

The background of the cover is a composite of several petri dishes containing different types of bacterial cultures. Some dishes show dense, colorful colonies (pink, green, blue), while others show more sparse or distinct patterns of growth. The dishes are arranged in an overlapping, circular pattern across the entire cover.

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In the heat of the moment

Australia is tentatively taking its first steps towards freedom from COVID-19 lockdowns, and with summer just around the corner, people will no doubt be taking advantage of the opportunity to enjoy family barbecues, beach days and ice-cold beers at the pub. But for some there must be a lingering worry that the Australian summer may not remain all that tolerable for much longer, given the number of reports in recent months about the state of the climate.

The US National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) recently revealed that July 2021 has earned the unenviable distinction as the world's hottest month ever recorded. Around the globe, the combined land and ocean-surface temperature was 0.93°C above the 20th-century average of 15.8°C, making it the hottest July since records began 142 years ago. It was 0.01°C higher than the previous record set in July 2016, which was then tied in 2019 and 2020.

In the Northern Hemisphere, the land surface-only temperature was the highest ever recorded for July, at an unprecedented 1.54°C above average, surpassing the previous record set in 2012. Asia had its hottest July on record, besting the previous record set in 2010; Europe had its second-hottest July on record, tying with July 2010 and trailing behind July 2018; and North America, South

America, Africa and Oceania all had a top-10 warmest July.

With 2021 likely to rank among the world's 10 warmest years on record, the NCEI acknowledges that such extreme heat is likely a reflection of the long-term changes outlined in the latest report from the Intergovernmental Panel on Climate Change (IPCC) — which showed that emissions of greenhouse gases from human activities are responsible for approximately 1.1°C of warming since 1850–1900, and found that averaged over the next 20 years, global temperature is expected to reach or exceed 1.5°C of warming. The report does, however, show that human actions still have the potential to determine the future course of climate, finding that strong and sustained reductions in emissions of carbon dioxide (CO₂) and other greenhouse gases would limit climate change — though it could take 20–30 years to see global temperatures stabilise.

The good news is that at least some of the world's coral communities are becoming more heat tolerant as ocean temperatures rise, providing hope that they may survive our changing climate — see our story on page 34 for more on the research being done in this area. And for those looking to decrease their emissions by moving to a plant-based diet, our story on page 18 details the development of an extremely nutritious and

apparently more flavourful meat substitute made using fermented okara, which should spark some interesting conversations at the aforementioned family barbecues.

Elsewhere this issue, we take a look at the some of the equipment you should consider for your lab. Our cover story, on page 29, offers insight into how to use weighing systems for microbiology applications. Meanwhile, on page 14 you can learn all about how rugged laptops offer durability and other advantages that make them particularly suitable for data handling in the laboratory environment.

See you on the other side of lockdown!

Regards,
Lauren Davis
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Creating a genetic medicine manufacturing ecosystem

Part 2

In the April/May 2021 issue of *Lab+Life Scientist*¹, I wrote about the need to create a genetic medicine ecosystem. I am humbled to hear it has had some level of impact.

The landscape has shifted from a hopeless pipedream to firm steps and to the creation of such an ecosystem, from the unlikeliest places. There has been a maturation of groups fundamental to the success of such a concept and formalised structures in the design stage. State governments may be the key to the ecosystem dilemma given the apparent lack of action federally to date! So, let's dive in and learn what's been happening since then.

Whilst I was delivering a genetic medicine seminar on 21 April at the Doherty Institute, the Victorian Government weighed into the national



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void by investing a whopping \$50 million to advance the production of a COVID-19 vaccine. This kicked the nation into overdrive, seemingly caught other governments by complete surprise and buoyed the Australian RNA Production Consortium (ARPC).

The masterplan of a complete ecosystem enjoyed some tinkering around the edges by Therapeutic Innovation Australia, involved in an RNA production facility at The University of Queensland. This is a much-needed initiative for one of the puzzle pieces.

The Australian Government has at last embarked on a plan with 'Australia's onshore mRNA manufacturing capability: approach to market' led by the Department of Industry, Science, Energy and Resources. The Department said: "Building on the success of COVID-19 mRNA vaccines, the Australian Government recognises that mRNA technology is part of the next generation in advanced health care ... On 21 May 2021, the government opened this approach to market. It enables manufacturers who can provide mRNA manufacturing capability in Australia to plan a partnership approach with the government to bring forward this capability."²

On the face of it, this looks like a fabulous initiative but will require careful planning given the enormity of the project, requiring an end-to-end, onshore, population-scale mRNA capability to be fully operational within a short time frame. Respondents were given only eight weeks to respond to the approach to market as it closed on 16 July. This is an onerous task for smaller biotech companies which may leave only big pharma capable of responding. I wait with interest to see if this will be the full ecosystem we are anticipating. Interestingly, the government may elect not to invest nor have they postulated the investment value. The research community is highly sceptical of this. Will the organisation granted access to this funding be a champion for the research community? Perhaps the grant should force local research collaboration, given this is where the most amazing discoveries arise from; ideally it should have researcher governance.

ANZ alliance and the Australian Academy of Science (AAS)

The ARPC has advised governments on so many levels, it is nice to see they have collaborated with our friends in New Zealand. Now they are the

ANZRPC. A little over a year ago, six motivated and highly driven scientists from across Australia came together to promote the opportunity to manufacture genetic medicines locally, now having the support of the Australian Academy of Science. They collaborated with the AAS for a roundtable event³ which resulted in a statement on our national RNA science and technology priorities:

"The agreed recommendations from the roundtable are to advance opportunities towards:

- a national mission for the whole RNA science and technology pipeline in Australia, driven by strategic investment and prioritisation across funding schemes
 - the national mission should provide sustainable, long-term funding for projects from fundamental research to translation
- a local mixed RNA manufacturing ecosystem, including pilot facilities to enable new Australian products to be translated, production of pre-clinical trial components and GMP sovereign manufacturing capability to support clinical trials
- the formalisation of cross-disciplinary coordination to:
 - develop a roadmap for a national RNA science and technology mission
 - holistically nurture the entire research to translation pipeline
 - connect the research community to each other and industry
- the facilitation of commercialisation and establishment of a self-sustaining RNA biotech industry through new and existing mechanisms, including incentivising the capture of new intellectual property, the R&D tax incentive and proposed patent box initiative
- schemes to build capacity in entrepreneurial and translation expertise, including facilitating greater mobility between research and industry"⁴.

Looking at these recommendations through the lens of a future for STEM, young researchers, manufacturing and sovereign capacity, they are on target and a scream to the government NOT to lock up funding with a self-serving corporate entity without interest in engaging with basic research.

The pedigree of the participants is a formidable list of outstanding researchers. The observers to this event were fortunate to witness what will go down in history as one of those rare events of immense importance.

Monash makes a move

Professor Colin Pouton was awarded \$5 million from the Victorian Government to progress his COVID-19 vaccine to the clinic. It was exciting to see Prof Pouton explain his vaccine concept during the BioForum⁵ recently. This forum was made possible by the BioMelbourne Network with mRNA Victoria as collaborators for the event, plus sponsor the Victoria State Government Department of Jobs, Precincts and Regions, and I should acknowledge the speakers — the Hon Jaala Pulford, Prof Pouton and Dr Amanda Caples. This is no pipedream: the reality is they acquired a NanoAssemblr Blaze for phase 1 clinical trials at IDT Australia (Institute of Drug Technology Limited) — a publicly listed Australian cGMP pharmaceutical manufacturing company based in Melbourne. What a monumental step towards securing local manufacturing led by the researcher! The Victorian Government should be applauded for such an initiative.

Then UNSW arrives

The UNSW RNA Institute will be a science, therapeutics and translational facility driving cross-disciplinary approaches to global challenges in RNA chemistry, biology and medicine. It will be established with a \$25 million investment from UNSW as part of a collaborative RNA bioscience alliance between NSW universities. Another ARPC founder, Professor Pall Thordarson from UNSW Science, will lead the UNSW RNA Institute.

“An mRNA manufacturing capability would position Australia as a leader in the global research effort to combat emerging vaccine-resistant viruses, such as new COVID-19 variants,” Prof Thordarson said.

“More importantly, this is not just about mRNA vaccines. They are only the tip of the iceberg in terms of a whole range of RNA therapeutics that are revolutionising medicine — a field that UNSW has great strengths in and includes novel cancer treatments and RNA-based treatments against the virus that causes COVID-19.”⁶

In partnership with NSW Health, UNSW will also lead the NSW RNA Production and Research Network. This network brings together four universities — The University of Sydney, the University of Technology Sydney, Macquarie University and The Australian National University — plus several medical institutes and hospital-based facilities with the UNSW RNA Institute, to enable an RNA community of practice in NSW/ACT.⁶

Delta rages — in a word... VACCINATE!

As Australia comes to grips with a fresh COVID-19 outbreak of the Delta variant, NSW has stepped up and run hard to vaccinate — the way forward to some semblance of normality is clearly vaccination. Companies are scrambling to resolve their approach to manage this situation. Some are attempting to mandate vaccination; others are taking a more carrot than stick tactic where access will require certified two jobs. Such a passport scheme appears to be effective in encouraging ambivalent people to step up and expose their arm. It is a ‘vaxxed’ or is that a vexed issue — even the Fair Work Ombudsman has updated its guidelines stating that employers can “direct” employees to get vaccinated where it is “lawful and reasonable”.⁸ What does this mean and who judges this?

As with many things in life the key is education; this cannot be clearer than looking at the ATA Scientific example. We are boasting a high vaccination rate without any encouragement from management. The status will be 100% soon as the vaccination appointments come along. This prompts me to consider why we are finding 100% relatively easily as the national percentage of fully vaccinated is approximately 36% at the time of writing⁹; perhaps it is what we do.

ATA Scientific supplies instruments to the medical research industry; we are immersed in vaccine research, genetic medicine, COVID treatment research and so much more. We are proud to play our small part in Australia’s response. Not all our team were immune to the prevailing virus of social media rabbit holes, however, requiring a little Vaccine 101 and explanation of how mRNA works. We certainly are fortunate we can reference to peer-reviewed research, and many of these researchers are our direct customers and friends.

Much has been said about the current batch of mRNA vaccines, specifically developed too fast to trust. The idea that these vaccines came out of nowhere is a failure of scientific communication. They are based on decades of research across multiple fields. In a recent presentation on lipid nanoparticle RNA vaccines⁷, 2020 Nobel Laureate Dr Michael Houghton describes the journey of mRNA vaccine development eloquently.

And we wait

I concluded my first genetic medicine ecosystem article calling for funding to back the ARPC vision. I borrowed a phrase from Professor Archa Fox: “The opportunity is there — we just have to be bold and grasp it with both hands.” Let’s grasp the

opportunity the Victorian and NSW Governments have bestowed, look to the future and all the possibilities from this amazing journey so far and make Australia a global powerhouse of scientific research, democratising medicine!

Australian & New Zealand RNA Production Consortium



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Automated computer program counts micronuclei in cells

Micronuclei, which are small, nucleus-like structures within cells, are commonly associated with tumours. Now, researchers from the University of Tsukuba have developed an automated computer program that can count these structures from microscope images of stained cells, which should increase the speed and accuracy of micronuclei research. Their work has been published in the journal *Scientific Reports*.

Micronuclei can be stained the same way as regular nuclei, but they are differentiated from nuclei by their much smaller size. However, identifying them is easier said than done, because automatic systems for counting micronuclei have traditionally used images taken from just a single level of tissue. Imagine cutting a cross-section through a ball that is fixed in space; if you cut a slice closer to the top or bottom areas of the ball, the size of the cross-section would be much smaller than if you chose a slice closer to the centre — so a cross-section close to the periphery of a nucleus can easily be mistaken for a micronucleus.

To combat this problem, the researchers took photos at different levels through cells or tissue and created a MATLAB-based program, named CAMDi (Calculating Automatic Micronuclei Distinction), capable of analysing the resulting three-dimensional information. In this way, they ensured that what the program counted as micronuclei



were, in fact, micronuclei.

They then used this program to look at micronuclei in mouse neurons and tested the effects of neuroinflammation on micronucleus numbers.

“A link has been reported between inflammation and micronuclei in cancer cells,” said Dr Fuminori Tsuruta, corresponding author of the study. “We decided to test whether neuroinflammation in the brain might affect the numbers of micronuclei in neurons.”

To do this, the researchers first introduced inflammatory factors into mouse neurons grown in culture, but they found no changes in micronuclei number using their CAMDi program. However, when they gave mice injections of lipopolysaccharides, which caused inflammatory cells in the hippocampal region to become activated, there was an increase in micronuclei in the hippocampal neurons.

“These results were surprising,” Dr Tsuruta said. “They suggest that the formation of micronuclei in neurons is induced by inflammatory responses from nearby cells.”

Given that micronuclei are markers of a range of pathologies, the development of the CAMDi program could be very important for pathological diagnoses and the tracking of treatment responses. Research into micronuclei, to better understand their formation and roles in disease, should also be enhanced by the program.

Powerful nanolasers ‘trap’ light energy

Researchers at The Australian National University (ANU) and Korea University have developed extremely powerful microscopic lasers that are even smaller than the wavelength of the light they produce.

The team used a clever trick to modify conventional lasers, which traditionally comprise some form of light amplification device placed between two mirrors. As the light bounces back and forth between the two mirrors, it becomes brighter and brighter.



Instead of mirrors, the research team created a device that works like ‘inside out’ noise-cancelling headphones and which traps energy and prevents it from escaping. The trapped light energy builds up into a strong, well-shaped laser. This trick overcomes a well-known challenge of nanolasers: energy leakage.

The researchers say their device has high efficiency — only a small amount of energy was required to start the laser shining — with a threshold about 50 times lower than any previously reported nanolaser and narrow beam. Their results were published in the journal *Nature Communications*.

The so-called ‘nanolasers’ also have a huge variety of medical, surgical, industrial and military uses, covering everything from hair removal to laser printers and night-time surveillance. According to lead researcher Professor Yuri Kivshar, they promise to be even

more powerful than existing lasers, allowing them to be useful in smaller-scale devices.

“They can also be integrated on a chip,” said Prof Kivshar, from ANU.

“For example, they can be mounted directly on the tip of an optical fibre to lighten or operate on a particular spot inside a human body.

“This technology uses laser light instead of electronics, an approach called photonics. It’s exciting to see how this can be realised in everyday practical devices, like mobile phones.”

Prof Kivshar said the new laser builds on a quantum mechanical discovery made almost 100 years ago.

“This mathematical solution was published by Wigner and von Neumann in 1929, in a paper that seemed very strange at the time — it was not explained for many years,” he said.

“Now this 100-year-old discovery is driving tomorrow’s technology.”



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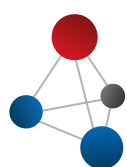
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Craft beer more unique than mass-produced, study confirms

In news that is sure to make beer snobs feel vindicated, Australian researchers have discovered that craft beer is more unique when compared to mass-produced brews.

“Craft beer was strikingly different to beer from multinational breweries,” said The University of Queensland’s Associate Professor Ben Schulz.

Assoc Prof Schulz and PhD candidate Edward Kerr used a technique called mass spectrometry proteomics to identify, quantify and characterise the proteins in 23 different styles and brands of beer. Their study was completed in collaboration with The University of Melbourne and Newstead Brewing Company, and has been published in the journal *Scientific Reports*.

“Our initial assumption was that there would be a difference between different styles of beers, such as lagers, pale ales, IPAs and stouts, but the results proved otherwise,” Assoc Prof Schulz said.

“Surprisingly, it was only when we targeted our analysis on a single brewery to remove any variation that we found any differences between beer styles. Proteins from yeast make craft beers distinct from beers from larger breweries — which may be due to different process scales or to different styles of yeast.”

Assoc Prof Schulz said proteins played an essential part in forming a beer’s sensory properties.

“Crisp, malty and bitter flavours and floral and fruity aromas are perhaps the first descriptions that come to mind when describing beer, but other sensory factors are just as important,” he said. “An attractive, stable head of foam and smooth, creamy mouth-feel are also essential, but-often-overlooked, elements of a great beer.”

The ‘beer proteome’ — or the full set of proteins in a beer — is critical in controlling these factors, and is dependent on the ingredients,



the yeast used for fermentation and the overall beer-making process.

The mass spectrometry techniques allowed Assoc Prof Schulz and Kerr to measure the beers’ complete set of proteins.

“Our research looked at what proteins are present and how much there is of each protein,” Kerr said. “Essentially, a mass spectrometer measures the mass of a molecule, allowing us to then match these experimentally measured masses to a theoretical list of proteins, identifying which are present and measuring the abundance of each. When we considered these features, we could clearly distinguish the profiles of different beers and different breweries.”

With only 23 beers studied, there’s more research to do, but Kerr said the findings would prove beneficial in future beer-making processes.

“We’re excited about using these techniques to understand and improve the beer-making process for non-barley gluten-free beers and with different types of yeast,” he said.



Australian researchers have discovered that liver damage caused by a life-threatening genetic blood disorder, known as hereditary haemochromatosis, can be detected with a simple blood test or scan — removing the need for an invasive and painful liver biopsy.

Haemochromatosis, a disorder marked by increased amounts of iron in the blood and liver, affects around one in 150 Australians. The condition makes them feel sick or weak or experience abdominal or joint pain. In the long run, haemochromatosis can lead to arthritis,

No more liver biopsies for haemochromatosis patients?

cirrhosis, heart disease, type 2 diabetes and certain forms of cancer, if left untreated.

Professor John Olynyk, an international expert in liver disease and hereditary haemochromatosis at Edith Cowan University, was a senior author on the paper along with Professor Martin Delatycki from the Murdoch Children’s Research Institute. Prof Olynyk said, “This work provides a simple tool to risk profile patients with haemochromatosis for those most at risk of developing liver scarring which leads to liver disease.”

The research team worked with patients who had recently been diagnosed with hereditary haemochromatosis from four hospitals around Australia to gather the information. Blood samples were taken from these newly diagnosed patients to search for common markers that would help with diagnosing future complications of the disease.

The study shows that a number of non-invasive blood tests and a special type of ultrasound, known as elastography, can detect liver scarring without the need to perform liver biopsy. The findings were published in the journal *Scientific Reports* and were welcomed by Dr Dianne Prince, President of Haemochromatosis Australia.

“Until now patients with a high iron count (serum ferritin more than 1000) have needed to undergo a liver biopsy to test for advanced liver fibrosis,” Dr Prince said.

“These findings have demonstrated a way to diagnose advanced liver fibrosis with a simple blood test or scan. Furthermore, results showed that patients with advanced liver fibrosis responded well to phlebotomy treatment, thus reducing the likelihood of further liver damage and potentially liver cancer.”



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Why rugged laptops are a good alternative in laboratories

Laboratories take various forms; however, they tend to have in common the importance of gathering accurate, comprehensive data. This means that lab workers need tools that let them collect and analyse data in a way that's reliable and robust enough to withstand the sometimes harsh, dangerous or stringent conditions of the lab they're working in.

Working with consumer-grade tools can often leave lab workers frustrated or stymied because those tools aren't purpose-built for the lab environment. Rugged devices can fill this gap and let workers get on with their core tasks.

Each lab has unique working conditions, from the requirement for sterility in cleanrooms to the need for strict safety protocols in labs that

handle hazardous material. Not having appropriate equipment can mean that lab results and outcomes are incorrect. It can add a significant burden to the employees' workday or, in the worst-case scenario, it could even contribute to an increased risk of injuries.

In a lab, workers run the risk of spilling liquids or solids onto their devices. Hazardous fumes could also affect the device's ability to operate, along with temperature extremes and the ever-present danger of drops, knocks and shocks. Lab workers who wear gloves can find it challenging to use touchscreens

effectively. And, if there are no charging stations nearby, workers can find their devices run out of battery before they run out of work to do.

Rugged devices offer enhanced functionality and resilience compared to standard machines. In turn, this means long-term cost savings and superior employee productivity. This technology is no longer exclusive to construction or engineering fields; a range of industries are now choosing rugged devices for various reasons. Primarily, rugged laptops withstand harsh and extreme conditions without sacrificing performance or connectivity.



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Extensive durability: drops, knocks and shocks

Rugged devices are solid and durable, withstanding conditions ordinary devices can't. While consumer devices tend to struggle in anything other than optimal conditions, rugged devices take rain, humidity, strong wind, dust, moisture and other requirements in their stride.

For example, workers can operate rugged devices with wet or gloved hands. On any standard device, this could cause serious functionality problems. Additionally, most people have experienced the dismay when a consumer device is dropped even from a modest height. The cracked screen can be expensive to repair and compromises the worker's ability to continue working effectively while fixing the device.

Even with tough covers and screen protectors, consumer devices just aren't meant to handle such rough treatment. But, with heightened toughness built in from the ground up, rugged devices easily endure the impacts, shocks, drops, moisture and heat extremes that can happen in laboratory facilities.

By withstanding such a harsh environment, a rugged device offers long-term cost savings and efficiencies through not having to be replaced or repaired anywhere near as often as consumer-grade devices.

Easy to keep sterile without comprising performance

Having a clean work environment translates to a safer, more efficient workforce. Keeping spaces clean and organised is one thing; however, when it comes to devices, it can be challenging to ensure they're cleaned to the lab's specifications to avoid cross-contamination. Users can carefully wipe down consumer-grade devices, but rugged devices can be thoroughly and comprehensively cleaned with relevant chemicals to ensure proper cleanliness and sterilisation. This helps prevent cross-contamination in the lab environment and limit the spread of infections such as COVID-19.

Staying connected to enhance productivity

Devices need to remain connected to the internet to be helpful in laboratories. Real-time data transfer, remote logging and low latency can enhance lab operations. A rugged laptop will maintain connectivity for streamlined processes even when moving around the facility or from clean or cold rooms to warm, humid environments. This helps improve productivity and means there is no annoying delay in communications.

Maintaining compliance and safety

Most labs work within complex regulatory compliance requirements, including the need to keep data secure. It's essential to choose devices that go beyond traditional consumer-grade security. A robust approach is to start with rugged devices that are easily customisable to meet current and future security needs. This includes protecting communications across cellular, Wi-Fi and other networks, including cloud backhauls.

Reduced total cost of ownership

Rugged devices are often more expensive upfront in comparison to consumer-grade devices. Rugged devices, however, suffer far fewer damages, breakages or downtime. This means the total cost of ownership, including support and repair costs, will be significantly cheaper.

Because rugged devices also boast superior endurance, labs can spend less money on replacing devices, which is often more frequently necessary for consumer devices. Zero downtime has other benefits as well. With less wasted employee time due to device issues, workers can focus on valuable tasks that make a difference.

Long battery life

A common complaint with consumer-grade devices is their relatively short battery life. Rugged laptops include long battery life even with peak usage. These devices also have hot-swappable batteries so workers can keep productive without having to stop to recharge their device, become tethered to a charging device that's plugged into a wall socket or change devices altogether. This means rugged laptops can keep up with the longest days in the lab.

What to look for in a rugged device

Rugged laptops should be built from the ground up to be rugged, rather than have ruggedised features added. They should come with various accessories, including mounting kits, mobile power supplies, security and connectivity software.

The ideal rugged laptop should be independently certified to comply with military-grade standards while keeping users connected and secure. This includes the ability to withstand blasts, moisture, dust, shocks and vibration.

Large screens and sunlight-readable displays should come as standard to make rugged laptops easy to work with. They should also feature easy access to protected connections and ports, which can be covered to prevent foreign matter from entering the computer.

With the proper rugged laptops, labs and lab workers can confidently work in even the most extreme environments without concerns about the equipment's ability to keep up in the long term. This makes rugged laptops the ideal tool for the laboratory of the future.

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Smart lab management software

To meet more needs and overcome challenges in laboratories worldwide, Eppendorf offers a smart lab management software solution: the VisioNize Lab Suite.

The SARS-CoV-2 pandemic has impacted the operation of laboratories, including the adoption of digital technologies to cope with the new norms of social distancing, working remotely and restricted access to lab benches. These past months have proven that digitalisation is central in every interaction — whether on an individual or organisational level — and this has fast-tracked the acceptance of digital solutions.

Within a single cloud platform, VisioNize Lab Suite users may gain access to a modular range of services that can be activated to suit the needs and workflow of the laboratory. The product is designed to be a vendor-agnostic solution with connectivity to Eppendorf and third-party devices, making it a sustainable investment for digital transformation.

VisioNize Lab Suite provides the ability to connect lab devices and archive device data, so all relevant documents such as SOPs and operating manuals for lab instruments are available at the user's fingertips. Remote monitoring enables device parameters and status to be checked from anywhere at any time, while alarm notifications are available in the event of instrument error and safeguard against sample loss. Users can also schedule one-time or recurring maintenance tasks for all lab instruments, including receiving notifications when service maintenance/calibration is due.

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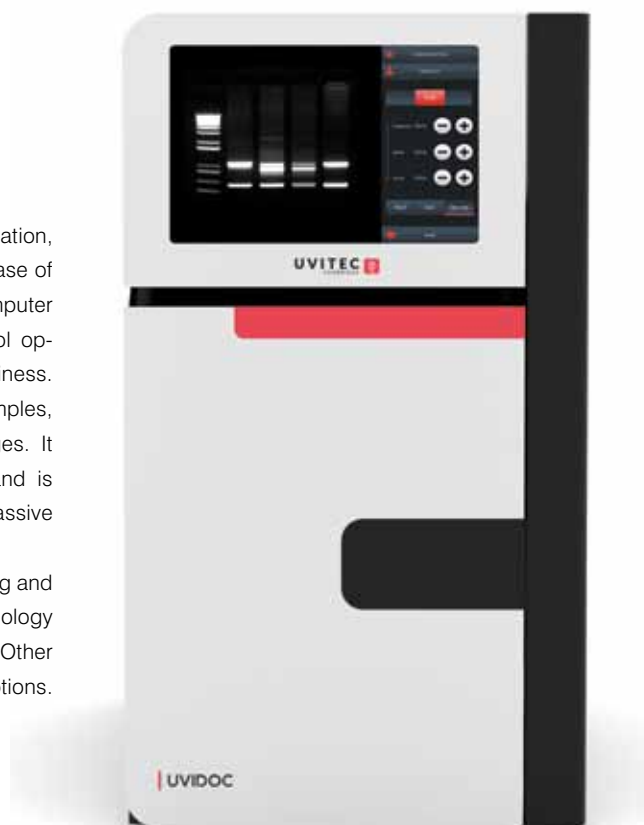
Gel documentation system

A standalone platform and voice-controlled DNA/protein gel workstation, the Uvidoc HD6 is suitable for crowded labs where automation, ease of use and high sensitivity are required. Featuring a real onboard computer and a large 12.2" HD touch screen, the product's Voice Control option allows for powerful system operation, speed and user-friendliness.

The product's 26 x 21 cm field of view is suitable for larger samples, with 6 million pixels offering high-quality, publication-level images. It has responsive 6x zoom optics for a versatile imaging area and is designed to feature reduced noise for clearer images from the passive cooling system.

The system has a slide-out tray for hassle-free sample positioning and one-touch imaging for quick, effortless acquisition. Uvipure technology is designed to enable enhanced UV for EtBr and all safe stains. Other features include a three-position filter wheel and up to 18 filter options.

Thermo Fisher Scientific
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Desktop FEG-SEM

While optical and conventional (tungsten) scanning electron microscopes (SEM) provide high-resolution imaging for many types of samples, only a field emission SEM can reveal the fine details.

The morphology of nanoparticles, small defects in thin films, insulating materials, or materials sensitive to high-energy electron beams can be adequately studied using a field emission SEM. However, these systems are known to be large, often requiring a dedicated room while also requiring special infrastructure and connections. Additionally, they can be difficult to master.

As a result, many institutions that own a field emission SEM will restrict its use to highly trained personnel. Many research groups, departments or companies outsource their FEG SEM needs to service labs or central facilities to avoid these inconveniences. The Phenom Pharos G2 Desktop FEG-SEM overcomes these challenges.

The FEG-SEM offers floor-model performance on a desktop microscope, with loads of added benefits that make it fast and easy to operate. The desktop Phenom Pharos enables research groups or companies to own their own FEG-SEM and no longer rely on external services. A (solid) table and a regular power outlet are all that are needed to install it. In <30 s after sample loading, full-screen, high-quality images are presented on a wide 24" monitor at 2 nm resolution and acceleration voltage up to 20 kV. Users can also image soft, beam-sensitive or insulating samples at energy levels as low as 1 kV without the need to apply a coating.

The Phenom Pharos G2 Desktop FEG-SEM also offers multiple fully integrated detectors. A secondary electron detector (SED) is optimal for applications where topography and morphology are important, while the energy-dispersive spectroscopy (EDS) detector provides comprehensive elemental analysis.

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Meat analogue made from fermented okara

Researchers from Kaunas University of Technology (KTU) and the University of Helsinki have proposed an extremely nutritious meat analogue made using fermented okara (soy press cake). Described in the journal *European Food Research and Technology*, their product is claimed to have less salt, less saturated fat and more flavour than real meat.

New component for the industry

Experts say that the probiotics produced during fermentation can help restore the balance of friendly bacteria and, by enhancing the number of free amino acids as well as minimising the effect of anti-mitogenic substances, may alleviate some digestive problems. But although fermented foods are rich in nutrients and fermentation can produce ingredients that improve smell and taste, there are few who rely on this process in meat analogue production.

Researchers from the KTU Food Institute and the University of Helsinki produced meat analogues by adding fermented okara, the by-product of soy milk production, to plant-based matrices. Okara samples were fermented by applying probiotics *L. plantarum* P1 and *L. acidophilus* 308 strains. The products containing different amounts of fermented okara modelled under different conditions were then evaluated.

“[The] meat industry has deep-rooted traditions and people possess a clear expectation how a pork or beef burger, chicken sausage or other meat product should look, smell, taste and feel like,” said study co-author Dr Alviija Šalaševiciene, Director of the KTU Food Institute. For example, it was determined that although Lithuanian senior consumers are willing to use meat analogues produced from plant origin material, the sensory

properties of the products that are currently available in the market are still less appealing in comparison with meat.

The researchers concluded that the use of fermentation makes okara a suitable component for meat analogues. According to the sensory and nutritional analysis, the optimum condition for producing meat analogues was the application of 6% okara in the matrices fermented by *L. plantarum* P1, when the matrices and okara are matured at 4°C for two hours.

Health benefits

There are many health-induced reasons for reducing meat consumption: it is hard to digest, the amounts of saturated fat raise ‘bad’ cholesterol, and meat foods are usually over salted as fat reduces the flavour.

Meat analogues with fermented okara have more free amino acids, which diminish the antinutritional factors and are therefore more easily digested than meat. The meat analogues modelled at KTU laboratories also contain less fat and saturated fat but the same amount of protein — about 14–18%, depending on different recipe variations.

“Non-hydrogenated oils containing only small amounts of saturated fat were used while developing our products,” said study co-author Dr Gitana



Alencikiene, a senior researcher at the KTU Food Institute. “Thanks to the small amount of fat, we were able to create characteristic flavours by using only 1% of salt. Among the 11 ingredients used in our product are only natural spices, pigments and aromatic compounds, and no preservatives.”

Food from waste

Currently, there are no commercialised meat analogue products with okara. However, the researchers are convinced that, as organic waste recycling is becoming more and more relevant in today’s world, their meat analogue will find its way to the market. Indeed, it is just one of many products created by the KTU Food Institute; recently, their pea-based meat analogue won the local innovation fair.

“Both meat analogues are nutritionally valuable: our product with fermented okara is more easily digested and the pea-based meat analogue is enriched with iron, which is very important for the normal functioning of the human organism,” said Aelita Zabulione, a researcher at the KTU Food Institute. “While creating our products we aim to solve at least one nutritional problem — be it calorie control, lack of fibre or iron, or sluggish digestion process.”

The researchers emphasise that every new plant-based product widens the choice for consumers and can reduce the usage of processed meat products. They claim that meat analogues enriched with fibre, microelements, vitamins and amino acids, processed to remove antinutrients from raw materials, are the future of food.

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Enhancing cell line development and streamlining processes

Single-cell technologies are removing barriers and boosting productivity within complex cell line development processes to transform the delivery of novel biotherapeutic molecules for contract development and manufacturing organisations (CDMOs) such as FUJIFILM Diosynth Biotechnologies.

CDMOs provide critical support services for pharmaceutical and biopharmaceutical companies working in highly competitive environments, aiming to deliver the most robust and efficient cell lines that demonstrate the best possible productivity. But this can be challenging due to the shift in focus in the field of biological medicines, away from conventional therapeutic monoclonal antibodies towards antibody fragments and bispecific antibodies that are more difficult to express in cellular systems. This is a fast-paced area of the drug development industry, and timelines for cell line provision are under increasing scrutiny as companies compete for their share of the marketplace.

To complicate matters further, evidence of monoclonality proving that the cell line producing the therapeutic molecule is derived from a single parent cell is required to obtain approval from industry regulators such as the Food and Drug Administration (FDA). Companies must prove that the cell line producing the therapeutic molecule is derived from a single parent cell. Time-consuming and low-throughput conventional screening techniques, such as colony picking and limiting dilution cloning, do not allow individual cells to be visualised, and monoclonality can be difficult to demonstrate using these methods. Higher throughput screening technologies, such as fluorescence-activated cell sorting (FACS), provide a more efficient approach, but they can be complex to use, are only able to detect membrane-bound antibody and may risk damaging delicate cell lines as suspensions are driven through the system under pressure.

Using Sphere Fluidics' Cyto-Mine technology, FUJIFILM Diosynth Biotechnologies has implemented a new single-step cloning technique, bypassing the traditionally time-consuming, multistep selection, isolation and verification process. Researchers are now able to swiftly transition from the initial transfection phase through to the delivery of highly productive research cell banks within timelines of approximately 10 weeks. Following this approach, pools of transfected cells are encapsulated as single cells within individual picolitre-sized aqueous droplets in a biocompatible carrier oil (picodroplets). Each picodroplet provides a defined and supportive environment that maintains cellular viability. Single cells and their secreted proteins are rapidly screened and characterised within a fully automated, high-throughput workflow.

Previously, screening required lengthy manual procedures and analysis techniques. As its assays are miniaturised within a single, integrated platform, Cyto-Mine allows analysis that may once have taken weeks to finish to be completed within one day. Approximately 200,000 cells can be screened in a matter of hours, compared with around 10,000 cells with multistep manual techniques that run over a number of weeks. Using this streamlined approach, researchers have been able to identify highly productive recombinant cell lines within significantly shorter timelines. Crucially, single cells can be visualised using the Cyto-Mine system, providing evidence of monoclonality and helping to meet regulatory requirements.

Leveraging Cyto-Mine, workflows are considerably more efficient as cellular screening is conducted early in the process, allowing the best-performing cells expressing the protein of interest to be selected and taken forward for development. This offers benefits regarding the use of resources, including reduced reagent requirements and optimised laboratory space due to the incorporation of multiple screening, sorting and validation steps within one machine. The user-friendly approach also provides greater freedom from laborious manual procedures for scientists working in the laboratory, allowing them to apply their skills and expertise to other essential aspects of their work.

In a rapidly expanding and competitive marketplace, biopharmaceutical companies are seeking to combine quality with capacity. Technologies like Cyto-Mine, which enable greater productivity while supporting quality improvements, represent an attractive proposition to meet the needs of biopharmaceutical development companies and satisfy the requirements of regulatory bodies. In applying these enhancements, biologics development processes are streamlined and less labour-intensive, revolutionising timelines for the development of groundbreaking new medicines to prioritise speed to clinic.

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Nucleic acid analyser

DNA and RNA quantitation and sizing can be accomplished in seconds using the LabChip GX Touch Nucleic Acid Analyzer. LabChip electrophoresis is performed using modern chip-based microfluidic technology. Less than 150 nL of sample is used for sizing and concentration

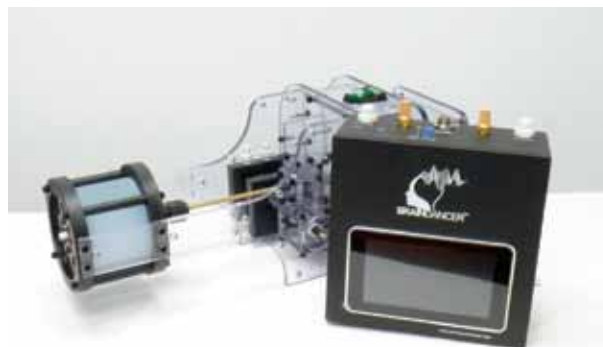
analysis, generating high-resolution, reproducible data. The nucleic acid analyser can support a wide range of applications including verification of PCR amplicons, reporting of total DNA quantitation and optimising NGS workflows.

The system offers LabChip microfluidic technology to modernise gel electrophoresis by enabling fully automated genomic samples analysis in real time with sample process as fast as 30 s. Data is obtained in a digitised format for convenient analysis, review, share and archive. The quantitative metric of RNA and DNA sample integrity obtained means only the best samples go downstream and its native high-throughput capability is able to support up to 384 samples in a single run.

For scientists who are part of a sequencing lab running rare and precious samples, PCR-free libraries or quantitating individual fragments for genotyping, the ease of use and high-throughput capabilities of the LabChip GX Touch Nucleic Acid Analyzer should ease the burden of managing results from a growing number of samples.

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fMRI calibration system for brain imaging

The BrainDancer by ALA Scientific is a commercial-grade dynamic phantom, designed to identify and correct systematic scanner-induced noise using ALA Scientific's deep learning algorithm, NoiseNet. The product can be used in a variety of applications, such as macropatch, single-channel and whole-cell recording, cardiac rhythmicity, systems neuroscience, exocytosis, brain/spinal cord slice recording and retinal physiology.

Features include: pneumatically controlled movement; rotating inner cylinder to produce T2* changes within voxels; imitation of BOLD amplitudes of human brains; motion synchronised with MR scanner; externally triggered programmable sequences; NoiseNet software for temporal noise estimation; a clean signal and strong results.

The dynamic phantom is designed to improve the signal-to-noise ratio, and can also be used for standardisation of protocols and normalisation between scanners.

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All-in-one vacuum concentrator kits

For more than 50 years, scientists around the world have been using Thermo Scientific Savant SpeedVac Vacuum Concentrators to remove solvents from their samples. SpeedVac systems use state-of-the-art centrifugation, vacuum and heat technologies for removing solvents and concentrating samples while maintaining sample integrity.

A diverse product range provides solutions for a wide variety of solvent applications ranging from the traditional drying down of DNA preparations in water and methanol, to the more complex and aggressive applications presented by the combinatorial chemistry and drug discovery sectors of the pharmaceutical industry.

Now Thermo Fisher is combining the three major components of a concentration system into a single housing and making the components virtually maintenance-free. The SPD Integrated SpeedVac kits are designed to take sample concentration to a higher level, as each kit is a completely self-contained unit. The SPD1030 and SPD2030 SpeedVacs provide a 'plug and play' convenient set-up with uncomplicated controls, as well as built-in sample evaporation programs and display.

Thermo Fisher Scientific

thermofisher.com



PET/CT scanner for in vivo preclinical imaging

The IRIS PET/CT scanner, by Inviscan, is dedicated to in vivo preclinical imaging research on small animals such as mice and rats and is well suited to medical research applications such as oncology, neurodegenerative diseases and cardiac studies.

The easy-to-use and high-sensitivity scanner has a PET spatial resolution near 1 mm and a full mouse field of view, and is CT optimised for speed. It also features sensorless cardiac and respiratory gating as well as 4D CT imaging technology.

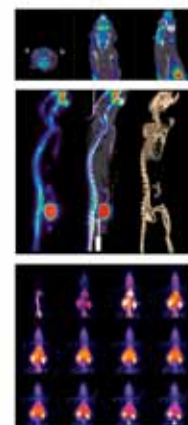
The IRIS PET/CT scanner is available in single-modality PET, CT or dual-modality PET/CT. IRIS technology is flexible and an IRIS PET or CT scanner can be upgraded to PET/CT at a later stage.

Specifications for PET include: sensitivity of >9% (250–750 keV); spatial resolution of <1 mm (CFOV), average 1.1 mm; axial FOV of 96 mm; trans-axial FOV of 81 mm; energy resolution of <13%; and timing resolution of 1.8 ns.

Specifications for CT include: X-ray tube 20–80 kV, 0–1 mA, 80 W max; detector imaging area of >11.4 x 14.5 cm²; scan time of <7.3 s (ultrafast mode), 20 s (speed mode) or 1 min (high-resolution scan); low dose <6.5 mGy; resolution of 73 μ m @ 10% MTF, minimal voxel resolution of <30 μ m; axial FOV of >90 mm; dynamic 4D acquisition; and software-based respiratory and cardiac gating.

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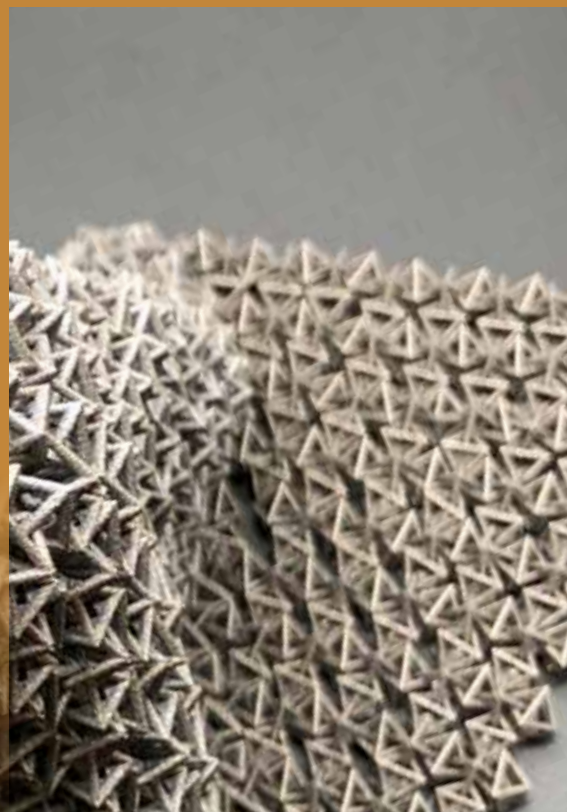
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‘Chain mail’ fabric can stiffen on demand



Scientists from Nanyang Technological University, Singapore (NTU Singapore) and the California Institute of Technology (Caltech) have developed a chain mail fabric that is flexible like cloth but can stiffen on demand.

Described in the journal *Nature*, the lightweight fabric is 3D-printed from nylon plastic polymers and comprises hollow octahedrons (a shape with eight equal triangular faces) that interlock with each other. When the soft fabric is wrapped within a flexible plastic envelope and vacuum packed, it turns into a rigid structure that is 25 times stiffer or harder to bend than when relaxed.

The scientific concept behind the variable-stiffness fabric is called ‘jamming transition’. This is a transition in which aggregates of solid particles switch from a fluid-like soft state to a solid-like rigid state, with a slight increase in packing density — similar to the stiffening behaviour in vacuum-packed bags of rice or beans. However, typical solid particles are usually too heavy and do not provide enough tensile resistance for wearable applications.

In their research, the authors designed structured particles — where each particle is made of hollow frames — in the shape of rings, ovals, squares, cubes, pyramids and different shapes of octahedrons that are then interlocked together. These structures, known as topologically interlocked structures, can then be formed into chain mail fabric that has a low density and yet high tensile stiffness, using state-of-the-art 3D printing technology to print them as a single piece.

They then modelled the number of average contact points per particle and how much each structure will bend in response to the amount of stress applied. The team discovered that by customising the particle shape, there was a trade-off between how much weight the particles will have versus how much the fabric can bend, and how to balance the two factors.

To add a way of controlling the stiffness of the fabric, the team encapsulated the chain mail fabric in a flexible plastic envelope and compacted the fabrics

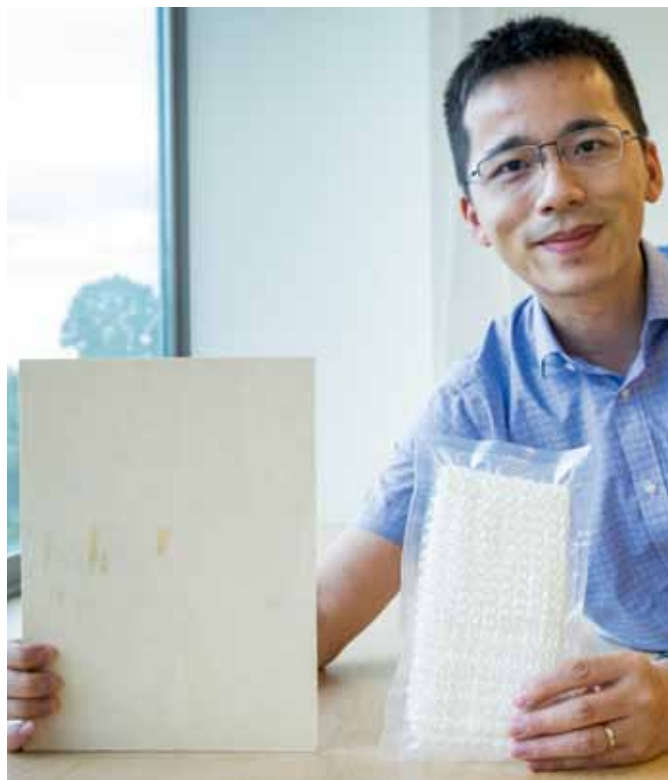
using a vacuum, which applies pressure from the outside. The vacuum pressure increases the packing density of the fabric, causing each particle to have more contact with its neighbours, resulting, for the octahedron-based fabric, in a structure that is 25 times more rigid. When formed into a flat, table-shaped structure and vacuum locked in place, the fabric could hold a load of 1.5 kg — more than 50 times the fabric’s own weight.

In another experiment, the team dropped a small steel ball (30 g, measuring 1.27 cm in diameter) onto the chain mail at 3 m/s. The impact deformed the fabric by up to 26 mm when it was relaxed, but by only 3 mm when it was stiffened, a six times reduction in penetration depth.

The lead author of the paper, NTU Assistant Professor Wang Yifan, said the research has fundamental significance as well as industrial relevance and that it could lead to a new platform technology with applications in medical and robotic systems that can benefit society.



When stiffened, the new chain mail fabric can withstand up to 50 times its own weight.



Asst Prof Wang Yifan comparing the stiffened chain mail fabric in his left hand to a piece of wood in his right hand.

“With an engineered fabric that is lightweight and tuneable — easily changeable from soft to rigid — we can use it to address the needs of patients and the ageing population, for instance, to create exoskeletons that can help them stand, carry loads and assist them with their daily tasks,” said Asst Prof Wang, who started the research when he was a postdoc researcher at Caltech.

To show the possibilities of their fabric concept using different source material, the team 3D-printed the chain mail using aluminium and demonstrated that it has the same flexibility and ‘soft’ performance as nylon when relaxed and yet it could also be ‘jammed’ into structures that are much stiffer compared to nylon due to aluminium’s higher stiffness and strength.

These metallic chain mails could be used in applications such as body armour, where they must protect against hard and high-speed impacts from sharp objects. In such a case, the encapsulation or envelope material could be made from aramid fibres, commonly known as Kevlar, used as a fabric in bulletproof vests. Metallic variants could also be used for larger-scale industrial applications requiring higher load capacity, such as bridges or buildings.

Moving forward, the team is looking to improve the material and fabric performance of their chain mail and to explore more methods of stiffening it, such as through magnetism, electricity or temperature.

“We wanted to make materials that can change stiffness on command,” said Caltech Professor Chiara Daraio, corresponding author on the study. “We’d like to create a fabric that goes from soft and foldable to rigid and load-bearing in a controllable way.”

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Automated protein determination systems

For the determination of nitrogen and protein in food, there are different established methods. As well as the classic Kjeldahl method, nowadays the faster Dumas method has become more and more accepted. This can be seen from the fact that the Dumas method is indicated as an additional reference method in various international standards. C. Gerhardt provides users with two options for automated protein analysis: Kjeldahl analysis with VAPODEST and Dumas analysis with DUMATHERM.

The VAPODEST 500 C has everything onboard for fully automated Kjeldahl analysis, which is still the universal reference method for all sample matrices. Designed for continuous operation with large sample numbers, the system is equipped with an autosampler to do 20 analyses in series. Titration during distillation reduces the analysis time, while the system's intelligent monitoring and components are said to meet the highest safety standards.

The DUMATHERM N Pro meanwhile offers rapid Dumas (combustion) analysis within 3 min, with a system that handles up to a 156-position autosampler. Exhaust equipment is not required for the virtually chemical-free process, which also has low usage of consumables and low gas consumption, consuming 50% less helium than other systems according to the company. Components are easily accessible and maintenance can be carried out within a few minutes.

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HEMCO's Inline Fume Scrubber can be used for removing highly corrosive and acid fumes from individual laboratory fume hoods. The compact scrubber is constructed of chemical-resistant materials and features a vertical venture design.

The scrubber requires a low 30.28 L/h of water for operation. There are no moving parts and a complete recirculation system option is available, including recirculation tank and pump, pH controls, feed tubing, and chemical feed tank and pump.

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Isolation of V5-tagged proteins

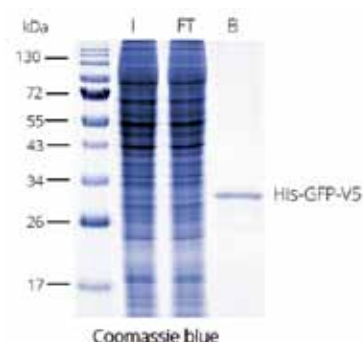
ChromoTek has introduced the V5-Trap, which is a Nanobody or V_HH coupled to agarose, magnetic agarose and magnetic beads for immunoprecipitation (IP) and co-IP of V5-tagged proteins.

The V5-tag is derived from the P and V proteins of Simian virus 5 (SV5 — a paramyxovirus) and is a popular epitope tag for the capture and detection of V5-tagged proteins in yeast, bacteria, insect and mammalian cells. The V5-tag may be fused to either the N-terminus or C-terminus of a protein or be internal. The short linear peptide sequence of the V5-tag is GKIPNPGLLDST and has a size of about 1.4 kDa.

Benefit for IP include: very low background; no heavy and light antibody chains in gel; high specificity and high binding capacity; high stability even under harsh washing conditions; compatibility with N- and C-terminal and internal V5-tag; effective elution with V5-peptide; and the recombinant Nanobody enables consistent results.

The V5-Trap is a convenient, well-characterised and high-performing tool; it is ready to use for fast and specific IP of V5-tagged proteins. It is compatible with downstream applications including mass spectrometric (MS) analysis, ELISA and enzymatic assays. V5-Trap's pulldowns provide pure extracts of V5-tagged protein without contaminating heavy and light chain peptides as can occur with the use of conventional antibodies. Effective elution of bound V5-tagged proteins can be conducted under denaturing conditions (for SDS-PAGE/WB, MS) or under gentle, native conditions using V5-peptide.

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Electrostatic Spray Drying of High Oil Load Emulsions and Heat Sensitive Materials

Preservation of biological material is often achieved by removing free water and lowering water activity. In commercial settings, this is predominantly possible by using established technologies such as high-heat spray drying and low-temperature freeze drying. Both are effective; however, each technique is also limited to specific applications.

Spray drying for example operates at high temperatures and is unsuitable for drying biologically active material susceptible to thermal degradation. Living cells, microorganisms and many active ingredients often result in denaturation, product degradation and loss of quality when heated above specific temperatures. The commercially viable alternative to high-heat spray drying is sub-zero freeze drying. Although the technology is well established in the preservation of microbiological samples and other biological materials, the operating temperatures are so low that they cause damage to some materials. The underlying limitation of commercial freeze drying is generally not temperature related but rather batch processing, thereby limiting throughput.

There is a clear need for continuous, non-batch commercial-scale drying technologies that maintain a product's thermal integrity. This gap in process capability was recently filled by the PolarDry® range of electrostatic spray dryers. By delivering an electrostatic charge during the atomisation process of liquid droplets, water is evaporated at lower temperatures than possible in traditional high-heat spray drying. Electrostatic spray drying is an innovative approach combining gas-liquid

atomisation and electrostatic charge. Heat transfer to the atomised droplets is based on latent heat transfer, allowing powders to be dried at temperatures as low as 30°C.

Successful applications include the drying of biological solutions such as colostrum and lactoferrin where there is no loss in biological activity. Other suitable applications include the drying of microalgae and living microorganisms. Probiotic microorganisms, agricultural bacteria and various other species associated with the human microbiome have been dried successfully using a polysaccharide carrier to obtain >50% bio-mass to dry-mass ratio. Survival post-drying is generally high with expected viable losses of approximately half a log reduction.

Unlike traditional high-heat spray drying, electrostatic spray drying takes place in an inert gas environment where oxygen is replaced by nitrogen. This expands applicability to oxygen sensitive materials and not only appeals to anaerobic microorganisms, but it is extremely well suited to spray drying of encapsulated oils. By electrostatic charging the active components base on polarity, the surface chemistry of the atomised droplets changes during the drying process and this becomes evident in resulting powders. In powders with high fat content, some of the surface fat is replaced by protein and carbohydrate. When using a carbohydrate carrier and protein stabiliser, oil retention in the powder reaches 60–80% (w/w). Interest in oil encapsulation is driven by the processing of highly volatile and unsaturated lipids, oil soluble flavour and aroma compounds, nutritional formulations and cannabinoid oils.

The future of food and nutraceutical manufacturing is driven by innovation, and high value-adding nutritional, functional and bioactive ingredients are key to sustainability. Consequently, the drive for high-quality ingredients also requires innovation in manufacturing technology necessary to support emerging markets and novel product development. PolarDry electrostatic spray dryers are developed to meet the demands and challenges associated with conventional spray- and freeze drying by providing alternative commercial solutions.

Designed and built in the US, the PolarDry commercial range of spray dryers was first launched in the US followed by Europe and Asia where sales have steadily grown in the years following market launch. Fluid Air Australia and New Zealand is excited to introduce the innovative PolarDry technology to the region with the support of a state-of-the-art, fit-for-purpose research and development ISO certified facility located in Melbourne, Australia. Equipped with advanced analytical and electrostatic spray drying capability, the facility exists to support local manufacturers with R&D requirements.

For more information visit the Fluid Air website: <https://bit.ly/3jLaMbw>.



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Compact dust collector

Many processes in the pharmaceutical industry can produce hazardous dusts in high concentrations. Cleanable filter systems are sometimes necessary to facilitate continuous manufacturing processes, preventing regular filter replacements.

The Quad Pulse Package PX is a space-saving cleaning unit requiring a single primary HEPA filter cartridge. Camfil's pleated filter technology provides good dust release, designed to enable extended filter service life and reduced filter replacement. The efficient, segmented design of the filter cartridge allows segmented cleaning during operation for production process and product quality control.

The Quad Pulse Package HEPA filter captures the fine dust particles and is a tested flame and contamination barrier. The compact and strong unit construction incorporates an explosion shock pressure-resistant design with specialised materials from the aerospace industry, enabling it to maintain its integrity with no damage during an explosion event with ST2 organic dust.

Suitable for hazardous dusts requiring full containment, the Quad Pulse Package also includes bag-in/bag-out filter safe change systems for all maintenance stages.

Camfil Australia Pty Ltd
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IHC workflow kits

The IHCeasy Ready-to-use IHC Kits from Proteintech are designed to provide all the antibodies and reagents required to stain tissue samples, including the primary antibody. Each kit's protocol has been thoroughly optimised to provide the best staining for the user's protein of interest, the company says. The reagents in the kit are supplied in ready-to-use dropper bottles — simply apply them directly to the tissue sample, and high-quality IHC data will be just a few steps away.

There are 40 kits currently available, targeting popular proteins such as BCL2, TDP-43, beta-catenin and CD13. Included reagents are: antigen retrieval buffer; blocking and wash buffer; primary and secondary antibody; dab chromogen; counter stain and signal enhancer; mounting media; and a fully optimised protocol.

United Bioresearch Products Pty Ltd
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The role of weighing equipment in microbiology

The microbiology field has seen considerable growth and its knowledge is used in various industries, from environmental clean-ups to cultures for cheese and yoghurt, understanding how organisms interact and industrial processes.

Moisture analysers, and analytical and semi-micro balances are important tools for carrying out tasks in microbiology. This article will look at weighing performed in routine microbiological applications and which features can streamline work.

Media preparation

If you've ever grown bacteria in a lab for work or school, you might remember using petri dishes filled with a gel-like substance. This is the media, in which bacteria will be grown. The media can be bought pre-made, but that can be expensive and is specific to certain cultures, which is why many laboratories make their own media recipes.

A key component of media preparation is agar. Agar is a polysaccharide (meaning a carbohydrate formed from sugar molecules bonded together; poly = many, sacchari = sugar, ide = suffix meaning nonmetal anion) derived from algae. It solidifies media and gives it that gel-like texture. It's used because it only melts when heated to boiling temperatures, but it stays melted until cooled

until 42°C. Why is that useful? Because scientists can fully dissolve components in the agar to make the media of their choice. Another useful characteristic is the fact that it does not get eaten or degraded by most bacteria, so samples can be controlled efficiently.

Once the agar is completely dissolved, other ingredients (like peptones, massing reagents, yeast and broth powder) can be added. They're usually solids in powder form that must be dissolved in water. There is a wide variety of recipes and types of nutrients depending on the type of bacteria that will be cultivated. They must be weighed precisely in order to follow the recipe. Furthermore, some reagents can react differently to other substances, and because the media will be heated to a boil, it's important to measure the right quantity, or else the media could boil over and spill. The dry solids often get weighed in succession, so you can keep adding dry ingredients with the tare feature before mixing them.

Pipette calibration

Pipettes are used to dispense various liquids during formulation and compound creation, so it's paramount to ensure that they dispense the right amount. It also helps ensure repeatability and accuracy, and of course, can be required by various organisations like ISO. >

Biomass determination

Microbial biomass is a fundamental variable used in microbiological research. Expressed as dry weight, it allows researchers to ascertain factors such as growth kinetics (the relationship between bacterial growth and substrate concentration), yield factor (the weight of the bacteria that has formed), and metabolic quotients (essentially, the flux of CO₂ produced by bacterial respiration). All these are paramount for analysis, research and general advancements to make processes more efficient. A commonly used method is to dry the samples in an oven, with measurements before and after taken with an analytical balance. Moisture analysers can also be used, though the oven method remains prevalent despite its time-consuming process because moisture analysers do not always have fine enough readability.



Sampling

From food to cosmetics and medication, samples are often tested for bacterial contamination. It's important to measure specific quantities to get accurate results, especially since multiple smaller samples are better for testing than a single big sample. Depending on the sample type and the bacteria tested, the sample sizes can be regulated and require specific amounts to be tested for the test to be legally compliant. Some foods, for example, must be blended, mixed or crushed and measured again after processing. The sample is then mixed with various components (such as yeast) and the finished mixture is incubated and tested for microbial growth.

Which features should you look for?

Acute precision and excellent accuracy are essential, since the quantities studied can be very fine. A formulation feature, as well as percentage weighing, can be very useful when creating media, especially if the balance lets you store the recipes. A preset tare feature can speed up tasks that use the same containers.

Automatic calibration can be very helpful, as the balance will calibrate itself if it detects ambient changes like temperature. If the samples are very fine and weighed as powders, a draft shield can minimise displacement during weighing. Data communication and exporting data to software while following GLP guidelines is possible through RS-232 and USB interfaces, so it's worth making sure your balance can export data to various software.

Most laboratories have specific requirements regarding calibration, readability, certificates and other specifications. Make sure your balance is compliant with these requirements.

Adam Equipment Inc
www.adamequipment.com.au

what's new



Air filtration audits for life science facilities

Camfil Australia's site service team can provide pharmaceutical or life science facilities with obligation-free air filtration audits to help meet relevant industry standards and identify potential operational cost savings.

The audit includes documenting the condition of existing plant room and internal HEPA location structures, external fabric, fixtures, fittings and mechanical services. Camfil assesses the useful lifetime of HVAC equipment, identifying filtration requirements and recommending appropriate equipment improvements, HVAC filter change schedules and, where appropriate, HEPA filter change and NATA validation service schedules.

To identify potential long-term cost savings, the company can conduct total cost of ownership (TCO) assessments internally for each site utilising Camfil LCC software to compare various filters and predict long-term costs. Considerable savings for life science sites are often identified through the upgrade of standard HVAC filters to premium, high-performance HVAC filters requiring less frequent replacement and lower resistance operation, which can result in reduced fan horsepower and energy consumption.

Camfil can provide regular HVAC filter changeouts, HEPA filter changeouts and NATA validation services as required, using premium filters from its own stock holdings.

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Microinjection syringe pump

The UltraMicroPump3 (UMP3), from World Precision Instruments, is a versatile microinjection syringe pump that uses micro syringes to deliver picolitre to millilitre volumes. The microinjection syringe pump is designed for applications that require injections of precise and small amounts of liquid.

With its touchscreen controller, the UMP3 can displace as little as $0.53 \mu\text{L}/\text{step}$ (using a $10 \mu\text{L}$ syringe with 60 mm scale length).

The MICRO2T SMARTouch controller, which accompanies the pump, is feature rich. All operations are controlled through an interactive touch screen. It has a graphical indication of the flow and the volume remaining in the syringe. It offers end stop detection that is dependent on the syringe volume.

Users can control two pumps independently from one controller with its dual display. It also has automatic pump detection and a pause/resume feature that allows dosing during infusion/withdrawal. The volume accumulated is displayed on screen, as well as the percentage of volume left in the syringe. The SMARTouch controller is fully compatible with all earlier versions of the UltraMicroPump.

Coherent Scientific Pty Ltd

www.coherent.com.au



Anti-inflammatory screening library

The Cayman Chemical Anti-Inflammatory Screening Library consists of three plates and contains approximately 235 anti-inflammatory and related compounds in a 96-well Matrix tube rack format as 10 mM stock solutions in DMSO.

The library includes inhibitors of pro-inflammatory cytokine production, macrophage and T cell activation, cytokine storm receptor signalling, the NLRP3 inflammasome, NF- κ B signalling and kinases involved in canonical and non-canonical inflammatory signalling pathways. It also includes corticosteroids, glucocorticoids and inhibitors of enzymes involved in inflammatory lipid mediator production and metabolism, such as COX-1 and COX-2, 5-lipoxygenase (5-LO), microsomal prostaglandin E synthase-1 (mPGES-1), cytosolic phospholipase A2 (cPLA2) and soluble epoxide hydrolase (sEH).

Additional targets include enzymes and receptors involved in NETosis, coagulation and platelet aggregation.

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Protein characterisation software

SCIEX's Biologics Explorer software enables users to acquire insights from their high-resolution protein characterisation data, and to therefore reach decisions quickly and confidently on the most important critical quality attributes for biopharmaceuticals.

To bring life-saving protein therapeutics to market safely and rapidly, it is critical to fully characterise candidate molecules at every stage of development. The software allows scientists to harness the full potential of the rich spectra produced from SCIEX's Zeno trap and electron activated dissociation (EAD), from the ZenoTOF 7600 accurate mass system, into informative and actionable results. These results are based on a nodal algorithm structure that enables each processing and analysis step to be optimised so scientists can get the clear answers they need from their assays.

Biologics Explorer extends the reach of the ZenoTOF 7600 into protein therapeutics, allowing biologic manufacturers to rapidly progress their therapies through the pipeline. It is built on Genedata Expressionist, an enterprise software platform for biopharmaceutical mass spectrometry. Currently available workflows include intact and subunit analysis, PTM determination and MAM, peptide mapping by EAD or CID, and disulfide bond analysis.

AB Sciex Australia Pty Ltd

www.sciex.com



Automated spiral plater and colony counter

The Whitley WASP Touch is an automated precision laboratory instrument designed to deliver a spiral deposition offering 1000-fold dilution across a single plate. This makes the product useful for any bacterial enumeration work where serial dilutions would normally be required. Spiral plates produced by the instrument are suitable for use with devices such as aCOLyte 3 HD, the latest automated colony counting device from Synbiosis.

The Whitley WASP Touch features an intuitive touchscreen to enable users to process samples rapidly with good reproducibility. The aCOLyte 3 HD software uses a powerful algorithm for colony counting on pour and spiral plates. Plates are automatically counted with results directly transferred to Excel or Open Office.

When used together, the Whitley WASP Touch and aCOLyte3 HD are claimed to reduce cost and time per sample by up to 70%, making them a good package for the needs of modern microbiology laboratories.

Don Whitley Scientific Australia

www.dwscientific.com.au

CO₂ incubator

The CellXpert CO₂ incubator family incorporates Eppendorf's award-winning design to optimise cell growing conditions and reduce running costs. The incubator is now available with the option of 4- or 8-segmented inner doors, which offers several advantages to maintain a stable environment — particularly important for sensitive cell cultures.

The longer and more often the door of a CO₂ incubator is opened, the longer it takes for the inner atmosphere to recover to the desired setpoints. The segmented inner doors of the CellXpert help to reduce the disturbance of the incubation conditions, thus improving reproducibility of culturing results. The risk of airborne contaminants entering the CO₂ incubator is also reduced.

Segmented inner doors decrease gas consumption, reducing running costs and the frequency of changing gas cylinders of supplied gases (CO₂ and N₂). The user can also stack their existing incubator unit from any manufacturer on top of the CellXpert with the Universal stacking stand to help save lab space.

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



Wireless CO₂ data logger for incubator monitoring

Vaisala's latest life science environmental measurement solution combines the carbon dioxide probe GMP251 with the wireless RFL100 data logger.

This configuration leverages the measurement stability of the GMP251 probe and provides carbon dioxide percentage measurements for incubators used for example in cell culturing, gene therapy and vaccine research.

The RFL100 can provide several measurements in a single data logger: CO₂ percentage, temperature and humidity. Along with the GMP251 carbon dioxide probe, other RFL100-compatible probes include Vaisala's TMP115 temperature probe, and the HMP115 and HMP110 temperature and relative humidity probes.

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Some coral reefs demonstrate tolerance to ocean warming

A research team led by the Woods Hole Oceanographic Institution (WHOI) has found that some coral communities are becoming more heat tolerant as ocean temperatures rise, offering hope for corals in a changing climate. Their work has been published in the journal *Geophysical Research Letters*.

Just like on land, heatwaves underwater are becoming more frequent and intense as the world warms, putting stress on ocean ecosystems. High temperatures hit coral reefs especially hard by causing widespread bleaching events, where corals eject the symbiotic algae in their tissues, further weakening the animals. With continued ocean warming, coral reefs face a dim future. Some corals, however, are more adept at managing heat stress than others.

In the new study, researchers used daily satellite data and temperature loggers to monitor coral communities at four islands within the Phoenix Islands Protected Area (PIPA), an area encompassing over 400,000 km² of coral reef and deep-sea habitat in the central Pacific Ocean. The Republic of Kiribati established the reserve in 2008 and the United Nations Educational, Scientific and Cultural Organization (UNESCO) designated PIPA as a World Heritage Site in 2010.

“The protected area gives us a rare opportunity to study pristine and isolated coral reef ecosystems, a privilege for which we thank the people of Kiribati,” said study co-author Anne Cohen, a marine scientist at the WHOI.

After a 2002–2003 heatwave, the surveyed sites lost more than three-quarters of their coral cover. The reef was beginning to recover when another heatwave hit in 2009–2010, sparking fears of widespread bleaching, but two years later coral cover had increased by more than 5%. Following the ‘Super El Niño’ in 2015–2016, which raised ocean temperatures by 3°C, the loss of coral cover was 40% — about half of the 2002 losses, despite causing twice the level of thermal stress. The study authors have ruled out 11 environmental factors that might explain the higher-than-expected survival following the 2009–2010 and 2015–2016 heatwaves, such as greater cloud cover or more gradual warming.

“It’s easy to lose faith in coral reefs,” said first author Michael Fox, a postdoctoral scientist and coral reef ecologist at the WHOI. “But in PIPA, which is protected from local stressors, and where reefs have enough time to recover between heatwaves, the coral populations are doing better than expected.

At other reefs worldwide, sometimes only a handful of especially hardy or fast-growing species

recover after a bleaching event. Coral larvae can float long distances on ocean currents, but due to PIPA’s isolation, the researchers hypothesise that heat-tolerant offspring from the surviving corals are repopulating the reefs, allowing the community to keep pace with warming seas — at least for the time being.

“We’re seeing areas that were devoid of corals after 2002–2003 that are now flourishing with most of the original species,” Fox said.

The study could help coral reef managers identify coral communities most likely to survive in the warming ocean, with the team’s next step being to figure out how they are doing it. And they are not the only ones embarking on such an endeavour, with a separate research team recently revealing how thermally tolerant corals have different mechanisms for responding to heat stress — and how identifying and researching these different heat stress response patterns will help to protect the world’s reefs.

In order to elucidate the factors that contribute to higher thermal tolerance in corals, Professor Christian Voolstra from the University of Konstanz and colleagues introduced a new mobile testing system last year — the Coral Bleaching Automated Stress System (CBASS). The system makes it possible to quickly identify corals that are particularly resilient.

“It allows researchers and conservationists alike to assess coral resilience anywhere on Earth and to find out how endangered each coral reef is, without the need for costly and sophisticated tech,” Prof Voolstra said.

In their current study, the research team used CBASS to evaluate the thermal tolerance of the smooth cauliflower coral (*Stylophora pistillata*) in different regions of the Red Sea. The results show that corals from the Gulf of Aqaba, the most north-eastern arm of the Red Sea, demonstrate a remarkable thermal tolerance — up to about 7°C above the respective maximum monthly average for the warmest summer month — just like their peers from the central part of the Red Sea. However, the absolute thermal tolerance of smooth cauliflower corals from the central part of the Red Sea is up to 3°C higher than for the same species in the Gulf of Aqaba, which could suggest that different tolerance mechanisms are at work.

In order to investigate this possibility, the research team conducted molecular analyses to elucidate mechanisms of thermal tolerance in corals from the different locations. Genetic examinations showed that smooth cauliflower corals from the Gulf of Aqaba respond to heat stress with a strongly altered gene expression — for example, the increased production of certain proteins. Parallel to this, the composition of the coral-associated bacterial communities changed. By comparison, corals from the central part of the Red Sea did not exhibit any of these changes when exposed to heat stress.

The molecular results, published in the journal *Molecular Ecology*, support the idea that smooth cauliflower corals have different thermal tolerance mechanisms. According to Prof Voolstra, “We interpret the response of the corals from the Gulf of Aqaba as that of a ‘resilient’ population that directly and proportionally reacts to increases in temperature. By contrast, the more static expression of genes of the corals from the central part of the Red Sea indicates a fixed reaction norm, irrespective of the heat stress applied, which provides ‘resistance’ to high water temperatures, but at the cost of the ability to flexibly respond to further increases in temperatures.”

At the moment, it is unclear which of these tolerance mechanisms protects corals better from the global increase in ocean temperatures caused by climate change. The fact that ‘resilient’ and ‘resistant’ tolerance mechanisms can be distinguished using molecular methods could be of great importance for the conservation prioritisation of existing coral reefs or for restoration approaches that could use heat-tolerant corals for sexual propagation. For this reason, the research team is making plans to employ the methodological approach used successfully in the Red Sea study around the world.

“Our study shows the tremendous value of an integrative, combined approach: using the CBASS system for the standardised identification of thermal tolerance in corals with subsequent follow-up molecular analyses to identify the underlying tolerance mechanisms and marker genes,” Prof Voolstra said.

Philips helps Healius deploy a digital pathology system



Health technology company Royal Philips has announced that it has partnered with Healius Pathology, a provider of private medical laboratory and pathology services, to deploy a multisite digital pathology system using the Philips IntelliSite Pathology Solution.

Limited in time and resources and expected to accomplish more at lower costs, pathology departments need to find new ways to adapt. Before the pandemic, diagnostic services were already burdened with high demand and inefficient workflows. In the face of COVID-19, the need for greater efficiency and responsiveness has become even more urgent. As a result, pathology is beginning to transform into a digital discipline, bringing exciting new possibilities that can aid, streamline and enhance diagnostic and clinical decision-making.

Digital pathology aims to reduce pressure on pathology services by streamlining workflow and extending collaboration to increase diagnostic confidence. The Philips IntelliSite Pathology Solution is highly scalable, with technology that should enhance productivity with high-resolution digital images, collaborative features and case management tools. It is designed to support clinical practice, improve patient care and reduce healthcare costs.

A pathological review of patient tissue has historically been done using a microscope. Pathologists can now gain new insights through real-time collaboration with Image Management System (IMS) software and algorithms designed to aid, streamline and maximise diagnostic confidence. Using the Philips IntelliSite Pathology Solution, Healius pathologists can digitise their workflow with consistently high image quality and fast, first-time-right scanning capabilities.

Deanne Broughton, General Manager of Healius Pathology's Veterinary division, SVS Pathology Network, is excited about the new solution's quality and versatility. She said, "It is an exciting time for our national veterinary business to begin the rollout of this new digital pathology solution. This new solution will deliver many things for our business, with the most important being simplicity and ease for our practitioners and our patients."

The solution will initially be rolled out through Healius Pathology's National Pathology Division, with the ultimate goal of providing easy and immediate access to medical and veterinary pathology information across the business — allowing clinicians to make timely decisions about patient care. John McKechnie, Healius Pathology CEO, said, "Once deployed across our business, the new solution will create a virtual pathology network that will reinvent the pathologist experience, improving turnaround time and enabling increased quality and versatility of the digital image provided to pathologists for interpretation and diagnosis."

Matt Moran, Managing Director of Philips in Australia & New Zealand, concluded, "Philips is using its unique position as a long-established innovator focused on serving our customers' needs with many solutions to bring together people, technology and data into a more seamless workflow across the health continuum. Through the digitisation of pathology, we aim to break boundaries, reduce complexity and deliver meaningful innovation to help our customers achieve diagnostic confidence and better patient care."

Philips Healthcare
www.philips.com.au/healthcare

Mass flow meter for dosing of corrosion inhibitors

In industrial applications, especially in the chemical, process and oil and gas industry, corrosion can be a real challenge. These types of industries are coping with demanding environmental and process conditions in production and operation. Prevention or control of corrosion by inhibiting often proves to be an economic solution.

A corrosion inhibitor system will add small concentrations of (bio)chemicals into the process. The effectiveness of an inhibitor system greatly depends on the correct injection amount and can be influenced by the environmental and process conditions, so accuracy is crucial.

Using a low-flow control system containing a Bronkhorst CORI-FLOW (mini) mass flow meter can help to manage the dosage of corrosion inhibitors. The flow meter is designed to achieve high accuracy and high turndown ratio based on pure mass flow measurement. It can directly control valves and pumps by onboard PID control and can be further optimised with PLC and HMI control extending both performance and flexibility.

Bronkhorst's Coriolis dosing system approach enables real-time monitoring, control and logging of injection rates. This allows online checking of flow rates and instantaneous resetting of the required flow rate. Asset management and preventive maintenance are supported with several active diagnostics.

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When skin cancer therapy backfires

Scientists at Austria's Research Institute of Molecular Pathology (IMP) have investigated how different forms of cancer therapy can influence the efficacy of subsequent therapies, finding that administering targeted therapy could jeopardise the effectiveness of immune-stimulating immunotherapies in skin cancer patients.

Scientists and clinicians have developed a host of strategies, drugs and treatments to combat cancer and its many forms, but within a few months of treatment, most tumours start growing back — they gain resistance to therapies. In such cases, two types of therapy are often applied to the same patients: targeted therapy acts fast and blocks vital molecular pathways within cancer cells, thereby stopping their proliferation; and immunotherapy mobilises and stimulates the patient's immune cells to eradicate tumour cells, which can induce long-lasting responses, but acts less reliably than targeted therapy.

Clinicians often administer targeted therapy first until they observe resistance; only then do they turn to immunotherapy to finish the job. This strategy, however, is not failproof: some patients do not respond to immunotherapy nearly as well as they should, and their tumours continue to grow. In this case, scientists talk of cross-resistance: the tumours manage to evade the sequential action of multiple types of therapy whose modes of action differ entirely.

Tipped off by this peculiar phenomenon, researchers have started to wonder whether resistance to one type of therapy could have an influence on entirely different forms of treatment. IMP scientists from the lab of Anna Obenaus investigated the effect of resistance to targeted therapy on the composition of skin tumours in mice and its influence on subsequent immunotherapy. With the help of their collaborators at the Medical University

of Vienna and in Switzerland, Australia and the UK, they confirmed their findings with clinical data and have now published their study in the journal *Nature Cancer*.

Cross-resistance: tumours recoil

"The skin tumours we study develop resistance to targeted therapy in 75–80% of cases, which is quite alarming," said Lisa Haas, a recent PhD graduate from the Obenaus Lab and first author of the study. "We found that acquired resistance to targeted therapy has a strong impact on the tumour's immune cell composition, which could lead to resistance to immunotherapy."

The scientists found that tumours that had developed resistance to targeted therapy were short of a type of cells — dendritic cells — that are crucial to activate the immune system during immunotherapy. Not only were there fewer dendritic cells in these tumours, but they did not function properly. As a result, immunotherapy was ineffective in waking the

immune system from slumber, and the tumours kept on growing, unnoticed.

"The good news is that clinical trials are ongoing to develop strategies to activate dendritic cells and improve the effectiveness of immunotherapy," Haas said. "Our work provides solid evidence that resistance to immunotherapy arises in part because of the changes that occur within tumours after they've gained resistance to targeted therapy." The researchers' next plan of attack is to identify the molecules that affect the number and function of dendritic cells.

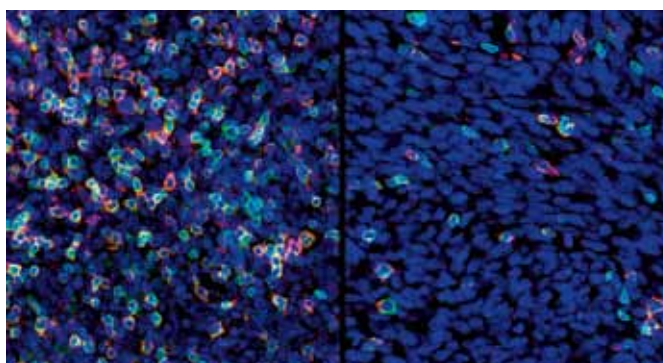
A strategy to prevent resistance

Clinicians are still exploring which kind of therapy they should employ first, and for how long. Such decisions can lead to very different outcomes for patients with cancer. This study brings a guiding light to the debate.

According to the researchers, it is essential to avoid resistance to targeted therapy to ensure that sequential immunotherapy treatment is effective. Targeted therapy as a first treatment should be

limited to a short period of time, and a switch to immunotherapy should occur before the tumour becomes resistant. In cancers that are detected early, immunotherapy should be the first-line treatment to avoid resistance.

"We need to understand how therapies shape tumours and influence subsequent therapeutic responses — that certainly will open up new treatment opportunities and change the way we treat cancer patients," Obenaus said. "Our results help honing our best weapons against skin cancer and could have an impact on clinical practices."



Left: A tumour naive to targeted therapy contains many immune cells (fluorescent). Right: A tumour after acquiring resistance to targeted therapy has much fewer immune cells. Image credit: IMP/Izabela Krecioch.

Hygienic keyboard

GETT Asia's InduProof Smart Pro KG22203 is a hygienic keyboard for use in hospitals, laboratories or food production. Due to the waterproof and dust-proof casing, it is possible to completely clean and disinfect the unit.

The keyboard's high-quality workmanship and robust design enable a long serviceable life. It includes a touchpad, a stand-by key for cleaning operations, integrated magnets for flexibly attaching the unit to work surfaces and an adjustable key lighting feature.

The keyboard has USB compatibility, with USB 2.0. It can also be mounted as it supports magnetic mountings, whereby the user can attach the unit to iron metal surfaces in a flexible way.

Backplane Systems Technology Pty Ltd

www.backplane.com.au



Capillary electrophoresis system

The P/ACE MDQ Plus is an automated, programmable capillary electrophoresis (CE) system designed to perform fast separations from complex samples. Separations occur in a capillary that is housed in an interchangeable cartridge with circulating liquid coolant for efficient temperature control. This finely regulated temperature control allows the use of high ionic strength buffers and large-bore capillaries necessary for analysing difficult samples. With CE, users should find methods fast to develop, easy to validate and less expensive to run.

The system offers high run-to-run reproducibility, with a liquid-cooled capillary array and robust sample injection control. It is suitable for automation of protein, DNA and RNA gels with a built-in high-pressure gel pump; this saves lab space, as there is no need for an external gas supply.

The product is designed to offer maximum flexibility of analysis with modular and integrated detectors, including photodiode array (PDA) and laser-induced fluorescence (LIF) detectors. There is also maximum flexibility in sample format, with the ability to inject samples from either 96-well plates or vials.

Samples can be kept stable with built-in cooling, independent from buffer temperature; this saves lab space as there is no need for an external water bath. Direct injection is available from sample volumes as low as 5 μ L using nanovials.

Pre- and post-sales application support is provided by the SCIEX global application team. The system can also be upgraded with an optional second detector: a laser module and LIF detector upgrade kit (488 nm, SGL COLOR) for the P/ACE MDQ Plus.

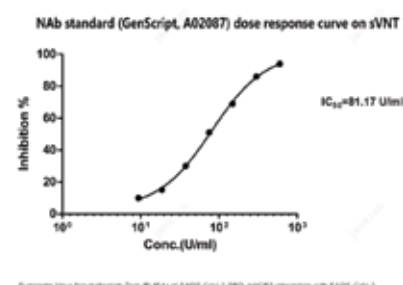
AB Sciex Australia Pty Ltd

www.sciex.com



COVID-19 virus antigens and antibodies

From diagnostics to drug discovery and vaccine development, GenScript has developed a comprehensive range of products that scientists may use to accelerate COVID-19 research and development. As the virus continues to mutate, much focus is now being placed on the variants due to their more infectious nature. GenScript provides both wild-type and variant versions (eg, Alpha, Beta, Gamma, Delta, Lambda, etc) of the SARS-CoV-2 protein, and these have been validated to bind to the human ACE2 receptor and may serve as antigens in both ELISA assays and Western Blot.



To complement these antigens, the company also offers COVID-19 antibodies that are specific to the SARS-CoV-2 nucleocapsid protein or the SARS-CoV-2 spike protein. The SARS-CoV-2 Spike Neutralizing Antibody Standard (A02087) is particularly useful in the assessment and development of assays for the detection and quantitation of SARS-CoV-2 neutralising antibodies. Neutralising antibodies are known to be more effective than regular binding antibodies in decreasing the SARS-CoV-2 viral infection of cells. The antibody standard binds to multiple neutralising epitopes in the receptor binding domain, and may be used in ELISA assays and in performing neutralisation tests.

GenScript Biotech (Singapore) Pte Ltd

www.genscript.com

Empowering researchers to develop genetic medicines

As we move from an absolute zero COVID-19 case load in Australia to being relatively swamped by the Delta variant, also advancing rapidly across the world, we are looking for a light out of this tunnel.

Many of Australia's brightest researchers have rallied to build a genetic medicine ecosystem that will enhance our sovereign capacity to manufacture locally. Extremely important advances have been made in funding such facilities, where we will soon see vaccines and treatments for not just COVID but a myriad of other infectious diseases and cancer.

There is a central puzzle piece common to all this research and that is the Precision Nanosystems NanoAssemblr, a platform of technologies designed to encapsulate a drug or genetic material. Using advanced microfluidics in an automated system, the NanoAssemblr removes batch-to-batch and user-to-user variability. Formulations are easily scalable from 1 mL to ultimately full GMP manufacture.

The most ubiquitous of the NanoAssemblr range is the Ignite, a research-level system where a drug product is produced by adhering to the unit process steps necessary for clinical manufacturing. Ignite simplifies the transition into clinical programs by incorporating these fundamental process steps for scale-up in the earliest stages of pre-clinical development. Years of research in Australia is paying off where we are on the precipice of a stream of drug candidates ready to scale.

Recently the team from the McMillan/Morris lab at Griffith University published an exciting opportunity for a COVID treatment¹ encapsulating their siRNA in a Lipid Nanoparticle (LNP) using the NanoAssemblr

Ignite. Queensland is home to several other drug candidates heading into the clinic soon. Unfortunately, some are going offshore whilst we build our local capacity.

Ignite's ability to empower genetic medicine advancement was recently witnessed when Prof Colin Pouton and his team at Monash University progressed from their Ignite to their newly acquired NanoAssemblr Blaze.³ The group is now ready to take their mRNA LNP candidate for a COVID vaccine to phase 1 clinical trial. It was exciting to see Prof Pouton explain his vaccine concept during the BioForum² recently. This forum was made possible by the BioMelbourne Network with mRNA Victoria as collaborators for the event, plus sponsor the Victoria State Government Department of Jobs, Precincts and Regions, and the speakers — the Hon Jaala Pulford, Prof Pouton and Dr Amanda Caples.

The UNSW RNA Institute will be a science, therapeutics and translational facility driving cross-disciplinary approaches to global challenges in RNA chemistry, biology and medicine. In partnership with NSW Health, UNSW will also lead the NSW RNA Production and Research Network. This network brings together four universities — The University of Sydney, the University of Technology Sydney, Macquarie University and The Australian National University — plus several medical institutes and hospital-based facilities with the UNSW RNA Institute, to enable an RNA

community of practice in NSW/ACT.⁴ This builds on the awesome work of Professor Maria Kavallaris' team at Children's Cancer Institute, where they are making huge advances with their NanoAssemblr Spark and Ignite.

ATA Scientific supplies instruments to the medical research industry; we are immersed in vaccine research, genetic medicine, COVID treatment research and so much more. We are proud to play our small part in Australia's response. Please contact Peter Davis at pdavis@atascientific.com.au for further information or to book a demonstration of the incredible NanoAssemblr.

References

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16th Congress of the Federation of Asian and Oceanian Biochemists and Molecular Biologists (FAOBMB)

November 22–25, Christchurch and online

Under the umbrella of the FAOBMB, five life science societies from New Zealand and Australia are partnering to deliver a diverse program that covers topics in biochemistry, molecular biology, microbiology and plant biology. Reflecting the breadth and depth of the five partner societies, as well as the great number of abstracts submitted, the parallel sessions will include a wide range of topics. The FAOBMB-IUBMB Education Symposium, 'Virtual Reality in Life Science Education', will be an exciting part of the main congress program, while the Young Scientist Program will give early-career researchers the chance to exchange ideas and seek career advice from senior mentors.

<https://www.faoymb2021.org/>

Australasian Cytometry Society Conference

November 7–10, online

<https://cytometryconference.org.au/>

Food Structure, Digestion & Health International Conference

November 16–19, online

<https://events.csiro.au/Events/2021/April/23/Food-Structure-Digestion-Health-International>

9th International Conference on Environment Pollution and Prevention

November 19–21, Sydney

<http://www.icepp.org/>

6th International Conference on Frontiers of Composite Materials

November 20–22, Melbourne

<http://www.icfcm.org/>

EQUUS Annual Workshop 2021

December 1–3, Noosa

<https://equus.org/events/equus-annual-workshop-2021>

22nd Asia-Pacific Prostate Cancer Conference

December 2–3, Melbourne

<https://www.prostatecancerconference.org.au/>

Food for Thought: The Future of Food and Nutrition

December 14, Canberra and online

<https://www.science.org.au/news-and-events/events/food-thought-future-food-and-nutrition>

Lorne Proteomics 2022

February 3–6, Lorne and online

<https://www.lorneproteomics.org/>

Lorne Proteins 2022

February 6–10, Lorne and online

<https://www.lorneproteins.org/>

Lorne Cancer 2022

February 10–12, Lorne and online

<https://www.lornecancer.org/>

Lorne Genome 2022

February 13–16, Lorne and online

<https://www.lornegenome.org/>

Lorne Infection & Immunity 2022

February 16–18, Lorne and online

<https://www.lorneinfectionimmunity.org/>

Acoustics 2021 Wollongong

February 21–23, Wollongong

<https://www.acoustics.org.au/Acoustics2021/Home/Acoustics2021/Home.aspx>

Cutting-edge Symposium on Integrated Systems Biology: Challenges and Future Perspectives

March 1–3, Brisbane and online

<https://wp.csiro.au/sisb/>

Pathology Update 2022

March 4–6, Sydney and online

<https://www.rcpa.edu.au/Events/Pathology-Update>

ARPS 2021 Conference

March 7–10, Canberra

<https://arpsconference.com.au/>

ACS 49th Annual Scientific & Business Meeting

April 29–May 3, Glenelg

<https://www.cytology.com.au/49th-annual-scientific-business-meeting>

ASM 2022

July 11–14, Sydney and online

<https://www.theasmmeeting.org.au/>

ComBio2022

September 27–30, Melbourne

<https://www.combio.org.au/combio2022/>

32nd International Congress of Antimicrobial Chemotherapy

November 27–30, Perth

<http://32icc.org/>

Australian Institute of Physics (AIP) Congress

December 11–16, Adelaide

<https://aip.org.au/congress/>

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Head Office

Unit 7, 6-8 Byfield Street,
(Locked Bag 2226)
North Ryde BC NSW 1670,
AUSTRALIA
Ph: +61 2 9168 2500

Editor

Lauren Davis
LLS@wfmedia.com.au

Publishing Director/MD
Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Colleen Sam, Krystyna Kappel

Circulation
Dianna Alberly
circulation@wfmedia.com.au

Copy Control
Mitchie Mullins
copy@wfmedia.com.au

Advertising Sales

Sales Manager: Kerrie Robinson
Ph: 0400 886 311
krobinson@wfmedia.com.au

Nikki Edwards
Ph: 0431 107 407
nedwards@wfmedia.com.au

Tim Thompson
Ph: 0421 623 958
tthompson@wfmedia.com.au

If you have any queries regarding our privacy policy please email privacy@wfmedia.com.au

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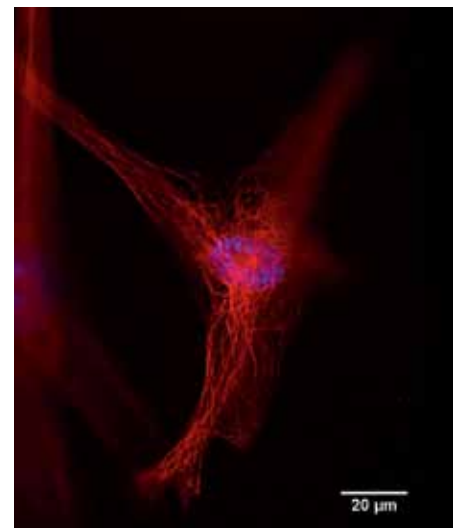
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