called 'powerhouse of the cells', are tiny organelles in cells that serve as energy-generating factories. As it is an important organelle for energy metabolism, if the gene is mutated, it causes serious genetic diseases related to energy metabolism.

"There are some extremely nasty hereditary diseases arising due to defects in mitochondrial DNA," said Jin-Soo Kim, Director of the IBS Center for Genome Engineering. "For example, Leber hereditary optic neuropathy (LHON), which causes sudden blindness in both eyes, is caused by a simple single point mutation in mitochondrial DNA."

Another mitochondrial gene-related disease includes mitochondrial encephalomyopathy with lactic acidosis and stroke-like episodes (MELAS), which slowly destroys the patient's brain. Some studies even suggest abnormalities in mitochondrial DNA may also be responsible for degenerative diseases such as Alzheimer's disease and muscular dystrophy.

The mitochondrial genome is inherited from the maternal line. There are 90 known disease-causing point mutations in mitochondrial DNA, which in total affects at least one in 5000 individuals. Many existing genome editing tools cannot be used due to limitations in the method of delivery to mitochondria. For example, the CRISPR-Cas platform is not applicable for editing these mutations in mitochondria, because the guide RNA is unable to enter the organelle itself.



"Another problem is that there is a dearth of animal models of these mitochondrial diseases; this is because it is currently not possible to engineer mitochondrial mutations necessary to create animal models," Kim said. "Lack of animal models makes it very difficult to develop and test therapeutics for these diseases."

As such, reliable technology to edit mitochondrial DNA is one of the last frontiers of genome engineering that must be explored in order to conquer all known genetic diseases, and the world's most elite scientists have endeavoured for years to make it a reality.

In 2020, researchers led by David R Liu of the Broad Institute of Harvard and MIT created a new base editor named DddA-derived cytosine base editors (DdCBEs) that can perform C-to-T conversion from DNA in mitochondria. This was made possible by creating a new gene-editing technology called base editing, which converts a single nucleotide base into another without breaking the DNA. However, this technique also had its limitations. Not only is it restricted to C-to-T conversion, but it is mostly limited to the TC motif, making it effectively a TC-TT converter. This means that it can correct only nine out of 90 (10%) confirmed pathogenic mitochondrial point mutations. For a long time, A-to-G conversion of mitochondrial DNA was thought to be impossible.

"We began to think of ways to overcome these limitations," said Sung-Ik Cho, first author on the new study. "As a result, we were able to create a novel gene-editing platform called TALED that can achieve A-to-G conversion.

"Our new base editor dramatically expanded the scope of mitochondrial genome editing. This can make a big contribution not only to making a disease model but also to developing a treatment."

Indeed, being able to perform A-to-G conversions in human mtDNA alone could correct 39 out of the 90 known pathogenic mutations, or 43%.

The researchers created TALED by fusing three different components. The first component is a transcription activator-like effector (TALE), which is capable of targeting a DNA sequence. The second component is TadA8e, an adenine deaminase for facilitating A-to-G conversion. The third component, $DddA_{tox}$, is a cytosine deaminase that makes the DNA more accessible to TadA8e.

One interesting aspect of TALED is TadA8e's ability to perform A-to-G editing in mitochondria, which possess double-stranded DNA (dsDNA). This is a mysterious phenomenon, as TadA8e is a protein that is known to be specific to only single-stranded DNA. Director Kim said, "No one has thought of using TadA8e to perform base editing in mitochondria before, since it is supposed to be specific to only single-stranded DNA. It was this thinking-outside-of-the-box approach that has really helped us to invent TALED."

The researchers theorised that $DddA_{tox}$ allows dsDNA to be accessible by transiently unwinding the double-strand. This fleeting time window allows TadA8e, a superfast-acting enzyme, to quickly make the necessary edits. In addition to tweaking the components of TALED, the researchers also developed a technology that is capable of both A-to-G and C-to-T base editing simultaneously, as well as A-to-G base editing only.

The group demonstrated their technology by creating a single cell-derived clone containing desired mtDNA edits. TALEDs were found to be neither cytotoxic nor to cause instability in mtDNA, and there was no undesirable off-target editing in nuclear DNA and very few off-target effects in mtDNA.

The researchers now aim to further improve the TALEDs by increasing the editing efficiency and specificity, eventually paving the way to correct disease-causing mtDNA mutations in embryos, foetuses, newborns or adult patients. The group is also focusing on developing TALEDs suitable for A-to-G base editing in chloroplast DNA, which encodes essential genes in photosynthesis in plants.

"I believe the significance of this discovery is comparable to the invention of blue LED, which was awarded a Nobel Prize in 2014," said IBS science communicator William I Suh. "Just like how the blue LED was the final piece of the puzzle that allowed us to have a highly energy-efficient source of white LED light, it is expected that TALED will usher in a new era of genome engineering."

Dewpoint hygrometer

The Easidew Advanced Online dewpoint hygrometer from Michell Instruments measures dewpoint, moisture content and now also pressure. Developed as a versatile, high-performance hygrometer system, it features an easy-to-use touch screen interface for set-up and operation. Incorporating the latest Michell ceramic metal-oxide technology, the hygrometer is designed to provide stable and repeatable trace moisture measurements.

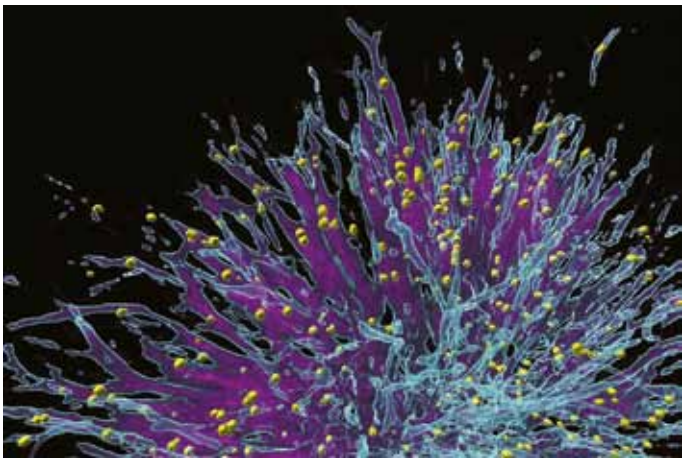
Because pressure is such an important variable when measuring the dewpoint of a gas, the hygrometer compensates for this either with a live pressure sensor input or by using a fixed pressure input value. The device can be used for any moisture measurement application, displaying data in °C or °F dewpoint, ppm_V, lb/mmscf or g/m^3 from -110 up to +20°C at pressures up to 450 bar. Additionally, the hygrometer also provides analog, digital and four user-configurable alarm outputs. As well as the four-colour display, the hygrometer can be configured remotely via application software.

Regular maintenance and recalibration are important for ongoing reliability and Michell customers have two options to achieve this with minimum disruption. The sensor exchange program is designed to eliminate process downtime: customers order a reconditioned sensor and, when this arrives, replace and return their old sensor. Where traceability of calibration is needed, the company offers a recalibration service at one of its regional calibration laboratories.

The hygrometer is suitable for a wide range of trace moisture measurement applications, such as surgical and medical air, glove boxes, hydrogen refilling stations, pharmaceutical manufacturing, membrane and adsorption dryers, and many more.

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

Image analysis software



Bitplane has released Imaris 9.9, the latest version of its microscopy image analysis software, suited to applications such as cancer, cell biology, developmental biology and neuroscience. The latest version adds a pixel classification segmentation method powered by Labkit.

Training the pixel classifier with a few brush strokes leads to smart segmentation of data. This method can be applied to fluorescent data as well as some greyscale images. The addition of machine learning pixel classification with an intuitive and interactive training mode broadens the diversity of images for analysis as it enables some electron microscopy segmentation and shape recognition. All other parts of Imaris Surface creation workflow, such as filtering, editing or object classification, are available with this method. It makes the workflow smooth and opens good image analysis and visualisation options.

Imaris 9.9 is designed to be the most open and flexible version ever. It facilitates the connection between open-source software packages like MaMuT (or TrackMate) and Imaris by enabling the ability to directly import label images or position data as Surfaces or Spots, respectively. Tracking objects like single nuclei in developing embryos can be a challenging task, but software packages like MaMuT — a tracking and track-editing framework for large, multi-view images — can help to analyse the data. By importing the data into Imaris, users have access to the software's 3D rendering with object colour coding and multiple visualisation modes. Overlaying tracking results with the raw, multichannel microscopy data unlocks the possibility to create stunning snapshots and animations.

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www.scitech.com.au

The S-Monovette® is the revolution in blood collection.

The S-Monovette is an innovative enclosed blood collection system that allows the user to draw blood from the patient using the syringe or vacuum method, uniting the advantages of both techniques in a single product.

When used as a syringe, the phlebotomist has full control over the speed at which the blood is drawn into the tube. This is particularly useful for patients with fragile veins, such as the very young or elderly, where the use of the aspiration technique prevents even the most fragile veins from collapsing. When the tube has been filled, the plunger is simply snapped off to leave a primary sample tube which can be centrifuged and is compatible with all major analysers.

The S-Monovette can also be used as an evacuated tube by drawing the plunger fully down and snapping it off immediately prior to blood collection. This creates a fresh vacuum and ensures a precise filling volume, ensuring a correct dilution ratio.

The reduced vacuum pressure in the S-Monovette drastically reduces the rate of haemolysis and vein collapse, meaning increased sample quality and reduced costs associated with repeat collections. Furthermore, unlike pre-evacuated tubes, the S-Monovette does not have to hold a vacuum for many months after manufacture, which allows the membrane stopper to be thinner and more easily penetrated by the needle sheath. This minimises the movement of the needle in the vein when attaching the tube, ensuring optimum patient comfort.

The S-Monovette needle is ready to use so that there is no need for assembly to a holder. The needle is of a compact, low profile design, which reduces the chance of haematoma by allowing for a reduced angle of puncture and eliminates the possibility of needle stick injury caused by assembly of the needle and holder. The compact design also results in approximately one sixth of the sharps volume caused by using a pre-evacuated system, giving significant cost savings.

If you would like a visit from one of our Sales Representatives to demonstrate this system, please contact us on **toll free 1800 803 308**.

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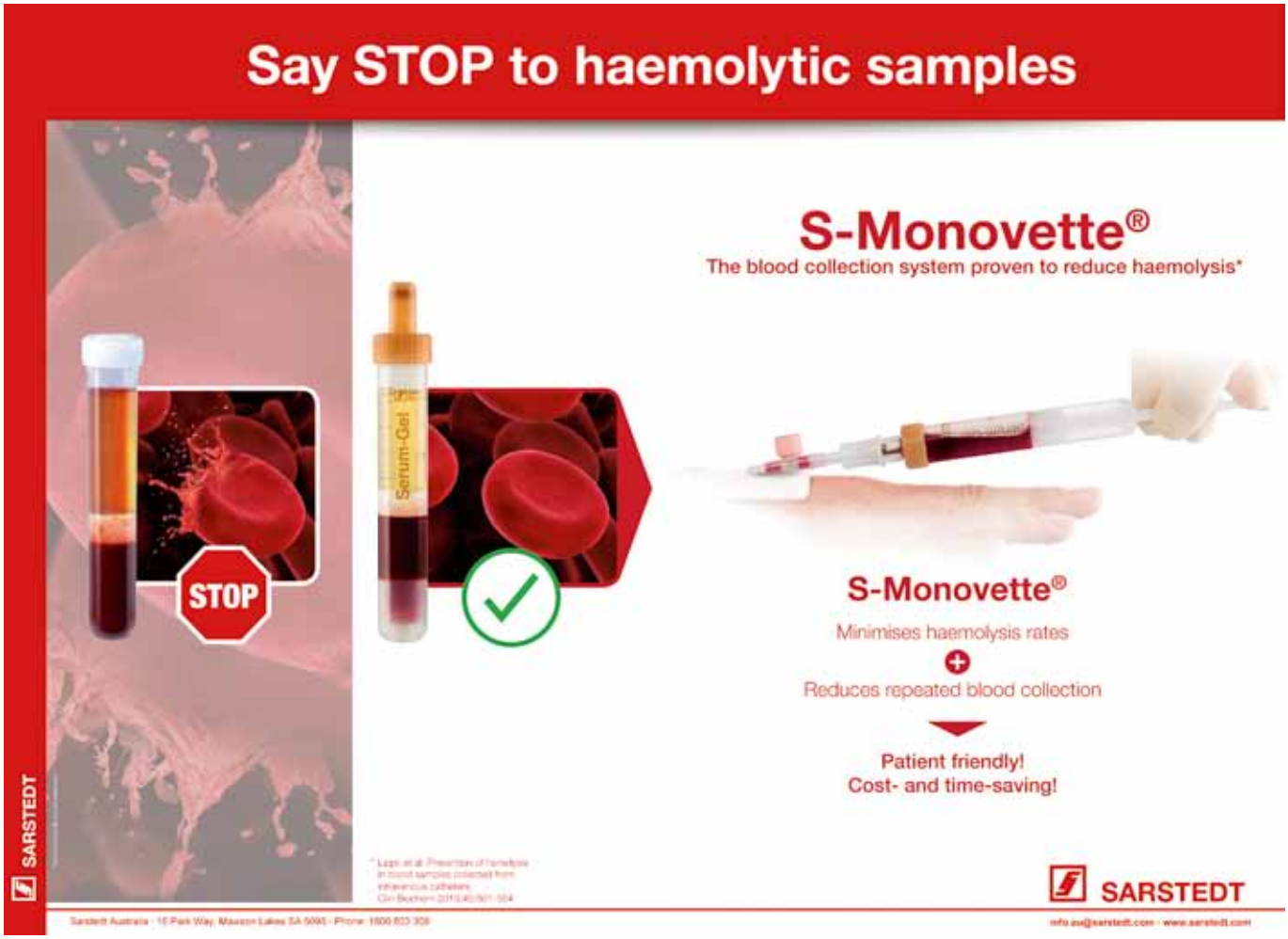

Centrifuge

The LabCo Low Speed Micro Centrifuge has a six-place, built-in, fixed-angled rotor that can hold 15 mL centrifuge tubes; 10, 7 and 5 mL Vacutainer tubes; and 1.5 and 2 mL microcentrifuge tubes.

It has a switch to change the speed from RPM to RCF, with a speed range of 300 to 5000 rpm and maximum RCF of 2350 G. The centrifuge is suitable for blood and urine separation for use in hospitals, pathology clinics and research institutes.

The centrifuge has a two-program memory and a timer that can run from 30 s up to 99 min. It has an easy-to-read LCD display, sound alert, and automatic lid lock and release. The other features are an overspeed function, automatic internal diagnosis and a DC brushless motor.

The centrifuge is supplied with 6 x adapters for 5 mL tubes; 6 x adapters for 1.5 and 2 mL tubes; 1 x power adapter; and 1 x user manual.

Labtek
www.labtek.com.au

ECL detection reagent

The Amersham ECL detection reagent uses enhanced luminol-based detection, suitable for all routine confirmatory Western blotting experiments. The product has for decades been a widely used chemiluminescent detection reagent for researchers worldwide, giving correct results and being cited in thousands of publications worldwide.

Based on the enhanced chemiluminescent reaction of luminol with horseradish peroxidase, ECL substrate can be used to detect probes which have been labelled either directly or indirectly with horseradish peroxidase. Rapid light output enables results to be achieved in 10 to 15 min. The substrate is useful for target amounts above 500 fg.

Offering high sensitivity and fast results, the product detects up to 10 to 12 ng of protein, which is said to be ~10x more than colorimetric methods. It is optimised to use with Amersham Protran nitrocellulose (NC) membranes and delivers results in just a few minutes, after which users can image using a CCD imager like the Amersham ImageQuant 500 or Amersham Hyperfilm ECL.

The convenient, easy-to-use kit contains ECL detection reagent, horseradish peroxidase (HRP)-conjugated antibodies and blocking agent.

Global Life Sciences solutions Pty Ltd trading as Cytiva
www.cytivalifesciences.com/en/au

Media preparation system

Merck's Life Science business sector has launched the innovative ReadyStream system — a product that prepares and instantly dispenses culture media for use in microbiological food testing, thus enhancing testing efficiency.

With traditional microbiological food testing methods, quality control lab technicians prepare the culture media themselves or use voluminous bags of ready-to-use media. This makes culture media and sample preparation a time-consuming, multi-step process, especially for those testing in large sample volumes. The ReadyStream system has been designed to transform the way QC labs test by doing most of the work.

Up to 100 L of ISO 11133-compliant culture media can be prepared at the touch of a button right in the lab, at the point of use. Concentrated media is diluted with sterile water to dispense up to 100 L pre-heated culture media from a 10 L bag (shipped dry and reconstituted with the system). Autoclaving, powder handling, washing and dealing with bottles are eliminated from the process, shortening the multi-step workflow. The system also removes the need to handle or move heavy bags of ready-to-use culture media, freeing additional lab space.

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Ion exchange column for food safety analysis

Thermo Fisher Scientific is providing laboratories performing food safety analysis with an ion chromatography tandem mass spectrometry (IC-MS/MS) workflow solution for regulatory-compliant analysis of quaternary ammonium pesticides (Quats).

The Thermo Scientific Dionex IonPac CS21-Fast-4μm ion exchange column enables scientists to easily determine and quantify the four cationic pesticides: diquat, paraquat, mepiquat and chlormequat. These highly polar, permanently charged chemicals are challenging to analyse, and have, until now, required complex workflows that are prone to quantitation errors.

To meet regulatory requirements across Europe, Asia and the Americas, and promote consumer safety, it is paramount for food safety laboratories to correctly determine the residue levels of these pesticides in or on food products. Ion chromatography has an advantage over other technologies, Thermo Fisher says, in that it causes fewer matrix effects, and delivers good retention and separation of ionic species.

When coupled with the Thermo Scientific TSQ Altis Plus triple quadrupole mass spectrometer, food safety testing laboratories should benefit from robust Quat analysis that meets regulatory requirements while improving laboratory productivity. The IonPac CS21 and TSQ Altis Plus complement the existing Anionic Pesticide Explorer (APX) solution from Thermo Fisher Scientific, providing total coverage for all polar, highly polar, ionic and ionisable food contaminants in one IC-MS/MS system. Together, the system and column can determine and quantify not only Quats, but also glyphosate and its metabolites, and related compounds.

Thermo Fisher Scientific
thermofisher.com

PCR cycler

The Mastercycler nexus gradient PCR cycler serves as a dependable companion when it comes to the daily PCR routine. The universal thermoblock supports all tube and plate formats to give users flexibility when it comes to selecting the right PCR consumables to fit their assay best. The aluminium block accommodates 96-well plates, 0.2 mL tubes, 0.2 mL tube strips and 0.5 mL tubes.

The Mastercycler nexus gradient is equipped with an ergonomic handle and flexlid heated lid. This allows one-handed ergonomic operation by users and automatically adjusts the contact pressure of the lid to securely seal all types of PCR consumables. When the lid is heating, the thermoblock is actively maintained at a constant temperature to minimise non-specific annealing and reduce sample evaporation.

The standout feature is the SteadySlope gradient technology which allows users to optimise the annealing temperatures in the same PCR run. The thermoblock has multiple heating elements to offer a smooth gradient and temperature homogeneity for reproducible PCR results.

Programming is quick, easy and intuitive using the control panel with graphical screen. PCR protocols can be stored and protected by password on the instrument for extra security. With a small footprint and whisper quiet operation, the Mastercycler nexus gradient PCR cycler is a suitable choice for any lab.

Eppendorf South Pacific Pty Ltd
www.eppendorf.com.au

Aberrant protein
found to kill bacterial cells

Biologists at the US Department of Energy's Brookhaven National Laboratory and their collaborators have discovered an aberrant protein that is deadly to bacteria.

In a study published in the journal *PLOS ONE*, the scientists describe how the erroneously built protein mimics the action of aminoglycosides, a class of antibiotics. The newly discovered protein could serve as a model to help scientists unravel details of those drugs' lethal effects on bacteria — and potentially point the way to future antibiotics.

The Brookhaven scientists, who normally focus on energy-related research, weren't thinking about human health when they began this project. They were using *E. coli* bacteria to study genes involved in building plant cell walls — research that could help scientists learn how to convert plant matter (biomass) into biofuels more efficiently. But when they turned on expression of one particular plant gene, enabling the bacteria to make the protein, the cells stopped growing immediately.

"This protein had an acutely toxic effect on the cells — all the cells died within minutes of turning on expression of this gene," said Brookhaven biologist Paul Freimuth, who led the new research. But why would a plant protein cause such dramatic damage? The group discovered that the toxic factor wasn't a plant protein at all — it was a strand of amino acids, the building blocks of proteins, that made no sense.

This nonsense strand had been churned out by mistake when the bacteria's ribosomes (the cells' protein-making machinery) translated the letters that make up the genetic code 'out of phase'. Instead of reading the code in chunks of three letters that code for a particular amino acid, the ribosome read only the second two letters of one chunk plus the first letter of the next triplet. That resulted in putting the wrong amino acids in place.

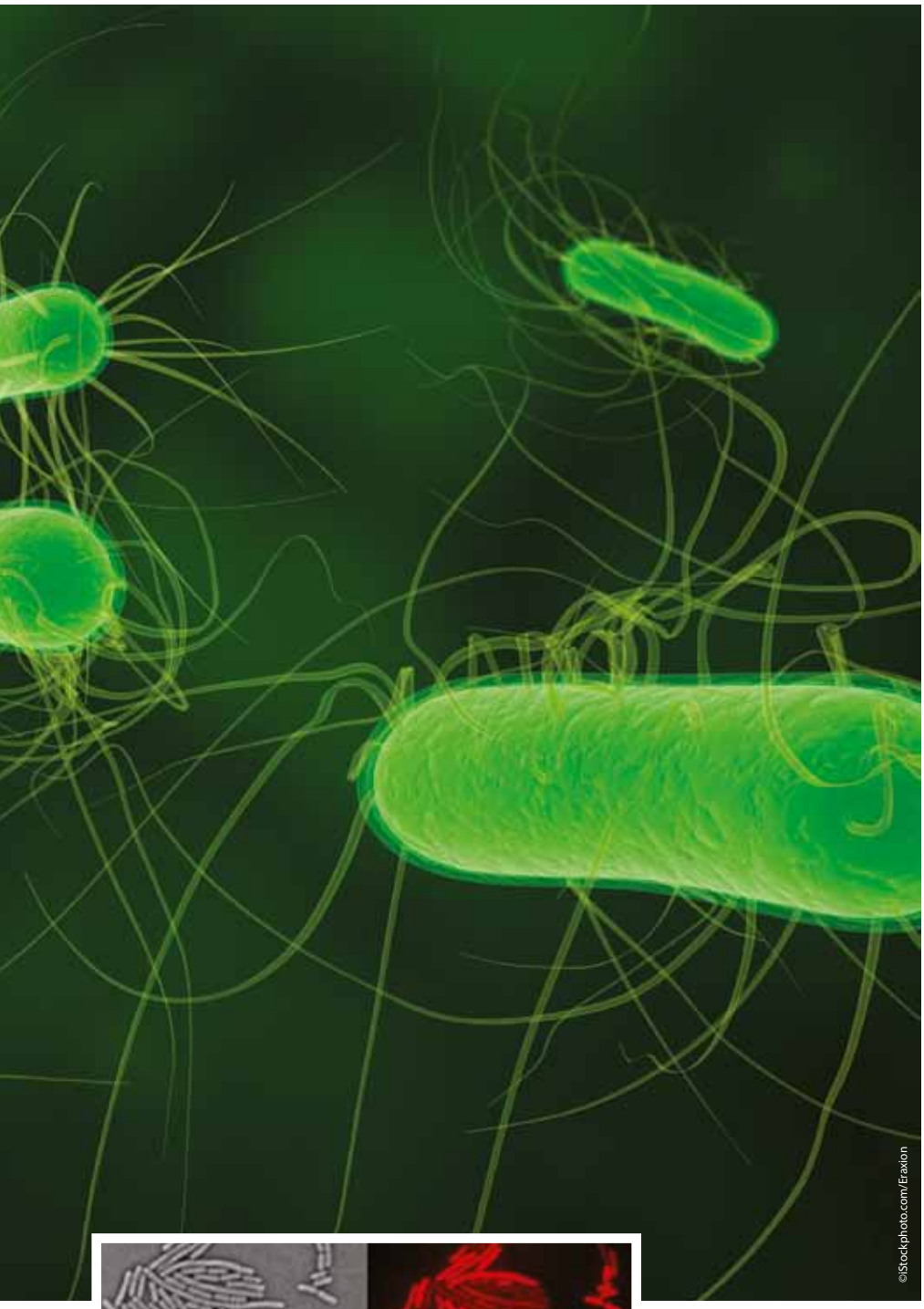
"It would be like reading a sentence starting at the middle of each word and joining it to the first half of the next word to produce a string of gibberish," Freimuth said.

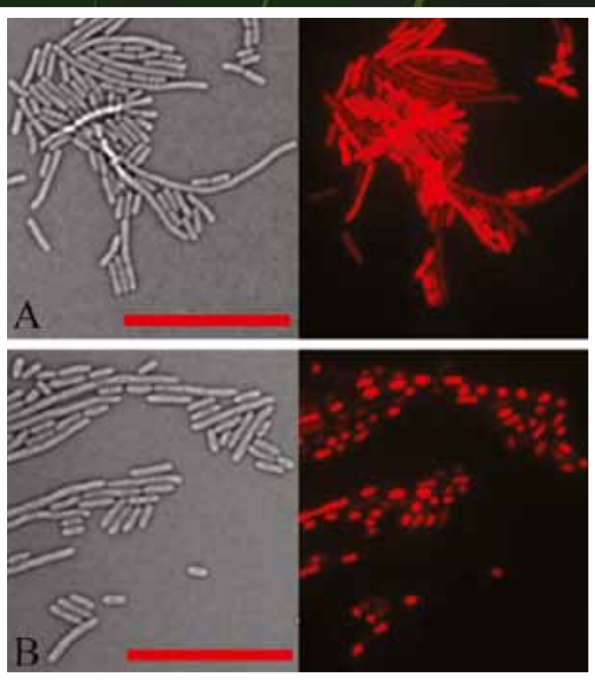
The gibberish protein reminded Freimuth of a class of antibiotics called aminoglycosides. These antibiotics force ribosomes to make similar 'phasing' mistakes and other sorts of errors when building proteins. The result: all the bacteria's ribosomes make gibberish proteins.

"If a bacterial cell has 50,000 ribosomes, each one churning out a different aberrant protein, does the toxic effect result from one specific aberrant protein or from a combination of many? This question emerged decades ago and had never been resolved," Freimuth said.

The new research shows that just a single aberrant protein can be sufficient for the toxic effect. This wouldn't be too farfetched, as nonsense strands of amino acids can't fold up properly to become fully functional. Although misfolded proteins get produced in all cells by chance errors, they usually are detected and eliminated completely by 'quality control' machinery in healthy cells. Breakdown of quality control systems could make aberrant proteins accumulate, causing disease.

The next step was to find out if the aberrant plant protein could activate the bacterial cells' quality control system, or somehow block that system from working. The team found that the protein indeed activated the initial step in protein quality control, but that later stages of the process directly required





Light microscope images of *E. coli* cells in transmitted light (left) and reflected light that picks up the red fluorescence of a dye staining the cells' DNA (right). In normal cells (upper panel), the DNA is spread throughout the cells. But in cells expressing the aberrant plant protein identified in this study (bottom panel) all the DNA within each cell has collapsed into a dense mass. DNA condensation also occurs after bacteria have been treated with aminoglycoside antibiotics.

for degradation of aberrant proteins were blocked. They also discovered that the difference between cell life and death was dependent on the rate at which the aberrant protein was produced.

"When cells contained many copies of the gene coding for the aberrant plant protein, the quality control machinery detected the protein but was unable to fully degrade it," Freimuth said. "When we reduced the number of gene copies, however, the quality control machinery was able to eliminate the toxic protein and the cells survived."

The same thing happens, he noted, in cells treated with sub-lethal doses of aminoglycoside antibiotics. "The quality control response was strongly activated, but the cells still were able to continue to grow," he said.

These experiments indicated that the single aberrant plant protein killed cells by the same mechanism as the complex mixture of aberrant proteins induced by aminoglycoside antibiotics, though the precise mechanism of cell death is still a mystery. "The good news," Freimuth said, "is that now we have a single protein, with a known amino acid sequence, that we can use as a model to explore that mechanism."

Scientists already know that cells treated with the antibiotics become leaky, allowing things like salts to seep in at toxic levels. One hypothesis is that the misfolded proteins might form new channels in cellular membranes, or alternatively jam open the gates of existing channels, allowing diffusion of salts and other toxic substances across the cell membrane.

"A next step would be to determine structures of our protein in complex with membrane channels, to investigate how the protein might inhibit normal channel function," Freimuth said. That would help advance understanding of how the aberrant proteins induced by aminoglycoside antibiotics kill bacterial cells — and could inform the design of new drugs to trigger the same or similar effects.

"What we've discovered is a long way from becoming a drug," Freimuth said. "We've identified a single protein that mimics the effect of a complex mixture of aberrant proteins made when bacteria are treated with aminoglycosides. That gives us a way to study the mechanism that kills the bacterial cells. Then maybe a new family of inhibitors could be developed to do the same thing."

Fed-batch in small scale

Kuhner Shaker is known for high-quality shaking incubators and now manufactures an innovative and easy-to-use solution for screening under fed-batch conditions in microtitre plates, shake flasks and spin tubes.

While screening for more efficient and productive strains, the user is frequently confronted with one challenge: a large part of process and strain development is carried out under batch conditions. In this operating mode, an excess of nutrient is available at the beginning of the cultivation, whereas the final production process is usually carried out under fed-batch conditions.

Kuhner's polymer-based feeding tool enables cultivations in a reproducible fed-batch mode during primary screening. As screening conditions will be similar to conditions in the production process, any statement about the productivity of a clone should be more accurate. Negative effects of batch conditions, eg, overflow metabolism, oxygen limitation and substrate inhibition, can be avoided.

Feeding Technology can be used to cultivate a wide spectrum of organisms: from typical model organisms such as ***E. coli*** and ***S. cerevisiae***, to ***P. pastoris*** and ***H. polymorpha***. The feeding tools are integrated easily into existing screening processes and can be used with standard laboratory equipment.

Kuhner Feeding Technology offers flexibility regarding possible substrates, release rates and culture vessels. The technology is ready to use and delivered sterile.

Capella Science
www.capellascience.com.au

Lab to measure nanoplastics in the human body

Images supplied by The University of Queensland.

The Minderoo Centre Nanoplastics and Human Health Laboratory is a highly specialised research facility at The University of Queensland (UQ) that is investigating the impact of nanoplastics on human health. A partnership between UQ and Minderoo Foundation, the lab aims to determine whether nanoplastic particles and plastics smaller than 10 μm stay in the body, rather than passing safely through the system.

Measuring nanoplastics has been described as like looking for something the size of a tennis ball between here and 100 km away, with Minderoo Foundation Chair Dr Andrew Forrest saying that researchers have not previously been able to accurately measure plastic particles at the nanoscale to determine whether fragmented plastics and plastic-associated chemicals pose a human health risk. The new lab is set to change this.

"We know that humans are exposed to plastics daily, but we don't know if nanoplastics are in our urine, body and brain and if they do harm," said Professor Kevin Thomas, Director of UQ's Queensland Alliance for Environmental Health Sciences.

"Samples from the Sydney Brain Bank are transferred to the lab to test for plastics such as polyethylene, polypropylene, PVC, and additives including phthalates and bisphenols, all found in commonly used products.

"After this first phase of research is complete, we can then start to measure chemicals and plastics within humans accurately so we can determine whether nanoplastic particles are in humans or not, and get more accurate measures of plastic chemicals."

Thomas said his team has been working to develop methods that are sufficiently sensitive and robust to provide clear data to ensure plastic hasn't entered the sample from the external environment. For example, the scientists wear brightly coloured, 100% cotton scrubs made specifically for work in the clean lab to avoid fibre shedding from standard lab coats and to ensure any fibres are easily identified.

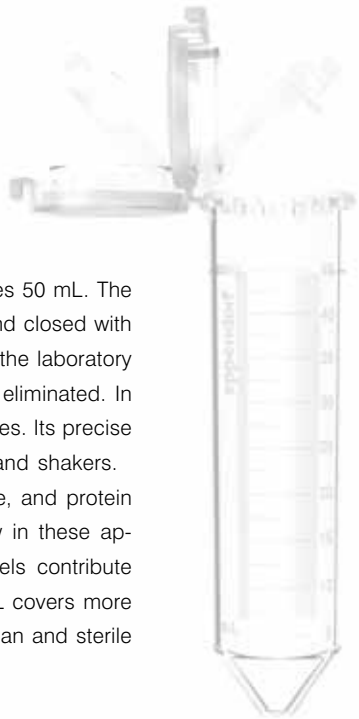
Furthermore, to ensure a controlled environment for the research, m3architecture was engaged to design a lab almost entirely free of plastic and any other contaminants that might impact the veracity of the work. The director of the company, Michael Christensen, said the challenging brief meant the design team had to go back to basics.

"We worked intensively with scientists at UQ to carry out rigorous testing on every element of the lab's design and construction, from the walls, flooring and sealants through to the equipment needed to carry out the research," Christensen said. "The task was made more complex by the need to comply with technical requirements, for example chemical resistance, which ruled out timber and many other alternative materials."

A small sample from each proposed material was analysed by the UQ team to determine its composition and arrive at the best, most plastic-free choices. The final design is a welded, stainless steel box, with additional wall and ceiling panels made from aerated molten metal to improve acoustics and make the laboratory a better working environment.

The research team expects to release the first findings by the end of the year and will then actively seek collaborations with other leading institutions working on similar missions around the world.

The University of Queensland
www.uq.edu.au



50 mL conical tube

The Eppendorf Conical Tube SnapTec 50 offers all the advantages of classic conical tubes 50 mL. The decisive, innovative detail is the SnapTec closure — a snap-on lid that can be opened and closed with one hand and is firmly attached to the vessel so that it does not come into contact with the laboratory bench. The risk of cross-contamination is thus reduced and confusion with other lids is eliminated. In addition, the SnapTec 50 vessel is autoclavable, which opens further application possibilities. Its precise dimensions are designed to offer maximum compatibility with centrifuge rotors, mixers and shakers.

Typical applications for conical tubes are mainly found in cell culture, bacterial culture, and protein or DNA/RNA extraction. Contamination-free handling is essential for a smooth workflow in these applications. Fast and safe opening and closing as well as autoclavability of such vessels contribute significantly to meeting these requirements. The conical tube's nominal volume of 45 mL covers more than 75% of all its main applications. The tube is available in Eppendorf Quality, PCR clean and sterile (free of pyrogens, DNase, RNase, human and bacterial DNA).

SnapTec is a registered trademark of Eppendorf SE.

Eppendorf South Pacific Pty Ltd
www.eppendorf.com.au

Ultrasensitive assay platform

Many biomarkers are readily measurable in the pg/mL to μg/mL range. Some analytes are present at much lower concentrations, making them difficult to detect.

S-PLEX is the latest assay range from Meso Scale Discovery (MSD) to improve sensitivity. The ultrasensitive assay is designed to reduce the lower limit of detection (LLOD) by 10- to 1000-fold over other immunoassays, with detection limits in the low fg/mL range.

The format builds on existing MSD consumables and instruments but uses a different chemistry to the company's other assay methods. High sensitivity and specificity are achieved with an electrochemiluminescent label, Turbo-TAG, which when combined with a detection antibody conjugated with a Turbo-Boost label results in larger signal generation.

The assay is said to allow shifts in the dynamic range, with the lower detection limits enabling detection of analytes in samples that are not readily detected by other assay formats. Small changes in biomarkers related to disease progression or drug administration can thus be detected.

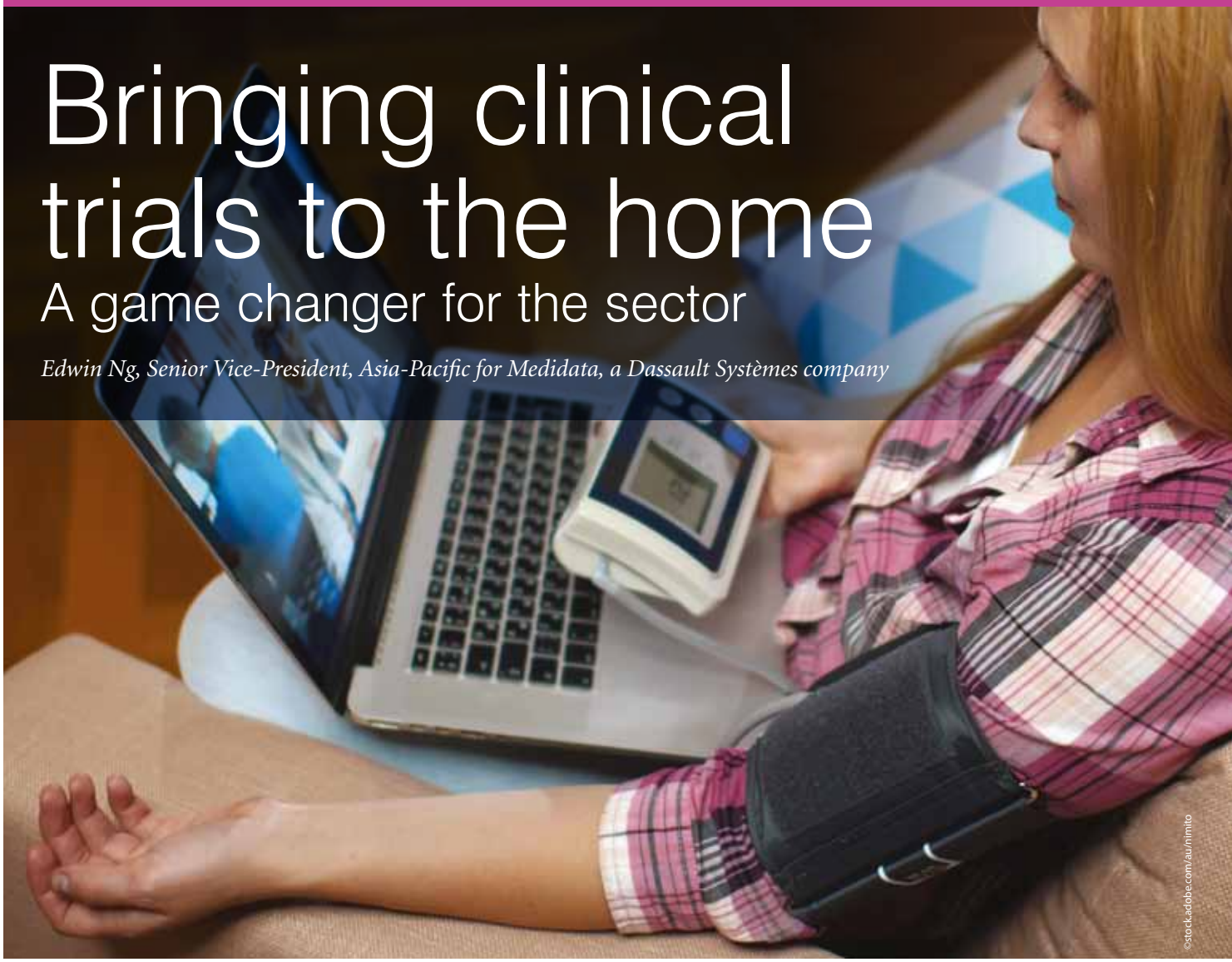
The assays are available as single-plex kits for over 20 different biomarkers including SARS-CoV-2 N and SARS-CoV-2 spike protein. A multiplex S-PLEX Proinflammatory Panel, including nine biomarkers associated with inflammation response and immune system regulation, is also now available.

Bio-Strategy Pty Ltd
www.bio-strategy.com

Bringing clinical trials to the home

A game changer for the sector

Edwin Ng, Senior Vice-President, Asia-Pacific for Medidata, a Dassault Systèmes company



COVID-19 has highlighted the vital importance of clinical trials for drug and vaccine development, but it has also forced Australia's pharmaceutical and healthcare companies to completely redesign how these trials are run.

In an era of lockdowns and restricted movement where it may not be desirable for many participants to get to physical sites, the clinical trial industry has had to follow in the footsteps of other healthcare services, in moving from clinics to the couch so that important research can continue remotely.

This promises many benefits, not least the possibility of shortening timelines for important drug and vaccine development. However, issues of interoperability and data privacy will need to be urgently addressed for it to achieve its full potential in Australia. In fact, interoperability and quality assured technology has been flagged as an area requiring attention for effective and sustainable adoption of virtual health by The Australian Healthcare & Hospitals Association[1].

From online consultations with doctors to remote monitoring of patients' vital signs, COVID-19's acceleration of telehealth in Australia has already been well documented. Deloitte predicts Australia will exceed the global average for telehealth adoption, with more than 10%[2] of Australians regularly using telehealth services in 2021.

Moving clinical trials into a home setting is the next frontier, following on from the shift of other healthcare services out of hospital and clinical settings since the start of the pandemic. The development of e-consent systems and patient portals — whereby patients can access all information relating to the trial in one place and consent via an e-signature — also makes the enrolment process much easier, without patients even having to leave the comfort of their sofas.

For clinical trials, the additional opportunities centre around using apps, sensors and wearables in the home to track important health indicators — like respiratory rate, sleeping patterns, blood pressure and heart rate — that were previously measured at specific points in time during onsite visits and check-ins. For the first time, this opens the possibility of continuous patient monitoring through passive devices working in the background to collect data 24/7, rather than just gathering data at specific points in the year when patients have physical appointments.

A major paradigm shift

For an industry that has relied on paper-based documentation and patients being monitored at fixed sites for decades, this is a breakthrough with huge potential benefits.

Especially in Australia with patients based remotely, commuting to trial sites can be a burden, including lost days from work, travel costs and time. Removing the barriers to taking part is a major boon for an industry that regularly cites patient recruitment and retention as its biggest obstacle.

Collecting and analysing patient data in real time allows for early detection of both trends and issues, so that important adjustments can be made while trials are ongoing. As in other industries, digitisation of clinical trials also promises to free up staff from cumbersome administrative tasks so that they can focus more attention on value-add roles, and continuous monitoring will provide much richer datasets.

Australia's combination of high device penetration, 5G rollout and Smart Cities Plan makes it an ideal testbed for facilitating this shift to the home. However, some issues to its wider adoption remain.

Putting the patient first

Patient willingness to take part in trials from home will be the main deciding factor in how quickly and successfully this new model can be adopted in Australia.

Allowing patients to use their own smartphones and devices, rather than having to incorporate separate, provisioned devices into their daily routine, is one way to get patients on board. This will require a complete rethink of the way trials are designed. However, the even bigger issue to be addressed is reassuring patients of their privacy. Privacy is a major concern for 70%[3] of Australians, and almost nine in 10 want more choice and control over their personal information. The way we address this concern is through transparency.

Transparency is key to building trust, and Australia's government and industry will need to work together in prioritising patient safety. This needs to be built into every stage of trial design and the industry needs to consider not only the minimum privacy protection requirements by law, but to benchmark against the most stringent standards in the market.

Interoperability is the other major challenge. For remote clinical trials to be effective, all of the different devices and systems in the patients' homes and the lab need to connect seamlessly. This includes the patients' own smartphones and devices.

While COVID-19 was the trigger, it's unlikely that the industry will ever go back to its old operating model. 10 years from now, there probably won't be a clinical trial that isn't measuring potential biomarkers continuously rather than at discrete points in time, whenever they can. Australia has the set-up and infrastructure to be a pioneer in this field, provided government and industry work together to put patients first.

References

1. The effective and sustainable adoption of virtual health care — https://ahha.asn.au/sites/default/files/docs/policy-issue/ahha_blueprint_supplement_-_adoption_of_virtual_health_care_-_july_2020_0.pdf
2. Telehealth to boom, Australia leads the way in commercialising women's sports, 5G health risk perception to wane — https://www2.deloitte.com/au/en/pages/media-releases/articles/telehealth-boom-australia-leads-way-commercialising-womens-sports-5g-health-risk-perception-wane-160321.html
3. 2020 Australian Community Attitudes to Privacy Survey — https://www.oaic.gov.au/engage-with-us/research/australian-community-attitudes-to-privacy-survey-2020-landing-page/2020-australian-community-attitudes-to-privacy-survey/

Medidata Solutions International Asia Pacific Pte Ltd
www.medidata.com/en/office/singapore

sCMOS camera with USB 3.2 Gen 2 interface

Teledyne Photometrics' Moment sCMOS camera can be used for fast, high-resolution imaging and documentation in true plug-and play fashion. The 7 MP global shutter sCMOS camera provides a large field of view and small pixels to maintain high-resolution imaging at low magnification.

The camera delivers quantitative measurements and optimises image quality by suppressing hot pixels and patterns common to industrial devices. Combined with low dark noise and optimised linearity, the product provides high-quality images in low-light situations.

Global shutter minimises complexity of illumination control, simplifying imaging set-up. Users can collect all the light that comes their way without the dead time, artefacts and synchronisation issues of a rolling shutter device.

Measuring just 50 x 40 x 42 mm, the camera is designed to fit easily into existing instruments and to minimise footprint. It utilises the simple, versatile and high-speed USB 3.2 Gen 2 interface at 10 Gbps to deliver 50 fps full frame. Both data and power are provided by the same cable, simplifying integration.

Interfacing and integration are simple. With its compact design and single cable interface, hardware integration is straightforward. With onboard triggering, combined with Windows and Linux support, communicating with the camera is easy.

SciTech Pty Ltd
www.scitech.com.au

Interfacial shear rheometer

Studying the stability of thin films that are formed at air–liquid or liquid–liquid interfaces is important for a range of applications such as pulmonary surfactants, and in industrial applications such as food, pharmaceutical, cosmetics and oil. Surface tension is usually sufficient to describe simple interfaces; however, when surfactants, particles or proteins are present, complex fluid–fluid systems can form which can have an interfacial viscoelastic response. Investigating these interfacial properties is necessary to determine how the system is behaving when the interface is deformed.

Interfacial rheology is a challenging field of research because the magnitude of forces in the interface is exceedingly small. Still, there are several different interfacial shear methods proposed, which include the rotating ring, bicone and magnetic needle methods. Primarily, the bicone method suffers from low sensitivity and thus limits the studies for macromolecular layers.

The KSV NIMA interfacial shear rheometer, ISR Flip, is a sensitive interfacial shear rheometer for measuring the interfacial shear elasticity and viscosity of a Langmuir film both at the air–liquid and liquid–liquid interface. It utilises a small magnetic probe that is moved with an oscillating magnetic field. The method reduces the inertia and should enhance the sensitivity of the probe compared to the rotating ring and bicone methods to enable the measurement of low molecular weight surface-active compounds.

Three automated measurement modes expand analysis: frequency sweep measurement provides information about the dominance of viscosity or elasticity; amplitude sweep measurement allows shear thinning or thickening to be detected; and single frequency measurement can be used to define the time dependency of viscoelastic properties. When combined with the ISR Flip high compression trough, the viscoelastic changes can be defined as a function of surface pressure. From the Langmuir isotherm different phases of the film can be seen, and viscoelastic properties are determined as a function of layer packing density.

ISR Flip is a sensitive, versatile tool for the analysis of surfactants and their influence on foam and emulsion stability, which helps to expand our understanding of interfacial layers.

ATA Scientific Pty Ltd
www.atascientific.com.au

‘Silver bullet’
keeps medical devices free of bacteria

According to folklore, silver bullets kill werewolves, but in the real world, researchers want to harness this metal to fight another deadly foe: bacteria.

Scientists have previously tried to develop a silver coating for implantable medical devices to protect against infection, but they’ve had limited success. Now, researchers from The University of British Columbia (UBC) and the Vancouver Coastal Health Research Institute have developed a silver-based coating that can easily be applied to devices such as catheters and stents. Their novel formulation, discovered by screening dozens of chemical components, overcomes the complications of silver that have challenged scientists for years.

Sometimes medical care requires surgeons to implant a device, such as a tube to drain a wound or the bladder, or to deliver medication directly into the blood. However, bacteria can attach to and collect on the surfaces of these devices, creating a risk for dangerous infections. Urinary tract infections from catheters, for example, are among the most common hospital-acquired infections.

Image credit: Kizhakkedathu Lab.

Photo of a coated versus an uncoated catheter.

Coating these devices in silver has long been viewed as a potential solution because of its ability to kill bacteria, but its use on implanted devices poses several challenges that have stumped researchers until now. Silver can also be toxic to human cells as well as to bacteria, and it’s difficult to make a coating that continually releases small amounts of the metal over long periods. Coatings incorporating silver have also proven overly complicated to make, lacked durability, became easily gummed up with proteins or crystals, or simply didn’t adhere well to the surface of devices and implants.

The UBC team, led by Dr Hossein Yazdani-Ahmadabadi, wanted to identify a formula that could overcome these and other difficulties. To develop a simple-to-use coating, they screened many sets of ingredients that they could apply to a surface in a single step. The formula that worked the best included silver nitrate, dopamine and two hydrophilic polymers.

The silver-based film-forming antibacterial engineered (SAFE) coating formed stable, silver-containing assemblies, which in lab tests gradually released silver ions in small, controlled quantities — enough to kill bacteria but not enough to harm human cells. It also maintains its killing activity for longer than has been achieved by other coatings. The results were described in the journal *ACS Central Science*.

When exposed over 28 days to eight of the most common species of bacteria that cause serious infections, this new coating recipe effectively kept the microbes at bay. It did so in a unique way: by repelling the bacteria from the surface and then killing them with the silver ions. Indeed, it repelled both live and dead bacteria as well as other fouling agents from its surface, keeping it clean.

To test SAFE’s effectiveness in a living animal, the team coated a titanium implant with it, then placed the implant beneath the skin of rats. After a week, the researchers found that implants with the coating had dramatically fewer bacteria than those without it. In addition, there were no signs of toxicity to the rats’ tissues.

The coating also appeared tough, showing little wear and tear after being rubbed and sterilised using harsh conditions. This combination of attributes is likely to make the coating useful in many types of medical devices and implants to prevent bacterial infection over the long term, the researchers said.

“Other silver-based coatings rely on contact killing, meaning the bacteria have to attach to the material in order to be exposed to the silver and die. This results in dead bacteria building up on the surface over time and rendering the device ineffective,” said co-senior author Dr Dirk Lange, an associate professor

> After a week, the researchers found that implants with the coating had dramatically fewer bacteria than those without it.

at UBC and Director of Basic Science Research at the Stone Centre at Vancouver General Hospital.

"We're preventing that by keeping bacteria off the surface in the first place, and then killing them with the release of silver. Since we prevent attachment of both live and dead bacteria, this coating has significant potential to maintain a clean surface for any device or material for an extended period of time, which is something we haven't seen so far."

The coating could be applied to almost any material used to make medical devices such as central venous catheters, urethral catheters, peritoneal catheters, feeding tubes, vascular grafts, ureteral stents or orthopaedic implants, without requiring pre-treatment. And while silver is a precious metal, the amount required is so small that it would add only about 50 cents to the cost of a catheter.

The research team looks forward to seeing how the coating performs in clinical trials, and is optimistic that their discovery could be in wide use to prevent infections in patients within the next decade.

"This is a highly effective coating that won't harm human tissues and could potentially eliminate implant-associated infections," said UBC's Dr Jayachandran Kizhakkedathu, co-senior author of the study. "It could be very cost-effective and could also be applicable to many different products."

Adapter kit for tube selector

Ziath has released an adapter kit that enables its Mohawk tube selector to quickly and easily pick and reformat tubes from Azenta Life Sciences' Acoustix racks, used by the latest generation of Labcyte Echo acoustic liquid dispensers.

Acoustix is a small sample tube with a screw cap that has been widely adopted for storage of novel compounds in solution held in compound storage facilities. However, many automated tube selectors struggle to effectively handle these tubes due to their small size and the fact that they are locked into racks that are suspended upside down in the Labcyte Echo acoustic dispenser.

The Acoustix adapter for Mohawk reduces the effective height of the Mohawk tube selector lid by introducing a clear acrylic plate at a lower height, which prevents tubes from exiting the inverted rack. This should both simplify and improve the speed of tube picking.

In addition, as Acoustix tubes 'lock' into their racks, Ziath developed a 'release plate' that can quickly and easily unlock all 96 tubes in a rack, ready for picking. Using an Acoustix software plug-in, in combination with the adapter and release plate, fast and easy single tube cherry-picking and reformatting from racks with automatic confirmation of pick list integrity is now possible.

Designed to enable picking of frozen or thawed sample tubes from 96-position racks, the Mohawk semi-automated has been designed to work out of the box and needs no set-up or calibration. Instrument control is through the user-friendly software, which provides an intuitive interface for effortless operation. Tubes can be picked from a single rack, or a picklist can be set up to select tubes across multiple racks. Pick list operations are normally started from reading the 1D code on a rack placed onto the tube selector, but manual selection is also possible.

Pathtech Pty Ltd
www.pathtech.com.au

Recombinant antibodies

Merck's ZooMAb recombinant antibodies have received an Accountability, Consistency and Transparency (ACT) label from My Green Lab, a non-profit organisation dedicated to creating a culture of sustainability in science. The antibodies received the lowest environmental impact factor (EIF) scores in the chemicals and reagents category.

Unlike traditional monoclonal antibodies, or mAbs, made from identical immune cells from an animal-sourced parent cell, ZooMAb antibodies use recombinant technology. This offers an endless and consistent supply while reducing the use of animals in research.

The antibodies can be shipped at room temperature and then stored between 2 and 8°C, unlike traditional mAbs that must be shipped and stored between 2 and 8°C, eliminating the need for specially insulated, ice-cooled containers that contribute to high packaging material consumption and transport emissions. The antibodies do not contain any Red List chemicals, CMRs, PBTs or GreenScreen Benchmark-1 chemicals.

Merck Pty Ltd
www.sigmaaldrich.com/AU/en

Cytochalasin D vs Nocodazole

Livecyte exposes dramatic differences on a cellular and population level, all label free

Mitosis is a crucial biological process that takes place in all eukaryotic cells and involves the equal segregation and division of a parent cell into two genetically identical daughter cells. Changes to the cell cycle where there is irreversible arrest of cell proliferation have been shown to lead to aging and age-related disease, whereas uncontrollable cell division is linked to cancer.

What is the problem we are solving?

The detection of mitosis events and quantification of their properties is of particular interest in a number of areas, especially oncology where drugs are designed to inhibit cell division and cell cycle progression. To fully understand the protective effects of these compounds, an accurate analytical method is needed to study their actions at different stages of the cell cycle.

Studying the process of mitosis is currently very challenging. Current methods that exist to measure mitosis usually rely on fluorescent labelling of cell mitotic spindles or the manual analysis of brightfield or phase contrast images which use relatively high light levels.

Why is that a problem?

Whilst fluorescent labels can enhance contrast and potentially open the door to automated segmentation and analysis routines, the process and relatively high light levels required can ultimately perturb the natural function and division of cells. The manual analysis of brightfield or phase contrast images is also very time-consuming and subject to human bias.

How does Livecyte solve this?

Livecyte's primary imaging modality is a quantitative phase imaging technique called ptychography. It produces high-contrast label-free images without the need for fluorescent labels. Coupled with time-lapse imaging and cell tracking algorithms, Livecyte provides users with the tools to monitor mitotic differences over time, independently and in response to external stimuli. Users can see not only how their treatment is affecting the number of mitosis events but also event duration. This provides key insights into the anti-proliferative nature of a treatment, as well as its mode of action on the cell cycle.

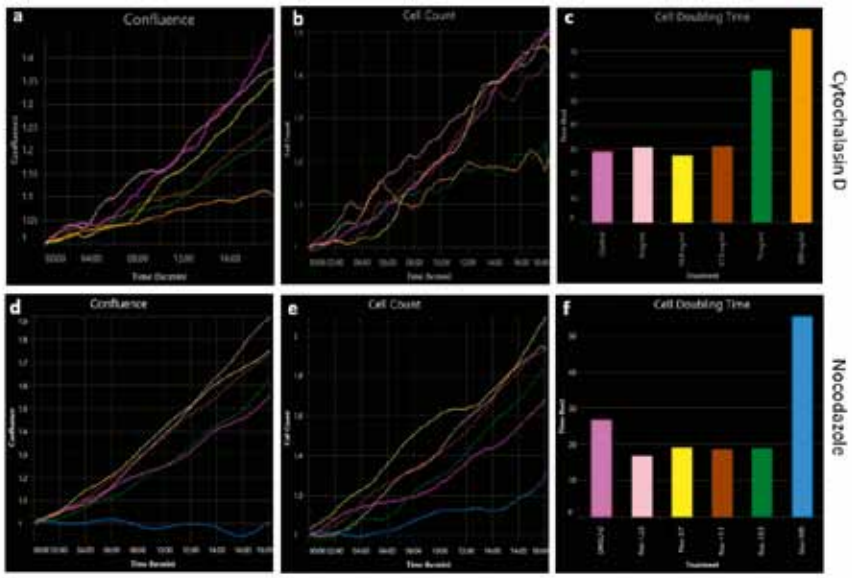


Figure 1: a) Plot of Confluence and b) Cell Count over time for cells treated with cytochalasin D (300 ng/mL in orange, 9 ng/mL in pink) and untreated control (Bright Pink) and c) histogram plot illustrating median Cell Doubling Times. d) Plot of Confluence and e) Cell Count over time for cells treated with nocodazole (100 µM in blue, 1.23 µM in pink) and untreated control (Bright Pink) and f) histogram plot illustrating median Cell Doubling Times for these cells.

A recent study sought to measure and contrast specific cell cycle changes in mitosis between different concentrations of two anti-cancer drugs (cytochalasin D and nocodazole), as compared to untreated cells, through Livecyte's label-free imaging and analysis tools. This experiment exposed that proliferation alone is far from a reliable indicator of cell cycle behaviour, along with insight into a dramatic dose dependence of these drugs where underdosing is likely to be catastrophic. By quantifying the effect of two cancer treatments on the number of mitosis events and mitotic time, Livecyte enabled insights into how these treatments impacted cell cycle progression. Multi-parametric analysis at a population level view via the Proliferation and Mitosis dashboards, as well as single-cell investigation, allowed a full comparison of cell behaviour in response to the two cell cycle inhibitors and gave a clear quantifiable differentiation between their mechanisms of action.

Livecyte's quantitative phase imaging mode and Analyse software can be utilised to automatically extract a wealth of single cell metrics in the form of proliferation and mitosis data, label-free. In combination with an intuitive workflow, Livecyte enables users to reliably examine the pathways that regulate cell cycle and division in order to enhance the understanding of disease states, from a single assay.

For more information, contact us:
+61 2 9541 3500 or
enquiries@atascientific.com.au.

Reference

1. Phasefocus.com. 2022. ***Label-free Analysis of Mitosis Assays*** [online]. Available at: https://www.phasefocus.com/resources/app-notes/label-free-analysis-mitosis-assays [Accessed 25 May 2022].

ATA Scientific Pty Ltd
www.atascientific.com.au

Pharmaceutical fridges

Safe and secure storage is essential for the likes of pharmaceutical products, where often the value of products far outweighs the value of the refrigerator. To ensure product viability within storage specifications and no untoward product degradation due to warming temperatures, PHCbi has released its range of pharmaceutical fridges and fridge-freezers.

The MPR pharmaceutical refrigerators are designed to prioritise sample integrity with temperature uniformity, even during defrost cycles. Units come with either fixed roller drawers or adjustable-height wired shelving to cater to all demands of the lab. Large-capacity swingout doors are popular; however, should space be an issue, PHCbi offers a significant range of sliding-door units, reducing the footprint size and catering for all manner of storage requirements.

Upgraded models in the MPR fridge-freezer and refrigerator range incorporate the latest technologies such as inverter compressors and hydrocarbon refrigerants, to reduce the cost of ownership via savings in power consumption to the units and reducing usage of HVAC systems. OLED displays provide essential data logging functions and display min/max temperatures over 12/24 h to comply with vaccine and medicines storage guidelines.

The MPR models are now in stock with Bio-Strategy.

Bio-Strategy Pty Ltd
www.bio-strategy.com

Sensitive back-illuminated sCMOS camera series

Sona is Andor's latest high-performance sCMOS camera series, specifically for life sciences imaging applications.

The Sona 4.2B-6 provides a balanced combination of sensitivity, speed and resolution for optimal imaging performance across many applications. The 4.2 MP format with 6.5 μm pixels is suited to the widely used 40x and 60x magnifications. The flagship model, the Sona 4.2B-11, is the company's solution for sensitivity and field of view, offering a 32 mm field of view. Both models support SRRF-Stream real time super-resolution technology, while all Sona models feature the latest back-illuminated sCMOS technology with 95% quantum efficiency (QE).

With 95% QE and vacuum cooling down to -45°C, the series is designed to provide good sCMOS sensitivity, thus preserving living cells during extended measurement periods. It also allows capture of large fields of cells or whole embryos with clarity.

Sona is suitable for quantitative measurement. Linearity of >99.7% enables optimal measurement in applications such as FRET, ion signalling and gene expression analysis. The platform also has low fan vibration, meaning measurement precision should not be compromised in vibration sensitive set-ups such as super-resolution and electrophysiology.

Coherent Scientific Pty Ltd
www.coherent.com.au

Human coronavirus antigens and antibodies

The Native Antigen Company develops and manufactures high-quality recombinant antigens and antibodies as well as offering a range of services for the diagnostic and biopharmaceutical industries. The company's VirtuE mammalian expression system has been developed for the purpose of producing native-like proteins, which are being widely adopted by in vitro diagnostic, vaccine and academic groups in cutting-edge R&D, where correct folding and glycosylation are vital.

There are six different coronaviruses that can infect humans and cause illness. These comprise the four common coronaviruses — 229E and NL63 (alpha coronaviruses), and OC43 and HKU1 (beta coronaviruses) — and two other coronaviruses, MERS-CoV and SARS-CoV, both of which can cause severe illness and remain a significant public health concern. Following the declaration of SARS-CoV-2 pandemic by the WHO in March 2020, Native Antigen has rapidly expanded its range of SARS-CoV-2 recombinant antigens and antibodies.

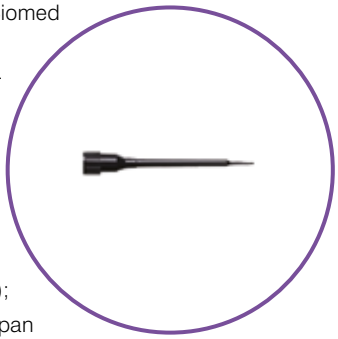
To support the investigation of SARS-CoV-2 variants, the company offers a growing range of mutant Spike antigens. Expressed through the VirtuE mammalian expression system, the antigens display full glycosylation and proper folding for use in the development of high-performance assays and other applications.

BioNovus Life Sciences
www.bionovuslifesciences.com.au

Automation tips

Pacific Laboratory Products offers a comprehensive line of Axygen tips for Tecan, Aurora Biomed and PerkinElmer automation systems.

The 50 μL liquid level sensing tips are manufactured to stringent specifications under strict process controls and assembled via automation for consistent performance and quality. RNase-/DNase-free and non-pyrogenic, the tips are available in non-sterile, sterile, non-filtered and filtered options.



The clear and conductive black polypropylene tips are available in a 96-well format and also available in a hanging tip rack format. They are designed for compatibility with the Tecan Genesis Freedom/Freedom EVO/Miniprep with LiHa (one, four or eight heads); Aurora Biomed Versa with 8-channel head; and PerkinElmer Janus/MultiProbe with Varispan (one, four or eight heads).

Pacific Laboratory Products
www.pacificlab.com.au

ASM 2022
is coming to Sydney

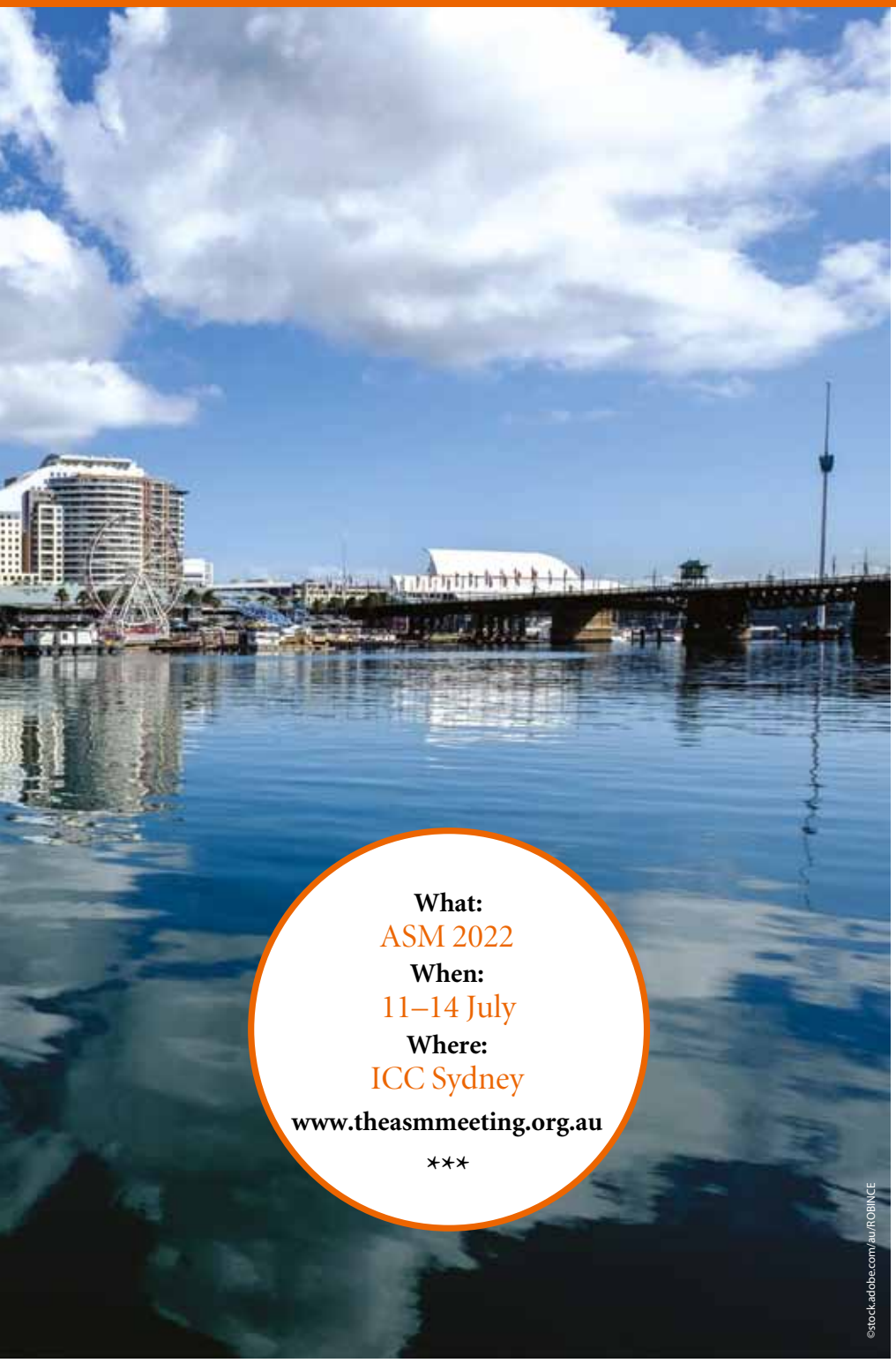
The Australian Society for Microbiology (ASM) is excited to be able to invite you to Sydney for our annual national scientific conference, ASM 2022. The conference will be held at the Sydney International Convention Centre (ICC) that overlooks beautiful Darling Harbour.

Darling Harbour is rimmed by cafes, bars and restaurants that will provide a vibrant background to our conference this year. The ICC is within walking distance of the heart of Sydney that boasts Australian icons like the Harbour Bridge, Opera House and Manly Ferry. Just outside the CBD you can get your feet sandy walking along Bondi or Manly beaches. Sydney is awake after the lockdowns and it's time to celebrate!

Sydney is home to world-leading universities and biomedical research institutes. With five research-intensive universities, the Garvan Institute of Medical Research, the Centenary Institute, the Westmead Institute of Medical Research, ongoing development of the Randwick Health and Innovation Precinct and many more dedicated research facilities, Sydney is a national hub for biomedical research.

We have assembled an inspiring and exciting scientific program for our first in-person event since 2019. We have visiting speakers and guests from around Australia and the rest of the world that will present science across the breadth of ideas and research that makes up microbiology.

We kick off the conference with our public lecture on marine microbiology. The lecture is appropriately held at the Maritime Museum on Darling Harbour and Professor Justin Seymour (USyd) and Associate Professor Diane McDougald will discuss the important roles of marine microorganisms in health and disease. Seymour will share his perspectives on our changing oceans and the microscopic life beneath the surface. McDougald's world-leading research on cholera has uncovered a surprising role of waterborne protozoa in transmission. Protozoa feed on cholera in the water



column, but far from reducing the burden of this deadly pathogen, it seems that ingestion increases survival and virulence.

Our marine microbiology theme continues during the conference with a plenary lecture from Associate Professor Rebecca Vega Thurber from the Oregon State University in the USA. Thurber has been at the forefront of coral and marine microbiome research for many years and has made seminal contributions to our understanding of how viral predators shape the microbiome of our reefs.

Keeping on our public engagement theme, we are pleased to have Professor Johnjoe McFadden join us from the University of Surrey, UK. McFadden has made many significant contributions to our understanding of *Mycobacterium tuberculosis* pathogenesis but is best known for his science communication work, where his commentaries have featured on news and radio.

This year our Rubbo Orator is Professor Jillian Banfield FRS FAA, who joins us from the University of California, Berkley, USA. Banfield is a geomicrobiologist who has advanced our understanding of the function of microbial communities in the soil. Banfield's work spans an impressive breadth of terrestrial microbiology, with recent notable contributions working with Nobel Laureate Professor Jennifer Doudna to understand the genetics of these communities and apply CRISPR gene editing to soil microbiomes.

Recent years have highlighted the important role of international organisations in coordinating medical aid and we are pleased that Dr Craig Spencer from Columbia University, USA, will be joining us for a plenary lecture. Spencer has been an active member of Doctors without Borders and has served on the board of directors. He has been involved in public health initiatives in Africa, East Asia, Burundi, Indonesia, and more recently working on the epidemiological response to Ebola in Guinea. Spencer's unique perspectives on public health during the pandemic will no doubt be enlightening.

The COVID-19 pandemic has impacted every person in Australia and we are likely to feel its effects for many years to come. This year we will be joined by a number of leading researchers and clinicians that have been working across COVID-19 epidemiology, policy development and fundamental research. The NSW Chief Health Officer, Dr Kerry Chant, will join us for a lunchtime seminar. Chant led the NSW response to COVID-19 and played a critical role in shaping policy during this challenging time. We are also joined by Professor Jodie McVernon from the Doherty Institute in Melbourne. McVernon contributed to the federal government's National Plan on COVID-19 and will discuss how we can anticipate and respond to COVID-19 in the future.

This year ASM has introduced a new award that recognises outstanding Australian microbiologists that are global leaders in their field and whose work has far-reaching impact beyond microbiology. This year the society will honour Professor Elizabeth Hartland, the Director and CEO of the Hudson Institute in Melbourne. Hartland works at the host–pathogen interface, where she has uncovered sophisticated molecular mechanisms used by bacterial pathogens to control host cells through the injection of a cocktail of 'effector' proteins.

With over 70 symposia presentations and more than 100 poster presentations, ASM 2022 will showcase the best of Australian microbiology and stimulate professional (and social) discussion. We have a series of social events — the Welcome Night, the Trade and Poster Night, and the Rubbo Celebration. The ASM 2022 organising committee is genuinely excited to welcome you to Sydney this July looking forward to the science and the discussions, and having fellow microbiologists enjoy ASM 2022 in Sydney.

ASN Events
www.asn.events

International Human Gene Therapy Conference

September 26–28, Melbourne

The aim of the 2022 Gene Forum is to bring together all the key stakeholders interested in genetics and gene therapy to share and discuss advances and developments in these fields. It is aimed at assisting academicians, business executives, researchers, scientists, manufacturers, gene therapy companies, communities and agencies to make new developments in their specific fields and to join forces in finding alternative solutions.

The agenda features a series of talks, poster presentations, panel discussions and networking events to keep participants engaged in learning. It brings together researchers from around the world to collaborate with industry to focus their efforts. The industry partners and attending experts should also provide a fantastic networking experience.

https://genetherapyconference.com/

2022 RACI National Congress
July 3–8, Brisbane
https://www.raci2022.com/

XAFS 2022 Hybrid
July 10–15, Sydney and online
https://xafs2022.org/

ASM 2022
July 11–14, Sydney and online
https://www.theasmmeeting.org.au/

AOGS2022 Virtual
August 1–5, online
https://www.asiaoceania.org/aogs2022/public.asp?page=home.asp

AMSA 2022
August 7–11, Cairns
https://www.amsa.asn.au/2022-cairns

National Science Week
August 13–21, Australia-wide
https://www.scienceweek.net.au/

Energy Oceania 2022
August 29–31, Melbourne
https://www.energyconferenceaustralia.com/

ASCIA 2022 Conference
August 31–September 2, Melbourne and online
https://ascia2022.com/

ComBio2022
September 27–30, Melbourne
https://www.combio.org.au/combio2022/

AACB 59th Annual Scientific Conference
October 18–20, Perth
https://aacb.eventsair.com/aacb-59th-annual-scientific-conference

ACTIVATE 2022
October 25–27, Sydney and online
https://atse.eventsair.com/activate-2022/

AusBiotech 2022
October 26–28, Perth
https://www.ausbiotech.org/events/event/AusBiotech2022

Australasian Cytometry Society Conference
November 20–23, Melbourne
https://cytometryconference.org.au/

Human Genetics Society of Australasia Annual Scientific Meeting
November 24–27, Perth
https://aacb.eventsair.com/hgsa-45th-annual-scientific-meeting

32nd International Congress of Antimicrobial Chemotherapy
November 27–30, Perth
http://32icc.org/

The International Microreaction Technology Conference
November 27–30, Melbourne
https://imret2022.com/IMRET2022/home/IMRET2022/Home.aspx

Materials Oceania 2022
December 5–8, Gold Coast
https://www.materialsconferenceaustralia.com

Australian Institute of Physics (AIP) Congress
December 11–16, Adelaide
https://aip-congress.org.au/

The 6th International Conference on Frontiers of Composite Materials
December 28–30, Melbourne
http://www.icfcm.org/

Lorne Proteins 2023
February 5–9, Lorne
https://www.lorneproteins.org/

Lorne Genome 2023
February 12–14, Lorne
https://www.lornegenome.org/

Australasian Exploration Geoscience Conference
March 13–18, Brisbane
https://2023.aegc.com.au/

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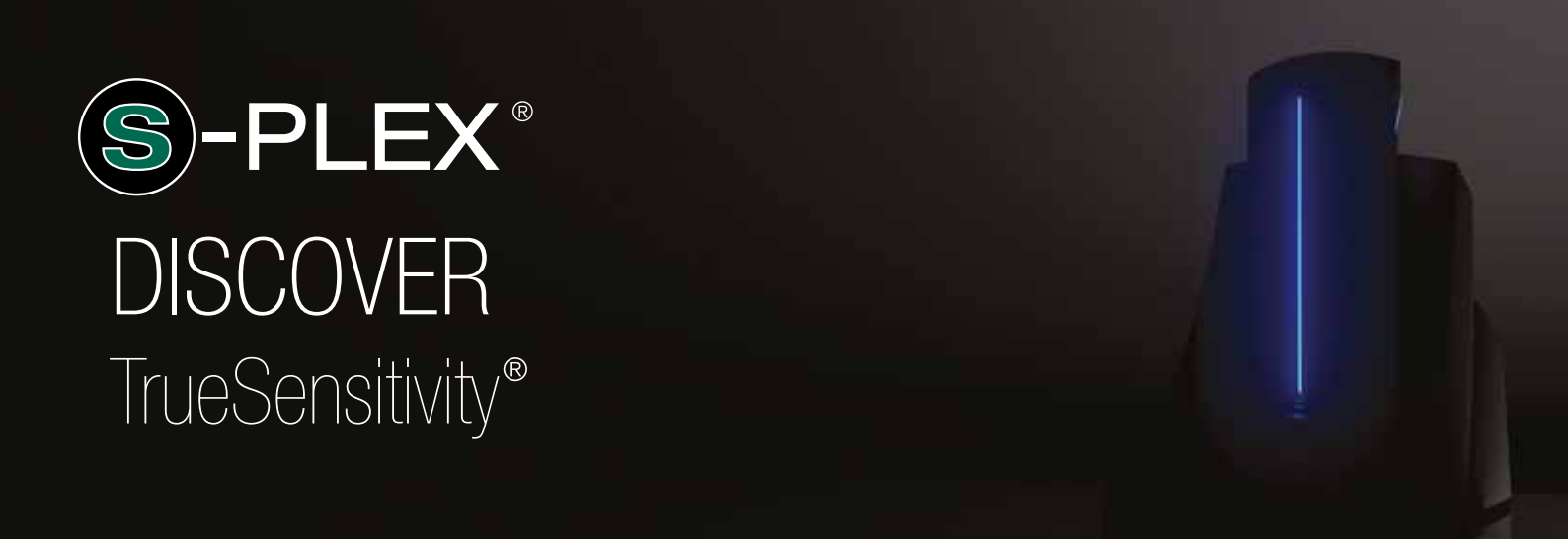

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IL-5	2.2
IL-22	2.2
TNF-α	6.8