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Was there (microbial) life on Mars?

At the time of writing, NASA's Ingenuity Mars Helicopter has just touched down on the surface of Mars, having been successfully deployed from the belly of the Perseverance rover — the largest, most advanced rover the agency has ever sent to another world. It's the latest milestone in an ambitious campaign to collect samples from the Red Planet and return them to Earth.

As you may recall, the rover officially touched down on Mars on the morning of 19 February, after a 203-day journey traversing 472 million km. About the size of a car, the robotic geologist and astrobiologist is on a two-year mission of Mars's Jezero Crater, which 3.5 billion years ago had its own river delta and was filled with water.

While the rover will investigate the rock and sediment of Jezero's ancient lakebed and river delta to characterise the region's geology and past climate, a fundamental part of its mission is astrobiology, including the search for signs of ancient microbial life. To that end, the Mars Sample Return campaign will allow scientists on Earth to study samples collected by Perseverance to search for definitive signs of past life, equipped with seven primary science instruments, the most cameras ever sent to Mars and a complex sample caching system — the first of its kind sent into space.

"The first pristine samples from carefully documented locations on another planet are another step closer to being returned to Earth," stated Thomas Zurbuchen, Associate Administrator for Science at NASA. "We don't know what these pristine samples from Mars will tell us. But what they could tell us is monumental — including that life might have once existed beyond Earth."

Of course ancient microbial life may not seem as interesting to some as the little green men of science fiction, but microorganisms have some fascinating abilities that we still don't fully understand. For example, US scientists have recently identified a strain of *E. coli* bacteria that, when living in the guts of female mice, causes them to neglect their offspring — see our story on page 13.

Elsewhere this issue, we highlight an experimental HIV vaccine which has produced promising results in a phase 1 clinical trial (page 18) and look through the lens of what is claimed to the smallest and cheapest high-resolution microscope to date (page 30). We also examine how the COVID-19 pandemic has encouraged innovation in different areas, including the fast-tracking of antibody development (page 38) and digital transformation in the life science industry (page 36).

Yes, the spectre of SARS-CoV-2 is regrettably still with us, spurred by a slower-than-expected vaccine rollout here in Australia and continued trepidation surrounding AstraZeneca's candidate, which has now been linked to very rare but serious cases of blood clotting. But the war against SARS-CoV-2 is being fought on multiple fronts, with vaccines just one part of the puzzle. Other weapons include a German-designed ventilation system, which filters the virus from ambient air before destroying it via cold combustion, and an Australian-developed nasal spray, designed to prime the immune system in the respiratory tract, which may also prove effective against rhinovirus.

Genuine protection against the common cold, you say? Now that's truly out of this world.

Regards,
Lauren Davis
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Lauren Davis

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Creating a genetic medicine manufacturing ecosystem

Peter Davis

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Recently the Australian Government announced the Medical Products National Manufacturing Priority road map[1]. This Modern Manufacturing Strategy (MMS) is to be led by industry to assist in scaling up, becoming more competitive and having more resilient supply chains.

One of the key areas identified is high value-add medicines, and it is this segment that can be utilised in creating a genetic medicine manufacturing ecosystem.

Why an ecosystem?

Australia has a proud history of world-class research, at times translating these findings into amazing medicines. We stand tall, wave the flag and laud such forays in global recognition and impact, citing how the latest eureka moment adds to notable achievements of years past from a relatively tiny nation punching above its weight with brilliant Nobel Laureates. Scientific endeavour requires talent, patience, time and funding — a whole lot of funding. Importantly, science of the future needs to coordinate a skill mix of brilliant minds from many disciplines coming together to develop solutions to the questions posed. The scientific tradition of sharing talent to the far corners of the planet may work in our favour in the current pandemic; however, attracting such people is easier when the environment is conducive to them. Indeed, Australia has amazing scientists, respected worldwide. We do have some cool infrastructure, but do we have an ecosystem?

Stem the brain drain

Building an ecosystem has benefits beyond the obvious protection of our IP: the creation of our own medicines morphs into vaccination security and helps the loss of our talent overseas. A recent survey[2] noted, "Although most respondents indicated a 'love of science', many also expressed an intention to leave their research position."

An ecosystem in this context can be defined as a complex network or interconnected system, building an industry with tangible employment across levels of opportunity.

This survey is a chilling read. It feels like these despondent researchers are leaving in droves or soon will be. The mantra is to promote STEM, get more women in STEM, so where are the jobs in STEM? Perhaps it is time to play this game smarter; to develop an industry in science. This is not just a smattering of research institutes around the country but a concerted approach to integrate an industry leveraging off the human capital we have, creating the capacity.

What would the ecosystem look like?

If Silicon Valley could be translated into Australia, we could create ecosystems in quantum computing, genetic medicines or any number of high-value industries. An ecosystem in this context can be defined as a complex network or interconnected system, building an industry with tangible employment across levels of opportunity. Much has been spoken about developing a facility to create the next vaccine, preparing for a future pandemic, and as the pharma companies line up to receive funding to build the infrastructure, I fear we will miss the golden opportunity this presents.

Scientific solutions to a challenge rarely are plucked from thin air; they require research and the environment to do this effectively. If we are at the precipice of dramatic funding for the manufacturing of medical products, let's be astute about this. If an ecosystem is to be developed in genetic medicine, there will likely be two main streams: R&D and manufacturing. These are not unrelated; indeed, they are inextricably linked with commonalty of raw materials, scientific IP and technology. To develop sovereign capacity, lessons learnt from this current pandemic must be observed. No number of iron-clad vaccine contracts from big pharma can protect the supply if the foreign government bans the export. Currently, there are global shortages of raw materials, basic laboratory products, value-added consumables such as mRNA, lipids and instrumentation. All this can be secured if a well-thought-out ecosystem is planned and executed — upstream from the actual production and downstream requirements such as fill and finish.

Will the ecosystem be profitable?

This depends on your definition of profitable. For some this is jobs, for others it is monetary wealth creation and for scientists, it is the translation of research into treatments for diseases. All of these have merit, especially if you include the opportunity this presents for our early-career researchers.

To be clear, a clever ecosystem can help with all manner of drug candidates: small molecules, peptides, siRNA and mRNA could easily create veterinary medicines as well. Starting a facility usually has a long wait for a result given the years of research, as well as preclinical and clinical trials. Currently researchers are moving to preclinical trial in desperate need to scale up their candidates, unable to afford the infrastructure to go it alone, forced to send it

offshore and at times losing their IP. Much of the final-stage development work is contracted out to companies again offshore. Ideally, it is well within the intellectual scope of Australian academia; we simply lack the necessary resources. There are possibilities for short-term successes.

Tapping into the untapped

The next wave of STEM students in high school is poised to have an advantage beyond a large portion of the world, given the COVID-19 impact on schooling worldwide. The effects of lockdown on the student population in Australia have been significant although we have been particularly fortunate in comparison to elsewhere, considering the US are still not going to school one year down the track. Add the opportunity to recruit to our ecosystem from a global pool anxious to move out of lockdown to clean and green Australia, and this is a substantial opportunity.

The ANZAC collaboration

Australia and New Zealand share many things, compete with passion and collaborate when necessity dictates. There are strategic and cooperative advantages in extending alliances with our close neighbours. The scientific community already has close relationships, and presents readiness to create an mRNA vaccine for both these countries. A quick stocktake of capabilities proves to illuminate the value in working together on this; it is a symbiosis well worth the investment.

There are strategic and cooperative advantages in extending alliances with our close neighbours.

Where to start

Behind the scenes, a group of scientists scattered around Australia have formed an alliance. This is a formidable bunch of professors from an array of disciplines recruited for their skill mix to create a genetic medicine facility in Australia. They are 'the real deal' — passionate about the science, keen to make a difference for Australia, agnostic to where it will be, they just want it to happen! The group is the Australian RNA Production Consortium (ARPC). Collectively, they have deep expertise in the biology, chemistry, manufacture and use of RNA medicines. ARPC was formed in mid-2020 and has since made submissions to government at various levels, consulting to government consultants in the hope one day this dream will become a reality and these consultants are not simply paying lip service to the ecosystem. Now what is needed is both levels of government and industry/venture capital to back these efforts of the ARPC and fund a new and dynamic ecosystem in genetic medicines. The opportunity is there — we just have to be bold and grasp it with both hands.

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2. Research Culture: A survey of early-career researchers in Australia. Christian, Johnstone et al. https://elifesciences.org/articles/60613

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Oral ketamine can be used to reduce chronic suicidality

Researchers from the University of the Sunshine Coast (USC) have found that oral doses of ketamine administered in a clinical setting can provide a rapid-acting treatment for chronic suicidality. Their study has been published in the journal *Translational Psychiatry*.

Antidepressant medications are a common treatment for suicidality but can have significant limitations for some patients. Ketamine, meanwhile, has been shown to influence the firing of the brain, turning uncoordinated and overactive brain networks into ordered and precise networks that function more effectively.

The study from USC's Thompson Institute showed that within the first six weeks of treatment, 69% of participants achieved a clinical reduction in suicide ideation — and half of participants still noted significant improvement four weeks after treatment had ceased. Principal investigator Dr Adem Can said patients experienced "a significant reduction in suicide ideation, from a high level before the trial to below the clinical threshold by week six of the trial".

"In medicine this response rate is significant, particularly given it was experienced by patients with chronic suicidality, which can be difficult to treat," he said.

"These patients had lived with suicidality for a very long time and presented a range of psychiatric conditions, including mood, anxiety and personality disorders, and many of them had lost hope of recovery."

Dr Can said the study successes were consistent with those shown in intravenous ketamine trials, in which the ketamine was administered by injection, typically in a hospital setting. "Intravenous administration, however, is invasive, expensive and carries a higher chance of adverse reactions due to its injection straight into the blood stream," he said. "So logistically it is a lot easier and faster to clinically administer an oral dose."

USC Thompson Institute Director and study supervisor Professor Jim Lagopoulos has been studying the potential therapeutic benefits of ketamine for 20 years, and said the findings were an exciting development.

"The longer you have a particular condition, the more resistant it can become to treatment," Prof Lagopoulos said.

"We also had a very complex group of patients with a variety of conditions such as depression, anxiety, borderline personality disorder — all factors that can increase your potential for suicidality — yet the treatment still worked across the group.

"This means the trial group was representative of the community we are serving, where suicidality is often accompanied by one or more other conditions. So results like these across the spectrum are very encouraging."

New strain of deadly Hendra virus discovered

The Australian veterinarian-led research project 'Horses as Sentinels' has identified a new strain of the deadly Hendra virus as the cause of a previously unexplained horse death in September 2015.

Hendra virus (HeV) is highly lethal in both horses and humans, with mortality rates approximately 79% and 60% respectively. The originally recognised strain of Hendra virus has resulted in the deaths of four humans and over 100 horses in Australia since it was first identified in 1994, when racehorse trainer Vic Rail and 13 racehorses in Hendra, Queensland, died after suffering a pneumonia-like illness.

The newly recognised variant has not been detected previously by routine biosecurity testing in horses; it was, however, detected in grey-headed flying fox samples from Adelaide in 2013 and found to share ~99% sequence identity with the 2015 horse case strain. Partial sequences of the variant have also been detected in flying foxes in other states.

Grey-headed flying foxes migrate and their range includes parts of southern Australia, which previous advice classed as low risk — with some interpreting this to mean negligible risk of Hendra virus spillover. Up until now, the original strain of Hendra virus has only been known to occur within the range of black flying foxes and spectacled flying foxes.

The findings indicate that HeV should be considered as a differential diagnosis in unvaccinated horses anywhere in Australia that flying foxes are present, and that unwell, suspect horses that return an initial negative Hendra virus test should continue to be treated with the same caution as a Hendra virus positive case, until testing for the new variant is performed.

The research team has developed updated diagnostic laboratory techniques capable of identifying the new strain, and will be sharing them with relevant laboratories. They have also established that the current Hendra virus horse vaccine is expected to be equally effective against the new strain.

On top of vaccination, there are a number of measures that people who work closely with horses can take to reduce the risk of infection with HeV and other viruses, including good biosecurity, use of personal protective equipment and good hygiene. It is also recommended that veterinarians, horse owners and handlers review their Hendra virus management plans.

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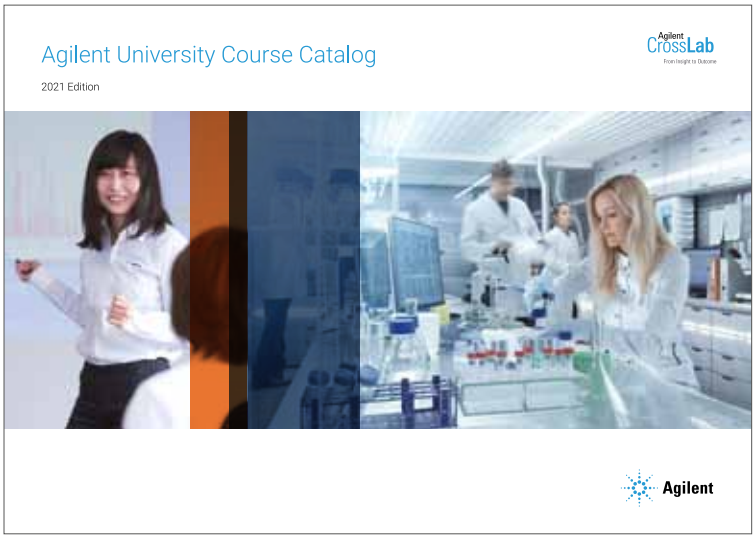

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Monitoring microbes with handheld DNA sequencers

Researchers from the Teagasc Food Research Centre and APC Microbiome Ireland have tested handheld DNA sequencers as a routine microbial monitoring solution for food production facilities, finding that they have key advantages in ease of use and in identifying a broad variety of bacteria. Their study has been published in *npj Science of Food*.

Microbes can cause food spoilage and disease, so routine checks on the microbial life in food production facilities is a necessity. However, current techniques to achieve this, while tried and tested, have some limitations.

"Microbiology testing in the food chain has, and continues to, rely on older, classical microbiology testing such as the use of agar and Petri dishes," said senior study author Professor Paul Cotter, from the Teagasc Food Research Centre and APC Microbiome Ireland. "This is a time-consuming approach and only microorganisms that are being specifically tested for are identified."

DNA sequencing offers an alternative. Instead of culturing bacterial samples in petri dishes, it can rapidly analyse bacterial DNA and identify the species in a sample. The problem is that conventional DNA sequencing involves expensive lab-based equipment and only highly trained lab technicians can perform the procedure and analyse the results, which isn't ideal for routine microbial surveillance in busy food production facilities.

A newer technology offers rapid DNA sequencing with an easy-to-use handheld device, but no one had tested its potential in food production — until now. Prof Cotter and colleagues, led by Teagasc's Dr Aoife McHugh, set out to investigate how such portable sequencing technology would compare with lab-based sequencing, using swab samples from a working dairy facility.

Strikingly, the handheld device proved to be similar to the larger lab-based sequencing system in terms of the number of bacterial species it could identify in the samples, suggesting it has potential as a routine monitoring device in food production. However, the small device requires a minimum amount of DNA before it can function correctly, and in the well-cleaned dairy facility there simply weren't enough bacteria in many of the samples. The researchers therefore had to perform an extra step to amplify the bacterial DNA before there was enough to analyse; further developments with the technology may help to overcome this minor hurdle.

"This study represents a key step towards a day when non-experts can use DNA sequencing tools to carry out microbiology testing in the food chain," said Prof Cotter.

Holidays have restorative effects on shift workers' DNA

Finnish researchers have revealed that resting during a holiday period restores functions associated with DNA regulation in shift workers suffering from sleep deprivation. Published in the journal *Scientific Reports*, their work provides new insight into the molecular biological mechanisms set in motion by sleep deprivation which underlie related adverse health effects.

The researchers from the University of Helsinki, the Finnish Institute for Health and Welfare, the Finnish Institute of Occupational Health and the Finnair airline set out to investigate dynamic changes to DNA methylation in shift workers. DNA methylation denotes epigenetic regulation that modifies gene function and regulates gene activity without changing the sequence of bases in the DNA.

While methylation is connected with our surroundings, more research is needed on how the environment affects epigenetic regulation and gene function. The Finnish research provides new information on both DNA methylation and the biological processes that have an impact on a sleep disorder related to shift work (shift work disorder, or SWD).

A total of 32 shift workers participated in the study, of whom 21 suffered from shift work disorder and 11 were in the control group. Dynamic changes to DNA methylation were investigated through a genome-wide analysis during work and after a holiday period.

Changes to DNA methylation which affected gene function were identified in study subjects suffering from a sleep disorder caused by shift work. The findings demonstrated that rest and recovery during holiday periods also resulted in the restoration of DNA methylation in cases where changes had been observed during the work period.

The study proved the dynamic nature of DNA methylation, which was particularly emphasised in the activity of NMDA glutamate receptors. The strongest evidence was gained from the GRIN2C receptor: the methylation level of a specific CpG base pair in the regulatory region was lower during the work period in subjects suffering from shift work disorder. However, this change was reversed after the holiday period.

"Based on the results, we can deduce that changes to the DNA methylation of white blood cells are associated with shift work disorder," said doctoral student Alexandra Lahtinen, MSc, from the University of Helsinki. "These changes, such as low methylation levels observed during the work period, are probably linked to sleep deprivation and related inflammatory consequences which DNA changes may mediate."

Gut bacteria prompt mother mice to neglect their pups

As scientists learn more about the microorganisms that colonise the body — collectively called the microbiota — one area of intense interest is the effect that these microbes can have on the brain. Now scientists from the Salk Institute for Biological Studies have identified a strain of ***E. coli*** bacteria that, when living in the guts of female mice, causes them to neglect their offspring.

The team's findings, published in the journal *Science Advances*, show a direct link between a particular microbe and maternal behaviour. Although the research was done in mice, it adds to the growing body of science demonstrating that microbes in the gut are important for brain health and can affect development and behaviour.

The ways in which the microbiota can impact mental health and neurological disorders is a growing area of research. The makeup of the gut microbiota in people has been linked to depression, anxiety, autism and other conditions. But it has been difficult to study how individual strains of bacteria exert their influence on human behaviour, a connection often called the microbiota–gut–brain axis.

Professor Janelle Ayres, Head of Salk's Molecular and Systems Physiology Laboratory and senior author on the study, uses mice to study how body systems and the brain interact with each other to promote health. This includes focusing on how body processes are regulated by microbes and the ways in which microbes affect growth and behaviour.

In recent experiments, Prof Ayres and her team were investigating groups of mice that each had a single strain of *E. coli* in their gut. Mice with one particular strain of *E. coli*, called O16:H48 MG1655, mothered offspring that had stunted growth. Further examination revealed that the mice were smaller because they were malnourished.

"We found that the pups' behaviour was normal, and the milk made by the mothers was of normal, healthy composition and was being produced in normal amounts," Prof Ayres said. "We eventually figured out that being colonised with this particular bacteria led to poor maternal behaviour. The mice were neglecting their pups."

Additional experiments revealed that the mice could be rescued from stunted growth, either by giving them a growth factor called IGF-1 or handing them off to foster mouse mothers that could take care of them properly. This confirmed that the cause of stunted growth was coming from the mothers' behaviour rather than something in the pups themselves.

"To our knowledge, this is the first demonstration that the intestinal microbiota is important for promoting healthy maternal behaviour and bonding between mom and offspring in an animal model," Prof Ayres said. "It adds to the ever-growing evidence that there's a gut–brain connection, and that microbes are important for regulating the behaviour of the host that they're inhabiting."

"Our study provides an unprecedented understanding of how the intestinal microbiota can disrupt maternal behaviour and how this can negatively impact development of an offspring," added first author Yujung Michelle Lee, a former graduate student in Prof Ayres' lab and now a postdoctoral fellow at biotech company Genentech. "It is very interesting to me that establishment of a healthy mother–infant relationship is driven by factors beyond hormones, and that the microorganisms residing in our bodies play a significant role in it."

Prof Ayres and her team plan to study how the O16:H48 MG1655 strain — which has been found in human guts and was previously believed to have no positive or negative effects — provokes changes in mouse behaviour. Early findings suggest the bacteria might be affecting levels of serotonin, the hormone associated with feelings of happiness and wellbeing, but more work is needed.

"It's very hard to study these relationships in humans, because the human microbiota contains hundreds of different species of microorganisms," Prof Ayres said. "But once we understand more about the mechanisms in animal models, we may be able to translate our findings to humans to determine whether the microbes and their effects might be the same."

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SARS-CoV-2 PCR workflow

Retailers and producers are increasingly looking for laboratory tests that can help them control the efficiency of the sanitation processes and barriers procedures. The Thermo Scientific SARS-CoV-2 PCR Workflow for food packaging and environmental surfaces is a complete end-to-end workflow, encompassing sampling, sample preparation and detection. It can deliver results in as little as 3 h, quickly providing users with the information they need to manage any potential surface or packaging contamination risks.

The test, which has been performance tested and validated by AOAC International for qualitative detection of the virus on environmental surfaces, includes three TaqMan RT-PCR assays to target SARS-CoV-2 (ORF1ab, N-gene, S-gene) genes and one positive control assay, targeting the Human RNase P RPPH1 gene offering both high specificity and sensitivity. Because of the multi-target design of this assay, overall test sensitivity should not be impacted by the recent SARS-CoV-2 strain lineage (B.1.1.7 variant).

The test targets three different viral genomic regions — ORF1ab, N-gene and S-gene — reducing the risk of false negatives. Extensive bioinformatic selection and analysis has been undertaken to specifically target sequences that are unique to SARS-CoV-2. The RNase P assay is run in duplex with the combined 2019-nCoV assays as an internal positive control.

The workflow can be run on the Applied Biosystems 7500 Fast Real-Time PCR System or the Applied Biosystems QuantStudio 5 Real-Time PCR System, which many food and environmental testing labs are used to working with. Both instruments are also suitable for the company's complete portfolio of PCR tests for food pathogens and environmental samples, biothreat organisms, animal species identification and GMO testing.

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Biological microscope

Nikon has announced the release of the Eclipse Si biological microscope, with intelligent time-saving features, an automatic shut-off mode and an ergonomic design to reduce the physical strain that can occur with prolonged microscope use.

The Eclipse Si has intelligent features such as a Light Intensity Management function which reduces the time spent on adjusting the light intensity when changing magnifications. The ergonomic design of the product, including a tube featuring a 45° inclination angle and a low stage height, should ensure that users maintain a natural posture. The device is designed to improve the workflow for a wide range of users, helping them to stay focused during long hours of observations.

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Confocal imaging reader

BioTek Instruments has released the Cytation C10 Confocal Imaging Reader. The versatile and multifunctional automated system is suitable for research laboratories and core facilities looking to increase productivity while reaping high-quality qualitative and quantitative data to support cell-based research.

The compact device combines automated digital confocal and widefield microscopy with conventional multimode microplate reading in a unique, patented design. Spinning disk confocal capabilities offer high image resolution and optical sectioning for a variety of sample types, including 3D cell cultures and thick tissue sections.

High-quality components, such as a Hamamatsu scientific CMOS (sCMOS) camera, Olympus objectives and laser-based illumination, support publication-ready images. With its modular design, the product may be upgraded at any time as laboratory needs evolve. Additional imaging modes include widefield fluorescence, brightfield and phase contrast optics. Assay versatility is further expanded with variable bandwidth monochromator-based optics for detection-based applications and environmental controls for long-term live cell imaging analysis.

The product is powered by Gen5 software, offering a 3D viewer and automated ROI functionality among other powerful processing and analysis features.

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Antibody affinity and concentration in undiluted serum

The emergence of mutant variants of SARS-CoV-2 and associated concerns about the effects of these mutations on the efficacy of vaccines and therapeutics has underscored the vital importance of understanding the antibody response to SARS-CoV-2.

Using the Fluidity One-W, measurements to determine the affinity, concentration and neutralisation potential of antibodies can be performed directly in human serum. In the recent paper 'In vitro measurements of protein–protein interactions show that antibody affinity governs the inhibition of SARS-CoV-2 spike/ACE2 binding in convalescent serum' the capabilities of the Fluidity One-W serum platform were shown.

The product offers an in-solution, receptor-binding competition assay that quantifies the affinity, concentration and neutralisation potential of antibodies against the SARS-CoV-2 spike protein. The platform has the ability to quantitatively profile the underlying protein interactions directly in serum.

Scientists who would like to book a trial, to see how the capabilities of the Fluidity One-W serum can support their research, can do so by contacting ATA Scientific.

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Cool room/controlled-temperature room services

Many moulds and bacteria thrive in a moist environment, even at 4°C. Each time the cool room door is opened, warm, relatively moist air is drawn into the cool room, further fuelling the cool room's total moisture content. This results in the closed, cool room operating at a relative humidity of 80–100%. When this is added to a high organic source load in the cool room, an ideal environment exists for mould and bacteria growth.

Cool rooms are often forgotten in a laboratory environment. They are communal areas that most staff use, but no one person is assigned ownership of the site. Facility managers often have the responsibility for cool room plant maintenance but are justifiably reluctant to interfere with staff samples stored in the area, sometimes for excessive lengths of time. A challenging situation may lead to severe cross-contamination of precious samples or pose a health risk to staff using the cool room.

Biosafety can assist as the company integrates the entire process for all involved. Biosafety follows IICRC S520 Mould Guidelines and Australian Standards to clean and disinfect the cool rooms. This should result in minimised cross-contamination of essential samples, increased efficiency and, most importantly, protection of staff from exposure to mould and spores.

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Automated workstation

Beckman Coulter Life Sciences introduces the Biomek i7 Automated Workstation, an automated NGS solution that can be used to accelerate genomic research.

The Illumina TruSeq Exome Library Prep Kit is a workflow to generate indexed paired-end libraries and is specially designed to work with formalin-fixed, paraffin-embedded (FFPE) samples. Solid-phase reversible immobilisation (SPRI) bead chemistry is utilised throughout the protocol for size selection and sample clean-up steps. The process can be laborious and error-prone, and is therefore suitable for Biomek automation.

Choose from low- to high-throughput Biomek liquid handling workstations to automate all steps of the workflow, providing the option for a complete walkaway solution. The methods have been shown to deliver sequence-ready libraries through demonstrated performance using scientifically relevant samples. The ready-to-implement methods are compatible with Illumina TruSeq Exome Library Prep Kits (Illumina P/N FC-150-001, FC-150-002 or FC-150-003).

This application is automated on multiple Biomek workstations and is designed to provide: standardised workflow for improved results; reduction in costly errors; reduced hands-on time and increased throughput; quick implementation with ready-to-implement methods available delivered by knowledgeable support teams.

Beckman Coulter Australia
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DreamPrep™ NGS.

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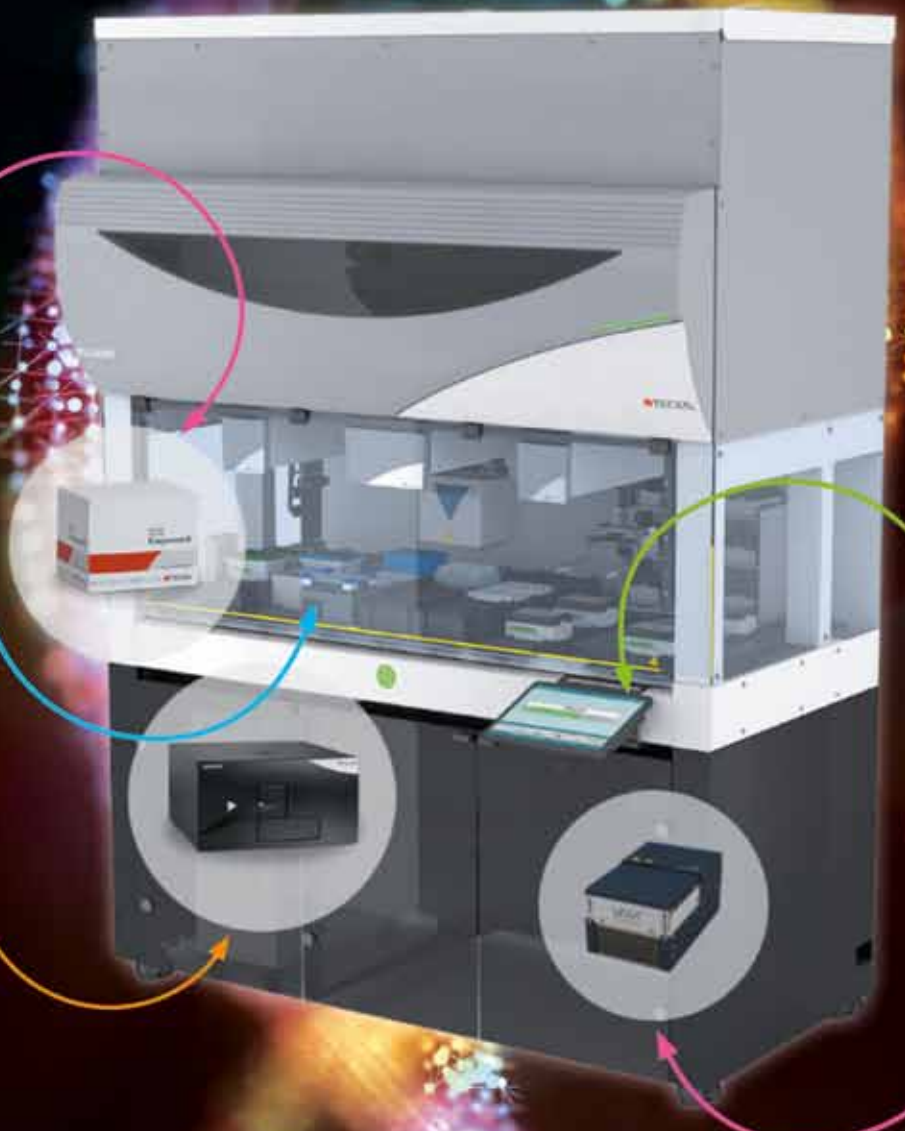

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INTEGRATED PLATE READER for full walk away QC and normalization

THERMAL CYLER INCLUDED for longer walk away times

https://lifesciences.tecan.com/dreamprepngs

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Example methods have not been validated. Please make a copy of this method in order to customize it to accommodate and validate your workflow according to your desired intended use and laboratory protocols. Tecan makes no claims regarding the performance of the example methods.

TECAN.

Lauren Davis

Experimental HIV vaccine trialled in humans

Researchers from IAVI and Scripps Research have developed a novel vaccine approach to prevent HIV which has produced promising results in a phase 1 clinical trial. It's a bold claim to make, given that HIV is known to be among the most difficult viruses to target with a vaccine — in large part because it constantly evolves into different strains to evade the immune system.

For decades now, HIV researchers have pursued the Holy Grail of stimulating the immune system to create rare but powerful antibodies that can neutralise diverse strains of HIV. Known as 'broadly neutralising antibodies', or bnAbs, these specialised blood proteins could attach to HIV spikes, proteins on the virion surface that allow the virus to enter human cells, and disable them via important yet difficult-to-access regions that don't vary much from strain to strain.

"We and others postulated many years ago that in order to induce bnAbs, you must start the process by triggering the right B cells — cells that have special properties giving them potential to develop into bnAb-secreting cells," said Professor William Schief, an immunologist at Scripps Research and Executive Director of Vaccine Design at IAVI's Neutralizing Antibody Center.

"In this trial, the targeted cells were only about one in a million of all naïve B cells. To get the right antibody response, we first need to prime the right B cells."

The strategy of targeting naïve B cells with specific properties is called 'germline targeting', as these young B cells display antibodies encoded by unmutated or 'germline' genes. The priming step would be the first stage of a multistep vaccine regimen aimed at eliciting many different types of bnAbs, Prof Schief said.

The trial

The clinical trial, IAVI G001, was sponsored by IAVI and took place at two sites: The George Washington University in Washington, DC, and the Fred Hutchinson Cancer Research Center (Fred Hutch) in Seattle, enrolling 48 healthy adult volunteers. Participants received either a placebo or two doses of the vaccine compound, eOD-GT8 60mer, along with an adjuvant developed by pharmaceutical company GSK.

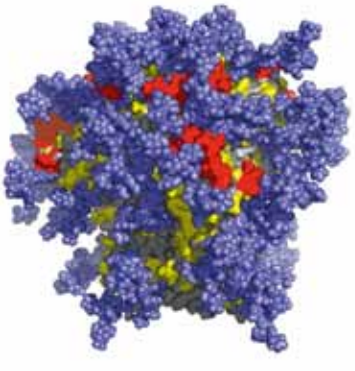
The vaccine showed success in stimulating production of rare B cells needed to start the process of generating antibodies against the fast-mutating virus; the targeted response was detected in 97% of participants who received the vaccine. Prof Schief presented the results on behalf of the study team at the International AIDS Society's HIV Research for Prevention (HIVR4P) virtual conference in February 2021.

"This study demonstrates proof of principle for a new vaccine concept for HIV — a concept that could be applied to other pathogens as well," Prof Schief said. "With our many collaborators on the study team, we showed that vaccines can be designed to stimulate rare immune cells with specific properties, and this targeted stimulation can be very efficient

in humans. We believe this approach will be key to making an HIV vaccine and possibly important for making vaccines against other pathogens."

"This is a landmark study in the HIV vaccine field, demonstrating success in the first step of a pathway to induce broad neutralising antibodies against HIV-1," added Dr Julie McElrath, Senior Vice President and Director of Fred Hutch's Vaccine and Infectious Disease Division, who served as lead investigator at the Fred Hutch trial site.

"The novel design of the immunogen, the clinical trial and the molecular B cell analyses provide a roadmap to accelerate further progress toward an HIV vaccine."



A computer image of HIV's outermost layer, densely coated with sugar molecules (purple) that do not trigger an immune response. Most of the surface not covered in sugars (in red and yellow) is highly variable, making it difficult for the immune system to generate antibodies capable of neutralising the virus. Image credit: Sergey Menis, IAVI.

HIV and beyond

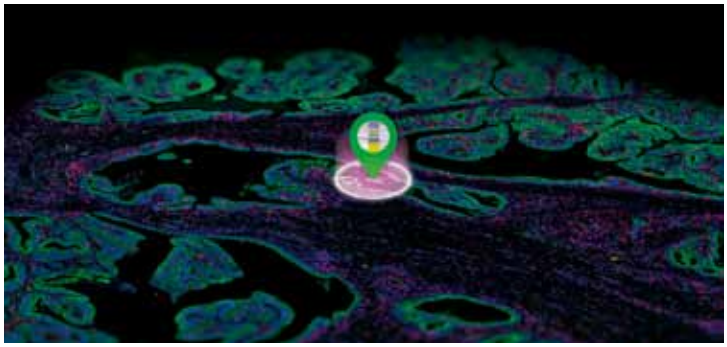
The study sets the stage for additional clinical trials that will seek to refine and extend the approach — with the long-term goal of creating a safe and effective HIV vaccine. As a next step, IAVI and Scripps Research are partnering with biotechnology company Moderna to develop and test an mRNA-based vaccine that harnesses the approach to produce the same beneficial immune cells. Using mRNA technology could significantly accelerate the pace of HIV vaccine development.

"Given the urgent need for an HIV vaccine to rein in the global epidemic, we think these results will have broad implications for HIV vaccine researchers as they decide which scientific directions to pursue," said Dr Mark Feinberg, President and CEO of IAVI. "The collaboration among individuals and institutions that made this important and exceptionally complex clinical trial so successful will be tremendously enabling to accelerate future HIV vaccine research."

Beyond HIV, the researchers believe the germline-targeting approach could be applied to vaccines for other challenging pathogens such as influenza, dengue, Zika, hepatitis C viruses and malaria.

"This is a tremendous achievement for vaccine science as a whole," said Professor Dennis Burton, Chair of the Department of Immunology and Microbiology at Scripps Research, Scientific Director of the IAVI Neutralizing Antibody Center and Director of the NIH Consortium for HIV/AIDS Vaccine Development.

"This clinical trial has shown that we can drive immune responses in predictable ways to make new and better vaccines, and not just for HIV. We believe this type of vaccine engineering can be applied more broadly, bringing about a new day in vaccinology."



Human protein assays

NanoString has expanded high-plex protein assay support from tens to now hundreds of validated proteins to be analysed from a single tissue section with spatial resolution on the GeoMx Digital Spatial Profiler (DSP) instrument. This breakthrough is made possible by harnessing Illumina next-generation sequencing (NGS) readout, enabling multi-analyte (RNA and protein) analysis for both nCounter and NGS readout.

Users select any particular cells of interest using the GeoMx microscope and quantify the protein or RNA molecules those cells express with digital precision. The NGS readout protein assays have been tested for multi-plex performance on both formalin-fixed paraffin embedded (FFPE) and fresh frozen (FF) tissue. Proteins are targeted using antibody conjugation and assays are configurable by ordering pre-optimised antibody sets in mix-and-match modules of ~10 functionally related proteins each.

Currently available content covers applications in immuno-oncology and future content releases will cover immunology and neuroscience. Custom-barcoded antibodies from NanoString or Abcam can also be spiked into the high-plex assays to further increase the targeting potential of the system.

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

RT-qPCR system

GeneCopoeia's CytoCt RT-qPCR System enables users to analyse gene expression by real-time RT-qPCR directly from 10–100,000 cultured cells either in tubes or 96-well plates without any RNA purification, providing high levels of convenience, speed, throughput and sensitivity.

RNA is traditionally extracted and purified from cultured cells before gene expression quantification and profiling analysis by RT-qPCR assays. The CytoCt RT-qPCR System skips the RNA extraction step and prepares cell lysates directly from cells cultured in 96-well plates or other formats.

Gene expression analysis can be completed in about 90 min using a cell lysis buffer followed by either a two-step or a one-step RT-qPCR workflow. The system includes CytoCt Cell Lysis kits, CytoCt cDNA Synthesis kits and CytoCt One-Step RT-qPCR kits.

The product provides robust performance with system optimisation from cell lysis to RT-qPCR reactions.

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

Air restriction pipettor option

Tecan has expanded the range of pipetting options for its Cavro Magni Flex OEM liquid handling framework with the creation of the Air Restriction Pipettor (ARP). Complementing the existing liquid displacement option based on the Cavro Pulssar PBC Pump, the option is suited to molecular biology, immunoassay and genomics applications — including molecular diagnostics — increasing the potential range of applications for a versatile development platform.

The modular and scalable Magni Flex is useful for instrument development applications, with a range of sizes and options to match the needs of specific workflows. By offering a choice of liquid or air displacement pipetting using fixed or disposable tips, Tecan has now further extended the versatility of the OEM development platform. ARP Technology provides a broad volume range — from 1 µL up to 5 mL — for two, four or eight independent pipetting channels with variable tip spacing capabilities. It uses built-in temperature and pressure sensors to automatically adjust to varying liquid viscosities and types, as well as atmospheric conditions, to ensure reproducible liquid transfers.

Combined with MAPlinx Software, a powerful tool to streamline and simplify instrument development, the platform provides a versatile solution for the automation of liquid-handling workflows.

Tecan Australia
www.tecan.com

SPONSORED CONTENT

Enabling new levels of quantification

Using the SCIEX Triple Quad™ 7500 LC-MS/MS System – QTRAP® Ready, powered by SCIEX OS Software

The ability to achieve high levels of sensitivity while retaining quantitative performance is key to achieving robust analytical results.

The growing number of demanding workflows requiring reliable quantification of more analytes per assay, in increasingly complex matrices, highlights the need for a sensitive MS instrument capable of providing the high level of performance that can meet these analytical challenges while providing the highest levels of robustness. The SCIEX Triple Quad™ 7500 LC-MS/MS System – QTRAP® Ready is enabling new levels of quantification across a large suite of sample types and workflows. The greater sensitivity is achieved through the introduction of hardware features that enable significant gains in the generation, capture and transmission of ions including the OptiFlow® Pro Ion Source (1 µL/min to 3 mL/min), D Jet™ Ion Guide and E Lens™ Technology.[1,2,3]

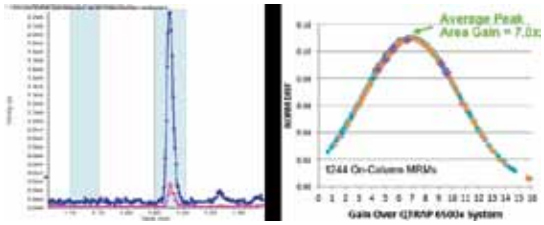


Figure 1: Sensitivity gains for SCIEX 7500 System over QTRAP 6500+ System. Large numbers of analytes were run in various matrices on both systems and the peak areas and S/N gains were measured. (Left) Example data from propranolol in rat plasma, area gain of 9x with S/N gain of 3x. (Right) Summary of comparison of 1244 MRMs in positive and negative mode across 10 studies (pesticides, drugs, peptides), average peak area gain across the compounds was 7x.

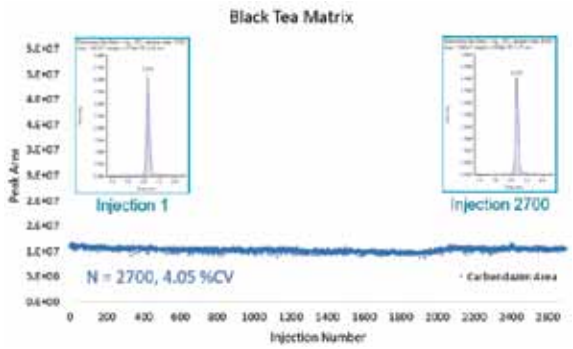


Figure 2: High robustness observed across 2700 injections. To test robustness, many injections were performed using a very complex matrix (black tea dosed with carbendazim) using a short 4 min LC gradient at 400 µL/min. The raw peak area of carbendazim was then plotted vs. injection number and the variance across these peak areas was computed to be 4.05% for 2700 injections.

Key innovations in the SCIEX Triple Quad 7500 System – QTRAP Ready

- D Jet Ion Guide — improved ion capture and transmission, combined with an orifice with increased sampling area for increased ion sampling, resulting in greater sensitivity
- E Lens Technology — improved ion generation through more energetic ESI droplet desolvation and more efficient ion collection
- OptiFlow Pro Ion Source — designed for robustness and ruggedness with modular architecture to future proof the lab
- QTRAP ready[4] — triple quadrupole functionality for quantification, plus full scan linear ion trap MS/MS for confirmation and MRM[3] for selectivity[5]
- Detection system with high energy dynode and pulse counting detector — fast polarity switching (5 msec) and up to 6 orders of magnitude across the linear dynamic range
- SCIEX OS Software — designed for intuitive and streamlined data acquisition and data processing, all on one single platform[6]

Figure 3: D Jet Ion Guide – improved ion capture and transmission, combined with an orifice with increased sampling area for increased ion sampling, resulting in greater sensitivity.

For more information: https://sciex.li/SCIEX7500.

References

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2. Highly sensitive pesticide analysis in baby food. RUO-MKT-02-11958-A.
3. High Sensitivity Peptide Quantification Workflow. RUO-MKT-02-11882-A.
4. Powerful scan modes of QTRAP® system technology. RUO-MKT-02-8611-A.
5. MRM³ quantitation for highest selectivity in complex matrices. RUO-MKT-02-2739-A.
6. SCIEX OS Software: Transform your samples into meaningful analytical answers

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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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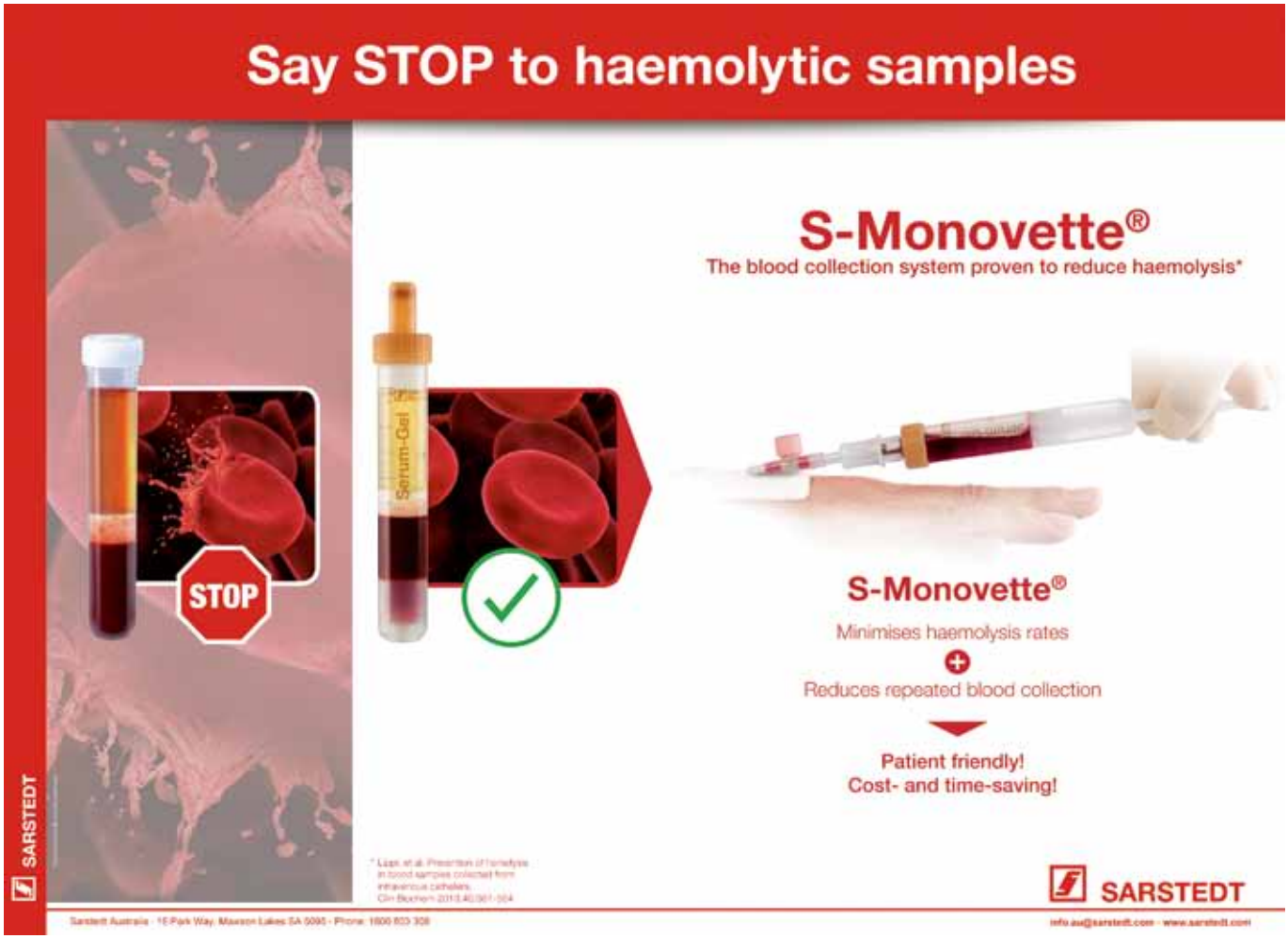

Early human embryo models generated from skin cells

An international team of scientists led by Melbourne's Monash University has generated a model of a human embryo from skin cells — a breakthrough that is expected to revolutionise research into the causes of early miscarriage, infertility and the study of early human development. Their work has been published in the journal *Nature*.

A few days after an egg has been fertilised, it develops into a blastocyst. This is a spherical structure made up of an outer layer of cells surrounding a fluid-filled cavity that contains a mass of embryonic cells. However, our understanding of early human embryonic development has been limited by a lack of appropriate models. Human blastocysts donated to research following IVF have provided insights, but their availability and use is limited. Mouse blastocyst-like structures called blastoids have meanwhile been produced in the laboratory, modelling several aspects of early development in mice, but the generation of similar blastoids from human cells has not previously been reported.

A team led by Professor Jose Polo, from the Monash Biomedicine Discovery Institute and the Australian Regenerative Medicine Institute, has now reprogrammed human fibroblasts — the main cell type found in connective tissue — to produce three-dimensional models of the human blastocyst in the laboratory, which they called 'iBlastoids' (induced blastoids). The scientists found that iBlastoids model the overall architecture of blastocysts and are capable of giving rise to pluripotent and trophoblast stem cells. They were also able to model several aspects of the early stage of implantation. They note, however, that an iBlastoid should not be considered as an equivalent to a human blastocyst, as it is not generated using an egg or sperm and has limited ability to develop beyond the first few days.

The Polo Lab succeeded in generating the iBlastoids using a technique called 'nuclear reprogramming', which allowed them to change the cellular identity of human skin cells that — when placed in a 3D 'jelly' scaffold known as an extracellular matrix — organised themselves into blastocyst-like structures. Jia Ping Tan, a PhD student in the Polo Lab and co-first author on the study, said, "We are really amazed to discover skin cells can be reprogrammed into these 3D cellular structures resembling the blastocyst."

iBlastoids are morphologically and molecularly similar to human blastocysts, modelling their overall genetics and architecture — including an inner cell mass-like structure made up of epiblast-like cells, surrounded by an outer layer of trophectoderm-like cells and a cavity resembling the blastocoel. In human embryos the epiblast goes on to develop into the embryo proper, while the trophectoderm becomes the placenta.

"iBlastoids are not completely identical to a blastocyst," Prof Polo noted. "For example, early blastocysts are enclosed within the zone pellucida, a membrane derived from the egg that interacts with sperm during the fertilisation process and later disappears. As iBlastoids are derived from adult fibroblasts, they do not possess a zona pellucida."

With the ability to model the biology of early human embryos in the laboratory, without the use of actual embryos, iBlastoids should provide a significant breakthrough for the future study of early human development, including infertility and miscarriage. Some miscarriages can be caused by early-stage human embryos failing to implant or failing to progress at the time of implantation; a process that takes place in the first two weeks after conception, when women do not even know they are pregnant. These 'silent' miscarriages are likely to represent a significant proportion of the total number of miscarriages that occur.

According to Prof Polo, the generation of iBlastoids provides a model system that will enable insights into this early stage of pregnancy. In the past, the only other way to study these first days has been through the use of difficult-to-obtain blastocysts obtained from IVF procedures.

"iBlastoids will allow scientists to study the very early steps in human development and some of the causes of infertility, congenital diseases and the impact of toxins and viruses on early embryos — without the use of human blastocysts and, importantly, at an unprecedented scale, accelerating our understanding and the development of new therapies," Prof Polo said.

PhD student Jia Ping Tan, Professor Jose Polo and Dr Xiaodong (Ethan) Liu.

In similar research, also published in *Nature*, scientists from the University of Texas Southwestern Medical Center have developed a 3D culture strategy that allowed them to generate blastocyst-like structures, which they term 'human blastoids', from human pluripotent stem cells. The human blastoids resembled human blastocysts in their morphology, size, cell number and composition of different cell lineages. Human blastoids are able to generate embryonic and extraembryonic stem cells and can self-organise into structures with features of peri-implantation human embryos; the authors emphasise, however, that human blastoids are not equivalent to human blastocysts and are unable to give rise to a viable embryo.

The publication of the two studies comes as the International Society for Stem Cell Research is about to release guidelines for research on modelling human embryos in vitro following 2017 and 2018 reports on the generation of mouse 'blastoids' in vitro by UK and Netherlands scientists, as well as advances in the generation of human stem cells that replicate aspects of early embryonic development. It is not known whether the new guidelines will reference the Polo study, which is the first to produce an integrated stem cell model that closely mimics key fate and spatio-temporal decisions made by the early human embryo. The Society has, however, stated, in a paper published in *Stem Cell Reports* in February 2020, that "if such models could be developed for the early human embryo, they would have great potential benefits for understanding early human development, for biomedical science, and for reducing the use of animals and human embryos in research. However, guidelines for the ethical conduct of this line of work are at present not well defined."

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For the Better

Laboratory balances

Adam Equipment, a leading manufacturer of professional scales and balances worldwide, has expanded its line of balances with the launch of the Luna. Available in both analytical and precision models, Luna's design combines an elegant form with intuitive function.

A generously sized LCD display features large, 24 mm-tall digits, allowing the user to easily discern results. To allow use across multiple regions, the balance features multilingual text. Navigation is simple, with colour-coded buttons that allow users to perform functions with minimal training.

Luna offers a wide variety of applications for everyday lab use, such as weighing, parts counting, percentage weighing, dynamic/animal weighing, checkweighing and net total weighing. The analytical models offer capacities from 80 to 250 g with a readability of 0.0001 g, while the precision models feature a large range of capacities from 220 to 15,000 g with readabilities from 0.001 to 0.1 g. Weighing units vary by model, though all include g, ct, GN, dr, ozt, dwt, tl.T. tl.H, tl.S, T and custom units. Certain models also include mg, N, oz, mm, kg, lb and lb:oz.

Models are available in external calibration using weights or internal calibration, which allows automatic calibration after a set interval or if the temperature has changed. For easy connectivity, each product comes with standard USB and RS-232 interfaces.

Luna can output reports formatted to meet Good Laboratory Practice (GLP) guidelines. Robust ABS plastic construction and a stainless steel pan help make the device both easy to clean and durable enough to withstand demanding lab use.

Adam Equipment Inc
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Vacuum pumps

The Rocker Chemker 600 series vacuum pumps are chemical-resistant diaphragm pumps capable of achieving a flow rate of up to 65 L/min and vacuum of up to 7 mbar.

The vacuum pumps are suitable for use with rotary evaporators, concentrators, vacuum ovens or solvent extraction. All wetted parts of the series are made of PTFE material, which makes them resistant to corrosive gases. The pumps are designed to start against a vacuum, making them suitable for applications that require frequent starting and stopping.

The vacuum pumps are driven by the diaphragm, with no need for lubricant, regular oil changes and maintenance. Driven directly by motor, the vibration-proof assembly means the series runs at a low noise level. All pumps have a built-in thermal protection device, which shuts off the pump automatically when overheated and resumes working when the temperature cools down.

Labtek
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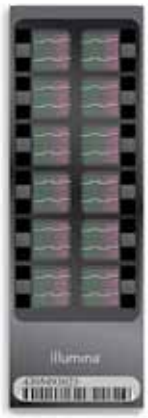
Methylation array

Illumina's Infinium Mouse Methylation BeadChip has been designed to simplify biomarker discovery for epigenetic researchers using model organisms. The methylation array offers comprehensive, expert-selected coverage and high sample throughput, making it suitable for genome-wide DNA methylation studies with a large number of samples.

The product interrogates >285,000 methylation sites per sample at single-nucleotide resolution. It provides balanced coverage of CpG islands, translation start sites, enhancers, imprinted loci and other regions. It achieves >98% reproducibility for technical replicates and shows a high correlation with whole-genome bisulfite sequencing data.

Possible applications include epigenome-wide association studies, xenograft experiments, preclinical research, ageing studies, developmental biology and more. The product is available in 24-, 48- and 96-sample kits.



Illumina Australia Pty Ltd
www.illumina.com

Homogeniser

Regardless of the sample type, whether it be saliva, plant material or animal tissue, scientists can increase their yield of protein, DNA and RNA by using the BeadBoost Bead Mill Homogenizer to prepare the sample prior to incorporating into downstream genomic workflows.

The BeadBoost homogeniser family of instruments provide flexible sample throughput and formats accommodating simultaneous processing of 1–96 samples, in plate and tube formats. Non-stop processing of samples can be achieved as no cooldown is required between runs, and with quick processing of samples there are no sample degradation issues to be concerned with. The use of disposable tubes/plates also means there is no threat of cross-contamination between precious samples. The product is specifically designed for grinding, lysing and homogenising biological samples prior to molecular extraction.

PerkinElmer can help users to fully automate their genomic workflow for PCR set-up or NGS library construction. Start with the incorporation of a homogenisation step in the sample preparation process to increase the nucleic acid sample yield, followed by sample reformatting, liquid handling and nucleic acid extraction with the company's suite of chemagen kits and instruments, and finally automate workflows for PCR set-up utilising the Janus G3 workstation or the Sciclone G3 NGSx iQ for NGS library preparation.

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perkinelmer-appliedgenomics.com/

FIB-SEM

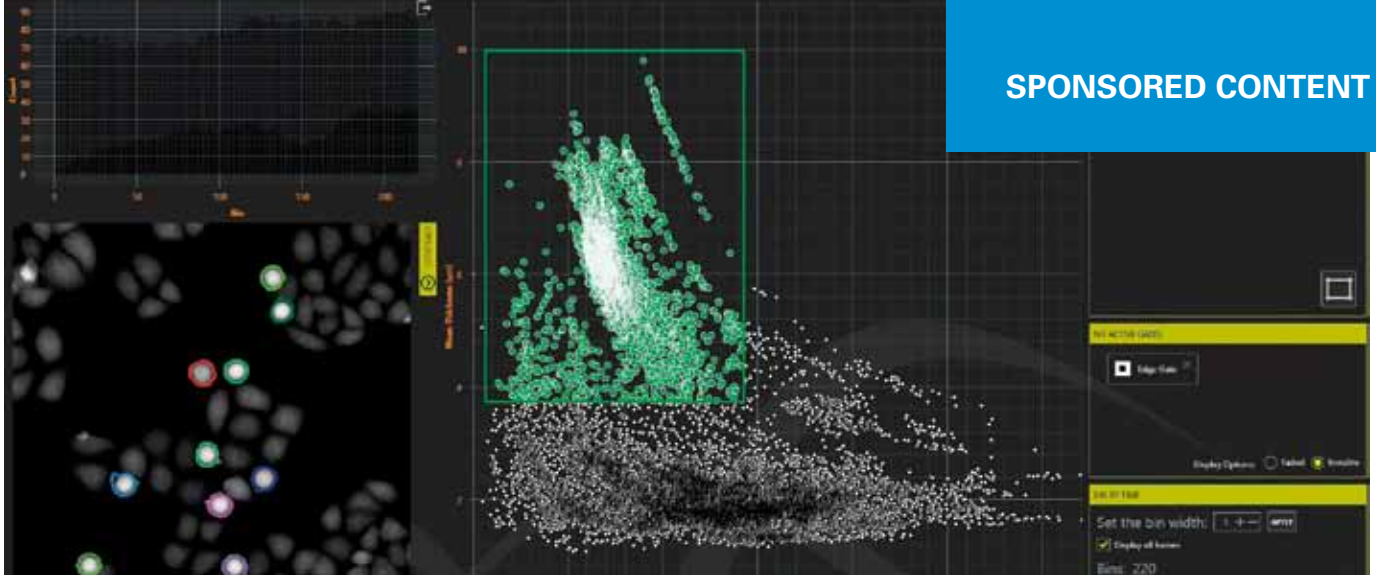
The Thermo Scientific Helios 5 PXL PFIB Wafer DualBeam is a plasma focused ion beam scanning electron microscope, designed to reduce time to data from days to hours for inline through-stack metrology and verification of high-aspect ratio structures.

The product offers high-resolution, high-contrast imaging as well as fast, precise, large-area sample deprocessing, diagonal milling and cross-sectioning of advanced 3D semiconductor devices, such as 3D NAND and advanced memory. The easy-to-use system supports whole wafer analysis and fully automates delayering, milling and metrology in the fab, reducing wafer scrap while accelerating yield learning.

The device enables full inline metrology and process monitoring for advanced process control and excursion monitoring compliant with 300 mm fab communication protocols and standards. Users can measure and verify features of interest within complex vertical stacks and high-aspect ratio structures.

Other benefits include: nanometre-scale SEM imaging; high-volume, high-speed milling and cross-sectioning; optimised planar deprocessing for high-sensitivity materials and surface quality preservation; deprocessing of advanced metallisation layers through proprietary chemistries; precise, site-specific preparation of large-area lamellae with the optional Thermo Scientific EasyLift Nanomanipulator; and full coverage of 300 wafer handling.

Thermo Fisher Scientific
thermofisher.com



Cell tracking casts doubt over fluorescent microscopy validity

Livecyte should be seen as a solution to a problem you didn't know you had. It has the capacity to create a paradigm shift in your research.

This novel technology facilitates high-resolution images without the need for fluorescence. The software manages all the data and analysis on board. Analysis dashboards frequently clarify phenotypical behaviours that were previously unknown. All data is open for export.

Livecyte is quietly proving that fluorescent probes perturb your cells, at times killing them, fundamentally questioning the validity of research that is so heavily invested in fluorescent labelling. Fluorescent labels have helped with the expansion of live cell imaging but at what sacrifice?

Deciding whether a probe is harmful or not is at times ad hoc; "I transfected with the label, they lived". So on the strength of this are you good to go? Labels have the potential to alter normal cell function and induce toxicity[1,2] whilst phototoxicity presents an additional barrier to long-term imaging since the high intensity light required to excite fluorophores can also alter cell behaviour and induce cell death[3].

How often can your cells be used after a week of imaging, especially if you have successfully isolated a sub population? Arguably never if you have perturbed them! Livecyte inherently enables the reuse of cells, providing confidence in cellular viability, while preserving natural behaviour and facilitating an extension to the experiment. Livecyte carefully borrows your precious cells and returns them to you at the end of your experiment.

Livecyte allows you to watch your cells grow over a week or so, segment them and then at a click of a button, track their every move, follow them through their cycle, watch their mitosis, follow the daughter cells, and analyse the added metrics provided by such functionality.

What you want to investigate, and your predictions about the cell behaviours are sometimes turned on their heads once you drill down into the data or move from a population behaviour to single cell analysis. Unleashing this power has transformed cellular microscopy, removing the dependence on fluorescence, enabling the study of natural behaviours resulting in confidence with the treatments.

How do we segment and track cells better?

Cell tracking is the process of following individual cells over time through mitosis or other cell cycle events and variations due to treatments. This can be an arduous task for just a few cells over a week long time-lapse. Now run along and do this over a bunch of fields across 96 wells… see you next year!

Automating cell tracking unlocks kinetic aspects of your experiment, logging fundamental changes, coupling dynamic phenotypes, directionality, track speed, mitotic time, cell lineage and meandering index to dry mass, morphology and proliferation. Remembering this can be on a population basis or down to single cell interrogation.

It is commonplace to attempt to assess cellular migration with a scratch wound technique. This is logical if you wish to understand the movement of fibroblasts but is not so ideal to injure other cells particularly if this is not the reason for the experiment. What kind of cellular cascade will this produce, will it be contrary to the experimental purpose?

Livecyte automatically collates image, single cell segmentation and cell tracking data into an interactive Cell Motility Dashboard enabling a label free, scratch free alternative.

Livecyte also calculates Cell Displacement and Cell Confinement Ratio for random migration studies. These metrics represent the distance a cell migrates relative to their point of origin and also considers the degree in which a cell meanders from its starting and end point. The random motility assay has been shown to be an effective, quantitative measure of cell migration without the contradictory activation of cellular processes, known or unknown or arbitrary measures such as gap closure in isolation. You can visualise this at https://vimeo.com/345641762.

Contact Peter Davis at ATA Scientific for more information or a virtual demo.

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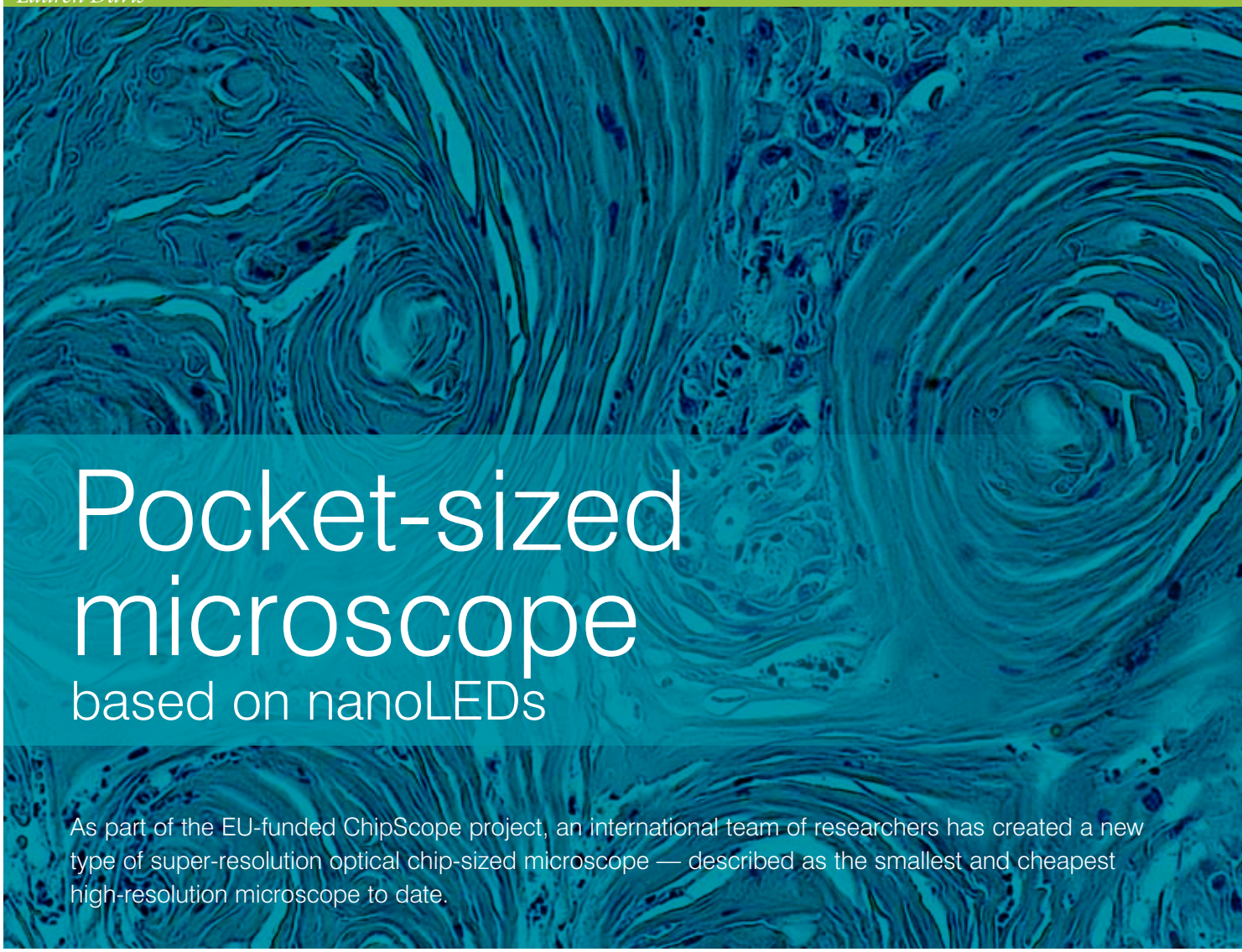
ATA Scientific Pty Ltd
www.atascientific.com.au

Lauren Davis



Pocket-sized microscope

based on nanoLEDs

As part of the EU-funded ChipScope project, an international team of researchers has created a new type of super-resolution optical chip-sized microscope — described as the smallest and cheapest high-resolution microscope to date.

The four-year project has receiving funding of €3.75 million as part of the Future and Emerging Technologies (FET) program. Project participants include the University of Barcelona (UB), the Technical University of Braunschweig, Tor Vergata University of Rome, Expert Ymaging, the Austrian Institute of Technology, the Medical University of Vienna and the Swiss Foundation for Research in Microtechnology.

Unlike traditional microscopy, in ChipScope's method the resolution depends on the size of the lightening source instead of the detection system. That is, instead of a single source of light — such as in conventional microscopes — it used millions of light sources in miniature.

"ChipScope essentially consists of a control chip and another chip which measures the intensity, in other words an optical photo detector," said UB Professor Ángel Diéguez, coordinator of the project. "And what makes this microscope unique is its LED array."

To build the microscope, researchers developed 200 nm nanoLEDs that act as a lightening source and determine the resolution of the microscope without lenses. This should allow the observation of some viruses and cellular processes in real time without the problems of current high-resolution techniques.

"After several decades of research, the Technical University of Braunschweig has succeeded in developing a method for making the LED array with the world's smallest LEDs. We can switch on one after the other independently," UB Professor Daniel Prades said. "This is something that has never been achieved before, and enables us to scan the array and give shape to the ChipScope images."

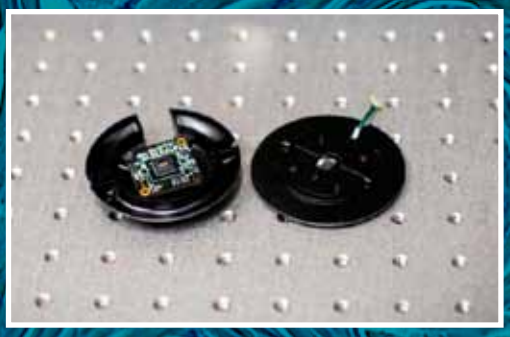
"The sequential and independent activation enables us to determine the position of the observed object and to follow it real time," Prof Diéguez added.

The project proved that the microscopy method works and offers a resolution that depends on the size of the used LEDs. It has been successfully tested with different samples, including cellular images of idiopathic pulmonary fibrosis (IPF) — a chronic lung pathology related to age which causes half a million deaths per year.

"There are three important points which must be considered for the microscopy of living cells," said Stefan Schrittwieser, a research scientist at the Austrian Institute of Technology. "First, we have to transport the cells to the active point on the microchip. Second, we have to supply the cells with nutrients. Third, we have to guarantee a stable temperature of 37°C. All this can be miniaturised to the level of a pocket microscope."

The current prototype has been developed at a cost of nearly €1500 but could cost as few as tens of euros when produced at a large scale, since it is completely based on conventional microelectronic technologies. Combined with its small size, this makes it advantageous for remote and disadvantaged regions.

"Consider that there are a lot of remote regions in the world," said Sylvia Geleff, a pathologist at the Medical University of Vienna. "Additionally, many regions suffer from economic disadvantages. A handy and inexpensive instrument would be a huge benefit for these regions. Above all, the instrument can be applied for medical diagnostics."



The ChipScope high-resolution microscope.

Dani Prades and Ángel Diéguez are the UB researchers who led the project.

SMILE

As a continuation of ChipScope, the UB team is leading a new project, titled SMILE. The coordinator of the project, Prof Prades, explained that its aim is to "develop technology-based micro-lightening tools created in ChipScope".

"This is a step forward to bring this new technology to a broader market," he added.

The objective is to develop an array of microLEDs (about 10 µm) to bring a higher lightening intensity and which can be added to standard optoelectronic instrumentation systems. This will achieve a scalable lighting platform in terms of number of pixels, intensity and speed, which is more flexible than current solutions. In addition, when combined with colour conversion systems, the tool will be able to operate at different wavelengths and will be applicable beyond microscopy, such as in controls of chemical and biological reactions.

To adapt the development to the needs of the market, SMILE counts on the participation of a group of final users formed by multinationals, small companies and research centres from different branches that will be responsible for the final experimental tests in the fields of the manufacture of DNA chips, photolithography, optogenetics, high-performance fluorimetry and holographic microscopy.

The project has received funding of nearly €2 million in two years from the European FET-Proactive program, which is awarded to promising technologies. This has enabled the creation of the Braunschweig-based start-up company known as QubeDot, whose mission is to market the technology of nanoLED arrays.

Intrinsically safe humidity and temperature transmitter

Vaisala's HMT370EX is an intrinsically safe humidity and temperature transmitter that is designed to meet the demands of hazardous and explosive environments. The product builds on over 20 years of experience based on the company's previous version of the transmitter, the HMT360. Benefiting from developments in technology, the latest model meets and exceeds the current hazardous area regulations.

Robust and easy to use, the transmitter can be mounted directly in explosive areas, up to zone 0/20, with no need for additional protective enclosures. Its rugged display withstands continuous exposure to areas that contain flammable gases or dust, meaning it should keep on measuring safely and correctly.

In addition to measuring relative humidity and temperature, the transmitter outputs also other humidity parameters: dewpoint temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapour pressure and enthalpy. Special models for moisture in oil and jet fuel measurements are available.

Typical applications include fuel storage tanks; manufacturing of chemicals, pharmaceuticals and food; biogas production; paint booths; and any other industry or process where intrinsically safe humidity or moisture in oil measurement is required.

Vaisala Pty Ltd
www.vaisala.com/lifescience

Collection tube and transport medium for COVID-19 testing

The US Food and Drug Administration (FDA) has cleared Zymo Research's DNA/RNA Shield collection tube as a Class II medical device, allowing the product to be used as an in vitro diagnostic (IVD) device for COVID-19 testing.

Specifically granted for COVID-19 testing, the collection device is designed to inactivate the virus and preserve the SARS-CoV-2 RNA. The SARS-CoV-2 virus is effectively inactivated, which allows the sample to be safely handled, transported and stored. The viral RNA is stabilised at ambient temperature for prolonged periods for robust analysis via downstream RT-PCR.

The product consists of a tube filled with Zymo Research's DNA/RNA Shield transport medium; this enables the stability of the SARS-CoV-2 RNA during sample transportation and storage for up to 28 days at ambient temperatures. The transport medium may be kitted with a swab or sputum collection kit, or as a tube alone.

The technology is compatible with upper and lower respiratory human specimens suspected of containing SARS-CoV-2. Specimens collected and stored in the collection tube are suitable for use with appropriate molecular diagnostic tests.

Integrated Sciences Pty Ltd
www.integratedsci.com.au

Biological indicators

Liofilchem provides a wide range of biological indicators for the steam, ethylene oxide, dry heat, hydrogen peroxide and irradiation sterilisation processes, available in ampoules, self-contained, strip, suspension and coupon formats in several materials such as glass, aluminium, poliflex, steel and PVC.

The company manufactures its biological indicators in a strictly controlled environment to fulfil the requisites indicated in USP and EP and in accordance with the ISO 11138 and EN 866 regulations, as well as offering a D value calculation service.

Cell Biosciences Pty Ltd
www.cellbiosciences.com.au

16- and 24-channel pipettes for 384-well plate

Eppendorf's 16- and 24-channel pipettes and epT.I.P.S. 384 are designed to enable the convenient pipetting of entire columns and rows of a 384-well plate.

The 16- and 24-channel pipettes can be used in the same orientation to enable users to evenly and simultaneously fill 24 wells of a 384-well plate in just one step. This increases user efficiency, minimises pipetting steps and plate handling, and increases reproducibility by starting reactions at the same time. Labelling of the first and last channel helps users to pipette into the correct wells, making pipetting into 384 wells easier and more reliable.

Mechanical and electronic 16- and 24-channel pipettes are available in volumes of 20 and 100 μL, and function as a system with the epT.I.P.S. 384 and ep Dualfilter T.I.P.S. 384.

The pipette and tip system uses SOFTattach technology with tip elasticity for good tip fit and seal to increase sample safety, and a spring-loaded tip cone reduces tip attachment forces. A fine tip shape is designed to ensure accurate pipetting into the wells, and the SOFTeject feature reduces tip ejection forces by 50% for ergonomic operation.

The 16- and 24-well multichannel pipettes and epT.I.P.S. 384 are designed to make working with 384-well plates convenient, ergonomic and safe.

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

Nitrogen gas generator

Peak Scientific's Genius XE SMZ has been designed to provide a long-term gas solution for Shimadzu high-flow LC-MS/MS systems, including the latest LCMS-8060NX. Offering Shimadzu users a tailored solution in a compact unit, the product features multi-stage purification filtration, targeted at reducing moisture and contaminant levels to provide consistent, high-quality nitrogen gas.

The system is capable of generating high gas flows with one nitrogen output at up to 29 L/min and one air output at up to 27 L/min. It is said to offer enhanced compressor technology and management, optimising power consumption and reducing the lab's carbon footprint.

The product also eliminates the additional hidden costs associated with alternative methods of gas supply. Unlike bulk gas sources, such as nitrogen gas cylinders or dewars, the generator only requires a one-time delivery for installation. Its plug-and-play, user-friendly operation means there is no need for complicated staff safety training.

Peak Scientific Instruments Pty Ltd
www.peakscientific.com

EMCCD cameras

Teledyne Photometrics' Evolve is a high-resolution, back-illuminated EMCCD camera providing high sensitivity for low-light applications. The series features highly stabilised deep cooling and back-illumination for >95% quantum efficiency, as well as electron multiplication to achieve a read noise as low as 0.25e- without sacrificing frame rate. For single-molecule imaging, TIRF microscopy and more, users are able to achieve high imaging performance when every photon counts.

The range includes 13 and 16 μm pixel cameras to provide optimum sensitivity. However, resolution was previously limited for EMCCDs due to a lack of smaller pixel size options. Now with sensor manufacture taking place in-house, Teledyne is able to offer a 10 μm pixel back-illuminated EMCCD, matching the required pixel size for 100x oil immersion microscope objectives. Full-frame imaging rates of up to 61 fps can be sustained in high-speed readout mode, with frame rates greater than 4000 fps available when imaging with regions of interest.

Through their single output amplifier, EMCCDs offer uniform noise performance across the sensor. This is advantageous for analysis in many single-molecule fluorescence imaging techniques. The series fine tunes the performance of EMCCD sensors to provide high image quality through careful electronic design and calibration.

SciTech Pty Ltd
www.scitech.com.au

*Pierre Kardasz**

Innovation in life sciences amid a pandemic

We have now passed the one-year anniversary of the COVID-19 outbreak in Australia, which forced the entire nation into lockdown; and still today, we find ourselves managing new clusters and following a strict quarantine process for returning travellers. A reminder that we are all still living and working in unpredictable times.

During the early stages of the virus, there was a lot of anticipation over how the world would 'return to normal' once a vaccine had been discovered. But the predicted 'V-shaped' economic bounce-back that analysts forecast never eventuated. The reality has been far more sobering, with government scientists and medical experts expressing "cautious optimism" — optimism that is now real, with a variety of reliable vaccine candidates available and a vaccination program underway.

It is worth noting that vaccines are just one — albeit crucial — aspect of bringing COVID-19 under control. Since the virus was first identified, the life sciences sector has played an outsize role in disease management: from prevention (manufacturing of hand sanitisers and personal protective gear), to diagnosis (development of swab testing kits and antibody tests), to treatment (ventilators), and now to the discovery of vaccines.

With epidemics set to become a regular part of this century due to prevalent urbanisation, globalisation and factory farms, the rapid global spread of COVID-19 has highlighted the importance of the life sciences industry.

The unprecedented speed at which the pharmaceutical companies have successfully developed vaccines for COVID-19 is to be applauded. After all, taking lab testing, human trials and various rounds of scientific, commercial and regulatory approvals into account, experimental drugs average a span of 12 years to hit the market.

This achievement is due to several factors — the researchers, the universities, governments, making human trials more efficient and much more. It is also due to the fact that some of the organisations involved embraced digital transformation and were better positioned to adapt to immediate demands while maintaining production of other critical items.

Here are three key areas in which life science companies should look to digitalise.

1. Maintaining safety and business quantity

Employees in the healthcare and pharmaceutical sectors are still subject to standard social distancing measures. Unlike their office-based peers, equipment operators, manufacturing plant workers and lab technicians are just some roles that require a physical presence onsite.

Skyrocketing demand for medical equipment and life-sustaining drugs meant pharmaceutical firms were tasked with the additional challenge of keeping production lines moving faster than ever during this crisis.

Deploying remote technologies

Building capability to manage operations remotely is paramount to maintaining plant safety while safeguarding business continuity. For example, augmented reality (AR) provides machine operators with step-by-step instructions directly to smartphones, tablets and wearable devices such as smart glasses. This enables telecommuting supervisors to provide guidance to their site-based colleagues. It also allows for

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technical specialists to remotely troubleshoot and support manufacturing operations without stepping foot in the plant.

2. Addressing fluctuating demand at scale

Global supply chains have been hampered by worldwide lockdowns, travel restrictions and labour shortages as a direct result of the pandemic. Despite laboratories, medical testing facilities and manufacturing plants being stretched to maximum capacity, many life science players are hesitant to expand for fear of uneven demand patterns and prolonged economic uncertainty.

Connecting an enterprise with IoT technologies

The Internet of Things (IoT) gives businesses greater oversight and predictability of supply chains as well as allowing them to gain a more holistic control of their assembly lines, which are fundamental to increasing efficiency and scalability to meet heightened demand as well as adapting rapidly in accordance to fluctuating future needs.

3. Allowing agility, adaptability and knowledge transfer

To ameliorate the shortage of medical supplies, many businesses have pivoted towards directly addressing the demand for health care. Notable instances include luxury conglomerate LVMH converting perfume factories to make hand sanitisers; consumer technology firm Dyson temporarily began developing ventilators; and Kodak, once synonymous with analog photography, announcing a strategic shift towards becoming a pharmaceutical player. Altering manufacturing capabilities and reskilling employees requires significant investment. This necessitates a means to quickly adapt production lines and skillsets, while retaining the flexibility to switch back.

Enabling flexible manufacturing lines through ICT

Independent cart technology (ICT) allows businesses to rapidly adapt to changing demands and deliver increased throughput and much faster machine changeover times to produce new products at scale. A high degree of automation means that less on-site intervention is required than with traditional production lines, enabling plants to run effectively without staff being physically present.

Combined with analytics, simulation and other cutting-edge technologies, such as wireless power transfer and wireless communication, ICT can elevate manufacturing to the next level. Data analytics provide full transparency into how machines are running — maximising uptime — while AR and virtual simulations can be leveraged to create digital twins allowing for device optimisation.

Racing against time

For the research labs, pharmaceutical firms and biomanufacturers racing against time, accelerating production capabilities and reducing time to market is key to saving as many lives as possible as new variants of COVID-19 occur. To address the added layer of complication brought on by the disruption to global supply chains, Rockwell Automation has managed to reduce production turnaround time from weeks to just days by helping manufacturers quickly implement innovative automation solutions at scale, while helping ensure adherence to the stringent regulatory and compliance requirements for medical devices.

Charting a digital roadmap for the future

Digitalisation marks the future for all industries, not just life sciences. In the short term, it allows for quick wins: efficiency, adaptability and business continuity. In the long run lies the real reward — a trove of interoperable and real-time data that can be mined to analyse trends, anticipate future needs and build the framework for innovation and scientific discoveries, at speed and at scale.

When implemented successfully, the digital transformation of operations and processes seamlessly merges the formidable capabilities of human knowledge and artificial intelligence, and ultimately helps us all stay ahead of the next epidemic.

Pierre Kardasz is Asia Pacific Regional Industry Manager, Consumer Packaged Goods and Life Sciences, at Rockwell Automation.

Rockwell Automation Australia
www.rockwellautomation.com/en-au.html

Researchers at Fraunhofer ITEM following preparation of doses of a monoclonal antibody.

Researchers fast-track antibody development

Researchers at the Fraunhofer Institute for Toxicology and Experimental Medicine ITEM have developed a production method that fast-tracks the passage of biopharmaceuticals from the lab to clinical trials — from as long as two years to just six months.

The COVID-19 pandemic has underlined just how vital it is to speed up the development and release of new drugs, yet reality paints a different picture. The development of a suitable bioprocess and the pilot production for a protein-based drug candidate can take anything between 18 months and two years. Only then can clinical development begin — and with many candidates eliminated in the first or second phase of clinical studies due to low tolerability or lack of efficacy, it is of the utmost importance to obtain these clinical results as quickly as possible.

Researchers from the Division of Pharmaceutical Biotechnology at Fraunhofer ITEM have now been able to significantly accelerate the process — from the discovery of a new mechanism of action to the preparation of a new investigational medicinal product ready for clinical trials. As explained by Professor Holger Ziehr, Director of the Division of Pharmaceutical Biotechnology, the team's approach to bioprocess engineering was born of necessity, in response to the COVID-19 pandemic.

"Anyone looking to develop a human antibody for treating SARS-CoV-2 is very much in a race against time," Prof Ziehr noted. "A period of 18 months to two years is simply too long. That was what led us to opt for a different production strategy, so that suitable candidates for a new active substance can progress to clinical studies much more quickly."

Development of the strategy

Like most other antibody production processes, the process developed at Fraunhofer ITEM is based on Chinese hamster ovary (CHO) cells. Around 80% of all biotechnologically produced pharmaceutical-grade proteins are produced with the help of this cell line. One of the principal reasons for this is that the sugar chains, which in the CHO cells are attached to a newly synthesised protein, are similar to those of humans.

In order to produce antibodies, the genetic material from this antibody — ie, its DNA, which contains the corresponding antibody gene — must be introduced into CHO cells. "For this, we use so-called plasmids," Prof Ziehr said. "These are ring-shaped DNA molecules, which are introduced into the CHO cells by means of a process known as transfection."

This process of transfection takes place in a vessel containing a few millilitres of a liquid nutrient and millions of cells. The plasmids are then added to this culture, where they penetrate the cells and then randomly integrate into the chromosome. The composition of the liquid nutrients ensures that only those cells that have incorporated the antibody gene multiply.

In the conventional approach, the tedious next step is to isolate and test individual cells until a CHO cell clone displaying optimal integration of the antibody gene within its genome is identified. This is an extremely time-consuming process, since it can take as long as 48 hours for a single cell division.

"This means that a year can easily pass before a usable clone is available," Prof Ziehr said. "That's far too long, especially if the aim is to develop a drug for COVID-19. We therefore opted to dispense with the lengthy process of cell isolation and work directly with the cell pool from transfection.

"This meant accepting the risk that some of the cells would have incorporated the genetic information from the antibody much more successfully than others. However, the selection conditions applied to the cell pool were such that the cells that produced the most antibodies were also the ones that grew best. Some cells produced more antibodies, others somewhat fewer, but all of them produced the same antibody."

New business model

The risk paid off — the result is a stable cell pool that grows well and produces, as a whole, a large number of antibodies. In just six months, researchers were able to harvest a large quantity of pharmaceutical-grade monoclonal antibodies using this method and prepare 3500 doses for clinical trials. Furthermore, the process can be used for almost any kind of pharmaceutical-grade protein. It has therefore created a completely new business model in the field of pharmaceutical biotechnology for Fraunhofer ITEM.

Platform for mRNA lipid nanoparticle development and manufacture

RNA vaccines are at the forefront of the many vaccine technologies providing solutions for the COVID-19 pandemic. They are produced in the laboratory from a DNA template using in vitro transcription reactions with readily available materials that are less expensive and faster than conventional vaccine production.

RNA vaccines carry only the directions for producing these antigens; in this way, the RNA can be delivered into cells to allow the body's own cells to produce antigens and fight the infection. However, RNA is a fragile molecule that rapidly gets degraded by enzymes once inside our bodies. Encapsulating mRNA in a lipid nanoparticle helps to overcome this challenge and ensures that a vaccine can successfully enter cells and deliver the mRNA into the cytoplasm.

The NanoAssemblr platform from Precision NanoSystems (PNI) enables the rapid, reproducible and scalable manufacture of nanoparticle formulations such as lipid nanoparticles to encapsulate mRNA. Using laminar flow conditions, particle size can be fine-tuned to create highly reproducible mRNA LNPs with high mRNA encapsulation efficacy and potency within seconds. NxGen microfluidics mixing technology simplifies and accelerates nanomedicine formulation by enabling all scales of development through one single mixing element — from formulation to full GMP.

In a recent talk co-hosted by the RACI Pharma group, PNI's Dr Andrew Geall discussed how the company has identified a potent LNP delivery system for self-amplifying mRNA and how this is now been applied to COVID-19 mRNA vaccines. He described how the NanoAssemblr GMP system is being used to provide accelerated clinical and commercial development of COVID-19 nanomedicines: by reducing the number of engineering batches through seamless transfer of manufacturing process; by eliminating cleaning validation by using a fully disposable single-use fluid path; by supporting all stages of clinical development through a modular continuous flow pumping system capable of producing volumes of 200 mL to >100 L at outputs up to 12 L/h; and, by enabling flexibility and redundancy in clinical development plans through simple tech transfer of the GMP system to any global non-GMP and GMP facility.

ATA Scientific Pty Ltd
www.atascientific.com.au

Terminal HEPA filter housings

The Camfil Pharmaseal is a fully customisable terminal HEPA filter housing designed specifically for life science facilities seeking high performance within critical applications and risk-free compliance with TGA/GMP requirements for Grade A and Grade B cleanrooms.

Camfil Pharmaseal is suitable for use within supply air applications for pharmaceutical, biotechnology and medical device manufacturing where clean space is required. Specifically designed to minimise operation downtime during required NATA accredited HEPA filter validation and HEPA filter change-outs, the product includes several user-friendly features.

Universal tool-less filter holding clamps, filter retaining clips, quick disconnects and room-side adjustable dampers, along with an easy-access hinged grille, facilitate one-person filter change-out. In-built aerosol ports allow room-side accessibility for NATA accredited HEPA filter validation by a single technician (avoiding the requirement for a second technician to introduce the test aerosol within the ceiling duct). This offers time and labour savings for facilities.

Standard Pharmaseal housings include a guillotine damper where airflow can be regulated between 10 and 98%. Optional radial bow tie dampers or 100% shut-off isolation dampers are also available.

Camfil Airepure
www.camfil.com.au

Recombinant antibodies

Recombinant antibody production occurs in vitro by cloning antibody genes into high-yield expression vectors. These vectors are then introduced into expression hosts (eg, bacteria, yeast or mammalian) to generate recombinant antibodies.

Recombinant antibodies can be used wherever one would normally use a traditional monoclonal antibody. In comparison, monoclonal antibodies are typically made using B-cells from an immunised animal to form immortal hybridoma cells that secrete the desired antibody clone. While this technique produces consistent, specific and sensitive monoclonal antibodies in large quantities, over time hybridoma cell lines can experience genetic drift, resulting in slight variations to the antibodies produced. Antibodies against difficult targets, ie, toxins, nucleotides and membrane-bound proteins, can't always be made with this in vivo model either.

Abcam's recombinant antibodies overcome the limitations of traditional antibody production to provide a high level of consistency between batches, reproducibility, confirmed specificity and a long-term supply. With recombinant technology, it is easy to improve antibody sensitivity through antibody engineering. To ensure specificity, the company uses extensive validation methods, including knockout validation, to help provide confidence in results.

With the antibody genes isolated and the sequence known, antibody expression can be carried out at any scale and the long-term supply of the antibody assured, the company claims. This makes recombinant antibodies suitable for long-term studies or for using the same antibody across multiple samples. For antibodies generated using Abcam's phage display technology, even the gene of the antibody can be isolated with an animal-free procedure.

Abcam Australia Pty Ltd
www.abcam.com

Electrochemiluminescence imager

MSD's MESO QuickPlex SQ 120 instrument offers access to high-performance electrochemiluminescence immunoassays. The compact system has been engineered for ease of use, with a combination of rapid read times and the ability to perform multiple, simultaneous tests on a single sample designed to increase productivity, save sample and deliver results quickly. The instrument has a wide menu of commercially available assay kits and a full line of components and reagents that enable users to develop their own assays.

The product features: ECL detection for high sensitivity and dynamic range; single and multiplex assays; commercially available kits and components for user-developed assays; single-well read mode for high performance; a small footprint, a quarter of the size of MSD's SECTOR Imagers; and ultrafast read times of 90 s per plate — twice the speed of a SECTOR 2400.

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

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The Australian Society for Microbiology

bringing Microbiologists together

Invitation to Attend

THE AUSTRALIAN SOCIETY FOR MICROBIOLOGY (ASM) 2021 ANNUAL SCIENTIFIC MEETING 31ST MAY – 3RD JUNE 2021.

The meeting is being held as a hybrid event, with face-to-face components taking place in Melbourne, Australia. The Organising Committee have invested heavily in a virtual platform that will ensure the meeting is engaging and interactive for virtual delegates that cannot travel due to COVID-19.

Connect with fellow microbiologists worldwide and explore a broad range of Microbiology topics with plenary presentations from distinguished microbiology professors! Further details can be found on the conference website

Invited Speakers

Prof Elisabeth Grohmann

Prof Graham Hatful

Prof David Murdoch

Prof Ferric Fang

Prof Sharon Lewin

Prof Edward Holmes

Laureate Prof Peter Doherty

and many more!

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AusMedtech 2021

May 17–21, online

AusMedtech 2021: Reimagine and reconnect provides a week of virtual half-day sessions that represent Australia's medtech industry; celebrate the successes and impacts the industry has made; and engage on the reimagined future of medtech. A premier medical technology conference for medtech executives, the event provides business partnering opportunities for decision-makers and investors. AusMedtech 2021, held by AusBiotech, brings together key stakeholders of the Australian and international devices and diagnostics sector to help prepare the industry sector for its changing landscape. The event is a clear reminder of the strong and experienced industry Australia holds, and one that is demonstrating global leadership in addressing the challenges of the current global pandemic.
https://www.ausmedtech.com.au/

TSANZSRS 2021
May 1–2, Auckland and online
https://www.tsanzsrs2021.com/

Science on the Swan 2021
May 16–18, Perth
https://scienceontheswan.com.au/

ANZAN 2021 Virtual ASM
May 19–21, online
http://www.anzan2021.com/

ASM 2021
May 31–June 3, Melbourne and online
https://www.theasmmeeting.org.au/

SALSA 2021: Saliva Symposium Australia
June 8–10, online
https://events.csiro.au/Events/2021/February/5/Saliva-Symposium-Australia

Parasitravaganza 2021
June 23–25, online
https://www.parasite.org.au/parafest

AMSA 2021 Conference
June 27–July 2, online
https://amsa2021.amsa.asn.au/

Pathology Update 2021
July 2–4, Sydney and online
https://www.rcpa.edu.au/Events/Pathology-Update

FOODCONF 2021
July 12–14, Melbourne
https://www.foodconferencesaustralia.com/

foodpro 2021
July 25–28, Sydney
https://foodproexh.com/

Collaborate Innovate 2021
August 9–11, Canberra
https://collaborateinnovate.com.au

HGSA 44th Annual Scientific Meeting
August 14–17, Adelaide and online
https://aacb.eventsair.com/hgsa-44th-annual-scientific-meeting/

National Science Week 2021
August 14–22, Australia wide
https://www.scienceweek.net.au/

ASCIA 2021 Conference
September 1–3, online
https://www.ascia2021.com/

Energy Oceania 2021
September 6–8, Melbourne
https://www.energyconferenceaustralia.com/

Australasian Exploration Geoscience Conference
September 15–20, Brisbane
https://2021.aegc.com.au/

AACB 58th Annual Scientific Conference
September 28–30, Brisbane
https://aacb.eventsair.com/aacb-58th-annual-scientific-conference/

Materials Oceania 2021
October 11–14, Brisbane
https://www.materialsconferenceaustralia.com/

AusBiotech 2021
October 25–29, Brisbane
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