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CASE STUDY

ELECTROPHORESIS

The case of a 74-year-old female diagnosed with melanoma: *p.34*

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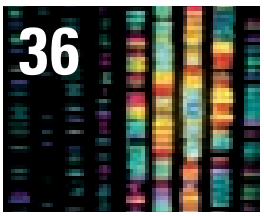

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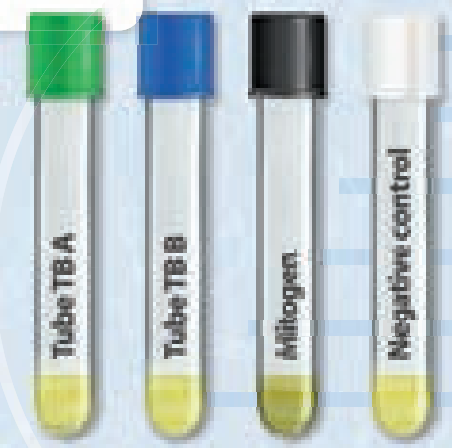
LIOFeron® -TB/LTBI

The latest aid in diagnosing tuberculosis infection

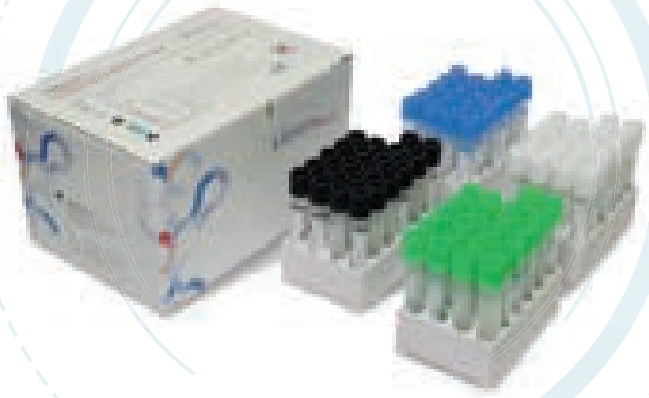
LIOFeron® -TB/LTBI is an **in vitro blood assay for the detection of *Mycobacterium tuberculosis***, the bacterium that causes tuberculosis (TB). The test is intended for use in conjunction with other medical and diagnostic evaluations. **LIOFeron® -TB/LTBI** results alone can detect both active and latent tuberculosis infections (including the disease).

The technology

LIOFeron® -TB/LTBI is designed to work with LIOFeron® Stimulation tubes



- **Tube TB A** contains antigens known to be missing in BCG (green cap)
- **Tube TB B** contains a proprietary Lionex antigen of CD8+ epitopes known to be missing in BCG (blue cap)
- **Mitogen**, positive control (black cap)
- **Negative control** for background adjustment (white cap)



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Tube A and Tube B are distinct and contain individual and independent full-length proteins, ensuring better discrimination of positive and negative results (indeterminate results are reduced to 2%).

1; World Health Organisation (2017) Global tuberculosis report 2017. www.who.int/tb/publications/global_report/en

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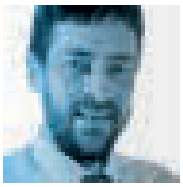
A.MENARINI diagnostics

COMMUNICATING WHAT WE DO



IBMS Chief Executive **David Wells** on why it is important for the Institute to inform members of exactly what it does.

The recent *Workforce* report from the Health and Social Care Select Committee confirmed what we have been long reporting – that there is a workforce crisis. Many understaffed laboratories struggle to maintain the resources needed to support registration training or further develop their registered staff. This is compounded by significant numbers of registered professionals leaving the workforce early due to pressures in the healthcare sector.

Efficiency drives can only go so far. If our profession is expected to thrive and maintain a world-class service then there has to be more time and money driven into the recruitment, retention and training of the workforce.

The IBMS knows this and lobbies for it constantly. We are governed by our members, and the motivation behind all we do is supporting and progressing our members' careers and profession. Yet, we often find that our members don't quite understand what we do, or why we do it.

I think the IBMS needs to work harder to explain exactly what we do and don't do. For instance, we DO accredit university courses that prove they meet the HCPC standards for education. We DON'T create or regulate those HCPC standards. We DO create training materials and processes that enable several routes to HCPC registration as a biomedical scientist. We DO NOT create or regulate the HCPC standards of proficiency (although we are consulted).

Some members call out for the IBMS to seek reform. We do this where we can but are limited by the strict standards the HCPC puts in place to protect the public. It is conforming to these HCPC standards prior to registration that makes it difficult for some people to start practising.

Unfortunately, when workplaces are fraught with the need to have new staff on the bench and practising yesterday, training or education barriers can seem insurmountable and detrimental to the needs of the service and workforce. They are, however, entirely necessary.

To support us all through these difficult times, I think the IBMS needs to create and disseminate more information so that young people understand that biomedical science is an HCPC-regulated profession. We also need the Department of Education to help us disseminate information about IBMS accreditation and training to schools, colleges and careers advisors up and down the country.

Clear communications will offset the dissatisfaction that comes from those who have been underinformed and unwittingly made choices that have negatively impacted their route to registration. If we can help those people sooner, we can make joining the profession a much better experience.

David Wells
Chief Executive

Institute of Biomedical Science is the professional body for the biomedical science profession.

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SCIENCE NEWS

IN NUMBERS

The six countries with the highest reported COVID rate per 100k people at the start of August were:

71,198
Faroe Islands

59,362
Andorra

59,342
Gibraltar

50,017
San Marino

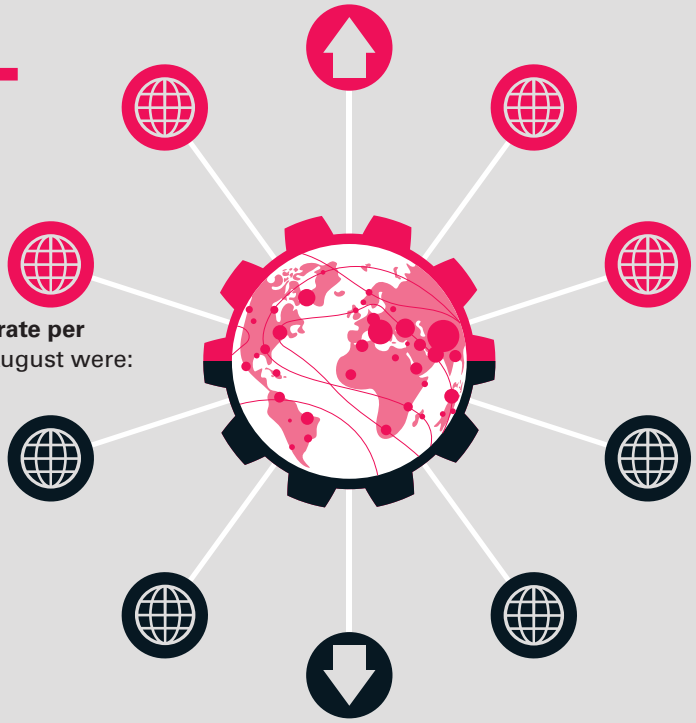
56,379
Martinique

56,046
Iceland

GLOBAL COVID RATES

The six countries with the lowest reported COVID rate per 100k people at the start of August were:

<1 North Korea
39 Niger
41 Yemen
47 Chad
65 Mainland China
65 Tanzania



41%
RISE IN DRUG DEATHS

There has been a sharp rise in deaths from drug misuse in Wales, new Office for National Statistics figures reveal.

There has been an **increase of 41%**, with **210 deaths recorded in 2021**, compared with 149 in 2020.

The figure is the **highest since records began** in 1993.

The Welsh government said it is **investigating the increase**.

CHINA'S LIFE EXPECTANCY

The **average life expectancy in China has risen** from 76.5 years in 2016 to

77.93.

It has now overtaken the US, where the figure is 76.6.

COVID fines: Those in the most deprived areas of Scotland were 2.6 times more likely to receive a fine during COVID lockdowns.

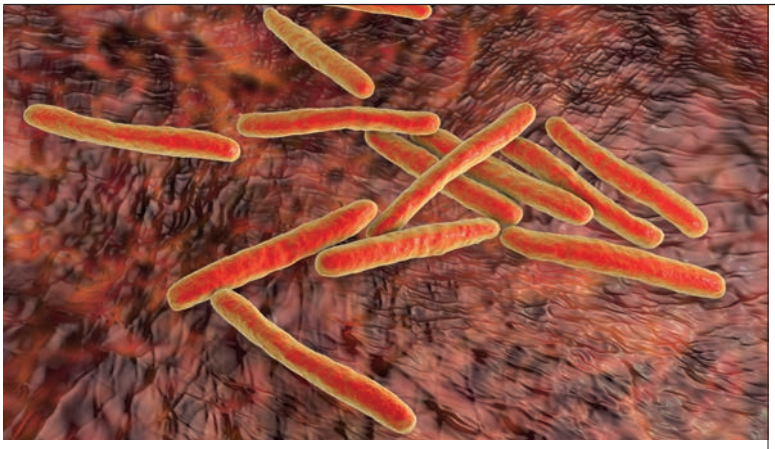
More than 20,000 people in Scotland received police fixed penalty notices during 2020/21 for breaking the rules.

100,000

More than 100,000 doses of the monkey pox vaccine have been acquired for England, the government has said.

Vaccines minister Maggie Throup said the **majority of vaccines were being made available in London**, with about **75% of confirmed cases in the capital**.

At the start of August, out of **2436 confirmed cases**, 1778 were in London.



SCIENCE NEWS

GENETIC ANALYSIS

Antibiotic resistance genes identified in TB

An analysis of more than 10,000 *Mycobacterium tuberculosis* bacterial isolates from 23 countries has revealed new genes associated with resistance to 13 first- and second-line new and repurposed antibiotics.

In one paper, the researchers outlined how they assembled an open-access data compendium of 12,289 *M. tuberculosis* isolates, processed in CRyPTIC partner laboratories around the world.

Each isolate was sequenced, and then tested on a high-throughput grid with varying concentrations of 13 antimicrobials. Of the samples included in the compendium, 6814 were resistant to at least one drug, including 4685 samples resistant to multiple drugs or to the first-line treatment rifampicin.

In a second paper, the consortium presented their findings from a genome-wide association study (GWAS) using the data on 10,228 *M. tuberculosis* isolates.

For all 13 drugs, the group discovered uncatalogued variants associated with significant increases in the minimum inhibitory concentration – the lowest concentration of an antibiotic that stops the growth of *M. tuberculosis*.

→ **bit.ly/3Pdona7 & bit.ly/3zJpE36**

OBSERVATIONAL STUDY

AI AND ECG HEART TRACE TO PREDICT DIABETES

An artificial intelligence (AI) algorithm, derived from the features of individual heartbeats recorded on an ECG (electrocardiogram), can accurately predict diabetes and pre-diabetes, suggests preliminary research.

If validated in larger studies, the approach could be used to screen for the disease in low-resource settings, say the researchers.

Families with at least one known case of type 2 diabetes and living in Nagpur, India were enrolled in the study.

The prevalence of both type 2 diabetes and pre-diabetes was high – around 30% and 14%, respectively. The prevalence of insulin resistance was also high – 35%.

Based on the shape and size of individual heartbeats, the algorithm quickly detected diabetes and pre-diabetes with an overall accuracy of 97% and a precision of 97%, irrespective of influential factors, such as age, gender, and coexisting metabolic disorders.

→ **bit.ly/3zNMCG2**

CANCER RESEARCH

"COLLAGEN A KEY PLAYER IN BREAST CANCER METASTASIS"

Collagen type XII plays a key role in regulating the organisation of the tumour matrix, reveals a new study.

A team of scientists from the Garvan Institute of Medical Research also discovered that high levels of collagen XII can trigger breast cancer cells to spread from the tumour to other parts of the body.

The tumour microenvironment is the ecosystem that surrounds a tumour, a component of which is the extracellular matrix.

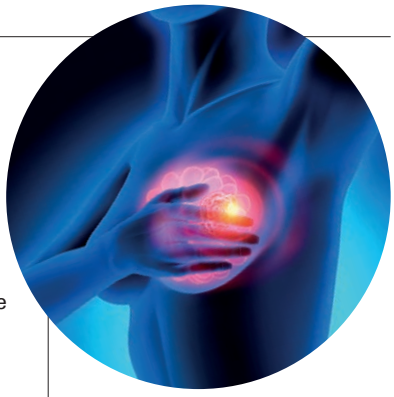
Cancer cells constantly interact with the tumour microenvironment, which affects how a tumour grows. Collagen is an important part of this microenvironment, but how it influences tumours has not been understood.

"There's still a lot we don't know about the role of the extracellular matrix in cancer metastasis. Our study shows that collagen XII plays an important role in breast cancer progression and metastasis," said senior author Associate Professor Thomas Cox.

"Imagine cancer cells as seeds, and the tumour microenvironment as the soil. By studying the soil – the extracellular matrix – we can begin to understand what makes some tumours more aggressive than others, and by extension, begin to develop new ways to treat cancer."

The research also suggests that measuring the level of collagen XII in a patient's tumour biopsy could potentially be used as an additional screening tool to identify aggressive breast cancers.

→ **go.nature.com/3QpniNs**



IMAGES: SCIENCE PHOTO LIBRARY/ISTOCK/SHUTTERSTOCK

GENOMICS

"GENE EDITING VIA CRISPR/CAS9 CAN LEAD TO CELL TOXICITY AND GENOME INSTABILITY"

CRISPR/Cas9 is a commonly used, very precise, gene editing technique often known as "genetic scissors".

It allows the introduction of a DNA sequence into (virtually) any spot of the genome, thus modifying or inactivating a gene.

This technique is widely used in biomedical research and some CRISPR-based therapies are in clinical trials for the treatment of human blood disorders, some types of cancer and HIV.

Scientists at the Institute for Research in Biomedicine Barcelona have now reported that, depending on the targeted spot of the human genome, CRISPR gene editing can give rise to cell toxicity and genomic instability. This unwanted effect is mediated by the linchpin tumour suppressor protein p53 and is determined by the DNA sequence near the editing point and various epigenetic factors in the surrounding region.

Using computational methods, researchers analysed the most popular CRISPR library designed for human cells and have detected 3300 targeted spots that show strong toxic effects.

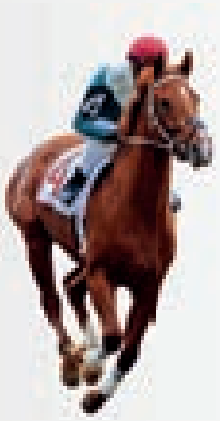
The work also reports that around 15% of the human genes contain at least one toxic editing point.

Research lead Dr Fran Supek said: "Our work addresses an important issue with TP53-associated toxicity of Cas9, which was a matter of some controversy recently, and it also provides guidelines on how to sidestep the problem. Avoiding editing in these 'risky' spots would not only make CRISPR editing more efficient but, more importantly, safer."

→ **go.nature.com/3JLy66r**

3300 USING COMPUTATIONAL METHODS, RESEARCHERS **ANALYSED THE MOST POPULAR CRISPR LIBRARY** DESIGNED FOR **HUMAN CELLS** AND HAVE DETECTED **3300 TARGETED SPOTS** THAT SHOW STRONG TOXIC EFFECTS.

WHAT'S HOT AND WHAT'S NOT



HOT

RACEHORSES

A new method has been developed to screen for bucked shin – a condition featuring tiny stress fractures that occurs in 70% of racehorses – using ultrasound.

HOT

ROBOTS

Robot-assisted lung surgery is a cost-effective intervention that yields better patient-reported quality-of-life measures, compared with video-assisted lung surgery, according to research.

IMAGE: ©INTUITIVE

HOT

OPTICAL FIBRES

Researchers have developed infrared optical fibres – with potential applications in diagnostics – that are non-toxic and retain their properties when treated with up to 1 MGy of ionising beta radiation.

NOT

BAD POSTURE

A new study employs a biomimetic *in silico* simulator based on the realistic anatomy and morphology of the stomach to investigate and quantify the effect of body posture and stomach motility on drug bioavailability.

NOT

ASTHMA

A possible way to tackle one of the underlying causes of asthma has been developed. In tests in mice, researchers were able to virtually eliminate asthmatic symptoms by focusing on pericyte stem cells.

NOT

TUBERCULOSIS

Research in animal models showed the potential of delivering a TB drug with one injection that lasts at least four months, in lieu of the current standard treatment requiring constant adherence to a daily drug regimen.

IMMUNOLOGY

NEW TEST MAY PREDICT COVID-19 IMMUNITY

Massachusetts Institute of Technology researchers have developed an easy-to-use test to predict COVID-19 immunity.

Their test, which uses the same 'lateral flow' technology as most rapid COVID antigen tests, measures the level of neutralising antibodies that target the SARS-CoV-2 virus in a blood sample.

Easy access to this kind of test could help people determine what kind of precautions people should take against COVID infection.

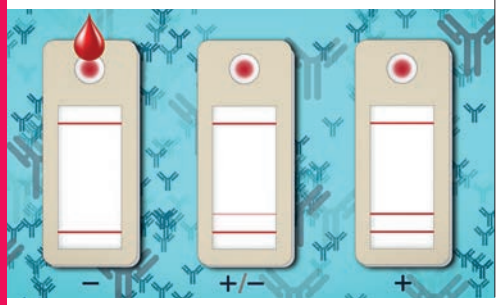
The team has filed for a patent on the technology and is now hoping to partner with a diagnostic company that could manufacture the devices.

The researchers said the test could make the biggest difference for those who are immunocompromised.

The test is designed so that different viral spike proteins can be swapped in, allowing it to be modified to detect immunity against any existing or future variant of SARS-CoV-2.

→ **bit.ly/3dl4May**

IMAGE: ©MIT



MICROBIOLOGY

Genetic method for identifying hundreds of disease agents

A new paper compares the pathogen-detecting ability of a next-generation sequencing (NGS) system — the Respiratory Pathogen Infectious Diseases/Antimicrobial Resistance Panel (RPIP) — with a previously studied NGS system and standard of care (SOC) diagnostic methods for samples obtained with bronchoalveolar lavage.

This is where a bronchoscope is passed through the mouth or nose into the lungs, followed by a fluid wash that is collected for examination.

The researchers believe their study is among the first to compare NGS and SOC diagnostics for respiratory pathogens.

"We evaluated the two NGS diagnostic techniques, one of which was the RPIP, and found that in both cases, the ability of NGS to identify specific pathogens was nearly comparable to the battery of diagnostic tests clinicians have been using for decades," says study senior author Patricia Simner.

"Although this shows great promise for the RPIP and NGS diagnostics in general, we feel more work is needed to further refine the technology before NGS can be considered equal to or better than current SOC methods."

The team first evaluated the diagnostic ability of metagenomic NGS, a previously studied workflow process during which all DNA obtained from a bronchoalveolar lavage is sequenced — including genetic material unique to the patient (the "host read" or "human read") and the sought-after pathogen (the "microbial read"). Removing the host DNA enable clinicians to concentrate their search on the remaining genetic material to hopefully find the microbial read and ultimately, identify the cause of the patient's illness.

→ **bit.ly/3QAfybk**

IMAGES: SCIENCE PHOTO LIBRARY/GETTY

UNDER THE MICROSCOPE

This month: aldosterone

What is aldosterone?
A steroid hormone secreted by the adrenal glands. It serves as the principal regulator of the salt and water balance of the body.

Has it been in the news?
It has been linked to an increased risk of kidney failure in patients with chronic kidney disease (CKD), according to a study published in the *European Heart Journal.*

Tell me more.
The findings suggest aldosterone plays a role in CKD progression and an existing drug that targets the action of aldosterone may help to prevent CKD getting worse.

Which drug is this?
Ashish Verma, Assistant Professor at Boston University School of Medicine, said: "Recent randomised controlled trials have shown that a drug called finerenone is effective in delaying CKD progression and adverse cardiovascular outcomes in patients with chronic kidney disease and diabetes. However, the role of aldosterone in this process was not directly investigated."

How does finerenone function?
Finerenone targets the non-steroidal mineralocorticoid receptor. When this is activated by aldosterone, elevated levels of the hormone lead to high blood pressure, cardiovascular and kidney diseases.

What is the relationship between aldosterone and finerenone?
Since excessive aldosterone is very common, yet mostly unrecognised, the authors hypothesised that one reason finerenone was effective in lowering the risk of CKD progression was that it was treating unrecognised high concentrations of the hormone.

Where can I read more?
Visit – **bit.ly/3SF654v**

DATA ANALYSIS

Non-COVID-19 respiratory infections statistics

An increase in the number of non-COVID-19 respiratory infections should be expected this winter, say scientists.

The warning comes following the results of a new study that found that over 55% of respiratory disease hospitalisations during the pandemic's peak in 2021–2022 were caused by non-SARS-CoV-2 infections.

The University of Bristol-led study is the first to compare the number of hospitalisations from respiratory disease infections caused by COVID-19 and non-SARS-CoV-2 infections.

Using data from 135,014 hospitalisations from two large hospitals in Bristol between August 2020 and November 2021, researchers identified 12,557 admissions attributable to acute lower respiratory tract disease (aLRTD) with patients admitted with signs or symptoms of respiratory infections including cough, fever, pleurisy, or a clinical or radiological aLRTD diagnosis.

Of these, 12,248 (98%) patients, comprising mainly older adults, consented to participate in the study.

The team show that of the 12,248 aLRTD hospitalisations, 55% (6,909) were due to infection with no evidence of SARS-CoV-2, while confirmed SARS-CoV-2 infection only accounted for 26% (3,178) of respiratory infections. The remaining 17% (2,161) were due to infection with no infective cause.

→ **bit.ly/3dq6PdO**

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TECH NEWS

AGILE LIFE SCIENCES

MENOPAUSE

A UK start-up is developing an easy-to-use, accurate and reliable diagnostic test that could transform the way the menopause is diagnosed, monitored and managed, it is claimed.

Agile Life Sciences has developed an at-home urine sample collection test that can identify where a woman is during the various stages of her menopausal journey.

It is more accurate and reliable than any current menopause test available, said the start-up.

→ **agilelifesciences.com**

BIO-RAD

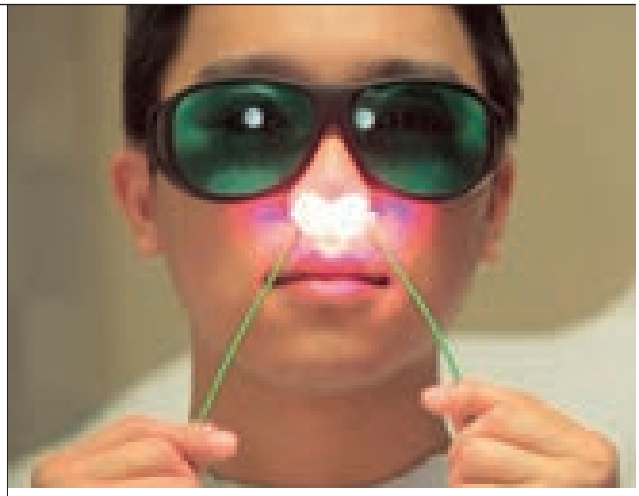
ULTRAVIOLET DYES

Bio-Rad Laboratories has extended its range of StarBright Dyes to provide greater flexibility in multicolour flow cytometry panels.

The StarBright Violet 760, StarBright UltraViolet 575, and StarBright UltraViolet 605 dyes offer improved brightness with narrow excitation and emission profiles for precise resolution.

The range provides researchers with highly stable, validated flow antibodies conjugated to proprietary fluorescent nanoparticles.

→ **bio-rad.com**



ONDINE BIOMEDICAL

NASAL PHOTODISINFECTION

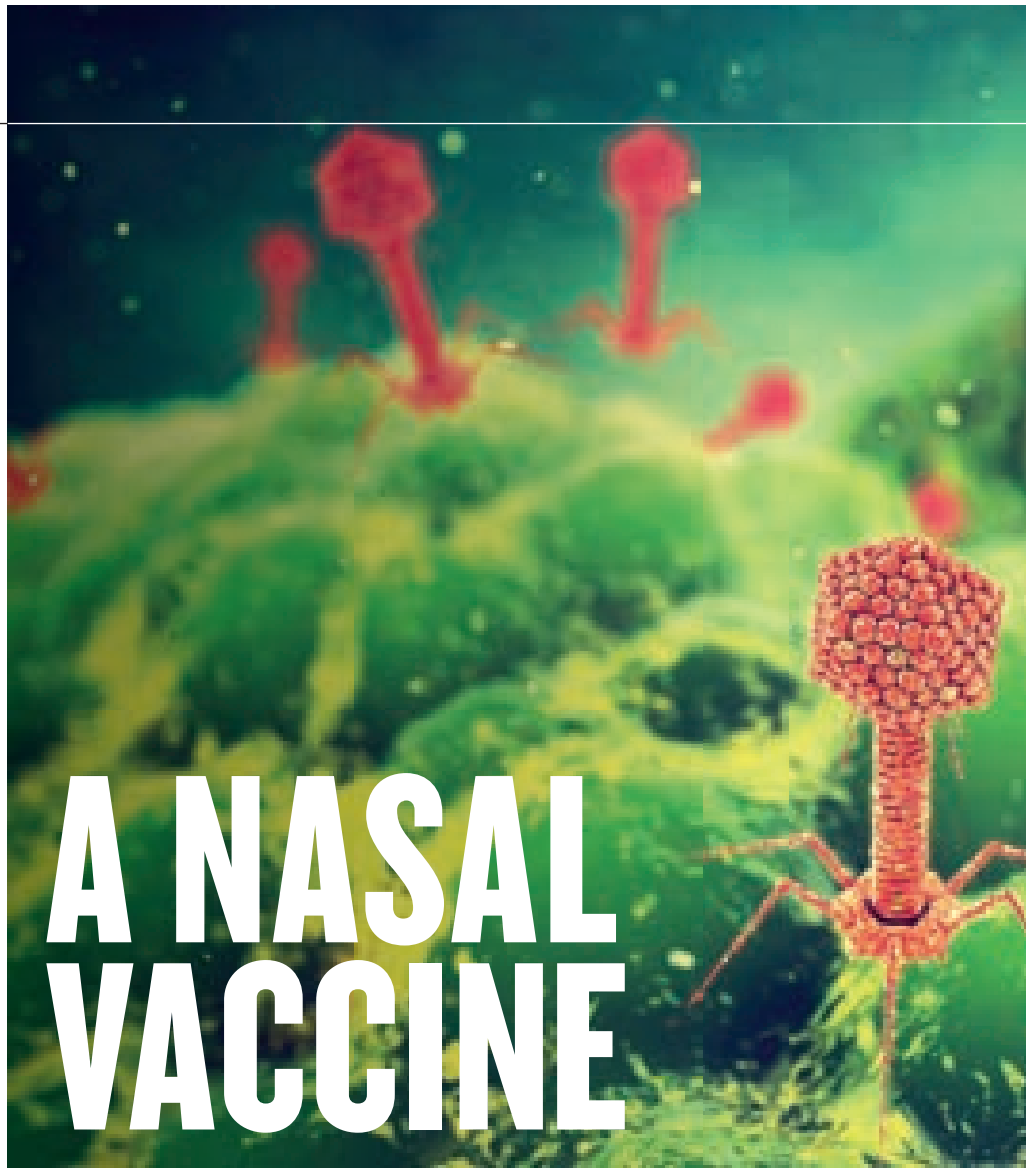
Ondine Biomedical has recruited the final patients to its nasal photodisinfection exploratory phase 2 trial.

The trial is evaluating how effectively Ondine's nasal photodisinfection technology eradicates pathogens – specifically *Staphylococcus aureus* – in the nose.

The single-centre open-label trial has recruited over 300 patients who will undergo a pre-surgery nasal culture to determine the prevalence of *Staphylococcus aureus* – the main cause of surgical site infections.

Ondine's nasal photodisinfection is a patented platform.

→ **ondinebio.com**



A NASAL VACCINE

Researchers have found the first non-infectious needle-free nasal vaccine to be effective against COVID-19. Senior study co-author **Dr Venigalla B Rao** explains how it works.

In March 2020, a research team of biologists and immunologists in the US submitted a grant proposal to the National Institutes of Health to develop a COVID-19 vaccine that uses a bacteriophage T4 virus-like particle (VLP) platform. The researchers had already published papers on anthrax and plague vaccines that use the bacteriophage T4 platform, and had submitted a grant proposal two months earlier to develop a "universal" influenza vaccine – which was rejected.

"We were making a shift to make this platform more universal by using CRISPR engineering – to be able to produce vaccines rapidly against any emerging or pandemic pathogen," says Dr Venigalla B Rao, Professor in Biology at The Catholic University of America in Washington DC and senior study co-author. "Our thought process and a template had already been in place in late 2019, and this proposal was submitted at the time COVID-19 was emerging in Wuhan and the US."

The proposal was accepted and the research team worked through the entire lockdown period. By November 2020, they found that the phage T4-COVID-19 vaccine they constructed was effective in mice, showing complete protection.

The team went on to test its effectiveness as a needle-free vaccine. Two doses of the T4-COVID-19 vaccine were administered intranasally in mice, 21 days apart. The vaccine induced robust mucosal immunity as well as strong systemic humoral and cellular immune responses. The results were published in *mBio*, the flagship journal of the American Society of Microbiology.

The vaccine also neutralised multiple COVID-19 variants, including the mouse-adapted SARS-CoV-2 MA10 strain, the ancestral WA-1/2020 strain, and the most lethal Delta variant in mouse models. The vaccine did not affect the gut microbiota, and the immune responses were much stronger in intranasally vaccinated mice than those injected with the same vaccine.

"In eight months since conceiving the vaccine design, we have developed the recombinant phages and tested them to determine which one would actually work. By the time the mRNA vaccines came along, we had demonstrated that we had a vaccine using our platform," Rao adds. While the vaccine needs to be tested on non-human primates, as well as humans, previous research using the same platform for an anthrax vaccine reproduced the same findings – complete protection – in rhesus macaques as mice. "Our vaccine has the promise to prevent or greatly minimise person-to-person transmission of COVID-19," Rao adds.

Protection

While having a "tremendous impact on preventing severe infections, hospitalisations, and deaths", mRNA and adenovirus-based vaccines do not induce mucosal immunity or prevent transmission, Rao explains. "The Omicron variants are now spreading like wildfire, despite the fact that 60%–70% of the US population are vaccinated and boosted. That's the same all over the world. These breakthrough COVID-19 infections will continue and the emergence of a more lethal and transmissible variant remains a possibility."

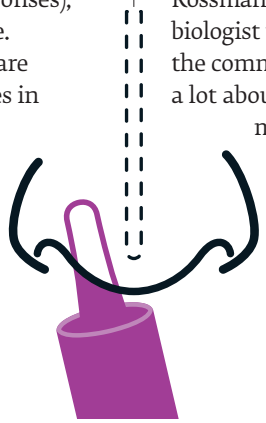
The mucosal immunity offered by the T4 vaccine means that the COVID-19 virus may not be able to enter through the respiratory pathways. Even when transmission occurs

it may not lead to full-blown infection or long COVID because the well-developed immunity in the respiratory airways might limit the viral load.

The T4 vaccine appears to provide sterilising immunity too. It might limit shedding of the infectious virus that can be transmitted to another individual. The virus could not be detected in the lungs of the mice even though they were challenged with lethal doses of COVID-19.

Unlike most of the nasal vaccines under development, which use an infectious human virus, the T4 vaccine is non-infectious, free of adjuvants (chemicals used to stimulate immune responses), and stable at room temperature.

"Mucosal vaccines in general are not as robust as injected vaccines in generating systematic immune responses, such as neutralising antibodies," Rao says. "Surprisingly, the nasal T4-COVID-19 vaccine stimulated greater systemic immune responses, including neutralising antibodies and T cell responses than the injected intramuscular vaccine. This is even better because the nasal vaccine has both breadth and strength of immune responses."



Future applications

The platform that has been created is near universal, Rao says. "At the time we were developing the vaccine design template, we had also developed the CRISPR engineering strategy. It was a convergence of different technologies that led to the development of this universal platform. To my knowledge, it's one of the most flexible and powerful vaccine design platforms out there."

Because the platform uses a bacteriophage that can be grown in bacteria, it can be cost-effectively manufactured. "If the manufacturing process is in place, it could be produced in compatible levels of timeframes and urgency as the mRNA vaccines, but it is expected to be more potent because we are including antigens directly into the vaccine," Rao adds.

But substantial funding is required if the vaccine is to be tested to establish effectiveness in humans, and that is hard to secure. "In my opinion, this is a powerful platform that we should invest in. It nicely complements the mRNA- and adenovirus-based platforms in our preparedness for pandemics and the pay-off would be tremendous" Rao says.

He has spent more than 40 years researching bacteriophages, including a period working with Professor Michael Rossman, the physicist and structural biologist who discovered the structure of the common cold virus. "We've learned a lot about bacteriophage structure, mechanisms, and so on. That's been our primary motivation and inspiration – we accumulated enough basic knowledge that we started thinking about how to harness this knowledge for applications."

Rao is working on a new paper on novel genetic therapies and human cells using bacteriophage T4. "This could potentially be a breakthrough," he says. "All we do is observe nature closely for what it is and what it is teaching us, then solutions will come up." BMS

VENIGALLA B. RAO

- ✔ **1980** completed PhD in Biochemistry, Indian Institute of Science, Bangalore, India
- ✔ **1980 – 1989** Postdoctoral Research, Molecular Virology, University of Maryland School of Medicine, US
- ✔ **1989** joined the Faculty of Biology, The Catholic University of America, Washington DC, US
- ✔ **1994** Associate Professor, Biology, The Catholic University of America, Washington DC, US
- ✔ **1995 – 2019** – Chair, Microbial and Cell Biology Graduate Programme, The Catholic University of America, Washington DC, US
- ✔ **1997 – present day** – Director, Centre for Advanced Training in Cell and Molecular Biology
- ✔ **2000 – present day** – Professor, Biology, The Catholic University of America, Washington DC, US
- ✔ **2001 – 2019** – Chair, Biology, Centre for Advanced Training in Cell and Molecular Biology
- ✔ **2021** – Founded the Bacteriophage Medical Research Centre, The Catholic University of America, and currently serving as Founding Director
- ✔ **2021** – elected Fellow, American Society of Microbiology
- ✔ **2021** – elected Fellow, National Academy of Inventors.

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THE BIG QUESTION

THIS MONTH WE ASK

"What is the most vital skill or attribute for a newly qualified biomedical scientist to possess"

Bamidele Farinre

Lead Biomedical Scientist
Halogene, I-HUB

"Congratulations you've passed, welcome to the world of endless possibilities". I remember something along those lines when I passed my IBMS Certificate of Competence. One thing that kept me going was the confidence in my new title. After qualifications, it's easy to mount pressure on oneself, but it's okay to know that one is just beginning. Be open-minded about your competence limit and be willing to learn more from the qualified experts. New registrants must be able to make and maintain strong relationships with their colleagues, stakeholders and hospital staff.

Communication is one of the most important professional skills for scientists. Individuals should feel comfortable explaining complex biomedical theories in written and oral communication to a range of audiences. Outside the laboratory setting, biomedical scientists may be called upon to deliver lectures or presentations about their work to industry stakeholders and students. Flexibility is also an important biomedical science skill because it allows individuals to balance the fast pace at which science advances with the meticulous approach of research. Success requires an eye for detail, a willingness to ask clear questions and follow-up, and organisational skills so that research findings and other appropriate materials are in order. A sense of curiosity and persistence goes hand in hand with motivation.

IMAGE: GETTY

Dylan Jones

Lecturer in Biomedical Sciences (Haematology & Human Physiology)
Bangor University

Don't be afraid to ask questions! During your studies no doubt you will have spent many an hour working on your own in a library, sat by your computer or even within an exam hall. It can develop you into a strong, independent practitioner but it's important to remember that biomedical scientists work as part of a team.

The shared knowledge and experiences of your colleagues will be phenomenal, and they will be more than happy to share them and aid in your development as a scientist.

Given the importance of continual professional development, which can come in the form of formal training events, journal clubs or post-graduate education, it can also be incredibly valuable to learn in a more informal way from your colleagues.

If you see a technique new to you being performed, ask if you can shadow. If you see an interesting result, ask the more experienced scientist what the significance of the result is. These conversations can form an invaluable developmental opportunity for you and allow you to identify avenues for you to develop as a scientist.

Whilst it may be intimidating to find yourself in a new environment, just remember that everybody you work with started in the same place and they will be happy to answer any questions you may have. You never know, they may have had the same questions as you do!

Cherie Beckett

Acting Senior Biomedical Scientist (Microbiology)
The Princess Alexandra Hospital NHS Trust

The HCPC has set out 15 standards of proficiency that an individual must meet in order to register (and stay registered) as a biomedical scientist. As described by the HCPC, these are threshold standards that are considered necessary to protect members of the public alongside keeping to the HCPC standards of conduct, performance and ethics.

The most vital attribute that I believe a newly qualified biomedical scientist should possess is that of holding the patient at the heart of everything. Within this, if one truly does hold the patient at the heart of all that they do, I feel there is a direct link with the adherence of the aforementioned standards.

Putting the patient first lends itself to staying within one's own scope of practice, understanding the necessary requirements of training, expertise and experience and practising safely and effectively. In the basic sense, this means a newly qualified biomedical scientist should simply be honest: to be able to raise their hand when they don't know what to do, or if they are unsure, and not to perform a task in which they are not competent. Furthermore, to be able to say when things may have gone wrong or if something is not quite right.

As biomedical scientists often work behind closed doors, it can be easy to lose sight of the patient that we seldom meet, but every sample represents a patient, and every patient matters. Plus – without patients, we would all be out of a job!

ASSESSING EMPLOYABILITY SKILLS

Tahmina Hussain and **Martyn Hicks** interrogate the results of a study into gaps in the knowledge, skills and experience of new graduates entering the biomedical science workforce.

Graduate employability is becoming increasingly competitive in the biomedical science workforce with significant demands and pressures on the services delivered by pathology departments. An educational and employment research study was carried out to assess a perceived gap between the skills of new graduates pre-employment and employers' requirements and expectations in a Pathology laboratory. The aim of the study was to identify in which areas the gaps in the knowledge, skills and experience lie in graduates and how those gaps could be bridged to better support employers and higher education institutes (HEIs) to influence the development and engagement of students with the curriculum. Two separate surveys were sent out to employers and HEIs to explore their perceptions of the employability skills in graduates. The data collection from this survey will be useful to the newly established practice educator network to better understand current shortfalls and assist the HEIs and employers to work together with the practice educators to put some robust measures in place that will improve the recruitment and retention rate of talented and skilled graduates in the biomedical science workforce.

The employers survey was distributed via the practice educator network across England and stimulated a healthy response from employers with a total of 42 replies. The survey for HEIs was sent via the IBMS to all universities in the UK providing accredited BSc biomedical science degrees.

A total of 11 responses were received. A definite trend was highlighted but also some contradictions between the employer and HEI responses.

The responses

In response to the opening question (Figure 1), 93% of employers who responded believe new graduates do not meet the requirements at Band 5 interviews. The top six reasons represented in Figure 2 account for 80% of the areas of deficiency with over 60% of responses indicating five or more of the skills that are lacking in these areas. The number of graduates without an accredited degree was also noted.

Out of the 93% of employers who stated that the shortfall in new graduate skills puts strain on lab services, 74% stated that this is also delaying the training and progression of other staff.

On top of the skills gaps noted by employers at interview, just 19% of employers think graduates are fully prepared for interview, with 95% stating that HEIs should do more interview preparation for graduates. The survey also highlighted that 88% of employers were not aware if HEIs included a pre-employment module into their curriculum. Just over half of the respondents (52%), are involved in employer liaison groups, of which 76% thought they produced a positive outcome for the employer, but there were mixed views on this.

Employer liaison groups

Responses from employers in relation to employer liaison groups are listed below:

"I don't know what they are – never had an impact where I work as far as I am aware."

"Not aware that I've witnessed much change from things raised at the groups to process/learning change at the HEIs – graduates are still coming out with the same deficiencies at interview as above – frustrating how many graduates don't know basics on the full aspect of what constitutes a quality management system or teaching is not updated with current practice."

"Currently this is the case as we have no programme at our local HEI that feeds directly into graduate roles within our department."

"The liaison group is used as an opportunity to update annually on changes between lab and HEI and apply pressure to labs to continue to provide placement opportunities and encourage lab staff to provide uni lectures rather than as a pathway to facilitate change/gather feedback etc. that would benefit employers. The time spent could be used more constructively for the employer as it is generally driven by university interests."

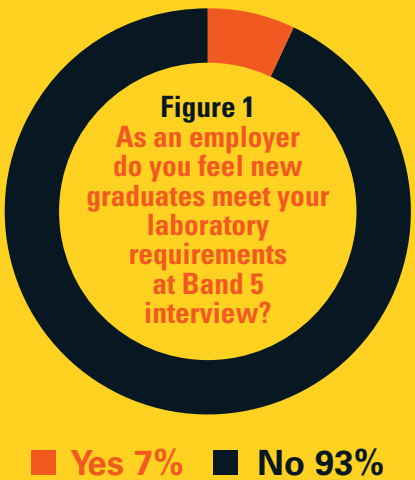
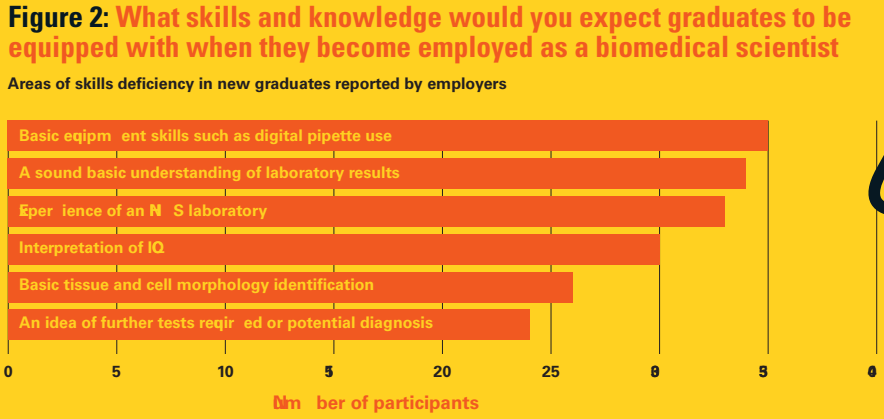


Figure 1
As an employer do you feel new graduates meet your laboratory requirements at Band 5 interview?

When asked what skills and knowledge employers would expect graduates to be equipped with to become a biomedical scientist, 64% of respondents noted the same key areas as indicated in Figure 2. There were a range of other skills noted – such as time management, professional attitudes and role awareness – for which employers suggested students would benefit from the help of a mentor. Employers also noted that they would expect graduates to have knowledge of UKAS as well as the role of pathology in patient care.

Placements, work experience and internships make a huge difference to employability skills, however, access to these opportunities are highly competitive. To explore the options to facilitate more placement opportunities, employers were asked if they would be willing to provide more placements to students if some aspects of the registration portfolio were completed at university, as this would reduce the workload and pressure on training

Figure 2: What skills and knowledge would you expect graduates to be equipped with when they become employed as a biomedical scientist



"The time spent could be used more constructively, as it is generally driven by university interests"

officers. HEIs were also asked if they were able to support this. Responses from both surveys are indicated in Figures 3 and 4.

Those HEIs that stated that they were able to support completion of some aspects of the portfolio were asked to specify which sections they felt were appropriate to complete at university. There was an agreement across all responses that completing the knowledge requirements for all modules in Section 1 and some aspects of Section 2 (professional knowledge, health and safety and research and development) could be facilitated at university. One of the responses stated that *"partial completion of the registration portfolio would have little value to those students who do not want to pursue biomedical science as a career"*.

The responses from employers on whether HEIs should cover more of the Registration Portfolio was mixed. Many stated that Section 1 could be completed at university prior to placement, with Section 2 completed in a hospital laboratory setting, but a lot of the basic technical areas could be completed at university. Some employers noted a lack of training capacity as a major barrier, while others indicated that training graduates in basic methods and procedures was more of a problem than covering portfolio modules.

Employer feedback

Feedback from the employers included the following responses:

"Training capacity is already maximum - we need to balance the training of own staff via apprenticeship and student portfolio provision.

Figure 3: Would you be willing to provide more placements if some aspects of the Registration Portfolio were completed at university?

Grow-your-own staff will be easier now our local university has a band 6 apprenticeship course (degree apprenticeship)."

"The registration portfolio is not the barrier to taking more students, it is the volume of internal trainees that we have that are in a training process and the demand outweighs the resource to provide the training."

"Some of the knowledge sections, such as personal responsibility and development, equality and diversity, communication, can be generically taught."

"The portfolio is a vocational practical portfolio where the training laboratory is signing off practical knowledge and competence of experience received in training. I wouldn't want to be signing alongside a university mentor where I don't know what they've learnt or witnessed myself/departments have witnessed. By completing it at uni it's not giving 'real life' workplace experience, which is very important with the portfolio and the application of the knowledge."

Responses from HEIs

HEIs were asked what skills undergraduates are provided with to help them step into employment on completion of their degree. In order of importance, the answers were: understanding of basic laboratory results, awareness of COSHH and health and safety regulations, ability to interpret and suggest follow-up tests, interview technique and practice and a good understanding of IQC/EQA and outliers.

Although 100% of the responses demonstrated that the top 5 skills indicated above are provided to undergraduates, 73% of the respondents at HEIs stated that they do not think graduates are fully prepared for interview after university, as indicated in Figure 5.

All HEIs that participated stated that they have an employer liaison committee. In total, 82% felt that employer liaison committees provide positive outcomes while 18% felt that there isn't enough involvement of the committee.

IMAGES: SHUTTERSTOCK/ISTOCK

Some of the responses from HEIs are listed below:

"There tends to be more HEI staff attending than employers. NHS staff are over stretched so do not prioritise working with HEI regarding this."

"I don't think there is enough physical involvement from the committee – ideally they would observe the student experience and we would also visit the hospital environment to understand where our students are struggling. We could then decide a positive way forward with clear actions".

"Employer liaison committees fully embed NHS employers in the decision-making process, interview and selection of students, supporting students and verification of students alongside any programme amendments or improvements."

"We have received good constructive employer feedback when graduates (or placement students) fail to demonstrate appropriate/ sufficient skills which has fed into our course improvement processes."

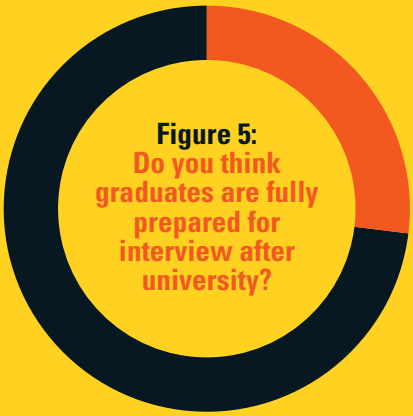
"It helps us to understand the requirements of the workforce, but often just turns into a discussion of the problems with the employers. We probably don't utilise this fully, however since the pandemic engagement with the committee has been poor."

HEIs were also asked if any pre-employment modules were integrated into the curriculum. While 45% of HEIs do not have any pre-employment modules, 55% include tutorials that build in employability skills, careers modules covering CV writing, reflection, CPD, practical lab-based competencies and placement preparation.

Academics also stated that the shortfall in employability skills is impacted by the difference in "what is delivered in a degree and the reality of current pathology labs; some academics have never set foot in a hospital lab" and "replicating laboratories in a university setting is very challenging".

Next steps?

In summary, the employers have highlighted the gap in skills seen in new graduates that is impacting workforce and service delivery. Although the HEIs have demonstrated from the survey these skills are covered in the curriculum there is this disparity and three quarters of HEIs do not think graduates are prepared for interview. HEIs note employer liaison groups are often poorly attended by the employer due to laboratory pressures, but employer engagement is fundamental to addressing the issues they have noted. The practice educator networks are key to providing the missing link for employers and HEIs by increasingly networking and collaborating to engage stakeholders and influence workforce plans.



How can the issues raised in this survey be addressed? Suggestions to bridge these gaps are listed below:

- Introduce mentoring scheme
- Incorporate pre-employment module into HEI curriculum to include CV writing, job application support, mock interviews
- Placement preparation and integrate some portfolio evidence into curriculums (with input from employers)
- Employers to facilitate laboratory tours to provide insight for students and lecturers
- Post-degree support and follow up from HEI
- Modules to include professional bodies, HCPC registration and role of IBMS
- HEI outreach projects with stakeholders to include employer liaison groups – key HEIs to act on feedback to engage employers
- Students have access to mock laboratory results and interpretation utilising up-to-date methods in laboratory practical sessions
- Create virtual laboratory training platform, introduce simulation centres
- Employers to collaborate with HEIs to agree on appropriate evidence for registration portfolio.

Thank you to all participants in this survey as the data and feedback obtained add real value to the ongoing conversations around this subject. Special thanks to Brian Orman, PMO Support Diagnostics, NHSE South West Region for collating the data and responses.

Tahmina Hussain is a HCPC-registered Biomedical Scientist Lecturer at the University of Salford. **Martyn Hicks** is a Biomedical Scientist and Regional Pathology Apprenticeship and Educational Lead for South West England

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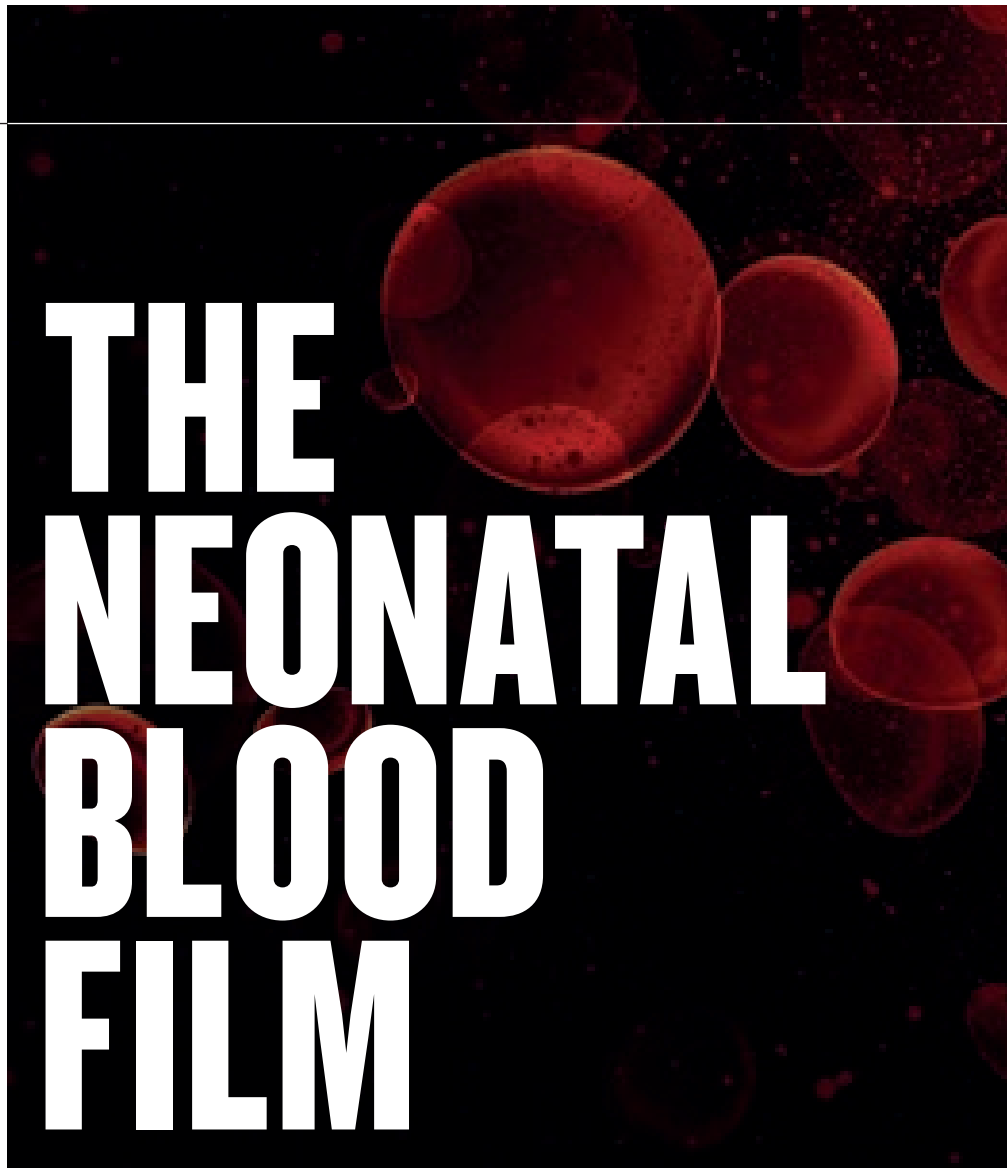


THE NEONATAL BLOOD FILM

As at any other time in life, examination of a blood film in a neonate can be very informative. It is important that films are interpreted in the context of the clinical details and the blood count. It is also necessary to consider the period of gestation of the neonate at birth, since what is normal differs in term and preterm babies, particularly for those born before 28 weeks' gestation.

What is normal?

In comparison with infancy and later in childhood, the blood count of a neonate shows a higher red cell count (RBC), haemoglobin concentration (Hb), haematocrit (Hct), mean cell volume (MCV) and mean cell haemoglobin (MCH). As a result, a blood film may appear "packed". The erythrocytes will be notably larger than those of infants, children and adults but they should not be described as "macrocytic" if they are of normal size for a neonate. In preterm neonates the Hb and Hct are slightly lower and the MCV and MCH are higher than in term neonates. Nucleated red blood cells (NRBC) may be present, these being more numerous in preterm neonates (of the order of up to 25/100 white cell count (WBC) in comparison with up to 5/100 WBC). In the first month of life the Hb, Hct, MCV and MCH fall while NRBC disappear from the peripheral blood in healthy neonates in the first postnatal week.

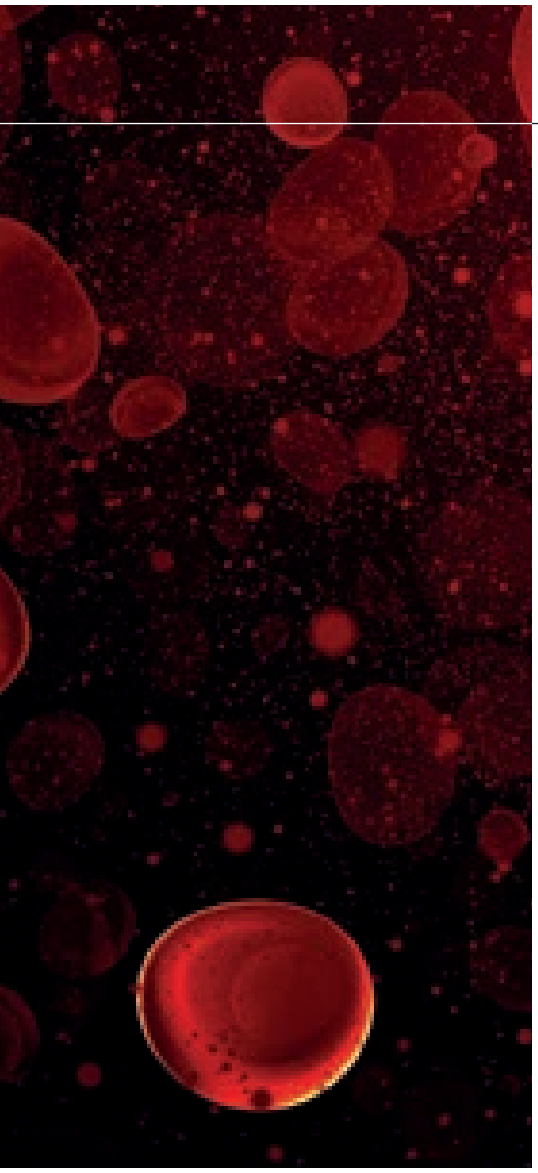
In addition to greater erythrocyte size, the neonatal blood film may show other erythrocyte features that would be abnormal at other stages of life, specifically the presence of echinocytes (more numerous if preterm) and fragments (schistocytes). Features of hyposplenism may be present, particularly in preterm neonates.

In addition to the red cell features, the neonate often has a higher WBC, neutrophil count, monocyte count and lymphocyte count in comparison with later in life. Low numbers of blast cells may be present (less than 5% at term, slightly higher earlier in gestation). Granulocyte precursors may be present in preterm neonates.

The platelet count reaches adult levels (≥150 × 10^9/L) by the end of the second trimester.

What can we learn from microscopy?

Diagnosis of some haematological conditions peculiar to the neonatal period is aided by microscopy, for example haemolytic disease of the newborn (HDN, alloimmune haemolytic anaemia), in which spherocytes and polychromasia are seen, and alloimmune thrombocytopenia, when a low platelet count without other features is apparent. Spherocytosis is more prominent in ABO HDN than Rh HDN. The presence of neonatal jaundice is an indication for a blood count and film and in *hydrops fetalis* these investigations are obligatory. The diagnosis of hereditary elliptocytosis is readily apparent on blood film examination but it should be noted that in some neonates with this condition there is very striking poikilocytosis, so that there can be confusion with hereditary pyropoikilocytosis; genetic testing and follow up over the first few months of life permits the distinction to be made. The diagnosis of infantile pyknocytosis can be made only with the aid of a blood film, which shows "pyknocytes" – irregularly contracted, spiculated cells. Southeast Asian ovalocytosis, which at other times of life is asymptomatic, can cause anaemia in the neonate with typical blood film features of stomatocytes and oval macrocytes. In microangiopathic haemolytic



anaemias, schistocytes are more frequent then in healthy neonates and there may also be thrombocytopenia; however, it is important to be aware that schistocytes are not infrequent in healthy neonates and their presence should not be overinterpreted. The effects of twin-to-twin transfusion will be apparent from the disparity in blood count findings between twins; the blood film does not give much information but the red cells of the polycythaemic twin may show hypochromia and in the anaemic twin the expected response to anaemia is seen. Red cell aplasia from intrauterine parvovirus B19 infection shows anaemia without polychromasia or increased NRBC.

The blood film is of critical importance in the diagnosis of transient abnormal myelopoiesis of Down syndrome, which is a multilineage disorder but often shows predominantly megakaryoblasts. Rarely a neonatal blood film shows the features of acute myeloid leukaemia, most often associated with *KMT2A* rearrangement, t(8;16)(p11.21;p13.3)/*KAT6A::CREBBP* or t(1;22)(p13.3;q13.1)/*RBM15::MRTFA*. A distinctive feature of AML associated with t(8;16) is that spontaneous remission can occur in neonatal cases. Acute lymphoblastic and mixed phenotype acute leukaemia can also present in the neonate.

Non-haematological conditions peculiar to fetal and neonatal life produce haematological changes. For example, the number of NRBC is increased if there has been chronic intrauterine hypoxia and also if there is acute perinatal hypoxia. Perinatal hypoxia can also cause an increased WBC with a leucoerythroblastic blood film and toxic granulation. Maternal chorioamnionitis typically causes marked neutrophilia, left shift and toxic granulation even though the neonate itself is not infected. As at other times of life, neonatal infection can lead to leucocytosis, neutrophilia, left shift and toxic granulation, changes that are sometimes difficult to distinguish from the effects of hypoxia or maternal chorioamnionitis. It should also be noted that acute bacterial infection in a neonate can lead to neutropenia. Neonatal viral infections are likely to lead to reactive lymphocytes but it should be noted that in healthy neonates lymphocytes are more pleomorphic than later in life.

In addition to what has been discussed here, there are many rare inherited and acquired disorders that have haematological manifestations apparent in the blood count and film of neonates. Review of family history and parental blood counts and film can be an important supplement to an assessment of the neonatal findings.

Conclusion

By careful examination of a blood film, the haematologist and biomedical scientist can make a major contribution to neonatal care. A great deal of information can be gleaned from a single drop of blood – something of particular importance in neonates where blood letting may be difficult and has to be kept to a minimum. BMS

Barbara J Bain is Professor of Diagnostic Haematology at Imperial College London and a consultant at St Mary's Hospital, London. **Irene Roberts** is Professor of Paediatric Haematology at the Weatherall Institute of Molecular Medicine at the University of Oxford.

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HEALING AND THE MEDICINE OF THE NATIVE AMERICANS

Stephen Mortlock casts an eye back over history and the healthcare practices of the Native Americans.

The majority of the Native Americans descended entirely from a single group of migrants that crossed over the Bering land bridge between Asia and America that existed more than 15,000 years ago.

They adopted a hunter-gatherer society – men would hunt for large animals while the women would forage for fruits and any other edible plant-based food and hunt for small animals. Everything was shared with the whole tribe so they did not waste food as they couldn't store any surplus. When a large animal, such as a bison (*Bison bison*), was killed, that entire animal was used, there was no refrigeration, so the meat was distributed amongst everyone, cooked to eat directly or smoked to make jerky for eating later. The bones and teeth were used to make weapons, personal decoration and fishhooks, and the skin was used for clothing, shoes or patching up tepees.

The origins of Native American healing practice and ceremony are as diverse and rich as the tribes themselves. And the healing practices varied widely from tribe to tribe, involving various rituals, ceremonies, and a diverse wealth of healing knowledge. At the heart of this would be the tribes' medicine man who was the spiritual guide of the tribe and its leader in an emergency, often holding a position equivalent to that of the war chief. Most tribes believed that health was an expression of the spirit and a continual process of staying strong spiritually,

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mentally, and physically. Each person was responsible for their own health, and all thoughts and actions had consequences, including illness, disability, bad luck, or trauma. There had to be balance and harmony between themselves, those around them and their natural environment. If this was correct, "the Creator" would keep them away from illness or harm and health could be restored. Not surprisingly, herbal remedies filled an essential role within these healing practices, stretching beyond the body's aches and pains and into the realm of spirituality and harmony. In 1832, George Catlin, the American adventurer, lawyer, painter, author, and traveller spent some time with the Mandan tribe who lived on the Knife River in Dakota. While there he met Old Bear, the tribe's medicine man and watched as he instructed new students in the ceremonial practices of the tribe and showed them the collection and use of herbal remedies.

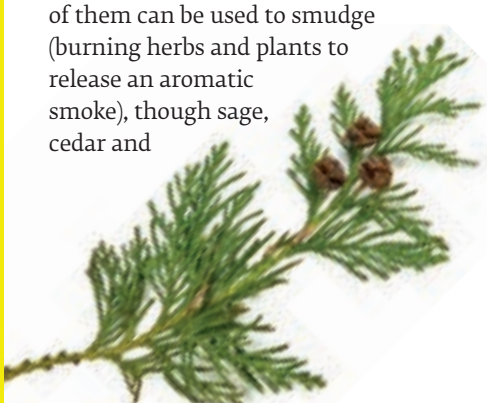
Although most herbs and natural products were gathered from their surrounding environment it has been theorised that if certain items were unavailable they would be traded for often over long distances.

Tobacco and cedar

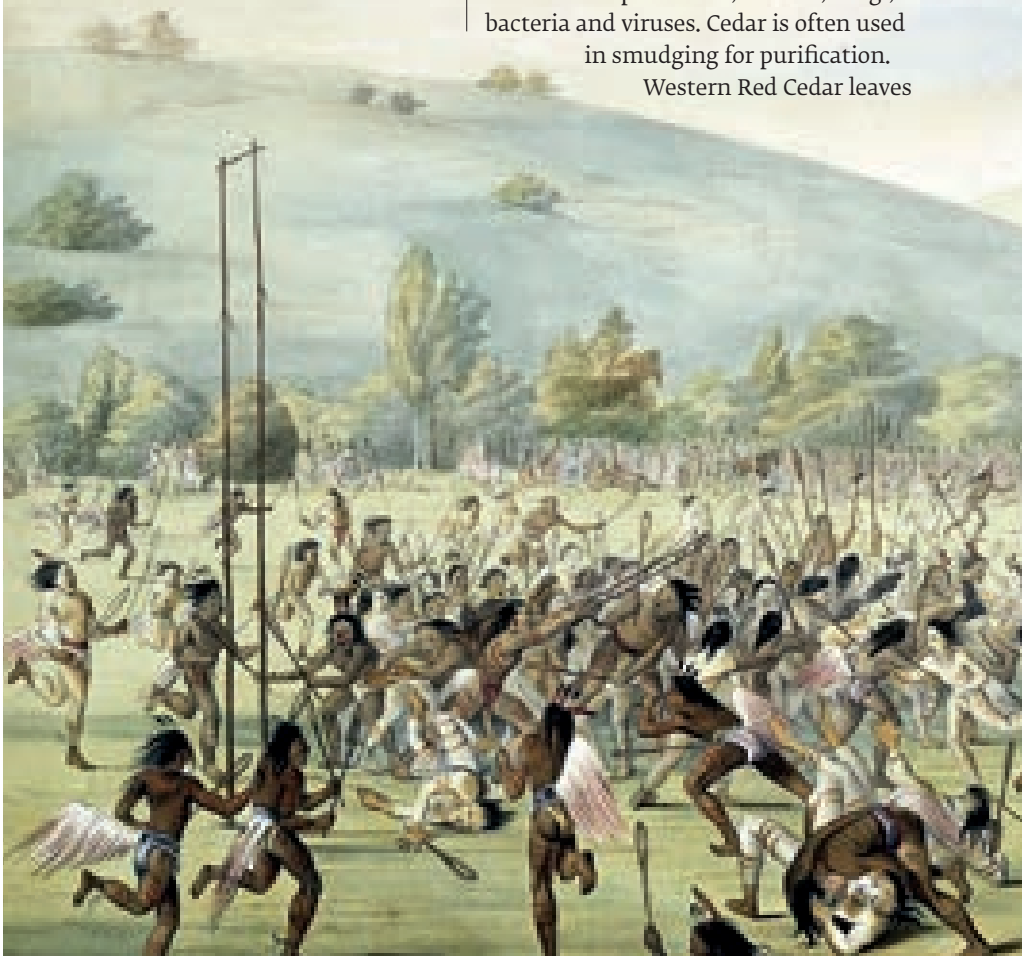
The Creator gave Native Americans the Four Sacred Medicines to be used in everyday life and ceremonies; they are tobacco, sage, cedar and sweetgrass. All of them can be used to smudge (burning herbs and plants to release an aromatic smoke), though sage, cedar and sweetgrass also have many other uses. The tribal elders would say that the spirits liked the aroma produced when the sacred medicines were burned.

Indian Tobacco (*Lobelia inflata*) has a long-standing cultural history among native people, recognised as the first gift the creator bestowed upon the native people. The herbaceous plants are annual or biennial, growing up to 100 cm tall, with tiny hairs covering the stems. The burning of tobacco during ceremonies honoured and welcomed guests in the sharing of a sacred peace pipe, but it also blessed food crops and an upcoming hunt, provided communication with the Creator, and bound agreements between tribes to ensure the general welfare of the community. The tobacco plant was used by the Cherokee, Iroquois, Penobscot, and other indigenous peoples as a poultice or cold infusion to heal body aches, bites and stings, abscesses, or sores. It was chewed, made into an infusion, or a tincture for its emetic properties (it is often referred to as "puke weed") and to help with a sore throat, asthma, or the prevention of colic. The Iroquois used the roots to treat venereal diseases and the Cherokee burned the foliage to smoke out gnats and unwelcome insects. However, consuming lobelia, especially the roots, can cause some extreme adverse effects, including sweating, diarrhoea, tremors, rapid heartbeat, mental confusion, convulsions, hypothermia, coma, and even death.

If you can imagine cedar trees (*Juniperus virginiana*) are found in cool, wet forests where fungi and moulds thrive it is not surprising that cedar oils have antioxidant and antibiotic properties which can repel insects, moulds, fungi, bacteria and viruses. Cedar is often used in smudging for purification.



Western Red Cedar leaves



have long been a popular internal and external medicine for painful joints among Coastal Native Peoples and are a useful antifungal for skin and nail fungus. It has restorative uses as cedar tea for fighting infections and fevers or as a cough medicine. Some studies indicate that cedar promotes immune function by helping the white blood cells to work better, stimulating the immune cells to fight infection.

Sage and sweetgrass

Sweetgrass (*Hierochloe odorata*) is a perennial plant with a vanilla-scented aroma that grows in North America, Asia and Europe. It contains coumarin ($C_9H_6O_2$), which has blood-thinning properties. The Native Americans used it as a purifying herb and as incense in smudging. It is said that the sweet-smelling smoke cleanses the spirit and brings sacred messages to the higher planes of existence. Herbal tea made from the leaves was used to treat coughs, sore throats and fever.

Apart from being mixed with onion to make a tasty accompaniment to the Sunday roast, sage has been used medicinally for generations. Sage (*Salvia officinalis*) is a perennial, evergreen shrub, with woody stems and grayish leaves. It is native to southern Europe and the Mediterranean region but has been naturalised to other warmer temperate climates, including North America. Traditionally, sage has been used in attempts to relieve pain, protect against

Sweetgrass contains coumarin ($C_9H_6O_2$) which has blood-thinning properties

oxidative stress, free radical damage, angiogenesis, inflammation, bacterial and virus infection. Sage is applied directly to the skin for cold sores, gum disease, sore mouth, throat and tongue and swollen, painful nasal passages. The leaves have been made into poultices and used externally to treat sprains, swelling, ulcers and bleeding. It can be used for digestive problems and women have used sage for painful menstrual periods, to correct excessive milk flow during nursing, and to reduce hot flushes. It was also commonly used in tea form to treat sores and it is also considered one of the good herbs for coughs. Some studies have claimed that essential oils of sage can inhibit the enzyme acetyl cholinesterase (AChE), which is responsible for degrading and inactivating acetylcholine in Alzheimer's disease.

Goldenseal, garlic and ginseng

Goldenseal (*Hydrastis canadensis*), a member of the Ranunculaceae is a herbaceous perennial plant with upright, unbranched, finely haired stems, with two palmately lobed leaves. The Cherokee, Iroquois, and Micmac tribes used this plant to combat inflammation and infection and to boost the immune system. Its antibacterial activity *in vitro* has been attributed to its alkaloids, the most abundant of which is berberine ($C_{20}H_{18}NO_4$) found in the rhizome and the stems. The Cherokees also used it as a wash to treat skin diseases and sore eyes and mixed a powder made from the root with bear (*Ursus americanus*) fat for use as an insect repellent.

More recently, some studies have suggested that it is possible that berberine has anticancer properties and may be able to block the

proliferation of and to kill cancer cells.

Saw palmetto (*Serenoa repens*) is a dwarf palm tree of the family Arecaceae and is indigenous to the southeastern parts of the United States. But, saw palmetto fibres have been found among materials from indigenous people as far north as Wisconsin and New York, strongly suggesting this material was widely traded prior to European contact.

Saw palmetto berries have traditionally been used by American Indians to cure genitourinary disturbances and relieve mucous membrane irritations. Their use in treating prostrate inflammation has been documented since the 1700s and traditionally they were used to treat testicular atrophy, erectile dysfunction and oliguria.

Ginseng, the aromatic root of the Panax species (*Panax quinquefolius* and *Panax ginseng*), resembles a small parsnip that forks as it matures. The active ingredients of ginseng are ginsenosides ($C_{42}H_{72}O_{14}$), which are also called ginseng saponins and are abundant in the roots, leaves, stem, and fruits of the plant. It has been used as a traditional medicine in China, Korea, and Japan for thousands of years and some of the Native American tribes also used this component in their herbal remedies for digestive troubles and pain relief. The Muscogee people used a poultice of the root to staunch bleeding and a tea infusion to treat respiratory conditions and fevers. While the Meskwaki people of the Great Lakes region have used it as both an aphrodisiac and as a universal remedy for children and adults – an early health tonic!

Another plant that has been used since the early years of human civilisation,– both as a food and herbal remedy, is garlic (*Allium sativum*). Traditional knowledge of allium plants is widespread in all human cultures, where garlic, onion, leeks, chives, scallions and shallot are commonly used. The Cherokee used the plant as a diuretic, expectorant, mild cathartic and for scurvy, asthma, and prevention of worms.

"Goldenseal's antibacterial activity in vitro has been attributed to its alkaloids"

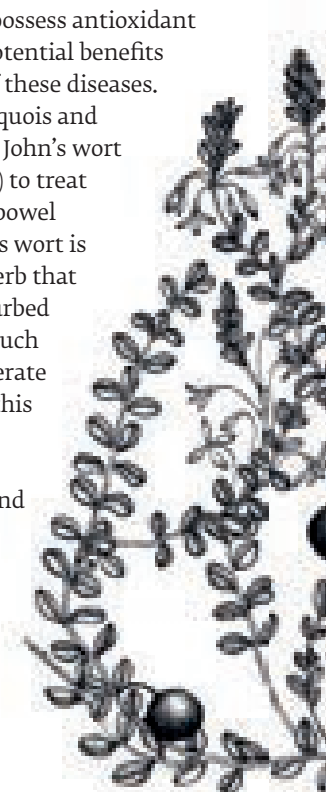
Cranberry and St John's wort

The cranberry plant (*Vaccinium macrocarpon*) is a low-growing, woody, perennial vine with small, alternate, and ovate leaves. The plant produces horizontal stems (stolons) growing to a height of up to six feet (2 m). Short, vertical branches, or uprights, 2–8 inches (5–20 cm) in height, grow from buds on the stolons, and these can be either vegetative or fruiting. Each fruiting upright may contain as much as seven flowers.

The Native Americans used cranberries in a variety of foods, the most popular being pemmican, a high-protein combination of crushed cranberries, dried deer meat, and melted fat (later consumed by Arctic and Antarctic explorers, such as Shackleton, Scott and Amundsen). They also used it as a medicine to treat arrow wounds and as a dye for rugs and blankets. While the Montagnais (a tribe from the northern shores of the Gulf of St Lawrence) used the cranberry to treat pleurisy.

Cranberries contain, amongst other things, anthocyanins and flavonols; these are a class of water-soluble flavonoids widely present in fruits and vegetables. Studies claim to have shown that these compounds exhibit a wide range of biological activities, including being an antioxidant, antimicrobial and anti-inflammatory. It has been claimed that they promote health by protecting from various degenerative diseases and diabetes as well as enhancing visual function and slowing the progression of neurological disorders. Consumption of flavonoid-rich plant foods has been claimed to protect against cardiovascular diseases. It is known that the oxidation of low-density lipoproteins (LDL) is associated with cardiovascular diseases, so it is possible that flavonoids, compounds which possess antioxidant activity, will have potential benefits in the prevention of these diseases.

The Cherokee, Iroquois and Montagnais used St John's wort (*Hypericum perforatum*) to treat fevers, coughs, and bowel complaints. St John's wort is a sprawling, leafy herb that grows in open, disturbed areas throughout much of the world's temperate regions. The use of this species as a herbal remedy to treat a variety of internal and external ailments dates back to the time of the ancient Greeks. Since then, people have



attempted to use it as a treatment for anxiety, depression, cuts, and burns. Some recent research also claims the effectiveness of this herb in treating other ailments, including inflammation-related disorders, and bacterial and viral diseases, and as an antioxidant and neuroprotective agent. Two major active constituents have been identified: hypericin (a naphtodianthrone – $C_{30}H_{16}O_8$) and hyperforin (a phloroglucinol – $C_6H_6O_3$), which are now used as antidepressant, anticarcinogenic (photodynamic), antimicrobial and virostatic (human immunodeficiency and hepatitis C virus) agents.

Evening primrose, yellow flower leafcup and nettle

Evening primrose (*Oenothera biennis*) is a plant native to North and South America that also grows throughout Europe and parts of Asia. It has yellow flowers that open at sunset and close during the day. The oil from evening primrose seeds contains omega-6 fatty acids, including gamma-linolenic acid (GLA). Native Americans made poultices from the evening primrose plant for bruises and wounds and used its stem and leaf juices as topical remedies for skin inflammations. The leaves were taken orally for gastrointestinal complaints and sore throats, while the roots were used externally to treat piles and boils. The whole plant – and especially the leaves – were boiled to make tea by Native American tribes as a stimulant to treat laziness and against "over fatness". Contemporary records suggest that the Cherokee, Iroquois, Ojibwa, and Potawatomi used extracts for premenstrual and menstrual pain. In the 17th century, evening primrose oil became a popular folk remedy in Europe, where it was known as "King's cure-all."

Smallanthus uvedalia, also known as hairy leafcup, bear's foot, and yellow flower leafcup is a herbaceous perennial of the family Asteraceae native to the Central and Eastern United States. It was reportedly used internally by Native American Indians for laxative properties, as well as a stimulant and also to treat swollen glands, especially mastitis. The Cherokee used a salve of the roots to treat burns and cuts, while the Iroquois took an infusion of the plant for back pain and as an antiemetic but, conversely, the Cherokee supposedly used a tea made from this plant to induce vomiting, though it is possible they used different parts of the plant to achieve this effect.

And who knew that the humble stinging nettle (*Urtica dioica*) had such a universal healing tradition? Certainly, contemporary records show that in ancient Egypt, the nettle was used as an infusion to relieve arthritis, while Roman soldiers brought nettle plants to the British Isles to sooth their aching joints and painful legs after a long day campaigning. Almost all of the Native American tribes knew how to prepare this plant by boiling the leaves in water prior to eating; the Mohegans ate this plant with pigweed (*Amaranthus retroflexus* – the leaves of which are high in vitamins A and C and folate, as well as calcium) and dock greens (*Rumex obtusifolius* - which contain high levels of oxalic acid). The nettles, along with other medicinal herbs were used in the sweat lodge for detoxing and poultices were applied to those patients who suffered from pain and arthritis. The Paiute, however, used the leaves and stalks as a temporary flail on their arms and legs to achieve a similar benefit. The Abnaki created a snuff of the dried and powdered leaves that was used for nosebleeds and the Sioux used a tea to treat urinary issues, while many other tribes drank the tea as a general health tonic or a digestive aid.

"Who knew the humble stinging nettle had such a healing tradition?"

Well-tried efficacy

The American missionary John Heckewelder (1743–1823) noted that in Native American tribes there were physicians of both sexes, who would take considerable pains to acquire a correct knowledge of the properties and medical virtues of plants, roots and barks, for the benefit of their patients. And that their science was founded on observation, experience and the well-tried efficacy of the remedies being used. Frances Densmore (1867–1957) the American anthropologist and ethnographer observed during her travels that the practitioners were able to heal wounds and cure diseases by the simple application of natural herbal remedies. She also noted that different healers often knew individual medicinal plants by multiple names, some unique to a

particular individual, and would gather and collect the herbs at the proper seasons, sometimes fetching them from the distance of several days' journey from their homes, then they would cure or dry them properly, tie them up in small bundles, and preserve them for later use.

Conclusions

Some of the Native American tribes have become immortalised through numerous reruns of old western films; the Apaches, the Cherokee or the Sioux and their chiefs live on in history – Sitting Bull, Geronimo and Crazy Horse.

In reality, it was a history of greed, tragedy and betrayal by the colonising Europeans. What started out as the mutual trade between the indigenous population and the colonists deteriorated over time as imported diseases like smallpox, tuberculosis, measles, cholera, and the bubonic plague decimated the native populations.

The colonists viewed the indigenous people as subordinate and uncivilised due to their nomadic lifestyles and "underutilisation" of the land. Relations worsened and over a period of 300 years, from 1609 to 1900, there were bloody conflicts and involuntary relocation until Native American tribes went from inhabiting their ancestral lands, which could encompass an entire land area, to living on specifically defined native reservations.

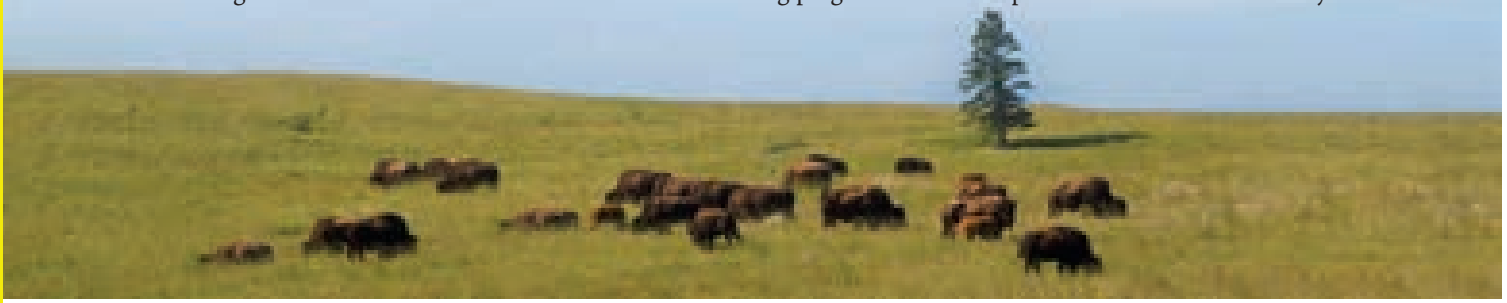
Today, many tribes in the United States are now reviving their traditions and cultures from teaching their language to the next generation, holding inter-tribal gatherings and exploring the role of traditional medicine. Native American traditional healing takes the holistic approach on the whole person with herbal remedies, ceremonies, prayers, and the inclusion of the family all being part of the healing journey and today traditional healers have found that combining modern medicine with traditional healing produces better health outcomes than from modern medicine alone.

Native Americans are being encouraged to return to more traditional forms of eating as part of the effort to address health issues like diabetes, obesity and heart disease often associated with a highly processed western diet. Because of this there has been an increasing demand for buffalo meat following studies that have shown the meat to be a leaner and less atherogenic risk than beef. The buffalo is well-adapted to the wide grass plains as its natural habitat and as a result the meat contains a lower total fat content and provides a more favourable fatty acid composition compared to animals that have spent a greater portion of their life eating corn. So, there has been a return of the buffalo, nearly hunted to extinction in the 1800s, with many animals now being bred for commercial purposes on farms and herds reintroduced into national parks as a part of conservation breeding programmes.

Bison are migratory herbivores who move across large areas, grazing almost exclusively on grasses, the result being that other plants normally dominated or overshadowed grow better, creating a more diverse mosaic of habitats. The bison also modify the environment by trampling woody vegetation, wallowing (rolling on the ground repeatedly to avoid biting insects and to shed loose fur), digesting vegetation and excreting their waste across large areas, which increases seed dispersal and nutrients over the landscape. This behaviour helps to increase arthropod, amphibian and plant diversity.

This biodiversity has seen the increase of birds such as the greater prairie chicken or the scaled and bobwhite quails. Larger animals like the pronghorn antelope and mule deer are among the large mammals that benefit as the bison grazing increases the abundance of forbs (herbaceous flowering plants) and shrubs that constitute the dietary mainstays of both species.

Just as the reintroduction of grey wolves into Yellowstone national park had a positive effect on the park ecosystem, perhaps the return of the buffalo will help to rewild the great plains for the benefit for everyone. BMS



AN ELECTROPHORESIS CASE STUDY

Madihah Abbas, Specialist Biochemistry Team Manager at Christie Pathology Partnership, looks at result interpretation, comparing gel and capillary zone electrophoresis.

Multiple myeloma (MM) is a B-cell malignancy derived from antibody-producing plasma cells in the bone marrow, which accounts for 1% of all cancers. Changes in immunoglobulins are of most interest in myeloma.

Serum protein electrophoresis (SPE) is used to identify the presence of monoclonal proteins in the serum, which can indicate that a patient has a monoclonal gammopathy, such as multiple myeloma.

The principles of gel SPE are as follows: at pH 8.8, proteins are separated in agarose, under the influence of an electric field. The degree of migration depends on the mass to charge ratio of the protein. Human serum proteins are separated into six major fractions: albumin, alpha-1 globulins, alpha-2 globulins, beta-1 globulins, beta-2 globulins and gamma globulins. The electrophoresis pattern produced when the medium is stained with amido black is scanned at 570 nm, and the electropherograms are evaluated visually for pattern abnormalities.

Densitometry is then used to provide semi-quantitative measurement of any band(s) present. Abnormal bands found on serum electrophoresis, primarily those in the beta globulin and gamma globulin zones, are always suspected of being monoclonal proteins and therefore an indication of monoclonal gammopathies. Immunofixation using antisera to IgG, IgA, IgM, kappa, and lambda can then be used to identify the immunoglobulin type of these abnormal bands.

Case study results

A 74-year-old female with diagnosed melanoma found to have slightly raised ALP/calcium and renal impairment, so SPE was requested. Initial investigations at referral showed a significantly raised IgM, elevated serum free light chains with normal kappa/lambda ratio (see Table 1).

Further analysis was requested by the clinical scientist, which showed visible abnormalities on SPE, and serum immunofixation with and without the addition of reducing agent dithiothreitol (DTT). Initial result interpretation suggested an oligoclonal pattern consisting of IgM kappa and lambda bands but then the DTT seemed to have merged the bands into an IgM kappa but still with a predominant lambda light chain on the fix. As the bands in the IgM and kappa tracks became one band post DTT treatment, this was a sign those bands were previously polymerised, and the original bands were from the same malignant clone. From results we could not confirm if free lambda was present or small IgG lambda. A second opinion was

sought from Sebia, and another hospital site for result comparison.

The capillary zone electrophoresis and immunofixation results from an alternative laboratory showed the lambda band was visible on the immunofixation gel but the associated IgM band was co-migrating, so could not be identified. This is where immunotyping has higher sensitivity as it can differentiate co-migrating paraproteins more clearly than immunofixation. A sample was sent to Sebia for immunotyping to confirm if the profile is oligoclonal.

Immunotyping works using the principle of immune subtraction. Antiserum is mixed with serum prior to the analysis and the charge of the target proteins is modified by the complex the antiserum forms. Immunoglobulins specifically react with their corresponding antiserum. At the end of the analysis, each antiserum pattern (IgG, IgA, IgM, κ and λ) is automatically overlaid with the ELP (protein electrophoresis) reference curve.

Immunotyping allows identification of abnormalities by removal, i.e. the disappearance of the abnormality in the antiserum-treated pattern indicates the presence of a monoclonal protein, and evaluation of what proteins remain.

The immunotyping results for this patient showed:

The IgM proteins were removed in the IgM track and a normal gamma zone restored, which confirmed all the peaks were intact IgM and remaining IgG polyclonal, not oligoclonal in the gamma zone. If the profile was oligoclonal, multiple faint distortions would be seen throughout the gamma zone.

In the kappa track all the kappa proteins were removed, both free and bound. A clear lambda single peak was seen in the residual gamma trace, which corresponded to the lambda band on the gel. Therefore, the band was IgM lambda and not free lambda present. The lambda track showed all free and bound lambda had been removed, leaving kappa proteins in the residual trace. Therefore, the three peaks represented the three IgM kappa's shown on the immunofixation gel.

Immunotyping concluded there were two intact monoclonal immunoglobulins present: IgM kappa in three polymerised form and an IgM lambda.

TABLE 1: TEST RESULTS

Analyte	Result (g/L) (pink: abnormal)	Reference range (g/L)
Total protein	62	60–80
Calcium	2.53	2.20–2.60
Adjusted calcium	2.75	2.20–2.60
Albumin	35	35–50
Globulin	27	20–35
IgG	8.30	6.50–16
IgA	1.20	0.40–3.50
IgM	14.53	0.50–3.00
Kappa light chain	44.51 mg/L	3.30–19.40 mg/L
Lambda light chain	38.16 mg/L	5.71–26.30 mg/L
Kappa lambda ratio	1.17	0.26–1.65

Conclusion

Laboratories should communicate unusual results, implement processes to avoid the release of incorrect results, and should have open communication with clinicians so that they are also aware and are able to discuss unexpected results with the laboratory specialists. In this case the electrophoresis results are not in keeping with myeloma, in particular the high free light chains are likely due to renal dysfunction. The patient was referred for a nephrology opinion and treated for hypercalcaemia. It was interesting to see what, if anything, in this patient's melanoma treatment/disease course could have caused this pattern of electrophoresis, perhaps the use of the targeted therapy drugs dabrafenib and trametinib could be the cause. However, further research is required to support or rule out this idea.

This case highlights the importance of reviewing results within the context of clinical background and other laboratory results and reporting any anomalies to the supplier of your electrophoresis methodology for further troubleshooting and advice. BMS

I would like to thank **Sally Thirkettle,** our Principal Clinical Biochemist, for her support in completing the case study, and **Derek Pugh** at Sebia for technical support.

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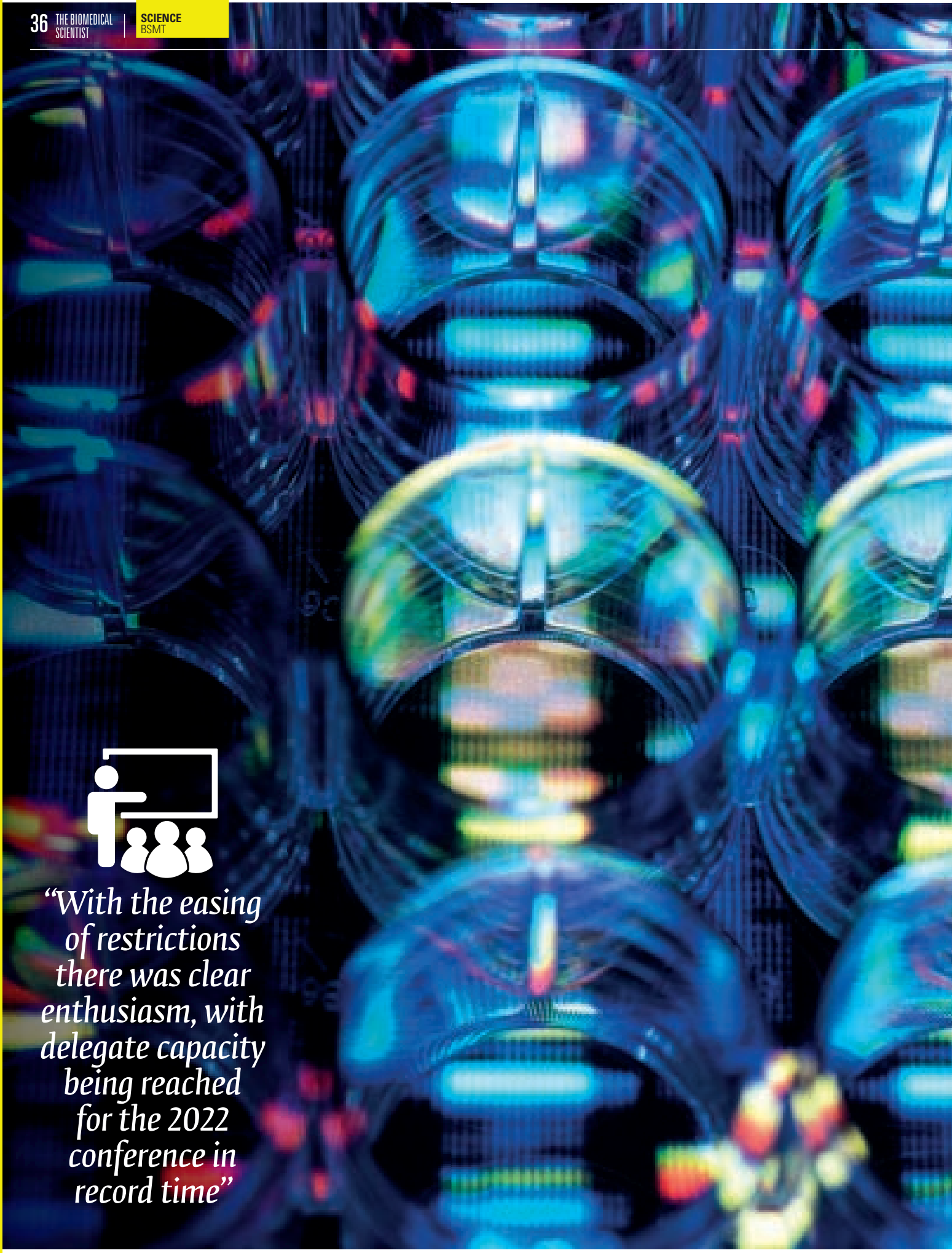

"With the easing of restrictions there was clear enthusiasm, with delegate capacity being reached for the 2022 conference in record time"

IN TECHNOLOGY WE TRUST?

David Westrip reviews the recent British Society for Microbial Technology conference, which was based on the theme "the genomic revolution in microbiology".

The British Society for Microbial Technology (BSMT) has been organising successful scientific meetings for 37 years, though with the events of the last few years this has become a more challenging process. The SARS-CoV-2 pandemic meant that 2020's meeting had to be cancelled and 2021's meeting switched to an online webinar format. With the easing of restrictions there was clear enthusiasm for the return of face-to-face meetings, with delegate capacity being reached for the 2022 conference in record time. However, a further resurgence in COVID rates then necessitated postponing the conference from its traditional May date to later in the summer.

In the lead-up to the meeting the potential for rail strikes to further upset plans was a concern, though as it turned out the biggest challenge was the unprecedented heatwave and record temperatures. Last-minute rearrangements to mitigate the impact of the weather had to be rapidly put in place and the professionalism and problem-solving by the staff at the RAF Museum in Hendon was essential to what was eventually a successful meeting.

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On the hottest day on record, speakers, delegates and trade representatives gathered at the museum. Despite significant travel disruption the vast majority managed to make it to the event. However, the BSMT's President Dr Kate Templeton and BSMT Treasurer Michael Croughan, both intending to fly from Scotland were unable to reschedule their travel plans after flight cancellations.

In the absence of Dr Templeton, BSMT Scientific Lead Dr Mark Wilks was drafted in at the last minute to chair the first session of the day, which began with Professor Paul Dark, Deputy Medical Director of the NIHR.

Clinical guidance and practice

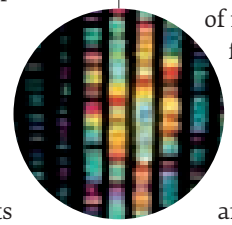
Professor Dark described the complexity and importance of large multi-organisation trials to produce evidence to guide clinical guidance and practice. The use of biomarkers, such as procalcitonin (PCT) and C-reactive protein (CRP), in intensive care to monitor infection is widespread but their role and clinical usefulness still remains an area of debate. The large-scale ADAPT trial aims to recruit nearly 3000 patients and should have enough power to unequivocally determine whether regular biomarker monitoring can be used to guide duration of antibiotic therapy and has been running for a number of years. It was interesting to note the effect COVID-19 lockdowns had upon recruitment into this trial as resources were redirected in the initial phases of the pandemic. Another area of significant interest to many clinical microbiology laboratories is the use of rapid diagnostics. Several trials are ongoing, including the A-stop study looking at antifungal stewardship in invasive fungal disease and the SepTIC trial investigating sepsis in critical care.

Genome sequencing

Discussion around whole-genome sequencing (WGS) and its various potential applications dominated the rest of the morning session as the next three speakers all provided their own experience on this rapidly evolving area.

"Analysis will only be as good as the database used and bioinformatics have a significant role"

Dr Katie Hopkins, Head of the Antimicrobial Resistance and Mechanisms Service in UKHSA, spoke on the current state of antimicrobial testing. Phenotypic testing remains the primary methodology with automation often being introduced to standardise technique and increase reproducibility. The intrinsic requirement for culture, however, means results can be slow, often confirming clinical decision-making rather than proactively guiding it. Some work has been undertaken to address these limitations with EUCAST publishing a rapid phenotypic antimicrobial susceptibility testing (AST) method. Dr Hopkins argued that there remains a need for more rapid techniques, particularly as more resistance means that empiric prescribing based on most likely pathogens may become less effective over time. Molecular methods may play a role, particularly in Gram-positive organisms where a comparatively small number of resistance genes are responsible for most phenotypic resistance markers. But further work is required to fully understand this area. In the future WGS may be able to give a give a full antimicrobial resistance (AMR) gene complement within any given bacterial isolate. However, analysis will only be as good as the database used to interpret and bioinformatics have a significant role in assessing the data produced. In conclusion, phenotypic testing is likely to continue to play a significant role, but there are likely to be specific advantages in molecular and genomic technologies that will see these become increasingly important.



Sequencing and samples

Adela Alcolea-Medina, a Clinical Scientist at St Thomas' Hospital in London, focused upon the direct application of sequencing technologies to clinical samples. This could clearly be a powerful diagnostic tool but presents additional challenges beyond those of WGS techniques, which are applied to pure isolates. In complex clinical samples it is inevitable that human DNA will dominate. Adela described a methodology to selectively deplete the human DNA within the sample to allow the targeting of microbial DNA/RNA, which effectively allows an increase in sensitivity and reduction of testing turnaround times. The potential of this is significant, as it could be possible in one test to give an assessment of the total microbial flora present in that sample including both bacterial and viral pathogens. This could replace a whole range of traditional and molecular tests.

Dr Natasha Weston, who was previously a Senior Clinical Fellow at the National Mycobacterial Reference Service in Birmingham, concluded the morning session with a look at how WGS is being applied to the diagnosis of TB and other mycobacterial infections. Given limited antimicrobial treatment options and very slow genomic evolution of this organism, WGS is capable of giving an indication of potential resistance markers and an assessment of strain relatedness. It has now replaced phenotypic cultures as the frontline antimicrobial susceptibility determination method. The advantages of

WGS as an outbreak investigation tool were vividly illustrated with a series of case studies showing how socially distinct cases can be linked using WGS thus targeting and guiding further public health investigation and contact tracing.

Quality assurance

The afternoon session, chaired by Professor Brian Duerden, began with a talk by Dr Elaine McCulloch from Quality Control for Molecular Diagnostics, Glasgow, which addressed the important topic of quality assurance and its application to molecular diagnostics and WGS. It is often the case that innovation is complicated in the early stages by lack of QC material and defined quality protocols. This can hold back the widespread use of new technology and is certainly a complication in achieving accreditation under ISO 15189 standards. Dr McCulloch comprehensively described how QC protocols have had to constantly change and adapt as new technologies and applications are developed to meet accreditation standards and ensure appropriate QC is in place to assure validity of results. Multiple testing platforms and technologies, multiplex assays, changing testing pathways – including the increasing role of near-patient testing and novel technologies such as the WGS – all present unique QC challenges to diagnostic departments.

Dr Esmita Charani delivered a thought-provoking antimicrobial stewardship talk from an international perspective, which considered antimicrobial prescribing as a complex social process. Decision-making can be influenced by a wide range of factors that are difficult to quantify and assess. For example, the marginalisation of non-medical staff, pharmacists and diagnostic staff may persist in strictly hierarchical professional structures. This can be detrimental to patient care as specialist knowledge is dismissed. The motivations and overly cautious nature of some prescribers is difficult to assess but nonetheless plays a significant role in decision-making.

Antibiotic stewardship and policy are important components, but there are often difficulties in implementation, which may be linked to a lack of training or resources.

However, many of the factors highlighted by this talk apply equally to high-income countries and it is clear that a more holistic approach is essential in combatting antimicrobial resistance through antibiotic stewardship.

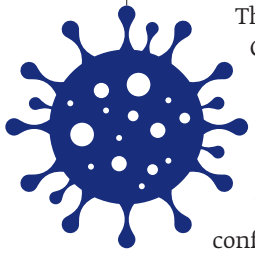
COVID-19

The work of COG-UK was fundamental to collating and sequencing COVID-19 genomes throughout the pandemic. In the final talk of the day Dr Dinesh Aggarwal, a Wellcome Clinical PhD Student, in the Department of Medicine, University of Cambridge, gave a fascinating and accessible talk on what can be a complex subject highlighting the impact of some of this work. By applying the data to a COVID-19 outbreak at the University of Cambridge, Dr Aggarwal demonstrated how sequencing data was used to track exact transmission pathways, identify sources of transmission, and assess interactions for risk, thus guiding outbreak management. On a national scale, sequencing was used to assess the impact of COVID-19 quarantine measures aimed at preventing the importation and onward transmission of the SARS-CoV-2 virus. This was able to show that closing "travel corridors" significantly reduced but is unable to eliminate transmission of imported strains and that sequencing may be able to guide and refine travel policy based on quantifiable risk rather than perception in future.

WGS clearly has a role to play in the future of microbiology, it is widely used in research and is frequently the method of choice in reference laboratory settings. Moving this technology into the diagnostic laboratory has significant potential advantages yet comes with the challenges typical of any great shift in technology. By applying this technology directly to clinical specimens, a snapshot of the total microbiological flora can be determined, potentially giving a more detailed and quicker result than traditional culture allows. Applying WGS to isolates will allow a level of detail to be assessed around genetic relatedness and pathogenicity determinants that was previously impossible. The potential of these two approaches is massive and much work remains to be done, but what is clear is that the microbiology laboratory will look very different in future years as these technologies are further refined and begin to become commercially available.

Up-to-date information

The BSMT is a not-for-profit organisation of healthcare scientists and medical microbiologists working mainly in the NHS and UKHSA. The society's aim is to promote an exchange of information on laboratory practices in clinical microbiology and it does this mainly by organising scientific conferences. BSMT conferences are aimed at senior biomedical and clinical scientists and medical microbiologists to provide up-to-date information about organisms and techniques especially with regard to new molecular technologies.



The next BSMT Microbiology Conference is planned for May 2023 – more details will be published on the BSMT website – BSMT.org.uk – and will be emailed to those who have attended BSMT conferences in recent years. BMS

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MY IBMS NEWS

HCPC

REVISED STANDARDS OF PROFICIENCY

Following a comprehensive review, publication consultation and stakeholder engagement with the IBMS, the HCPC has now published the revised *Standards of proficiency for biomedical scientists.*

The revised standards were approved by HCPC's Council and will take effect on 1 September 2023.

The standards set the knowledge and abilities that all registrants must have to become and remain registered with them.

Changes include an increased emphasis on:

- The promotion of public health and prevention of service users' ill-health
- The role of equality, diversity, and inclusion, with specific importance placed on ensuring practice is inclusive for all service-users
- The central role of the service-user, including the importance of valid consent and effective communication in providing good care
- The importance of registrants maintaining their fitness to practise by looking after their mental health and seeking help, where necessary
- The importance of leadership at all levels of practice
- The need to be able to use information, communication and digital technologies appropriate to practice.

There are also changes to the language and profession-specific standards, which reflect each profession's development and the feedback received from our consultation and stakeholder engagement.

From September 2023, the IBMS will be updating all Registration Training Portfolio and BSc degree accreditation documentations to reflect these HCPC revisions.

→To download the standards, visit bit.ly/3Qgpxml

PROFESSIONAL RECOGNITION

IBMS executive awarded National Teaching Fellowship

Dr Sue Jones, IBMS Executive Head of Education, has won a prestigious National Teaching Fellowship award from Advance Higher Education.

Sue was nominated for the award by her previous employer York St John University, where she was Associate Head of School for Biosciences for 2014–2022.

She has over 15 years of experience in academic programme development and design.

Sue said: "I am absolutely delighted to have gained National Teaching Fellowship in 2022. This prestigious individual award acknowledges my sustained positive impact on student outcomes, alongside my ongoing commitment to inspire academic and professional colleagues to actively develop and enhance their approaches to teaching and learning support."

The scheme celebrates and recognises individuals who've had an outstanding impact on student outcomes and the teaching profession in higher education.

The National Teaching Fellowship Scheme is open to all higher education providers across the UK.

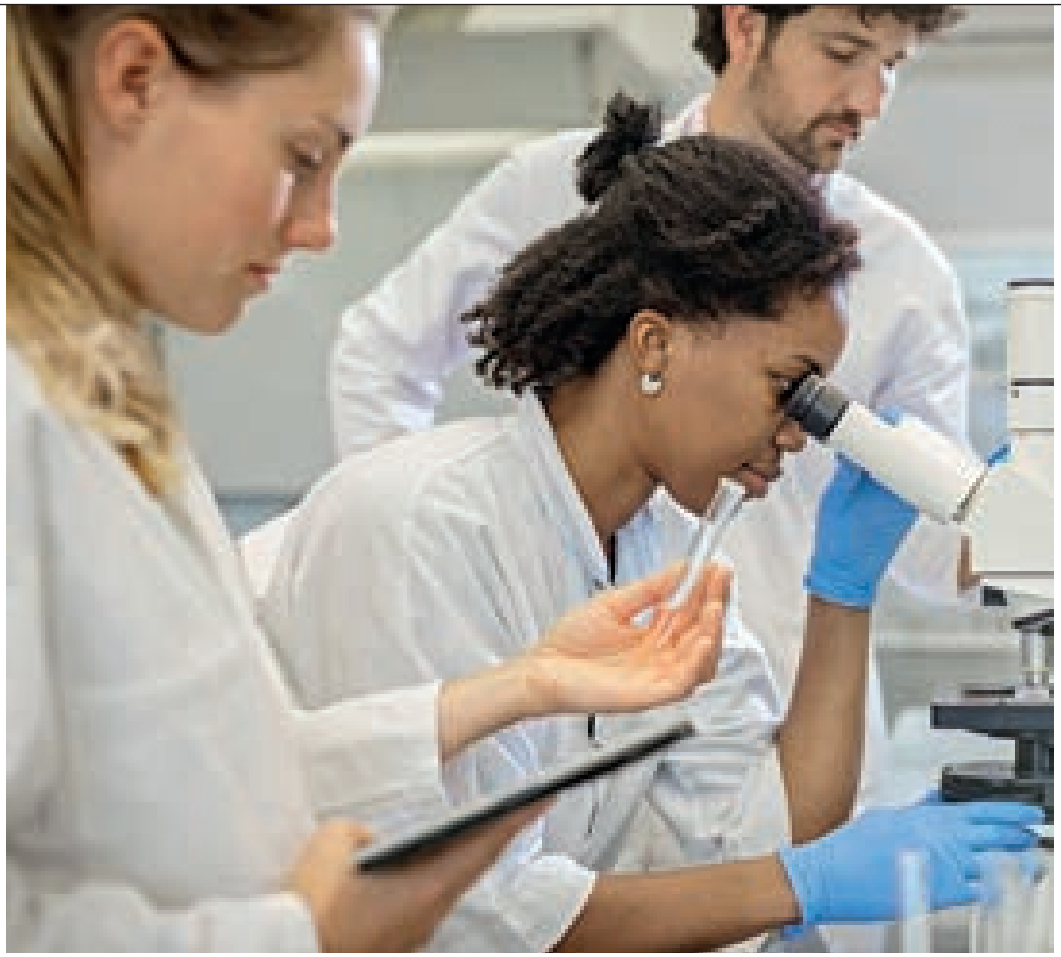
HISTOPATHOLOGY

EMBEDDING WAX SUPPLY GUIDANCE

The IBMS and the Royal College of Pathologists (RCPath) have collaborated to provide the profession with guidance around the emerging issue with the supply of wax for processing and embedding histopathology samples.

National Supply Disruption Response are liaising with procurement colleagues from National Services Scotland and Wales and Northern Ireland to ensure there is a UK-wide approach

→Visit bit.ly/3QiW77n



WORKFORCE STRATEGY

Workforce health and social care report published

The *Workforce: recruitment, training and retention in health and social care* report has been published by the Health and Social Care Select Committee.

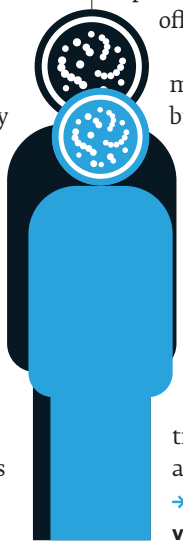
The Committee's assessment was that the NHS and the social care sectors are facing the greatest workforce crisis in their history.

The report proposes 73 recommendations covering areas such as workforce planning, recruitment, retention and working culture.

In order to alleviate the workforce crisis in healthcare laboratories, the NHS needs to make rapid progress to train more biomedical scientists and ensure the necessary support is in place for patient care.

The IBMS has consistently publicised how vital it is that our diagnostic services are reinforced and supported with an effective workforce strategy so that our biomedical scientists and laboratory staff can effectively deal with the healthcare backlog, COVID-19 related illness and maintain a pandemic-resilient service for the future.

IBMS training routes are the fastest, most effective and financially efficient ways of securing the future healthcare laboratory workforce. A graduate with an IBMS-accredited degree can be trained and registered in as little as six months – provided there is training officer support.



The UK government must recognise the biomedical science profession's great contribution to patient care by publishing a strategy for the biomedical science workforce that utilises IBMS-accredited graduates and IBMS training routes as soon as possible.

→To read the full report, visit bit.ly/3zSpCWu

IMAGES: ISTOCK/SHUTTERSTOCK

IBMS MEMBERS

THE POWER LIST 2022

Seven IBMS members have made *The Pathologist's* "Power List" this year.

The "Power List" is an annual celebration of the great and inspirational minds that underpin the medical laboratory.

The 2022 list celebrates contributions to the profession in five keys areas: Ready for Take-Off, Ground Control, Voyage of Discovery, First Contact and Strange New Worlds.

Members who made the cut include IBMS Chief Executive David Wells and IBMS past-President Allan Wilson.

The members who were included are:

Cherie Beckett – Acting Senior Biomedical Scientist, Princess Alexandra Hospital NHS Trust.

Dr David Gaze – Senior Lecturer in Chemical Pathology and Director of Employability, School of Life Sciences, University of Westminster, London, and Co-Editor-in-Chief of *Practical Laboratory Medicine*.

Patrick Kumah – Consultant Biomedical Scientist in gastrointestinal histopathology.

Malcolm Robinson – Founder of the charity Harvey's Gang.

Sheri Scott – Senior Lecturer and Biomedical Scientist, Nottingham Trent University.

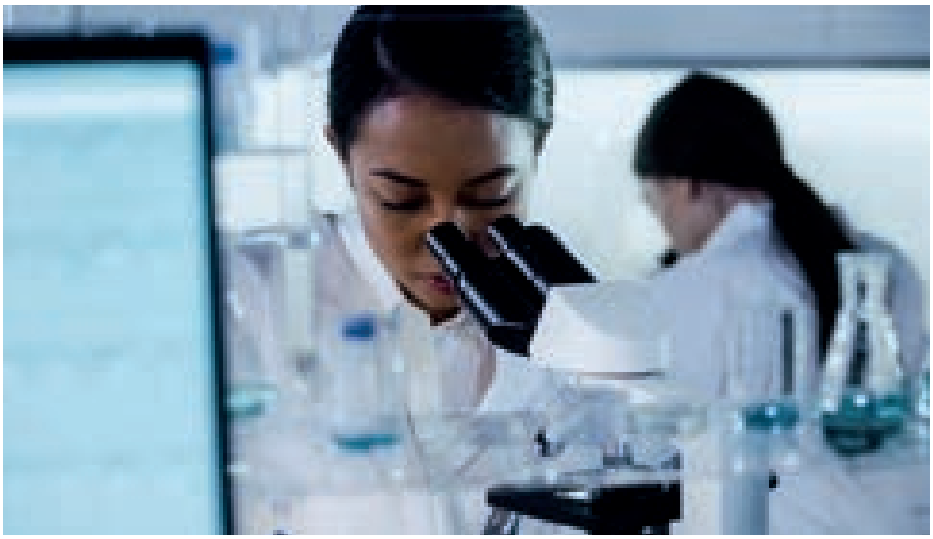
David Wells – Chief Executive, the IBMS.

Allan Wilson – Former IBMS President and Lead Clinician for the Scottish Cervical Screening Programme.

→ For more information and to see the Power List in full, visit thepathologist.com/power-list/2022

LABORATORY TRANSFORMATION AND IMPROVEMENT PROGRAMME

We look at a **skills development programme** that empowers laboratory scientists and managers to enhance and improve patient care.



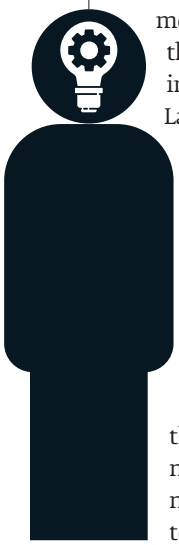
The IBMS is pleased to announce a collaboration with Power of Process to launch a new online training course.

The 10-hour programme builds on traditional knowledge and skills obtained through Lean and Six Sigma while creating a culture of continuous improvement, building laboratory-specific business excellence and improving laboratory-specific business processes.

The course can be delivered for teams or individuals and can be used to underpin workplace projects. It delivers, in detail, and with worked examples, how to understand laboratory processes, identify problem areas, gather data, use problem analysis tools and data to test different solution scenarios, evaluate improvement and implement project management tools to the improvement process.

There are two course options:

- Asynchronous - study at your own pace, utilising 10 hours of on-demand videos.
- Cohort - join a cohort group where a facilitated course is run over eight weeks.



Asynchronous – study at your own pace

IBMS members

The course is discounted for IBMS members who can access it via the IBMS members website. Log into your MyIBMS and visit the Laboratory Transformation and Improvement Programme page; this directs to the LabVine website where the course cost is £410.

Non-members

Non-members can join the course by visiting bit.ly/3SVdGvI, which directs to the LabVine website, where the course cost is £510. Non-IBMS members will then be invited to become IBMS members free for one year, at a membership grade appropriate to qualifications.

Cohort – join a facilitated cohort

The cohort programme will run annually over eight weeks starting on 30 January 2023 and will feature weekly facilitated sessions to assist individuals' progress with their project. As with the asynchronous programme, IBMS members will receive a discount through the link on the members page; non-IBMS members can access the course through the IBMS website and will be invited to receive IBMS membership, free for one year at a membership grade appropriate to qualifications. Course enrolment will be available from 1 Nov to 23 Dec 2022.

Organisations wishing to arrange a cohort within their own networks should contact Donna Torrance at the IBMS by emailing donnatorrance@ibms.org

For more information and to download the prospectus, visit **bit.ly/3A0pN1V**

IMAGES: ISTOCK/SHUTTERSTOCK

HERE TO HELP

ON BEING A VERIFIER

Tahmina Hussain writes about her experiences of being a verifier for the IBMS and why others should get involved.

After supporting some of my colleagues through their portfolios in my role as a Blood Sciences Training Officer, I decided I wanted to become an IBMS verifier and examiner to broaden my knowledge and experience.

On my first verification experience I was worried about going to a laboratory in a different specialism so the IBMS offered me the opportunity to "buddy up" with a more experienced verifier to learn the ropes – something I now offer to do for less experienced verifiers in my local area.

Since becoming both a verifier and examiner, I have found the experiences have not only strengthened my CPD but also my confidence. It's been great for building interpersonal skills and the ability to communicate effectively.

The role can involve having to provide constructive feedback in a way that does not knock the confidence of a trainee or scientist while ensuring they are aware of the need for development in some areas. This is a skill that develops over time.

I find it extremely rewarding to be a part of such a huge achievement – telling candidates that they have passed their verification or examination and are ready to become an HCPC-registered biomedical scientist, or take the next step in their career to become a specialist.

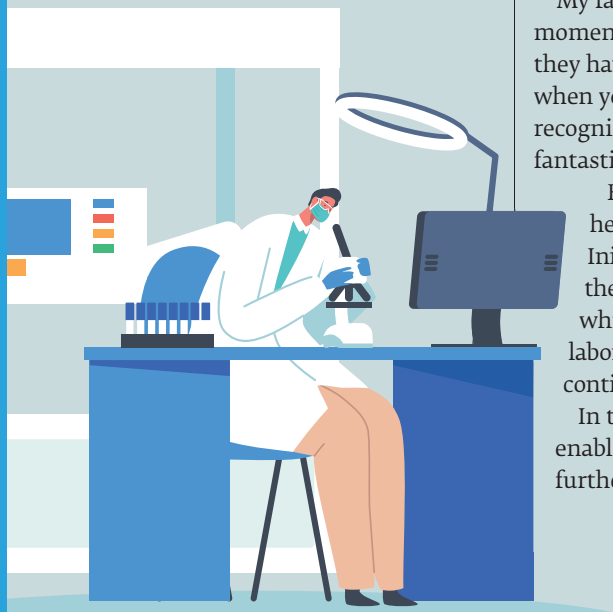
My favourite part is not only the moment where you tell the candidate they have passed, but during the process when you can see their enthusiasm and recognise how they will become a fantastic biomedical scientist.

Being a verifier and examiner has helped my professional development. Initially, I learned new things from the processes at other laboratories, which I brought back to my own laboratory – contributing towards continuous service improvement.

In the long run, the skills I gained enabled me to expand my role, gain further responsibilities and, ultimately, pursue an alternative career route. After becoming a member of the Life Sciences Group and Biomedical Science Advisory Board at local universities, I pivoted into a career in academia.

I have also become more involved with the IBMS – recently being elected to Council and now leading on the Equality, Diversity and Inclusion Working group.

Being a verifier and examiner can be a great stepping stone to new and interesting experiences and career developments – it has been for me. BMS



VERIFIERS NEEDED

We need more verifiers and examiners like Tahmina. If you meet the criteria below and would like to get involved in strengthening our future workforce, please visit our website (click carousel on homepage) and sign up for a virtual training day on 22 or 29 September.

Criteria:

- **IBMS Member or Fellow**
- **Health and Care Professions Council (HCPC) registered**
- **A minimum of three years post-registration experience**
- **Currently working in an IBMS-approved training laboratory**
- **Actively participating in CPD for at least the last two years.**

IMAGES: ISTOCK

SONIC HEALTHCARE UK

Leading the Way in Cellular Pathology

The consolidated Cellular Pathology services at 60 Whitfield Street are the flagship cancer and tissue diagnostics service for Sonic Healthcare UK. This hub and spoke service is the result of a unique partnership between The Royal Free and University College London Hospital. The service has also merged all tissue diagnostics from the Barnet and Chase Farm Hospitals and North Middlesex University Hospital.

The Cellular Pathology department at 60 Whitfield Street comprises Sonic Healthcare UK's core Histopathology and Diagnostic Cytology laboratories, as well as the national and international reference services provided by HSL Advanced Diagnostics. Together, they form one of the largest cancer-testing laboratories in Europe. Opening in January 2020, this state-of-the-art facility was purpose designed, equipped with new equipment and specified to deliver a modern pathology service.

The service is accredited to UKAS ISO15189:2012 standards and the implementation of these standards into daily work life and quality of care for patients is fundamental to what they do. Dedicated quality managers help to promote a 'get it right first time' approach. All levels of the team are responsible for developing a quality focused culture and the company has quarterly competitions for staff who have developed process and quality improvements.

Training and personal development is essential in all laboratories, but in a department of over 180 people, it requires heavily focused attention and support. The department has established a robust pipeline of trainees going through IBMS registration and specialist portfolios, allowing for team development and promotion. The completion of advanced professional qualifications such as MSc. and advanced and expert IBMS portfolios, up to trainee reporting, is strongly encouraged. This is supported by dedicated training officers in all individual departments.

The Cellular Pathology department is a consultant-led service with a broad range of complementary activities that regularly occur. These include presentation of clinical audit and seminars. The laboratory also has its own internal training and development series, with a focus on case studies and laboratory improvements. 60 Whitfield Street is a centre for clinical trials, supporting everything from small local research to large scale international clinical trials. One example is the OPTIMA study, a large multi-site research trial looking at patient outcome in breast cancer. The service also has a highly ambitious digital pathology project with the entire North Central London area. This multi-site digitisation project will deliver enhanced patient care for a population of over two million people. Based in central London, the laboratory offers a vast variety of opportunities to explore what the city has to offer, located within easy reach of many transport links.

Part of the Whitfield Street Laboratory

The HSL Advanced Diagnostics Team

If you are an individual, who is dedicated to progressing their career in cancer diagnostics and making a truly meaningful impact on the quality of patient healthcare, then scan the QR code or visit **www.sonicukjobs.com** to view the opportunities available at Sonic Healthcare UK.

MY LAB

FROM FLU TO COVID TO MONKEYPOX

Panagiotis Pantelidis gives a guided tour of Infection and Immunity Sciences at North West London Pathology.

I work for North West London Pathology (NWLP) as the Divisional Manager for Infection and Immunity Sciences (I&IS). We are an NHS provider, providing accredited diagnostic laboratory services to seven hospitals in our partner NHS trusts: Imperial College Healthcare NHS Trust, Chelsea and Westminster Hospital NHS Foundation Trust, and The Hillingdon Hospitals NHS Foundation Trust, as well as the primary care service users in North West London. My service has three laboratories: the combined Infection and Immunity laboratory, the Microbiology laboratory and the Histocompatibility and Immunogenetics laboratory.

Over the years we have placed significant emphasis on creating a flexible cross-trained workforce on the basis of technology. As a result, biomedical scientists from historically unrelated fields are able to rotate to perform tests from different disciplines, including taking part in Hammersmith's on-call tissue typing service. Looking back, our strength has been the laboratory staff's adaptability, and flexibility to unusual service demands.

Data modelling is a key component of our division's development planning process. This approach has been crucial over time in the implementation of well-recognised services in COVID and flu testing that have been used to support outbreak investigations in North West London over the last few years, as well as the establishment of a monkeypox testing service more recently.

The development of our approach took several years, beginning in 2012 when we actively began monitoring and informing our clinical colleagues about the local seasonal changes of respiratory viruses found in our laboratory. This data served as the foundation for developing a rapid two-hour influenza service in 2018.

When SARS-CoV-2 first manifested in December 2019–January 2020, we had already begun implementing our winter season response to flu testing. As a result, we were able to respond swiftly to a dynamic and challenging situation, and by March 2020, we had validated and started SARS-CoV-2 testing in Infection and Immunity. By April 2020 we had validated four new technologies in total and introduced alternative solutions to solve supply chain issues. These developments were supplemented by the introduction of a rapid COVID service to improve patient workflow. As the "London 1" network, we were able to do over 3000 tests per day during the peak of the COVID epidemic, including variant typing and antibody serology. Our mobilisation of divisional personnel, volunteers from other divisions and organisations was gradually replaced by a new COVID workforce.

Therefore, it was not unexpected that when the monkeypox virus first emerged, we used our experience from COVID to speedily develop in-house testing, making this choice even more crucial given the size of the sexual health services in our sector. Being in charge of such a great division, with such a diverse and committed workforce that fosters a terrific working environment, makes me feel at once immensely proud and incredibly humbled. In the words of Eddie Cantor: "It takes 20 years to make an overnight success." BMS

LAUNCH DIAGNOSTICS

RESPIRATORY MOLECULAR WINTER SOLUTION

Anatolia geneworks

Key points of the Anatolia assays:

- Simple workflow
- Compatible with routine extraction and real-time PCR platforms
- Same thermal profile so can be run together on the same PCR plate
- An endogeneous control is included to ensure sampling quality
- SARS-CoV-2 sequence data are reviewed monthly against emerging new variants

All products are CE marked

DETECTION OF SARS-COV-2, FLU & RSV

Triplex	✓ SARS-CoV-2: orf1ab and N gene ✓ Flu A/B ✓ RSV A/B
	✓ Endogenous control with RNAse-P ✓ Only 1 MasterMix

DETECTION OF SARS-COV-2 + MULTIPLE RESPIRATORY PATHOGENS (15 TARGETS)

SARS-CoV-2 respiratory panel	✓ SARS-CoV-2: orf1ab and N-gene ✓ Flu A/B ✓ RSV A/B ✓ Adenovirus ✓ Enterovirus	✓ Metapneumovirus ✓ Rhinovirus ✓ *Legionella pneumophila* ✓ *Mycoplasma pneumoniae* ✓ Parainfluenza 1 - 4
	✓ Endogenous control with RNAse-P ✓ Only 3 MasterMixes	

LAUNCH DIAGNOSTICS

For further information please call

+44 (0) 1474 874 426

or visit our website

launchdiagnostics.com

The life-changing value of diagnostics

The right diagnostic test, at the right time, can change the course of someone's healthcare experience – and their life.

Diagnostics inform the countless decisions which need to be made along every step of a person's health, wellness and disease journey.

We are committed to developing diagnostic solutions that support healthcare professionals in making critical decisions for their patients.

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