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and drug resistance

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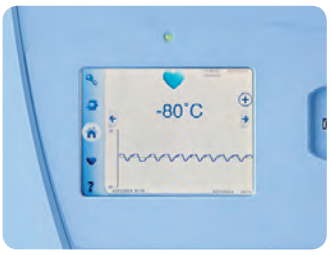

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Lauren Davis

Did the Budget do enough for science?

The 2015 Federal Budget will invest around $9 billion in Australian science, research and innovation, according to Minister for Industry and Science Ian Macfarlane.

The Australian Nuclear Science and Technology Organisation (ANSTO) will benefit from $193 million of this funding, $20.5 million of which will keep the Australian Synchrotron operating in 2016-17. Macfarlane described the synchrotron as "critical scientific infrastructure that benefits industries including mining, health, manufacturing, food security, energy and biosecurity, as well as improving productivity and research commercialisation".

"Through the synchrotron, Australia is developing treatments for lung disease and Alzheimer's and contributing to the development of innovative devices and materials for energy production and transport applications," Macfarlane added.

$49.1 million over the forward estimates will deliver new infrastructure at ANSTO's Lucas Heights campus, while $22.3 million over four years will allow ANSTO to retrofit two existing waste storage facilities. The buildings will eventually enable the characterisation and packaging of waste - created from the production of medical, scientific and industrial activities - to the forthcoming National Radioactive Waste Management Facility for long-term storage and disposal.

The previously announced Medical Research Future Fund (MRFF), which was to be partially funded by the now-abandoned GP co-payment, will apparently be legislated and operational by 1 August. $400 million is set to be distributed from the fund over the forward estimates - $10 million in its first year.

Other research funding includes $15.3 million over four years for tropical health research and $9.4 million for Antarctic research. Macfarlane also announced "a four-year investment in the CSIRO of over $3 billion over the forward estimates" - an interesting development given the 2014 Budget saw $111.4 million removed from the organisation over four years.

The 2015 Budget has additionally promised $300 million in continued funding for the National Collaborative Research Infrastructure Scheme (NCRIS) over the next two years. However, the executive director of Innovative Research Universities (IRU), Conor King, said this funding "does not address the ever-growing need for significant medium-term certainty of investment that ends the annual frenzy to keep the [NCRIS] facilities functioning".

King further noted that the NCRIS funds have been taken from the Sustainable Research Excellence (SRE) initiative, which will be cut by $263 million over the forward estimates and by $150 million in 2016-17 alone. These cuts reduce university-level capacity to support researchers, according to King.

"It's great that NCRIS facilities will continue to be supported for the next two years, but significant reductions to block grants to researchers in universities is like taking engines off the jumbo jet," said Professor Andrew Holmes, the president of the Australian Academy of Science.

"You need to fund the scientists as well as the tools they need to do their work; it can't be one or the other. NCRIS needs a long-term sustainable funding model."

Michael Cunningham, national leader life sciences at Grant Thornton Australia, meanwhile argues that there is a lack of significant measures to encourage commercialisation in Australia. For example, the government signalled that it will continue to make cuts of 1.5% to both the R&D refundable tax offset (43.5%) and the non-refundable tax offset (38.5%), despite not going forward with its intended 1.5% corporate tax rate.

"As most people are aware, the R&D incentive is a cornerstone underpinning Australian innovation, and it is extremely disappointing to see the incentive still being under attack despite being an extremely successful policy to date," Cunningham said.

The Australian Academy of Science last year concluded that funding for science and research is overall declining - a claim which it repeated this year. Professor Holmes said the academy welcomes the government's promise to further deliver on its national science, technology, engineering and mathematics (STEM) policy, but he said it is "absolutely imperative that this strategy is linked to significant additional funding for the sector, and that this funding begins to flow soon".

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Glenn Johnson

Antimicrobial drug resistance and corruption

Research recently conducted at the Australian National University by Dr Peter Collignon et al has shown there is a higher correlation between government corruption and antimicrobial drug resistance than there is between the incidence of drug usage and other commonly assumed factors.

Antibacterial drugs (commonly known as antibiotics) have been used for more than 60 years to cure infections, whether or not their use was appropriate in individual cases. However, as early as 1945, Alexander Fleming in his Nobel Prize speech warned that bacteria would become resistant to these treatments. Today we are seeing his prediction come true, and the world is now faced with the consequences of a long-term overdependence on the use of these drugs.

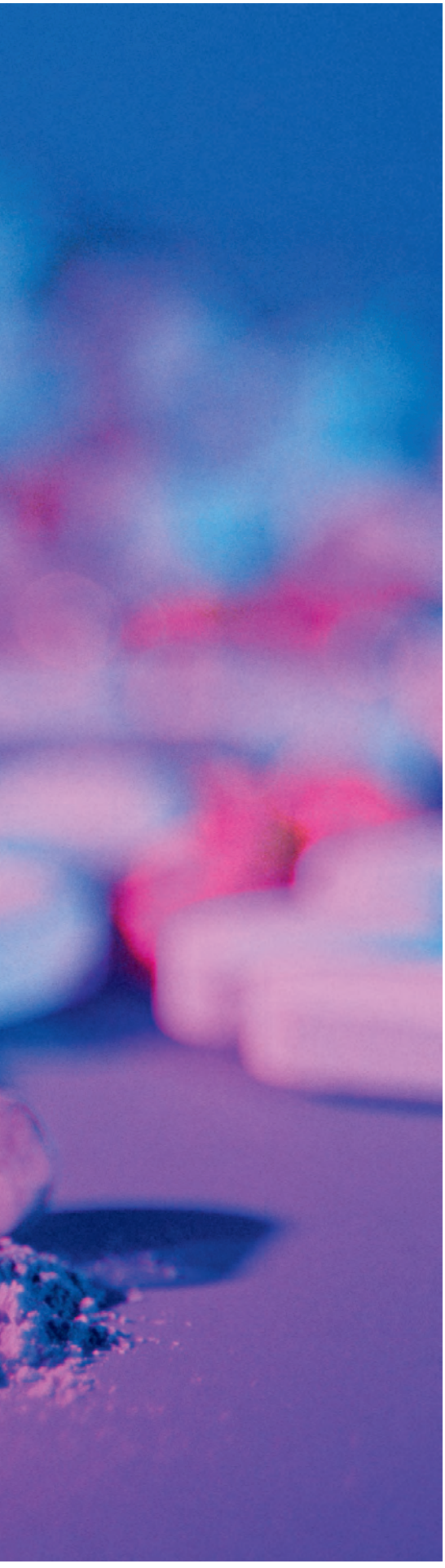
Antibiotics are actually a subset of a broader range of antimicrobial drugs. The commonly used term 'antibiotic resistance' refers specifically to the resistance to antibiotics that occurs in bacteria that cause infections. 'Antimicrobial' is a broader term, encompassing drugs used to treat infections caused by other microbes as well, such as parasites (eg, malaria), viruses (eg, influenza) and fungi (eg, *Candida*).

Antimicrobial resistance - a worldwide health problem

The World Health Organization (WHO) defines antimicrobial resistance as "resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it".

"Resistant microorganisms (including bacteria, fungi, viruses and parasites) are able to withstand attack by antimicrobial drugs, such as antibacterial drugs (eg, antibiotics), antifungals, antivirals and antimalarials, so that standard treatments become ineffective and infections persist, increasing the risk of spread to others.

"The evolution of resistant strains is a natural phenomenon that occurs when microorganisms replicate themselves erroneously or when resistant traits are exchanged between them. The use and misuse of antimicrobial drugs accelerates the



... antimicrobial resistance will kill 300 million people worldwide by 2050 and cost the global economy US$100 trillion if action is not taken to ease dependence on antibiotic medication.

emergence of drug-resistant strains. Poor infection control practices, inadequate sanitary conditions and inappropriate food handling encourage the further spread of antimicrobial resistance."[1]

It is also important to remember that it is not only antimicrobial drug use in humans that is increasing the problem. The use of antibiotics in animal husbandry and veterinary medicine is also impacting the growth of antimicrobial resistance. Since the 1960s, antibiotics have been used extensively in food animals as a means to reduce morbidity and increase farm yields. It has been claimed by some[2] that in the US in 2013 some 80% of antibiotic drugs sold were used on animals. Antibiotic contamination in wastewater, particularly from the pharmaceutical industry, has also in the past been linked to the increase in antimicrobial-resistant organisms in the environment.

In its *Antimicrobial Resistance Global Report on Surveillance* released in 2014[3], WHO raised the alarm at the extent of the problem:

"Some estimates of the economic effects of AMR have been attempted, and the findings are disturbing. For example, the yearly cost to the US health system alone has been estimated at US $21 to $34 billion dollars, accompanied by more than 8 million additional days in hospital. Because AMR has effects far beyond the health sector, it was projected, nearly 10 years ago, to cause a fall in real gross domestic product (GDP) of 0.4% to 1.6%, which translates into many billions of today's dollars globally."

In 2014, the UK government commissioned a report on the future effects of antimicrobial resistance. The resulting report published in December and titled *Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations*[4] predicts that antimicrobial resistance will kill 300 million people worldwide by 2050 and cost the global economy US$100 trillion if action is not taken to ease dependence on antibiotic medication.

"The damaging effects of antimicrobial resistance (AMR) are already manifesting themselves across the world. Antimicrobial-resistant infections currently claim at least 50,000 lives each year across Europe and the US alone, with many hundreds of thousands more dying in other areas of the world…But reliable estimates of the true burden are scarce."[4]

Antimicrobial resistance variation by country

Antimicrobial resistance has been observed to vary greatly from country to country. Factors that may contribute to this variation may include the relative wealth (GDP) of a country, the level of health expenditure, the quality of available health services and environmental factors - not least of which is the quality of sanitation and related services. However, these types of factors alone do not appear to adequately explain the actual variation found.

Research on the effect of corruption

Research recently published in Australia has highlighted the effect that government corruption and poor governance appears to have on the incidence of antimicrobial resistance. In a March 2015 paper by Australian National University (ANU) researchers titled *Antimicrobial Resistance: The Major Contribution of Poor Governance and Corruption to This Growing Problem*[5], the authors report that they found evidence to "support the hypothesis that poor governance and corruption contributes to antibiotic resistance and correlate better than antibiotic usage volumes with resistance rates".

The authors (Peter Collignon, Prema-chandra Athukorala, Sanjaya Senanayake and Fahad Khan) performed a multivariate analysis of the variation of antibiotic resistance in Europe in terms of human antibiotic usage, private healthcare expenditure, tertiary education, per capita GDP and quality of governance. The model used seven common human infections and covered 28 European countries for the period 1998-2010.

"The general perception of antibiotic resistance is that it is almost entirely related to the amounts of antibiotics used, not only in the broad sense of comparative usage by different countries but also in individuals. However, the available empirical evidence suggests that these two variables are not

perfectly correlated at national levels and across countries. We believe that other factors are as important, or even more important, to account for the variations in resistance observed between regions and countries. In particular, we wished to look at the contribution of corruption."[5]

Europe was chosen for the estimation because it was the only region where data was available for all parameters in the study across multiple countries. The countries covered are Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

The research also covered 25 pathogen/antibiotic combinations grouped into seven classes, namely:

- *Streptococcus pneumonia* resistance to penicillins and macrolides
- *Staphyloccocs aureus* resistance to methicillin and rifampicin
- *Pseudomonas aeruginosa* resistance to amikacin, aminoglycosides, carbapenems, ceftazidime, fluoroquinolones and piperacillin/tazobactam
- *Klebsiella pneumonia* resistance to cephaolosporins, aminoglycosides, carbapenems and fluoroquinolones
- *E. coli* resistance to cephaolosporins, aminoglycosides, aminopenicillins, carbapenems and fluoroquinolones
- *Enterococcus faecium* resistance to aminopenicillins, gentamicin and vancomycin
- *Enterococcus faecalis* resistance to aminopenicillins, gentamicin and vancomycin

Governance found to play a crucial role

The simplest of estimations, based on variations in antibiotic usage, showed that only 28% of the total antibiotic resistance variation in Europe could be attributed to usage patterns alone. When this was extended to include time-dependent effects, such as global shocks, it increased to only 33% that could be explained by usage.

Surprisingly, the income level of a country appeared to have no effect on resistance rates, nor did gross tertiary education enrolments. So in general, the wealth and relative educational advancement of a country was not a factor.

The rankings of countries by government control of corruption, however, yield a significantly different result. The data used was from the *International Country Risk Guide* published by the Political Risk Services Group, and when

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correlated with the other data, 63% of the antibiotic resistance variation was now explained. This would indicate that government corruption is a greater factor in explaining antimicrobial resistance than usage variation, and overall was by far the greatest socioeconomic factor.

Interestingly, when the data was compared on a year-on-year basis, it showed that the level of corruption in past years did not appear to influence outcomes in later years. In other words, the fact that corruption was higher in the past had no bearing on present levels of antimicrobial resistance - reduction in corruption resulted in a reduction in the level of resistant pathogens.

Governance factors

The results of the report indicate factors affecting antimicrobial resistance that are not expected in the common perception of most people. The authors of the ANU research have suggested that when the quality of governance is poorer it is less likely there will be effective controls over the use of antibiotics, not only in people, but also in food animals and the agricultural sector generally.

Where antibiotic use is not effectively controlled, it is suggested that there will be not only an increase in the development of resistant bacteria, but the spread of these bacteria will also be easier. Poorer control and law enforcement in relation to food and water safety would also help to increase the spread of drug-resistant bacteria.

How corruption affects the health sector

Corruption occurs to varying degrees in all countries, creating financial, economic and social costs, but it is especially damaging in poorer countries because of its effects, not only on pubic health, but also on development in general.

On a macroeconomic level, corruption limits economic growth: private organisations see corruption as adding risk to their investment decisions, and while particular multinational corporations might gain by bribing an official to win a contract or tax break, evidence suggests that corruption generally reduces the overall level of investment.[6] As a result, the lower economic growth means that less government revenue is available for investment, including investment in the health sector.

Choices in how to invest revenue are also affected by government corruption, since such governments are more likely to invest in infrastructure-intensive activities such as transport and the military, where there is a greater potential to extract bribes. Within the health sector, the construction of hospitals and purchase of medical equipment, while in themselves beneficial, can be prioritised over primary health care and health education for the same reason.

Corruption directly operating in the health sector also has a negative effect on access to, and quality of, patient care. It tends to drain resources from health budgets so that less funding is available to pay salaries and fund operations and education, leading to lower quality of care and reduced service availability and use - as well as poor diagnosis and the ineffective or inadequate prescription of medication, including the overprescription of common antimicrobial treatments.

The avoidance of the regulation of drugs is also common in jurisdictions without adequate governance. The dilution of medicines and the use of counterfeit drugs has been increasing - unregulated medicines that are of subtherapeutic value can contribute to the development of drug-

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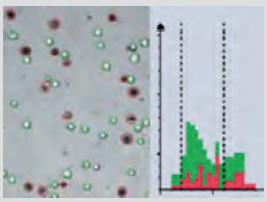

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... when the quality of governance is poorer there is less likely to be effective controls over the use of antibiotics, not only in people, but also in food animals and the agricultural sector generally.

resistant organisms and increase the threat of pandemic disease spread.

Another problem - well recognised in developed countries - has also been the unethical promotion of drugs and conflicts of interest for medical practitioners. In her January 2009 article *Drug Companies & Doctors: A Story of Corruption*[7], Marcia Angell, former editor-in-chief of *The New England Journal of Medicine*, wrote that pharmaceutical companies spend about $54 billion each year on drug marketing, including industry-sponsored education, drug information publications, and gifts and hospitality targeted at doctors. These activities, along with many other questionable consulting and education activities, help to influence decision-making and can lead to non-rational prescribing.

Example: Tuberculosis in India

The incidence of tuberculosis in India averages around two million cases per annum and poses a significant public health risk for the rest of the world. While India has been working hard to reduce the incidence of TB, in recent years there has been a rise in the incidence of multidrug-resistant tuberculosis (MDR-TB). According to the *Wall Street Journal* (19 June 2012)[8], "India's slow response to years of medical warnings now threatens to turn the country into an incubator for a mutant strain of tuberculosis that is proving resistant to all known treatments, raising alarms of a new global health hazard.

"In most of the country, India pays only for standard TB treatment, which medical authorities say is useless against the antibiotic-resistant strains. In fact, experts said, antibiotics that don't kill the disease provide favorable conditions for mutation of new, stronger strains."

India is well known for endemic public and private sector corruption. In 2012, India ranked 94 out of 176 countries in the Corruption Perception Index of Transparency International. Other recent surveys also reveal that, globally, corruption has worsened in the last two years, according to a survey conducted by Ernst & Young in India in 2013[9].

The availability of free diagnosis and treatment of MDR-TB has only occurred in recent years and in some locations, such as Mumbai, these services have been delayed. There is also an issue of the poor quality of TB and MDR-TB laboratory diagnosis in the private sector. The use of serology to diagnose TB, commonly used in India, is known to misdiagnose and has been recommended against by WHO and other expert groups.

There is also a lack of information about patients diagnosed with TB and MDR-TB in the private sector, since the public health sector is not informed, and the quality of the private care is not supervised.

Anti-TB drugs are also available without prescription and there is, therefore, subsequent widespread irrational and irresponsible use of them, further expanding the development of drug-resistant strains.

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Conclusion

Research recently conducted at ANU, while not accounting for all factors, has nevertheless shown that government corruption and poor governance is significant in raising the incidence of the development of antimicrobial drug-resistant strains of infection. The research has shown that the effect of corruption is significantly larger than the actual use of antimicrobial drugs in explaining variations in drug resistance between countries.

While medical research will continue to find ways to alleviate the effects of past medicine use, changes and improvements to the way governments manage corruption, not only in the health sector, but across all aspects of society, will help achieve better public health outcomes.

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Is alcoholic liver disease in your genes?

The US Government has invested $2.5 million in an international study to determine the role of genetics in alcoholic liver disease (cirrhosis) - a condition which costs $3.8 billion a year in Australia alone.

The study is being led by Dr Devanshi Seth from Sydney's Centenary Institute. She said, "It is widely accepted that 15-20% of chronic excessive drinkers will develop cirrhosis, although rates of up to 50% have been reported.

"There is widespread acceptance among liver specialists that not all patients who drink excessive alcohol will develop cirrhosis. Our study is working to uncover the genetic factors that increase the risk of developing cirrhosis."

The study is recruiting 5000 participants across the world, located in Australia, France, Germany, Switzerland, the UK and the USA. Dr Seth noted that alcohol consumption levels have so far been "similar in drinkers who did not have liver disease as to those who had cirrhosis, emphasising the existence of individual vulnerability factors".

Furthermore, many of the participants with cirrhosis have reported that their father consumed excessive quantities of alcohol and had died from liver disease. According to Dr Seth, this underscores and exemplifies the heritability of this disease.

In the next stages of this study, it is expected that the information generated will provide the first 'genetic architecture' of alcoholic cirrhosis and identify risk factors. Dr Seth believes the study will ultimately lead to better and earlier diagnosis and treatment of the condition.

Dr Devanshi Seth.

You weren't that smart - you just had the right epigenetic marks on your HES1 gene

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Research led by the University of Southampton, UK, with support from New Zealand and Singapore, provides evidence that epigenetic processes influence brain development enough to have an impact on a child's later ability to learn and their cognitive performance. The research aims to understand the mechanisms by which one's early-life environment affects one's chances later in life.

The body uses epigenetics as its principal control system, to increase or decrease the expression of our genes, and epigenetic processes are known to be important in memory and other aspects of brain function. The research team noted in the *International Journal of Epidemiology*, "In animal models, early environmental cues affect neuropsychological phenotypes via epigenetic processes but, as yet, there is little direct evidence for such mechanisms in humans."

Their research used umbilical cord tissue collected at birth and identified epigenetic marks, in a key brain development gene called HES1, that were linked to a child's cognitive performance and ability to learn at ages four and seven. The findings in two groups of children in Southampton were accompanied by additional findings in children from Singapore, whose HES1 epigenetic marks at birth were associated with aspects of socially disruptive behaviour previously linked with poor performance at school.

"Alongside the findings in different groups of children in the UK and Singapore, we also found evidence for an effect of the epigenetic marks on the function of the HES1 gene in laboratory studies," said study leaders Professor Karen Lillycrop and Dr Paula Costello. "Together, the findings provide substantial support for a role for epigenetics in mediating the long-term consequences of the early-life environment on brain development and later cognitive performance."

Dr Anne Rifkin-Graboi, a key investigator in the Singaporean study included in the research, added, "This is the first time that epigenetic marks at birth have been linked with substantial effects on a child's ability to learn. The effects on later cognitive function and behaviour in two culturally diverse populations are particularly noteworthy, as they relate to healthy children within the normal range of size at birth. The research marks an important step forward in determining biological mechanisms through which brain development is susceptible to environmental exposures."

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"Many in the research sector now agree that the 'real magic' often happens when scientists interact with each other," said Max Englisch, the Asia-Pacific manager for WALDNER. "Our fit-out systems, applied to the Australian Lab-to-let model, will make for rewarding science spaces where teamwork thrives."

The model is said to have been well received by the Australian lab sector. For more information, visit http://g3lab.com/lab_space_to_let.html.

Doping doesn't do much good

Following the examination of over 120 years of sporting records, University of Adelaide researchers have concluded that doping actually has very little effect on athletes' results.

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Aaron Hermann and Maciej Henneberg collected about 1560 records of male and female athletes, across 26 sports, between 1886 and 2012. Comparisons were made between pre- and post-1932 records - the year when steroids became available - as well as pre- and post-1967, when widespread use of doping was formally acknowledged.

"The average best life records for 'doped' top athletes did not differ significantly from those considered not to have doped," said Hermann.

The study suggests that doping practices are, if anything, harming athletes' results - "seemingly indicating that 'natural' human abilities would outperform the potentially doping 'enhanced' athletes", according to Hermann. He explained, "Doping may produce a minor improvement in one aspect of performance, but in other areas it may have a detrimental effect, which outweighs the positive."

Hermann said the study may also show that doping is more widespread than initially thought. He noted, "The 2000 Olympics gold medal result for the women's 100 m sprint was even poorer than the gold medal obtained in the 1968 Olympics - the first year of doping testing in the Olympics."

Hermann said he hopes the study will confront the perception that athletes need to dope in order to remain competitive.

New gold detection method

Researchers from the University of Adelaide are developing a portable, highly sensitive method for gold detection that would allow mineral exploration companies to test for gold on-site at the drilling rig. Exploration for gold is extremely challenging, with a desire to detect very low concentrations of gold in host rocks," said postdoctoral researcher Dr Agnieszka Zuber.

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"The presence of gold deep underground is estimated by analysis of rock particles coming out of the drilling holes. But current portable methods for detection are not sensitive enough, and the more sensitive methods require some weeks before results are available."

Using light in two different processes (fluorescence and absorption), Dr Zuber and her colleagues at the university's Institute for Photonics and Advanced Sensing (IPAS) have been able to detect gold nanoparticles at detection limits 100 times lower than achievable under current methods. According to Dr Zuber, the team's easy-to-use sensor will "allow fast detection right at the drill rig with the amount of gold determined within an hour, at much lower cost".

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Turbo molecular pump series

Shimadzu Corporation has launched the compact, robust, 'hybrid-bearing' TMP-B300 turbo molecular pump for vacuum industries and analytic scientific applications. The product features an onboard controller and has low power consumption (180 W).

Turbo molecular pumps (TMPs) produce a vacuum due to the high-speed rotation of turbines that enables vacuum pumping at the molecular flow level. Traditionally, TMPs have been essential components for the manufacture of semiconductors and flat panel displays where oil-free, clean, high vacuums are essential. The series was developed for vacuum industry and analytical scientific applications, where ultrahigh vacuums are required and TMP performance must satisfy the stringent requirements of analytical scientific research, where limited space, low power consumption, flexible mounting capability and robustness are key requirements.

At 195 mm high, the pump can be mounted in any direction (vertical, horizontal, inverted) to enable installation in space-constrained environments. It has a high compression ratio for hydrogen (1 x 105) for UHV operation with a smaller dry vacuum pump, such as a diaphragm pump. It features an integrated control panel for ease of use and is capable of continuous operation at a maximum backing pressure of 1000 Pa.

Shimadzu Scientific Instruments (Oceania) Pty Ltd
www.shimadzu.com.au

Multiparameter portable meters

Hanna Instruments has announced the release of several waterproof multiparameter portable meters. The meters have up to six sensors for measuring pH, ORP, EC, DO, temperature and barometric pressure, in addition to seven interpreted parameters including TDS, seawater salinity and pH in mV.

The meters are tough, compact and lightweight, yet provide the ability to measure critical water parameters with laboratory-grade accuracy. The pH, ORP, EC and DO sensors are field replaceable and mount into a single digital probe that is around 5 cm in diameter. The sensors are protected by an ABS plastic cage that is weighted with a stainless steel ring, allowing for the probe to achieve a maximum depth of 20 m in water.

The HI98194 (pH/ORP/EC/DO/temperature/barometric pressure), HI98195 (pH/ORP/EC/temperature) and HI98196 (pH/ORP/DO/temperature/barometric pressure) meters are designed for demanding applications. The meters are rugged and waterproof to IP67 specifications, while the probes with the sensors are IP68 rated.

The meters are suitable for users in the environmental industries, including environmental engineers, researchers and water treatment plant operators. They come supplied with a rugged carrying case containing the necessary probes, solutions and accessories needed for field measurements.

Hanna Instruments Pty Ltd
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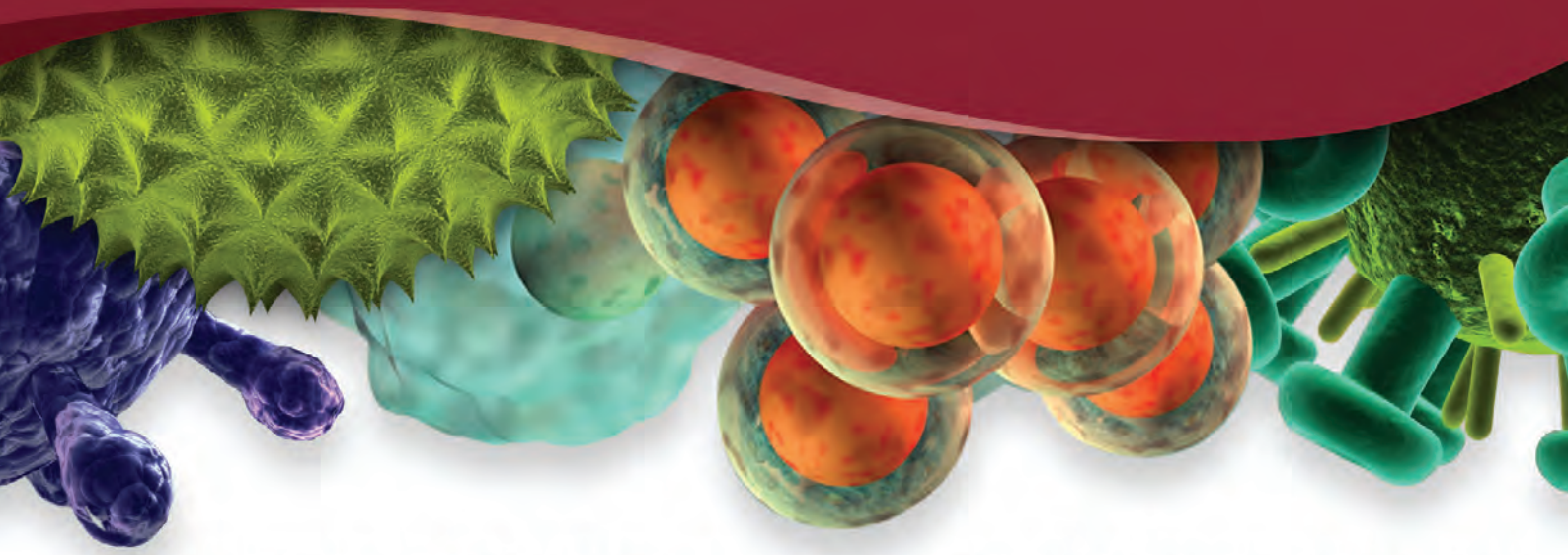

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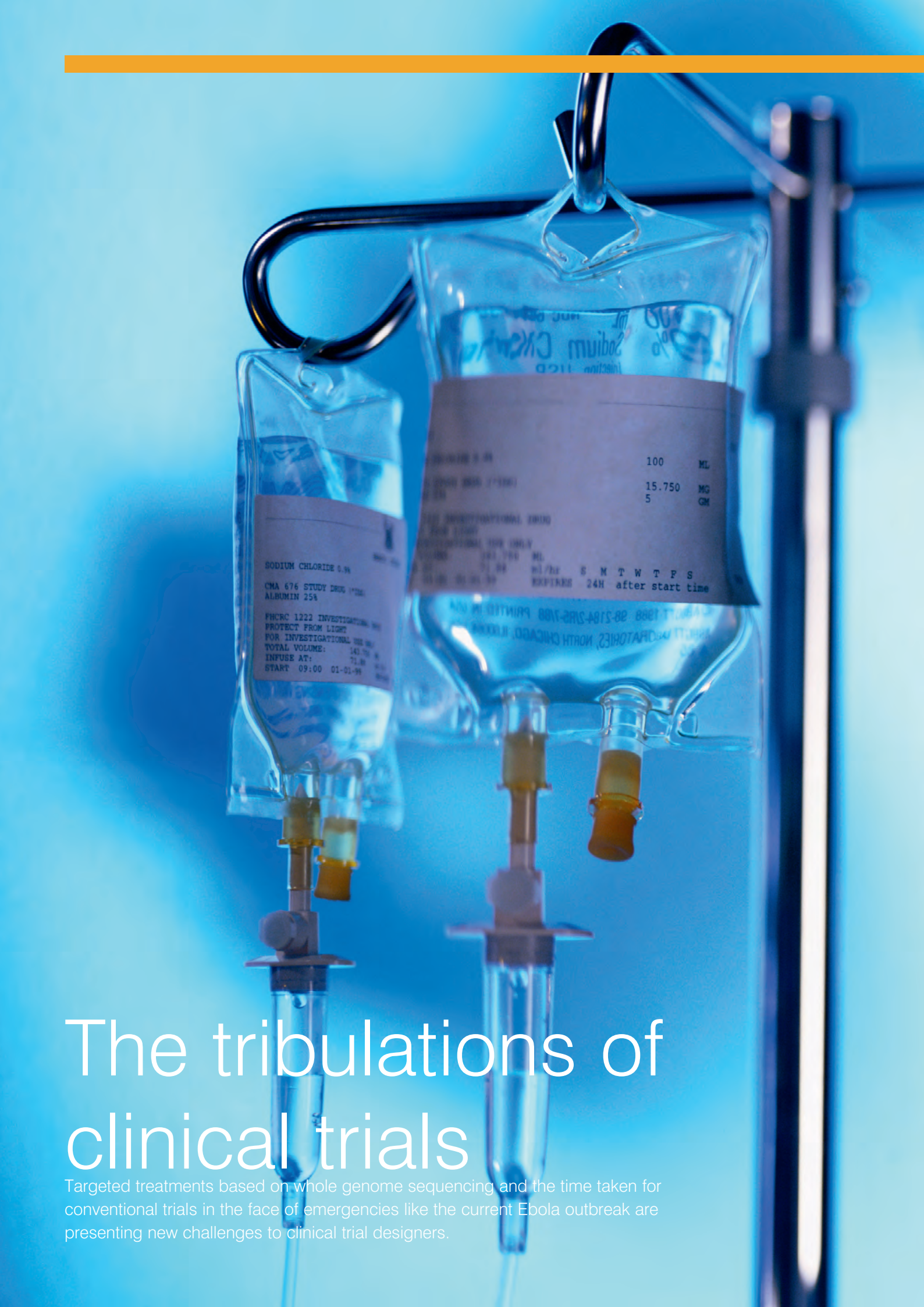

The tribulations of clinical trials

Targeted treatments based on whole genome sequencing and the time taken for conventional trials in the face of emergencies like the current Ebola outbreak are presenting new challenges to clinical trial designers.

Advances in whole genome sequencing have made it possible to identify unique druggable alterations in individual tumours but real-world application of this technology in diseases such as pancreatic cancer remains a challenge.

In an ongoing Australian pancreatic cancer clinical trial, the Individualised Molecular Pancreatic Cancer Therapy or 'IMPaCT' trial, researchers have been learning ways to bring about a new paradigm of personalised cancer care for pancreatic cancer and other aggressive cancer types. In conventional terms, the trial could be viewed as a failure, as to date it has been unable to recruit eligible patients. In reality, ways have been identified in which it can bring about a new model of personalised cancer care.

IMPaCT arose to exploit results from genome sequencing of pancreatic cancer under the auspices of the Australian Pancreatic Cancer Genome Initiative, a member of the International Cancer Genome Consortium (ICGC) in Australia. Sequencing revealed that small subsets of patients with changes in their tumour genome could benefit from existing therapies.

The pilot stage of the IMPaCT trial assessed the feasibility of acquiring suitable tumour specimens for molecular analysis and returning high-quality actionable genomic data within a clinically acceptable time frame.

Initially, the single-arm trial screened patients for three molecular targets: HER2 amplification, indicating treatment with trastuzumab/gemcitabine; KRAS wild-type, indicating treatment with erlotinib/gemcitabine; and DNA damage repair pathway defects, indicating treatment with platinum-based chemotherapy. While patients waited for the molecular analysis results, they were permitted to start standard-of-care chemotherapy treatment.

Patients in the initial cohort of the trial underwent disease resection, and 70% of patients eventually had disease recurrence. The researchers began collecting tissue for analysis in 2009; however, by the time the first trial site opened in April 2013, only eight patients with eligible molecular targets remained alive.

The researchers altered the trial design to conduct real-time screening for mutations in patients diagnosed with untreated metastatic disease. The screened mutations were expanded to include KRAS, BRCA1, BRCA2, PALB2 and ATM.

> We can do the scientific part, but the societal and systemic parts pose the greatest hurdles.

Out of 93 patients whose tumours were examined, 76 samples were of sufficient quality to be screened using next-generation genomic sequencing. Only 22 patients were deemed eligible to participate in the trial because their cancer cells contained one of the three molecules that could be treated with existing therapies.

Unfortunately, none of the eligible patients went on to receive targeted treatment. The researchers encountered many hurdles. The technology was very new; there was much scepticism about 'genomic medicine' to overcome; many complex administrative processes and protocols demanded by current clinical trial frameworks had to be observed in setting up the trial at three hospital sites; and they were dealing with a cancer that killed swiftly once diagnosed, so sequencing of the tumour had to be fast.

"Our data highlight just how difficult it is to do this sort of trial in a poor-prognosis cancer like pancreatic cancer," said Lorraine Chantrill, MBBS, FRACP, medical oncology staff specialist at Macarthur Cancer Therapy Centre in Campbelltown Hospital, and a researcher at The Kinghorn Cancer Centre, Garvan Institute of Medical Research, both in Australia. "We know that, unfortunately, only about 15% of the population had molecular targets eligible for this type of treatment and that it has been very difficult to do the molecular analysis quickly enough before patients get too sick to be treated.

"It became very clear to us that patients with advanced pancreas cancer can't afford to wait protracted periods of time for sequencing results before they start treatment, and they also don't want to be 'randomised' and risk being given 'standard-of-care' therapy - which isn't very effective in the case of pancreas cancer - rather than targeted therapy," said Dr Lorraine Chantrill.

"We are now particularly aware of the need to have efficient multidisciplinary teams that can work quickly to obtain patient consents, collect high-quality tumour samples, analyse them and return the results within a month or less."

Two amendments have been made to the trial to make it more appealing to patients and their doctors. Patients will now receive the best-known treatment available while they wait for sequencing results - which will then guide further treatment in all cases. No-one will be randomised from now on.

Professor Andrew Biankin*, MBBS, PhD, senior author of the study, observed that while the sequencing could be performed rapidly, simple logistics such as specimen access from hospital pathology departments resulted in the greatest time delays.

"We can do the scientific part, but the societal and systemic parts pose the greatest hurdles," he said.

"A disruptive approach, such as our ability to sequence cancer genomes, poses substantial problems for traditional healthcare systems, which have grown organically to accommodate other technologies and other practices.

"We now need to modify and align conventional health and research systems with new technologies and practices, interact more closely with regulators and payers, and work with government and industry partners to circumvent hurdles for the benefit of our patients.

"We have made a good start in mapping out what is necessary, the challenges that we need to overcome. Only by actually doing it will we work out the right way forward," said Biankin.

"We have found that a non-randomised trial is more appealing to patients in this situation," Chantrill said.

Andrew Biankin went on to say: "It highlights how current healthcare systems are not well aligned for a more personalised approach to therapy. Lessons learnt here could inform appropriate changes in healthcare systems to enable precision medicine in practice.

"It is important for the public to know how hard it is to put into practice molecularly guided treatment within the constraints of our health service delivery," Chantrill added. "We hope that our work will help others who are planning similar studies."

The Ebola epidemic could return with a vengeance unless lessons about medical trials are learnt

Health experts have warned that a greater flexibility must be brought to medical trials to combat diseases like Ebola to avoid facing another nightmare outbreak.

The rapidity and spread of the Ebola outbreak and the urgency of a response led to many challenges not least of which was to advise those managing people on the ground of the best way to treat the illness and which treatments might be effective.

The conventional design of medical trials may have been too time-consuming and demand recruitment of too many patients for what was a very urgent situation. The experts have urged a greater flexibility be used in future.

One of the experts, Professor Sanjeev Krishna, of St George's University of London's Infection and Immunity Institute, said: "The challenges posed by the current Ebola outbreak affect all types of interventions. These include difficulties in evaluating new potential drugs, vaccines and diagnostics, especially when the numbers of individuals who are infected can change quickly from day to day or week to week.

"To design really useful and informative trials that can give results to change practice in this and any future outbreaks, we suggest highly flexible, but nevertheless powerful designs that can adapt to changing patterns of infection and mortality."

Writing in the prestigious medical journal *The Lancet Infectious Diseases*, the medical experts and academics said: "Even if somehow the present epidemic is eventually contained (over a time course that is currently uncertain), the world will still be largely unprepared for the next epidemic that could strike again at any time in an equally explosive manner."

The Ebola outbreak that has devastated parts of West Africa represents an unprecedented challenge for research and ethics. Estimates from the past three decades emphasise that the present effort to contain the epidemic in the three most affected countries (Guinea, Liberia and Sierra Leone) has been insufficient, with more than 24,900 cases and about 10,300 deaths as of 25 March 2015.

Faced with such an exceptional event and the urgent response it demands, the use of conventional randomised controlled trials (RCT) for Ebola-related research are considered by some to be both unethical and infeasible. Others suggest that potential interventions should be assessed in non-randomised studies on the basis of compassionate use - giving patients what doctors think might work. However, these non-randomised studies might not yield valid conclusions, leading to large residual uncertainty about how to interpret results. It can also waste scarce intervention-related resources by not answering fundamental questions about their value, making them unethical in some people's eyes.

Scientifically sound and rigorous study designs, such as adaptive RCTs, could provide the best way to reduce the time needed to develop new interventions and to obtain valid results on their efficacy and safety while preserving the application of ethical precepts. They should be included in the toolkit against emerging infections.

Professor Biankin, who is now based at the Wolfson Wohl Cancer Research Centre at the University of Glasgow in Scotland, will be undertaking parallel trials in the UK, implementing all the lessons learned through the IMPaCT trial.

Isothermal titration calorimetry system

Isothermal titration calorimetry (ITC) is a technique used to measure and characterise biomolecular binding interactions. It works by directly measuring the heat that is either released or absorbed during a biomolecular binding event. The technique can simultaneously determine binding parameters such as binding affinity (KD), stoichiometry (n), enthalpy (ΔH) and entropy (ΔS) in a single experiment.

Requiring no modification, either with fluorescent tags or through immobilisation, ITC measures the affinity of binding partners in their native states. Applications include: drug discovery and design; characterising biomolecular interactions; and fundamental research such as the understanding and regulation of signal transduction pathways.

One of the challenges associated with the measurement and characterisation of binding interactions is the broad affinity range that needs to be addressed, which typically spans the low millimolar to subnanomolar range. The MicroCal PEAQ-ITC, designed for ease of use and with high sensitivity, has a wide affinity range that enables analysis of weak to high affinity binders with good reproducibility.

The non-reactive Hastelloy cell ensures chemical resistance and compatibility with biological samples, while the high-precision pipette enables smaller injection volumes. The high signal to noise, fully automated options for unattended operation and user-friendly guided workflow ensure data analysis consistence for confident decision-making.

ATA Scientific Pty Ltd
www.atascientific.com.au

Online training centre for biomedical engineers

Fluke Biomedical has launched Advantage Training, an online centre aimed at providing accessible training to the biomedical engineering community. The training centre covers the full spectrum of medical device preventive maintenance and quality assurance for biomedical and diagnostic imaging equipment.

Training is available for all skills levels. The courses follow an e-learning format and allow users to control their own learning experience. Certificates of completion are issued upon passing a quiz at the end of a course.

The training centre provides unlimited free access, so anyone can learn anytime, anywhere, on any device. Hundreds of training tools are available, including white papers, application notes, quizzes and more than 20 hours of recorded modules. Fluke Biomedical has plans to expand the centre in the future to answer growing training demands.

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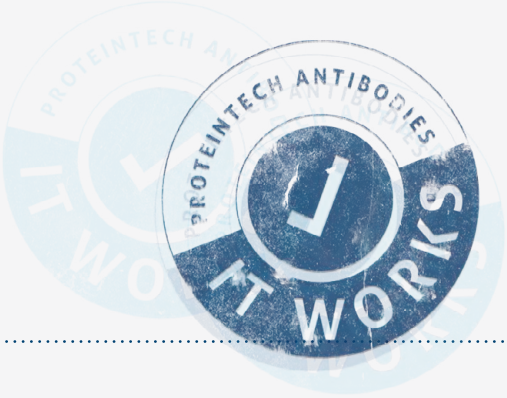

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Alcohol and extract meter for beer

An alcohol and extract meter for beer, Alex 500 from Anton Paar, frees craft brewers from the need for external laboratories. The lab-grade analyser determines beer's alcohol and extract content, calories, degree of fermentation and many more parameters. The meter is based on a combination of technologies, including absorption measurement via NIR spectroscopy and density measurement based on the oscillating U-tube technology.

The compact, easily operated instrument can be used in two modes. In the fermentation monitor mode, it directly displays a fermentation curve, assigned to a tank via sample ID. In the final production stages, it can be switched to its standard mode to determine a beer's alcohol content, original or real extract content and other beer parameters with lab-grade accuracy. The product measures alcohol with an accuracy of 0.2% v/v and determines density with an accuracy of 0.001 g/cm^3.

The device covers the entire beer measuring range, not just part of it. Brewers are provided with direct, real-time results, without the necessity for a separate calculation or distillation. They only need one single instrument and can handle the entire measurement procedure themselves.

MEP Instruments Pty Limited
www.mep.net.au

Tamperproof laboratory autoclaves

The Priorclave QCS H150 front-loading autoclave is suitable for any laboratory aiming to increase its sterilising throughput. The 150 L laboratory autoclave has a stainless steel, 500 mm-diameter sterilising chamber accessed via a wide door opening that allows easy loading - even of heavy loads, which may be delivered direct by trolley.

Precise control of the sterilising process has been made easy using single push-buttons on the Tactrol 2 microprocessor control panel. One-touch controls enable the user to step through settings of temperature and time in accordance with HSE prescribed sterilising parameters for a specified load.

The microprocessor keeps a log of the sterilising cycle data such as temperature, pressure and time. The data is held in an archive file which can be subsequently downloaded onto a USB flash drive for sending to the service team at Priorclave's manufacturing centre. Here, technical staff will analyse the data to help fine-tune the autoclave for maximum efficiency.

The secure key-lock switch on the front of the control panel governs access to certain parameter settings. There are three levels of authorisation: preset, which is the basic setting; intermediary, allowing adjustment of cycle times and temperatures; and a master level allowing other performance settings to be activated, such as accelerated cooling and media warming. The switch makes accessing each different level simple and fast.

Built to International Standards, the autoclave incorporates epoxy-coated panels and frame members treated with an antibacterial agent that is effective against all bacteria and fungi, preventing cross-contamination within the laboratory. It is suitable for diverse industrial sectors such as food, drink, dairy, pharmaceutical, agricultural, education and health care, as well as dedicated research establishments for sterilising applications such as media preparation, liquids and diluent, waste and glassware instruments.

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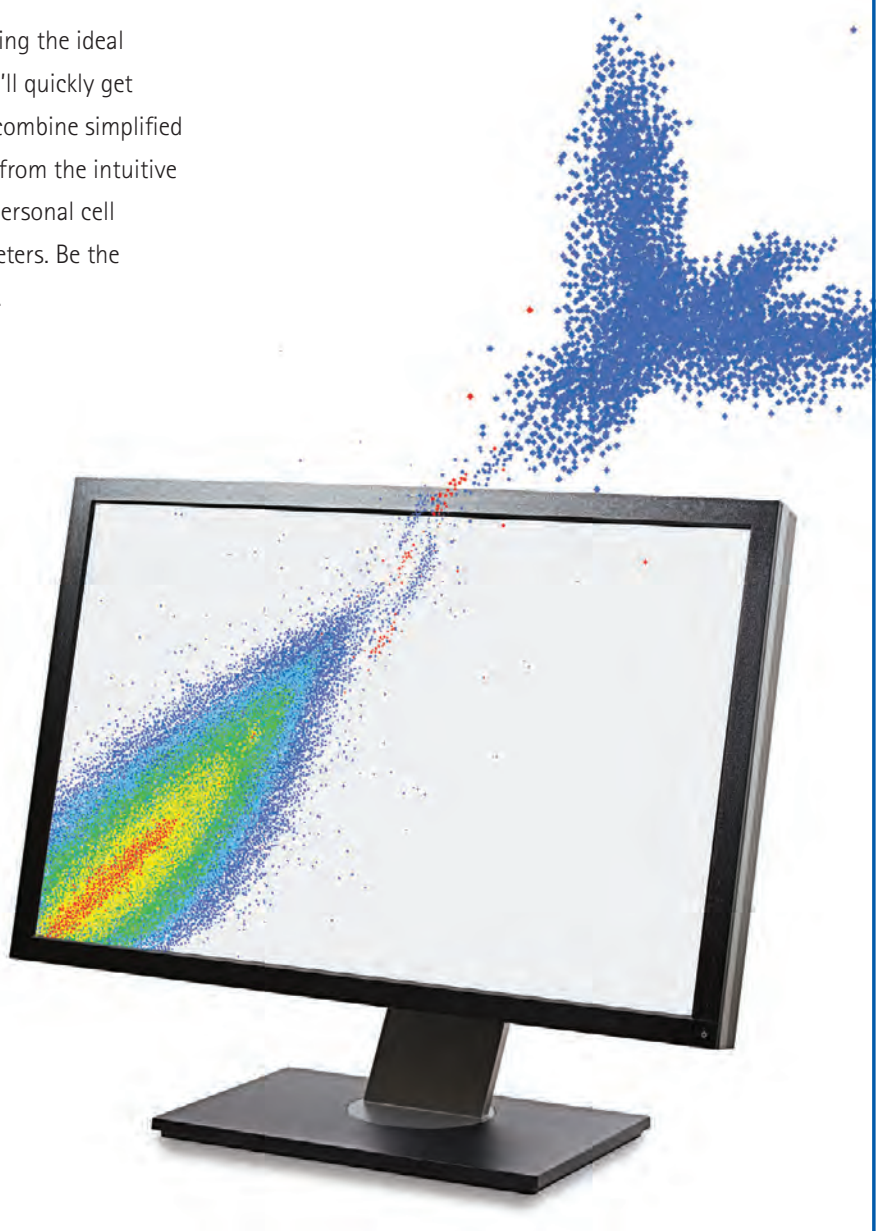

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AppNotes

Temperature monitoring reduces the risk of loss

Medicines, vaccines, blood products and tissue, lab and bio-samples in cold storage need defined, constant temperatures to avoid compromise. Without constant temperature monitoring, the risk of loss is greatly increased.

Losses can have significant monetary value in insurance claims and impact on research continuity. These losses may be from a few thousand dollars up to several million dollars but, more importantly, any loss can disrupt the continuity of the biomedical and scientific research or waste invaluable blood and other medical samples.

Melbourne University has a considerable number of research bio-samples that are stored in cold storage facilities located across the many faculties, departments, hospital departments and research institutions that make up the university. Many bio-samples are stored in scientific ultracold freezers, laboratory and domestic fridges and freezers, cool rooms and freezer rooms and a variety of liquid nitrogen storage vessels. Some of these have local temperature monitoring devices and alarms, but the majority do not.

The university and its research groups would not want to suffer significant losses to their research if a cold storage facility that contained their research biomaterials failed. This could result in substantial losses - not only in research material, but in millions of dollars. A monitoring and alarm system forms a key part of a freezer/cold storage management system that the university is developing.

The monitoring and alarm system will allow Melbourne University to keep a check on the operating conditions of its many cold storage facilities. In the first instance, the system will be used to monitor fridges and freezers across the university. This will allow for the collection of temperature data and temperature monitoring for each individual cold storage facility.

The collected data will be useful for facilities management, preventive maintenance programs and sustainable and efficient energy use of cold storage facilities. Fridge and freezer units can be adjusted to their optimal operating temperatures. The collected data can also be used by researchers to verify that their cold-stored biomaterials are stored at the required temperatures.

The alarm feature of the system will notify key personnel within the university when significant temperature changes occur in individual fridges or freezers. The temperature changes could adversely affect the research biomaterials or even indicate the failure of the cold storage equipment. The alarm will allow key staff to take preventive action before the bio-samples are significantly affected by changes in temperature.

The system will provide the researchers with information about the condition of their fridges and freezers; but more importantly, it will send out an alarm when there is a problem with the temperature of their valuable cold-stored research samples. In the event of a cold storage facility failure, the alarm feature will give the researchers every opportunity to save valuable research biomaterials and prevent losses to their research.

The testo Saveris system is a flexible off-the-shelf monitoring and alarm system that is designed for easy installation and operation. It is designed to monitor and collect data for reporting, while sending notification alarms, with software that is easy to use.

The system features 'local wireless networks' (probes and converters), together with communication 'over the internet' (converters and base station) for monitoring and alarm transmission. It only requires a small number of dedicated IP addresses for a large number of monitoring points. Saveris monitoring probes can easily be reassigned if a laboratory is relocated or a fridge or freezer needs to be relocated or replaced. It is said to be a cost-effective system compared to a number of other commercially available systems.

testo

www.testo.com.au

Tensiometer

The DCAT 9 tensiometer from DataPhysics Instruments now includes intuitive software as well as an extended choice of different measuring methods.

The weight-based measurements of the surface and interfacial tension are automatically steered and evaluated using the DuNoüy ring or the Wilhelmy plate method. In addition to the different dynamic and static analysis options which can be used to evaluate temperature, the Langmuir trough offers a method of investigating surface coatings or molecular self-organisation processes by chemical substances.

The product is available in three different variants: DCAT 9, without TV 70 (temperature-controllable vessel); DCAT 9T, including TV 70; and DCAT 9M, including TV 70 and a built-in magnetic stirrer. The innovative design and the high-quality device components are said to ensure optimal support in research, development and quality control.

Particle & Surface Sciences Pty Ltd
www.pss.aus.net

Molecular analysis profiling to identify cancer driver events

The Affymetrix Concurrent Molecular Analysis Profiling (CoMAP) program enables cancer researchers to gain rapid insight into the functional impact of DNA copy-number alterations by combining whole-genome copy-number data with gene expression profiles to easily visualise and identify cancer driver events.

Recent whole-genome DNA analysis of cancer samples has demonstrated that copy-number alterations affect more of the genome than any other DNA abnormality. Many of these alterations are 'drivers' of cancer, while others are merely 'passenger' events. Deciphering which DNA alterations are driver or passenger events has been a challenge.

The CoMAP capability enables the concurrent correlation of genome-wide gene expression changes with copy-number alterations, helping to identify and prioritise the number of potential driver events - which in turn can lead to the identification of functional biomarkers. This is particularly valuable to researchers studying C class tumours, which are characterised by functional copy-number changes, as opposed to somatic mutations (M class).

The capability is included in the Affymetrix Chromosome Analysis Suite (ChAS) 3.0 Software, enabling researchers to analyse and visualise the functional impact of copy-number changes on gene expression in cancer samples, including degraded FFPE tissue. The capability instantaneously combines and correlates whole-genome copy-number data with mRNA and miRNA data generated from Affymetrix tools such as OncoScan FFPE Assay Kit, GeneChip Human Transcriptome Array 2.0 and GeneChip miRNA 4.0 Array.

The approach enables researchers to go from samples to insights in just three days. Correlation maps may be generated for all RefSeq genes or a customised gene list.

Millennium Science Pty Ltd
www.mscience.com.au

Sukvinder Heyer, Partner - Indirect Tax, Grant Thornton Australia

Encouraging innovation

in Australia's life sciences and biotechnology industries

For those in the business of innovating, ensuring sufficient funding is available has always been a concern.

The Research & Development (R&D) Tax Incentive has been a long-established source of funding and support for businesses in the research, development and early developmental commercialisation phases. The policy driver behind the R&D Tax Incentive is to encourage more companies to engage in R&D in Australia. And it's working: a number of companies have publicly stated that they have set up in Australia because of the support provided by the R&D Tax Incentive.

The R&D Tax Incentive has two tiers:

- A 45% tax offset for businesses with an aggregate turnover of less than $20 million, which may be available as a cash rebate if the business is in losses (benefit of 15c in the dollar).
- A 40% non-refundable tax offset for businesses with a turnover greater than $20 million (benefit of 10c in the dollar).

Even though the understanding of taxation support for R&D is very high within the life sciences and biotechnology sphere in Australia, significant opportunities and complexities still exist. Therefore, companies can make major gains by taking advantage of this support and streamlining the process they do this through.

Tax opportunities for research, development and early-phase commercialisation

Be certain whether your activities and/ or expenditure are eligible for the R&D Tax Incentive

There are specific mechanisms under the R&D Tax Incentive to provide a company with certainty on the eligibility of its activities for the R&D Tax Incentive. An Advance Finding can provide this certainty, provided the company makes the application before the end of the financial year. If the year-end has passed, companies may also request AusIndustry to undertake a review of the

R&D claim made. ATO private rulings are also available if a high level of certainty is required over the eligibility of expenditure incurred on R&D activities.

Claim for R&D activities you need to undertake offshore

Expenditure incurred outside of Australia is only eligible if an Advance Finding, lodged before the end of the financial year in which the activity is undertaken, is obtained. Advance Findings do take time and require a rigorous understanding of the R&D Tax Incentive process and the provisions involved. Companies routinely get caught out by leaving the application too late and underestimating the procedural requirements involved.

Foreign-owned R&D

As noted above, the policy driver for R&D is to encourage R&D to be undertaken in Australia. It is recognised that sometimes Australian companies undertake (and indeed are compensated for) R&D on behalf of a foreign-related company. Depending on the country in which the foreign company is located, and the agreements in place between the entities, it is possible to claim the R&D being done in Australia at the tax offset rates already mentioned.

Get the supporting documentation and cost identification processes right

Making sure the supporting documentation for R&D Tax Incentive claims is maintained and systems for identifying eligible R&D expenditure are as efficient as possible saves time and protects the eligibility of any R&D Tax Incentive claim. Many companies unnecessarily take on too much of this burden, putting undue pressure on key research staff and risking the eligibility of the claim. Good support and advice is affordable and a great investment to streamline the process.

IP management/research location management

Unfortunately, Australia continues to lag global progress in supporting companies to locate their IP in Australia. 'Patent-box' provisions are increasingly being used around the world to ensure that companies that develop great new technology locally keep it onshore by providing tax breaks on revenue generated from such IP. Not only does this contribute to manufacturing being undertaken locally, but it also ensures companies are not put in a 'second-best' position compared to companies locating their IP in tax preferential jurisdictions. There has certainly been a push by the biotech community for such provisions be developed for Australia; however, this has yet to gain traction with the government.

In addition, some global jurisdictions offer excellent support for developers and early-phase developmental manufacturing, and so life science and biotechnology companies in the R&D phase should be giving serious thought to where and how they want to commercialise their product globally: which global markets will they be going into and where will they want to undertake their manufacturing and full-scale production development? All of these considerations will impact where the ultimate technology and IP will be located.

Cross-border transactions, related party dealings and transfer pricing

As part of the recent modernisation of Australia's transfer pricing rules, new provisions were introduced replacing the old transfer pricing regime. The new provisions contain special rules placing greater emphasis on record keeping and documentation, and create a significant administration burden on companies. Recognising this, the ATO has provided for a range of procedural safe harbours that reduce the documentation burden in specific cases. However, life science and biotechnology companies which commonly hold IP are broadly excluded from the safe-harbour provisions where there have related party dealings.

Specifically, the safe harbour for businesses with a turnover of less than $25 million will not be available where a company has related-party dealings involving royalties, licence fees or research and development arrangements.

This means that life science and biotechnology companies looking to global markets are very likely to be fully exposed to the full documentation requirements of the new transfer pricing provisions, making early planning critical to manage global manufacture, distribution and ongoing development, research and commercialisation.

Where to from here for the R&D tax incentive?

The ATO and AusIndustry have signalled that they are looking more closely into arrangements related to R&D and the types of claims being made. Of particular interest to the ATO is the application of the "aggregate turnover" rules in light of company ownership structures. Companies should be aware of the grouping rules which apply to this test.

The most recent legislative change for R&D has been the introduction of a cap on the expenditure which can be subject to the tax offset each financial year. The cap is $100 million, and any amounts above this receive the R&D tax offset at the corporate tax rate. It is expected that this will directly impact only a very, very small number of companies. However, what is sometimes forgotten is the effect that this may have on companies that provide R&D services to these large R&D companies.

Companies have been public about coming to Australia because of the R&D tax incentive. If companies are unable to access the R&D tax incentive, they will likely look overseas for their projects, particularly without further incentives to locate their IP in Australia. This will continue to have a limiting effect on the "spillover benefits" of the R&D Tax Incentive - the increased expertise and knowledge base in Australia - to the benefit of other local innovators.

Although the rate of offset has not been cut, it appears that this is still not off the table, with the government still seeking to balance a budget and cut costs. We wait to see what the May Budget for the 2016 year brings.

Grant Thornton Australia

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15 and 50 mL conical tubes

The Eppendorf Conical Tubes 15 and 50 mL extend the volume range of Eppendorf's microcentrifuge tubes from 0.5 to 50 mL.

The tubes feature screw caps that provide optimal sealing properties. With their grooved and multisurface side contour, they ensure a secure, slip-free grip. The optimised handling features further facilitate safe opening and closing of the tubes via convenient one-handed operation.

The tubes are further characterised by an expanded purity grade: sterile and pyrogen-free, they are also free from DNases and RNases as well as human and bacterial DNA. These features make them suited to cell biology applications in a sterile environment as well as laboratory protocols in the fields of microbiology and molecular biology, which rely on freedom from contamination with DNA.

A high level of manufacturing precision and robustness ensure smooth performance of the tubes in laboratory instruments such as centrifuges or thermomixers.

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Nucleic acid extraction kits

Scientex, along with its partner RBC Bioscience, presents various high-quality ISO-accredited and TGA-approved nucleic acid extraction kits for easy purification.

The Genomic DNA Whole Blood Kit is suitable for purification of total DNA - including genomic, mitochondrial and viral DNA - from whole blood, plasma and serum.

The Cultured Cells DNA Kit provides extractions for up to 5x106 cultured cells. Downstream applications include PCR, restriction enzyme digestions and southern blotting.

When using the Viral Nucleic Acid Extraction Kit, all consumables are pretreated and DNAse/RNAse-free to eliminate contamination issues. The product is suitable for HBV, HCV, HIV and influenza viruses.

The Genomic DNA Plant Kit for purified genomic DNA uses up to 100 mg of fresh tissue. Downstream applications include PCR, southern blotting and RADP/AFLP.

The Genomic DNA Bacterial Kit is designed to extract DNA from both Gram-positive and Gram-negative bacteria. Downstream applications include PCR, rtPCR, restriction enzyme digestion and southern blotting.

The Total RNA Whole Blood Kit offers purification from 0.4 mL of human whole blood. The product provides high-quality DNA-free total RNA, with high-sensitivity results suitable for downstream applications such as qRT-PCR.

Manual kits assists users with low-usage applications. Two main technologies are used - Silica Spin Kits for fast mini-preps and Ion Exchange Columns for high yield of plasmids.

The MagCore Automated Nucleic Acid Extractor utilises magnetic bead-based reagent cartridges for extractions including clinical molecular diagnosis, human identity testing, forensics and biomedical research.

Also available is the Automated Nucleic Acid Extraction System for unattended operation.

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UTS opens

state-of-the-art health and science building

The University of Technology, Sydney's (UTS) Faculty of Science and Graduate School of Health Building - the third major development in the university's billion-dollar City Campus Master Plan - was officially opened on 27 April by NSW Health Minister Jillian Skinner.

Images courtesy of Andrew Worssam.

Spanning eight occupied levels, and with a gross building area of 13,800 m^2, the building has capacity for approximately 900 students and 300 staff. According to UTS Dean of Science Professor Bruce Milthorpe, the facility contains state-of-the-art learning and research technologies and spaces.

"One of the new building's many laboratories is a crime scene simulation lab, designed to resemble a modern city apartment, complete with kitchen, bathroom, bedroom and dummy bodies, to teach students to detect blood, fingerprints and how these may be hidden to conceal crimes," Professor Milthorpe said.

The building's new super lab, described by Professor Milthorpe as "the only one of its kind in Australia", allows tutors to run different science classes concurrently. Accommodating up to 220 students, the lab features "stunning learning technologies to support the university's student-centred approach to learning that fosters interdisciplinary collaboration", said Professor Milthorpe.

The building's green roof includes a tree nursery and saltwater tank to grow algae, seagrass and saltmarsh plants, allowing researchers to better understand how carbon dioxide sequestration, solid waste and wastewater treatment, and the impacts of climate change. The roof additionally provides recreational space, insulation, improved air quality, a plant and animal habitat, and the ability to filter and clean stormwater run-off.

The green roof is one of several sustainability features incorporated into the new building, resulting in a 6 Star Green Star Design rating from the Green Building Council of Australia (GBCA). Other features include the use of environmentally friendly building materials; natural daylighting; insulated double glazing; water-efficient fixtures; and energy-efficient LED lighting. Meters and sensors constantly monitor the real-time sustainability performance of the building, making it a 'living lab'.

Professor Milthorpe said the science building is "an important physical milestone for the faculty's ongoing evolution", with UTS having recently reorganised its five schools of science into just two - the School of Life Sciences and the School of Mathematical and Physical Sciences.

"Our two new science schools will break down old discipline silos, offering researchers and students alike the chance to broaden their experiences," he said.

Minister Skinner noted that she is "particularly excited this fine building will house a psychology clinic - staffed by masters students working under supervision - which will have a research role with a multidisciplinary approach to issues such as pain management".

UTS Vice-Chancellor Professor Attila Brungs concluded, "This building, and our entire newly developed campus, embodies UTS's vision to be a world-leading university of technology and an inspiring place equipping our graduates for jobs of the future and delivering research with impact."

At **ICP Firefly** we make the commitment to help to create a cleaner, safer and healthier planet. We are at the forefront of Good Laboratory Practice (GLP) in Australia for our extensive nonclinical and ecotoxicology services. Our safety testing in mammalian species ranges from single dose to lifespan. For the assay development and identification of test compounds, we provide high sensitivity and specificity using liquid chromatography-mass spectrometry (LC-MS/MS) bioanalytical services. Our close-knit team brings passion, talent, knowledge and expertise to your project.

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Centrifuge

Beckman Coulter Life Sciences expands its range of high-performance centrifuges with the Avanti JXN-30. The product improves workflow by delivering high-throughput performance and an increasingly varied separations capability.

The MobileFuge remote application enables users to access all types of data, carrying out remote monitoring, control and error handling via networks and mobile devices. Available for Apple iOS and Android devices, its data management capability combines with the network and MobileFuge applications to make the centrifuge especially suitable for shared lab environments.

Recycled resin is incorporated in the outer panelling of the centrifuge, and each instrument contains up to 3.4 kg of recycled PET bottles. A friction reduction system (FRS) enables the device to run quietly, increasing energy efficiency by reducing the air in the chamber. This in turn reduces rotor friction, minimising the effort required to accelerate and to maintain speed. The FRS also lowers the amount of heat present in the chamber, reducing refrigeration system usage.

The BioCertified fixed-angle and swinging-bucket rotors offer a range of biosafety options, including a dual-locking lid configuration for workflows that include biohazardous samples. This maintains biocontainment when removing and transporting the rotor to a containment hood. Centrifuge rotors range in capacity from 360 mL to 4 L, and some are independently certified to contain liquids and aerosols.

Built-in safety features ensure that no individual rotor exceeds the maximum speed permitted. A low work surface makes rotor handling easier with a foot pedal for hands-free lid opening. Large footpads allow the unit to be used unanchored. Interface options enable users to customise the touch screen with pictures, backgrounds, avatars and sounds. An optional pharmaceutical-grade sterilising filter system, located on the unit exterior for ease of access, also enhances biosafety.

Beckman Coulter Australia
www.beckmancoulter.com

Desktop SEM

The Phenom XL desktop SEM is a user-friendly and fast tool that allows full imaging of large samples up to 100 x 100 mm. The product features several innovations, yet it uses little energy, does not require special facilities and is small enough to fit on a standard table. Sample structures can quickly and easily be examined and their elemental composition determined using the fully integrated EDS system.

The company's venting/loading mechanism provides high throughput and ensures a time-to-image of less than 1 min. The four-segment BackScatter Detector (BSD) yields sharp images and provides chemical contrast information. The unit can also be equipped with a secondary electron detector (SED) that enables surface sensitive imaging. Other features include up to 100,000x magnification and 'never lost' navigation ensuring ease of use.

The user interface enables both existing and new users to quickly become familiar with the system and get the most out of it without the need for significant set-up or training. The 'single-shot' optical navigation camera allows the user to move to any spot on the sample with just a single click, within seconds. The ProSuite software includes applications such as ParticleMetric, PoroMetric, FiberMetric and 3D Roughness Reconstruction, which allow the user to further analyse samples.

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Electrical pipette pump

The Electrical Pipette Pump Plus from LLG accommodates 1-100 mL glass or plastic pipettes and is designed with the user in mind.

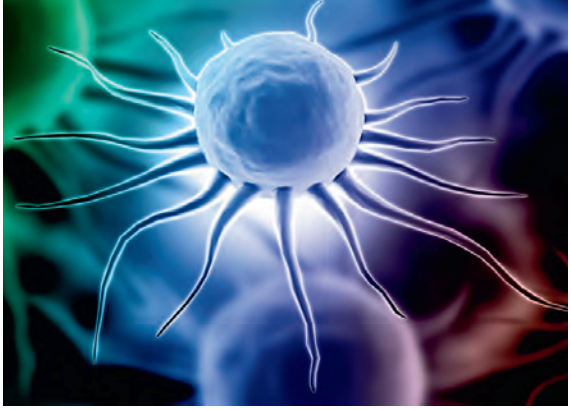
The pipette pump features a soft touch trigger for comfortable pipetting. The colour-coded autoclavable attachments allow easy organisation in the laboratory and the powerful pump offers rapid yet sensitive aspiration and dispensing. Filling and dispensing can be done one-handed due to the large buttons and their placement.

The long-life Li-ion battery gives up to 20 h of pipetting, resulting in less charging time for users. The pump is suitable for a variety of applications, environments and fields, with an ergonomic shape specially designed for repetitive tasks that cause injury and strain in traditionally designed pipettes.

The electrical pipette pump uses standard 0.45 μm hydrophobic filters, making a brand switch simple and fast. It features bright LEDs to indicate mode (high, low or gravity), while the user labelling area enables customisation and instant recognition and/or task designation.

With universal voltage, a plug-faced charger, bench stand and magnetic/fixed wall mount, the product provides a complete solution.

LabFriend
www.labfriend.com.au



Colorimetric assay

The Cell Counting Kit-8 is a sensitive colorimetric assay for the determination of the number of viable cells, using WST-8, in cell proliferation and cytotoxicity assays.

The high-throughput method enables simple and quick analysis for personal care and drug discovery applications. It is said to be more sensitive than MTT, XTT, MTS and WST-1.

The kit contains a ready-to-use solution that does not require organic solvents or radioisotopes and correlates with the [^{3}H]-thymidine incorporation assay. It can be added directly to the cell media for fast screening without harvesting, washing or solubilisation, obtaining reproducible and accurate results.

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

Chemical glove

The Glove Company has produced Chloronite, a lightweight chemical glove said to exceed industry standards for chemical protection in hand safety. The glove was rated with seven letters under EN 374, including >480 min resistance to MEK.

The outer layer of chloroprene, combined with accelerator-free nitrile on the inside, produces a glove that not only protects the user but is also comfortable to wear for an extended period of time, due to being less than half the weight of other chemical gloves on the market. The lightweight glove combines high levels of dexterity with resistance to a vast range of hazardous chemicals.

Chloronite, under certified testing AS/NZS 2161:10.1:2005/EN 374, is said to have higher ratings and more passes on aggressive chemicals than the majority of chemical gloves available on the market today. Certified and tested by VIC Labs, it is suitable for use in a variety of applications, including chemical and biological agents, fuel treatment, cargo hold insecticides, chemical handling and processing, biohazard agents and many more.

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• Is there dedicated support?	√	
• Does the system have a proven track record?	√	

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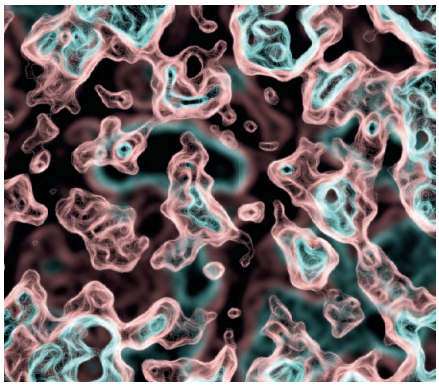
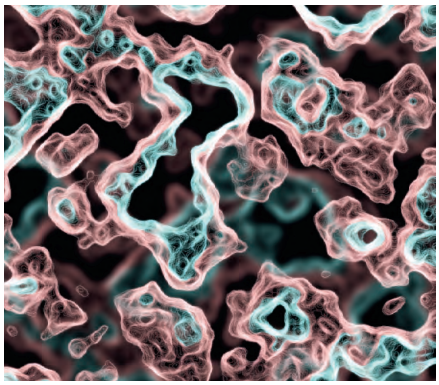
VAISALA

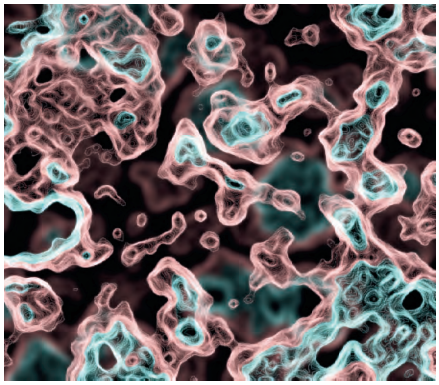
Exploding giant microbes anyone?

The Australian Society for Microbiology achieves critical mass in Canberra

The president of the Australian Society for Microbiology, ASN Conference Organisers and the Local Organising Committee of the 43rd Annual Scientific Meeting and Trade Exhibition would like to invite you to Canberra in July 2015 to immerse yourself in the microbial world. It will be cold. You have been warned. But it will be festive.







© freeimages.com/profile/Bessarro

Australia's investment in microbiology over the past century has paid handsome dividends. From celebrated medical discoveries to the everyday exploitation of domesticated microbes, the microbiology community in Australia, represented collectively by the Australian Society for Microbiology, have much to be proud of. If not for the accolades of Australian microbiologists on the international stage then for public health campaigns that give us daily reflexes to cover our mouth when we sneeze and wash our hands when they're dirty. Microbiologists have a huge responsibility to human and environmental health, and the best way to bear that burden is by sharing our knowledge.

The 43rd Annual Scientific Meeting and Trade Exhibition is preceded by the 2nd Annual ASM Educon conference for microbiology educators at ANU's University House 11-12 July 2015. The program tackles big picture issues such as the need for a national microbiology curriculum, through learning and assessment models, social media and graduate employability. Registration allows access to the opening session of the main course of the gathering.

This includes the Sunday afternoon Public Lecture (12 July) involving a brisk walk across to the Shine Dome co-hosted by the Australian Academy of Sciences. International speakers (Jansson, Giovanoni) join the chair of the LOC (Manefield) to showcase the extraordinary influence of microbes on the planet we cohabit in a three-part presentation From Guts to Great Oceans. This event is catered and Questacon will have a presence so it could get lively. Exploding giant microbes anyone?

It also includes the Bazely Oration across the road in the warmth of our principal conference venue, dressed to the nines, QT Canberra. The oration will be delivered by acclaimed virologist Yoshihiro Kawaoka specialising in influenza and Ebola viruses and followed by a welcome reception with trade sponsors and a nightcap in the Capital Bar, all at QT Canberra.

The scientific program proper runs Monday to Wednesday (13-15 July 2015) at QT Canberra showcasing some of the most influential local and international microbiologists in the world. Invited international plenary speakers include Stefan Schwarz (Germany), Chantel Abergel (France), Stephen Giovannoni (USA), Judith Berman (Israel) and Jorge Galen (USA). Acclaimed microbial ecologist of the human gastrointestinal tract Janet Jansson (USA) will deliver the Rubbo Oration on Tuesday evening followed by a formal Rubbo Supper and late-night revelry in QT Canberra's drawcard bar, Lucky's. Chief Medical Officer of Australia Chris Baggoley will deliver the Snowden Oration on Wednesday morning. The annual general meeting and awards ceremony of the society will take place over lunch on the Tuesday. The Australasian Mycological Society will join the meeting for the final day on Wednesday, 15 July 2015 flowing into an independent venue on Thursday, 16 July 2015.

Students and early-career researchers are invited to a host of career advancement events including the Nancy Millis Student Mentoring Breakfast and Lunch, the ECR Mentoring Lunch (focus on funding) and an evening of brewing, old-school social networking and unwinding at the awesome Bentspoke Brewery, Canberra. Check out the conference website for 'buy one get one free' deals on student registration. Three top-tier poster and trade sessions are woven into the program displaying as much as possible of the talent and tech that we couldn't fit on stage.

The conference has also attracted a feast of workshops covering imaging, antimicrobials, proteomics, bioinformatics, women in science and Illumina's sponsored workshop. The Cosmetics and Pharmaceuticals Special Interest Group will also host a technical workshop paying tribute to the late Paul Priscott. Other SIGs meeting during the conference include Parisitology and Tropical Medicine, Clinical Serology, Microbial Bioinformatics, Food Microbiology, Antimicrobials, History and Molecular Microbiology.

Outside the luxury of the conference venue, Canberra has a wealth of iconic museums, gardens, galleries, events, exhibitions, sport, scenery and arts, not to mention its thriving food and wine industry. Those of you who know Canberra know the deal. For those of you who don't, you're in for a treat so take your time to explore.

This year the traditional divisions recognised by the society (medical/veterinary, virology, environmental, molecular) have been removed to present a more fluid and integrated scientific program. The conference theme (One Microbiology) celebrates a passion for microbiology in all environments regardless of purpose and recognises the profound importance of microbiology and microbiologists to the future of human and environmental health on Earth.

For more details, visit www.asm2015.asnevents.com.au.

Hospital ware

Kartell has released a large collection of hospital wares, including invalid cups, sampling bottles for urine, kidney dishes and round bowls. The hospital wares are made to strict high-quality standards.

Kartell Kidney Dishes & Invalid Cups have good chemical and temperature resistance and are autoclavable. The company's Bed Pans have been moulded in white polypropylene and can withstand temperatures up to 120°C. Its Round Sampling Bottle & Container for Urine is available in sizes up to 2500 mL.

The company's Douche Cans or Irrigators are provided with a flat back and suspension tag. They are autoclavable and available in 1000 or 2000 mL.

The Kartell Round Bowl is a white bowl with a rim which is autoclavable at 121°C for 20 min. The product has a sturdy structure and features two grips that have been designed in the lower part of the rim to help carriage.

The company's smaller Input Pot is useful for storing or wet sterilising dissecting instruments. The larger Input Pot is suitable for storing larger instruments. Wide bases on both products make them stable and they are also autoclavable.

The company's Square Sampling Bottles for Urine can be used in hospitals for clearance testing on urine that has been collected throughout the day. They feature a specific design with a rectangular base for easy storage of the bottles and enhanced stability. The ergonomic design of the handgrip allows easy pouring. The bottles are available in sizes up to 2000 mL.

Sieper & Co Pty Ltd
www.sieper.com.au

Temperature and dewpoint meter

The testo 635-2-HPD is a portable humidity meter fitted with a high-pressure dewpoint probe. Available to rent from TechRentals, it is suitable for taking measurements in compressed air systems.

The illuminated display shows relative, absolute and degree of humidity, as well as enthalpy, temperature and dewpoint values for difference, min, max and mean. The fitted probe has a range of -60 to +50°C t_{pd} and 0 to100% RH.

Other features include: an intuitive and practical interface; protection class IP54; storage for 10,000 measurement values; and PC software for archiving and documentation of data.

TechRentals
www.techrentals.com.au

Micro-titration plates for susceptibility testing of yeasts

Susceptibility testing with MERLIN MICRONAUT-AM plates (EUCAST) is based on the rehydration of antimycotics by adding a standardised yeast suspension. Growth of the yeasts is indicated by a colour change from blue to pink mediated by the AST indicator supplementing the test medium. The addition of methylene blue solution facilitates reading of antimycograms of yeast with trailing effects.

After incubation of 22-48 h at 35-37°C, the result is read photometrically with the plate reader and evaluated with the MERLIN MICRONAUT software. It can also be read visually and interpreted.

Dutec Diagnostics Pty Ltd
www.dutecdiagnostics.net.au

Automatic titrators

The Titralab AT1000 Series one-touch automatic titrators are capable of analysing and delivering accurate results in just a few steps through a plug-and-play system.

The system consists of two elements: the hardware itself and the application package (applications are supplied on a loaded USB key). Depending on the application, titration systems can perform analysis simply by reading an application installed on the USB key, with a different key for each method/application.

While other titration methods involve a large number of steps and elements, the latest system offers a simple set-up straight from the box. There is no chemistry background required by the operator, allowing anyone from the lab to perform accurate titrations.

By reducing manual calculations and processes, as well as eliminating complex programing, titration results are quick and easy to achieve. There are five instrument options to choose from, as well as several application packages. The titrators are suitable for drinking water, wastewater, food and beverage, as well as petrochemical applications.

Pacific Laboratory Products
www.pacificlab.com.au

Lauren Davis

Are you tweaking your experiments?

Australian researchers have stated that some scientists are unknowingly tweaking experiments and analysis methods in order to increase their chances of obtaining easily publishable results. Their study has been printed in the journal ***PLOS Biology***, no doubt making some readers wonder if it too has been altered for publication!

The study examined a type of bias called p-hacking, which occurs when "researchers try out several statistical analyses and/or data eligibility specifications and then selectively report those that produce significant results", according to the authors. While such actions may be conscious or unconscious on the part of the researcher, the end result is the same - data is analysed multiple times or in multiple ways until a desired result is reached.

The study used text mining to extract p-values - a number that indicates how likely it is that a result occurs by chance - from more than 100,000 research papers in the PubMed database, spanning many scientific disciplines, including medicine, biology and psychology. According to lead author Dr Megan Head, from the ANU Research School of Biology, the researchers "found evidence that p-hacking is happening throughout the life sciences".

Dr Head suggested that "pressure to publish" may be driving this bias, noting along with her co-authors that "there is good evidence that journals, especially prestigious ones with higher impact factors, disproportionately publish statistically significant results". There is thus an incentive for researchers to selectively pursue and attempt to publish such results, with the study finding a high number of p-values that were only just over the traditional threshold that most scientists call statistically significant.

"This suggests that some scientists adjust their experimental design, datasets or statistical methods until they get a result that crosses the significance threshold," Dr Head said.

Dr Megan Head in her evolutionary biology lab at the ANU Research School of Biology. Image credit: Regina Vega-Trejo.

"They might look at their results before an experiment is finished or explore their data with lots of different statistical methods.

"Many researchers are not aware that certain methods could make some results seem more important than they are. They are just genuinely excited about finding something new and interesting."

The authors acknowledge that p-hacking is a serious issue, stating that the "publication of false positives hinders scientific progress". Many scientists may be uninterested in replicating previous (supposed unbiased) studies, while others may pursue fruitless research programs based entirely off their results.

Even when scientists review evidence by combining the results from multiple studies - a method called meta-analysis - this procedure will be compromised if the studies being synthesised "do not reflect the true distribution of effect sizes", according to the authors. They do concede, however, that p-hacking "probably does not drastically alter scientific consensuses drawn from meta-analyses".

The authors have made a series of recommendations to prevent p-hacking from occurring. They suggest researchers adhere to common analysis standards (performed blind wherever possible) and place greater emphasis on the quality of research methods rather than the significance of the findings. Journals, meanwhile, are encouraged to provide clear and detailed guidelines for the full reporting of data analyses and results.

Optimised solid-phase extraction of polar compounds

Porvair Sciences offers a range of products that enable optimised solid-phase extraction (SPE) of polar compounds. This includes the C18 silica-packed Microlute plate, vacuum manifolds, collection plates and solvent evaporators, all designed to streamline sample preparation.

The Microlute plate offers good separation of a wide range of polar compounds that are not attracted to the C18 tail. The 96-well plate provides all the advantages of automated and high-throughput SPE sample preparation in a convenient microplate format that is capable of rapidly processing 96 samples in one go repeatedly and precisely.

Constructed from a single piece of moulded high-quality polypropylene, the plate will not bend or distort because individual SPE cartridges do not have to be repeatedly plugged in and out. Using a sorbent slurry loading technique, Porvair has eliminated the channelling effects often limiting the performance of dry powder-loaded SPE columns. Each well on the plate has an individual drain spout, ensuring 100% sample transfer and zero crossover contamination.

Manufactured precisely to ANSI/SLAS dimensions from extractibles-free polypropylene, the plates deliver high productivity, good-quality results and trouble-free operation, with all robotic sample handling and preparation systems.

Pathtech Pty Ltd
www.pathtech.com.au

Hybrid silica-based HPLC columns

The YMC-Triart Series HPLC columns are organic hybrid silica-based columns produced by specialist Japanese manufacturer YMC. The columns provide high resolution without adsorption or tailing, as well as good durability, versatility and reproducibility. Available in 1.9, 3 and 5 μm particle sizes and a variety of lengths and diameters, the series includes five types of columns including the C18 column.

The hybrid silica surface of the columns provides good chemical stability and durability over a wide pH and temperature range. This durability is said to ensure a long lifetime for the columns, providing a lower cost per analysis than many competitors. The rigorous end-capping of the columns ensures symmetrical peak shapes for all types of compounds.

Sapphire Bioscience
www.sapphirebioscience.com

Time-of-flight mass spectrometer

LECO has announced the Pegasus GC-HRT 4D, claimed to combine the industry standard for comprehensive GCxGC with high-performance time-of-flight mass spectrometry. The GCMS innovation provides scientists with the ability to investigate complex samples and identify unknown analytes with confidence.

The company's ChromaTOF-HRT brand software with High Resolution Deconvolution (HRD) is tailored to get the most out of high-resolution data using NIST and accurate mass libraries. Workflows are enabled by features such as pseudomolecular ions via chemical ionisation, leveraging retention-time matching, isotope patterns and mass accuracy of deconvoluted fragments. All these features lead to confident identification of unknown species.

With mass accuracies of 1 ppm and increased peak capacity potential, the product is suitable for solving the problem of coelution and comprehensively characterising complex samples.

Leco Australia Pty Ltd
www.leco.com.au

Frozen sample aliquotter

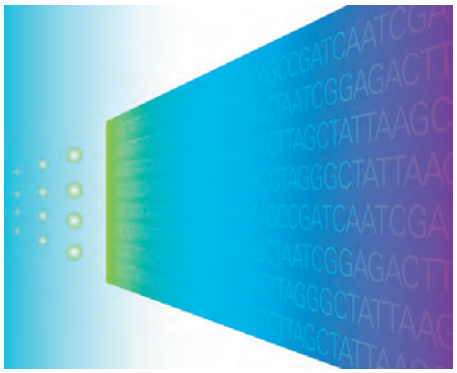
The CX350 Frozen Sample Aliquotter supports the widespread need for targeted, repeated and safe access to frozen samples to advance research and discovery. The system allows for uniform and efficient distribution of frozen tissue and biofluid aliquots, maximising sample integrity and optimising scientific outcomes.

The product provides good access to samples while maintaining their frozen state. This ensures the quality of both the primary and aliquotted sample, eliminating their potential degradation due to thawing.

The compact benchtop design and LN_2 chilling allow for integration into standard laboratory workflows. For tissue samples, the mounting method enables standard H&E slides and a pathology review to target specific regions of interest within the sample.

The frozen coring process includes pre-chilled coring probes and destination tubes designed to ensure the frozen state is maintained throughout the process. Single-use, nuclease-free, disposable coring probes eliminate the potential for sample-to-sample carryover.

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



Single-cell transcriptome analysis

Clontech's SMART-Seq v4 Ultra Low Input RNA Kit for Sequencing enables sensitive mRNA-seq data from single cells and ultralow inputs. The kit provides direct cDNA synthesis from as few as 1-1000 intact cells (or as little as 10 pg-10 ng of total RNA), high reproducibility, gene body coverage and good representation of GC-rich transcripts.

The single-tube protocol works directly on whole cells and helps to preserve sample integrity. This is achieved via ligation-independent incorporation of adapters. The full-length cDNA libraries from the kit are compatible with both Illumina and Ion Torrent sequencing platforms.

The product is said to be capable of identifying the highest number of genes of any SMARTer Ultra Low kit, maintaining full-length gene information and a low percentage of rRNA reads. Its template switching efficiency is said to have been improved by building on LNA technology.

Scientifix Pty Ltd
www.scientifix.com.au

Sponge sampling without sterile gloves

When screening the environment for pathogens such as *Listeria* or *Salmonella*, users often need to sample large surface areas. While most microbiological sampling is done with a traditional swab, the only way to really look at large areas is with a sponge swab.

The Hygiene Sponge from TSC comes with a reversible bag, which eliminates the need for using sterile gloves. Simply grip the sponge, pull the bag back over itself, take the sample, flip the bag back the right way and reseal it.

The sample is now ready for immediate testing or transport back to the lab. Increasing the convenience of taking a sponge swab will reduce contamination of samples and increase compliance with the user's testing program.

The Hygiene Sponge is ready to use and pre-moistened with neutralising buffer, designed to counter the effects of residual amounts of sanitiser that may be left behind on surfaces and can affect recovery of organisms.

Australasian Medical & Scientific Ltd
www.amsl.com.au

No need for bad reactions

when gloving up

Occasionally wearing glove products can cause issues with the health of our skin. This predominantly manifests itself in the form of skin allergies of a variety of different types and severity.

This paper reviews these various allergies, their causes and what glove solutions are available to help prevent these reactions from occurring. Skin allergies from adverse reactions to glove products are generally classified into three distinct types, immediate hypersensitivity or Type I, delayed hypersensitivity or Type IV, and irritant contact dermatitis.

Repeated exposure to NRL may lead to Type I allergies

Adverse reactions to natural rubber latex (NRL) gloves can range from irritant contact dermatitis to serious allergic response such as anaphylaxis. Latex allergy also known as Type I Allergy is a reaction to the residual allergenic proteins present in NRL products. NRL comes from the sap of the rubber tree, *Hevea brasiliensis*, found in South Africa and Southeast Asia.

While there are more than 250 different types of latex proteins, approximately 20% are allergenic. After repeated exposure to NRL products, the immune system of some susceptible individuals produces antibodies that react immunologically with these allergenic proteins. There is an immediate adverse reaction occurring within minutes after initial contact with NRL. The symptoms may include some or all of the following: swelling, redness on the site of exposure, itching and burning sensation. Symptoms can spread to areas near the site of glove contact and can be accompanied by: urticaria, conjunctivitis, rhinitis and bronchial obstruction. Symptoms of anaphylaxis is rare but can occur.

Chemical accelerators induce the majority of chemical allergies

Allergic reactions to chemical residues from the glove manufacturing process may produce what is known as a Type IV Allergy (Chemical Allergy) or ACD. This type of allergy is not life threatening, but it is a major concern for healthcare workers and those employed in the Life Science industry.

Glove manufacturers use a variety of chemicals to produce both NRL and synthetic rubber gloves. Different manufacturers use different chemical combinations and nearly all manufacturers leach and wash their gloves to minimise residual chemicals in the final product.

A chemical allergy is due to an immunological reaction to a residual chemical leached from finished glove products into the skin of the wearer.

The chemicals used in the glove manufacturing process fall into the following broad classifications:

- Accelerators;
- Accelerator activators;
- Stabilisers;
- Anti-degradants;
- Retarders;
- Fillers; and
- Extenders.

The chemical accelerators induce the majority of chemical allergies. The residues from these accelerators have become a major concern because of their ability to sensitise users and elicit chemical allergic reactions. Over 80% of reported glove associated allergic contact dermatitis is attributable to chemical accelerators.

The response is delayed, typically producing symptoms between 6-48 hours after initial contact with the glove and symptoms may persist for up to 4 days.

The symptoms may include: redness and swelling, dry skin to patch eczema and chronic sores that weep or bleed.

A Type IV response begins when residual chemicals leached from the glove penetrate the skin and trigger the formation of T cells sensitised to the specific antigens.

Hand irritation and reaction triggers

Many glove users experience what is known as irritant contact dermatitis - a non-immune reaction that occurs within minutes to hours of glove contact. It is not an allergy rather a condition as a result of many factors combined with glove use (for example: reactions to detergents/fragrant soap, frequent hand washing, inadequate rinsing/drying).

Symptoms are limited to where there is direct glove exposure and include redness, chafing, dryness, and scaling or cracking.

To reduce the risk of irritation: minimise contact with the causative agent, commit to a regular skin care regimen, avoid oil/fat based hand creams and wear powder-free gloves.

Type I Latex allergy solutions

In all cases of repeat or persistent dermatitis or allergic reaction associated with glove use it is recommended to consult a medical practitioner. Since skin allergies vary in possible severity, solutions to these problems also vary.

First and foremost a Type I or true natural rubber latex allergy can be a very serious condition.

In this case, a synthetic product is appropriate and must be worn as an alternative to a natural

rubber latex glove. As the donning powder on NRL powdered gloves is a possible carrier of allergenic NRL proteins which may become airborne and inhaled, co-workers practising in the same environment as someone allergic to NRL should wear either a synthetic glove or a powder-free NRL glove.

Synthetic material options

Polyisoprene: Most similar performance to natural rubber latex with a high level of comfort, excellent elasticity and moderate strength.

Neoprene: Characteristic performance falls between polyisoprene and nitrile with a good balance of comfort, strength and elasticity.

Nitrile: Higher strength, durability and puncture resistance than natural rubber latex but does sacrifice some elasticity.

Type IV Contact Dermatitis solutions

For individuals who are experiencing a Type IV reaction product recommendations are a little more complex as you will first need to identify and then eliminate the causative chemical agent. Since there are several classes of chemicals that tend to cause adverse skin reactions a better understanding of what chemicals are used and why they are required is needed.

Are accelerators necessary?

In order to manufacture a glove from a rubber material effectively, some type of chemical accelerator is generally used. Accelerators are used to chemically speed up the vulcanisation process during the manufacturing of natural and synthetic latex gloves.

Vulcanisation is one step in the process by which crude latex is transformed into a finished product. This is normally accomplished by subjecting the crude latex to heat and sulfur to crosslink the rubber molecules rendering a solid film with desired strength and elastic properties dependent upon the design features and material type.

These chemical accelerators speed the vulcanisation process by reducing the temperature at which vulcanisation occurs producing a much more consistent and reliable film from which the final gloves are formed.

Examples of accelerator classes commonly used in glove manufacturing are thiurams, mercaptobenzothiazols (MBT) and carbamates. Of these classes of accelerators the least likely to produce a skin reaction are carbamates.

Are accelerators safe?

For personal protective gloves, manufacturers are required to ensure the product is safe for use. This is typically done by conducting two skin irritation tests, one long term and one short term, on the finished glove product. In fact, current regulations in most geographic regions require this of medical grade gloves.

In the United States for example, the Food and Drug Administration (FDA) requires that all medical grade gloves pass both the skin irritation test and the skin sensitisation test prior to being marketed in the US. These battery of tests ensure that the vast majority of glove users will not experience any sort of irritating response from the glove itself.

Other regions such as the European Union under the Medical Device Directive (93/42/EEC) require similar types of testing and product assessment before those products can be placed on the market.

Product quality affects the potential for reactions

When it comes to allergic contact dermatitis caused by chemicals used in disposable gloves, the manufacturing process and how well a glove is produced can significantly reduce the potential for reactions. On a well manufactured glove product residual chemicals are leached out of the glove prior to packaging. For products that are poorly manufactured this leaching process is not always as effective as it should be and as such the potential for an increased number of people experiencing a skin reaction exists.

Can a glove be made without accelerators?

The short answer is yes! Ansell provides products that are specifically engineered for users who may have extremely sensitive skin. These products are produced without the use of the chemical accelerators listed above or any other chemical accelerators. Proper vulcanisation without the use of any chemical accelerators is done through a proprietary process that strengthens the material without using chemical accelerators. This process results in a cleaner, more skin-friendly product and provides the best possible solution when you need the barrier protection of a glove and healthy skin for your sensitive hands.

For those wearers with Type I or Type IV allergies, Ansell has a wide variety of options in the synthetic category and several different synthetic materials to choose from including nitrile, neoprene and polyisoprene. These materials vary in performance characteristics as well as cost.

Products may also have special design features for specific applications which should factor in to any glove decision.

And for those wearers with Type IV allergies or sensitivities, Ansell has products that are produced without the use of any chemical accelerators.

The TouchNTuff 73-500, TouchNTuff 73-701 as well as Microflex Sensation are several Ansell gloves that are perfect solutions for anyone who has extremely sensitive skin or who is having trouble finding a glove that is the least irritating to their skin. Not only have these products been specifically engineered to solve this particular problem it's been proven scientifically to be less likely to cause the types of reactions listed in this article.

Ansell Healthcare

www.ansell.com.au

GC and GCMS systems

The Scion range of GC and GCMS instruments features a full range of consumables - including consumables for all existing Varian GC and GCMS instruments.

The range is said to be a refinement of the original Varian GC and GCMS platforms undertaken in recent years. The instruments offer robust GC/GCMS with good specifications, after-sales service and support, and a full range of consumables and columns is included.

The range includes the 436 GC and GCMS systems, designed for routine QC or teaching applications; and the 456 model, which features multiple injection and detection facilities for demanding research and tailored applications.

Complementing the normal lab GC configurations, Scion Instruments also specialises in a number of 'off-the shelf' special configurations such as simulated distillation and hydrocarbon packages. The company also tailors bespoke GC and GCMS systems for difficult applications such as gas analysis.

Scientifix Pty Ltd
www.scientifix.com.au

NFκB translocation kit

The Amnis NFκB Translocation kit allows researchers to study the nuclear translocation of NFκB - a transcription factor that plays a central role in regulating key mammalian cell processes, including proliferation, inflammation, immune and stress responses. The kit uses imaging flow cytometry to obtain statistically significant quantitative assessment of NFκB translocation, as well as visual identification of the translocation at a single-cell level.

The kit, which works with cultured cell lines and whole blood cells, conveniently contains directly conjugated anti-Human NFκB monoclonal antibody, 7-AAD dye and required buffers. Using the dedicated Nuclear Localization Wizard in the IDEAS software, NFκB translocation can be studied and quantified in an objective, statistically robust manner. The kit is designed for use with the Amnis ImageStreamX Mark II and the Amnis FlowSight imaging flow cytometers - systems which combine the quantitative power of flow cytometry with the spatial information provided by microscopy.

Merck Millipore
www.merckmillipore.com

Phenotype test kit for live cells

The XFp Cell Energy Phenotype Test Kit, from Seahorse Bioscience, enables a real-time assay on live cells that determines their baseline metabolic phenotype and potential. The 1 h test measures both the mitochondrial and glycolytic activity of the cells and compares their baseline values with metabolic activity under stressed conditions, induced by a single injection, to determine the metabolic potential.

The test is claimed to be the only method available that can provide a metabolic phenotype with which scientists can make direct, functional comparisons of both metabolic pathways between groups of live cells. With this information, cancer researchers can quickly realise the functional consequences of somatic mutations in terms of metabolic adaptations and reprogramming events that drive tumour malignancies.

By simultaneously measuring the relative utilisation of the two major energy pathways under both basal and stressed conditions, researchers can realise the metabolic consequence of genetic changes. For example, the test makes it easy to examine the role of metabolism in linking tumour survival and the Ras oncogenes. The phenotype of tumours containing the Ras oncogenes shows a significant reliance on glycolysis for energy when stressed, revealing a metabolic vulnerability for survival in the hypoxic and acidic environment of a large tumour.

The test requires only a small amount of sample to measure the metabolic phenotype and metabolic potential of cells and the XFp Cell Energy Phenotype Report Generator software automatically calculates the parameters of the test, simplifying data analysis and interpretation. The kit is used with the XFp Extracellular Flux Analyzer and is suitable for use in pairwise comparisons, as well as with patient-derived and other precious samples.

In Vitro Technologies Pty Ltd
www.invitro.com.au

Hydrophobic interaction columns

Laboratories characterising monoclonal antibodies (mAb) now have additional hydrophobic interaction chromatography (HIC) selectivity options with the expanded family of Thermo Scientific MAbPac HIC HPLC columns.

Thermo Scientific MAbPac HIC-20 and MAbPac HIC-Butyl columns join the company's line of columns for monoclonal antibody analysis, responding to demand for additional selectivity options for characterising mAb oxidation variants, intact mAbs, mAb aggregates or fragments and antibody drug conjugates (ADCs).

The chemistry used in the columns is designed to provide more selectivity in high-resolution separations with good biocompatibility and high recovery. The columns are also designed for compatibility with organic solvent and aqueous mobile phase, as well as for rugged stability and low carryover.

Thermo Fisher Scientific
www.thermofisher.com.au

Microfibre-laminated mop

VILEDA's CleanTech Duo microfibre-laminated mop is suitable for meeting the high demands required for effective cleaning and disinfection of floors, walls and ceilings in cleanrooms and other controlled environments.

The mop is said to be faster, easier and more efficient than traditional methods. It allows users to fulfil contact time requirements for common disinfectants and still achieve good cleaning performance, with up to 99.9% bacteria removal.

The microfibre-laminated cleanroom mop is manufactured and sterilised in the USA and validated to 10-6 SAL per ISO 11137. It is designed for use in cleanrooms up to class ISO 5/GMP A and B/FED209D Class 100. Adhesive-free lamination techniques are used to prevent additional product contamination.

The mop is individually double bagged and includes an indicator dot on each package. It comes with the Certificate of Sterility.

Onboard Solutions
www.onboardsolutions.com

Multimodal holographic microscope

TESCAN is entering the optical microscopy market with its multimodal holographic microscope (MHM), Q-PHASE. The microscope is based on the principle of incoherent holography.

Where other available solutions make use of a laser or laser diode, which may cause adverse or undesirable effects in terms of imaging quality, Q-PHASE uses white light for illumination, thus producing high-quality imaging. The product enables the monitoring of live cells in real time and quantifies their parameters without needing to apply contrast stains. Live samples are not harmfully affected and pathogenic or toxic effects are avoided. The microscope also has the ability to observe samples in scattering media.

The quantitative phase imaging (QPI) instrument can be applied in a wide range of fields, including biological research, healthcare, pharmacology, biotechnology, metallography, microtechnology, nanotechnology, micro-optics, electrical engineering, etc. The instruments are primarily designed for biological applications, such as cancer research.

AXT Pty Ltd
www.axt.com.au

Overseas study opportunities now open

The Australian Government's 2016 Endeavour Scholarships and Fellowships round is now open, offering high-achieving Australian postgraduate students and researchers the opportunity of overseas study and research.

The merit-based scholarships provide the following:

- Endeavour Postgraduate Scholarships enable Australian postgraduate students to undertake long-term study or research towards their Australian qualification at Masters or PhD level, in any field, overseas.
- Endeavour Research Fellowships enable Australian postgraduate students to undertake short-term research towards their Australian qualification at Masters or PhD level, in any field, overseas. Fellowships are also available for postdoctoral fellows to undertake research overseas.

Minister for Education and Training Christopher Pyne said the scholarships and fellowships "provide unique opportunities for international education placements that will give Australians an edge in the highly competitive global jobs market".

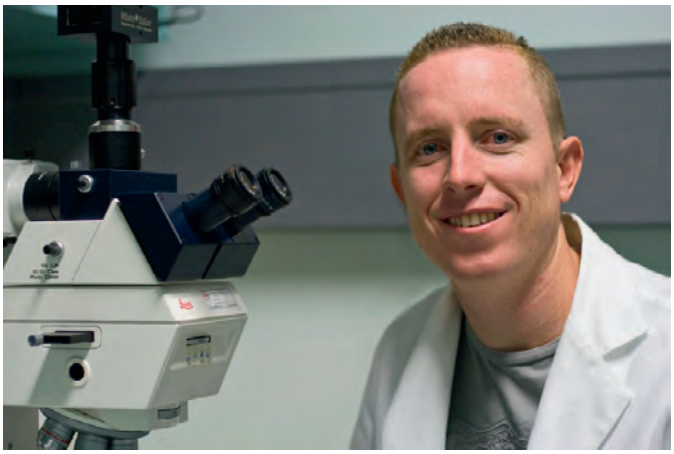
"Importantly, they will also increase the level of education and research collaboration between Australian and international higher education institutions," he added.

The Endeavour scholarships are also open to international students to study an Australian qualification in Australia, including at vocational education and training institutions. This is further supported by Endeavour fellowships available to international postgraduate students and researchers to undertake research in Australia.

Minister Pyne said the program complements the Australian Government's commitment of more than $100 million for the New Colombo Plan, which offers Australian undergraduates scholarships and grants for study and internships/mentorships in the Indo-Pacific region. Both programs are important parts of the government's strategy for promoting international educational linkages for Australia, he said.

Applications for the 2016 Endeavour Scholarships and Fellowships close on 30 June 2015 at 11.59 pm AEST. For more information, visit http://internationaleducation.gov.au/endeavour.

Funding announced for 19 NSW cancer projects



Cancer Council NSW has announced almost $7 million in donations for 19 groundbreaking cancer research projects. The organisation received 143 applications for grants this year, showcasing "the drive in the medical research community to learn more about cancer and the ways we treat cancer", according to Director of Cancer Research Associate Professor Karen Canfell.

The successful projects were selected for their visionary research that will challenge what we know about cancer and how we treat it, ultimately helping Cancer Council NSW reach its goal of reducing deaths from cancer by 50% over the next 20 years. Associate Professor Canfell said, "We are working with the best cancer researchers in Australia, many of whom are nationally and internationally recognised for their work."

Associate Professor Jeff Holst at the Centenary Institute will develop drugs that act like a nozzle on the nutrient pumps which feed cancer cells. By blocking the flow of these pumps, the cancer cells can be starved - an effect which has already been observed in prostate cancer, breast cancer and melanoma cells.

Dr Kenneth Micklethwaite from the University of Sydney has developed an artificial receptor (CAR) enabling immune cells to see and kill myeloma cells, which are otherwise invisible to the immune system. Dr Micklethwaite will improve this CAR to ensure maximum anticancer efficacy and will also modify CAR immune cells to produce myeloma-inhibiting drugs at the site of myeloma.

Dr Nicole Verrills from the University of Newcastle will be testing whether a new gene marker can predict which breast cancer patients won't survive, and so should be offered new therapies. Breast cancer cells with this gene marker are in fact sensitive to a drug that is already in clinical use for other cancers; therefore, the study could lead directly to human trials.

"These are just a few examples of the new and novel research that is being funded in Australia thanks to generous donations," Associate Professor Karen Canfell said.

The full list of recipients can be found on the Cancer Council NSW website.

Platform for water quality testing

The Hach SL1000 Portable Parallel Analyzer (PPA) platform has been designed and engineered to streamline water quality testing. The platform is claimed to offer faster testing of multiple parameters, reduced variability from test to test and operator to operator, and less hassle than traditional methods of testing.

The handheld drinking water instrument is able to test up to four colorimetric and two probe-based parameters simultaneously, eliminating the need to run multiple tests back to back. By halving the number of steps compared to traditional methods, the platform minimises opportunities for errors and saves time. Designed for use in the drinking water distribution system and the treatment plant, the platform enables operators to be confident in their results.

The simple-use model of the PPA platform offers operators of all skill levels the flexibility to test for the parameters that are relevant to their processes. The platform is available on its own or as a fully operational, rugged kit including everything needed to start testing, with the instrument, probes and Chemkey Reagents contained inside.

Hach Pacific Pty Ltd
www.hachpacific.com.au

5 mL microcentrifuge tubes

SSI's 5 mL microcentrifuge tubes are produced from high-quality homopolymer polypropylene and have large writing areas. With an intermediate working and storage option, the tubes offer users flexibility.

The tubes have 0.25 mL graduations and an operational range of -80 to 100°C. They can be centrifuged at speeds of up to 22,000 g and are available in natural and assorted colours. They are certified RNase, DNase, DNA and PCR inhibitor free.

In addition, SSI has the complementary flipper rack to safely hold the tubes.

Interpath Services Pty Ltd
www.interpath.com.au

Lauren Davis

Mythbusting with microfossils

There's no doubt that fossils provide an important window into the past, but just how much do we know about these traces of ancient life? Researchers from the Universities of Oxford, Bristol and Western Australia decided to find some answers, collaborating together on a project billions of years in the making.

Arguably one of the biggest milestones in the history of palaeontology came in 1993, when US scientist Bill Schopf described micrometre-long, carbon-rich filaments within 3.46 billion-year-old Apex chert (microcrystalline quartz) from the Pilbara region of Western Australia. Schopf likened the filaments to certain forms of bacteria, leading to their distinction as the earliest evidence for life on Earth.

But the microfossils soon came under scrutiny, with a team led by late Oxford University Professor Martin Brasier revealing that the host rock was not part of a simple sedimentary unit but actually came from a complex, high-temperature hydrothermal vein, with evidence for multiple episodes of subsurface fluid flow over a long time. In 2002, the team claimed that the 'microfossils' were in fact pseudofossils formed by the redistribution of carbon around mineral grains during these hydrothermal events.

It is only recently that scientific instrumentation has reached the level of resolution needed to map the chemical composition and morphology of the microfossils at the submicrometre scale. This led to the use of a transmission electron microscope (TEM), based at the University of Western Australia's (UWA) Centre for Microscopy, Characterisation and Analysis, to build up nanoscale maps of the microfossils' size, shape, mineral chemistry and distribution of carbon.

UWA researcher Dr David Wacey explained that the team studied a range of microfossils as part of the project - each of which featured "coherent, rounded envelopes of carbon having dimensions consistent with their origin from cell walls and sheaths". But when it came to the Apex microfossils, they found "a complex, incoherent spikey morphology, evidently formed by filaments of clay crystals coated with iron and carbon", he said.

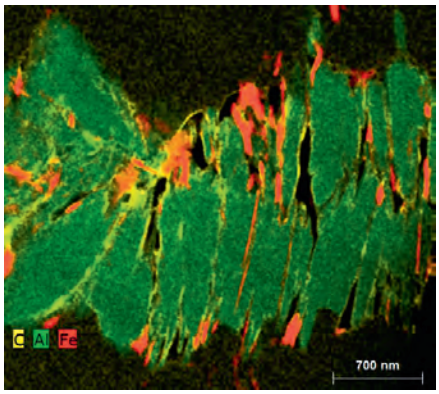
It was determined that the Apex microfossils comprised stacks of plate-like clay minerals arranged into branched and tapered worm-like chains. Carbon was then absorbed onto the edges of these minerals during the circulation of hydrothermal fluids, giving a false impression of carbon-rich, cell-like walls. The revelation has been published in the journal *Proceedings of the National Academy of Sciences* (PNAS).

"Mapping plus focused ion beam milling combined with transmission electron microscopy data demonstrate that microfossil-like taxa, including species of *Archaeoscillatoriopsis* and *Primaevifilum*, are pseudofossils formed from vermiform phyllosilicate grains during hydrothermal alteration events," the authors stated.

But it's not all bad news for fossil enthusiasts - in the same journal, the team described their use of modern analytical techniques to examine genuine microfossils taken from Gunflint chert in Northwestern Ontario, Canada. The 1.88 billion-year-old chert contains a microbe called *Eosphaera tyleri*, and is described by Oxford University researcher Dr Jonathan Antcliffe as "one of the most incredible fossils".

Originally discovered by Barghoorn and Tyler in 1965, the microbe is described by the researchers as having "a complex sphere-within-sphere construction, ~28-32 µm in diameter, with a thicker walled inner sphere enclosed within a thinner walled outer sphere. Each sphere is separated by a regular intervallar space containing from 0 to 15 small tubercle-like spheroids without regular arrangement.

"This construction makes *Eosphaera tyleri* among the most morphologically complex



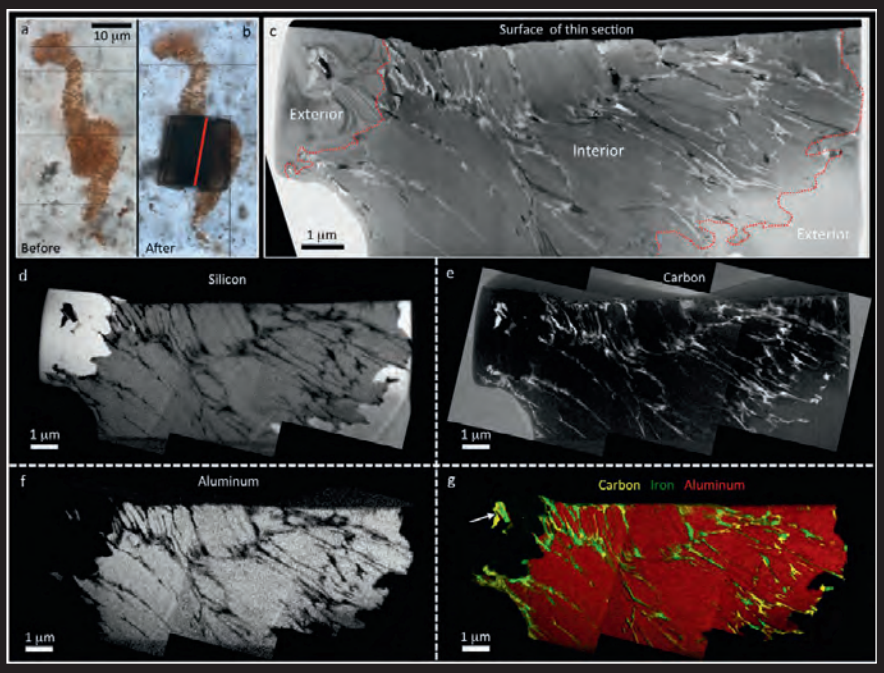
Elemental map of a cross section through a pseudofossil. It can be seen that the artefact consists of a complex stack of plate like aluminium-rich clay minerals (green, stacked from left to right). Some of these are coated with later generation of carbon (yellow) and iron (red) giving the false impression of cellular compartments.

fossils yet known," the authors said. Using 3D nanoscale reconstructions, enabled by focused ion beam scanning electron microscopy (FIB-SEM), the researchers discovered features of the microfossils "hitherto unmatched in any crown-group microbe".

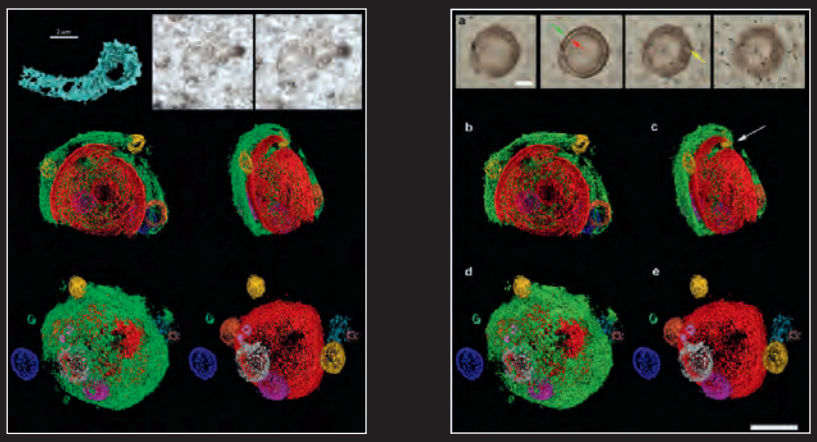
"The remarkable features of *Eosphaera* raise questions about the lack of comparable forms in the living microbial world," the authors noted, with the Gunflint chert fossils having preserved life at a time when complex cells were just starting to emerge. Dr Antcliffe hypothesised, "It is likely that *Eosphaera* is somehow related to modern cyanobacteria, but at a time before even eukaryotic algae evolved.

"There would have been no competition between bacteria and algae, so bacteria were freer to explore different morphologies that would later come to be occupied by organisms with more complex eukaryotic cells," he explained. "Life was experimenting for the very first time with how to get large, and the fossil record tells us it was doing this in a quite unique way."

The fossil record will continue to be updated as more theories are put forth, proven and disproven. The significance of these latest discoveries may not be immediately apparent, but they are certain to contribute to humankind's understanding of the emergence of complex life. The researchers are particularly optimistic for the future of the field, stating that the early fossil record "has the potential to help to drive forward novel biological thinking on major evolutionary questions on Earth, and maybe beyond".



Nanoscale structure and chemistry of a pseudofossil comparable to *Primaevifilum* spp from sample CHIN-03. Optical photomicrographs before (A) and after (B) extraction of an ultrathin wafer for analysis by TEM. Position of wafer indicated by red line in B. Bright-field TEM image (C) and corresponding energy-filtered TEM elemental maps of silicon (D), carbon (E) and aluminium (F) from the pseudofossil below the surface of the thin section. These show that the pseudofossil is almost entirely composed of platy aluminosilicate grains. Boundaries of the pseudofossil are indicated by dashed red lines in the TEM image and are marked by a clear transition from aluminosilicate to quartz (see Al and Si maps where brighter white colours equate to higher elemental concentrations). Carbon is abundant throughout the pseudofossil and is found in patches along quartz-aluminosilicate boundaries and interleaved between aluminosilicate grains within the pseudofossil. Carbon does not show any cell-like distribution. (G) False colour three-element overlay showing carbon (yellow) and iron (green) interleaved between aluminosilicate (red). Patches of carbon and iron are also seen exterior to the pseudofossil at quartz grain boundaries (arrow).



Exceptional preservation and novel morphology of the microfossil *Eosphaera tyleri* from the Gunflint chert, Ontario. (A) Four levels of optical focus through a thin section in nonstromatolitic microfabric, showing a well-preserved *Eosphaera* complete with inner sphere (red arrow) and outer sphere (green arrow) plus several rounded tubercles (eg, yellow arrow) within the intervallar space. (B-E) The 3D reconstructions (from FIB-SEM sequential slicing) of a different *Eosphaera* specimen. Note the thicker and more robust inner sphere (red, 20 μm across) with linear rupture (beneath white arrow), thinner and more membranous outer sphere (green, 30 μm across), and about 10 hollow, spherical to elliptical cell-like tubercles (various colours including yellow, 1–5.8 μm) plus two external tubercles (blue, <7 μm; pale green at left, 1.8 μm).

2015 Chemical Proteomics Symposium
16-17 July 2015, Sydney
www.cmri.org.au/Research/Workshops-and-Symposia/2015-Chemical-Proteomics-Symposium

GHS Training - Brisbane
17 July 2015, Brisbane
events.r20.constantcontact.com/register/event?oeidk=a07eaopy5k328e3742c&llr=s6ww5cdab

2nd Asia-Oceania Conference on Neutron Scattering
18-23 July 2015, Sydney
www.ansto.gov.au/ResearchHub/Bragg/CurrentResearch/ConferencesandWorkshops/#sthash.EQmDE6UV.dpuf

GHS Training - Sydney
23 July 2015, Sydney
events.r20.constantcontact.com/register/event?oeidk=a07eaoq0klc2f9aaed2&llr=s6ww5cdab

48th Annual AIFST Convention & the 15th Australian Food Microbiology Conference
11-13 August 2015, Sydney
www.aifst.asn.au/convention

ESA Clinical Weekend
21-23 August 2015, Adelaide
www.esaclinicalweekend.org.au

ESA-SRB 2015, ASM
23-26 August 2015, Adelaide
www.esa-srb.org.au

25th ISN-APSN Biennial Meeting
23-27 August 2015, Cairns
www.neurochemistry.org/biennial-meeting/isn-2015-biennial-meeting.html?id=18

ENSA
24 August 2015, Adelaide
www.ensa.org.au

ADS-ADEA ASM 2015
26-28 August 2015, Adelaide
www.ads-adea.org.au

ADIPS ASM 2015
28-29 August 2015, Adelaide
www.adipsasm.org

Agricultural Bioscience International Conference (ABIC) 2015
7-9 September 2015, Melbourne
www.abic.ca/abic2015

65th Australasian Grain Science Conference
16-18 September 2015, Sydney
www.ausgrainscience.org.au/conference

7th International Conference on Relaxin and Related Peptides
20-24 September, 2015, Malaysia
www.relaxin2015.org

CIM 2015: International Congress of Metrology
21-24 September 2015, Paris
www.metrologie2015.com/metrology-2015

BacPath 13: Molecular Analysis of Bacterial Pathogens Conference
27-30 September 2015, Phillip Island, Victoria
www.bacpath2015.org

ComBio 2015
27 September - 01 October 2015, Melbourne
www.asbmb.org.au/combio2015

AGTA Conference 2015
11-14 October 2015, Hunter Valley, NSW
agtaconference.org

TEMTIA-VII 2015
11-14 October 2015, Melbourne
www.emtmeeting.org/TEMTIA-VII_about.htm

Laboratory Management and Laboratory Design Conference 2015
16-19 November 2015, Melbourne
www.events.r20.constantcontact.com/register/event?oeidk=a07ea4hj3t6ffd374b1&llr=s6ww5cdab

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- Chemical Biology and Drug Discovery
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- Molecular and Cellular Imaging
- Proteomics and Metabolomics
- Systems and Computational Biology

Overseas Plenary Speakers

- **Martin Caffrey** (Trinity College Dublin, Ireland)
- **Junko Kyozuka** (Tohoku University, Japan)
- **Jiayang Li** (Institute of Genetics and Development Biology, Chinese Academy of Sciences, China)
- **Roberto Mantovani** (University of Milan, Italy)
- **Carolyn Moores** (Birbeck College, UK)
- **Ruth Nussinov** (National Cancer Institute, USA)
- **Guangshuo Ou** (Tsinghua University, China)
- **Pam Ronald** (University of California Davis, USA)
- **Bob Schmitz** (University of Georgia, USA)
- **Luca Scorrano** (University of Padua, Italy)
- **John Wallingford** (University of Texas, USA)
- **Minoru Yoshida** (RIKEN, Japan)

Early Registration and Abstract Deadline:

Friday, 26 June 2015

Combined ASBMB, ASPS, ANZSCDB, NZSBMB and NZSPB Annual Meetings

- Australian Society for Biochemistry and Molecular Biology
- Australian Society of Plant Scientists
- Australia and New Zealand Society for Cell and Developmental Biology
- New Zealand Society for Biochemistry and Molecular Biology
- New Zealand Society of Plant Biologists

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Registration/ Exhibitions:
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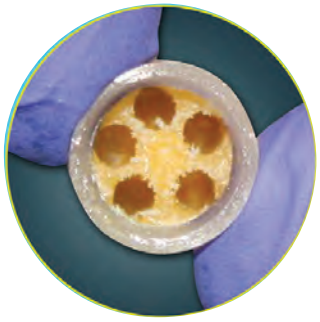

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