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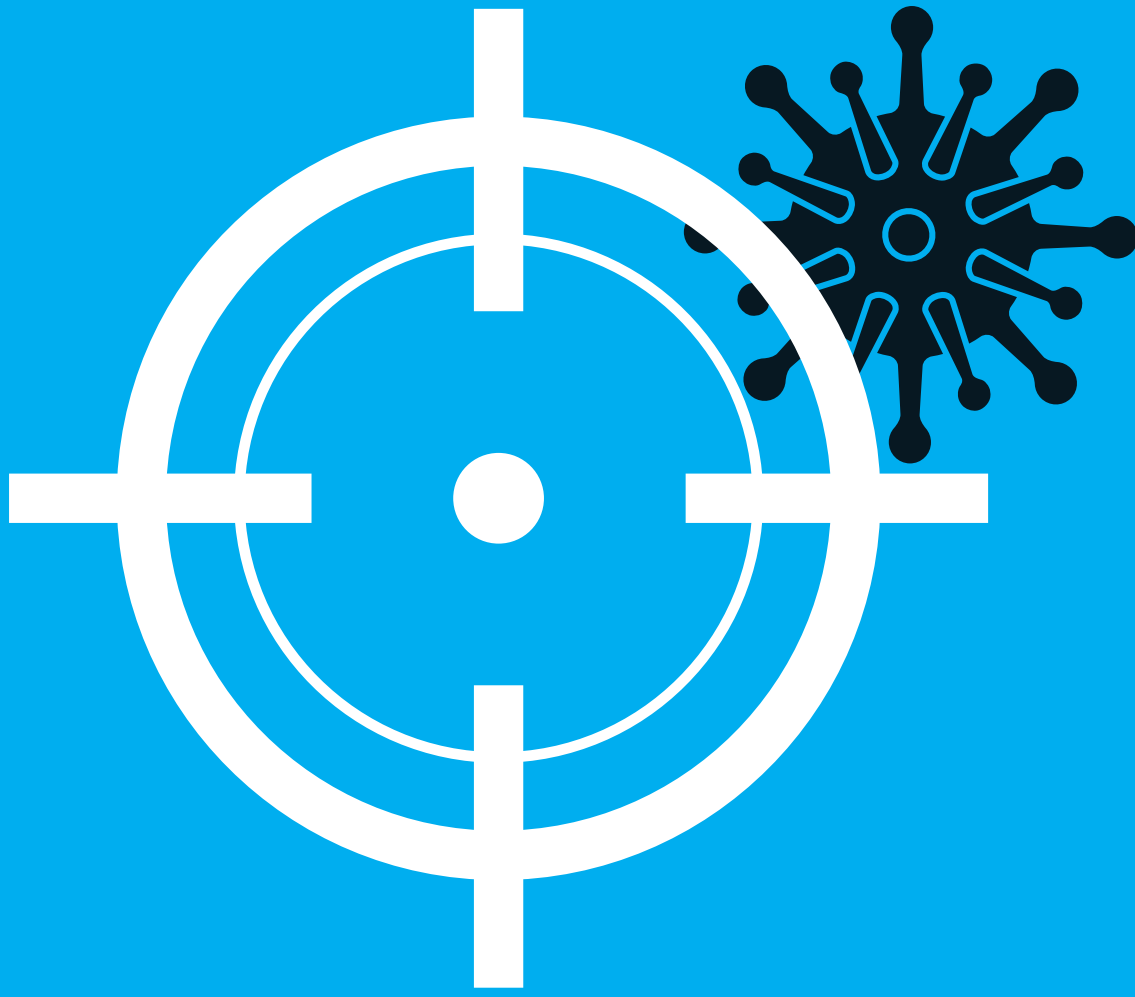
JULY 2017



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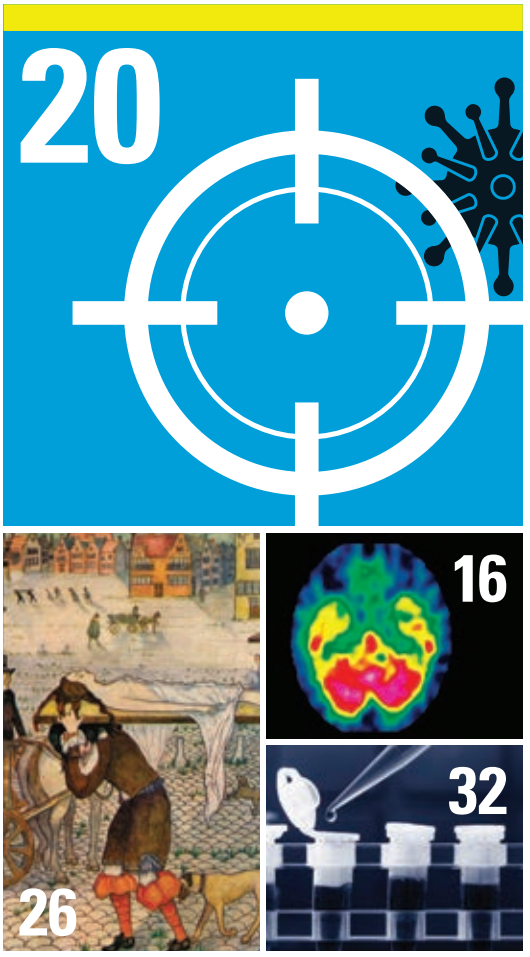

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VALUABLE SCHEME?

Are apprenticeships right for pathology, or are there already enough routes?

I seem to have misplaced my rose-tinted glasses, so I'm going to have to take a look at apprenticeships, in the context of pathology, using my harsh lens of reality.

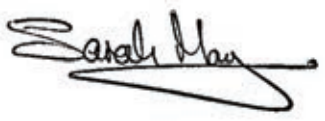
Before launching in, I must say that I think the overall concept of apprenticeships is excellent, as it makes good sense to forge careers through on-the-job training, supported by an educational component. It is not dissimilar to our original training model that worked extremely well for many years, but which was largely killed off as a consequence of the Modernising Scientific Careers project.

The key issue is that pathology is already very well catered for in terms of academic and professional education and training, through accredited degrees and the Institute's own professional qualifications. The apprenticeship scheme may offer a good option for some support staff, if there are sufficient numbers to make it economically viable. However, when it comes to biomedical science apprenticeship degrees, it is not clear how they will significantly benefit our profession when, aside from the option to "grow your own" biomedical scientists, there are already well-established accredited routes to HCPC registration.

Furthermore, the mandatory standards and measures associated with the apprenticeship scheme are an additional and unnecessary burden for a profession that already has statutory regulation. Success will be dependent on the ability of the universities to reintroduce their part-time degrees and hope they will not get their fingers burnt again a few years down the line.

I understand the employers who wish to reap some benefit from the top-slicing of their training budgets to fund apprenticeships, but who will receive this money? The pot available may not cover the full degree costs; then there are the employment costs associated with the training and the end-point assessment is separate from, and not necessary for, HCPC registration. Are trainers ready to take on yet more requirements, and who will perform the assessments? I hate being the killjoy who asks the questions, but the answers are key to understanding how this will work and may show that apprenticeships are not so attractive as the alternative – to recruit a registered graduate from an integrated degree.

I'm now gazing fondly down memory lane to the golden age of day-release courses, which worked extremely well for the profession. I wonder if we'll say the same about apprenticeships in the future?



Sarah May
Deputy Chief Executive

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SCIENCE NEWS

IN NUMBERS

100°C

Researchers from the Universities of Bath and Newcastle have created a new method to ensure vaccines can be stored and transported without refrigeration. This novel method, ensilication, encases the proteins in silica, a non-toxic and inert material, and can keep the proteins intact at temperatures up to 100°C.

420,000

-4%

There were 420,000 sexually transmitted infections diagnosed in England last year. This is a **4%** decline on the 2015 figures, according to Public Health England data.

However, it includes 5,290 cases of syphilis – the highest level since 1949. This is a **12%** increase on the cases of syphilis diagnosed in 2015.

Using a **computer to analyse CT images of patients'** organs, researchers were able to predict five-year mortality with accuracy levels of **69%**. The results are comparable with predictions made by doctors. **A paper on the work has been published in the journal *Scientific Reports*.**

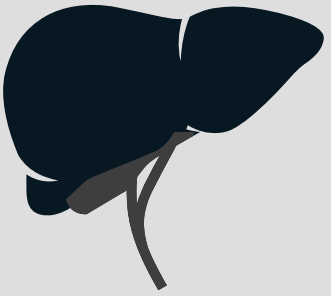
69%

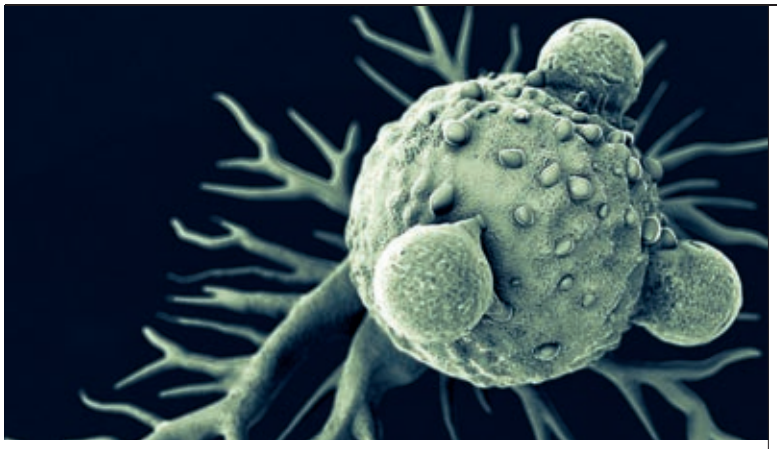
500m

The 1918 Spanish influenza pandemic infected an estimated third of the world's population at the time (500 million people). It killed up to **100 million**, while Second World War deaths numbered about **60 million**. The figures come from a new book about the history of the pandemic and how it changed the world. It is called *Pale Rider* and is by science writer Laura Spinney.

144%

Since the early 1990s, liver cancer incidence rates have increased by 142% in the UK. The increase is larger in **males (144%)**, than in females **(122%)**. It is the **7th** most common cancer in the UK and accounts for **2%** of all new cancer cases.





SCIENCE NEWS

MICROBIOLOGY

Can bacteria stop cancer drugs working?

The presence of particular microbes or enzymes could explain why some treatments are ineffective for some people.

Researchers now have evidence that healthy people metabolise certain drugs in different ways, depending on their microbial make-up.

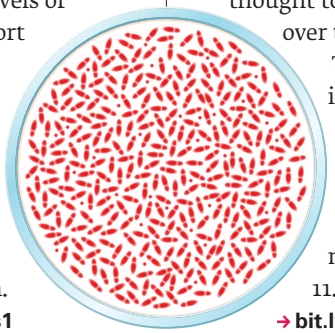
Computational Biologist Leah Guthrie, from the Albert Einstein College of Medicine in New York, and colleagues collected faecal samples from 20 healthy people.

They treated the samples with irinotecan, and measured the compounds produced by bacteria in the samples as they interacted with the drug.

Analysing the proteins produced in the faecal samples, they found that those from people with high bacterial metabolisms contained strains that made more β-glucuronidases. These people also had increased levels of proteins that transport sugar into cells.

This suggests that they would be more likely to absorb the toxic compound and develop gastrointestinal problems, they claim.

→ **bit.ly/BS_JulyNews1**



HAEMATOLOGY

HIGH BLOOD PLATELET COUNT IS A PREDICTOR

A high platelet count is strongly associated with cancer risk, according to the authors of a new paper.

This potentially means that a common blood test could help diagnose cancer earlier, they claim.

The *BJGP* paper states that raised platelet counts are as good a predictor of getting any cancer as a lump in the breast is for breast cancer.

The team looked at thrombocytosis – a condition in which too many platelets are produced, and which is thought to affect about half a million people in the UK over the age of 40.

The researchers compared one-year incidence of cancer between two cohorts: 40,000 patients aged 40 years and over with thrombocytosis, and 10,000 matched patients with a normal platelet count.

They found thrombocytosis is a risk marker of cancer. There was an increase of 11.6% in males and 6.2% of females.

→ **bit.ly/BS_JulyNews2**

VASCULAR RESEARCH

CONVERTING SKIN TO BLOOD VESSELS

A molecular switch has been identified that converts skin cells into cells that are found in blood vessels.

It could potentially be used to repair damaged vessels in patients with heart disease, or to engineer new vasculature in the lab.

This technique boosts levels of an enzyme that keeps cells young and could also help cells avoid ageing as they are grown in the lab.

This has been done before; however, this is the first time the technique has been understood by scientists.

One technique to convert cells involves turning a mature cell into a pluripotent stem cell, then using chemicals to mature it into the desired cell type. Cells can also be reprogrammed to bypassing the stem-cell state.

Scientists are now exploring a method in which skin cells lose some mature cell identity and become more stem-like.

"They don't revert all the way back to a pluripotent stem cell, but instead turn into intermediate progenitor cells," said the University of Illinois' Jalees Rehman, who led the study, published in *Circulation*.

Even though they only differentiate into a few different cell types, progenitor cells can be grown in large quantities, making them suitable for regenerative therapies.

The researchers discovered that progenitor cells could be converted into blood vessel endothelial cells or erythrocytes, depending on the level of a gene transcription factor called SOX17. When SOX17 levels were increased, progenitor cells were five times as likely to become endothelial cells. When reversed, there were fewer endothelials and more erythrocytes.

→ **bit.ly/BS_JulyNews3**

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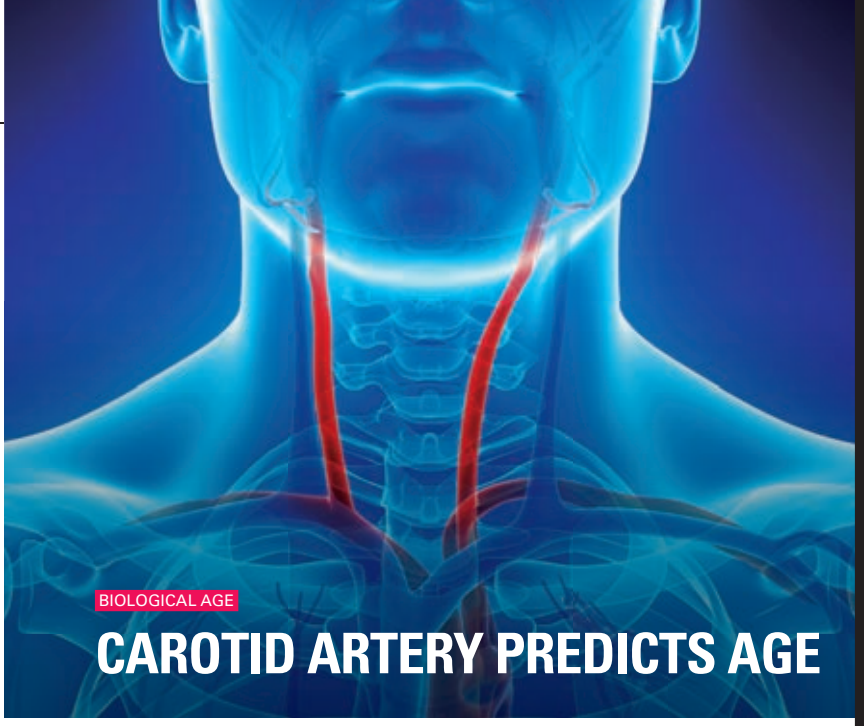


BIOLOGICAL AGE

CAROTID ARTERY PREDICTS AGE

Russian researchers have provided a new method of determining human biological age.

An average healthy individual has the same biological age and chronological age.

However, with age, these two indicators are likely to become mismatched, due to environmental factors, bad habits, manifestations of hereditary diseases and other factors.

To date, there has been no established method of predicting biological age.

The new study is based on a combination of carotid ultrasound and tonometry data. Using machine learning, a model was developed capable of determining the biological age of healthy men and women with a mean absolute error of 6.9 and 5.9 years, respectively.

The test set also included subjects with hypertension and type 2 diabetes, whose biological age turned out to be, on average, three years greater than their actual age.

The group behind the research, published in the journal *Aging*, was lead by the Engelhardt Institute of Molecular Biology.

→ **bit.ly/BS_JulyNews4**

STEM CELL RESEARCH

PATIENT-SPECIFIC CELLS CREATED

Scientists in the US have created blood-forming stem cells from patients' own cells.

The cells, produced from pluripotent stem cells, were a mixture of blood stem and progenitor cells, able to generate multiple human blood types when infused into mice.

"This step opens up an opportunity to take cells from patients with genetic blood disorders, use gene editing to correct their genetic defect and make functional blood cells," said study author Ryohichi Sugimura, from Boston Children's Hospital.

The team added transcription factors to induce endothelium into a blood-forming state. Endothelial cells were transferred into mice, which, weeks later, were carrying multiple types of human blood cells in their bone marrow and blood circulation, according to the paper published in *Nature*.

→ **bit.ly/BS_JulyNews5**

WHAT'S HOT AND WHAT'S NOT

HOT

MARRIAGE

A study of nearly one million UK adults indicates that marriage can reduce heart disease risk factors, including cholesterol and high blood pressure.

HOT

MOUNT EVEREST

A terminal cancer patient, given just months to live, is believed to be the first cancer patient to climb the world's highest mountain.

HOT

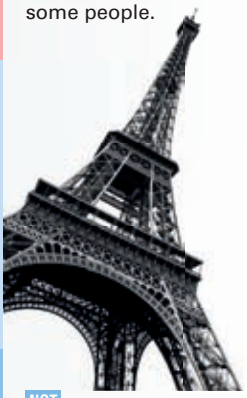
WHITE BREAD

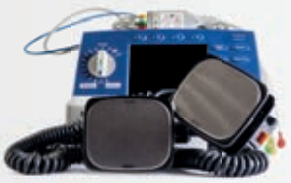
Researchers at Israel's Weizmann Institute of Science claim that white bread is as healthy as brown, for some people.

NOT

PARIS

A Parisian woman is taking the French state to court for failing to protect her health from the effects of air pollution.





NOT

PLANES

New proposals drawn up for cardiac arrest on planes say that airlines need to carry more medical equipment to deal with emergencies.

NOT

HOT WATER

A new study published in the *Journal of Food Protection* states that washing hands at 15˚C leaves them as clean as washing at 38˚C.

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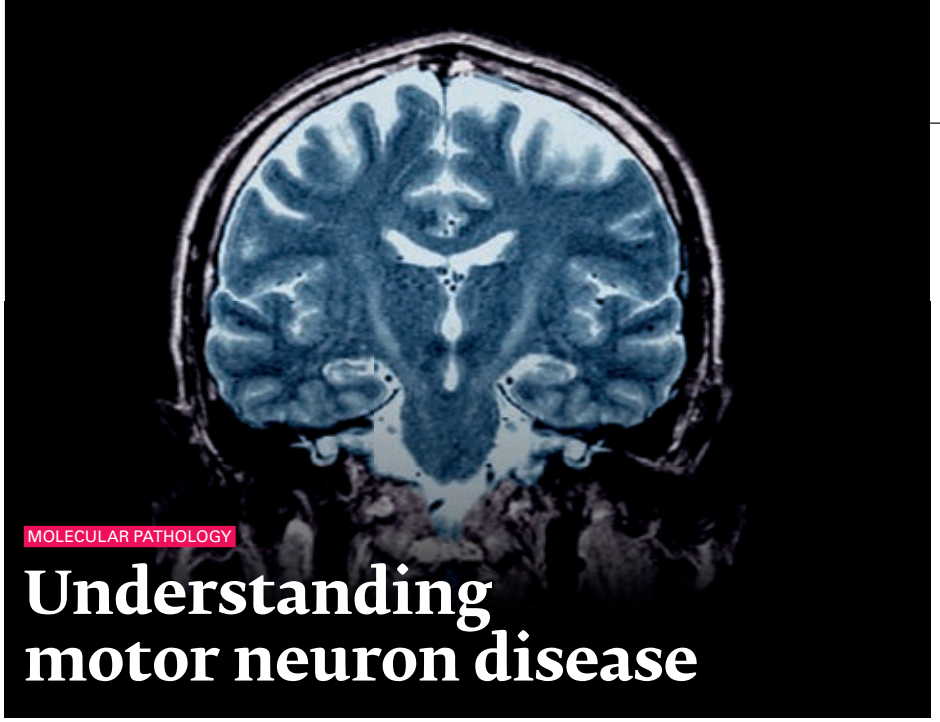

MOLECULAR PATHOLOGY

Understanding motor neuron disease

Scientists have discovered how certain forms of motor neuron disease begin and progress at cellular and molecular levels. It is hoped that the findings could reveal potential new ways to slow down or even stop the disease's progress.

The team is working with pharmaceutical companies to develop new treatments for motor neuron disease and other neurodegenerative conditions.

By studying cells from patients with motor neuron disease – also known as amyotrophic lateral sclerosis (ALS) – they revealed a detailed picture of how motor neurons decline and die.

The team from the Francis Crick Institute and University College London also found that the healthy neuron-supporting cells astrocytes may play a role in the survival of motor neurons in this type of ALS. This highlights the role they may play in combating neurodegenerative diseases.

Sonia Gandhi, one of the project leaders, said: "Understanding how and why neurons die is clearly vital in neurodegenerative diseases, but part of the puzzle is also understanding the emerging role of astrocytes in this context."

The research was funded by Wellcome, Cerevance, Grand Challenges, the National Institute for Health Research Queen Square Dementia Biomedical Research Unit and the NIHR University College Hospitals Biomedical Research Centre.

A paper on the work has been published in *Cell Reports*.

→ **bit.ly/BS_JulyNews6**

PATHOLOGY TECHNOLOGY

MICROSCOPE WITH ARTIFICIAL INTELLIGENCE

A microscope that uses artificial intelligence to develop 3D images has been developed.

The second-generation microscope can produce large, full-colour images of tissue and fluid samples.

It is expected to be available at a cost of hundreds of pounds – potentially reducing costs for disease diagnosis in developing countries.

The spectral light-fusion microscope has no lens but uses artificial intelligence and mathematical models of light to construct an image.

Alexander Wong, the Canada Research Chair in Medical Imaging at the University of Waterloo, co-led the research project.

He said: "We know that pathology is the gold standard in helping to analyse and diagnose patients, but that standard is difficult to come by in areas that can't afford it.

"This technology has the potential to make pathology labs more affordable for communities who currently don't have access to conventional equipment."

Details of the first-generation microscope were published last year.

→ **bit.ly/BS_JulyNews7**

UNDER THE MICROSCOPE

This month: Drosophila melanogaster

What are Drosophila melanogaster?
They are a species of fly, generally known as the common fruit fly or vinegar fly. They can be found on every continent in the world, except Antarctica, and are usually about 3mm long.

Why are we talking about them?
They are widely used in medical and health research and have led to scientists discovering a huge amount about cancer and genetics.

What makes them good for research?
Well, 75% of the genes that cause disease in humans are also found in the fruit fly. However, their genetic codes are simpler than humans. This means that the processes behind tweaking their DNA are simpler.

But aren't they tiny with a very short lifespan?
That's right, but these are research strengths – their size means scientists can keep thousands (even millions) of flies at a time, and their lifespan of eight to 14 days, combined with rapid reproduction, means several generations can be observed in a couple of months.

What recent research have they been involved in?
An EU-funded study in April used Drosophila melanogaster to reveal that gut bacteria can "speak" to the brain to inform food choices.

Another recent piece of research used the flies to help understand degenerative retinal disorders and discovered a new light-sensing molecule in their brains, which will inform future studies.

Why are they always hovering around my fruit bowl?
They are attracted to rotting and fermenting fruit, as this is where they lay their eggs. Might be time to throw away that fruit.

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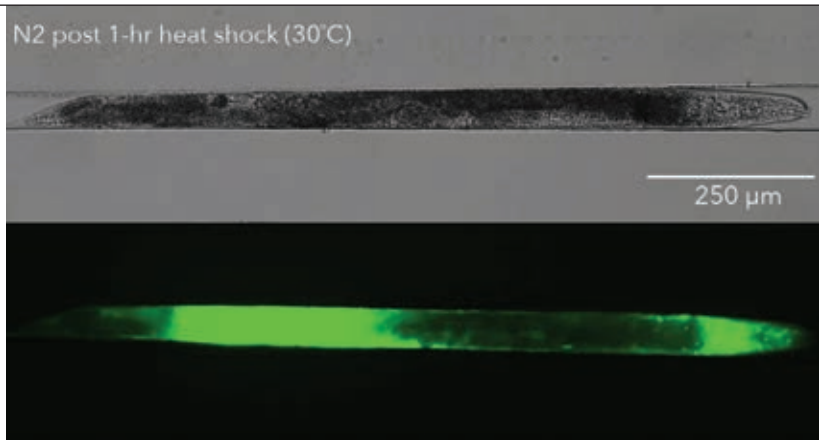

GENEPOC

GROUP B STREP TESTING

GenePOC is launching its GBS LB assay and its revogene instrument in Europe.

It is GenePOC's first molecular assay to detect Group B Streptococcus.

The company says the system is the most cost-effective diagnostics solution in the molecular point-of-care market today.

Revogene is a fully automated standalone instrument that is well suited to on-the-spot molecular diagnostic testing.

It allows the labs to run from one to eight samples simultaneously, for an optimal testing workflow.

→ **genepoc-diagnostics.com**

THERMO FISHER SCIENTIFIC

MASS SPECTROMETRY

Thermo Fisher Scientific launched new mass spectrometry technologies at the Annual American Society for Mass Spectrometry Conference.

It is hoped this will strengthen its leadership in mass spectrometry and advance cutting-edge research.

The new Thermo Scientific Q Exactive HF-X Quadrupole Orbitrap mass spectrometer is designed for exceptional sensitivity and reproducibility in the analysis of complex biological samples.

While new options for the Thermo Scientific Orbitrap Fusion Lumos mass spectrometer can expand instrument power, performance and versatility.

→ **thermofisher.com/asms**

NEMAMETRIX

FLUORESCENT STAINING KITS

NemaMetrix has launched its first series of RediStain fluorescent kits for improved visualisation of C. elegans' structure and function in phenotyping studies.

These kits expand the toolkit of C. elegans research to include the ability to perform structural and functional assays that are standard in cell biology.

Used with the company's ScreenChip System, the new staining kits provide a more efficient way to study nematode phenotypes and their directly-related underlying genotypes, which would not be possible with non-fluorescent techniques.

Matt Beaudet, CEO of NemaMetrix, said: "The introduction of fluorescent staining kits to our ScreenChip System will make previously invisible phenotypes easy to visualise, allowing scientists to generate more and better quality data on neuronal and physiological responses to a wide range of genetic and environmental changes."

→ **nemametrix.com**

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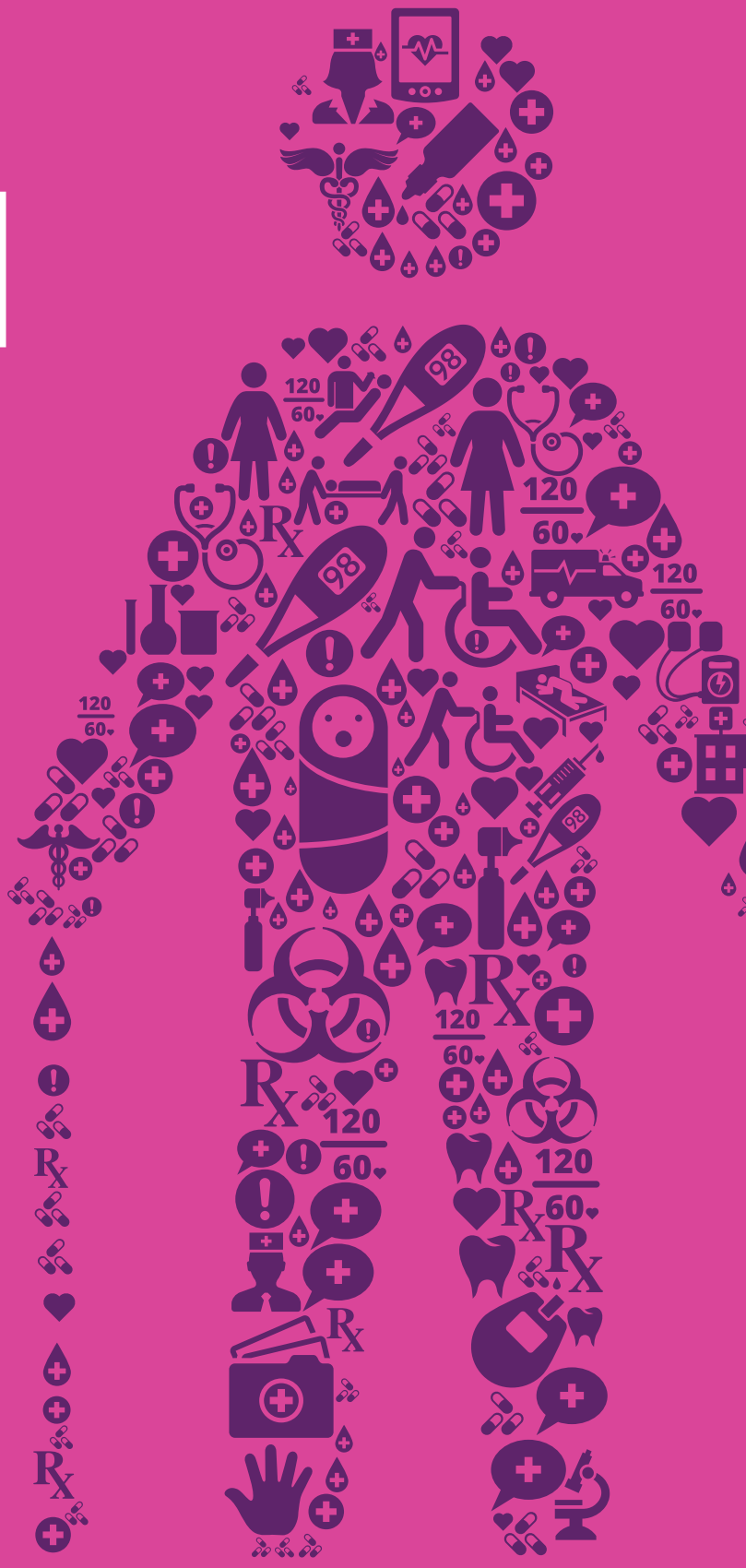
THE BIG QUESTION



THIS MONTH WE ASK

"Will raising the pension age have an impact on pathology as a service?"

Barry Hill

Former Blood Transfusion Manager
Southport and Ormskirk Hospitals NHS Trust

Yes it will, but for the better. As someone who retired from the service last year when I reached pension age, but recently returned in a part-time role back at the bench where I began my career, I can vouch for this from my own personal experience.

I have long considered that far too much laboratory knowledge, expertise and wisdom simply walks out of the laboratory door once a biomedical scientist reaches retirement age.

Although some will obviously be looking forward to a well-earned retirement, others will consider that they still have a lot to offer the service and would have liked to be able to continue on in some capacity, be that in a lesser or part-time role. Furthermore, the recruitment and retention of qualified biomedical scientists has been a perennial problem in pathology. Raising the pension age could have a positive impact on this, as it could allow those who wish to remain in the service to continue to provide valuable support and supervision to hard pressed laboratories, enabling a good skill mix and a longer period to allow their knowledge to be passed on to their younger colleagues.

Obviously maintaining the competencies of an older pathology workforce will be an issue, but this is not insurmountable. In many cultures "the elders" are considered to be wise because they have had much experience in their long lives and, consequently, the younger people depend on them to pass down their valuable knowledge.

IMAGE: GETTY

Alan Wainwright

Executive Head of Education
Institute of Biomedical Science

The question is provocative. To me, it is not suggesting there will be a positive impact, or is this because most of my peers have already retired, worn out by the constant demands of doing more for less, and the desire to restore a work/life balance? My answer attempts a balance between personal and professional.

Reaching a pensionable age for many is synonymous with retirement and an opportunity to leave for pastures new, with the resulting gap in the workforce providing an opportunity for "fresh blood" to bring renewed energy and ideas to old problems.

Raising the pension age could be initially viewed negatively, and – at the risk of sounding ageist (but then I do fall into this category) – there is reduced opportunity to progress younger staff who are ready and willing to face the challenges and make a difference.

These opportunities could still exist. Those facing additional years of the same routine may welcome the opportunity to do something different: to prove themselves in a different way, to be valued for the experience they already have, to not get stale. Pathology is renowned for lacking resources to address training needs, to carry out short-term projects, to engage with higher education institutes in the delivery of accredited biomedical science degrees. Why not use the experience available to plug these gaps, improve the management of training, to mentor, guide and support new managers who are stepping up?

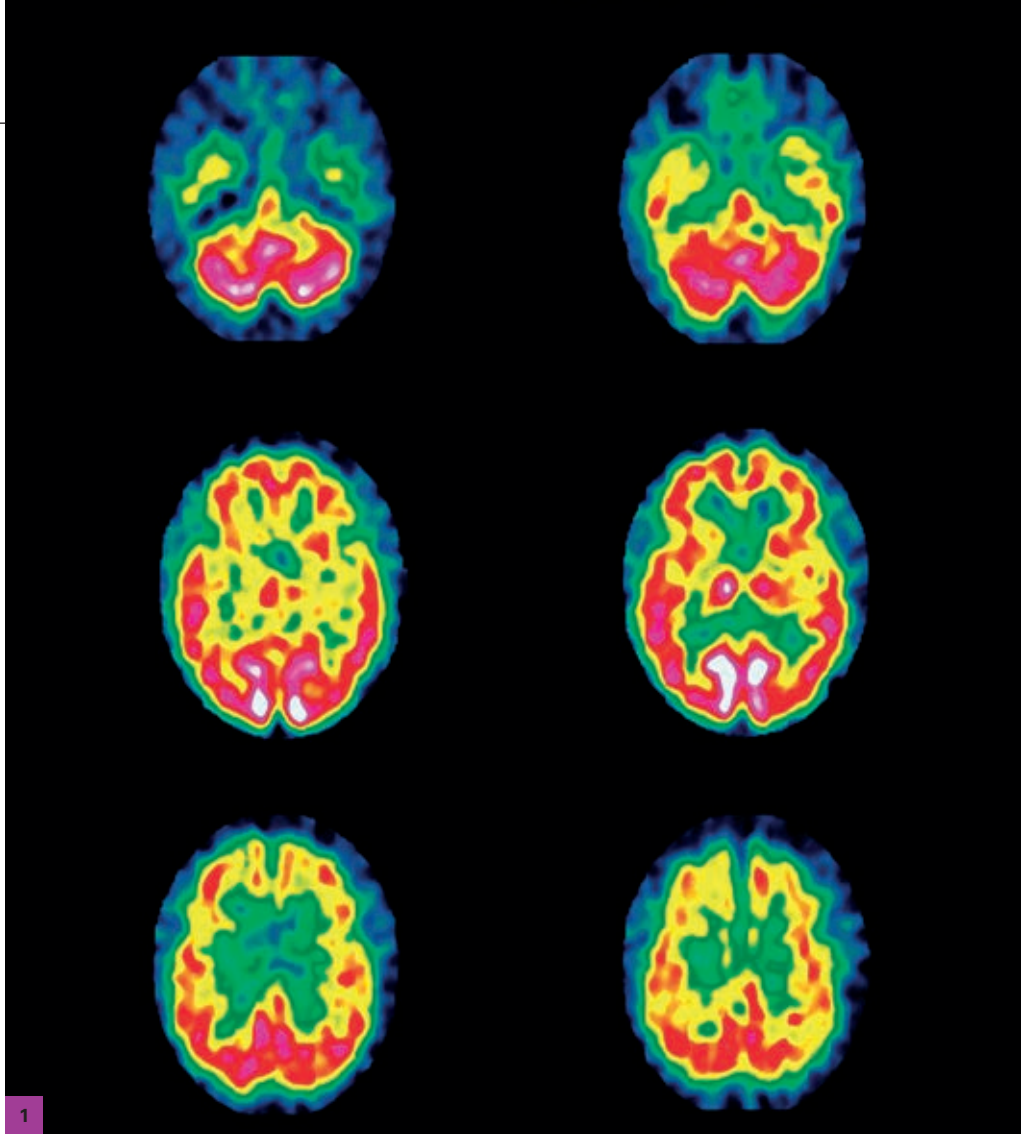
Joanna Andrew

Head Biomedical Scientist, Clinical Biochemistry
York Teaching Hospital NHS Foundation Trust

The short answer to this question is that I really don't know! There are many factors to consider but for a 24/7 blood science service, having a significantly older workforce will have an impact on the ability of staff to take part in shift work. In turn, this will impact the younger members of the team, who may have to cover more night shifts. But the reduction in staff retiring may help with the recruitment issues by ensuring we retain staff and knowledge.

Younger staff may see promotion opportunities reduced and feel demotivated

YOU CAN'T TURN YOUR BACK



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Ed Wild discusses the latest breakthrough in Huntington's disease and explains why he will always remain dedicated to the field.

Have you ever felt so proud of your research you've wanted to put it on a T-shirt? Ed Wild has – and he and his colleagues wore the T-shirts to presentations. He says: "It did create some slightly awkward situations. I found myself pointing to my chest saying 'these are the main take-home points'."

Ed is a neurologist who specialises in Huntington's Disease (HD), an inherited neurodegenerative disorder that affects mental abilities, mood and physical coordination, and which can devastate whole families. *The Biomedical Scientist* spoke to him, just after the publication in *The Lancet Neurology* of what he calls a very important development in understanding the disease.

The significant finding was the discovery that the blood of HD patients contains heightened levels of the protein neurofilament light (NFL). The amount of NFL rises as the condition worsens. And it can be mapped almost perfectly on to the number of 'CAG' repetitions a patient has in their huntingtin gene (HD patients have more than 35, those without HD generally have around 17).

"Essentially the question was, could your baseline NFL level predict how your HD would subsequently progress?" Ed says. "We found that NFL predicted brain atrophy and clinical progression, even after adjustment for age and CAG repeat length. So NFL is a speedometer where a single measurement gives you an almost instant readout for how quickly someone's HD is progressing."

The long view

To understand how Ed and his team got to this point we need to go back to 1993, when the cause of HD, a mutation of the huntingtin gene, was discovered.

"I think the advantage we have in HD is that, unlike almost every other relatively prevalent neurodegenerative disease, HD is monogenic. So everyone with the disease has the same basic mutation. Everyone with that mutation gets HD," Ed says. "After the discovery of the huntingtin mutation, the hope was that it would rapidly lead to treatment. In fact, it's taken us about 23 years, but we are now giving drugs that essentially silence or aim to lower the expression of the mutant gene. So the whole field has been focusing on drug development to treat the known cause of HD."

The difficulty is that while carriers of the huntingtin mutation have a 100% chance of getting symptoms, it hasn't been possible to predict when they will appear. "For 40 or 50 years you might look

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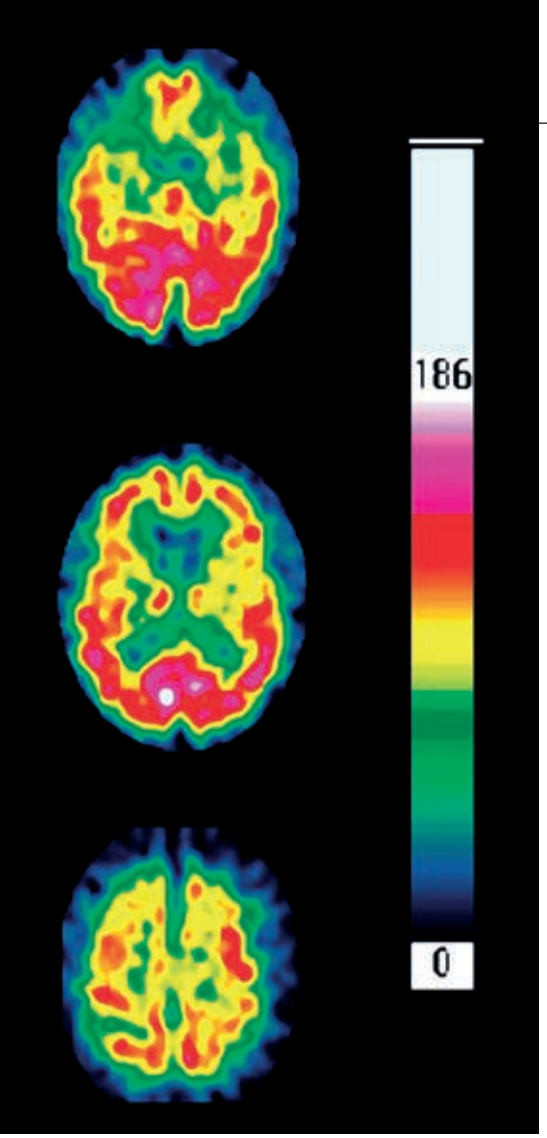

Fig 01: Coloured single photon emission computed tomography (SPECT) scans of axial sections through the brain of a patient with Huntington's disease

completely normal on the outside and on brain scans," Ed says. "So even if we had a perfect drug, if we gave it to someone, five years later we would have no way of knowing whether it had worked. This is where the promise of biomarkers came up, and why NFL work is so important."

In 2007, in an exemplary act of forward-thinking, Ed's long-time mentor Sarah Tabrizi, a neurologist at UCL, led a study called Track HD which included more than 360 HD patients. "We collected plasma blood samples. We had no idea what they would be used for, except that some day we might need good quality plasma," Ed says. "Nearly a decade later, we ran this neurofilament test on the plasma, not really having any expectation that we would see anything striking. And the results knocked our socks off – there were highly significant NFL increases in all the HD groups compared to controls."

Next steps

So now the NFL biomarker has been discovered, what's next for Ed and his colleagues? "We have to find out how to make it useful," he says. "There are ongoing and planned clinical trials. As a matter of urgency, we need to figure out whether neurofilament changes if you give a drug that's working."

He points out that there are still unanswered questions. "Our study only went up to the mid-stage of HD but we need to know what happens later on in the disease. We also need much bigger cohorts of very young patients who are very far from onset, so we can study in more detail the factors that predict progression. Plus, what I'd really like to do is translate this into animal models. So lots of work to do."

A vocation

Like many passionate scientists, Ed is clearly hooked on his work.

He first encountered HD when searching for a topic for his PhD in 2005. After an chat with Sarah Tabrizi, he went along at her suggestion to an HD clinic. "I found the idea quite depressing because HD is incurable and it decimates whole families. It's an incredibly challenging disease for anyone, including doctors and carers, to cope with. But one HD clinic as an observer was all it took to completely convert me," Ed says.

> *One Huntington's disease clinic as an observer was all it took to completely convert me*

"The determination in the hearts of these family members not to let the disease get the better of them, even when things were going terribly badly and their whole family was at risk, was incredible. And once you're in HD research, it's very difficult to leave. I've been in the field long enough now to see people who were completely well when I first met them start to develop symptoms and really that's not something you can turn your back on. You think we didn't quite get there to save that person, but maybe we can do something to make life different for his kids, for his younger brother. It's really that which motivates me." BMS

ALL ABOUT ED

- ✔ Studied medicine at Christ's College, Cambridge
- ✔ Is an MRC Clinician Scientist at UCL Institute of Neurology and Honorary Consultant Neurologist at the National Hospital for Neurology and Neurosurgery
- ✔ Has authored six book chapters and more than 50 peer-reviewed publications
- ✔ Has undergone three lumbar punctures to act as a control in his research. Some HD drugs are administered in this way, so it also helps him to reassure patients
- ✔ Is a fervent science communicator: he co-founded hdbuzz.net, a plain-English HD research news site.

A DAY IN THE LIFE OF...

Helen Tucker

I am the **Managed Services Contracts Manager at Thermo Fisher Scientific.** I work with **NHS trusts, primary contractors** and our internal sales teams to drive business by assisting customers with innovative solutions to help improve patient outcomes.

My first task when I arrive is... to work through my emails and update my "to-do list", or I'm jumping straight into my car and heading out for customer meetings.

One of the biggest challenges I face is... keeping the momentum going in the managed service process internally, where the involvement of multiple businesses and people needs a lot of coordination and control.

My favourite thing about my job is... success, of course, I'm in sales. But also knowing that we have a great range of products and services that can make a real difference in the laboratory.

The thing that makes my job unique is... having sole responsibility for managed services across the whole of Thermo Fisher Scientific in the UK. Many customers are surprised to find how much more there is to Thermo Fisher Scientific.

My route into the role involved... starting out as a Junior B MLSO in Morbid Anatomy at King's College Hospital in 1981. I completed my Fellowship in 1985 and became a Senior MLSO. In 1988, I moved into the commercial world with Shandon Scientific. The company has evolved hugely over the years to become Thermo Fisher Scientific, and I have held a number of sales management roles over the years.

It's exciting to know we have new, game-changing products in the pipeline

My typical lunch is... a sandwich if I'm working from my office. If I'm out on the road, I grab something from the services, even the occasional McDonald's.

My job fits into the wider healthcare context... by helping our customers find solutions to their everyday challenges in the laboratory. But also, because Thermo Fisher Scientific invests heavily in research and development, it's exciting to know that we have new, game-changing products in the pipeline that will make a real difference to patients in the future.

If I get a few spare minutes then I... will read the newspaper or get googling to plan my next holiday.

I feel like I've had a good day when... My "to-do list" is shorter than at the beginning of the day. When I'm with customers, it is seeing the light come on when they understand the full potential of Thermo Fisher Scientific as a partner. BMS

Would you like to be featured? Email the Editor rob.dabrowski@redactive.co.uk

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How do we predict outbreaks of viruses and infectious diseases and what measures are taken at present to stop them spreading?

TARGETING OUTBREAKS

Public Health England (PHE) started using whole genomic sequencing (WGS) to identify different strains of tuberculosis in March this year – the first time it has been used to diagnose and manage an infectious disease.

WGS can precisely identify a particular virus or infection in an individual, chart the evolution of the organism and compare it with the organism present in another person, enabling researchers to establish links between different people carrying the virus or infection and different geographical regions.

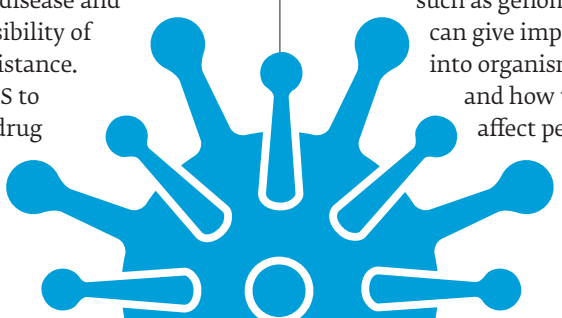
Previously, it could take up to a month to confirm a diagnosis of TB, confirm the treatment choices and detect spread between cases. WGS enables the process to take just over a week, slowing down the spread of the disease and reducing the possibility of antimicrobial resistance.

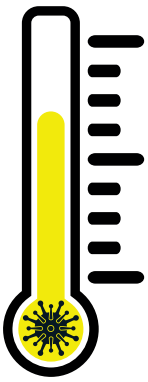
"The use of WGS to diagnose, detect drug resistance and very accurately type TB is a world first for any disease on this scale," says Professor Derrick Crook, Director of the National Infection Service at PHE. "We are now able to use cutting-edge science to effectively treat these patients with the right medicines quickly. This approach will also increasingly be used for many other infectious diseases."

While small predictions can be made based on what is known about viruses and infections, predicting where and when outbreaks will happen is a completely different proposition.

"Determining when an outbreak may occur remains unpredictable, but this is a really exciting time to be working in the field of infectious diseases," says Professor Nick Phin, Deputy Director of the National Infection Service.

"Modelling and technological advances, such as genome sequencing, can give important insights into organism evolution and how they may affect people, or emerge as new threats."





"Determining when an outbreak may occur remains unpredictable, but this is a really exciting time"

Surveillance

PHE currently has in place a variety of systems of surveillance for virus and infectious disease outbreaks – typically two or three different types tailored to what is known about the organism.

As a seasonal virus, winter flu is monitored for two reasons: to warn the government, NHS and individuals when the season starts and ends, so emergency planning can be undertaken; and to understand the changing nature of the virus, how severe and intense the strain is, and which age groups or regions are being affected, to enable targeted vaccination.

This is achieved through a variety of mechanisms. PHE undertakes surveillance of primary care in the NHS, collecting data from hospitals for laboratory testing, taking positive rapid flu tests from a sample of GP surgeries across the country and virological monitoring of any antiviral resistance.

This will affect clinical management – if there is significant drift, antivirals can be used sooner.

A similar approach is taken to viruses and infections that are not seasonal, such as sexually transmitted infections. Isolates from diseases such as gonorrhoea are tested for antimicrobial resistance, and data and test results are shared.

Monitoring the outbreak and spread of viruses and infections in England typically involve PHE working with other public organisations, including local authorities and NHS trusts.

The same applies to viruses and infections that spread internationally. In response to outbreaks of avian flu, PHE has teamed up with the Department for Environment, Food and Rural Affairs, and the Animal and Plant Health Agency, to pool information about the types of flu circulating in birds and animals and assess the potential impact on humans.

Similarly, for the Zika virus, PHE relies on notifications from the World Health Organization and reports from other countries to establish any potential new activity that could have an impact on the UK.

By monitoring the emergence of new infections across South America, and the international spread of the virus, PHE predicted that high levels of activity of the virus among the naïve populations would lead to the development of immunity and ultimately result in a general reduction in activity.

As of 24 May 2017, 299 travel-associated cases of the Zika virus have been diagnosed in the UK, and diagnoses in Brazil have dramatically reduced.

Problem solving

Zika is a classic example of a virus for which there are no antivirals or vaccine developed yet for treatment. The authorities rely on a traditional public health approach of identifying cases, early intervention in terms of isolation or treatment, preventing secondary and tertiary cases, and warning the public about the generic measures they can take take (avoid being bitten by mosquitoes, avoid travel to affected areas).

Conditions such as winter flu, which have a vaccine, are reliant on targeting those most at risk and most in need of vaccinating, such as the elderly, pregnant

WHY GOOGLE FLU TRENDS FAILED

The use of big data to predict viruses has been demonstrated by Google Flu Trends (GFT), which uses large and often messy data sets to predict flu outbreaks across the US on the basis that people suspected sick with flu use Google to search for symptoms and cures.

On its launch in 2008, GFT claimed to predict flu outbreaks two weeks earlier than the Centers for Disease Control and Prevention, which relies upon positive flu tests from doctors and hospitals that mean people are sick before treatment is mobilised.

However, GFT failed to predict the flu season in 2013.

One problem was the finding that Google's algorithm picked up seasonal terms unrelated to the flu, such as "high school basketball", according to "The parable of Google Flu: traps in big data analysis", published in *Science*.

Another was that Google didn't take into account changes over time in search behaviour, particularly in light of the launch of its suggested search feature, which affected flu tracking, according to two of the report's authors, David Lazer, Professor of Political Science and Computer and Information Science at Northeastern University and Ryan Kennedy, Associate Professor of Political Science at the University of Houston.

Yet Lazer and Kennedy point out that big data provides significant value in modelling the spread of disease and identifying emergencies in real time, writing: "Google's sequel to GFT, done right, could serve as a model for collaboration around big data for the public good."

women and children. But others, such as meningococcal disease, will be treated with antibiotic prophylaxis in the hope of both eliminating the condition in the individual and preventing it from spreading to others.

Ongoing improvement of approaches to monitoring and tackling virus and infection outbreaks is crucial, and PHE's "Lessons Learned" programme involves auditing its practices and reviewing any outbreak or incident and identifying how things could be done differently for a better outcome, and whether a change of practices is required to reflect this.

Technology to predict

The growth in technologies to help predict where viruses and infections may strike can aide surveillance and treatment, particularly when the traditional surveillance techniques are more expensive and time-consuming.

Google Flu Trends (see panel) was one of the first web-based tools to be used for real-time surveillance, and works on the basis that the number of people searching for flu-related keywords correlates to the number of people with flu symptoms. These tools tend to be more effective when applied to moderate- to high-prevalence diseases in developed countries with many web users, according to Eirini Christaki in her paper "New technologies in predicting, preventing and controlling emerging infectious diseases", published in *Virulence*.

She highlights how advances in computer science have enabled the possibility of simulation of epidemics, through agent-based models (using detailed data for each individual in the population to describe the epidemic) and spatially structured meta-population models (using geographic census data along with inter-population mobility patterns to study disease dynamics and predict spread).

Remote sensing technology, such as satellite imaging, can also be used to monitor environmental changes that may predict epidemics: for example, monitoring sea temperature and height to accurately predict the incidence of a cholera outbreak in Bangladesh, which is outlined in the paper "Using satellite images of environmental changes to predict infectious disease outb=reaks", published in the US journal *Emerging Infectious Diseases*.

The future

The advancement of sequencing methods – as seen by the use of WGS to identify different strains of tuberculosis – has also affected the prediction of infectious diseases. The use of pathogen genome data has come at the same time as a shift from diagnosing and discovering pathogens in humans and animals to screening for pathogens in samples collected from hotspots. "With better information gathering and sequencing diagnostics, there is much more data available from outbreaks that allows us to answer questions around source and transmission that would not have been answered 10 or 15 years ago," Phin says.

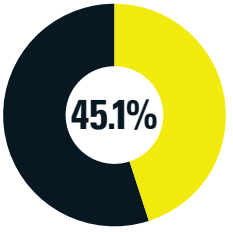
"This enables us to better protect the public from the health threats that outbreaks can pose and improves the way we contain them and respond." BMS

VIRUSES AND INFECTIOUS DISEASES IN NUMBERS

WINTER FLU

71%

of those aged 65 years and over had the winter influenza jab in 2015-16



of those under 65 years old, in clinical at-risk groups had the jab

TUBERCULOSIS

5,758

The number of cases of tuberculosis in England in 2015

8,280

A reduction of a third compared with the number of cases in 2011

SEXUALLY TRANSMITTED INFECTION

434,456

The number of sexually transmitted infections reported in England in 2015

3%

The decrease in number of cases compared with 2014

sebia FLC Kappa

sebia FLC Lambda

Serum Free Light Chain quantification

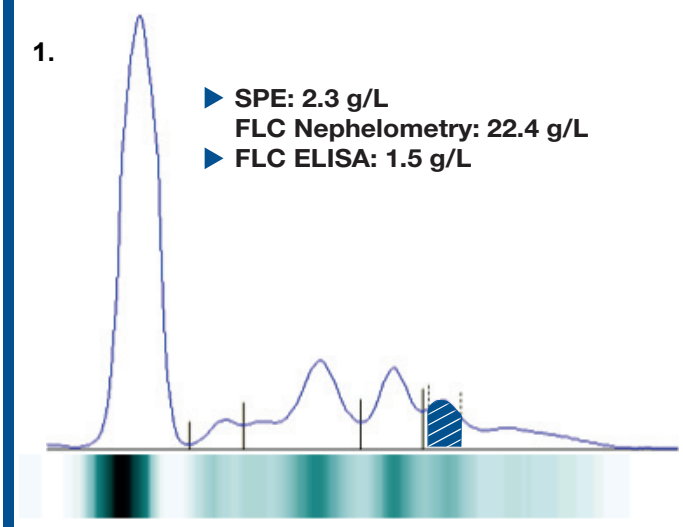
Addressing the past for a clearer future

If your actual FLC units are not coherent with the monoclonal peak quantification,

What exactly do you measure ?

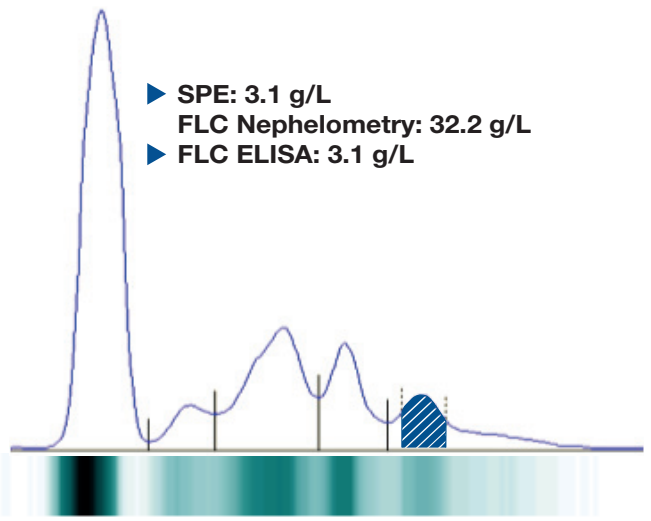
1.

- SPE: 2.3 g/L
  FLC Nephelometry: 22.4 g/L
- FLC ELISA: 1.5 g/L



2.

- SPE: 3.1 g/L
  FLC Nephelometry: 32.2 g/L
- FLC ELISA: 3.1 g/L



Overestimation of Serum κ Free Light Chain Concentration by Immunonephelometry
Corrie M. de Kat Angelino, Reinier Raymakers, Maria A. Teunesen, Joannes F.M. Jacobs, Ina S. Klasen
Clinical Chemistry Jul 2010, 56 (7) 1188-1190; DOI: 10.1373/clinchem.2010.143529
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REAL SCIENCE, REAL RELEVANCE

Sarah May, Deputy Chief Executive at the IBMS, explains the approach behind this year's Congress.

When planning for Congress 2017 began, we were conscious that it is getting harder each year for people to attend conference events. Therefore the approach we took was this:

- Absolutely everything must be of direct relevance to individuals and to the departments that support them to attend
- There must be a spread of material to suit those who are newer to the profession and those who are experienced
- We must reflect the core biomedical science subjects, but must also include the emerging sciences
- Time must not be a constraint so we will offer the most popular programmes on the Sunday in addition to the weekday programme
- We will offer a full three days of free seminars as a supplement to the main lecture programme, to provide additional perspectives and to prevent cost being a barrier to people accessing learning
- We want an exhibition that gives unprecedented access to experts in the newest science and technology who can advise on products, provide information and give demonstrations.

That was the six-point plan that has guided the last 18 months of preparation. I feel that we have more than delivered on our promise. We have taken from what we learned from Congress 2015 and have made it even better; our first attempt at introducing a practical microscopy element to Congress was so over-subscribed that this year we are doubling the amount of microscopes. Microscopy workshops include:

- **Non-gynaecological cytology** – Sunday afternoon. An intensive afternoon of practical microscopy followed by a guided analysis of all of the cases. This is an essential learning opportunity for anyone who screens non-gynae cytology.
- **Andrology microscopy and practical techniques** – Monday afternoon. There have been a number of challenges for andrology and semen analysis services in departments seeking UKAS accreditation. This workshop will be led by highly experienced andrologists who will guide participants through the requirements for handling samples, performing counts and assessing morphology. Positive and negative pressure pipettes, Neubauer counting chambers for sample counts and fixed wet preparations for morphology assessments will be provided. This is a unique opportunity to combine a practical workshop with andrology lectures on the following day.

Exhibition hall seminars

Our exhibition hall seminars are a more informal lecture setting and are free to all to attend. On Monday 25 September, we will have a focus on point-of-care testing (POCT) covering quality, managing POCT from a quality manager's perspective and EQA. This session will also incorporate an update from Health Education England on the 100K Genomes Project.

On the Tuesday, we are carrying our education and training programme over from the main lecture programme, in order for delegates to have the opportunity to discuss issues with the presenters in a more informal setting. This seminar programme will launch the latest edition of the Registration Training Portfolio, the revised Specialist Diploma and an "all you need to know" about the Higher Specialist Diploma.

On Wednesday, the army will be once again demonstrating their approach to delivering pathology services in challenging and often hostile conditions.

- Military laboratory support to United Nations Mission in South Sudan
- Alternative blood supply in austere environments
- Delivery of a portable clinical laboratory (BMS with a Bergan).

For those arriving early we are starting some programmes at 08.15am, to enable you to make the most of every minute at Congress. Never before have we included so much! BMS

BRING OUT YOUR DEAD

Stephen Mortlock tells the tale of the plague that ravaged London and asks whether it was really stopped by the Great Fire.

London in the 17th century was a thriving, growing city, with a population estimated to be around 384,000. The metropolis was by far the country's largest and richest city; it was the home of the principal royal palace, Parliament, and the courts of law. Its growth since the mid-16th century, when its population had been roughly 120,000, had brought problems of overcrowding and poor housing, with buildings being divided and then further subdivided until the gardens and yards were obliterated.

The only way people had to get rid of rubbish was to throw it out into the streets. This would be normal household waste, human waste and a combination of straw, animal dung, animal entrails from the slaughter houses and, of course, discarded beer (which, was safer to drink than the water from the Thames).

As a result, London in 1665 was filthy and a perfect breeding place for the rats carrying the plague that had been ravaging the city for almost a year. This was the worst outbreak of plague in England since the Black Death of 1348. London lost roughly 15% of its population and while 68,596 deaths were recorded in the city, the true number was probably over 100,000. Historians believe that the 1665 epidemic reached England from Holland (Amsterdam was ravaged with plague from 1663-1664, with a death toll of about 50,000), arriving with trading ships carrying bales of cotton during the winter of 1664.

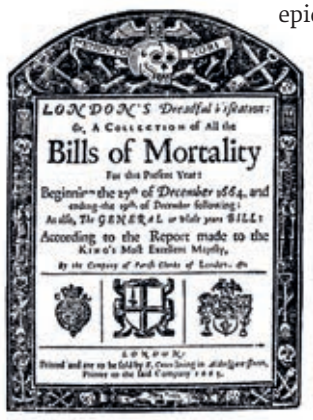
The first cases of plague were reported to be two French merchants, who died in London during December, but the weather and temperatures during the winter were very extreme, which probably prevented the infection spreading. The next recorded cases of disease occur in the spring of 1665 in the parish of St Giles-in-the-Fields outside the city walls (near the modern Tottenham Court Road), which then spread through the narrow alleys to the crowded and squalid parishes of

Whitechapel and Stepney on its way to the walled city of London.

The death rate began to rise during the unusually hot summer months and by September had reached nearly 8,000 people a week. Houses containing the dead and dying were no longer locked, as helpless municipal authorities threw their earlier caution to the wind and simply abandoned quarantine measures.

In the eyewitness account *Loimographia* (1665), William Boghurst attributed the plague's causes to filth and squalor, with inadequate disposal of sewage, and poor nutrition among London's impoverished residents. He criticised the treatments of bleeding, purging, and fumigating houses and objected to quarantining infected households since this was "oft enough tried and always found ineffectual".

Samuel Pepys' diary has been an important primary source of data and first-hand account for the Great Plague, and he gave a vivid account of the empty streets with almost daily references to the mournful silence broken only by the noise of the searchers (people paid to hunt out dead bodies or possible plague victims) shouting "bring out your dead", and the sound of the carts carrying them away to parish churches or communal plague pits, such as Finsbury Field in Cripplegate and the open fields in Southwark. The Bedlam burial ground (the site of Crossrail's new Liverpool Street station) was in use from 1569 to at least 1738, spanning the start of the period of Elizabethan explorers, the English civil wars, the Restoration, Shakespeare's plays and numerous plague outbreaks. Recent excavations suggest that perhaps 30,000 Londoners are buried here.


LONDON'S Dreadful Visitation:
Or, A COLLECTION of All the
Bills of Mortality
For this Present Year:
Beginning the 29th of December 1664, and ending the 19th of December following:
In which, The GENERAL or Whole years BILL:
According to the Report made to the
King's Most Excellent Majesty,
By the Company of Parish Clerks of London, &c.

Epidemics

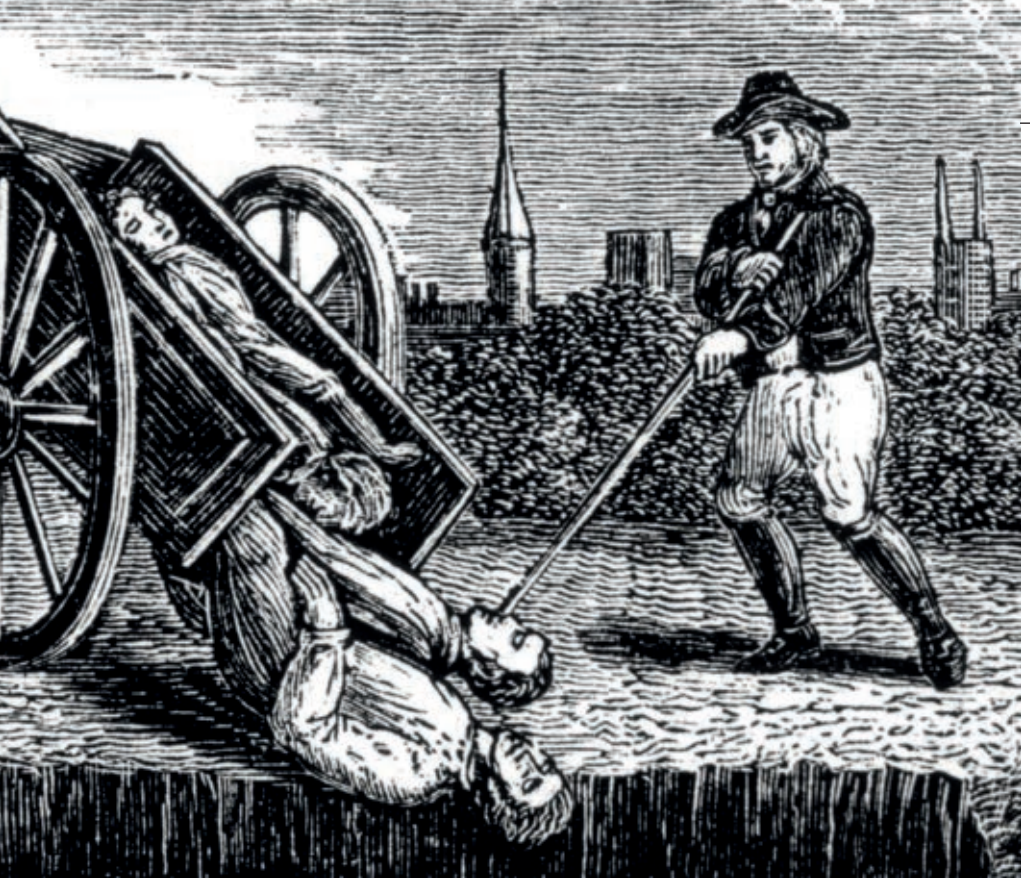
Of course plague was only one among many epidemic diseases which afflicted this period: typhus and dysentery were common, influenza killed many more people, and the rate of population growth continued to be determined by the many childhood diseases, like measles and whooping cough. Smallpox was prevalent, killing thousands and disfiguring many more; reports suggest that as many as half of London's citizens bore the unmistakable "pockmarks". Tuberculosis, or consumption, was another prolific killer, its symptoms exacerbated by the smoke and poor air of the city.

Why then is plague often selected for special prominence as a harbinger of doom? Although it was feared and loathed, plague was strangely familiar, due to its suddenness and cyclical character. When not living through an epidemic, Europeans were anxiously preparing for the next one. One feature of the plague is that it travelled slowly and was generally confined to towns where the concentration of houses favoured the sedentary nature of the black rat, who preferred to live in the roof spaces and where there was a plentiful supply of food. The second feature is that it was distinctively a disease of the poor, and studies reveal that there were very few upper-class victims.

In 1665, the mortality rates in the poorer parishes and suburbs to the south and north-east of the city were double those in the centre. This may be explained in part by the withdrawal of the rich to the countryside at the beginning of epidemics, but must largely be due to the nature of the buildings inhabited by different social groups, for well-maintained houses with tiled roofs would harbour far fewer rats than the ramshackle huts of the poor. This was illustrated during the outbreak, when most of the city's aldermen and suburban justices stayed at their posts - yet none died as they lived in better houses. The final aspect is that plague is essentially a disease of the household, a characteristic again derived from rodent infestation of the family home. Once the rats of a particular house were infected, it was likely that most, if not all, of its human inhabitants would develop the disease, whether young or old, male or female.

The Great Fire

On the night of September 2, 1666, however, a small fire began in the bakeshop of Thomas Farynor on Pudding Lane. At one o'clock in the morning, a servant woke to find the house aflame. The baker and his family made their escape, but one of their maids perished in the blaze. At this time, most London houses were of wood and pitch construction, dangerously flammable, and it did not take long for the fire to expand. The fire leapt to the hay and feed piles on the yard of the Star Inn at Fish Street Hill, and then spread to the inn itself. There was a strong wind that night which sent sparks to ignite the church of St Margaret, and then spread to Thames Street, with its riverside warehouses and wharves filled with food for the flames: hemp, oil, tallow, hay, timber, coal and spirits. Lord Mayor Sir Thomas Bludworth (1620-1682) was woken up to be told about



IMAGES: ALAMY

the fire, and was reported to have replied: "Pish! A woman might p*ss it out!"

However, the summer had been very hot and there had been no rain for weeks, so consequently the wooden houses and buildings were tinder-dry. The citizen fire-fighting brigades had little success in containing the fire with their buckets of water from the river. By eight o'clock in the morning, the fire had spread halfway across London Bridge. The only thing that stopped the fire spreading to Southwark, on the other side of the river, was the gap caused by a previous fire in 1633.

Bludworth worried about the cost of rebuilding, was hesitant to destroy the houses in the path of the flames, creating "fire-breaks", and by the time a royal command came down, carried by Samuel Pepys himself, the fire was moving rapidly across the city. This inaction by Bludworth has been blamed for much of the damage to the city. But now, the houses were being demolished by gunpowder; unfortunately the remaining jumble of wood was often too much to be cleared away before the fire was at hand, and it only slowed the fire's path onward.

The fire blazed unchecked for another three days, until it halted near Temple church, located between Fleet Street and the River Thames. Then, without warning it suddenly sprang to life again, continuing towards Westminster. The Duke of York (later King James II) had the presence of mind to create a fire-break, and the fire finally died down. The Great Fire of London was over.

Aftermath

Although the loss of life from the fire was minimal (some sources say only 16 perished), the magnitude of the property loss was staggering. Some 430 acres, as much as 80% of the city proper, was destroyed. Thousands of citizens found themselves homeless and financially ruined. The Great Fire, and the subsequent fire of 1676, which destroyed over 600 houses south of the river, changed the face of London forever. Charles II appointed six commissioners to redesign the city with wider streets and buildings of brick, rather than timber. Five years later, 9,000 houses and public buildings had been completed. Sir Christopher Wren (1632-1723) was commissioned to design and oversee the construction of nearly 50 churches, including a new St Paul's Cathedral, construction of which began in 1675. The King also had Wren design a monument to the Great Fire, which still stands today at the site of the bakery which started it all, on a street now named Monument Street.

One positive effect of the fire was that the plague, which had been spreading throughout London, diminished greatly, due to the mass death of the plague-carrying rats in the blaze and the destruction out of the old wooden buildings. It is now thought, however, that the plague had already started to subside before the fire. Certainly, many of the later cases of plague were found in the suburbs, and it was only the City of London that was destroyed by the fire.

The conception for many years was that the culprit for the disease was bubonic plague, spread by the fleas of infected rats. New evidence suggests the infection was in fact a combination of bubonic plague and the airborne infection – pneumonic plague – which is far more infective and can be spread by coughs and sneezes. So, the infection was spread human to human, rather than by rat fleas that bit a sick person and then bit another victim. This would account for the rapidity of the epidemic.

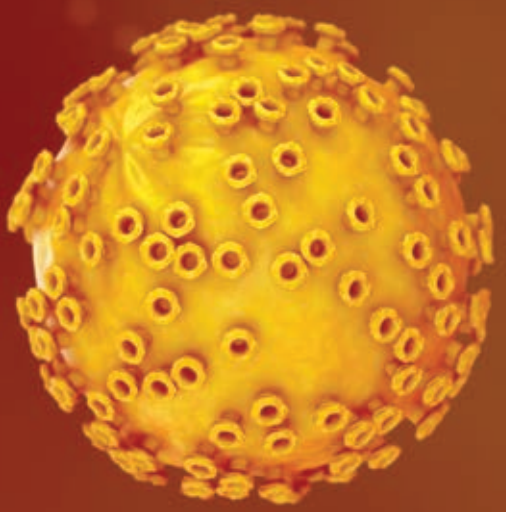
In 2005, C J Duncan and S Scott theorised in the *Postgraduate Medical Journal* that the plague was not caused by *Yersinia pestis* at all, but was in fact a viral haemorrhagic fever, probably a filovirus. It has been shown that the Black Death did spread remarkably rapidly, with vast areas of Europe being affected in less than three years. This is in contrast with an epidemic of bubonic plague, which moves very slowly; the black rat tends to have limited mobility.

But DNA has been analysed from skeletons excavated from the Bedlam burial ground with a significant proportion of the samples testing positive for *Yersina pestis*. So there is sufficient evidence to support the theory that these victims were exposed and succumbed to plague bacteria, but it may be that each epidemic was caused by multiple factors. But whatever the cause, this was the last major outbreak of plague in Britain. BMS

Stephen Mortlock is Pathology Manager at Nuffield Health Guildford Hospital.

British Journal of Biomedical Science Issue 3 2017: a synopsis

Issue 3 of our journal is now completed. By the time you read this, the hardcopy may already have landed on your doormats. However, those of you who have been to the **website** will already have accessed and read some of the papers. **Editor Andrew Blann** outlines the content in the **latest issue.**



B Crossley, J Crossley. A review of the use of human papilloma virus (HPV) testing in cervical screening
Human papilloma virus (HPV) has several isotypes, the most dangerous of which confer a risk of cervical cancer. There is clear evidence of a reduction in the incidence of cancer where HPV testing is used. As cervical cytology becomes increasingly rare, this review discusses its effectiveness and role in cervical screening.

NW Brown. Toxicology in clinical laboratories: challenging times
This review considers a number of significant developments in toxicology within clinical laboratories, both with the available instrumentation and in the range of compounds abused by the drug-using communities, and developments in the regulation of forensic science in the UK, which may in time impact on clinical toxicology.

Khatoon J et al. Association of heterogenicity of *Helicobacter pylori cag* pathogenicity with peptic ulcer diseases and gastic cancer
H pylori is linked to a variety of diseases of the stomach, the most serious being cancer. A major determinant of its pathogenicity is a gene, cag, and its product. Our colleagues show that alternative isotypes of cag are associated with different forms of gastic disease.

Fan J et al. A magnetic nanoparticle-labeled immunoassay with europium and samarium for simultaneous quantification of pepsinogen I and II

In the search for better laboratory methods, Fan et al report their development of an immunoassay that can measure two molecules at the same time. An interesting part of this is the use of two fluorescent rare-earth elements to label monoclonal antibodies, and magnetic nanoparticles as a separation step. This method could be adapted for the immunoassay of almost any two analytes.

Tan B et al. The clinical value of *Vav3* in peripheral blood for predicting lymphatic metastasis of gastric cancer

Vav3, with roles in signal transduction and metastatic invasion, is over-expressed in a variety of cancers, and encodes a soluble protein product (Vav3). Tan et al show increased serum Vav3 in stomach cancer, with higher levels in lymphatic metastases, and that levels fall after surgical excision. Thus Vav3 could be a new cancer marker that may enter routine practice.

Farid K et al. Development and evaluation of a novel score for prediction of large oesophageal varices in patients with hepatitis C virus indices liver cirrhosis

Cirrhotic liver failure in hepatitis C virus infection is a dominant pathology, but acute bleeding from oesophageal varices can be life-threatening. Farid et al present a new score for predicting risk of this haemorrhage (a combination of platelet count, prothrombin time and alpha-fetoprotein) that outperforms eight other scoring systems.

Cleary O et al. Evaluation of the Xpert norovirus assay for the rapid detection of norovirus genogroups I and II in faecal specimens within a routine laboratory setting

Norovirus accounts for >90% of cases of gastroenteritis and is a major issue in hospitals and care homes. Our colleagues from Ireland report that the Xpert assay has excellent performance criteria compared with a reference RT-PCT method, and out-performs an alternative assay method.

Eltorgoman AE et al. Pleural fluid DNA integrity index as a diagnostic marker of malignant pleural effusion

Diagnosis of a malignant or benign pleural effusion based on cytology has poor sensitivity and specificity, possibly due to the sampled cells being unrepresentative of the complete pathology. The advance reported here is that combining cytology with the ratio between two Alu repeats brings the specificity and diagnostic accuracy to 100%.

Cao Y et al. Fluorescent PCR detection of *mecA* in drug resistant MRSA: a methodological study

A key determinant of methicillin resistance is the product of mecA, detecting this gene is important. Cao et al compared standard phenotypic detection with fluorescent PCT, finding 98% concordance in sputum samples, and 100% in blood, urine and other body fluids, paving the way for an expansion of the use of method.

Andrew Blann is Editor of the *British Journal of Biomedical Science.*

One or more of these articles may be the subject of a Journal-based learning exercise for those seeking to improve their continuing professional development profile.

REFEREES 2016

It is my pleasure to thank our colleagues (almost all of whom are practicing biomedical or clinical scientists) who have given their invaluable time and opinions as to the value of the manuscripts submitted to our Journal. Without them, the Journal could not operate.

Dawn Alderson
Joanna Andrew
Sally Barratt
Andrew Botham
Richard Bradbury
Nigel Brown
Lesley Cain
Richard Cartwright
Ian Collacott
Gary Collins
Jennifer Collins
Sean Conlan
Kim Cooper
Beverley Crossley
John Crossley
Sally Cutler
Steve Davies
Ron Dixon
Derrick Edgerton
Chris Elliott
Jonathan Evans
G Fahmy
Sharon Forrest
Alistair Gammie
David Gurney
Rehana Jauhangeer
Alex Javed
Ian Jennings
Patrick Kimmitt
Alan Kitchen
Azra Khan
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Jenny List
Brigid Lucey
Fiona Lyon
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Martin McFadden
Gary Moore
John Moore
Victoria Moyse
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Gary Reynolds
Ian Rothnie
Chris Scott
Ruhi Siddiqui
Gordon Sinclair
Stephen Snewin
Arthur Strachan
Paul Waller
Qiuyu Wang
Anthony Warford
David Wells
Jamie West
Allan Wilson
David Wilson
Javed Yakoob

CULTURE VS MOLECULAR

Microbiologist **Dr Mark Wilks** looks at the key themes and messages that emerged from this year's British Society for Microbial Technology conference.

The recent 32nd Annual Scientific Conference of the British Society for Microbial Technology was entitled "Hot Topics in Microbiology". It focused on areas in medical microbiology where change has been rapid and is likely to be even more so in the near future.

In diagnostic clinical virology, there has been a wholesale move from culture to polymerase chain reaction (PCR) and, more recently, sequencing. In contrast, diagnostic bacteriology has remained largely culture based. There are many reasons for this, including cost, the necessary skillset, and the fact that culture methods, whatever limitations, are generally adequate.

Opinions have been polarised, with some refusing to engage with the new molecular methods, while others look down upon those still using culture and insist that PCR is now outdated and next generation sequencing (NGS) is the only way to go. Some have suggested that the only obstacle to high-throughput sequencing is the "innate conservatism of the profession".

The range of different topics covered at the meeting shows that there is, in fact, no conflict between the two different methods. Great gains are being made using molecular and cultural approaches to cope with different situations and, in some cases, a combined approach yields the best results. Let's look at how the approaches are being used in some rapidly changing fields.

Improving sepsis diagnosis

Professor Paul Dark, University of Manchester and NIHR Clinical Research Network Critical Care Lead, gave the first presentation on "Moving towards delivering precision medicine in sepsis".

Here we have the unusual situation where the gold standard – a positive blood culture – is actually not very good. Blood cultures are negative even in those in which sepsis is strongly suspected on

clinical grounds. The most important reason for this is probably prior antibiotic treatment, rather than the inadequacy of culture itself. As well as being insensitive, culture methods are often too slow to be useful in cases of severe sepsis.

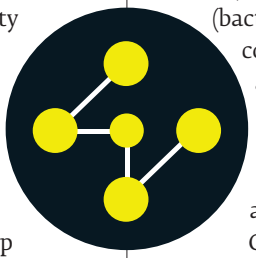
There are unlikely to be any significant improvements in culture methods, so what are the molecular alternatives? There are increasing efforts to develop molecular methods to rapidly detect bacterial and fungal DNA directly from blood without the need for blood culture. These are not affected by trial prior antibiotic treatment. Several CE-marked methods were reviewed and showed great potential, although the cost of each test was high.

A complimentary molecular approach is to look at host biomarkers, such as CRP and PCT, released into the circulation in response to acute pro-inflammatory stimuli. Bacterial stimuli are associated with rapid and high responses and, crucially, they fall rapidly with correct treatment for bacterial infection. So, when used quantitatively, they have the potential to aid antibiotic initiation and discontinuation decisions. Although of course they don't give any direct information about causative pathogen or antibiotic susceptibility.

It's likely that a combination of molecular methods to detect DNA and host biomarkers will give the best results and lead to major advances in the reliable and rapid diagnosis of sepsis.

Aetiology of community-acquired pneumonia (CAP)

One area in which the superiority of molecular methods has clearly been shown is in determining the aetiology of community-acquired pneumonia. In the pre-antibiotic era, *Streptococcus pneumoniae* could be isolated in up to 95% of cases, but in the majority of cases the credible pathogen is not isolated. It's not clear whether this represents a genuine change in the aetiology of the disease, more widespread use of antibiotics or both.



Dr Kate Templeton, Consultant Clinical Scientist, Edinburgh, described a recent landmark study in which they performed quantitative multipathogen testing of sputum samples in adults hospitalised with CAP. They collected mucopurulent sputum samples (96%) and endotracheal aspirates (4%) from 323 adults with radiologically confirmed pneumonia admitted to two tertiary care hospitals in the UK. They performed quantitative culture and multiplex real-time PCR for 26 respiratory bacteria and viruses. With PCR, they identified a potential pathogen (bacterial or viral) in 87% of patients, compared with 39% using culture alone. Predictably, PCR detected bacteria more frequently than culture in patients who had received antibiotics (77.6% vs 32.1%).

Of course the isolation of a credible pathogen does not prove that it was responsible for the disease in every case, especially as many of the bacteria detected are carried in the upper respiratory tract without apparent harm in much of the population. Nevertheless, the results of the study are hugely encouraging.

IMAGES: GETTY/SCIENCE PHOTO LIBRARY

Identification of Mycobacteria

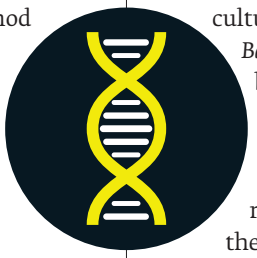
NGS to detect *Mycobacterium tuberculosis* from sputum samples has been shown to be possible, however, at present the detection of mycobacteria relies on culture. Dr Pieter Jan Ceyssens, Head of the Antibiotics and Resistance Unit at the National Reference Centre for Mycobacteria and Tuberculosis in Belgium, described the use of MALDI-TOF for the rapid identification of mycobacteria. In this case, the molecules are proteins and not nucleic acids, as in the other examples described.

The identification of cultured bacteria by MALDI-TOF has revolutionised the way of working in most labs in the UK and Europe. The vast majority of bacteria and yeasts can now be identified in minutes with minimal preparation. However, mycobacteria and filamentous fungi have proved much harder to identify. Dr Ceyssens described some simple methods in which positive cultures are heat killed, extracted with ethanol, sonicated and then loaded onto the MALDI-TOF in the usual way. This has allowed the identification of approximately 90% of the different species of non-tuberculosis mycobacteria that are encountered in clinical laboratories in a matter of minutes, a huge step forward over existing techniques, which are complex, expensive and take several days. This cheap and rapid molecular method may turn out to be superior to NGS in the majority of cases.

Microbial dark matter

Professor William Wade, from Queen Mary University of London, showed how molecular and cultural methods can be used in conjunction to greatly increase our knowledge of microbiology in a field where the limitations of culture have perhaps been too easily accepted. His talk was worryingly entitled "Cultivating the Uncultured". This turned out not to be a reference to the audience, but to an extremely ingenious and painstaking approach to growing new bacteria from the mouth.

Bacteria and yeasts can now be identified in minutes with minimal preparation



Oral bacteria are typically fastidious and slow growing – requiring complex media and long incubation times. Many are strict anaerobes requiring extra care in sample collection, transport and incubation. A comprehensive cultural analysis of samples is difficult, meaning that it is only possible to analyse small numbers of specimens and around half of oral bacteria detected by molecular methods are uncultivable.

Some of these belong to existing well characterised phyla, such as the Bacteroidetes, where there are many cultured representatives, such as *Bacteroides fragilis*, which have been known for over a century. Others constitute newly discovered-deep branching lineages with no cultivable representatives. The reasons for the lack of success could include under sampling – because culture is much more labour-intensive than molecular methods – and dependence on other bacteria in the community. This could be due to particular nutritional or signalling requirements, which are hard to reproduce in the laboratory or the bacteria may themselves be intracellular and parasitic and hence difficult to grow in pure culture.

His talk focused on his attempts to culture uncultivated members of the phylum *Synergistetes*. The underlying hypothesis was that some uncultivated oral bacteria required the presence of other bacteria, so it might be possible to grow them initially in mixed culture *in vitro*, with the aim of eventually weaning them off their dependence on other bacteria and thus get pure cultures.

The sample obtained from the periodontal pocket was cultured on blood agar and incubated anaerobically for 10 days. Plates were then photographed, replica plated and blotted onto nylon membranes. The membranes were hybridised with *Synergistetes* probe allowing the area of *Synergistetes* colonies to be rapidly located on the original plate. These colonies could then be subcultured on blood agar again and so the primary culture gradually enriched for *Synergistetes*. After eight passages, the mixture consisted of four well-described bacteria.

Molecular methods showed that there was not just the four species of bacteria, but the *Synergistetes* type Wo 90. By passage 12, this organism was able to grow independently, although next to a culture of *Parvimonas micra*. The organism was described, named (*Fretibacterium fastidiosum*) and its whole genome sequenced.

Remember that each passage took 10 days and 12 passages were needed to get the isolate in pure culture, so nearly six months of painstaking work were needed to recover the organism in pure culture.

This could only have been done by combining traditional cultural methods with molecular methods and it really shows the absurdity of trying to pose cultural and molecular methods as mutually antagonistic. BMS

Mark Wilks is Lead Clinical Scientist, Microbiology at Barts Health NHS Trust and a Committee member of the British Society for Microbial Technology.

THE
BIOMEDICAL SCIENTIST
BIOMEDICAL NEWS, VIEWS AND ANALYSIS

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HOW TO... ...PREPARE FOR INTERVIEWS

You've done the hard work — you have the qualifications and you've landed an interview. Next comes the step most candidates fret about – the interview. In this guide, the scientists at CY Partners provide steps, reminders and pointers you can use to execute the perfect interview and score your dream job in biomedical science.

Step 1: Plan ahead

Preparation is the key to success. Set out what you are wearing, familiarise yourself with the location and decide how you will introduce yourself. Practise the interview scenario in your head and prepare answers to interview questions such as:
Tell me about yourself, and
Why do you want this job?

Refer to your CV to see what you could use to your advantage — highlight qualities and skills that you have which fit the job criteria. Interviewers love to see that you have prepared well and it will be noted positively.

When you are planning for a competency-based interview, the questions will be more specific.

Be prepared to answer in-depth questions based on your past experiences. We have provided prompts that will help you answer these questions thoughtfully and thoroughly:

- Accomplishments that you are most proud of
- Situations you feel you have handled particularly well
- Ways in which you have contributed to the success of the business as a whole.

If the interviewer asks about your skills in the workplace, consider using the STAR method:

S – **situation**: What was the situation in which you found yourself?
T – **task**: What was the specific task that you had to achieve?
A – **action**: What action did you take?
R – **result:** What was the outcome of your action?

Step 2: Relax

Don't rush through your interview. Take your time to deliver the answers and information you've prepared for – remember, an interview is not an interrogation. You need to know about the job, the company and their expectations, but don't be afraid to ask your own questions. Example questions could be:
What opportunities are there for your career progression, promotion or travel?
What is the company's corporate social responsibility policy?

Accepting a job is a big commitment, so be sure that it is the correct position and employer for you.

Step 3: Finish on a positive note

It's all well and good if you make a good first impression and present yourself as a confident, relaxed candidate during your interview. But be sure to finish your interview on a strong note and leave your interviewers with a positive impression — clarify exactly what the next steps are:
Will they get back to you? If so, when?
Is it OK to follow up if you don't hear anything from them?

Don't leave the interview in a rush. Take the time to shake hands, thank them for their time and say goodbye properly. To follow up, it is smart to contact the interviewers the next day to thank them for their time and the opportunity. Manners cost nothing and will leave a good impression, but as a reminder, interviewers will not want to get drawn into conversations with individual job candidates after interviews.

Step 4: Take the results in your stride

If you are not successful and don't get the job, first things first: take a deep breath. It's not the end of the world. Treat the situation as a valuable learning experience and take full advantage of any feedback the interviewers offer. Even if they did not select you, their advice is invaluable and may just make the difference in your next interview. Don't forget to thank them for the opportunity

IMAGE: ISTOCK

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– you never know what opportunities may lie within that company in the future. Your interview could open doors to so many opportunities.

If you do get the job... well done! Now it's time to embrace the challenge and make your mark. BMS

CY Partners We are an independent recruiting consultancy focusing in the bioscience, pharmaceuticals and medical device fields. From entry-level to senior executive positions, we know how to find the right fit for you. Working closely with our clients, ranging from small entrepreneurial life science companies to large global corporations, we aim to increase performance by improving the efficiency and effectiveness of their recruitment processes. We use our wealth of industry-based experience, knowledge in the field and expertise to help our job seekers evaluate their career options, identify suitable positions and support them through the application process.
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TOP TIPS FROM THE CY PARTNERS TEAM

"Stay positive. Take everything with good grace and be open to new opportunities that the interviewer may provide you with."

Tom Kirkpatrick, pharmaceuticals

"Remember, an interview has two sides. You are finding out if you like the company as well as the company finding out if you are the right person for the job."

Anna Hastie, life sciences

"Make sure to contact the interviewers to thank them and get post-interview feedback – interviewers want to see candidates showing interest before they give their feedback."

Jack Rowan, QA/QC

"Know your CV inside and out – be prepared to be asked about anything and everything."

Graham Hankinson, chemistry

IBMS AGM: PRESTIGIOUS AWARDS AND PRIZES

The 75th annual general meeting of the IBMS took place in Aberdeen on 3 June. As well as the Council election results (see page 40), there were an array of awards and prizes. The awards were to recognise members' contributions and support to the Institute and the prizes awarded included Company Members Prizes.

AWARDS

50 Year Medal

This medal is awarded to members with half a century of continuous membership.

In recognition of his continuous membership and dedication to the Institute, an IBMS 50 year medal was awarded to John Hepworth.

John's career began at the Public Health Laboratory in Wakefield in 1966. Since then he has earned a reputation as an expert in microbiology, with his work being published in journals such as *The Lancet* and *Thorax*. John was involved in the founding of the IBMS North West Region in 1994, where he was elected branch secretary. He has since represented the region at Council and has organised meetings, symposia and today he organises publicity for his local branch. He was awarded Life Membership in 2013.

Honorary Membership

IBMS Honorary Membership is awarded to an individual who has shown an exceptional level of service to the IBMS at the branch or regional level.

While he was unable to be present at the AGM, the IBMS was pleased to note the awarding of IBMS Honorary Membership to Ronald Templeton.

Ronald joined the IBMS in 1959 when the IBMS was still the Institute of Medical Laboratory Technology. He acted as a CPD officer for the Institute and worked as a Senior Training Tutor and Lecturer at John Moores University in Liverpool, where his collaboration with Programme Leader Dr Janice Harland developed a 10-credit module called "Preparing for Work" which, combined with a one-year placement, led to what is today known as the coterminous/integrated degree used by universities around the UK. He also was a founding member of the Institute's microbiology discussion group.

Life Membership

IBMS Life Membership is awarded to formally recognise a person's considerable contribution and support to the Institute across a number of years.

The Institute was pleased to award Life Membership to members Betty Kyle and Dr David Petts.

Betty joined the IBMS as a Fellow in 1983 and became a Chartered Fellow in 2004. She has devoted years of service to the IBMS; as a Regional Council Member, as well as acting as a Specialist Diploma Examiner for Haematology and a Registration Portfolio Verifier. Today she works in the haematology department at Wishaw General Hospital, where she is the Strategic Lead Biomedical Scientist

for Haematology in Lanarkshire and the Lead Healthcare Scientist for Education in NHS Lanarkshire laboratories.

David joined the IBMS in 1961 and became an IBMS Fellow in 1967. He was an examiner for the IBMS Fellowship examination and acted as a portfolio assessor and acted as a member of the Joint Working Group on Quality Assurance for 10 years, before his retirement in 2005. Since then he has been working on building a new catalogue for the IBMS library's Mercer Collection, reorganising the library and archiving its historic collections, which are now housed at the Wellcome Trust. He is currently chair of the History Committee and the Medical Sciences Historical Society.

IBMS President Ian Sturdgess said: "These members have shown a passion for the field, skill and dedication to the Institute and profession. It is my pleasure to recognise their achievements today."

The Institute is delighted to recognise the achievements of these members at this year's AGM. For more information about these awards and the nomination process, see the IBMS website.

PRIZES

The Company Members Prize for the Higher Specialist Diploma (HSD)

Since 2007, this prize – a £250 cheque and a certificate – has been annually awarded to the candidates who in their first attempt receive the highest mark in each discipline of the Higher Specialist Diploma examination.

For their performance in the 2016 examinations, the following candidates were awarded the prize:

- Claire Birnie from Aberdeen Royal Infirmary for the Higher Specialist Diploma in Clinical Chemistry
- Joanne Raistrick from Wycombe Hospital in High Wycombe, for the Higher Specialist Diploma in Cytopathology
- Patricia Ryan from Wishaw General Hospital, for the Higher Specialist Diploma in Haematology
- Sarah Irene Griffin from Belfast City Hospital, for the Higher Specialist Diploma in Transfusion Science
- Tonya Bacon from Queen Elizabeth Hospital in Woolwich, for the Higher Specialist Diploma in Immunology.

While some members were unable to attend this year's AGM, the Institute wishes to note the awarding to:

- Poonam Singh from Charing Cross Hospital in London, for the Higher Specialist Diploma in Cellular Pathology
- Diana Jackson from Sheffield Teaching Hospital, for the Higher Specialist Diploma in Leadership and Management
- Matthew O'Dwyer from Queen Alexandra Hospital in Portsmouth, for the Higher Specialist Diploma in Medical Microbiology.

The IBMS congratulates all the winners and wishes them the best luck in future endeavours

The Company Members Prize in The Diploma of Expert Practice

This prize is awarded to the candidate who achieves the highest mark across all Diploma of Expert Practice qualifications.

This prize was awarded to Dr Jemma Wood from the Royal Devon and Exeter Hospital, who achieved the highest mark across all Diploma of Expert Practice qualifications in Histological Dissection.

The RJ Lavington Prize

This prize – a £500 cheque and a silver medal – was established in 1977 in memory of Richard Lavington, who was General Secretary of the Institute for 22 years.

This prize has been annually awarded to the candidate who at the first attempt receives the highest mark in the Higher Specialist Diploma examination across all disciplines.

This year's prize was awarded to Tonya Bacon who attained the Higher Specialist Diploma in Immunology. IBMS

MY IBMS NEWS

BRANCH NEWS

NEW IBMS SUSSEX BRANCH

After years of inactivity, the IBMS Sussex branch has been relaunched, giving the members in the region a voice.

A committee, comprising four IBMS members with differing biomedical science backgrounds, has been formed.

The branch hosted its first AGM in May at the Nuffield Health Haywards Heath Hospital.

The founders said they are "completely thrilled at the progress and support that the branch has received so far, not only from the IBMS but also the members".

It aims to provide members with the opportunity to network with other working professionals in various hospitals and companies within Sussex.

It also hopes to help members learn about how the IBMS can support professional development and it will host a range of activities and events, from walks to mini conferences.

→ Anyone interested in getting involved with the branch is asked to email sussexibms@gmail.com

ONCOLOGY RESEARCH

IBMS MEMBER AUTHORS PAPER

Histopathology staff from Great Ormond Street Hospital in London have published an influential article in *Lancet Oncology*.

The paper is about sequencing DNA from century-old tumour samples and has generated a lot of media interest.

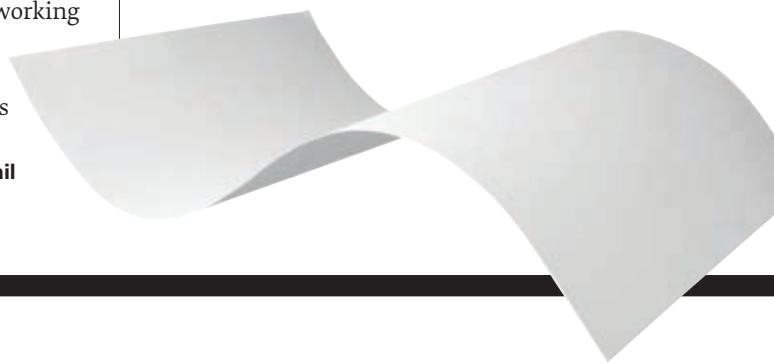
The work has been covered by *Nature News*, *the Guardian* and *BBC Radio 4*, among others.

Histopathology resercher Alexander K Virasami, an IBMS member, is the lead author of the paper.

The paper's summary states: "A major limitation in cancer genomics studies has been the scarcity of fresh-frozen tumour material.

"As massively parallel sequencing has evolved, sequencing of archival tumour material preserved as formalin-fixed paraffin-embedded tissue has become possible. The oldest tumour specimen sequenced to date was 32 years old."

→ To read the paper, visit bit.ly/LancetPaper



IBMS VACANCIES

Specialist Advisory Panel

The Institute of Biomedical Science's advisory panels are key to the success of many Institute initiatives.

Members of an advisory panel have the chance to undertake different roles, acquire new skills, develop their networks and be recognised by their peers for their professionalism and expertise.

The work includes:

- Organising the scientific programme for the IBMS Congress
- Working with Institute examiners on professional qualifications
- Representing the Institute on national committees
- Working in partnership with Institute standing committees and working groups.

There are eight advisory panels covering cellular pathology, clinical chemistry, cytopathology, haematology, immunology, medical microbiology, transfusion science and virology. We have at least one vacancy on each advisory panel.

Examiner for medical microbiology

The Institute is also seeking an examiner for medical microbiology. Our examiners have a crucial role in delivering the Higher Specialist Diploma (HSD). There are three examiners for each discipline who work together to set the HSD exam papers and mark the portfolios and exams for the HSD in their chosen discipline.

Person specification: essential

- Institute Member or Fellow
- Scientific or managerial

IMAGES: ISTOCK

IBMS ELECTIONS

COUNCIL ELECTION RESULTS ANNOUNCED

The results of the 2017 IBMS Council elections were announced by the President at the AGM in Aberdeen on 3 June 2017.

National

There were two national Council vacancies this year. Alison Geddis was elected President Elect, resulting in her national seat becoming vacant. Additionally, Joyce Overfield was due to retire at the close of the AGM.

Four candidates stood for election and Jane Harrison-Williams and Joyce Overfield were duly elected by ballot, and took office from the conclusion of the AGM and will serve for a term of three years.

Regional

Two regional members were due to retire at the close of the AGM – Jennifer Hancock (Wales) and Dr Jane Needham (South East). There was also a vacancy for the Council member for Yorkshire.

Nominations for the vacancies were received from Joanna Andrew (Yorkshire) and Dr Jane Needham (South East) who were duly elected regional members of Council, without the requirement for a ballot, and took office from the conclusion of the meeting for a term of two years (Yorkshire) and a term of three years (South East).

Two nominations for the Wales vacancy were received and Helen Archer was duly elected by ballot, and took office from the conclusion of the AGM and will serve for a term of three years.

→ **See pages 38-39 for the news from the AGM.**

experience in chosen specialty/discipline
- Evidence of liaison with professional and academic contacts
- Chartered Scientist or Senior Fellow of the Higher Education Academy.

Person specification: desirable

- Academic experience through employment or part-time lecturing
- Experience of setting, marking and monitoring professional exams
- Experience of facilitating or delivering training.

→ If you feel you meet the person specification, please send a copy of your CV (a maximum of two sides of A4) and a supporting letter from your manager to Chris Ward, IBMS Head of Examinations at: examinations@ibms.org The deadline for applications is 28 July 2017.

CHARITY CLIMB

Scientist scales solar system's tallest mountain

Jayanta Brahma, a biomedical scientist at Leeds, has climbed the height of Olympus Mons – a peak on Mars and the tallest mountain in the solar system.

He scaled a climbing wall over 5,000 times to reach the virtual summit at 22,000 metres high.

He undertook the challenge to raise money for the Brain Tumour Charity and hopes to hit £1,000.

The charity funds medical research, and gives support to those people affected by brain tumours.

Jayanta started the challenge in September 2016 and reached the summit at the end of May this year.

→ To donate to the cause, visit justgiving.com/fundraising/jayanta-brahma4

IBMS AFFILIATION

ANOTHER STUDENT SOCIETY JOINS

The University of Wolverhampton's biological society has joined the IBMS.

The Institute is pleased to welcome it as the 23rd student affiliate society.

This society will receive support, guidance and help in promoting their biomedical science events throughout the academic year.

→ For more information and the full list of benefits, visit ibms.org/about/affiliate-student-societies

NEW!

OsmoPRO

Multi-Sample Micro-Osmometer

OsmoPRO brings osmometry to the next level by offering a perfect balance of analytical performance, ease of use, and walkaway operation. It is ideally suited for mid to high volume laboratories that prefer to automate osmolality batch testing while improving laboratory efficiency, throughput, and workflow.

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Stem Cell Biology

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Biomedical Sciences

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MSc Stratified Medicine (eLearning, also available part-time)

Contact: T: +44(0)28 7012 4159 E: science@ulster.ac.uk

EVENTS AND TRAINING COURSES

A wide range of training courses, CPD and local events and activities is listed below. Members are advised to contact organisers for further information. A full list is available on the IBMS website.

DATE	TITLE	VENUE CONTACT
July		
4 Jul	**HPLC method development**	London I jsumner@hichrom.com
4 Jul	**Urinary cytology**	Bristol I swrctc@nbt.nhs.uk
5 Jul	**Train the trainer**	London | c.dsouza@westminster.ac.uk
6 Jul	**Northern autoimmunity education and quality assurance group**	Preston | fiona.nash@lthtr.nhs.uk
10 – 12 Jul	**BMS/cytoscreener update course 5**	London I nwlh-tr.lrctcbooking@nhs.net
10 – 13 Jul	**Identification of pathogenic fungi**	Bristol | michael.palmer@uhbristol.nhs.u
11 Jul	**Pharmaceutical data integrity**	Reading I jsumner@hichrom.com
12 Jul	**Cervical histology for technical staff 2017**	Bristol | swrctc@nbt.nhs.uk
18 Jul	**Update course in gynaecological cytology – review cases (2)**	Birmingham I amanda.lugg@bwnft.nhs.uk
20 – 21 Jul	**Getting the most from your confocal course**	York I karina@rms.org.uk
25 Jul	**Basic concepts of HPLC**	Loughborough I jsumner@hichrom.com
25 Jul	**HPLC/UHPLC column care and maintenance**	Loughborough I jsumner@hichrom.com
25 Jul	**HPLC instrument basics and troubleshooting**	Loughborough I jsumner@hichrom.com
August		
9 Aug	**UK NEQAS cellular pathology technique non-gynae cytology beginners/refresher workshop**	Gateshead I chantel.hodgson@ghnt.nhs.uk
10 Aug	**UK NEQAS cellular pathology technique non-gynae cytology intermediate workshop**	Gateshead I chantel.hodgson@ghnt.nhs.uk
16 Aug	**UK NEQAS cellular pathology technique special staining beginners/refresher workshop**	Newcastle I chantel.hodgson@ghnt.nhs.uk
17 Aug	**UK NEQAS cellular pathology technique specialist workshop B**	Newcastle I chantel.hodgson@ghnt.nhs.uk
September		
5 – 7 Sep	**Three-day update for cervical cytology**	Bristol I swrctc@nbt.nhs.uk
7 Sep	**UK NEQAS cellular pathology – immunocytochemistry staining beginners workshop**	Newcastle I chantel.hodgson@ghnt.nhs.uk
10 – 15 Sep	**Flow cytometry course 2-17**	York I karina@rms.org.uk
12 Sep	**POCT connectivity national networking forum**	Birmingham | nichola.cadwallader@sbk-events.co.uk
12 Sep	**One-day update course in thinprep gynaecological cytology evaluation of glandular cells in cervical samples**	Wakefield I kathryn.hawke@nhs.net
14 Sep	**Laboratory aspects of haemoglobinopathy diagnosis**	London I b.bain@imperial.ac.uk
15 Sep	**Morphology update 2017**	London I b.bain@imperial.ac.uk
20 Sep	**NHSCSP diploma assessors induction training course**	London I nwlh-tr.lrctcbooking@nhs.net
27 Sep	**One-day medic's update course for pathologists/APs 2**	London I nwlh-tr.lrctcbooking@nhs.net

October		
2 – 27 Oct	**Intro to gynaecological cytology (NHSCSP Diploma) 2**	London I nwlh-tr.lrctcbooking@nhs.net
4 Oct	**BSAC antimicrobial susceptibility testing user days**	York | ecarruthers@bsac.org.uk
5 Oct	**Superficially porous (core shell)**	Reading I jsumner@hichrom.com
5 Oct	**Techniques for biomolecule characterisation**	Reading I jsumner@hichrom.com
11 Oct	**Exploring eluent pH in method development**	Manchester I jsumner@hichrom.com
11 Oct	**Method development strategies to exploit selectivity**	Manchester I jsumner@hichrom.com
11 Oct	**Step-by-step hilic method development**	Manchester I jsumner@hichrom.com
12 Oct	**HPLC/UHPL troubleshooting**	Manchester I jsumner@hichrom.com
13 Oct	**HPLC method development**	Manchester I jsumner@hichrom.com
13 Oct	**HPLC method development**	Manchester I jsumner@hichrom.com
14 Oct – 27 Jan	**Biomed advanced human genetics course 2**	Online I biomed@gre.ac.uk I 020 8331 9978
14 Oct – 27 Jan	**Biomed analysis of nucleic acids course 2**	Online I biomed@gre.ac.uk I 020 8331 9978
14 Oct – 27 Jan	**Biomed blood transfusion course 2**	Online I biomed@gre.ac.uk I 020 8331 9978
14 Oct – 27 Jan	**Biomed chromatography-mass spectrometry analysis in healthcare settings course**	Online I biomed@gre.ac.uk I 020 8331 9978
14 Oct – 27 Jan	**Biomed clinical data interpretation course 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed diagnosis of breast cancer course 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed governance and risk management 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed implementing advanced quality management 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed lung disease 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed management of healthcare-associated infection 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed managing learning and development in healthcare 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed point of care testing 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed quality systems management 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed renal disease 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed robotics and automation 2**	Greenwich I biomed@gre.ac.uk
14 Oct – 27 Jan	**Biomed immunocytochemistry in diagnostic cellular pathology**	Online I biomed@gre.ac.uk
14 Oct – 27 Jan	**Choice of online courses: email for information**	Online | biomed@gre.ac.uk
17 Oct	**Stepwise introduction to practical HPLC part 1**	Manchester I jsumner@hichrom.com
19 Oct	**The technique of GC in three parts: 1. fundamentals 2. troubleshooting 3. method development**	Loughborough I jsumner@hichrom.com
31 Oct	**UK NEQAS CPT annual participants meeting**	Edinburgh I cpt@ukneqascpt.org.uk
November		
07 Nov	**HPL/UHPLC column care and maintenance biocity Scotland**	Newhouse | jsumner@hichrom.com
07 Nov	**Basic concepts of HPLC biocity Scotland**	Newhouse | jsumner@hichrom.com
14 Nov	**FNA cytology**	Bristol | SWRCTC@nbt.nhs.uk
14 Nov	**Big molecules – big challenges II**	Holiday Inn J10 M4 | jsumner@hichrom.com
15 Nov	**Northern autoimmunity education and quality assurance group**	Hull | fiona.nash@lthtr.nhs.uk
27 Nov	**Non-gynaecological urine cytology for biomedical scientists**	Wakefield I kathryn.hawke@nhs.net
21 – 23 Nov	**BMS/cytoscreener update 7**	London I nwlh-tr.lrctcbooking@nhs.net
December		
5 – 7 Dec	**Three-day update for cervical cytology**	Bristol | swrctc@nbt.nhs.uk
6 – 7 Dec	**Update in cervical cytology**	Edinburgh | fiona.mcqueen@nhslothian.scot.nhs.uk
12 – 14 Dec	**BMS/cytoscreener update 8**	London I nwlh-tr.lrctcbooking@nhs.net

JOURNAL-BASED LEARNING EXERCISES

Each article's contents should be read, researched and understood, and you should then come to a decision on each question. The pass mark is 17 out of 20 questions answered correctly. JBL exercises may be completed at any time until the published deadline date. Please select your choice of correct answers and complete the exercises online at: **ibms.org/go/practice-development/cpd/jbl**

DEADLINE WEDNESDAY 4 OCTOBER 2017

Toxicology in clinical laboratories: challenging times.
Brown NW. *Br J Biomed Sci* 2017 (Epub ahead of print). Assessment No: 070317

01	The EMCDDA reports the most widely abused drug to be cocaine.
02	Synthetic cannabinoids are the most numerous NPS in Europe.
03	Legal high (NPS) use is not associated with significant adverse effects.
04	Cannabis strength has remained constant over the last few years.
05	Synthetic cannabinoid use can be detected using cannabis drug screening methods.
06	Phenazepam is primarily detected in the urine as its demethylated metabolite.
07	Euphoria is a known side effect of pregabalin.
08	The number of admissions for alcohol-related disease has almost doubled in 10 years.
09	CDT can be used to detect binge drinking.
10	It is impossible to adulterate an oral fluid sample.
11	Clinical cut offs are clearly defined.
12	Immunoassay drug screening methods can be used to detect NPS.
13	Buprenorphine is always present in the urine of persons regularly taking the drug.
14	Nefopam is known to give false-positive opiate screen results.
15	GC cannot be used to screen for thermally labile drugs.
16	In-source fragmentation when using LC-MS/MS is not a significant problem in toxicology.
17	Deuterium loss from internal standards may be a serious issue.
18	LC-high resolution MS requires careful use when identifying drugs and metabolites.
19	ISO 15189 is acceptable for forensic toxicology.
20	Amphetamine half-life in the body is decreased with acidic urine.

Chronic mucocutaneous candidiasis disease associated with inborn errors of IL-17 immunity. Okada S, Puel A, Casanova JL, Kobayashi M. *Clin Transl Immunology* 2016; **5** (12): e114. doi:10.1038/cti.2016.71 Assessment No: 070517

01	The Janus kinase inhibitor, ruxolitinib, has been trialled in two patients with GOF-*STAT1* mutations, leading to improvement of chronic mucocutaneous candidiasis (CMC) and autoimmune syndrome, but with significant adverse effects.
02	The IL-17 receptor family consists of four members (IL-17RA, IL-17RB, IL-17RC and IL-17).
03	In 2009, a primary immunodeficiency, which associates with a genetic defect of CARD9, was identified in the patients who suffer from CMC and invasive fungal infections.
04	Chronic mucocutaneous candidiasis is characterised by recurrent or persistent infections affecting the nails, skin, and oral and genital mucosae, caused by *Candida* spp., often *C. albicans*.
05	Most patients with CMC disease (CMCD) are treated with topical and/or systemic antifungal agents.
06	Hyper IgE syndrome (HIES) has either a dominant or recessive pattern of autosomal inheritance, with the rare autosomal-recessive (AR) HIES largely shown to be caused by mutations in *DOCK8*.
07	There are several reports describing increased frequency of circulating IL-17-producing cells in CARD9-deficient patients, probably explaining the clinical phenotype of CMC.
08	Neutrophils from CARD9-deficient patients show a selective *C. albicans*-killing defect that is CR3- and CARD9-independent, but NADPH oxidase-dependent.
09	Patients with APECED produce neutralising autoantibodies against IL-17A, IL-17F and/or IL-22, leading to development of CMC.
10	Hyper IgE syndrome is a primary immunodeficiency disease, is characterised by elevated serum IgE levels, recurrent staphylococcal skin abscesses, eczema and pulmonary infections.
11	Peripheral blood mononuclear cells from autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED) patients with CMC show decreased IL-17F and IL-22 secretion *in vitro*.
12	RORγT is a master transcription factor of Th17 cells.
13	Patients with AR-complete IL-12p40 or IL-12Rβ1 deficiencies show decreased frequencies of circulating IL-17-producing cells, albeit a less severe reduction than observed in patients with autosomal-dominant (AD) HIES.
14	There is some controversy regarding the frequency of circulating IL-17-producing cells in CARD9-deficient patients.
15	STAT3-deficient patients frequently develop CMC associated with other infectious and clinical manifestations.
16	The *STAT3* mutations identified in AD HIES patients are gain-of-function (GOF) and exert a dominant positive effect on wild-type STAT3-mediated signalling.
17	The first patient reported with AR IL-17RA deficiency was born to consanguineous Argentinian parents.
18	The first case of AR-complete IL-12p40 deficiency was identified in 1998 in a patient born to consanguineous parents who developed disseminated infection with BCG and *S. enteritidis*.
19	APECED, also called APS-1 syndrome, is an autosomal-dominant inherited disorder caused by bi-allelic mutations in *AIRE*.
20	ACT1 also has an inhibitory role in B-cell survival by upregulating CD40 and B-cell-activating factor receptor through interaction with TRAF3.

REFLECTIVE LEARNING

01	You are required to re-establish your laboratory's toxicology service following the retirement of the previous postholder. Given that the analytical workload is 1200 samples a month, what techniques will you use to perform the analyses, and why?	01	Review the pathways of inborn errors of IL-17 immunity and outline the mutations which give rise to a compromised immune system.
02	Discuss ion suppression, in-source fragmentation and isobaric interference in MS-based assays.	02	Discuss the role of IL-17 in mucocutaneous immunity to *Candida* in humans.

HERE TO HELP

APPRENTICESHIPS – CURRENT DEVELOPMENTS

IBMS Executive Head of Education **Alan Wainwright** reports on apprenticeships, after attending a number of events for the IBMS.

Barts Health NHS Trust held a launch event in May and outlined key aspects of level 2, 4 and 6 apprenticeships. Highlighting the new levy on employers that was replacing government funding, pressure was clearly on to use the levy. Key points to emerge were:

- Apprenticeships must be employed (12 months minimum, 30 hours a week)
- 20% of the job must be training
- Apprenticeship standards define the job role at the end of the apprenticeship
- AHPs and nurses are not ready to go in September 2017
- For biomedical scientists, current IBMS-accredited degrees and completion of the IBMS registration training portfolio could be used in conjunction with the End-Point Assessment (EPA) to demonstrate achievement of the level 6 standard
- The EPA would introduce another layer of training and assessment, which is an additional cost to the employer and as it is an "add-on" there is a risk to recovering the levy if the student fails to complete it
- Apprenticeship standards are not automatically recognised by the HCPC as giving eligibility for statutory registration.

A meeting of AHP Education Leads in June explored aspects of degree apprenticeships, not least the role of the HCPC and the need for any new apprenticeship programme to be approved and major changes to existing programmes to be assessed before apprenticeships can start their training.

From an HCPC perspective, standards of education and training (SETs) are designed to be flexible and can be applied to a variety of training models. Education providers will need to demonstrate how their apprenticeship programme meets the SETs. Standards affected may be:

- Admission standards, especially those around professional entry, accreditation of prior (experiential) learning, and equality and diversity – impacted by changes to admissions for widening access to the programme
- Assessment and management standards – likely to be impacted as the EPA for apprenticeships is embedded within the programme (in the case of integrated apprenticeship degrees)
- Curriculum and assessment, programme management and practice placement standards – impacted by changes to teaching and assessment methods.

The discussion was wide-ranging and a number of concerns were raised demonstrating the high degree of uncertainty and concern for maintaining professional standards.

Outcomes for the meeting identified the need to:

- Pursue HCPC engagement
- Assert the importance of professional body accreditation (or equivalent) role
- Ensure a level 6 degree qualification is embedded within all entry route apprenticeship standards for the professions
- Consider the merits of the EPA being integrated into degree apprenticeships and promoting this, including as a way of ensuring that the apprenticeship degree can be considered as a complete package and as a way of achieving alignment between graduation, certification of successful completion and registration
- Explore further how our respective established approaches to accreditation form the starting point for considering degree apprenticeships, and what additional facets would need to be included to capture key aspects of employer with a view to identifying an outline model/key principles.

The Institute will continue to engage with employers, HEIs and other professional bodies to seek greater clarity on the apprenticeship schemes offered at levels 2, 4 and 6 but also recognises that its strength lies in the variety of routes available to HCPC registration (integrated and non-integrated degrees) and its established standards for laboratory approval for pre-registration training which could form the basis for delivering apprenticeship degrees if these are a viable option. IBMS

IMAGE: ISTOCK

Biomedical Scientist – Multidiscipline BMS (Ref: IRC10361)

Full Time – 37.5 hours per week, fixed term for up to 12 months
Band 5 – Salary Range £22,440 - £29,034 per annum
Band 6 - Salary Range £26,830 - £35,933 per annum
Relocation assistance of up to £4,000
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Want to hone your multi-discipline skills and in an amazing place? Want to work overseas but need to get multi-discipline skills before you go? As part of Northern Isles Laboratory, we provide a routine service to the main hospital and to primary care for the whole of Shetland.

Learn to be self reliant, converse with clinicians and really make a difference to clinical care; whilst gaining skills that are sought after world-wide. The role requires participation in on-call and weekend rosters so you will be trained in all areas of the laboratory. This contract is for a fixed-term for up to 12 months to allow for ongoing workforce planning and review of establishment.

Shetland offers low pollution, low crime, excellent schools, great leisure facilities, unique wildlife & amazing scenery, whilst still only a short flight away from the UK mainland. More about living & working in Shetland: www.shetland.org

For an informal chat about this role contact Dawn Smith, Deputy Laboratory Manager on 01595 743041 or email dawnsmith10@nhs.net

Closing date for application is 31st July 2017 and interviews will take place in Shetland on 16th August 2017.

Please apply via the following e:ESS website link:- www.jobs.nhsscotland.com

In promoting equal opportunities, we welcome applications from all sections of the community.

HEALTH SERVICES LABORATORIES

QUALITY MANAGER - FULL TIME

An exciting opportunity has arisen to appoint **three Quality Managers** who can lead and monitor quality aspect within our state of the art flagship laboratories at the Halo building, central London. The post holder(s) will be working with the Operational team and quality leads of other disciplines to deliver the quality policies and objectives at HSL. The new posts will cover the following disciplines; **Biochemistry**, **Haematology** and **Microbiology**.

Applicants will have post graduate qualifications in Biomedical or Life Sciences and have significant experience of working in a clinical laboratory as well as knowledge and experience of laboratory accreditations.

For further information please contact Jacqueline Sutherland - **jacqueline.sutherland@hslpathology.com**

Closing Deadline: Sunday 16th July 2017

THE DOCTORS LABORATORY

CAREER OPPORTUNITIES WITH TDL

The Doctors Laboratory is looking for ambitious, highly motivated, talented Biomedical Scientists to join our teams who are based in regional laboratories across the UK.

Our regional laboratories offer a multidiscipline working experience and include the operation of various analysers, including the Roche COBAS lines for biochemistry and Sysmex platforms for haematology and coagulation. Additionally many of the laboratories provide hub and spoke blood transfusion services to surrounding hospitals using Bio-Rad instrumentation and remote issue. Whilst specialist experience in a particular discipline is desirable, this is an opportunity to further your education and experience in a multi-disciplined environment.

We have Group wide IBMS training approval for both pre and post registration training. Staff development is well supported across our services with regular CPD programmes and strong links with our national Education and Training Faculty. The training officers work closely with our Head of Scientific Training in designing and having oversight of programmes for local staff.

Contact Regional Manager Kelly Thwaite **kelly.thwaite@tdlpathology.com** for further details or apply at **www.tdlpathology.com** to complete an application form.

BMI Blackheath (South East London)
Haematology Senior BMS / Training Lead *(Ref: BHSNR2514)*
Biomedical Scientists *(Ref: BHBMS2520)*
Bank Medical Laboratory Assistant *(Ref: BHBMLA2549)*

Ramsay Rivers (Hertfordshire)
Biomedical Scientist - Maternity Cover *(Ref:RRIV2540)*

Hospital of St John and St Elizabeth (London)
Biomedical Scientist / Quality Lead - Maternity Cover *(Ref: HJE2529)*

BMI London Independent Hospital (East London)
Transfusion Lead Biomedical Scientist *(Ref: LIH2550)*

Closing Date: **16th July 2017**

The closing date may be earlier where there is high interest.

TDL is a committed equal opportunities employer and does not unlawfully discriminate on the basis of any status or condition protected by applicable UK employment law.

Due to continued success and to support plans for growth, a leading life sciences company is eager to appoint a number of talented individuals into R&D. Based in a state of the art facility in Newcastle upon Tyne, our client offers attractive salary packages, generous holiday allowances, and benefits including pension and medical insurance.

The following positions are now available:

Senior Scientist

This is a unique opportunity to:

- Provide technical leadership on projects
- Develop new and novel IVD assays
- Complete projects efficiently and within budget

Applicants must hold a degree (or equivalent) in Biomedical/Biological science & have proven exposure and understanding of histopathology and immunohistochemistry principles. You must be legally entitled to work in the UK.

Scientist

This position will involve:

- Product planning/design
- Microscopic slide examination
- Interpreting antibody/probe staining (primarily on formalin-fixed paraffin embedded tissue where required)
- Participation in technical support and customer complaint investigations

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To apply please forward your CV and cover letter to thomas.kirkpatrick@cypartners.co.uk or call 0191 477 4733 for further information.

REC CY Partners is an employment business/agency

MANCHESTER 1824 The University of Manchester

EPSRC Engineering and Physical Sciences Research Council

MRC Medical Research Council

MSc / PGCert / PGDip Molecular Pathology (part time)

Our flexible Molecular Pathology MSc course will enable you to take advantage of growing opportunities within this field, which is critically important for translational medicine.

You will benefit from:

- unique focus on the molecular analysis of tissue samples
- optional units in innovative diagnostic modalities such as proteomics and chemical pathology, digital pathology
- being part of Manchester's world-leading precision medicine research community

We have designed this course to meet the training requirements of biomedical scientists, clinical scientists and trainee histopathologists and the option to take the course over four years will particularly appeal to specialist trainee pathologists, who will be able to fit study around their clinical training and undertake the research project as the research component of their training.

Please direct informal enquiries to Dr Richard Byers, Programme Director: **Richard.Byers@cmft.nhs.uk**

Please find further details, including how to apply, here: **www.manchester.ac.uk/study/masters/courses/list/10418/msc-molecular-pathology/**

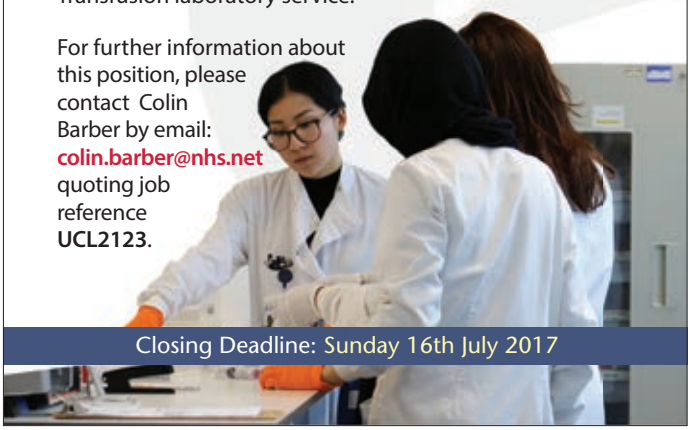
HEALTH SERVICES LABORATORIES

BIOMEDICAL SCIENTIST – BLOOD TRANSFUSION

Applications are invited from experienced Specialist Biomedical Scientist wishing to join our busy Blood Transfusion Department located in Central London.

Consideration will be given to HCPC registered band 5 BMS's who are under taking their specialist portfolio. The department provides a service to UCLH Trust which has a wide range of Clinical services. Duties include performing routine analyses to support a 24/7 Blood Transfusion laboratory service.

For further information about this position, please contact Colin Barber by email: colin.barber@nhs.net quoting job reference **UCL2123**.



Closing Deadline: Sunday 16th July 2017

TDL MANCHESTER OPPORTUNITIES

The Doctors Laboratory is continuing to expand its northern hub facility in Manchester and is looking for highly motivated, talented Biomedical Scientists to join the team. Our laboratory is based in the fast developing Salford Quays, now home to Media-City.

Working as part of a dynamic multi-disciplinary team, duties will include the operation of a range of analytical platforms, including Roche COBAS lines for biochemistry, Sysmex platforms for haematology and coagulation and HPLC techniques. Our virology service, expanded under national recommendations for sexual health screening utilises PCR and nucleic acid amplification platforms. Additionally, the laboratory provides a hub and spoke blood transfusion service to surrounding hospitals using Bio-Rad instrumentation and remote issue.

Our Manchester laboratory has IBMS training approval for both pre and post registration training. Staff development is well supported across our services with regular CPD programmes and strong links with our national Education and Training Faculty. The training officers work closely with our Head of Scientific Training in designing and having oversight of programmes for local staff. Training officers are developed within the role of the trainer, for example undertaking the IBMS certificate of expert practice in training.

If you are motivated, enthusiastic and want to find out more about your career development, please contact the Operational Manager Shilla Mutamba by email: **shilla.mutamba@tdlpathology.com**. Or visit the **www.tdlpathology.com** to complete an application form.

Haematology Senior BMS / Training Officer *(Ref: SQSNR2516)*
Biomedical Scientists *(Ref: SQ2347)*
Medical Laboratory Assistants *(Ref: SQ2517)*

Closing Date: **16th July 2017**

The closing date may be earlier where there is high interest.

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Department Manager (BMS 4) Clinical Chemistry/Haematology

NHS Forth Valley

Full-time 37.5 hours per week, Permanent

Band 8b, £47,562 - £58,799 per annum

Ref No: 17050354

NHS Forth Valley seeks to appoint an enthusiastic and innovative Biomedical Scientist colleague to lead the Haematology, Blood Transfusion and Clinical Chemistry Departments. You must be suitably qualified, experienced and Health and Care Professions Council registered. This is a replacement post that has arisen through retirement.

Forth Valley Royal Hospital is located very centrally between Scotland's two largest cities, approximately 30 minutes from Glasgow and 45 minutes from Edinburgh by car or train. Their respective airports are little over half an hour from most parts of Forth Valley and road and rail links are excellent.

The post holder is responsible for the delivery and development of haematology, biochemistry and blood transfusion services to the acute hospital, community hospitals and to general practice.

A direct ordering system is in place for primary and secondary care and we are currently implementing new laboratory equipment which will provide end to end automation within the Blood Sciences area.

You must have a M.Sc. qualification and/or Fellowship of the Institute of Biomedical Science with experience as a Biomedical Scientist, leading a team in an NHS Blood Science Laboratory. A management qualification would be desirable and evidence of active participation in Continuing Professional Development is required.

For further details please contact Sheila Kowalczyk, Laboratory Manager on 01324 566767. Visits to the department are encouraged.

NHS Forth Valley is an equal opportunities employer.

The duties of this post require the successful candidate to complete a Standard Police Act Disclosure Scotland Check.

Application forms and job descriptions are available on the NHS Forth Valley Intranet site or by visiting www.show.scot.nhs.uk. Alternatively by quoting relevant post title and reference number and e-mailing FV-UHB. Recruitment@nhs.net or by telephoning the recruitment answerline on 01786 447488.

Please note, if we have not contacted you within 6 weeks of the post closing, please assume your application has been unsuccessful on this occasion.

Closing date: Monday 17th July 2017 at 12 noon.

For further information on NHS Forth Valley please visit our website where you will find copies of our Healthcare Strategy and Annual Review. www.nhsforthvalley.com.

NHS Forth Valley Board aims to improve health and healthcare for the people of Forth Valley. In recent years we celebrated the opening of the new Forth Valley Royal Hospital and we are now embarking on a new and exciting chapter of quality improvement as we continue to design and deliver healthcare services fit for the future, with the launch of our new Healthcare Strategy.

INVESTORS IN PEOPLE

MY LAB

IMMUNOCYTOCHEMISTRY AND MOLECULAR PATHOLOGY

Sharon Forrest, Immunocytochemistry and Molecular Pathology Services Manager, gives a tour of her lab at the Royal Liverpool University Hospital.

Liverpool Clinical Laboratories (LCL) is one of the largest providers of pathology services in the North West, jointly owned by Royal Liverpool and Broadgreen University Hospitals NHS Trust and Aintree University Hospital NHS Foundation Trust.

Our vision is to pioneer new technologies and ways of working that better inform decisions about a person's health, by providing greater accessibility to clinical diagnostic services. We employ over 550 staff across four locations, providing services 24 hours a day and process in excess of 15 million tests each year.

My immunocytochemistry and molecular pathology lab is based in the Royal Liverpool University Hospital, which is one of the largest and busiest hospital trusts in the North West. The majority of our work includes the investigation of breast pathology, GI and hepatobiliary malignancies, renal native and transplant services, head and neck tumours, a sarcoma service, a dermatopathology service, a gynaecologic sample service and urology and ophthalmic services.

We also provide a number of regional testing services, the haematological oncology diagnostic service and the thoracic service certainly ensure that we never have a dull day.

The immunocytochemistry service stains in excess of 100,000 slides per annum and has a repertoire of approximately 200 different primary antibodies. Staining is largely delivered using automated platforms although immunofluorescence staining on renal and skin biopsy samples is still conducted as a manual technique.

We use chromogenic in situ hybridisation technologies for the identification of EBV and HPV and the service was one of the first labs in the UK to offer a PD-L1 testing protocol as a guide to the use of new generation immune modulating drugs in the treatment of lung cancer and we are very proud of this achievement.

Our molecular pathology service offers a range of nucleic acid-based tests to aid in the diagnosis and management of patients with solid and haematological tumours and we use paraffin wax tissue scrolls and blood samples to perform PCR-based fragment analysis to detect TCR/IgH gene rearrangements in B and T-cell neoplasms and in coeliac disease. We use RT-PCR to detect EGFR gene mutation in non-small cell lung cancer (NSCLC) and use immunocytochemistry and fluorescence in situ hybridisation (FISH) to detect genetic aberrations in NSCLC, breast cancer and synovial sarcoma.

The lab also participates in the 100K Genomes Project, as part of the NW Coast Genomics Medicine Centre performing DNA extraction on blood and tissue samples from cancer patients for whole genome sequencing.

Although life in such a busy city centre laboratory can be challenging, my team is always ready to rise to the challenge and play their part in ensuring that Liverpool is seen as a world class centre for science and innovation. BMS

Sharon Forrest will be at speaking at the IBMS Congress on Monday 25 September. Her talk is called "Calamity Stains" and is about how to troubleshoot when histological stains go wrong.

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