LabMedNews

Association for Laboratory Medicine

APRIL 2024

- LabMedUK24 programme and conference information
- Nominations open for our next leaders
- Volunteering opportunities – Global Health Workforce Programme
- Learning Academy – help to develop content required
- Standardising Lp(a) measurement in the UK
- The carbon footprint of information and communication technology
- Clinical metabolomics for the diagnosis of IMD
- Microbiology Society Divisions Day

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Association for Laboratory Medicine

LabMed News ISSN 3033-3814

CEO AND PRESIDENT UPDATE

Welcome to the April edition of *LabMed News*! It is exciting to see the bookings coming through for LabMedUK24 as we start the run-in to our annual scientific meeting from 10-12 June in Brighton. It will be a great opportunity for you to showcase the work that you have been doing over the year and we would encourage you to submit your abstracts, cases and audits, and to join us for what promises to be a fantastic scientific programme. More highlights on the programme can be found in this issue. Bookings have also opened for our ever popular Leadership and Management residential course being held at Christ Church University in Canterbury from August 19-23.

Look out for the article regarding the THET-funded project we are working to develop in collaboration with the Royal College of Pathologists. The project secured THET (the Tropical Health and Education Trust) funding to improve the quality of chemical pathology training in Ghana, Kenya and Nigeria. We are looking for interested members to develop material for planned virtual CPD sessions and case sessions on a variety of subjects from lipids to laboratory process audits. Details on how to get involved in this worthwhile activity can be found at the end of the article.

Following work that we have been doing with the task and finish group on membership engagement, we would encourage all members to get involved in the activities of the Association. Visit the Get Involved pages of the website to find out about current opportunities including Honorary Officer roles within LabMed covering a number of different functions. We are also promoting the opportunities for the Federation of Clinical Scientists (FCS) representatives with training days arranged for May, September and November 2024 to support and develop any members interested in taking on one of these essential roles.

We have been working with all of the regional committees of the Association to harmonise our policies and funding opportunities for bursaries, awards and regional meetings to ensure equity of access for all of our members. We thank all those members of regional committees who have worked with us to bring these together. We're delighted to be offering up to 30 regional bursaries in 2024 through a simplified application form online.

This year marks the 20th anniversary of the launch of LabTestsOnline UK which continues to attract ever increasing numbers of patients and healthcare professionals each month to this fantastic resource. We look forward to celebrating this achievement at LabMedUK24 in Brighton. We are also looking for new Associate Editors and would love to hear from any members who are interested in developing, reviewing and writing content.

For clinical and scientific updates, the Lp(a) taskforce report is published this month. From a much earlier time, look out for the fascinating article 'Looking back at… Clinical Biochemistry in the 1950s', a brilliant reminder that Laboratory Medicine has been around since the inception of the NHS.

Finally, we would like to introduce and thank our new strategic partner, Roche Diagnostics, and we look forward to developing our relationship with them over the next year.

VICTORIA LOGAN Chief Executive
KATH HAYDEN President

EARLY BIRD DISCOUNT AVAILABLE UNTIL 12 APRIL

LabMedUK24

Brighton 10–12 June

Join us at the DoubleTree by Hilton Brighton Metropole for an exciting programme that covers big picture thinking, new science and updates on key areas such as Paediatrics, Faecal testing, home testing and AI.

We also have a number of social events including:

MONDAY 10 JUNE

Welcome drinks at Brighton Music Hall

TUESDAY 11 JUNE

Beach clean and Conference dinner at the Brighton i360

MONDAY 10 JUNE

- Clinical Biochemistry Training Day
- Microbiology Training Day

The morning sessions will be combined and run as an interactive workshop, splitting off into specialised afternoon sessions featuring a series of talks during the microbiology afternoon and further workshops for the biochemistry session.

TUESDAY 11 JUNE & WEDNESDAY 12 JUNE

Join us for two days of high quality science comprising four plenary sessions and ten parallel symposia.

Industry Sponsored Workshops will add variety to the lunchtime breaks alongside the popular poster presentations where you can chat with the authors.

CPD ACCREDITED BY ROYAL COLLEGE OF PATHOLOGISTS FOR UP TO 11 POINTS

Find out more at
labmed.org.uk/LabMedUK24

Association for Laboratory Medicine

NOMINATIONS OPEN FOR OUR NEXT LEADERS

Crucial roles for the Association are now available for members who are ready to step up as leaders and join our Council, on which they will shape the future of our organisation. We welcome all members to put themselves forward for nomination for the roles below.

In accordance with the provision of Articles 11 and 14 and the Association Bye-Laws subsection 6.2, we give notice that all Honorary Officers have expressed their wish to remain in their posts for the coming year, with the exception of the **Director of Education, Training and Workforce** (whose term ends at this upcoming AGM) and the **Director of Regulatory Affairs/FCS Chair**. We also give notice that a **National Member** position will become available for appointment at the Annual General Meeting on 12 June 2024.

The nominations processes for our next **Director of Education, Training and Workforce, Director of Regulatory Affairs/FCS Chair** and a **National Member** has now been launched and more information is available on our website. The nominations form can be found on page 50 of this issue. Completed forms should be sent by email to mike@labmed.org.uk in the first instance by the deadline of 26 April 2024.

ARE YOU INTERESTED IN JOINING THE *LABMED NEWS* TEAM?

We are looking for members to join our small and friendly LabMed News team as Associate Editors.

The main roles include:

- proof-reading articles
- working with authors to provide guidance
- organising meeting reports
- liaising with other groups (e.g. LabMedUK, LTOL-UK, FCS, Green Champions, EDI Working Group)
- helping us to champion LabMed values of inclusion, sustainability and innovation
- participating in, and contributing ideas to, LabMed News Board meetings, held bimonthly via Teams

Attention to detail and working to strict deadlines are essential. People from across the UK and Ireland, in all specialties and career stages, are welcome to get in touch.

For further information and/or an informal chat, please contact: Gina Frederick, Lead Editor, *LabMed News* and Clinical Biochemist at Royal Derby Hospital. Tel: 01332-789407
E-mail: gina.frederick1@nhs.net

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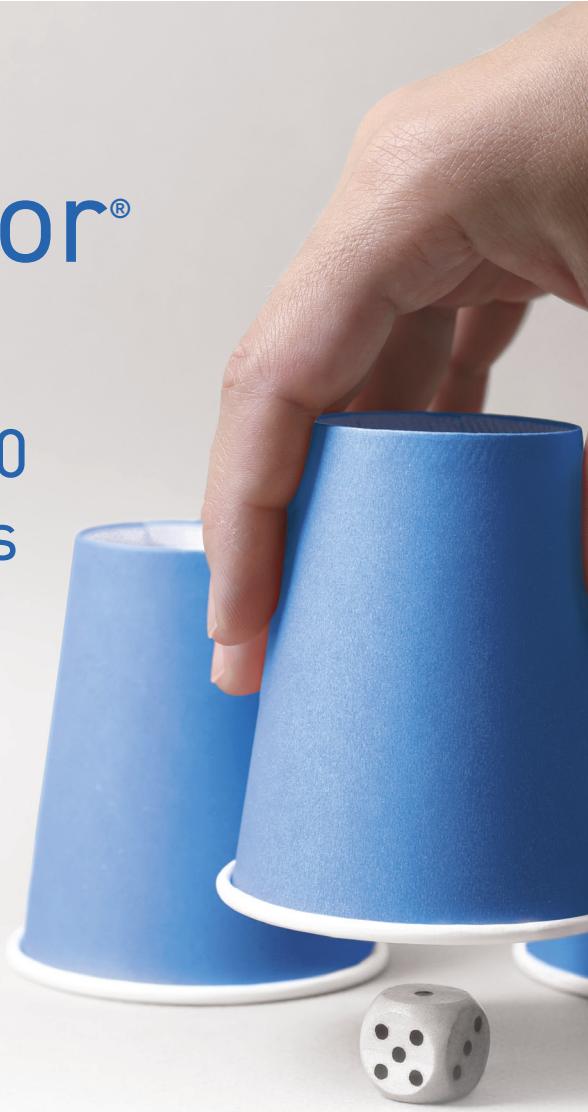

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BURSARY APPLICATIONS OPEN

Education bursaries are an important benefit of membership of the Association, allowing us to support members to attend scientific meetings or specialist training courses. We now have a simpler, standard application form.

Regional education bursaries

Regional education bursaries (of up to £500) are awarded by the relevant regional committee and can be used to cover whole or in part expenses for travel, registration and anything that enables access, for example, additional caring costs associated with attending a meeting. The bursary can be used in conjunction with other funding sources including the Association national education bursaries. For example an applicant can apply to a regional bursary to cover registration fees and the national bursary to cover travel costs.

National education bursaries

National education bursaries (of up to £500) are awarded by the Education and Training Committee and should be applied for when you have applied for a regional bursary and not been successful or need additional funding.

You can apply if:

- you have been a member of the Association for at least 12 months
- the event is in the future (retrospective applications are not considered)
- you agree to write a summary of the meeting or course attended for the Association for publication.

For further information and to apply for a bursary, please visit our website.

BOOK NOW FOR REGIONAL EVENTS

April and May are busy with regional events as follows:

22 April: LabMed South West and Wessex Scientific Meeting, Taunton

22 April: LabMed Southern and UK NEQAS Clinical Chemistry Meeting, RCPath

25 April: LabMed Trent Northern and Yorkshire Regional Audit Day, MS Teams

1 May: LabMed Wales Scientific Meeting, Cwmbran

22 May: LabMed North West Ian Ward Meeting, Liverpool

Please take the time to support your regional meetings, especially the in person events which provide a great chance to network and catch up with colleagues face-to-face. All regional meetings are now provided to members free of charge and online meetings are available to members nationally.

The LabMed Management and Leadership Course has now also opened for booking and will be running 19-23 August at Canterbury Christchurch University.

Full details on all our events can be found here.

AQMLM

Association for Quality Management in Laboratory Medicine

www.aqmlm.org.uk

AQMLM is celebrating 15 years of its educational activities with a 2-day Conference on 3rd & 4th July at the Edgbaston Park Hotel in Birmingham.

The Conference comprises two days of presentations from expert speakers, with posters and presentations from attendees. There is a Reception and Dinner with live entertainment on the evening of the first day.

AQMLM subscribing members pay discounted rates! You may combine annual membership with Conference registration to benefit from this! Those accepted for posters or presentations receive further discounts!

Principal Speakers & Topics

Dr Jonathan Middle	AQMLM, an historical perspective
Mr Nigel Coles	Quality Management in Genomic Services
Dr Katy Heaney	Quality monitoring in POCT services
Dr Rachel Marrington	EQA in laboratory medicine and the laboratory's role in ensuring quality
Prof Jonathan Kay	Informatics and Artificial Intelligence
Dr Bill Bartlett	Biological Variation. Delivering Reference Data for Quality Applications
Prof Brian Keevil	Mass Spectrometry in Laboratory Medicine
Ms Doris-Ann Williams	IVD Manufacturers' Support for Quality Management

Full event details and the registration form are here: https://www.wpnew.aqmlm.org.uk/forthcoming-events or you may scan the QR code.

Please email us at mail@aqmlm.org.uk if you have any questions or need further information.

AQMLM is a not-for-profit, mutual support organisation for those with a quality-related role, or an interest in quality management, in laboratory medicine services.

WELCOME TO OUR NEW MEMBERS

The Association is proud to introduce the following new members who have joined us since the last edition of LabMed News. Please extend a warm welcome to:

Miss Millie Fry, Trainee Clinical Scientist, Clinical Biochemistry, Pathology, Barts Health NHS Trust, London

Miss Abeer Gilani, Student, University of Strathclyde Glasgow, Glasgow

Miss Temitayo Oluwatosin, Student (Microbiology), University of Wolverhampton, Wolverhampton

Mr James Thomas, Trainee Clinical Scientist, South West London Pathology, St George's University Hospital NHS Foundation Trust, London

Miss Amelia Tollet, Trainee Clinical Biochemist, Blood Sciences, East Suffolk and North Essex NHS Foundation Trust, Colchester

Miss Poppy Simpson, Trainee Clinical Biochemist, Pathology Blood Sciences, Colchester Hospital, Colchester

Mr Rupen Limachya, Trainee Clinical Biochemist, Pathology, Norfolk and Norwich University NHS Foundation Trust, Norwich

Ms Megan Dolan, Trainee Clinical Scientist, Clinical Biochemistry, Pathology, Wythenshawe Hospital, Manchester

Dr Jason Chung, Chemical Pathologist, Clinical Chemistry, Westmead Hospital, Westmead, Australia

Mr Lachlan Beal, Student, Queensland University of Technology, Queensland, Australia

Dr Faizanur Rahman, Consultant Metabolic Medicine and Chemical Pathology, Chemical Pathology and Metabolic Disorders, University Hospitals of Leicester NHS Trust, Leicester

Mrs Sophie Paskauskas, Trainee Clinical Scientist, Biochemistry, UHCW, Burntwood

Mr Shaun Chowdhury, Trainee Clinical Scientist, Pathology, Royal Berkshire NHS Foundation Trust, Reading

Dr Lauren Elizabeth Starbrook, Trainee Clinical Biochemist, Dept of Clinical Chemistry/Pathology, New Cross Hospital, Wolverhampton

Dr Mairead Connor, Clinical Scientist, Microbiology - Regional Virus Laboratory, Belfast Health & Social Care Trust, Belfast

Mr Mahmoud Rabi, Academic Researcher, School of Pharmacy at Queen's University Belfast, Belfast

Dr Ben Hall, ST3 Chemical Pathology, Biochemistry - McEwen Building, Glasgow Royal Infirmary, Glasgow

Mrs Lynda Hadjilah, Clinical Scientist, Infection Sciences, King's College Hospital, London

Mx Abbie Storan, PhD Researcher, School of Applied Sciences, The University of Huddersfield

Dr Zwe Lwin, Pathology, Leeds General Infirmary, Leeds

Dr Ann Leonard, Research & Innovation Manager, Laboratory Medicine Innovation Hub, Tallaght University Hospital, Dublin, Republic of Ireland

Miss Marie Clarke, Trainee Clinical Scientist, Clinical Biochemistry, Torbay and South Devon NHS Foundation Trust, Torquay

Ms Deirdre Browne, Laboratory Manager, ICON Clinical Research Limited, Dublin

Miss Martha Woolf, Trainee Clinical Scientist, Pathology, East Kent Hospital NHS Trust, Willesborough

Dr Malika Atailia, Associate Practitioner, Lighthouse Laboratory-Berkshire and Surrey Pathology Services (BSPS), Royal Berkshire NHS Foundation Trust, Bracknell

Mr Kyle Sarong, Student, Imperial College London, London

Ms Fiona Alcock, CEO, Oxford Biosystems Ltd, Oxfordshire

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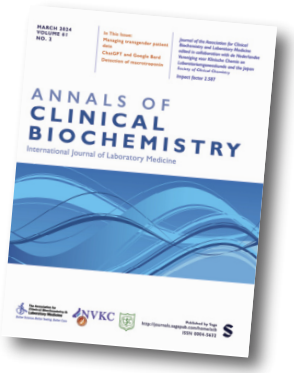
ANNALS OF CLINICAL BIOCHEMISTRY LATEST RESEARCH ARTICLES



Take a look at some of the articles most recently published online in the *Annals of Clinical Biochemistry* and if you'd like to submit your own work, click here for our submission guidelines. The Annals considers papers that contribute to knowledge in all fields of laboratory medicine, including clinical biochemistry, clinical audit, metabolic medicine, immunology, genetics, biotechnology, haematology, microbiology, computing and management where they have both biochemical and clinical relevance.

Rodgers S, Woolley T, Smith J, Prinsloo P, Fernando N. Updated adult ferritin reference intervals based on a large, healthy UK sample, measured on Roche Cobas series analysers. *Annals of Clinical Biochemistry*. 2024;0(ja). doi:10.1177/00045632241243026

Kobori Y, Hirayama S, Fukushima Y, *et al*. Low serum carnitine level is associated with increased urinary carnitine excretion in late pregnancy. *Annals of Clinical Biochemistry*. 2024;0(ja). doi:10.1177/00045632241239806

Patel D, Sargur R, Sheldon J, Wheeler R, Stanley C. Evaluation of Cryoprotein Investigation Using A Digital External Quality Assurance Scheme. *Annals of Clinical Biochemistry*. 2024;0(ja). doi:10.1177/00045632241239805

MEET SAHANA KRISHNAN, OUR NEW PUBLISHING MANAGER

Sahana joined us in February 2024 with experience in STM journal publishing and team management. She will be supporting the Editorial Boards of the Annals of Clinical Biochemistry, LabMed News and Lab Tests Online, with a focus on introducing more unity and cohesion to the output of the three entities.

Having switched careers after a medical education, Sahana is thrilled to be able to channel many of her passions into supporting the work our members do to advance healthcare and improve quality of life for everyone.

She lives in London but is a Northerner (and a woodcarver) at heart.

GLOBAL HEALTH WORKFORCE PROGRAMME: A VOLUNTEERING OPPORTUNITY FOR MEMBERS

The Association for Laboratory Medicine is proud to share news of its partnership with the National Postgraduate Medical College of Nigeria (NPMCN), the Ghana College of Physicians and Surgeons (GCPS), the Aga Khan University in Kenya and the Royal College of Pathologists (RCPath) in a newly launched Global Health project. RCPath has received a grant, funded by the UK Department of Health and Social Care, to strengthen a diminishing workforce of chemical pathologists and improve the quality of chemical pathology training in Ghana, Kenya and Nigeria. This project falls under the overall Global Health Workforce Programme, directed by The Tropical Health and Education Trust (THET), which will provide £8.9 million to build the health workforce in these countries and contribute to Sustainable Global Development goal 3.8 for universal health coverage.[1]

The global health workforce is in decline, with estimates projecting a shortage of 18 million health workers by 2030.[2] This is the case with chemical pathology fellows and trainees in Ghana and Kenya, whose numbers are decreasing in part due to a lack of available specialist training programmes.[3]

The Association for Laboratory Medicine will therefore be asking members to volunteer with the Global Health Workforce Programme by contributing talks or teaching materials for CPD activities. This project provides an exciting opportunity to help build the capacity and reach of a sustainable healthcare infrastructure, to ensure any future interventions are as effective and beneficial as possible. It will employ strategies designed to improve the quantity and quality of training opportunities to staff in underserved areas, ensuring local faculties are able to support these training programmes long-term and to increase the retention of individuals within the health workforce across the three countries.

Get involved

Contact Kelley Price on the International team by email or call +44 (0) 20 7461 6761/723

The main activities of the project, as outlined by RCPath and in association with partners, will include:

- Fellowship training standards: reviewing chemical pathology curricula to harmonise training in Kenya.
- Facilitating mentorship links between Ghana and Nigeria.
- Scoping visits to Ghana and Kenya to evaluate the needs required for respective Fellowship training programmes in chemical pathology.
- Virtual training courses: point-of-care-testing certification, CPD-accredited continuing medical education opportunities for Chemical Pathologists and related healthcare professionals and monthly case report sessions with UK-based colleagues.

Additionally, any CPD sessions recorded for this project will be made available to LabMed members. If you are interested in getting involved in the Global Health Workforce Programme, please contact Kelley Price at international@rcpath.org

More information can be found here.

References

1 The Tropical Health and Education Trust (available here) accessed March 2024.

2 Boniol M, Kunjumen T, Nair TS, *et al*. The global health workforce stock and distribution in 2020 and 2030: a threat to equity and 'universal' health coverage? *BMJ Global Health* 2022; 7:e009316.

3 RCPath (available here) accessed March 2024.

4 Nove A, Ajuebor O, Diallo, K *et al*. The roles and involvement of global health partners in the health workforce: an exploratory analysis. *Hum Resour Health* 21, 41 (2023). https://doi.org/10.1186/s12960-023-00825-5

5 THET Global Health Workforce programme (available here) accessed March 2024.

PUBLICATION DEADLINES

To guarantee publication, please submit your article by the 1st of the preceding month (i.e. 1 May for June 2024 issue) to: editor@labmed.org.uk
We try to be as flexible as possible and will accept articles up to the 20th to be published if space allows. Otherwise they will be held over to the next issue. If we are aware that articles are imminent, this gives us more flexibility and we can reserve space in anticipation. If in doubt, please contact: Gina Frederick, Lead Editor, via the above e-mail.

LEARNING ACADEMY

BECOME AN EDUCATIONAL CONTENT CREATOR

Are you interested in sharing your expertise and knowledge with those who need it? The Association seeks members for a rewarding opportunity authoring content for digital learning courses. We'd like to encourage you to help support the learning needs of future leaders in Laboratory Medicine, and ensure the continuation of high standards of practice and professionalism within the field.

In order to help our trainee members feel prepared and confident for their FRCPath exams, we are working hard to expand the free high quality study content we offer our membership, and we need you to help us!

The Laboratory Medicine Learning Academy is a digital learning platform developed by the Association in partnership with Health Education England, East of England offering a wide range of educational material. The Learning Academy is currently in the pilot phase with active development of educational material and best practices taking place.

Some of the upcoming course content that could use your input includes modules in laboratory analytical skills, laboratory data interpretation and laboratory management.

This role attracts compensation and will be fully supported.

For more information, including submission requirements and renumeration, please visit our website or email Digital Learning Officer Avi Surskas at avi@labmed.org.uk

"Really welcoming this as a resource. I think its development will be really useful for future trainees"

NHS NATIONAL SURVEY RESULTS ABOUT STAFF DISCRIMINATION

54.04% of the NHS staff who answered the national staff survey last year said they had experienced at least one incident of harassment, bullying and abuse at work during the last 12 months, either from the public, colleagues or managers.

An article accompanying the survey results from Autumn 2023 focuses on the abusive behaviours and sexual harassment frontline staff face primarily from the public, but it also mentions that 3.84% of staff reported facing unwanted sexual behaviour from a colleague.

The National Results Briefing 2023 states that the proportion of staff who said that they had experienced harassment, bullying and abuse within the preceding 12 months has been decreasing since 2020. Burnout scores are also lower this year than they were in 2021 and 2022, with 30.84% of staff reporting feeling burnt out due to their work in 2023, but overall figures relating to staff safety and health show much room for improvement. You can read the national results briefing here.

51.86% of those who experienced harassment, bullying and abuse said the experience was reported to their organisation, either by themselves or another member of staff, suggesting half of all incidents go unnoticed and unaddressed.

If you experience discrimination at work, we encourage you to speak to your FCS representative for support and advice. Alternatively, you can become an FCS representative by contacting your regional representative, who will be able to advise you on the process of training with us; we provide comprehensive, ongoing training sessions for our reps in order to give them the knowledge, skills and competencies needed to support their colleagues effectively and ensure workforce wellbeing is enforced in local policies.

If you would like to become a Union Representative, please write to us via our contact us form and a regional representative from the FCS will be in touch to discuss the next steps. The next FCS training session will take place soon; please refer to our website for updates.

References

NHS England » NHS staff report record levels of discrimination from the public

National-Results-Briefing-2023.pdf

A WARM INVITATION TO MEET AT LABMEDUK24

LabMedUK24 bookings are now open. I look forward to welcoming you all to Brighton and the Hilton Metropole for some sun, sea and science! We have more to celebrate this year, with the 20th Anniversary of Lab Tests Online UK.

Sally Benton and her Scientific Content Development Group have put together an excellent programme on pertinent topics including; artificial intelligence, home self-testing and faecal testing to name but a few. We are also excited to have our first session chaired and organised by our Immunology members on Myeloma and a healthy debate on the new NICE guidelines on Vitamin B12 deficiency organised by the Association's Scientific Affairs and Clinical Practice Committee.

As an Association we take our environmental impact seriously and always look for ways to reduce this, as such, not only are we moving to paperless conferences and are encouraging you all to bring your own lanyard; we have also organised a beach clean this year so that we can give back to the local community.

So if you'd like to blow away the cobwebs, network with peers, immerse yourself in leading scientific knowledge and debate away from the usual day-to-day distractions, then get yourself booked on! I can't wait to see you in Brighton!

SARAH ROBINSON

Director of Conferences and Events

The Hilton Metropole

Ticket information

		Full price	Early bird price (until 12 April)
Training Day	Members Non-Members	£110 £175	£90 £140
LabMedUK24 one-day ticket	Members Non-Members	£250 £385	£200 £310
LabMedUK24 two-day ticket	Members Non-Members	£445 £695	£355 £555

Early bird

Payment for the early bird price must be paid in full by 12 April 2024. If you are struggling to finance the cost of attending LabMedUK and are unable to secure financial assistance from your employer, there are a number of bursaries and grants available. Go to the LabMed website to find out more

The venue

All LabMedUK24 conference and training day sessions will be held at the DoubleTree by Hilton Brighton Metropole, Kings Road, Brighton BN1 2FU, between Monday 10 and Wednesday 12 June 2024. For suggested travel options, including by car, train and local transport, visit our website.

Social events

Welcome evening, Brighton Music Hall
Conference and Training Day delegates are warmly invited to attend the optional welcome evening on Monday 10 June, 5.00pm. Have a complimentary drink between 5.30-7.30pm, chat with fellow delegates and relax before the exciting conference ahead.

Beach clean – 11 June, 5.30-6.00pm
For something different, and to help with sustainability, please meet in the reception of the Hilton at 5.30pm for half an hour of litter picking on Brighton beach. This will be a good opportunity to grab some fresh air after the lectures, socialise with colleagues, all whilst helping with the environment. Gloves, bags and litter pickers will be provided.

Conference reception – Brighton i360
LabMedUK24 conference delegates are welcome to attend the Conference Reception at the end of the first Conference day on Tuesday 11 June. Starting from 7.00pm the event will be held at the iconic Brighton i360.
The evening will begin with a welcome speech and drinks from 7.00pm followed by a hot buffet supper.

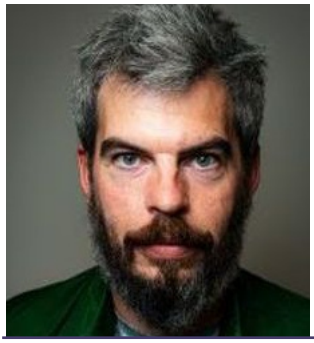
SPOTLIGHT ON LABMEDUK24 SPEAKERS

PAEDIATRICS

Spotlight – Simon Eaton

Metabolomics and GCMS

Simon Eaton, UCL Great Ormond Street Institute of Child Health, developed an interest in paediatric metabolism and nutrition in neonatal and paediatric critical illness. He runs a research laboratory which analyses a variety of metabolites and samples using GCMS, HPLC and isotope ratio mass spectrometry.



FAECAL TESTING

Spotlight –Shane O'Driscoll

Qualitative (lateral flow) point-of-care FIT tests – do they work?

Shane has been working in Bowel Cancer Screening for 12 years, and for seven years in research. His previous work has included evaluation of FIT for Hb laboratory and POC systems, assessment of EQA materials and NICE FIT.

LABORATORY MANAGEMENT

Spotlight – Denise Cook

System change

Denise is Executive Lead for Governance, Quality, Leadership and Development for Berkshire and Surrey Pathology Services (BSPS). Denise is a member of the Kings Fund Alumni having completed the Top Manager Programme in 2022. She is recognized for her work in senior leadership development, transforming individuals, teams, organisations and systems.

VITAMIN B12 DEFICIENCY AND THE NICE GUIDELINES: A DEBATE

Spotlight – Supriya Joshi

This debate session will provide a lively interactive and interesting overview of the laboratory medicine aspect of the NICE guidance on Vitamin B12. Supriya was appointed as a Consultant Chemical Pathologist at Maidstone and Tunbridge Wells NHS Trust in June 2015.

MYELOMA

Spotlight – Mairi Whiston

The importance of early diagnosis in myeloma: the patient perspective

Mairi qualified from St Andrews and Manchester medical schools in 2009 and 2012. She worked as a doctor for five years including time spent as a volunteer doctor in Thailand and Belize. During the COVID-19 pandemic, Mairi qualified as a dentist and worked as a vaccinator. She now works in early diagnosis at the blood cancer charity, Myeloma UK.

MASS SPECTROMETRY IN THE CLINICAL LABORATORY: IS METABOLOMICS THE NEXT BIG THING?

Spotlight – Warwick Dunn

Discovery and validation of clinical metabolic biomarkers using metabolomics tools

Warwick holds a PhD in mass spectrometry-based analytical chemistry and has applied chromatography-mass spectrometry platforms to study metabolism in mammals for more than twenty years. During the last 15 years he has focussed on studies to identify metabolic changes related to disease, ageing and food/exercise interventions including in precision medicine applications to stratify patients based on disease risk or treatment response.

HOME SELF-TESTING

Spotlight – Timothy Woolley

Operational Considerations and UKAS accreditation

Tim trained as a BMS at the Institute of Pathology and Tropical Medicine, RAF Halton; completing his BSc and MSc at the Royal Naval Hospital Haslar. During this time, he undertook research at Porton Down and Collingdale, before being seconded into the NHS. After leaving the forces Tim has worked primarily in the private sector, co-founding Inuvi Diagnostics in 2018.

SPECIALIST ENDOCRINOLOGY: NEW TEST, NEW METHOD, NEW EVIDENCE

Spotlight – Ally Matthews

Improving the measurement of thyroglobulin using mass spectrometry: is there hope for the future?

Ally is currently a Senior Clinical Scientist in Specialist Biochemistry at University Hospitals Birmingham NHS Foundation Trust. Her interests include using clinical proteomics to expand mass spectrometry-based protein analysis capabilities, concentrating on several important hormones whereby the only current analytical options are poorly standardised or manual techniques.

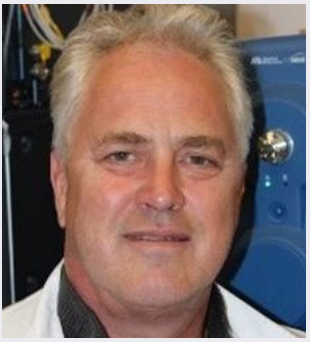
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING: WHAT ARE THE IMPLICATIONS FOR OUR PRACTICE IN LABORATORY MEDICINE?

Spotlight – Xavier Dieu

SPECTR: Automating the detection of monoclonal gammopathy using serum protein electrophoresis and deep learning

Dr Xavier Dieu holds a Medical Degree with a specialty in Laboratory Medicine, Biochemistry and Molecular Biology. He defended his PhD thesis in 2022, in the University of Angers, after developing several new laboratory medicine tools relying on the use of innovative data science methods, including machine learning and deep learning.

FREDDIE FLYNN AWARD



Spotlight – Graeme Eisenhofer

Clinical decision support system-based integration of plasma steroidomics with artificial intelligence: a blending of technologies for diagnostic stratification of primary aldosteronism

At Dresden, Dr Eisenhofer leads laboratory and clinical research groups with a focus on adrenal disorders and endocrine hypertension. The work has most recently centred on applications of mass spectrometry-based measurements of steroids and catecholamine metabolites. For this, approaches are being developed that integrate multidimensional diagnostics with artificial intelligence to build clinical decision support systems for efficient and appropriate therapeutic interventions.

LABMEDUK24 PROGRAMME: MONDAY 10 JUNE

Biochemistry Training Day

9.30am **Interactive workshop on method evaluation, verification and validation**
(shared with Microbiology Training Day)
Speakers: Katie Hadfield, Naomi Gadbsy, George Allen

12.30pm **Lunch break**

1.30pm **Dynamic function testing**
This interactive workshop will provide trainees with an overview of key dynamic function tests and how they are used in clinical practice
Speakers: Stephen Gibbons, Talat Mushtaq

4.30pm **Closing remarks**

Microbiology Training Day

9.30am **Interactive workshop on method evaluation, verification and validation**
(shared with Microbiology Training Day)
Speakers: Katie Hadfield, Naomi Gadbsy, George Allen

12.30pm **Lunch break**

1.30pm **Putting together your portfolio of evidence for STP equivalence**
Speaker: Lynne Smith

2.05pm **Portfolio preparation for HCPC registration: a Microbiology Trainee perspective**
Speaker: Azul Zorzoli

2.15pm **Immunology for Clinical Scientists: exploring immunodeficiencies and autoimmune mimics of infection**
Speaker: Dan Payne

3pm **Coffee break**

3.15pm **Undertaking infection research in the NHS – pathways, ethics, how to combine research into your training**
Speaker: Kate Templeton

3.45pm **Common Microbiology/Virology cases from Primary Care**
Speakers: tbc

4.30pm **Closing remarks**

LABMEDUK24 PROGRAMME: TUESDAY 11 JUNE

9.00am **Welcome from the President**
Speaker: Katharine Hayden

9.10am **International Award Lecture**
Laboratory medicine leads translating the power of diagnostics and data analytics to identify and eliminate health disparities
Speaker: Octavia Peck Palmer

9.50am **Coffee break**

10.15am **Parallel Sessions: Paediatrics**
Chair: Rachel Carling

10.15pm **Biochemistry of sterols, bile acids and oxysterols**
Speaker: William J Griffiths

10.45pm **The role of the Clinical Biochemist in the Syndrome Without a Name (SWAN) Clinic**
Speaker: Stuart Moat

11.15pm **Metabolomics and GCMS**
Speaker: Simon Eaton

10.15am **Parallel Sessions: Faecal testing**
Chair: Sally Benton

10.15pm **Qualitative (lateral flow) point-of-care FIT tests: do they work?**
Speaker: Shane O'Driscoll

10.45pm **A laboratory experience of calprotectin (and FIT) in clinical pathways**
Speaker: Neil Syme

11.15pm **Implementing faecal immunochemical testing (FIT) into symptomatic pathways: the Nottingham experience**
Speaker: David Humes

11.45am **Lunch and poster rounds**

12.00pm **Industry sponsored workshops**

1.45pm **Impact Award Lecture**

2.15pm **Parallel Sessions: Laboratory management**
Chair: Helen Bruce

2.20pm **System change**
Speaker: Denise Cook

2.50pm **TBC**
Speaker: Sarah Curtis

3.20pm **TBC**
Speaker: Bruce Daniel

2.15pm **Parallel Sessions: Medal Award presentations**
Chair: Kath Hayden

4.15pm **Parallel Sessions: Vitamin B12 deficiency and the NICE guidelines: A debate**
Chairs: Alexandra Yates and David Gaze

In August this year the Association asked members for input into the consultation request on the NICE guidance on Vitamin B12 deficiency in over 16s: diagnosis and management. The membership responded in unprecedented numbers, expressing both support for this guidance but also some concerns. In this session we will review the NICE guidance (published March 2024) and its impact on laboratory medicine, with views from those involved in the production of the guidance, GIRFT and LabMed membership. This debate session will provide a lively interactive and interesting overview of the laboratory medicine aspect of the NICE guidance on Vitamin B12.

Speakers: Supriya Joshi, Dominic Harrington, Emma Stevenson, Marion Wood

4.15pm **Parallel Sessions: Myeloma**
Chair: Alison Whitelegg

4.15pm **Development of an MGUS monitoring algorithm**
Speaker: Ross Sadler

4.45pm **Mass spectrometry in the monoclonal gammopathy pathway**
Speaker: Lauren Campbell

5.15pm **The importance of early diagnosis in myeloma: the patient perspective**
Speaker: Mairi Whiston

LABMEDUK24 PROGRAMME: WEDNESDAY 12 JUNE

9.00am **Laboratory Medicine Foundation Award**

9.30am **Parallel Sessions: Mass spectrometry in the clinical laboratory: is metabolomics the next big thing?**
Chair: Andrew Davison

9.30am **Discovery and validation of clinical metabolic biomarkers using metabolomic tools**
Speaker: Warwick Dunn

10.00am **Biomarkers of dying: how we die from cancer?**
Speaker: Seamus Coyle

10.30am **Urine steroid metabolomics for the differential diagnosis of adrenal tumours**
Speaker: James Hawley

9.30am **Parallel Sessions: Home self-testing**
Chair: Rav Sodi

9:30am **Introduction to home self-testing**
Speaker: Rav Sodi

9:40am **Home self-testing: a paradigm shift in laboratory testing**
Speaker: Bernie Croal

10:00am **Applications of home self-testing in the NHS**
Speaker: Timothy McDonald

10:20am **Operational considerations and UKAS accreditation**
Speaker: Timothy Woolley

10:40am **Discussion session open to the audience**

11.30am **Parallel Sessions: Specialist endocrinology: new test, new method, new evidence**
Chair: Sophie Barnes

11.30am **Using copeptin to improve the diagnosis of AVP disorders**
Speaker: Chris Boot

12.00pm **Improving the measurement of thyroglobulin using mass spectrometry: is there hope for the future?**
Speaker: Ally Matthews

12.30pm **Congenital adrenal hyperplasia: time to change from 17-hydroxyprogesterone to 21-deoxycortisol measurement?**
Speaker: David Taylor

11:30am	**Parallel Sessions: Artificial intelligence and machine learning: what are the implications for our practice in laboratory medicine?** Chair: Ed Wilkes
11.30am	**The complex pathway to AI implementation in the NHS** Speaker: Kamaljit Chatha
12.00pm	**Can artificial intelligence replace biochemists?** Speaker: Chelsey Walsh
12.30pm	**SPECTR: Automating the detection of monoclonal gammopathy using serum protein electrophoresis and deep learning** Speaker: Xavier Dieu
1pm	**Lunch and poster rounds**
1:30pm	**Industry sponsored workshops**
2pm	**LabMed and FCS Annual General Meetings**
3pm	**Freddie Flynn Award** **Clinical decision support system-based integration of plasma steroidomics with artificial intelligence: a blending of technologies for diagnostic stratification of primary aldosteronism** Speaker: Graeme Eisenhofer
3:30pm	**Clinical Cases** Chair: Danielle Freedman
5pm	**Closing Ceremony and Awards**

FIS/HIS INTERNATIONAL CONFERENCE 2024

Delegate registration and abstract submission for FIS / HIS International Conference 2024 is now open. The conference takes place over three days at the Liverpool Arena and Convention Centre (ACC), UK from the 20-22 November.

This is a must-attend event for anyone working in IPC, infectious diseases, clinical microbiology and biomedical science, with over 700 global attendees, fantastic networking opportunities and a programme including latest research, scientific sessions, keynote plenary lectures, debates, clinical cases and more.

Submit an abstract before the deadline on Wednesday 26 June to have the opportunity to present your research or findings as a poster or oral presentation at the conference.

Early Bird Registration closes on Monday 23 September.

As a participating society, the Association for Laboratory Medicine members are entitled to discounted member rates.

Visit the event website for more information.

HEART UK'S CALL TO STANDARDISE Lp(a) TESTING ACROSS THE UK

When Dr Mayur Patel, Consultant in Chemical Pathology and Metabolic Medicine, was invited to represent the Association on the Lp(a) taskforce at Heart UK, it was a role well-suited to Mayur's interest and experience in running the lipid service for Swindon and parts of Wiltshire. He saw it as an opportunity to address the variation and inconsistency in the way Lp(a) testing is currently used and to highlight the importance of this significantly under-recognised and under-utilised tool. "I felt it was important to represent the Society and to help shape the way this test is potentially used in the future."

DR MAYUR V. PATEL

Consultant in Chemical Pathology and Metabolic Medicine, Great Western Hospital NHS Foundation Trust

What is Lp(a)?

Lipoprotein(a) or Lp(a) is a cardiovascular risk biomarker which, if elevated, can increase your risk of a heart attack or stroke. It is highly atherogenic; more-so than LDL cholesterol.[1] And unfortunately, it's almost never tested.

Its levels are genetically predetermined, and one in five of the global population will have an elevated Lp(a).[2] Ideally everyone should receive at least one test in their lifetime to determine whether they have any risk. If Lp(a) is high, patients would be encouraged to make lifestyle improvements and start taking statins to lower their LDL cholesterol, thereby mitigating the risk of the elevated Lp(a).

Taskforce's efforts

Along with Mayur as the representative for the Association for Laboratory Medicine, the Lp(a) taskforce comprises the representatives of several other member organisations. Together they are working to get Lp(a) included as a factor in the QRISK score as well as in JBS and NICE guidelines. More immediately, they hope to publicise the problems around its current testing and reporting, and the importance of following Heart UK's consensus statement to ensure harmonised standards across the country. At present, there is too much variation in the way Lp(a) is being tested and in the units for expressing results. This is problematic because of the variation in the size of isoforms of Lp(a) and their relationship with varying

serum concentrations, making it tricky to convert from one unit to another. Only methods based on Denka reagents are recommended, as calibrators minimise any potential unreliability due to isoform variation.[3]

The taskforce conducted a drop-in session with around 20 MPs in December 2023, discussing the importance of Lp(a), encouraging the MPs to write to NICE and to speak to the executives at their local hospitals to promote standard practice in Lp(a) testing. The taskforce has further discussions scheduled at the Houses of Parliament.

Challenges

It seems more of an uphill journey than it ought to be, but with clinical trials underway there should soon be more evidence to support the Taskforce's push to take Lp(a) seriously and incorporate it into national guidelines. This will help the UK to stay ahead of the game; in the future "if a treatment comes, then we're going to need to start testing people on a larger scale".

Mayur highlights another striking possibility from his clinical experience: a pattern of elevated Lp(a) levels in members of the population who have a significant family history of early deaths due to cardiovascular events, yet who have very low QRISK scores. Mayur recalls a patient who visited the lipid clinic: "he was in his early thirties with a cholesterol in the 6 mmol/L range. His brother had a heart attack in his forties, dad had a heart attack in his fifties, granddad died from a heart attack in his fifties … potentially the QRISK for that person is going to be incredibly low, so it's going to underestimate anything that's going on in the

Left to right: Steve Richardson (Novartis), Jules Payne (CEO, Heart UK), Sir Lindsay Hoyle and Mayur Patel

family or anything genetically predetermined." It could be that Lp(a) provides the answer in those inexplicable hereditary cases of cardiovascular disease with no other risk factors.

What you can do

The Lp(a) taskforce is calling our members to follow the guidance outlined in the Heart UK consensus statement, the recommendations in which are endorsed by the Association for Laboratory Medicine. The key takeaways for members are summarised below.

Recommended testing method: Denka

Recommended units: nanomoles per litre

We hope to provide further updates as the Taskforce continue to make headway in their efforts. For more information, please visit the following links and share them with your colleagues: Lp(a) taskforce leaflet: a-call-to-action-from-the-lipoprotein(a)-taskforce---august-2023.pdf (heartuk.org.uk)

and Heart UK consensus statement: https://doi.org/10.1016/j.atherosclerosis.2019.10.011

References

1 A Call to Action from the Lipoprotein(a) Taskforce. August 2023. Available at https://www.heartuk.org.uk/downloads/health-professionals/a-call-to-action-from-the-lipoprotein(a)-taskforce---august-2023.pdf (accessed March 2024)

2 Enas *et al.* Lipoprotein(a): An independent, genetic, and causal factor for cardiovascular disease and acute myocardial infarction. Indian Heart Journal. 71(2): 99-112. April 2019. Available at https:// pubmed.ncbi.nlm.nih.gov/31280836/ (accessed March 2024)

3 Cegla et al. HEART UK consensus statement on Lipoprotein(a): A call to action. *Atherosclerosis*. 291: 62-70. December 2019. Available at https://doi.org/10.1016/j.atherosclerosis.2019.10.011 (accessed March 2024)

NICE CLINICAL GUIDELINES

You may be aware of the NICE clinical guideline 'Adrenal insufficiency: acute and long-term management' (NG10237) with an expected date of publication on the 28 August 2024. The draft guidance consultation period is taking place from the 8 March to 19 April 2024.

As the Association for Laboratory Medicine is registered as a stakeholder we can respond as an organisation.

I'm therefore asking for members with specialist interest/expertise in these areas, to contact us with your thoughts on the guidance with clear, concise reasons for your response so we can collate any themes.

Consultation closes on 19 April 2024 so I would ask that responses are sent to us by email to nice@labmed.org.uk by 15 April 2024.

It should also be noted that NICE also welcome individual input from registered individuals.

Dr Alaa Abdel-razik
NICE lead for the LabMed Scientific Affairs & Clinical Practice Committee

LOOKING BACK AT...

Clinical Biochemistry in the 1950s

In the 1950s, clinical biochemistry laboratories were significantly different from the ones we know today. While they were focused on analysing various biochemical parameters, the techniques and equipment available were much more rudimentary compared to the advanced technology used today.

The 1950s were notable for the introduction of electrophoresis, radioimmunoassay, and in the late fifties, the Auto-Analyser. Except for photoelectric colorimeters, the clinical biochemistry laboratories were not very different from those of 1925. There was lots of glassware of different kinds; pipettes, burettes, wooden racks of test tubes, funnels, filter paper, cylinders, flasks, beakers, colorimeters, centrifuges, water baths, an exhaust hood for evaporating organic solvents after extractions, a microscope for examining urine sediments and perhaps a pH meter. The most complicated apparatus was the manually-operated Van Slyke volumetric blood gas apparatus. The emphasis was on classical chemical techniques that did not require instrumentation.

A description of a typical 1950s Clinical Biochemistry Department

1 **Physical layout:** The lab would consist of a series of benches or workstations, each dedicated to a specific test or procedure. The lab would be divided into different sections, such as the chemistry section, enzymology section and hormone analysis section. The layout was often open, allowing technicians to move between workstations easily.

Walton Hospital clinical laboratory in Liverpool, circa 1950

CHARLES VAN HEYNINGEN

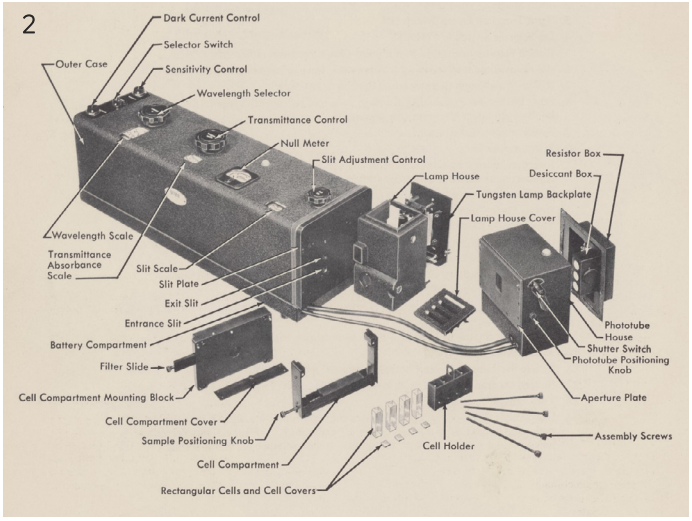
2 **Equipment:** There would be basic laboratory instruments, including centrifuges, spectrophotometers, microscopes, pH meters, and various glassware like test tubes, beakers and pipettes. These instruments were manually operated and required significant skill and experience to operate effectively.

3 **Testing methods:** Biochemical tests in the 1950s relied heavily on colorimetric reactions and manual titrations. Technicians would mix samples with specific reagents and observe colour changes to determine the concentration of the analyte. This required careful attention to detail and subjective interpretation of colour changes. The more complex instruments were supervised by specialised instrument technicians. New enzyme assays and protein electrophoresis on paper were introduced. The use of cellulose acetate for protein electrophoresis was introduced in 1957, enabling better resolution of protein fractions and significantly reducing the migration time from 16 hours to 20 minutes.

4 **Sample preparation:** The Evacutainer was invented in 1947 and renamed Vacutainer in 1949. This tube was used to draw venous blood through a needle into a glass tube. Alternatively, blood was obtained using a needle and glass syringe and blood injected from the syringe into colour-coded bottles containing anticoagulants. Samples were typically obtained from patients in hospital wards and clinics and transported to the lab. The samples needed to be prepared

1

2



3

Instruments used in clinical biochemistry laboratories in the 1950s:

1 *Beckman portable pH meter, 1956*
2 *Model DU spectrophotometer, exploded view in Beckman manual, 1954*
3 *Van Slyke manometric blood gas apparatus, 1953, used for measuring blood oxygen concentration*

before analysis, which involved centrifugation to separate cells and other solid components from the liquid portion.

5 **Quality control** was important in ensuring accurate results. There were internal standards, controls, and proficiency testing programs to monitor and verify the accuracy and precision of the tests. However, these procedures were less standardised compared to the stringent quality assurance measures employed today. External quality assessment (EQA) identified that results were not equivalent in different laboratories in the 1950s.

6 **Record-keeping and documentation** were crucial in the 1950s. Technicians would manually record all test results, observations, and any relevant patient information in paper-based notebooks or logbooks.

7 **Data analysis** was primarily performed manually, with calculations and comparisons completed by hand. Statistical analysis was limited and graphical representation of data was often performed using basic plotting techniques.

8 **The range of tests available** was significantly narrower compared to today. Basic tests for glucose, urea, electrolytes, liver function and lipid profiles were common. Basic tests were often performed in batches on certain days only. Specialised tests, such as enzymes, protein electrophoresis and hormone assays, were also performed but required more time and expertise. The lack of automation and advanced technology meant that testing was time-consuming and required a high level of technical expertise.

9 **The out-of-hours service:** After five o'clock in the evening the laboratory was closed and a resident pathologist provided the on-call service. Tests performed outside normal working hours were usually blood cross-matching, serum glucose and urea, CSF proteins and cells and some bacteriology.

Those who worked in the pre-automation era experienced the excitement of learning new methods, developing new skills and using different types of apparatus. The work was hands-on from start to finish with no time to walk away for a rest. Automation only started to make inroads in the late 1950s and became established in the next decade.

Reference

Rosenfeld L. A Golden Age of Clinical Chemistry: 1948-1960. *Clinical Chemistry* 2000; 46(10): 1705-1714

Martha Beck, Medical Technologist, Laboratory at Piedmont Hospital in Atlanta, 1953

GREEN CHAMPIONS

THE CARBON FOOTPRINT OF INFORMATION AND COMMUNICATION TECHNOLOGY

ALISON JONES

York and Scarborough Teaching Hospitals NHS Foundation Trust

Electronic messaging, as clean and green as it seems, actually has a carbon footprint. But are some methods of electronic communication less 'carbon heavy' than others? Should we use SMS text messages, an instant message via an app or send an email? Do these methods of communication share the same environmental impact? Whilst SMS texts use the frequencies of conventional telephony, instant messages and emails use internet data flows. These different ways of processing data expend different amounts of energy.[1]

The ICT sector is constantly evolving in terms of usage, equipment and improvements in energy efficiency meaning it can be challenging to keep information about its carbon footprint information up to date.[2] This can result in conflicting and contradictory information being published on line and in the media.[2] This article is based on the most up-to-date information I can find, although it may be out of date by the time you read it!

What contributes to the carbon footprint of ICT?

There are four main areas that contribute CO_2 emissions from ICT:

- Hardware – smartphones, computers, monitors, printers, modems, routers, and cables. To produce this equipment requires electricity and raw material extraction (often rare earth metals), manufacturing, transportation, and distribution.[6] The environmental cost of electronic equipment is high, as it wears out quickly, requiring end-of-life treatment, often ending up in landfills and forcing consumers to buy more (the production-disposal cycle). Currently, user devices account for the largest chunk of the sector's overall carbon footprint.[2]
- Use of equipment – electricity needed to charge phones or laptops, and to use routers or modems.[6]
- Data transfer – 4G and 5G network transmitters, as well as cable internet and wi-fi.[6]

- Data storage – servers that store terabytes of data consume huge amounts of electricity.[6] The cloud and all data available on the internet contribute to ICT's overall carbon footprint but is ultimately only a small share.[2]

The carbon footprint of emails*

The carbon impact of an email is extremely variable depending on the configuration in which the email is written and read, to how many people, with or without attachment, and what type of device is used. But to give you an idea of scale see the table below.[5]

The higher carbon footprint associated with the PC/wi-fi model is overwhelmingly due to the depreciation of the devices used to write and read the email (92%). The electricity consumption of reading and writing the email contributes only 7% of the total CO_2 emitted, whilst the transport and storage of the data contributes only 1% to the total carbon footprint. But wi-fi actually consumes 20-times less energy than 4G, so when using a smartphone, you can reduce energy consumed by connecting to wi-fi to read and write your emails, and especially to download attachments.[5]

Excluding the hardware contribution, the carbon impact of each individual email sent is actually minuscule. But consider how many emails are sent and received each day. And even a tiny amount of CO_2 becomes significant when multiplied up by the number of emails sent every year.

The carbon footprint of SMS and instant messages

So if you just want to send someone a short message, how does the carbon footprint of e-mail compare to SMS text messages? Two recent calculations estimate an SMS text to emit 0.014 gCO_2[3] and 0.00215 gCO_2[4] (and suggests an average email emits 4 g CO_2[3]). Although the SMS calculations are quite different, this does suggest that SMS uses less energy and emits less CO_2 than emails.[1]

Regarding instant messages, this has been less well studied. However, since messaging systems such as MS Teams use internet networks, it's reasonable to think that their carbon footprint is closer to the one of an email than to an SMS.[1]

The carbon footprint of downloads and streaming

Stepping outside of the office (or lab) for a moment, a 2020 article published by telecommunications company Ericsson[2] provides some interesting figures to help us understand the differing electricity requirements of digital activities undertaken on different devices.

The electricity required for streaming videos and downloading music varies widely

The carbon footprint of emails*

Attachment (Email size)	Device / Connection	Recipients	Carbon footprint
No (10 KB)	Smartphone / 4G	1	0.4 gCO_2
Yes (10 MB)	Smartphone / 4G	1	1.8 gCO_2 (x4.5)
Yes (1 MB)	PC / Wi-Fi	1	*3.3 gCO_2 (x8.25)
No (10 KB)	PC / Wi-Fi	10	4.9 gCO_2 (x12.25)

depending on your device: phone, tablet, computer or screen. The electricity required is not directly related to usage, as the connection to networks and data centres is fairly constant. In a rough comparison, streaming 400 two-hour movies on a laptop connected to an external screen would consume as much electricity as a modern fridge does in a year. If the streaming was on a smartphone, 2,900 films could be streamed using the same amount of electricity.[2]

How to reduce your ICT carbon footprint[2, 5, 7]

The most significant contributor to your ICT carbon footprint is the production-disposal cycle. Therefore, the most important thing you can do to reduce this is to take care of your device so it can be used for many years.

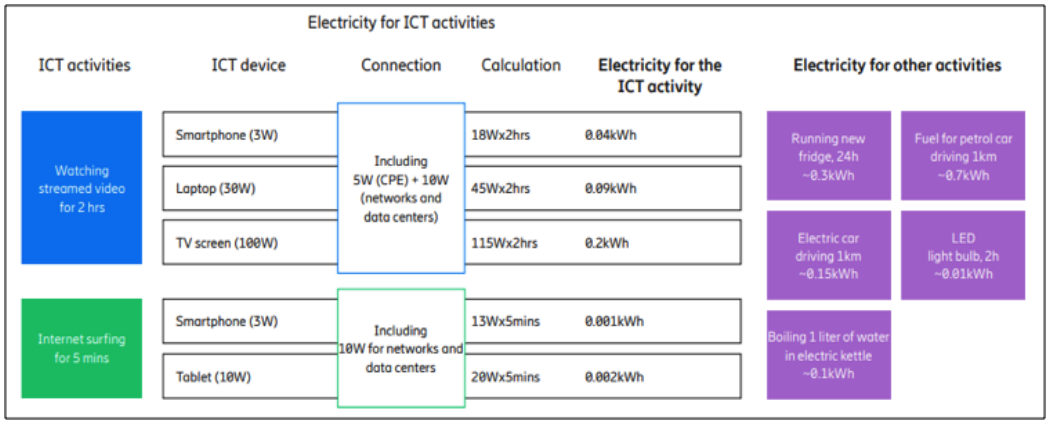
- Use your smartphone or other ICT devices longer before upgrading
- Recycle or reuse ICT equipment
- Consider buying reconditioned devices, instead of new

The electricity consumed whilst using your device is the most significant day-to-day contributor to CO_2 emissions. Where possible, source your electricity from renewable sources, and consider ways you can reduce your electricity usage by:

- Consuming digital services on smaller devices
- Charge batteries with electricity from renewable sources
- Ensure power-saving or sleep mode is enabled on your devices, and turn them off when not in use (don't leave in stand-by)
- Make your searches green: "Green" search engines (e.g. Ecosia) use the profits generated from your searches to plant trees around the world!
- Save commonly visited websites in your favourites – avoid going via a search engine

Data transfer and storage emits relatively very little CO_2 when calculating the overall carbon footprint, but there are still good habits you can get into to reduce your impact:

- Use Wi-Fi instead of 4G/5G for downloads and streaming
- Be rational about sending e-mails
  - "Think before you thank"
  - Limit recipients and avoid "reply to all"
  - Consider sending an SMS instead
  - Walk up the corridor or pick up the phone!
  - Unsubscribe from irrelevant e-mail lists
- Reduce the carbon weight of your e-mails:



- Lighten your signature: choose a light image, or even go logo-free
- Avoid attachments or compress them as much as possible. Use a file-sharing platform such as One-Drive, or just include a link
- Set your emails to use Plain Text by default. Use Rich Text if you need italics or bold. Reserve HTML for e-mails that require extra formatting. Plain Text is up to 12 times lighter than HTML

- Store data in a cloud, rather than on hardware.
  - Choose a "conscious" cloud: check whether your provider is using renewable electricity to power their data centres. All of the Big Three providers (Google, Amazon and Microsoft) have pledged to decarbonise their clouds.

References

1 What is more sustainable: an email or an instant message? – ATRIUM (atrium-sofia.com)

2 A quick guide to your digital carbon footprint – Ericsson (2020)

3 Mike Berners-Lee, "How bad are bananas"

4 Frédéric Bordage from GreenIt.fr

5 Email Carbon Footprint: Myths, Realities, and Solutions (sami.eco) (2023)

6 What is the digital carbon footprint? – Plan Be Eco

7 What is Your Online Carbon Footprint and How to Reduce it? | OVO Energy

FUTURE PERSPECTIVES

CLINICAL METABOLOMICS FOR THE DIAGNOSIS OF INHERITED METABOLIC DISEASE

GREG TOULSON

Newborn Screening and Biochemical Genetics, Birmingham Children's Hospital

The case for metabolomics in IMD

Depending on whether you're a lumper or a splitter, there are between 700-1,450 inherited metabolic disorders (IMD). One salient feature that this group tends to share are large metabolite perturbations within their affected pathway. This is to the extent that you may be able to smell the diagnostic biomarker in conditions such as isovaleric aciduria in affected patients.

This combination of large metabolite perturbations versus extremely varied diagnostic metabolites has led to an interest in using metabolomics as a tool to diagnose IMDs. This approach uses high-resolution mass-spectrometry (HRMS) to take a holistic assessment of every small molecule (<1.5 kDa) in a sample and then uses computational approaches to identify which metabolites are elevated or reduced, thereby yielding a diagnosis. Simple? Also, why not just use sequencing for the diagnosis of diseases that are ultimately genetic?

Multi-omics opportunities and the future of metabolic medicine

Next-generation sequencing continues to transform the diagnosis of genetic conditions and healthcare more widely. Turn-around-times have tumbled from years to days and genomic sequencing for newborn screening is being trialled in 100,000 UK babies. This change has brought a new set of challenges for clinicians and scientists alike in interpreting this data and what it means for an individual patient. Metabolic biochemists are increasingly referred work where the question may range from "what does this gene variant do to the pathway that you have an assay for?" to "what do any of these five variants do to their pathways that nobody has an assay for?".

While better characterisation and machine learning will aid in variant interpretation, IMD's are often rare birds where examples may range from a few to none. Metabolomics offers a versatile method to evaluate the biological output

of a given variant, accounting for penetrance and other polygenic factors that are present in each individual patient.

Knitting-needles in a haystack

Analysis using a routine tandem mass-spec is expected to resolve between one whole mass-to-charge (m/z) units, so that if we were trying to identify the aforementioned isovaleric acid by selecting for an m/z of 102, we would also pick up several hundred other metabolites with approximately similar m/z ratios. In HRMS, resolution can be extended to around 4 decimal places so that we could instead select for 102.0681, specific enough to be shared by only a handful of documented isobaric metabolites (pivalic acid will still try to ruin your assay unfortunately). Scanning across the entire available mass range at this resolution (50 to 1500 m/z) allows you to identify all metabolites with a similar degree of precision. As with tandems, fragmentation data can also be collected, although this is often measured on a technical duplicate and then computationally aligned with the parent spectra.

Depending on the extraction, separation technology and the resolution of the HRMS, a human plasma sample analysed in this format may yield up to around twenty thousand 'metabolic features'. These are then aggregated and collapsed down into a few thousand metabolites once adducts and ionisation modes are accounted for. This is the size of the haystack (metabolome) to be searched through.

Now, before discussing approaches to needle location, it is worth noting some of the advantages of this haystack. With one analysis we have potentially generated a dataset that is agnostic to the disorder we are looking for; it will identify multiple upstream and downstream metabolites for a given disorder that can also be assessed once treatment (if available) has commenced. Samples need not be triaged through layers of different specific investigations and ultra-rare disorders are covered just as well as common IMDs.

As to the diagnostic needles being searched for, we are aided by the fact that IMD needles are typically pretty big (knitting needles) and there's often more than one of them in each pathway. Most approaches also make use of some form of computational filtering, either for metabolites that are highly correlated with disease, or looking for metabolites that share the same pathway.

Clinical metabolomics

Several European groups are forging ahead with these approaches and their results look incredibly promising. We will never have a "measure everything machine" and many disorders only cause metabolite changes that are too subtle to detect without a fully quantitative, selective approach. Choices in separation technologies and preferencing of distinct mass ranges for better resolution may also mean that different metabolomic 'panels' may be required based upon the clinical question being asked. More practical barriers to implementation also include expensive instrumentation and complex data-analysis for interpretation.

It is instructive to look at the development of current metabolic tests. Initially, organic acid analysis could only identify the 'borderline smellable' concentrations of the volatile compounds from which organic acidurias take their name. Today, this technique has evolved to a level of sophistication where several hundred different disorders can be identified from relatively subtle patterns in the detected metabolites. Moreover, metabolic biochemists know the diagnostic limits of this approach and how to integrate results into a wider clinical picture. Metabolomic approaches would require a similar process of refinement to establish the human/institutional knowledge in how they should be used. The reward will be a patient-individualised assessment of metabolism, a tailored response to treatment and a new avenue to research rare disorders by the teams that are directly responsible for their care.

LabTestsOnline

All change on the logo front

Like our hosting organisation, LabMed (formerly the ACB), we too are in the process of a bit of a reinvention. We have a new logo that we'll be rolling out on the website in the coming weeks, but you can see it above. Going forward we will be using this new look in all of our communications, so watch this space

LTO-UK on the NHS App

We are delighted to tell you that, following many years of trying to get our foot in the door, we have finally succeeded in having Lab Tests Online links included on the NHS App. As the NHS App is the interface through which patients are able to access their medical records, this means that our links are right there when patients see their test results. As this is the very *raison d'être* for LTO, this is a major development for our site and our mission. Currently, the links are only available for a limited number of tests and embedded for users accessing results from GPs on the EMIS system, but it's a big step forward and eventually we hope to expand access to all users of the app.

How to get involved

Join the Editorial team – If you are interested in contributing to the vital work of the Editorial team to keep the website up-to-date and to introduce new material please contact us for more information.

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Contact us

Email: labtestsonlineuk@labmed.org.uk
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About us

Lab Tests Online-UK is a non-commercial website written by practising laboratory medics and scientists with lay editorial review of content to ensure its suitability. The aim of the website is to help patients and the public, including healthcare professionals, understand the many clinical laboratory tests that are used in diagnosis, monitoring and treatment of disease.

MICROBIOLOGY SOCIETY DIVISIONS DAY: A MEETING OF MINDS

MATHEW DIGGLE

Clinical Microbiologist, Associate Professor & Director of the Clinical Microbiology Fellowship Programme, University of Alberta Hospital, Canada

The Microbiology Society is a membership charity for scientists interested in microbes, their effects and their practical uses. It is one of the largest microbiology societies in Europe with a worldwide membership. The Microbiology Society's Divisions Day is an integral part of the planning of the Society's Annual Conference, which is planned by the members of its four Divisions: Eukaryotic, Prokaryotic, Virus and Irish Divisions. Divisions Day happens once a year and gives an opportunity for all Divisions to meet and collaborate on conference session planning based on previous internal discussions within each Division.

Divisions Day

The Divisions Day is about bringing together scientists to share and discuss the latest research and developments in various areas of microbiology. Each Division focuses on a different aspect of microbiology:

- The Eukaryotic Division promotes eukaryotic microbiology in fundamental, medical, applied and environmental aspects.
- The Prokaryotic Division comprises scientists working in bacterial and archaeal microbiology.
- The Virus Division is dedicated to fundamental studies of viruses, including their natural history, cellular and molecular biology, immunology and molecular pathogenesis.
- The Irish Division aims to promote all aspects of microbiology in Northern Ireland and the Republic of Ireland.

Divisions Day aims to help the Society's Scientific Conferences Panel to finalise the next year's conference program, helping to achieve the Society's principal goal of developing, expanding and strengthening the networks available to its members. The day generates new knowledge about microbes and ensures that it is shared with other communities. The impact of these events is intended to drive society towards a world where microbiology provides maximum benefit.

Attending the Microbiology Society's Divisions Day was an enriching experience that offered a unique blend of educational breakout sessions and invaluable networking opportunities.

The morning session began with a warm welcome by the Chief Executive of the Microbiology Society, Peter Cotgreave, whose message provided an enthusiastic and positive vision for the years ahead. This was followed by the ever-enthusiastic Professor Kalai Mathee, who chaired the remaining morning session, including a very important update from Charlie Holtum, who is leading the Society's Knocking Out AMR project on the staff side.

The Society's role is to help unlock and harness the knowledge of its members – it works to do this by bringing together and empowering communities that shape the future of microbiology. One such community is around antimicrobial resistance (AMR). Last year, it launched the Knocking Out AMR project, a comprehensive and ambitious initiative aimed at addressing the global crisis of AMR. Recognised as one of the most urgent threats to healthcare systems, economies, the environment and animal health, AMR necessitates a coordinated, interdisciplinary approach for effective management and mitigation. The project underscores the critical role of microbiologists across academic, industrial and clinical settings in pioneering innovative solutions to combat AMR. Charlie explained the project and its structure around three primary objectives, each targeting a critical aspect of AMR, namely, therapeutics and vaccines, diagnostics and surveillance and policy engagement. Finally, Charlie invited anyone working in the field of AMR to register their interest and stay informed about opportunities to contribute to the project.

The remainder of the morning's session involved updates by the Editors-in-Chief of the Society's publishing portfolios and an open forum discussion about the 2025 Annual Conference which will be held in Liverpool. The Microbiology Society's not-for-profit publishing portfolio encompasses a diverse range of journals that cater to various aspects of microbiological research. These journals serve as platforms for the dissemination of high-quality research papers and topical review articles across the breadth of microbiology. The Society operates as a not-for-profit publisher, supporting and investing in the microbiology community through its publishing activities.

Prokaryotic Division presentation. Photo courtesy of the Microbiology Society

Virology Division discussion. Photo courtesy of the Microbiology Society

The peer-reviewed journals include *Microbiology, Journal of General Virology, Journal of Medical Microbiology, Microbial Genomics, International Journal of Systematic and Evolutionary Microbiology* and *Access Microbiology.*

The open forum and discussion about the 2025 Annual Conference were split into the four Divisions of the Microbiology Society, each focusing on a specific area of microbiology: Eukaryotic, Prokaryotic, Virus and Irish Divisions. These discussions offered an opportunity to highlight the latest trends and strategies in microbiology, ranging from fundamental research to applied and environmental aspects and to build into the 2025 conference the opportunity for scientists to share their latest findings, discuss challenges and explore new methodologies.

The discussions were not only educational (for me!) but also encouraged everyone to interact and participate, promoting positive engagement with each other. Each group was led by the Division Chairs and experts in their own fields who provide guidance and support. The sessions extended from the morning into the afternoon with a short lunch break, which was an excellent opportunity to catch up with old friends and make new ones. And it is this networking which is also a key component of Divisions Day, offering attendees the chance to connect with peers, mentors and leaders in their own and closely related fields. The whole event is structured to enable knowledge exchange and to strengthen membership networks, which are woven throughout the day.

Towards the end of the day, there was an opportunity for these various Divisions to provide feedback and allow for a wider discussion on topics aimed for the 2025 Annual Conference. The informal nature of these sessions allowed for a relaxed environment where we shared our views and learned from one another. The goal was to develop an exciting and inclusive agenda for the conference in 2025.

From my own perspective, the Microbiology Society's Divisions Day was a day well-spent which allowed me to jump over the pond and visit my homeland, learn from colleagues about the latest research and to expand my professional network. The Annual Conference discussions offered a deep dive into the various branches of microbiology and exciting topics to support, while the networking provided an opportunity for establishing new connections and fostering existing ones. Overall, the day exemplifies the Society's commitment to developing, expanding and strengthening the networks available to its members, ultimately contributing to the global benefit of microbiology and I would encourage anyone who has read this far to seek out those opportunities to support when they arise.

THE DIGGLE MICROBIOLOGY CHALLENGE

These questions, set by Dr Mathew Diggle, are designed with Trainees in mind and will help with preparation for the Microbiology Part 1 FRCPath exam.

Question 41

Considering the importance of the vaccines available to the population, are the following statements true or false regarding the rubella virus?

A) The rash of rubella is similar to that caused by parvo and enteroviruses.
B) It is teratogenic.
C) Congenital rubella is charaterised by eye, ear and heart defects.
D) Congenital rubella is diagnosed by the finding of rubella-specific antibody in the cord blood.
E) Infants with congenital rubella poses a great infectious risk.

The answer to this question will appear in the next issue of LabMed News.

Question 40 from the February issue

True or false, which of the following viruses are transmitted from animals to humans?

A) Influenza A H5N1
B) HTLV-1
C) Hantaviruses
D) Poliomyelitis
E) Rabies

Answers

The following are all true:

A) Human cases of influenza A(H5N1) have primarily occurred due to zoonotic transmission through direct contact with infected birds (dead or alive) or contaminated environments. Human-to-human transmission is extremely rare.

C) Hantavirus is spread when virus-containing particles from rodent urine, droppings or saliva are stirred into the air. It is important to avoid actions that raise dust, such as sweeping or vacuuming. Infection occurs when you breathe in virus particles.

E) Rabies virus is transmitted through direct contact (such as through broken skin or mucous membranes in the eyes, nose, or mouth) with saliva or brain/nervous system tissue from an infected animal. People usually get rabies from the bite of a rabid animal.

The following statements are false:

B) The human T-lymphotropic virus type 1 is also known as human T-cell leukaemia virus type 1. The virus can cause a type of cancer called adult T-cell leukaemia/lymphoma (ATL). HTLV-1 is transmitted primarily through infected bodily fluids including blood, breast milk and semen.

D) Humans are the only known reservoir for polio virus. The virus is transmitted via droplets or aerosols from the throat and by faecal contamination of hands, utensils, food and water. The majority of transmissions occur via person-to-person contact or the faeco-oral route, although the oro-oral route is also possible.

MEETING REPORT

LABMED WEST MIDLANDS SCIENTIFIC MEETING IN ASSOCIATION WITH METBIONET

CHRIS STOCKDALE

Clinical Scientist, Birmingham Women's and Children's NHS Foundation Trust

The Exchange Conference Hall in central Birmingham was the venue for the LabMed West Midlands Scientific meeting in association with the UK Metabolic Biochemistry Network (MetBioNet) on 28 November 2023. Around 100 delegates travelled from locations around the UK and Ireland to hear 10 speakers present on a variety of metabolism-related topics.

The first speaker was **Mary Anne Preece** who recently retired as Consultant Biochemist from Birmingham Children's Hospital and delivered a talk entitled 'a lifetime of organic acids'. Mary Anne described developments in this key metabolic investigation over four decades and emphasised the impacts on patients through diagnosis and management of conditions detected.

Dr Saikat Santra (Consultant Paediatrician in IMD, Birmingham) then described the impact of genomic technologies on IMD diagnosis in recent years. These have aided the recognition of newer IMDs, such as deficiencies of carbonic anhydrase VA and phosphoenolpyruvate carboyoxykinase as well as aiding diagnoses of mitochondrial disorders and known conditions with unusual presentations (eg, intermittent Maple Syrup Urine Disease).

Dr Nathan Cantley (Chemical Pathology Registrar, Bristol) and **Dr Darren Powell** (Alder Hey) have recently done a great job updating the MetBioNet website. Dr Cantley gave a talk describing the main features of this invaluable resource which include an assay directory, guidelines and educational presentations.

After the mid-morning coffee break **Dr Pippa Goddard** (Consultant Clinical Scientist, Birmingham) turned the audience's attention to newborn screening. Dr Goddard included an overview of the current screening repertoire in the UK and also covered recent and planned developments. These include evaluation of screening

for severe combined immunodeficiency, reducing false positives for isovaleric acidaemia and the possible future introduction of programmes for tyrosinaemia type I, spinal muscular atrophy and metachromatic leukodystrophy.

Dr Amro Maarouf (Chemical Pathology Registrar, West Midlands) then illustrated the harmful effects of nitrous oxide abuse on vitamin B12 metabolism through a case presentation. Serum B12 may be within the reference range in these cases therefore a functional marker of B12 status such as homocysteine or methylmalonic acid may be useful. The recent NICE guidance on B12 deficiency in over 16s (NG239) features specific recommendations about testing in suspected nitrous oxide abuse.

Another highly topical case presentation followed from **Dr Shona Brothwell** (Paediatric IMD Registrar, Birmingham) who discussed the acute effects that can occur after ingestion of glycerol-containing 'slushie' type drinks in some children. Hypoglycaemia and glyceroluria can be features of these episodes, which may thus resemble an IMD. Recent UK-wide guidance has been issued about the suitability of these drinks for young children.

The afternoon session kicked off post-lunch with two talks on inherited disease and renal stones. **Professor Sally Anne Hulton** (Consultant Paediatric Nephrologist, Birmingham) focused on primary hyperoxalurias (PHs). PH types 1-3 are caused by variants in different genes with possibly at least one extra type still to be genetically defined. In addition to renal stones, systemic oxalosis in PH type 1 can also lead to oxalate deposition and harmful effects in multiple organs. Lumasiran, an RNA interference-based medication, has recently received NICE approval for use in PH type 1. **Erin Emmett** (Lead Scientist at the Purines laboratory, London) described four inherited disorders of purine metabolism that can cause renal stones: urate stones resulting from PRPS1 superactivity or HPRT deficiency, xanthine

oxidase deficiency leading to xanthine stones and 2,8 dihydroxyadenine stones caused by deficiency of APRT.

Following the afternoon coffee break **Dr Felix Chan** (Lecturer in Neuroscience, Aston University Pharmacy School) described his laboratory's research which is helping to uncover how disordered metabolism in inherited disorders can cause epilepsy. This may in turn lead to improved treatments.

The final talk of the day was titled 'Disorders of amino acid metabolism in adulthood' by **Dr Charlotte Dawson** (adult IMD Consultant, Birmingham). Dr Dawson covered phenylketonuria (PKU), tyrosinaemia type 1, disorders of branched chain amino acids and classical homocystinuria, giving an update on recent findings and current research including the multiple strategies by which it may be possible to reduce phenylalanine concentrations in PKU (cofactor, mRNA, gene and enzyme substitution therapies).

Thanks are due to the speakers for their efforts in preparing and delivering a series of excellent talks explaining with great clarity some complex metabolic pathways, to the Association for Laboratory Medicine and MetBioNet for supporting this meeting and to **Dr Adam Gerrard** (Consultant Clinical Scientist, Birmingham) for chairing.

DEACON'S CHALLENGE REVISITED

NO 30. ANSWER

A man has a PSA of 5 µg/L. Twenty-two percent of patients with benign prostatic hypertrophy and 38% of patients with prostatic cancer have concentrations of PSA between 4.1 and 10 µg/L.

What is the positive predictive value for a diagnosis of cancer of the result for this man in this range, if the prevalence of cancer in his age group is 5% and benign prostatic hypertrophy is 20%? Assume 2% of patients without any prostatic pathology have a PSA >4.1 µg/L.

This question differs from usual problems on sensitivity and specificity in that there are three, not two, groups of patients. However, there are only two groups as far as the disease in question (prostatic cancer) is concerned – those with cancer and those without. The only difference is that the group without disease is made up of two populations:

- those with benign prostatic hypertrophy (BPH)
- those without either BPH or prostatic cancer (CAP).

For those patients with CAP, let

TP = number with raised PSA who have CAP

FN = number with normal PSA who have CAP

Incidence of CAP in the population is 5% = (TP + FN)

The proportion of CAP patients with raised PSA (sensitivity) = 38%

Therefore, $\text{Sensitivity} = \frac{TP}{TP + FN} = \frac{TP}{5\%} = 38\%$

Rearrange and solve for TP: $TP = 38\% \times 5\% = 1.9\%$

Next, calculate the percentage of false positives for both the BPH and normal groups.

BPH group

Twenty-two percent of the patients with BPH have raised PSA. Therefore the false positive rate (FP) for the BPH group is 22%.

The incidence of BPH in the population (TN + FP) is 20%.

Substitute (TN + FP) = 20% into the expression for false negative rate and solve for FP:

$$\text{FP rate (BPH)} = \frac{FP}{(TN + FP)} = \frac{FP}{20} = 22\%$$

Therefore, FP = 22% x 20% = 4.4%

Normal group
Similarly, 2% of the normal group have raised PSA. Therefore the false positive rate (FP) for the normal group is 2%.

The incidence of normals is

100 – (% with CAP + % with BPH)
= 100 – (5 + 20)
= 75%

Again, this proportion is equal to (FP + TN).

$$\text{FP rate (normals)} = \frac{FP}{(TP + FN)} = \frac{FP}{75\%} = 2\%$$

so that FP = 75% x 2% = 1.5%

The positive predictive value (PV+) of the PSA test is the proportion of the positive results which are due to CAP (the remainder being due to false positives from both the BPH and normal group).

$$PV(+) = \frac{TP\ (CAP)}{TP\ (CAP) + FP\ (BPH) + FP\ (normal)}$$

Substitute for TP (CAP), FP (BPH) and FP (normal):

$$PV(+) = \frac{1.9}{1.9 + 4.4 + 1.5} = \frac{1.9}{7.8} = 0.24 \text{ (or 24\%)}$$

Therefore only about 1 in 4 positive results will be due to prostatic cancer.

Question 31

As the half life of a radionucleotide is 20 hours, at the end of how many complete days will the activity have fallen to less than 2% of the initial value?

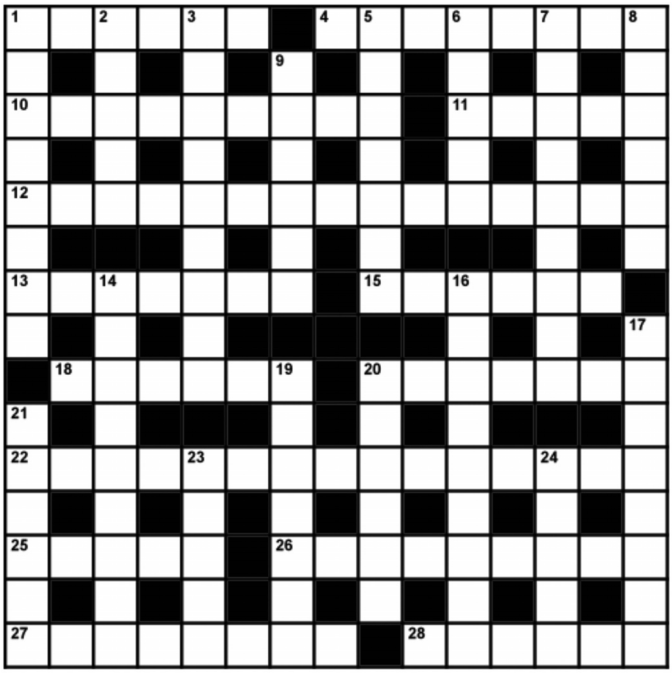
THE CROSSWORD BY RUGOSA

Across

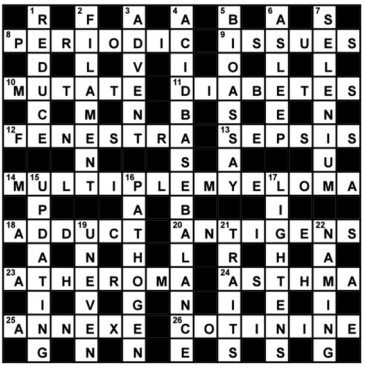
1 Agree to take small volume bound with woven tape (6)
4 Exclude figure for this quantitative representation? (3,5)
10 State of being like a chemical anagram (9)
11 Charged particle emanations lose steam (5)
12 Hormone precursor seen in deodorant preparation (15)
13 Tried – no help for upset sleepyheads (7)
15 Cite as evidence publicity preceding Italian leader (6)
18 Poet has expression of uncertainty concerning institution of conservation (6)
20 More difficult holding ring for magpie (7)
22 Metabolic syndrome outcome research tool is unsettled point (15)
25 Some are waiting on admission for organ (5)
26 Hormones affect end organs (9)
27 Organ of corrupt police state banished pensioner (8)
28 Optical device unorthodox pharmacies ship out (6)

Down

1 Protests at ageist treatment (8)
2 Obscure type of computing (5)
3 Characteristics of loveless unhappy phoney poet (9)
5 Gas: odd mint aroma not right (7)
6 Finale from Church of England organ (5)
7 French friend has no current identification for compound (5, 4)
8 Watch seeker (6)
9 Down for an operation? (6)
14 Ballads about expression of pain get refreshing beverages (9)
16 Rambling radiographers with no mobile internet connection get GI upset (9)
17 Troubles arise about using his body of water (5, 3)
19 Wrongly name many claims in error (7)
20 Hide gangster inside compound (6)
21 Aim for goal (6)
23 Stole from rewritten editorial's mathematical lines (5)
24 Separate riddle (5)



SOLUTION FOR FEBRUARY'S CROSSWORD



SUDOKU ... THIS MONTH'S PUZZLE

		T	E	Y				
		S		M	R	C	H	
		E					S	
	C	Y				E	T	
	R					I		
	H	I	C	E		Y		
				T	Y	S		

SOLUTION FOR FEBRUARY

C	T	S	R	H	E	Y	M	I
H	Y	I	C	S	M	E	R	T
E	M	R	I	Y	T	S	H	C
M	R	T	S	I	Y	H	C	E
I	C	Y	E	R	H	T	S	M
S	E	H	M	T	C	R	I	Y
T	H	C	Y	M	R	I	E	S
R	S	E	T	C	I	M	Y	H
Y	I	M	H	E	S	C	T	R

ASSOCIATION FOR LABORATORY MEDICINE HONORARY OFFICERS NOMINATION FORM

We, the undersigned, being Members of the Association nominate:

Name .....

Address .....

.....

.....

For election as Director of Education, Training and Workforce; Director of Regulatory Affairs/ FCS Chair*; or National Member

(delete as appropriate)

Name 1 ....

Capitals Signature

Name 2 ....

Capitals Signature

Name 3 ....

Capitals Signature

I am willing to undertake the duties and responsibilities of this office if elected.

.....

Signature Date

*Please note only those in the Member and Honorary Member categories may be nominated for the position of National Member. If there is more than one nominee for this position, a ballot will be held with all voting members (see Bye-Laws of the Association items 2 & 3 and 9).

This form, duly countersigned, to be returned by email to: Membership Manager, Mike Lester, or by post to The Association for Laboratory Medicine, 130-132 Tooley Street, London SE1 2TU no later than 26 April 2024.

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Headquarters
Association for Laboratory Medicine
130-132 Tooley Street
London SE1 2TU
Tel: 0207-403-8001
Email: admin@labmed.org.uk

President
Dr Kath Hayden
Email: president@labmed.org.uk

CEO
Victoria Logan
Email: victoria@labmed.org.uk

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