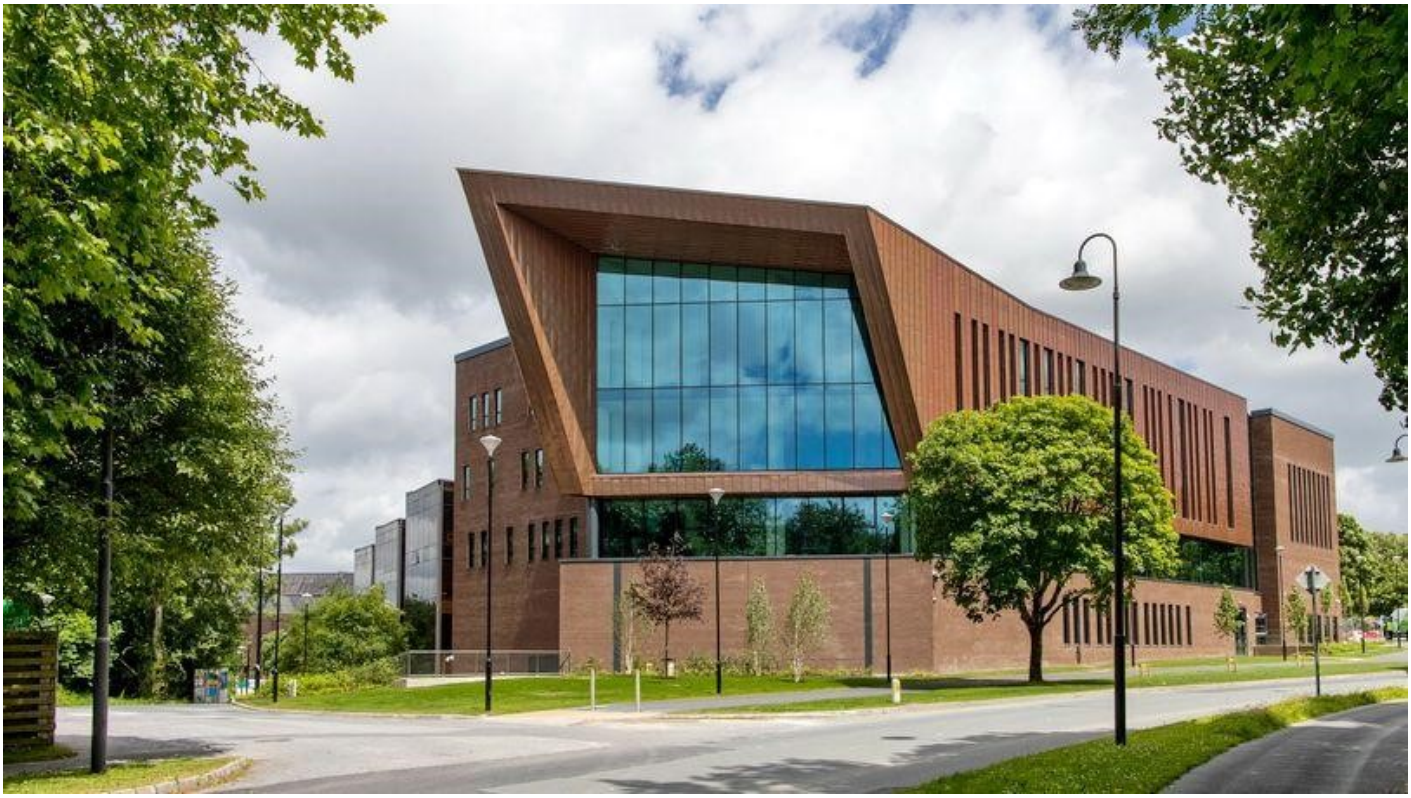
Clinical Biochemistry News

ACBI

ACB

November 2018

Newsletter of the Association of Clinical Biochemists in Ireland
and the Association for Clinical Biochemistry and Laboratory Medicine (Republic of Ireland Region)



University of Limerick Glucksman Library - "The biggest campus library in the country and one of the most digitally advanced in the world" - opened in June 2018. Its building was funded by the philanthropic Glucksman family to the tune of €31 million

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Edited by Martin Healy

Greetings from the President of the ACBI

Prof. Graham Lee, Consultant Biochemist, Mater / Cappagh / Mullingar Hospitals

Another busy year for the ACBI and its council! Following a successful business meeting in December 2017, the ACBI hosted a well-attended and vibrant meeting on Biobanking in January 2018, organised by the out-going president Prof. Maria Fitzgibbon. The issues posed by the General Data Protection Regulation (GDPR) came into sharp focus at that time. This topic was also discussed at the annual meeting of our sister organisation (ACB, ROI Region), held in January as well, to which our members also lent support in its preparation and attendance. All such discussions helped the ACBI in readiness for GDPR in May 2018!....many I'm sure have made analogies to the frenzy accompanying the Y2K bug!

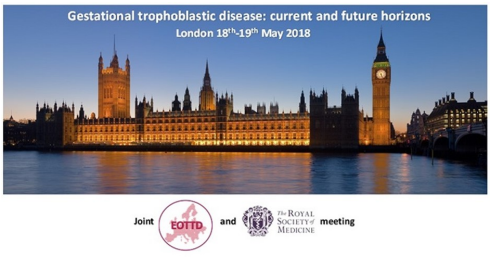
The ACBI also organised several workshops for its career grade members including statistics (February) and communication skills (May) and we are planning further sessions such was their success! Other perks of membership this year brought access for the first time to CLSI documents as well as continued access to the journals CCLM and Clinical Biochemist Reviews. The ACBI's Conference and Course Bursary was also re-launched in September 2018 and has been granted to some members already upon their successful applications. Clinical Biochemist training and assessment including specialist training for those taking FRCPath examinations continue to strengthen amidst growing enthusiasm.

Clinical Biochemists have continued to actively publish in many peer-reviewed journals in clinical biochemistry, endocrinology and various medical journals demonstrating clinical biochemistry's far reaching importance. Members have contributed to a number of national guidelines for the National Laboratory Handbook, through their work with the National Clinical Programme for Pathology and this year sees the launch of a new edition of the ACBI's Guideline for the use of Tumour Markers.

Clinical Biochemists continue to lead and participate on a number of national working groups, committees and initiatives including NCCP, MedLiS, IEQAS, RCPath (UK), the SADS National Biobank and the National GTD registry.

We continue to welcome new members to the ACBI and we hope to keep in regular communication, through email and our website which sees even greater use than before! We hope to continue engaging with our members and keeping them informed as best we can regarding new developments and opportunities!

Much work lies ahead for the ACBI for it to fulfil all of its stated objectives. The establishment of the Clinical Biochemist registration board with CORU remains a key objective!



Caroline Joyce, Principal Clinical Biochemist, Cork University Hospital

Reporting on a Royal Society of Medicine Conference on Gestational Trophoblastic Disease, 18th/19th May 2018, London

THE EUROPEAN ORGANISATION FOR THE TREATMENT OF TROPHOBLASTIC DISEASE (EOTTD) AND THE ONCOLOGY SECTION of the Royal Society of Medicine held a conference on Gestational Trophoblastic Disease (GTD) on 18th & 19th May 2018. I was awarded an ACBI bursary to attend this conference in London which happened to coincide with the Royal Wedding! I had enjoyed this conference when it was held in Cork in 2016 so I welcomed the opportunity to attend it in London especially given Cork University Maternity Hospital (CUMH) is now the National Centre for Gestational Trophoblastic Disease.

The program for this meeting addressed the molecular and genetic basis of GTD, its diagnosis, presentation and management, including the latest developments in the field. Local organiser Professor Michael Seckl welcomed guests and introduced the opening session on the diagnostic pathway for GTD, histological, genetic and biochemical. Dr Baljeet Kaur (Consultant Histopathologist) highlighted the difficulties in diagnosing a molar pregnancy as ultrasound identifies less than 50% of hydratiform moles. She told us that although molar pregnancy is a rare occurrence with an incidence of 1.24 per 1000 worldwide, prompt diagnosis and treatment is key to a successful patient outcome. We learnt that moles may be gestational or non-gestational and that these are

indistinguishable histologically even though treatment pathways and prognosis are much different.

Professor Neil Sebire, a specialist in paediatric and developmental pathology followed with an update on GTD pathology. He noted that other chromosome anomalies (eg. Trisomy 21) present with villous dysmorphic features and basal membrane mineralisation, features which are absent in moles. Also he cited a recent study of "atypical" placental site nodules which indicated they may have pre-malignant potential. However he said "atypical" nodules are difficult to classify as normal placenta is not generally referred. He stressed the need for a molecular marker to distinguish chemo-resistant from chemo-sensitive moles as these are indistinguishable morphologically and immunologically.

This was followed by two excellent lectures on the genetic classification of moles. Genetic classification is frequently performed by Chromogenic In Situ Hybridisation (CISH) for the paternally imprinted (ie. maternally expressed) marker, $p57^{kip2}$ (p57). Thus, a CHM which is diploid and androgenic in origin will be p57 negative and a PHM which is triploid and consists of bipatental DNA will be p57 positive. There was some discussion on the quality of p57 testing in the UK and the need for an EQA scheme to compare and standardise reporting. We were told that ploidy analysis using FISH, karyotyping or microsatellite analysis could be used to distinguish CHM from PHM but did not prove cost effective and in practice is reserved for difficult cases. Professor Lone Sunde (Clinical Geneticist) then spoke about using maternal blood as a liquid biopsy to provide cell-free DNA (cfDNA) for trophoblastic disease diagnosis. I found this whole topic fascinating and the possibility of using cfDNA from GTD patients to improve diagnosis and treatment pathways seemed really attractive. However, he cautioned that cfDNA which is normally cleared rapidly after delivery may persist in women with invasive molar disease and this needs to be appreciated when interpreting these tests.

The diagnostic pathway session was concluded with a lecture from Dr Wilson Stewart on the development of a new immunoassay to replace the UK 895-RIA "gold standard" for hCG monitoring which has diminishing antibody stocks. The assay developed in collaboration with a company called Mologics can detect all types of hCG (intact hCG, free hCGb, hCGn, hCGbn, hCGbcf) in serum and urine and can be used for hCG monitoring. Further validation of this reference method is required prior to marketing. On Saturday morning, I attended the hCG working group chaired by Dr Richard Harvey. This was a particularly interesting session with discussion on the need for a reference method which detects all types of hCG in equimolar amounts. The group also recommended use of a minimum of two hCG assays in GTD centres to confirm low levels and identify antibody interference. The use of a hCG assay validated for use in GTD was also recommended. Sheffield use Roche for urgent serum results and use Mologic/RIA for follow up monitoring. Charing Cross and Nijmegen labs hope to distribute EQA samples from germ cell tumours and GTD patients to test commercial hCG assays. Professor Michael Seckl also referred to measurement of hCG in CSF (which was new to me) using the Immulite assay. The CSF: serum hCG ratio is used to monitor brain metastases and spinal invasion and a ratio of 1:60 considered normal.

The workshops were followed by updates from all the national GTD centres. Dr John Coulter spoke about the Irish National GTD centre opened in Cork in 2017. Based on GTD incidence estimate (1.36/1000 births), Ireland would expect 120 cases per year and one year on the registry has 131 cases of which 43 CHM and 88 PHM. Use of chemotherapy for these patients is guided by FIGO 2000 criteria. Professor Michael Seckl discussed the use of immunotherapy for chemotherapy resistant tumours. This he said is largely focused around overexpression of EGFR (using tyrosine kinase inhibitors), anti-hCG antibody, anti-vascular and immune checkpoint inhibitors (anti-PD1, -PDL1). The conference closed with discussion on newer approaches to monitoring GTD treatment. These included use of the uterine artery pulsatility index (UAPI) to predict methotrexate resistance and use of a biomarker (BMP-9) to predict resistance to single agent chemotherapy. Use of LC-MS for hCG measurement was discussed but as the initial extraction phase would required an antibody, problems inherent to immunoassay may persist. At the meeting closure, the imminent publication of new clinical guidelines for Gestational Trophoblastic Disease was announced.

Webcasts from this meeting can be viewed at https://www.esgo.org/network/eottd/

European Society for Molecular Oncology (ESMO) guidelines are in preparation and HSE guidelines are due to be updated by the end of 2018.

The National Gestational Trophoblastic Disease Registry for Ireland was established by the Health Service Executive, the National Cancer Control Programme and Cork University Maternity Hospital with the Monitoring and Advisory Centre located in CUH.

It has been agreed by the HSE and the National Cancer Control Program that all patients with molar pregnancy should be registered with the Registry.

Extensive information on GTD and the Registry can be found at www.cuh.hse.ie/Cork-University-Maternity-Hospital/Gynaecology/GTD-Centre/ along with moving testimonials from patients affected with GTD ***-editor***

Diarmuid UaConaill—An Appreciation

Dr. Peadar McGing, Principal Clinical Biochemist, Mater Hospital, Dublin

The death took place on July 2nd 2018 of Diarmuid UaConaill, retired consultant biochemist. In his early days as head of the Mater's Biochemistry Laboratory Diarmuid led many developments in the hospital's clinical chemistry service, but it was in the field of 'computers' that he was to make a very significant contribution to healthcare across all Pathology disciplines in his own hospital, nationally, and internationally.

Diarmuid was born in his grandmother's house in Cork city. As a young child he lived in Dingle, in Mayo and in Donegal before settling back to Kerry and the first of three addresses in Tralee. He attended the Christian Brothers schools in Tralee where his Leaving Cert in 1959 won him a scholarship to UCC. With an honours BSc from UCC in 1962 he began his clinical chemistry career with a 5-month locum as Biochemist in the Children's Hospital, Temple Street. He returned to UCC and completed an MSc , and in 1964 took up a post in the Luton and Dunstable Hospital. In November 1967 he was appointed senior biochemist in charge of the Biochemistry Laboratory at the Mater Misericordiae Hospital, Dublin. Within a few years he was appointed Top Grade / Consultant Biochemist when the Department of Health set up that post as part of career re-structuring.

Soon after his appointment to the Mater Diarmuid visited two laboratories in the UK. On his return he made a case to the hospital for installation of a computer system. I'll come back to that story, as it was a long journey to fruition. On the analytical side Diarmuid took over the laboratory at a time of immense change in clinical biochemistry. Although the first Technicon Auto-Analyser was manufactured in the U.S. in 1957 it was 1965 when the Mater purchased its first 'automated' instrument – a single channel Auto-Analyser 1. Diarmuid added three more single channel analysers in 1968.

In 1969 an extension was built on to the Pathology Laboratory. Biochemistry moved into the upper floor of the extension (we're still there). As an aside, Diarmuid told me that a staff canteen was built at the same time because as the hospital got busier staff members no longer had time to amble down to the city centre for their lunch. The lab was certainly busier, workload increased from 25,000 tests in 1962 to 120,000 in 1971. Diarmuid set out his wish-list in a February 1971 document 'Equipment for the New Biochemistry Lab'. He argued for a Technicon SMA 12/60 as "the only well-proved multi-channel analyser at present on the market", and for a linked laboratory computer system. Although the computer system did not arrive for seventeen years, the 12/60 equipment arrived in 1974 and served the hospital well (with upgrades) until 1988 when three Abbott Spectrum analysers were installed. The 12/60 coordinated tests such as lipids, LFTs, creatinine, and urate from miscellaneous instruments onto one platform; from then on automation of core tests was standard.

The 12/60 gave me one of my most enduring memories of Diarmuid during the 1980s. The early automation instruments produced much more results, on many more samples, but resulted in a lot of manual transcription. Diarmuid had managed to get our IL-508 to print its results (the full U&E plus calcium) onto large labels which were then stuck on to the multi-sheet request forms. He wanted to have something similar for the SMA but Technicon were not prepared to co-operate. So every night for quite a period as soon as the instrument was turned off for routine analysis Diarmuid would set it up to 'print' to ticker tape; he would then process that tape the next day until he 'broke the code'. Result was we got all our SMA results printed on A5 pages (standard lab request form size), including our own lab's reference ranges printed and flags where results were outside the reference limits. He became the "go to man" for computing and for elegant mathematical calculations, across Pathology. In the 1980s he crafted reports from the Endocrine lab to replace symbols < and > by safer 'Under' and 'Over'. He set up a series of simple rules to focus on information, rather than data. Results were rounded to three significant figures, so a tumour marker result of 169,405 was reported as 169,000. For specific assays, results were limited to one decimal point.

Continued on next page

Although it took 21 years from Diarmuid's initial request to the hospital for installation of a computer system before it finally arrived (still many years ahead of most other hospitals) he managed to acquire laboratory computers in various ways, as he explained to me in a January 2011 email:

'The first programmable calculator I got for the lab was a Casio, which could be loaded with programs of up to 30 instructions. It was expensive – about £600 [equivalent to about €10,000 today]. *I wrote programs for it and encouraged their use.*
Endocrinology got the first mini-computer in Pathology, a Wang PCS II (Personal Computer System) but in our submission it was a calculator, as the Department of Health was not keen to introduce computers. We called it ERIC, the Endocrinology Radio Immunoassay Calculator.'

Through the efforts of Diarmuid, Gerry Hurl, and others the Mater was one of the first hospitals in Ireland to introduce an electronic requesting and reporting system. Diarmuid also played a key role in the evolution of hospital computing nationally, with Des Kenny and Rory O'Moore, and also in collaboration with Leo Morgan (Belfast). He wrote the first drafts of the Recommended Standards for Clinical Laboratory Computers issued by the joint Liaison Committee (1985 and 1992). He also worked with the Department of Health's GP-IT group to define standards for laboratory messaging. He was an early member of the ICS Healthcare Specialist Group and was key to establishing that group as an independent Society, the Healthcare Informatics Society of Ireland (HISI). For 30 years, 1980 to 2010, he represented Ireland at the International Medical Informatics Association (IMIA). After retirement from the Mater (2003) Diarmuid served as IMIA secretary from 2003 to 2009, which he delightedly informed me offered him the chance to attend conferences on a subject dear to his heart in many different parts of the world.

In 2012 Diarmuid was presented with the O'Moore Medal, an award given by the Healthcare Informatics Society of Ireland (HISI) 'to individuals or organisations that have made a major contribution to Healthcare Informatics'. Diarmuid was presented with the medal by HISI Chair Gerard Hurl and HISI President Prof. Gerard Lyons. Following his death the HISI website added a tribute to Diarmuid, which readers may like to access at https://bit.ly/2Q9YQRv (copy into your browser).
Diarmuid interviewed me for my first permanent Clinical Biochemist post and, along with his deputy Frank Kyne, was very supportive of my career, particularly working towards MRCPath and building areas of expertise. With his help I managed to build on the programming I had done for my PhD by writing some programmes for the lab. Back in the 80's if you wanted a table or similar on a printout you had to programme every line, every word, every input.

Diarmuid was not afraid to get his hands dirty. One story I heard from before I started was how he personally led a novice basic biochemist through analysing three day collections of faecal fats, though apparently he neglected to mention there were 28 more collections in the freezer awaiting analysis.

On a personal note Diarmuid became a grandfather about the same time I became a father and we would often 'compare notes' ; clearly being second time around, as it were, he had a distinct advantage in experience. He always spoke so proudly of his children and grandchildren. His family tree was also a keen interest of his. He was proud of his Irish heritage and of his Italian sculptor ancestor. I was influenced by his enthusiasm, and by his family tree system (which I adopted and adapted for myself). My last conversation with Diarmuid earlier this year featured family history studies featured alongside discussion of his health. Diarmuid was a key player in the organisation B.A.S.I.C. (Brothers and Sisters in Christ; 'Praying and Working for the Ordination of Women in a Renewed Church'). Once he appeared in the background of the RTE 6 o'clock News, campaigning for women priests. Diarmuid was a member of Astronomy Ireland, and enjoyed sailing. He liked singing or reciting poems. Like his long-time Chief Medical Scientist Eddie Wright, he had an incredible memory and could recite multiple verses, sometimes possibly too many, but always with great verve. Whenever I hear the old Percy French favourite Abdul Abulbul Amir, I think of Diarmuid.

Although Diarmuid's professional body involvement for most of his career was in the informatics area he was a member of ACBI throughout his career and very supportive of his staff being involved in ACBI affairs plus attending and contributing to our annual conferences. In the early days of the ACB Republic of Ireland Region, he served as Secretary from 1980 to 1982 and Chair in 1983.

I hope in this piece I have given you a flavour of Diarmuid and of his contribution to our profession and to the broader field of healthcare.

Castletroy Hotel and Environs

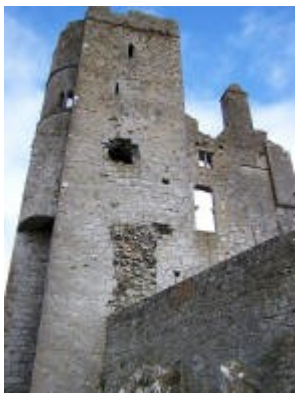
This year's ACBI conference, the 41st, takes place in the Castletroy Park Hotel, Limerick on November 9th and 10th 2018. The hotel is named after the area of Limerick it is located in. Built by Chuck Feeney of Atlantic Philanthropies fame it opened its doors in 1991. It was the first modern hotel of its size built in Ireland since the second World War. Mr. Feeney took great pride in the hotel and according to Conor O'Clery, his biographer, "would sit unnoticed in the lobby and watch how guests were treated." After a re-alignment of his priorities in the early 2000's Mr. Feeney sold his properties, including the hotel. It came onto the market again in 2012 after its owners at the time got into financial difficulties. Mr. Feeney showed interest in acquiring it but was beaten to it by Pat McDonagh, founder and managing director of the Supermac's fast food chain. An extensive refurbishment of the hotel was announced in 2017 with a planned 50% expansion in the number of rooms. The hotel is located close to Limerick University and the National Technology Park in Castletroy.

The Castletroy area itself has a long and storied history with archaeological findings showing human habitation and activity dating back to Neolithic, Bronze Age, Iron Age, Early Christian and Medieval eras. The Lough Gur Heritage Centre, about 20 minutes drive from the hotel, has a wealth of information on what is regarded as one of the most important archaeological areas in the country.

An interesting medieval structure close to the hotel is Castletroy Castle also known as The Black Castle. Built originally in the reign of Henry III (1216-1272) the current building probably dates from the 15th or 16th century. After many years being the centre of strife and treachery the castle was eventually canon blasted by Cromwell's General, Henry Ireton in 1651. Holes can still be seen in the wall where cannon balls struck. In the 1690's the castle was reduced to a ruin by the Williamites and the land was sold to the Hollow Blade Company in 1703.

50 years ago Castletroy was considered rural farmland mostly and had a sparse population. That changed dramatically with the opening of the University of Limerick (UL) in 1972. In 2006 Castletroy's population had risen to about 12,500. By 2016 it had reached 14,733 (approximately 8% of the Limerick County population). About half of Castletroy's population, it is said, is made up of students.

The aforementioned Chuck Feeney not only owned the Castletroy Park Hotel but was a serious benefactor to UL and to other third-level institutions across the country. In 2012 the universities of Ireland (9 in total including UL) conferred an honorary doctorate on the philanthropist to mark his contribution to Irish education. - Martin Healy



The Black Castle with cannonball hole

Castletroy Park Hotel

Selection of Members' Publications

Laird E, O'Halloran AM, Carey D, *Healy M*, O'Connor D, Moore P, Shannon T, Molloy AM, Kenny RA. The Prevalence of Vitamin D Deficiency and the Determinants of 25(OH)D Concentration in Older Irish Adults: Data From The Irish Longitudinal Study on Ageing (TILDA). J Gerontol A Biol Sci Med Sci. 2018 Mar 14;73 (4):519-525.

Canney M, Sexton DJ, O'Leary N, *Healy M*, Kenny RA, Little MA, O'Seaghdha CM. Examining the utility of cystatin C as a confirmatory test of chronic kidney disease across the age range in middle-aged and older community-dwelling adults. J Epidemiol Community Health. 2018 Apr;72(4):287-293.

Jones M, Denieffe S, Griffin C, Tinago W, *Fitzgibbon MC*. Evaluation of cystatin C in malignancy and comparability of estimates of GFR in oncology patients. Pract Lab Med. 2017 May 19;8:95-104.

Deverell D, Corcoran E, Macauley M, Newcombe N, Branagan P et al.. Finger Prick to Finger Tip: Use of Mobile Phone Technology to Send PKU Blood Results. Article ID 2178346, Volume 2018 (2018)

Hamon SM, *Griffin TP, Islam MN*, Wall D, Griffin MD, *O'Shea PM*. Defining reference intervals for a serum growth differentiation factor-15 (GDF-15) assay in a Caucasian population and its potential utility in diabetic kidney disease (DKD). Clinical Chemistry and Laboratory Medicine. 2018 Sep 15. doi: 10.1515/cclm-2018-0534.

Lobo R, Jaffe AS, Cahill C, *Blake O*, Abbas S, Meany TB, Hennessy T, Kiernan TJ. Significance of High-Sensitivity Troponin T After Elective External Direct Current Cardioversion for Atrial Fibrillation or Atrial Flutter. Am J Cardiol. 2018 Jan 15;121(2):188-192.

Kennelly MA, Ainscough K, Lindsay KL, O'Sullivan E, Gibney ER, McCarthy M, Segurado R, DeVito G, *Maguire O*, *Smith T*, Hatunic M, McAuliffe FM. Pregnancy Exercise and Nutrition With Smartphone Application Support: A Randomized Controlled Trial. Obstet Gynecol. 2018 May;131(5):818-826.

Coffey W, Magee B, Harris J, Edwards R, *McKillop D*. Centrifugation in GP practices - Can it improve diagnostic efficiency? Ulster Med J. 2018 Jan;87 (1):52-53.

Colhoun HO, Treacy EP, MacMahon M, Rudd PM, *Fitzgibbon M*, O'Flaherty R, Stepien KM. Validation of an automated ultraperformance liquid chromatography IgG N-glycan analytical method applicable to classical galactosaemia. Ann Clin Biochem. 2018 Sep;55(5):593-603.

McKenna MJ, Murray B, Crowley RK, Twomey PJ, *Kilbane MT*. Laboratory trend in vitamin D status in Ireland: Dual concerns about low and high 25OHD. J Steroid Biochem Mol Biol. 2018 Oct 5. [Epub ahead of print].

Stepien KM, Abidin Z, *Lee G, Cullen R*, Logan P, Pastores GM. Metallosis mimicking a metabolic disorder: a case report. Mol Genet Metab Rep. 2018 Sep 25;17:38-41.

King K, Macken A, *Blake O*, O'Gorman CS. Cholesterol screening and statin use in children: a literature review. Ir J Med Sci. 2018 Jun 1 [Epub ahead of print].

Colhoun HO, Rubio Gozalbo EM, Bosch AM, Knerr I, Dawson C, *Brady J*, Galligan M, Stepien K, O'Flaherty R, Catherine Moss C, Peter Barker P, *Fitzgibbon M*, Doran PP, Treacy EP. Fertility in classical galactosaemia, a study of N-glycan, hormonal and inflammatory gene interactions. Orphanet J Rare Dis. 2018 Sep 19;13(1):164 Free PMC Article

Hutchinson K, Dermitzaki E, W Shah, M. McKeever, Louw M, Rochev Y, Faul J. An association study between Vitamin D (25OHD) levels and obesity in Ireland. Irish Journal of Medical Science .2018 Oct; DOI: 10.1007/s11845-018-1877-z

Jeffery, J., Frank, A.R., Stosnach, H., *Costelloe, S.J.* Method for measurement of serum copper, zinc, and selenium using total reflection X-ray fluorescence spectroscopy on the PICOFOX analyser: validation and comparison with AAS and ICP-MS. Ann Clin Biochem, published online 30th July 2018.

EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

Below are some recent publications from the Biological Working Group of the EFLM

Biological variation estimates for prostate specific antigen from the European Biological Variation Study; consequences for diagnosis and monitoring of prostate cancer.
Carobene A et al. On behalf of the EFLM Working Group on Biological Variation. Clin Chim Acta 2018;486:185-91.

EuBIVAS: within- and between-subject biological variation data for electrolytes, lipids, urea, uric acid, total protein, total bilirubin, direct bilirubin, and glucose.
Aarsand AK et al. European Federation of Clinical Chemistry and Laboratory Medicine Working Group on Biological Variation. Clin Chem 2018;64:1380-93.

Harmonization initiatives in the generation, reporting and application of biological variation data.
Aarsand AK et al. European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) Working Group on Biological Variation. Clin Chem Lab Med 2018;56:1629-36.

The Biological Variation Data Critical Appraisal Checklist: a Standard for Evaluating Studies on Biological Variation.
Aarsand AK, R Raas T, Fernandez-Calle P, Ricos C, Díaz-Garzón J, Jonker N, Perich C, González-Lao E, Carobene A, Minchinela J, Coŝkun A, Simón M, Álvarez V, Bartlett WA, Fernández-Fernández P, Boned B, Braga F, Corte Z, Aslan B, Sandberg S. Clin Chem 2018;64:501-14.

Upcoming Meetings

14th International Conference on Laboratory Medicine & Pathology July 22-23, 2019 London, UK.
www.laboratorymedicine.conferenceseries.com

EUROMEDLAB, May 19-23 2019, Barcelona, Spain.
www.euromedlab2019barcelona.org/2019/home

71st AACC Annual Scientific Meeting & Clinical Lab Expo August 4-8 2019, Anaheim, California, US.
www.aacc.org/meetings-and-events/2019-annual-meeting

Frontiers in Laboratory Medicine January 29-30 2019, Austin Court, Birmingham, UK.
www.acb.org.uk/docs/default-source/meetings/film/film-2019-hold-the-dates-29-30-jan-2019.pdf

Focus May 1-3 2019, SEC, Glasgow, UK
www.acb.org.uk

12th International Conference on Endocrinology & Diabetology September 2-3 2019, Berlin, Germany
www.endocrinology.euroscicon.com/

WEBSITES / APPS

Introductory primer on Clinical Chemistry from Abbott Diagnostics
(116 pages of basic clinical chemistry)
www.corelaboratory.abbott/sal/learningGuide/ADD-00061345_ClinChem_Learning_Guide.pdf

Clinical Laboratory Diagnostics App From Siemens Healthineers (developed by Prof. Lothar Thomas)
(Can be downloaded on Android or IOS devices—119 MB—textbook like in its detail Searchable under numerous headings)
www.healthcare.siemens.com/education/clinical-laboratory-diagnostics-app

The Manchester University Academic Phrasebook
(Use the right words/phrases in paper writing. Covers the main sections of a publication and suggests appropriate phraseology)
www.phrasebank.manchester.ac.uk/

Royal Society of Chemistry Period Table
(App with extensive detail on the elements)
https://play.google.com/store/apps/details?id=org.rsc.periodictable