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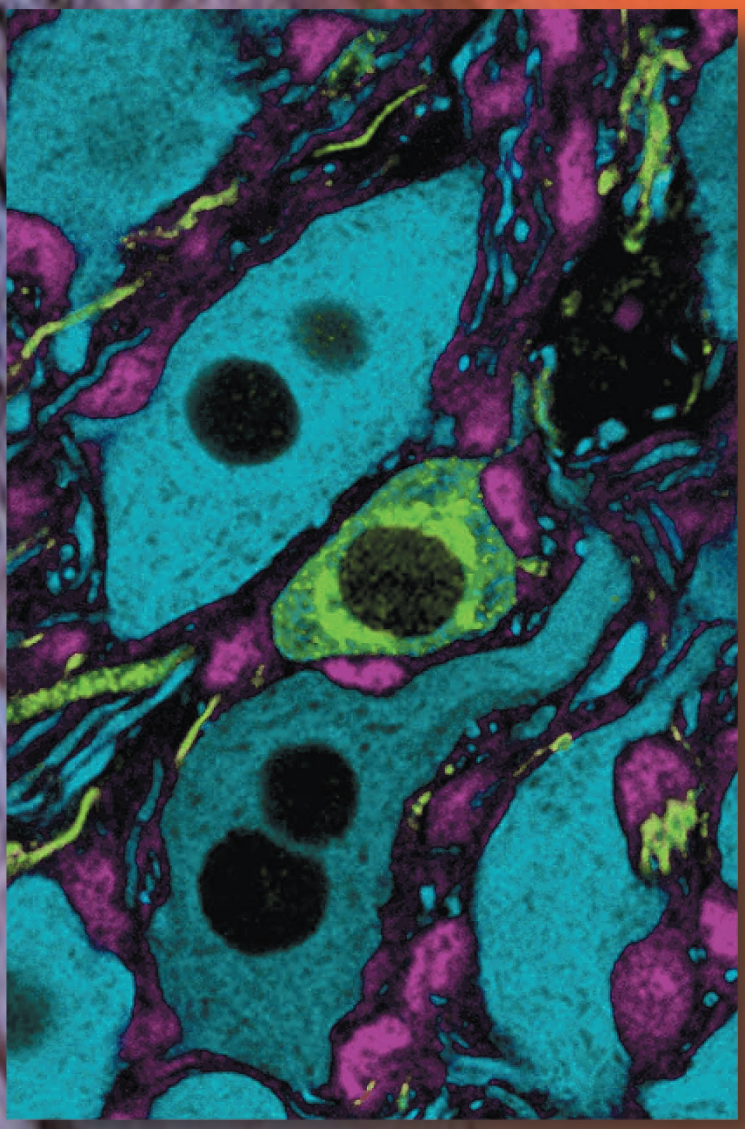

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Instructions to authors *are available on the AIMS website www.aims.org.au*

O1: Where am I going, what will I do? An industry experience week for first year medical laboratory science students.

F Breen[1]

[1]*Queensland University of Technology*

Commencing students of the Bachelor of Medical Laboratory Science course have limited or no understanding of the work of Medical laboratory Scientists (MLS) or where this takes place. The 'Industry Experience Week' in the course foundation unit, Introduction to Medical Laboratory Science, addresses this by allowing students to see first-hand the working world of a pathology laboratory and experience the world of opportunities for MLS graduates through the eyes of experienced scientists.

Timetabled in Week 9-10 of semester, Industry Experience Week comprises (1) a talk on career progression for MLS and a brief introduction to regulation of the pathology industry, (2) an introductory talk and guided tour in a large central laboratory followed by a debrief session, and (3) an industry speaker panel.

The laboratory tour affords the opportunity to observe work in real time, explained by discipline-specific MLS. In addition to the eye-opening experience of the pathology workplace itself, students see the nexus between real world practice and the foundational skills learnt in their multidiscipline practical case study, and more advanced techniques and automated instrumentation they will use in their course and workplace.

Building on the experience of the large laboratory visit, the two-hour industry panel exposes students to a range of other work opportunities. Invited industry scientists share their journeys and experiences in STAT labs, relieving work, clinical trials, international community aid, remote regional labs, research and affiliated *in vitro* diagnostic companies.

This Industry Experience Week is an aspirational experience that demystifies the work and world of MLS, provides students a 'glimpse into their future' and places their course learning in 'real work' context. Student feedback captures the opportunities as exciting, motivating and enlightening and commends the inclusion of this week at the start of their course as worthwhile and important - it "opened a black box".

O2: *In vitro* inhibition of the glycolytic process; Is a chemical or mechanical methodology superior in the modern diagnostic setting?

J M Denton[1]

[1]*University of South Australia*

Introduction

To ascertain whether the tradition of collecting specialised glucose measurement tubes has warrant in the modern diagnostic framework, just in case redundancy exists within the system whose elimination could lead to greater accuracy and lower cost of pathology services.

Methods

A number of 331 matched pairs of sodium fluoride tubes and lithium heparin gel tubes were compared. The source of these pairs were unique patient encounters where in the collection happened within a collection centre with a dedicated centrifuge for use by the collection staff. The samples arrived at the core lab in a centrifuged state and were run in tandem on the Rouche Cobas 501. The results were compared statistically as matched pairs to determine whether FlOx tubes maintained glucose levels *in vitro* more effectively than spun lithium heparin tubes.

Results

There was a statistically significant difference between the two groups for the preservation of glucose. Spun Lithium Heparin tubes were superior to FlOx in this regard which is in accordance with the theoretical basis behind the preservation process. Previous research has shown that 60 to 120 minutes elapse before glucose levels stabilise in FlOx tubes. Therefore removal of the metabolically active portion of the blood from the plasma results in the generation of a more true to in vivo result than the use of the specialised tube.

Conclusions

The results indicate that the tradition of collecting specialised tube where a lithium heparin gel tube is present is an outmoded practice in the modern pathology setting where access to centrifugation is ubiquitous.

O3: Are traditional methods for monitoring quality control results appropriate for infectious disease serology?

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National Serology Reference Laboratory, Fitzroy, Victoria 3065 Australia

Introduction

Laboratories accredited to the ISO 15189 standard are required to have quality control (QC) processes in place, present results graphically and have a system for the long-term monitoring and review. The NATA Standard Application Document states that guidance on QC issues be sought from publications of relevant professional societies. A review of applicable documents suggest that laboratories establish QC acceptance ranges by calculating the mean ± two standard deviations (± 2 SD) on the first 15-20 data points and apply Westgard rules. In 2015, NRL developed and published an alternative model of establishing control limits for infectious disease testing, called QConnect Limits.

Methods

Using QC data submitted to NRL's QC online QC

monitoring program (EDCNet) during the calendar year 2015, the percentage of QC results flagged as outliers were determined when each dataset were subjected to the traditional methods and QConnect Limits. A total of 21,510 QC test results, from 14 different serology assays, representing 103 datasets were analysed. The percentage of QC results for each dataset failing each rule was divided into three categories: <10%, between 10% and 20%, and >20%, where a failure rate greater than 20% was deemed to be not fit for purpose.

Results

The percentage of the 103 datasets having more than 20% of QC results failing Westgard rules when the first 20 results were used to calculate the mean ± 2 SD ranged from 3 (2.9%) for R4S to 66 (64.1%) for 10X rules. By contrast, only two datasets (1.9%) had more than 20% of results outside the QConnect Limits.

Conclusions

The guidelines for QC monitoring do not recognise the significant lot-to-lot variation associated with infectious disease serology. The rate of QC failure using QConnect Limits was more applicable for monitoring infectious disease serology compared with traditional methods.

O4: Bone marrow morphology proficiency testing – a virtual experience

G Earl [1], F Estepa

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Introduction

The definitive diagnosis of haematological malignancies usually requires the examination of bone marrow aspirate/trephine biopsies. In the past, RCPAQAP have not been able to provide an External Quality Assurance (EQA) program for bone marrow (BM) examination due to the difficulties in obtaining sufficient amounts of samples for distribution.

In 2015 a study was undertaken to ascertain the suitability of virtual microscopy (VM) as a means to deliver an EQA program. Following the success of this trial the RCPAQAP Haematology introduced an EQA program for BM Morphology in 2016.

The purpose of this study is to review the performance of participants for all seven BM case studies despatched since 2016.

Methods

The BM program consists of two case studies per year. Using a similar format to the participants, an expert committee evaluates the case studies to ascertain suitability for survey material. Participants receive a hyperlink containing the virtual images of peripheral blood (PB), aspirate (BMA) and trephine (BMT), special stain if needed, brief clinical details and limited full blood count results. Participants perform a differential count on the BMA, report on the morphological findings of the PB, BMA/BMT and provide a diagnosis. The assessment of the diagnosis is based on a predefined scoring system. All results are displayed graphically, and a commentary on performance and educational content are provided on the report.

The results of seven cases over four years from 2016 to 2019 have been reviewed.

Results

Case studies included granuloma, megaloblastic anaemia, metastatic carcinoma, acute erythroid leukaemia, AMML and ET. The acceptable responses for these surveys ranged from 70% to 97% with the rarer cases scoring lower than the more common conditions.

Conclusions

BM examination remains a key diagnostic tool in the haematology laboratory and VM has proved to be a successful means for delivering an EQA/educational program.

O5: Preparation for employment and the reality of pre-analytical errors on clinical placement – a medical laboratory science student's perspective

A Green[1], M Sanders[1], I Singh[1], I Cassady[1]

[1] *Griffith University, Gold Coast, Queensland, Australia*

Introduction

Awareness of diagnostic laboratory pre-analytical errors is an essential skill required by Medical Laboratory Science students upon graduation. Errors occur at every stage of the clinical testing cycle, but most frequently in the pre-analytical phase. Knowledge of the types of pre-analytical errors and the processes for handling them form an integral part of the Griffith University curriculum. This talk will present one student's perspective of educational training for pre-analytical errors and the experience of its application during clinical placement.

Methods

The Medical Laboratory Science program at Griffith University introduces students to the concept of pre-analytical testing throughout its four-year course. The curriculum emphasises: identifying sample integrity, understanding of patient identifiers, specimen handling and the requirements for Quality Assurance.

Results

Student training in Medical Laboratory Science at Griffith University uses lectures and laboratory practicals to develop pre-analytical error recognition through sample assessment, request forms checks and comparing

sample types. Enhanced learning occurs by intentional incorporation of errors in practical classes where students use critical thinking to identify and resolve these errors. Quality Assurance is introduced in first year and by their third year students participate in simulated activities including Quality Assurance Program Report interpretation and Westgard Rules. Fourth-year students undertake ten weeks of full-time clinical placement and perform a reflective analysis during their training. My placement at the Lismore Base Hospital introduced me to the full extent of both pre-analytical errors and Quality Assurance. I also recognized gaps in my education that affected my overall understanding of the testing cycle.

Conclusions

Griffith University's Medical Laboratory Science program prepares students for both placement and future employment through its coursework, but gaps in student in knowledge occur because of the limitations of simulating the clinical testing cycle in a classroom setting. I will share students view on training required during placement.

O6: Cell free fetal DNA RHD genotyping in pregnancy - a study from New Zealand

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[2]*MedLab Central, Whanganui, Whanganui 4501, New Zealand*

Introduction

Haemolytic disease of the foetus and the newborn (HDFN) is a complication of blood group compatibility in pregnancy. The most severe cases have been caused by the RhD blood group incompatibility between the foetus and maternal anti-D. Post-partum anti-RhD prophylaxis has markedly reduced Rh HDNF but not eliminated all cases of maternal RhD sensitisation. Today RhD immunoprophylaxis is also used during pregnancy to prevent RhD negative mothers from become sensitised to fetal RhD antigens before childbirth. We investigated the use of cell free fetal DNA for RHD genotyping to better direct the use of antenatal RhD immunoglobulin.

Methods

Thirty RhD negative women from the Manawatu/Whanganui region of New Zealand were enrolled in the study. Blood was collected from participants in the first and third trimesters of pregnancy and plasma stored frozen prior to blind testing. DNA extraction of plasma samples was followed using TaqManTM PCR amplification of exons 5 & 10 of the RHD gene.

Results

The method successfully predicted the fetal RhD group in 98.1% of cases.

Conclusions

In New Zealand the use prophylactic of RhD immunoglobulin occurs without knowledge of the fetal RhD group. This study looked into the feasibility of using RHD genotyping to better guide the use of antenatal anti-RhD immunoglobulin.

O7: Identification of cryoprotectant aldehydes and their removal by thiol scavengers

M Legge[1]

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Introduction

Cryoprotectants are widely used for preservation of cells, embryos and gametes, however their interactions are not fully understood. The potential for two cryoprotectant solvents, dimethyl sulphoxide (DMSO) and 1,2 propanediol (PROH) to undergo non-enzymatic reactions, generating reactive aldehydes and the role of aldehyde scavenging interacting with embryos is described.

Methods

Varying batches of DMSO and PROH were analysed using dintrophenylhydrazine (DNPH) derivatives of aldehydes using high pressure liquid chromatography and a reverse phase C-18 column and a linear acetonitrile:methanol:water gradient. Cyclohexanone was used as an internal standard and data captured on a Maclab analogue to digital converter using a Power Chrome data analysis package. Commercially sourced DNPH aldehyde standards were used to identify solvent aldehyde derivatives. Both solvent contained aldehydes and were scavenged using thiols. The scavenging mechanism, and product was determined using proton NMR. The interaction of cryosolvents and their 'scavenged' product was tested on mouse embryos using zona pellucida hardening as in indicator.

Results

Ten individual DMSO and three PROH were analysed and 11 low molecular weight aldehydes and two ketones were detected in varying concentrations. The most prominent were: formaldehyde, acetylaldehyde and acetone. Thiol scavenging interacted with the solvent aldehydes and NMR identified the product as thiozoladine-4-carboxylic acid. When tested on mouse embryos the scavenged solvents improved the ability to remove the *zona pellucida* compared to the un-scavenged solvents.

Conclusions

Commonly used cryoprotectants have the potential to form aldehydes via non-enzymatic reactions to varying degrees, which is dependent, to a certain extent, on the quality or

grade. The aldehydes may be scavenged using thiols such as cysteine, which will form a non-toxic product thiozoladine-4-carboxylic acid. This can cross cell membranes and deliver reducing power to the cells. The biological interactions of aldehyde scavenging using mouse embryos confirmed the beneficial effects of the use of aldehyde-thiol scavenging.

O8: MLH1 promoter hypermethylation analysis - challenges in the investigation of Lynch syndrome

A Marubayashi[1]

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Introduction

Methylation analysis of the promoter region of MLH1 is an important screening test in the investigation of Lynch syndrome. The MLH1 promoter is divided into four regions:A, B, C and D. The literature suggests that region C, -248 to -178 (relative to the transcription start site) in the MLH1 promoter, best correlates with loss of protein expression. One hundred seventy seven tumour samples with loss of MLH1 expression as determined by immunohistochemistry underwent methylation testing for promoter regions B, C and D at LabPLUS in the past 17 months. Among the samples found to be unmethylated, a subset showed low level methylation in region B, whilst regions C and D were strongly correlated.

Methods

Tumour DNA was bisulfite converted (EZ DNA Methylation Gold Kit, Zymo Research), followed by polymerase chain reaction (PCR) amplification of regions B, C and D, Mass Cleave reaction and analysis with the EpiTyper software (Agena MassArray Methylation assay).

Results

Out of the 177 samples, 110 (62.1%) were methylated at all regions and 38 (21.5%) were overall unmethylated. Within the unmethylated group, 10 samples (26.3%) presented an average methylation level of 18.9% for region B although they showed lower levels for regions C and D (4% average). There was a 16.4% equivocal result or failure rate (29 samples).

Conclusions

In tumour samples characterized as having unmethylated MLH1 promoter, regions C and D present similar levels of methylation and therefore region D may also have an important role in MLH1 expression, whilst the B region can present higher levels, which supports previous published findings. This pattern was observed across both endometrial and colorectal samples.

O9: Haemophagocytic Lymphohistiocytosis: a case study

M Price[1], J Royle[1]

[1]*Pathology Queensland, Townsville, Queensland, Australia*

Introduction

Today, we present a case study of a male with adult-onset HLH without an obvious trigger. Haemophagocytic Lymphohistiocytosis (HLH) is a highly fatal syndrome of inappropriate immune activation. It is almost invariably fatal without intervention and retains a significant fatality rate with treatment. The syndrome is often divided into a familial form and a sporadic form, commonly the result of immune insult. These insults may include malignant, infective or rheumatological triggers with the most common being Epstein-Barr Virus (EBV) infection.

Diagnosis

HLH has no singular specific biomarker (even the presence of haemophagocytosis is not pathognomonic) therefore several protocols have been developed for diagnosis. The most recent being the H-score protocol developed in 2014. This protocol combines clinical features such as fever and organomegaly (hepatic and/or splenic) with pathology testing for cytopaenias, haemophagocytosis and deranged patient biochemistry.

Treatment

Several treatment protocols have been developed including HLH-2004. This protocol combines high strength immunosuppressive therapy with chemotherapeutic drugs over a prolonged period to control the syndrome and prevent flare-ups. Treatment of HLH (including the familial form, FHL) is targeted toward patient survival until a Haematopoietic Stem Cell Transplant can be performed.

O10: Fibrinogen replacement in severe trauma patients

A Ross[1]

[1]*Pathology Queensland, Townsville, Queensland, Australia*

Introduction

Fibrinogen replacement in severe trauma has been shown to improve patient outcomes. Hypofibrinogenaemia is a side effect of severe trauma, and replacement has become an important target for treatment. Major haemorrhage protocols are increasingly replacing fresh frozen plasma and cryoprecipitate with fibrinogen concentrate, which can be administered faster and more easily. This study investigates the serum levels of naturally occurring anticoagulant proteins following trauma and fibrinogen replacement.

Methods

Trauma patients were randomly assigned treatment groups to receive either fibrinogen concentrate or cryoprecipitate. Antithrombin, protein C and protein S levels were assessed on presentation, prior to and following fibrinogen replacement, on admission to ICU and at nominated

timepoints thereafter for 7 days.

Results

Levels of anticoagulant proteins were low at presentation for all patients. Following treatment, the cryoprecipitate group demonstrated a more rapid recovery of anticoagulant proteins returning to the normal range. A significant difference between protein S concentrations at 12 hours post ICU admission for the treatment groups was seen. Fibrinogen replacement source was also shown to have a moderate to large effect on antithrombin and protein C levels, suggesting that different treatments may have different effects on coagulation system protein levels. Thromboembolic events occurred in 27% of patients, demonstrating that post treatment complications are common in this cohort.

Conclusions

Disruptions to the haemostatic balance may have consequences for patients if fibrinogen concentrate were to replace cryoprecipitate completely, due to the complex nature of coagulopathy, anticoagulant protein function and risk of thromboembolic events in the longer term. There may be a role for more than one type of fibrinogen replacement therapy in major haemorrhage protocols, although the results suggest more research is required.

O11: Improving laboratory economic and environmental performance by the implementation of an environmental management system

J Ross[1]

[1]*Royal College Of Pathologists Of Australasia Quality Assurance Programs*

Introduction

Benefits to an organisation of implementing an environmental management system (EMS) include improved environmental awareness and community relationships, cost savings and business efficiencies, regulatory compliance, improved marketing opportunities and corporate image and reduced risk of disaster. There have been many organisations that have embarked on implementing an EMS, but few diagnostic laboratories or their suppliers. The RCPAQAP is a medium sized healthcare organisation with a laboratory, logistics and office area. The organisation has successfully integrated an EMS as well as Lean and Business Excellence into its business practice.

Methods

RCPAQAP began working on creating an environmental management system with the establishment of a 'Green Team' comprising key staff with an interest in environmental issues and seeking ways to reduce the company's environmental footprint. Stage 1 saw the development of an Environmental Policy and Action Plan, and the team set about identifying activities that had a significant impact on the environment. They sought ways to monitor these with the aim of establishing overall goals and targets. Opportunities initially identified included paper and printer usage, electricity and water usage, waste disposal and recycling, and selection of suppliers. As a measure of commitment to the 'greening' of the organisation it was decided to work towards certification to ISO 14001:2015 Environmental Management Systems to seek recognition for the efforts. An internal gap analysis demonstrated that while excellent improvements in relation to environmental issues had already been made across the organisation, there could be improvements in the documentation of these and integrating the EMS with the existing Quality Management System (QMS).

Conclusions

There have been real and tangible benefits to the organisation in terms of environmental footprint, cultural change and financial performance. There have been significant savings in waste, power and reduced paper usage and in financial savings to the organisation. The organisation has achieved accreditation to ISO14001 and received an award from the Australian Business Excellence Awards scheme. The RCPAQAP has been able to document a process that has led to the successful integration of an EMS into business practice and has recorded real benefits from the exercise.

O12: **Returning tissue to patients - a cultural journey**

L Sinclair[1]

[1]*Counties Manukau Health*

Introduction

Middlemore Hospital services the most culturally diverse population in New Zealand and has the largest responsibility in providing return of tissue to patients. All patients are given the opportunity to have their surgical tissue or limbs returned for cultural tradition and purpose.

Methods

In this study we research the cultural, legislative, practical, and relational responsibility of histopathology in returning tissue to patients. We also explore and research the interdepartmental associations, their practical and cultural considerations, to further define our role in histology. Finally, to understand the process fully we embark on a cultural journey into the significance of tissue return for patients.

Results and Conclusions

Standardisation of protocol, including patient identification, documentation and tracking was fundamental to the process of tissue return to patients; however building relationships with open communication to a diverse party involvement was the foundation to a workable system. The knowledge of cultural significance to patients further strengthens the

relational foundation. This study highlights the central and responsible role that histology has, in supporting a unified process in the return of tissue to patients.

O13: Antioxidants decrease platelet hyperactivity and inflammation in aspirin resistant diabetes

I Singh[1]

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Abstract

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality among patients with diabetes mellitus (DM). Oxidative stress associated with hyperglycaemia and metabolic disorders leads to impaired antioxidant function, platelet hyperactivity and inflammation. DM induced chronic inflammation and fibrosis in a range of tissues, leads to formation and progression of disease states. It has been suggested that increased reactive oxygen species may be primarily responsible for the development of diabetic complications.

Low dose aspirin (LDA) has been the cornerstone for prevention of CVD in DM and treatment of coronary artery disease during the last 35 years. In patients with atherosclerotic risk factors and DM, LDA is unable to show any benefit in primary prevention of cardiovascular events. Although low-dose daily aspirin regimens reduce the risk for cardiovascular events by about 25% in patients with cardiovascular disease, meta-analyses found that subjects who were resistant to ongoing aspirin therapy, as opposed to those who were sensitive, are about three times more likely to experience cardiovascular events due to aspirin resistance reflecting genetic or metabolic factors that alter the expression or function of platelet proteins such that platelets can aggregate effectively in the absence of thromboxane.

We have demonstrated, antioxidants and lifestyle changes could be used as alternative or complementary to aspirin therapy for prevention of CVD in diabetes. The assessment includes platelet function, inflammation, lipids, glycaemia, blood parameters and gene expression of various biomarkers in diabetes and prediabetes.

O14: Spurious Mean Cell Volume in Hyperglycaemia

N Whiting[1]

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Introduction

Hyperglycaemia is known to cause spurious MCV results on impedence analysers. This study aimed to determine the threshold glucose concentration over which the MCV is likely to be affected on the DxH 800 analyser, to validate methods for correcting the error and to determine the frequency of errors at Monash Health.

Methods

Thirty volunteers donated 20x3ml EDTA samples. The glucose concentration was adjusted incrementally for each set of samples. After incubation, the MCV and glucose concentration were determined. The threshold glucose level was determined for each participant as the level over which the MCV would increase by >2fl. Each aliquot was corrected using 1:2, 1:4 dilutions and saline replacement methods using both 0.9% saline and DxH 800 analyser diluent to determine the most effective means of correcting the MCV. Look back over 12 months of FBE results with glucose levels over 20mmol/L were examined to determine the frequency of error and effectiveness of corrective measures used.

Results

Threshold levels for the 30 participants varied between 26 and 39 mmol/L and was shown to be very individual with no correlation to age, ethnic group, or base MCV. A slightly lower threshold found in females than males. A 1:4 with 0.9%saline was the most effective method of correction. 12 month lookback revealed 160 episodes with glucose levels above 26mmol/L, a significant number of these exhibited spurious MCV results.

Conclusions

Significant numbers of spurious MCV results were shown to occur when the glucose concentration is above 26mmol/L on the DxH 800 analyser. It is advocated that a glucose level of 26mmol/L should be used as a trigger to investigate the possibility of a spurious MCV result.

A 1:4 dilution with 0.9% saline should be used to correct the MCV back to the true value.

P1: Significance of biochemical markers for the verification of bacterial and candidal bloodstream infection

A Antonets[1], V Dmitrieva[1], O Kit[1], G Klyasova[2], O Kozyuk[1], O Kutsevalova[1], I Lysenko[1], E Marykov[1], E Pak[1], N Panova[1], D Rozenko[1]

[1]*Rostov Research Institute Of Oncology;*

[2]*National Research Center for Hematology*

Introduction

The early detection of the causative agent of bloodstream infection (BSI) is crucially important. We evaluated the prognostic significance of procalcitonin and mannan antigen of Candida spp (MA).

Methods

We examined 349 patients with suspected BSI from 16 intensive care, oncology and oncohematology units in the South of Russia. Sterility blood testing was performed using the BacT/ALERT3D analyzer and identification of strains was made with the Vitek-2 automatic analyzer (BioMerieux, France). We measured the levels of procalcitonin as a marker of bacterial BSI and MA for detection of Candida spp. using the Procalcitonin kit ELISA-BEST (Russia) and Platelia™ Candida Ag Plus kit (France) correspondingly. Positive values were, procalcitonin ≥10 ng/ml and MA ≥125 pg/ml.

Results

Positive blood cultures were obtained in 84 (24.1%) patients. Bacteria accounted for 77.4% (65 strains), Candida spp. 22.6% (19 isolates), bacterial-candidal associations 3.6%. High values of procalcitonin accounted for 68 (33.2%), MA for 118 (57.6%) and both markers for 19 (9.2%) of patients. For 144 (41.3%) patients with initial negative blood culture testing and normal biomarker levels, additional studies were needed to exclude or confirm BSI. There were 70 patients who received a positive result, 14 of them had high procalcitonin and 56 had a positive MA. Also 18 patients had a positive blood culture and 52 patients were observed with only positive biomarkers. The remaining 48 patients had fever of unknown origin.

Conclusions

A comprehensive approach to the diagnosis of BSI has increased the percentage of pathogen verification to 58.7%. Blood culture and biomarkers testing of bacterial infection revealed almost the same diagnostic significance. MA testing improved dramatically the early diagnosis of a candidal BSI. The inclusion of biochemical markers testing in the diagnostic algorithm for suspected BSI allowed early identification of the causative agent.

P2: Renal days in the Northern Territory

J Ashford[1]

[1]*Territory Pathology, Darwin, Australia*

Introduction

Territory Pathology is a Northern Territory government pathology network with hospital laboratories in Darwin, Palmerston, Alice Springs, Katherine, Tennant Creek and Gove. Chronic kidney disease patient's on dialysis have a significant presence in the Northern Territory.

Once a month on "Renal days", which are on the first and second weeks of the month, all end stage kidney failure patients on dialysis are tested on monthly and three monthly panels; aluminium is also tested annually. From 1/06/2018 to 31/5/2019 Territory Pathology performed monthly dialysis testing on 740 patients in 10482 blood collections.

Monthly Panel

Full blood count, Calcium, Magnesium, Phosphate (CMP), C Reactive Protein (CRP) and post dialysis Urea.

Three Monthly Panel

Full blood count, Calcium, Magnesium, phosphate (CMP), C Reactive Protein (CRP) and post dialysis urea, Liver function tests (LFTs), Lipid profile, Iron, Haemoglobin a1c (if diabetic). Aluminium is tested once a year.
Aim: Investigate the magnitude of work increase over these days and between Territory Pathology Network laboratories.

Methods

By using statistics report from our Laboratory Information system we were able to review post dialysis urea requests. Along with the knowledge of the renal dialysis pathology schedule, we were able to statistically evaluate workload increases of the number of episode and extent of testing. Patient location and date of collection was also confirmed.

Results

Royal Darwin Hospital, Alice Springs Hospital and Tennant Creek Hospital are most affected by renal days. Tennant Creek saw the most significant test set percentage increase of 153 % vs the usual average. Palmerston Hospital followed on a 92% positive test request increase, Royal Darwin Hospital showed a 83% percent increase and Alice Springs a 65%. Gove and Katherine not significantly affected by renal days the percentage change <10%.

Conclusions

There is a substantial increase of blood requests on renal days in Darwin, Palmerston, Alice Springs and Tennant Creek on Renal days. PTH requests have split into patient groups to reduce the number of PTH requests at once. Maybe this should be considered for more tests.

P3: Rapid quantitation of Hb H and Hb Bart's by automated HPLC integration; correlation with cellulose acetate elution.

N Hussein[1], E Hoskins[1], L Meyepa[1], Z Kaplan[1]

[1]*Monash Pathology, Clayton, Victoria, 3168 Australia*

Introduction

At Monash Pathology Hb H and Hb Bart's quantitation is currently performed using a time consuming method of cellulose acetate elution. With increasing numbers of Hb H estimations being performed, we have investigated the much faster method of including the Hb H and Hb Bart's peaks in the integration by automated HPLC.

Methods

Approximately 45 EDTA samples from adult patients with Hb H peaks by HPLC were analysed in a 12 month period.

Cellulose acetate elution was performed by preparing a Hb lysate and electrophoresing on a Titan III-H cellulose acetate plate at alkaline pH (8.2-8.4). After separation the Hb A, and Hb H/Hb Bart's bands were cut out and eluted in Tris-EDTA-Borate buffer for 1 hour. Optical densities were then determined at 415nm using a Cintra 10e spectrophotometer, and the Hb H/Hb Bart's percentage calculated.

Automated HPLC integration was performed by reanalysing samples after analysis on the BioRad Variant II HPLC system using the β-thal short program. The integration time was retrospectively changed from 0.55 to 0.0.

Results

Hb H/Hb Bart's estimation by reanalysis integration showed good correlation with our current method of elution after cellulose acetate electrophoresis (r2 approximately 0.9). In general results by integration are slightly higher than by elution. Possible reasons for this will be discussed.

Conclusions

Reanalysis of HPLC results by retrospectively changing the integration time to 0.0 to include Hb H and Hb Bart's peaks is much faster, easier, has less variables and shows good correlation with our traditional method of quantitation of these haemoglobins.

P4: Homogeneity testing of EQA material using osmolality as a marker

C Kehoe[1], P Graham [1]

[1]*RCPAQAP*

Introduction

External Quality Assururance (EQA) providers are accredited to the ISO/IEC 17043:2010 Conformity assessment standard which covers general requirements for proficiency testing. The standard includes requirements for pre- and post-assessment of survey material to ensure it is homogenous for each round of samples. Various methods have been used to assess suitability, depending on the availability of the test and nature of the material. Haemoglobin is a standard way of assessing whole blood EQA material, however for serum/plasma/urine and other fluid samples, a variety of methods are in use (e.g. glucose, sodium, albumin) depending on the material being assessed. By only measuring a single analyte in a multi-analyte program, a potential issue may be missed. Given osmolality is defined as a measure of the concentration of all the solutes in a given weight of water. The instrumentation required is readily available and cost effective for an EQA provider. We sought to test its suitability to detect possible non-homogeneity across a range of EQA materials.

Methods

Osmolality for a number of RCPAQAP programs was introduced in 2017. Random samples from each batch were tested (using an Advanced Instruments Model 3320) and results checked for between sample standard deviation. Criteria for suitability was set a <3% variation between samples.

Results

Once operator technique was established, osmolality testing for homogeneity was found to be suitable. Most programs passed (>90%), some required re-testing (<5%) and the remainder (1-2%) were rejected. Returned survey data was also checked for any signs of non-homogeneity (e.g. tailing on histograms) and no issues were detected.

Conclusions

Osmolality has proved to be useful and readily available option for homogeneity testing for RCPAQAP liquid based (serum/urine/ plasma/ body fluid) programs.

P5: Immunoexpression of Ki-67 labelling proliferation index in Phyllodes tumour of breast in Myanmar

A A Khin[1], A M Mon[1], K C Wai[1]

[1]*University Of Medical Technology, Yangon, Myanmar*

Introduction

Phylloides Tumours (PTs) are rare breast neoplasms with a variable clinical course depending on the tumuor category. The classification of PTs proposed by the World Health Organization into benign, borderline, and malignant is based on a combination of several histologic features, including stromal cellularity, nuclear atypia, mitotic activity, stromal overgrowth and tumour margin appearance. The diagnosis of PTs based on the integration of morphology remains challenging and additional study of proliferative markers such as Ki 67 are essential to identify those with potential for aggressive behavior. This study was undertaken to assess the histopathological characters and correlate Ki 67 expression in different subtypes of PTs.

Methods

In this study, 30 cases of PTs were studied and histologic features by routine H&E stains were considered for diagnosis and classification of tumours. Immunostaining for Ki 67 was performed by polymer-based detection method. Nuclei of tumour cells showing diffuse brown staining were regarded as positive regardless of the staining intensity. Ki-67 labelling index (Ki 67 LI) was categorized depending on the percentage of positive tumour cells and was correlated with histologic grade and clinical history in each case.

Results

Twenty cases (66.7%) of benign PT (BPT), three cases (10 %) of borderline PT, and seven cases (23.3 %) cases of malignant PT(MPT) were noted in this study. Among 20 cases of BPT, three cases (15%) were recurrent tumours. Average Ki 67 LI in BPT was 5% (range 1-10%) and borderline PT was 17.5 % (range 15-20%). respectively. MPT exhibited Ki 67LI range of 15-35 % with average LI of 25 %. A significant association was seen between expression of Ki 67 in different grades of PT (P = 0.01).

Conclusions

Ki 67 LI should be performed in routine histopathology reporting of phylloides tumours for classification and prognosis.

P6: The accuracy of unverified full blood count reports

R Palit[1]

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Introduction

At Sullivan Nicolaides Wesley Hospital unverified full blood count reports (UFBC) are used by a private oncology day treatment facility (POD). The shorter turn around time (TAT) of the UFBC compared to the verified full blood count reports (VFBC) improved patient management. An investigation was performed to verify the accuracy of the UFBC.

Methods

Retrospective assessment of 69 randomly selected UFBC and VFBC for patients from the POD was performed. Multiple methods of statistical analysis were performed on the UFBC and VFBC, specifically analysing the, TAT, neutrophil count, platelet count and haemoglobin as measured by the XN 1000 haematology analysers and Apollo laboratory information system.

Results

The TAT for the UFBC was shorter (4.75 minutes, P-value<0.05) compared to the VFBC TAT (46.25 minutes, P-value <0.05). 11 of the 69 UFBC results showed haematology parameters of interest falling outside the acceptable levels of performance when compared with their own VFBC results. Acceptable levels of performance were based on the measurement of uncertainty (MOU) and the haematology ranges from the Royal College of Pathologists of Australasia Quality Assurance Program (RCPA QAP). However, the 11 UFBC that were outside the MOU and RCPA QAP levels did not impact patient management given the POD's patient management levels for neutrophils, platelets and haemoglobin.

Conclusions

When UFBC are used appropriately, they can lead to a decreased TAT for oncology patients who require day treatment. UFBC results can still fall outside the levels of acceptable performance according to MOU and RCPA QAP, however UFBC can still be used for patient management if handled carefully under established clinical policies and guidelines.

P7: Prospective assessment of immune profile and evidence of transfusion-associated immunomodulation in coronary artery bypass grafting patients

A Perros[1,2,3], S Engkilde-Pedersen[1,3,6], K Rooks[1], F Chong[1], A Esguerra-Lallen[1,3,6], H Faddy[1,2,4], E Hewlett[1], R Naidoo[5], J P Tung[1,2,3,4], J Fraser [2,3,6], P Tesar[5], M Ziegenfuss[6], S Smith[5], D O'Brien[5], R Flower[1,4], M Dean[1,3,4]

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[6]*Adult Intensive Care Services, The Prince Charles Hospital, The Prince Charles Hospital, Queensland, Australia*

Introduction

Transfusion has been associated with increased rates of poor patient outcomes including infection and mortality. Patients undergoing coronary artery bypass grafting (CABG) were recruited to prospectively assess changes to their immune profile and further assess the impact of transfusion on the immune profile.

Methods

Blood (10 mL) was collected from CABG patients (n=49) at 5 time-points (admission, intra-operative, ICU, day3 (D3), day5 (D5)). The absolute counts of monocytes, natural killer (NK) cells, B-cells, T-cell subsets, and dendritic cell (DC) subsets were determined (Trucount, BD Biosciences). An *ex vivo* whole blood culture model was used to assess the patient DC and monocyte immune profile at each time-point. Lipopolysaccharide (LPS) was added in parallel

to model a bacterial complication. Association between changes to the immune profile and adverse outcomes (prolonged ICU length of stay (LOS) and post-operative atrial fibrillation (AF) was assessed for the entire patient cohort and for the transfusion sub-group (n=7).

Results

CABG modulated multiple leucocyte subsets as well as expression of DC and monocyte activation markers and cytokine production. Following CABG, DC and monocytes had a reduced capacity to respond to bacterial stimuli, indicating immunoparalysis. Modulation of DC and memory T-cell numbers, and the DC and monocyte phenotype was associated with prolonged ICU LOS and post-operative AF. Compared to non-transfused patients, transfused patients had increased numbers of NK cells and T-regulatory cells, and a different DC and monocyte phenotype post-CABG. Transfused CABG patients were more likely to have prolonged ICU LOS (71% of transfused patients vs. 33% for non-transfused patients).

Conclusions

CABG modulated multiple leucocyte subsets, and the DC and monocyte phenotype. Patients who received transfusion had a different immune profile and spent longer in ICU. In line with the principals of patient blood management, our assays to profile the immune response used minimal blood volumes which are translatable to other patient cohorts.

P8: Pacific pathology training centre external quality assessment programme

R Siebers[1,2], N Karan[2], V Khieng[2], P Wakem[2], F Faiga[2], R Cole[2]

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[2] Pacific Pathology Training Centre, Wellington, New Zealand

Introduction

The PPTC External Quality Assessment Programme [PPTC-EQAP] commenced in 1985 as an evaluation process of students attending residential courses. This was enhanced when the PPTC was conferred Collaborating Centre status by the World Health Organization, and is now the main EQA provider to the laboratories in the Pacific region.

Methods

The PPTC EQAP includes six panels in the medical pathology disciplines of Serology, Blood Bank, Microbiology, Haematology, Biochemistry and Anatomical Pathology. Samples for each survey are dispatched from Wellington, in lyophilised form or as a whole specimen, following the IATA shipping of biological substances guidelines. All disciplines are delivered over three cycles expect for Biochemistry which consists of two cycles with four parts. The PPTC contract's consultants (registered New Zealand medical laboratory scientists and pathologist) who are specialists in the selected disciplines for analysis and reporting of the results. Participating laboratories are given five weeks to process the samples and return their results to the centre. Interim report is provided a week after the due date for all programmes. A final reply is compiled by consultants and provided to each participating laboratory, which details the laboratory score for the respective cycle, their accumulated score for the previous cycle in that discipline, and the average score for all participating laboratories.

Results

In 2019, there are 99 laboratories from 21 countries participating in all or part of the PPTC EQA programme. The New Zealand Government, through the Ministry of Foreign Affairs and Trade (NZ-MFAT), provides funding to the PPTC to deliver the EQA programme at no cost to 30 laboratories in 17 countries, while the rest of the laboratories are privately enrolled through their own funding or through a donor partner funding.

Conclusions

The PPTC has provided a free external quality assurance programme for medical laboratories in the South Pacific.

P9: Histopathology – there is life in the old dog yet

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[1]School of Biomedical Sciences, Faculty of Health, Queensland University of Technology;

[2]Sullivan Nicolaides Pathology, Bowen Hills, Queensland 4006

Introduction

To evaluate the utility of claudin-4 as a pan-carcinoma marker in cell blocks of effusion specimens and compare results with Ber-Ep4 staining.

Methods

Effusion cell blocks (n=284) were stained for claudin-4 and results compared with Ber-Ep4. Cases included 164 metastatic malignancies (137 adenocarcinomas, 20 small cell lung tumours, 4 squamous cell carcinoma, 3 urothelial cell carcinoma) 8 metastatic melanoma), 49 benign reactive cases and 63 mesotheliomas.

Tumour tissue for 39 cases with a cell block were also stained with the same claudin-4 protocol to assess correlation of results. This included 13 mesotheliomas; 15 breast carcinomas; 9 lung tumours (6 adenocarcinoma and 3 small cell carcinoma and 2 metastatic squamous cell carcinomas.

Results

All 49 benign effusions were negative. Only 1/63 (1.6%) mesotheliomas was positive for claudin-4. Claudin-4 staining was positive in 131/137 (95.6%) adenocarcinoma cases. Cases negative for claudin-4 included single cases of metastases from breast, colon, stomach, prostate, kidney and ovary. Claudin-4 outperformed Ber-Ep4. Sensitivity (95.6% vs 85.4%), specificity (99.1% vs 86.6%), negative predictive value (94.9% vs 82.9%) and positive predictive value (99.2% vs 88.6%) were all higher for claudin-4

compared with Ber-Ep4, respectively. Only two cases were Claudin-4 -/ Ber-Ep4+. Significantly (P<0.0064) more cases of metastatic adenocarcinoma stained positive for claudin-4 (131/137; 95.6%) than Ber-Ep4 (117/137; 86.2%). Claudin-4 staining was present in 15/20 (75%) of neuroendocrine carcinomas, 3/4 (75%) SCC and 3/3 (100%) UC. All 8 cases of melanoma were negative for both claudin-4 and Ber-Ep4.

All but one case showed concordance between the biopsy and effusion cell block result.

Conclusions

Claudin-4 staining is a useful addition to IHC panels for effusions specimens with superior performance to Ber-Ep4. It may also have application in tissue specimens. In contrast, in obesity we observe a systemic immunosuppressive response which is then associated with increased respiratory and extra-respiratory viral replication. Our current research seeks to use this in-depth mechanistic information to develop new therapeutic options to protect the growing number of people living with obesity and diabetes. Given that 2017 was one of Australia's worst influenza seasons on record, this research is both highly timely and pertinent.

S1: Mutational profiling of myeloid malignancies

H Aung[1]

[1]*Pathology Queensland*

Abstract

The utility of Next Generation Sequencing (NGS) in molecular haematology has resulted in an increase in the number of genes with actionable driver mutations that can provide useful information in routine clinical practice. Using multiple gene approach, a specific mutation profile can be generated at diagnosis for each patient. As a result, there is now a need to test multiple genes rather than a single exon and/or gene for most of the haematological malignancies, including myeloid malignancies. The Cytogenetics Laboratory, Pathology Queensland, receives over 900 diagnostic bone marrow specimens per annum. Of these, ~40% are for myeloid malignancies (~15% for AML, ~8%for MPN and ~18% MDS). Recent studies have shown that ~90% of AML will have at least one detectable mutation in one of the critical genes, and consequently the mutational landscape in AML can provide diagnostic and/or prognostic information, identification of therapeutically targetable mutations, and/or potential markers for minimal residual disease (MRD) monitoring. In order to obtain a balance between diagnostic and discovery, the use of small targeted panels has become method of choice for NGS testing of somatic mutations in a clinical diagnostic setting. Archer® VariantPlex® Assay is a powerful NGS-based technology that can be used to detect sequence variants by generation of target-enriched libraries. At Pathology Queensland, we have recently completed the validation of the Archer® Somatic VariantPlex® Blood Cancer assay using the Archer® VariantPlex Core Myeloid panel, which is a 37-gene panel that has been specifically designed for the investigation of mutational burden/landscape associated with myeloid malignancies, with a view to implement as a first-line diagnostic testing for myeloid malignancies. This assay will also be used as a testing tool for the clinical implementation project "Queensland myeloid genomics program – improving the survival of children and adults with myeloid cancers", which is led by Dr Cameron Curley and funded by Queensland Genomics.

S2: Data Mining Principles

T Badrick[1]

[1] *RCPAQAP, St Leonards, NSW, Australia*

Abstract

Data mining is the practice of examining large pre-existing databases in order to generate new information. The new information arises either because different questions are being asked or different techniques are being used. Different questions may arise because our understanding of fundamental processes has changed and we are searching 'old' data to verify these processes. Different

techniques may involve the use of greater computer power which can examine ever bigger data bases ('big data') or different statistical techniques that may be able to identify associations within data sets. Pathology data is a rich source of information which can supplant animal models in many cases. Every human disease has clinical and pathology data associated with it. Mining that data will tell us as much as an animal model.

There are problems with this data mining of human information. These include the heterogeneity of medical data, ethical, legal, and social issues of accessing this information. There are also statistical issues such as the following myths:

- Myth 1. Big data is universally big;
- Myth 2. Big data means never having to say what your research question is;
- Myth 3. Big data means never having to say what your model is;
- Myth 4. Big Data means never having to consider sampling theory, a standard error, or a p-value;
- Myth 5. Big data means more valuable information;
- Myth 6. Big data means observational data can be used to measure causal relationships;
- Myth 7. Classical statistical methods are inadequate to deal with big data.

Practical examples of data mining include the following:

- Quality Control;
- Reference Intervals and Critical Differences;
- Relationships between analytes;
- Modelling;
- Predicting outcomes;
- Detecting Poor Performance.

Some of these will be discussed in particular new evidence on red cell survival in the circulation and the role of RDW as an important biomarker.

S3: a) Adamts 13 testing challenges and controversies

J Beggs[1]

[1]*Pathology Queensland, Queensland, Australia*

Abstract

This presentation discusses the challenges faced by laboratories when performing testing to confirm or rule out a diagnosis of TTP. The new tests available will be discussed and my experience with these new tests. Controversies experienced by our laboratory will be discussed and how the new tests available will perhaps address some of these challenges and controversies.

b) Case studies

J Beggs[1]

[1]*Pathology Queensland, Queensland, Australia*

Abstract

This presentation takes a slow stroll through some coagulation results and what investigation can lead to a diagnosis. Its often difficult for inexperienced staff to navigate the coagulation cascade and know what direction to take when it comes to investigations. The cases presented will be a learning experience and hopefully teach scientists what fits and doesn't fit in some circumstances.

S4: Cutting Edge Technology for Phlebotomy

A Bissett[1]

[1]*Waitematadhb, Auckland, New Zealand*

Abstract

My presentation today is mostly about the cutting edges in phlebotomy, the incision-making devices. We have had some very exciting enhancements to our equipment over the last few years, literally and proverbially cutting edge technology. You all will have been on the receiving end of a sharp needle now and again but did you notice that our needles have become faster, safer and sharper? Technology experts are always coming up with innovative ways to make our processes more refined, easier, and more efficient. Biometrics, radio frequency identification, barcode enhancements, e-orders, and bedside identification and labelling devices are just some of this cutting edge technology in phlebotomy.

Biography

My current role as a phlebotomist at Waitematā DHB started in 2000 and I have been the supervisor for 16 years. I always wanted to be a lab tech and have been happily working in labs for 47 years so far. I have spent time in each discipline and have three QMLTs – general, biochemistry and phlebotomy. I am a member of the Preanalytical Special Interest Group. I have been called on occasionally to perform duties as a technical expert but I know I can still learn a thing or two. I love working for my patients and with my colleagues. My goal is to be better at my job tomorrow than I am today.

S5: Optimising employability strategies through pre-analytical error training for graduates in medical laboratory science

I Cassady[1], J Wilson[1], M A Shuker[1], Y Banens[1], I Singh[1]

[1] *Griffith University, Gold Coast, Queensland, Australia*

Introduction

The Medical Laboratory Science program at Griffith University aims to graduate "work-ready" students with

the vocational knowledge and skills to perform as effective clinical diagnostic scientists. Upon completion of their undergraduate degree our students are well prepared in scientific, ethical and organizational aspects for clinical placement and the workplace. It is clear that our students need to learn to identify and act on pre-analytical diagnostic errors, which occur frequently and are a major ongoing problem in diagnostic laboratories. The incorporation of a targeted and systematic approach to pre-analytical error training is consistent with aims of the Australian Institute of Medical Scientists.

Methods

In this project, we plan to integrate our existing training resources with data acquisition software and package it into a stimulating adaptive learning technology. This activity will take students through identifying and dealing with pre-analytical errors in an interactive format to facilitate learning and incorporate assessment analytics.

Results

Existing student training in Medical Laboratory Science at Griffith University uses standard approaches of lecture material, case studies and laboratory practicals. In fourth-year of the Medical Laboratory Science program students undertake 10 weeks of full-time clinical placement that provides a work-integrated learning environment. This has enabled placement laboratories to assess and provide feedback on student job-readiness. The incorporation of a systematic approach to pre-analytical error training including adaptive learning technology will facilitate further modification in response to industry feedback.

Conclusions

Undergraduate training in classes and pre-analytical error training is being used in combination to address industry requirements for student preparedness for employment.

S6: Bursary and grant funding opportunities: introducing the AIMS Research Engagement Scheme (RES)

A M Christensen[1,2]

[1]*Australian Institute of Medical Scientists,* [2]*Queensland University of Technology, Queensland*

Introduction

The Australian Institute of Medical Scientists (AIMS) has introduced a Research Engagement Scheme (RES). Funding in the form of bursaries and grants up to AUD $45,000 will be offered annually via a competitive application process. The RES aims to encourage and foster research, skill acquisition and professional development in all disciplines related to pathology, across all experience and career levels.

Methods

An objectives analysis algorithm was used to identify seven categories of funding, associated eligibility criteria and expected outcomes. Categories were designed to be inclusive and appropriate for students, early to senior career scientists, researchers and laboratory managers planning to conduct research or develop themselves and further their career in the pathology and/or medical science context.

Results

Up to 20 bursaries and grants from $500 to $10,000 will be available annually for members, scientists and researchers eligible for membership and stage 4 FAIMS candidates. All applications will require a project, budget and timeline proposal. Successful recipients will submit an article about their project to the Australian Journal of Medical Science (AJMS) within six months of project completion.

Conclusion

The AIMS RES is inclusive of all levels of experience, skill development and career progression and will provide the opportunity to publish and present project findings. This presentation will outline the funding categories, eligibility criteria and application process. Individuals considering research in the pathology context or enrolling in their FAIMS or a research higher degree are encouraged to attend.

S7: Imaging whole organisms to cells and beyond: the IMB microscopy core facility

N Condon[1], M Scott[1], J Springfield[1]

[1]*ACRF: Cancer Biology Imaging Facility, Institute for Molecular Bioscience, The University of Queensland,*

St Lucia, Australia

Abstract

The Australian Cancer Research Foundation funded Institute for Molecular Bioscience Microscopy facility was established in 2009 and is a world-leading example of technology designed for discovery. As technology progresses, the facility has continued to evolve revealing information previously beyond our reach, shifting the scientific frontier. Greater clarity, faster speed, and longer observational windows allow for deeper probing into the fundamental processes that make things tick. This opens the door to new questions and ultimately, new discoveries.

The facility incorporates over twenty instruments ranging from workhorse widefield and confocal microscopes to cutting edge technologies created by contemporary Nobel Laureates such as the Lattice Light-sheet and Stimulated Emission Depletion (STED) super-resolution microscopes. Significant investments have also been made in computing to process, quantify and visualise the big-data produced by modern microscopes. This significant investment in technology with wide-ranging capability which is programmed specifically for the needs of the 30 research teams that utilise it allows researchers to perform multiple

complimentary experiments within one facility, harnessing advances in technology to enhance our rate of discovery.

For more information about our systems, staff and access for externals visit: *imb.uq.edu.au/microscopy* or contact *microscopes@imb.uq.edu.au.*

S8: Putting your best team forward

A Coriat [1]

[1] *Pathology Queensland, Townsville, Queensland, Australia*

"Building a high performing team through recruitment of great staff, delivery of strong training programs, efficient and effective performance reviews and development opportunities for staff was only the beginning of the journey. What happens when changes are small but incremental, do the lessons learnt in creating the team ensure the success of the team into the future?"

S9: a) 1st Trimester Screening

M Culliton[1]

[1]*The National Maternity Hospital, Dublin, Ireland*

Abstract

The monitoring of fetal wellbeing has changed significantly over the past decade and we are now entering yet another exciting era.

The laboratory plays an important part as a member of the diagnostic team in monitoring fetal abnormalities and wellness. The combination of ultrasound measurements of fetal length and the thickness of the nuchal fold at the back of the neck is combined with biochemical markers of Free β HCG and Pregnancy Associated Placental Protein A (PAPP-A). This combination is used to calculate the risk of trisomy of Chromosomes 23, 18 and 13 at between 11-13 weeks gestation. This then triages the women for more invasive confirmatory Chorionic Villus Biopsy to confirm the presence, or absence, of Down's, Edwards or Patau's syndromes.

More recently the use of circulating cell free DNA has been used as a screening test replacing the combination of ultrasound and biochemical markers for the early detection of these conditions.

PAPP-A and Placental Growth Factor (PLGF) can also be used to monitor fetal wellbeing and predict the development of Pre-eclampsia or Intrauterine Growth Retardation.

b) Educating Biomedical Scientists for the future

M Culliton[1]

[1]*The National Maternity Hospital, Dublin, Ireland*

Abstract

Biomedical Scientists are a young and constantly adapting profession. Over the past 50 decades, or more, we have developed from an assistant role to a profession in our own right. This has led to formal qualifications of Bachelors, Masters and Doctorate Degrees and in some cases the attainment of professional qualifications previously reserved for Medical Doctors such as FRCPath (Fellow of the Royal College of Pathologists).

The profession must continue to adapt to new and changing political, economic social and technological challenges if it is to survive and take its rightful place as 'Diagnostic Partners in Healthcare'.

This presentation will consider what education: undergraduate, postgraduate, formal, informal and continuous professional development is required to keep this profession dynamic and relevant in a rapidly changing environment. What knowledge, skills and competencies do we need to give our current scientists to equip them to evolve and reach their potential?

S10: An update from the Blood Service

J Daly[1]

[1]*Australian Red Cross Blood Service, Brisbane, Queensland, Australia*

This presentation will outline recent activities in the Australian Red Cross Blood Service, with a focus on Pathology Services which includes the National Red Cell Reference Laboratory Service.

The new Blood Service Strategic Plan: Strategy 2023 – Blood and Beyond will be described including the 5 key trends that helped drive the development of the strategy. The Milk Bank will be provided as an example of the Blood Service delivering a Greater Contribution to Healthcare, beyond blood.

New tests and Services performed within the donor testing and Red Cell Reference Laboratories that contribute to improved safety and outcomes for blood product recipients will be described, including; Anti-A/B testing, extended donor blood group phenotyping, donor blood group genotyping and platelet donor tissue typing.

The new testing service for Non-invasive fetal RHD genotyping in high risk pregnancies will be briefly described.

A new research pilot study investigating the feasibility and potential benefits of providing HLA compatible red cells to patients with end-stage kidney disease, receiving renal replacement therapy and planned for live-donor kidney transplantation will be presented.

S11: Lymphoma (and other lymphoid malignancies) - The good, the bad and the ugly

L Dial[1]

[1]*Queensland Medical Laboratory, Queensland, Australia*

Abstract

The term lymphoma describes a heterogeneous group of lymphoid malignancies with different biology and prognosis.

Lymphomas arise in lymphoid tissues and can be either B cell, T cell or NK cell in origin. Lymphomas represent a progressive clonal expansion of these cells from an accumulation of lesions affecting proto-oncogenes or tumor suppressor genes, resulting in cell immortalization. The symptoms and presentation are varied reflecting the diverse nature of the disorders.

With a rising incidence of Lymphoma in Australia, scientific staff are seeing more cases in the Haematology Laboratory, many showing up in blood films. Is there a "good , bad or ugly?". This premise holds with the varying prognoses given the classification assigned to the individual case. However on examination of the abnormal lymphoid cells, we may regard all as "ugly".

The morphologic, immunophenotypic and genetic differences of some of the lymphomas seen in the Haematology Lab will be explored, exemplifying the WHO categories with case studies. The presentation may clarify some of the struggles that arise when ugly lymphoid cells are seen on a blood film.

S12: Makings of a malignancy: the world's first cancer-themed puzzle room

K Dutton-Regester[1,2]

[1]*Excite Science Pty Ltd, Brisbane, Queensland, Australia*

[2]*QIMR Berghofer Medical Research Institute, Brisbane, Queensland, Australia*

Abstract

Have you wondered what cancer is, how it occurs, and why some cancers are curable while others are not?

As an active cancer researcher and prolific science communicator, these are questions I frequently hear from the community. While traditional community outreach approaches such as seminars can be presented in engaging ways and informative ways, this is challenging to do effectively and require skillsets not intuitive for most scientists and for which need to be developed. Furthermore, these activities will tend to attract a defined scope of individuals who are already engaged with science. In order to engage a broader audience about the fundamental aspects of cancer, we created the world's first cancer biology-themed puzzle/ escape room (See a glimpse of what the room looks like on our youtube video: http://bit.ly/2kuPFjM)

Escape rooms are a unique entertainment platform and high-growth industry that require teams of individual to solve a series of puzzles in a defined period of time. Here I will discuss how using an escape room in an educational format can be a powerful way to educate the community about cancer and reach demographics that do not seek cancer-related information out (particularly youth audiences). I will also talk about the response we received from our launch at the Brisbane Science Festival in August 2019 and how the room is now being used to help institutions and organizations with outreach, education and philanthropy. Educational escape rooms could be a unique way to advance scientific knowledge, promote careers in medical science and help the community to understand the benefits of investing in medical research.

S13: Sexually Transmitted Infections and specimen collection in North Queensland

K Edmondson[1]

[1]*Townsville Sexual Health Service, Townsville, Queensland*

Abstract

Sexually Transmitted Infection (STI) screening in North Queensland can pose many challenges. Syphilis outbreaks have been spreading across the North of Queensland since 2011, resulting in the need for in increasingly creative screening approaches. Gonorrhoea also remains of significant concern with two highly resistant cases of gonorrhoea diagnosed in Queensland residents in 2018.

Specimen collection in the outbreak context is an interesting prospect. Large community screens, opportunistic outreach screening and contact tracing, as well as add-on testing in hospital settings are all methods being utilised. Planned community screens are generally conducted in remote settings, with large numbers of clients presenting in quick succession. Opportunistic screening may also be performed by outreach staff in the community with testing being performed in unorthodox places such as cars, lounge rooms and even parks. Establishing the identity of sexual contacts is frequently complicated when index patients provide incomplete or inaccurate information about their partners.

The Townsville Hospital is now performing routine add-on syphilis testing through the Emergency Department. Clients who change their names, provide alternate dates of birth or who go by aliases create confusion when trying to establish their syphilis treatment history. Each of these screening approaches come with unique complexities for client identification and specimen collection. Difficulties establishing identity, limitations around the physical setting of screening, and the potential for multiple names and duplicate identities are just some of the challenges experienced by collectors in sexual health.

Gonorrhoea antibiotic resistance also remains a looming concern. Microculture testing is still required to identify resistance patterns for gonorrhoea. As gonorrhoea PCR is the preferred screening modality, microculture testing is often not performed at all. If the resistance profiles of cases are not identified, it increases the likelihood that future highly resistant cases may be missed.

S14: a) Molecular testing in your lab

F Francis[1]

[1]*Pathology Queensland, Townsville, Queensland, Australia*

Abstract

Up until recently molecular testing has been available only in larger laboratories, due to the complexity of the test process and the requirement for steps to be performed in separate areas of the laboratory. Recently numerous small, simple to use, self-contained molecular instruments have become available. This presentation will focus on how this technological innovation has enabled molecular testing to now be performed by laboratories of all sizes, helping to reduce turn-around times and to enable medical scientists to provide rapid and accurate molecular results to many more of our clients.

b) Flock swabs and the collection of NPA samples

F Francis[1]

[1]*Pathology Queensland, Townsville Laboratory, Townsville, Queensland, Australia*

Abstract

The development of flock swabs has enabled easier and safer collection of nasopharyngeal (NP) specimens for the detection of respiratory viruses and pertussis. In this presentation we will follow a nasopharyngeal sample from collection through to processing in the lab. We will also examine various respiratory pathogens and the illnesses they cause.

c) Testing sexual health samples and case studies

F Francis[1]

[1]*Pathology Queensland, Townsville Laboratory, Townsville, Queensland, Australia*

Abstract

The quality of a pathology result is directly affected by the quality of the specimen collected. This remains the case for molecular tests, despite these tests being highly sensitive and specific methods for detecting pathogens such those causing sexually transmitted infections. In this presentation we will examine what specimens should be collected to detect sexually transmitted pathogens and how the pathogens are detected in the lab. We will also examine the clinical manifestations of some sexually transmitted infections.

S15: Coagulation troubleshooting

Freeman R[1]

[1]*Pathology Queensland Central, Royal Brisbane Hospital, Herston, Queensland, Australia*

Abstract

Troubleshooting of coagulation results creates fear in many people. The combination of analyser, multiple reagents and sample issues sometimes makes the process of troubleshooting coagulation errors seem like an impossible task. The purpose of this presentation is to demystify the process and improve your coagulation experience.

S16: Enteric bacteria: what's new in multi-resistance?

P Harris[1,2]

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Gram-negative enteric bacteria such as *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella* and *Shigella* spp. are not only major human pathogens, but are increasingly found to be resistant to commonly-used antibiotics. In recent decades, we have experienced the emergence, diversification and dissemination of multiple resistance genes, particularly those encoding beta-lactamases. This has been facilitated by horizontal gene transmission in association with highly mobile genetic elements, such as plasmids, and the global expansion of successful pathogenic clones (e.g. *E. coli* ST131). In this presentation, we will explore current gram-negative resistance threats relevant to the Asia-Pacific region and across the world, as well as current and emerging laboratory methods to identify and characterise these organisms.

S17: Too much of a good thing: two cases of dic-like coagulopathy in patients with decompensated cirrhosis after prothrombin complex concentrate

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[2]*Princess Alexandra Hospital, Woolloongabba, Queensland, Australia*

Abstract

Two patients with decompensated cirrhosis had a baseline derangement in coagulation profile managed with prothrombinex-VF, a prothrombin complex concentrate (PCC) manufactured by CSL (Commonwealth Serum Laboratories). Both patients developed a disseminated intravascular coagulation (DIC)-like coagulopathy as a consequence of administration. PCCs are regularly used throughout Australia for reversing coagulopathy particularly related to vitamin K antagonists (VKA) and are sometimes used in patients with cirrhosis. PCCs have a several advantages over fresh frozen plasma (FFP), including lower volume, greater viral safety and ease of use.

S18: Diagnosis of common types of lymphomas

K Hill[1]

Princess Alexandra Hospital, Woolloongabba, Queensland, Australia

Abstract

This talk will cover presentation and diagnosis of common types of aggressive and indolent B and T cell lymphomas.

S19: a) Cybersecurity in the laboratory

D Holzhauser[1]

[1] RCPAQAP, St Leonards, NSW, Australia

Abstract

It has been reported that a cyberattack occurs every 39 seconds.

Healthcare is over-represented in data breach statistics, consistently appearing at number one. In 2018 healthcare environments represented over 27% of the reported data breaches, almost double that of the next industry sector, Finance.

To addressing cyber risk, organisations require a coordinated approach, including addressing risks in the laboratory. Laboratories are at risk of a cyber incident due to a large number of connected devices handling sensitive patient information, the use of outdated operating systems on laboratory instrumentation, weak password practices and vendor restrictions on patching and anti-malware software.

Presented will be laboratory specific practices that can be implemented to reduce cyber risk and form part of a holistic cybersecurity strategy.

b) The importance of messaging standards – preventing patient harm

D Holzhauser[1]

[1]RCPAQAP, St Leonards, NSW, Australia

Abstract

What happens to results after they leave the laboratory? There is potential to introduce post-analytical errors through the use of non-standard electronic messaging and inconsistent report displays in desktop practice management and clinical systems. Differences in the way clinical systems and third-party plugins or sidebars extract and render atomic data from electronic messages and inconsistencies in test naming, cumulative report chronology, and the display of analytes tested using different methodologies on the same line can all lead to adverse events. Presented will be some real-world errors, practical aspects of implementing The Standards for Pathology Informatics in Australia (SPIA), the importance of implementing messaging standards for patient safety how RCPAQAP would assess message conformance to the standard as part of an Informatics EQA.

S20: Managing the errors and issues of specimens coming from remote areas

S Hornsby[1]

[1]Pathology Queensland, Queensland, Australia

Abstract

Queensland is the 2nd largest state in Australia with an area covering over 1,700,000 km2. Servicing the health care needs for remote communities can present challenging problems in the pre-analytical environment.

Ethnic diversity, transient populations, limited resources and weather events are some of the issues health care providers may have to contend with. Patient engagement is often a challenge, either because of cultural issues, isolation or insufficient providers and health care workers.

Despite this, health care workers contend with these obstacles to meet our state's unique health care needs. This presentation will address some of the unique and interesting challenges facing the provision of pathology services to these areas.

S21: Antigen vs antibodies. What do doctors really want?

A Jenkins[1]

[1]Pathology Queensland, Queensland, Australia

Abstract

Our CSR/SRA, much like many specimen reception areas, is comprised of non-health, non-medical trained staff. Interpreting clinical pathology requests provides many challenges, even to those of us with years of experience.

In PQ we have several hospitals utilising the ieMR system of integrated patient health information. This also includes clinician generated, electronic requests for testing. This has provided us with many new challenges and a greater emphasis on the laboratory to provide appropriate services to our clients.

In Serology at PQ-Central, we check all requests for serology tests for coding accuracy. This is performed by a small number of staff, continuously throughout the working day. I would estimate approximately 10-15% of requests require changes to be made, with information about these changes fed back to the initial operator. As part of our continuing education in PQ, I was approached to provide some basic background information on Serology and how this influences test requests and coding to help CSR/SRA staff with improving their accuracy. I believe if you know why you do what you do, there is more value in the task for you, our clients and the organisation. Clinicians know the information they need to manage a patient, but not necessarily what to order to gain that information. So hopefully this small presentation can provide some understanding of what we do in Serology and what tests best provide that information that clinicians require.

S22: Electronic ordering

A Joseph[1]

[1]*Waikato District Health Board, Waikato Hospital Laboratory, Hamilton, New Zealand*

Abstract

More than 70% of clinical decisions are based on laboratory test results. This explains the importance of providing the correct laboratory test results to the clinicians. Most of the laboratory errors happen in the pre analytical phase of testing process.

Majority of laboratory errors are transcriptional errors and collection of samples from wrong patient. Errors that happen in the pre analytical phase will be carried through to the testing process and even to the post analytical phase. Identifying and minimising such errors is the most important step in the quality improvement of laboratory.

The modern answer to minimise such errors is Electronic ordering of laboratory investigations. Choosing the right system for the laboratory is the most important step and they are very efficient and competitive. Clinical staff makes test request through electronic ordering system and therefore manual data entry errors could be minimised. Clinicians receive updates on the sample processing and results online. Phlebotomist who plays an important role in collecting quality samples for the analysis are also helped with electronic orders by getting the correct patient labels printed for each order with sample requirements. Annual budget for the labs could be best utilised by avoiding unwanted test requests and repeated test requests.

Even though electronic ordering system is very efficient there are some practical difficulties with these systems. Parallel manual system should be efficient to tackle the system outages, managing storage and privacy of data, auditing of the online order entry are the common issues.

Electronic ordering has significantly improved the turnaround time, decreased laboratory errors and recollects. An electronic ordering system has most advanced capabilities and proven results against manual data entry and plays an important role in the quality improvement of the modern laboratory diagnostics.

S23: Elevated expression of LAG3 is associated with poor outcome in patients with DLBCL treated with R-CHOP

C Keane[1], S Law, E Abro, J W D Tobin, S Francis, G Gifford, S Gabrielli, A Gill, W Stevenson, D Talaulikar, C Gould, S Jain, S Birch, D Cross, A Hernadez, S J Halliday, R Bird, M Hertzberg, M K Gandhi.

[1]*Mater Hospital, South Brisbane, Queensland, Australia*

Abstract

LAG3 is an immune checkpoint expressed on a variety of immune cells including a sub-population of 'exhausted' effector T cells and TREGs. Early-phase studies of anti-LAG3 mAb show promise in solid and haematological cancers. We have previously demonstrated LAG3 is enriched within the tumor microenvironment in Hodgkin Lymphoma (Gandhi et al. Blood 2006). Data in the aggressive B-cell lymphoma DLBCL is lacking.

We used a conventional discovery/ validation approach in two population based Australian cohorts (discovery: Brisbane/Canberra; validation: Sydney) totalling 250 patients treated with R-CHOP with >4 year follow-up. Digital gene expression (NanoString) using a consistent LAG3 cut-off showed inferior 5-year overall survival (OS) in both cohorts (discovery: 54% vs. 82%, HR 3.13, p=0.003; validation: 63% vs. 86%, HR 2.95, p=0.025 respectively). In a multivariate model, LAG3HI (p=0.001) was a predictor of OS independent of R-IPI and Cell-of-Origin (by NanoString LST assay). PD-L1 expression was also a predictor of survival though to a lesser degree than LAG3. Notably, LAG3 expression stratified PD-L1HI patients into two sub-groups with differential survival, with dual LAG3 and PD-L1 positivity conferring particularly poor OS (PD-L1HI/LAG3HI 39% vs. 81% PD-L1HI/LAG3LO, HR 3.65, p=0.023).

Next, the discovery/validation cohorts were combined with 129 additional DLBCL cases from the ALLG biobank (in whom tissue but no outcome data was available), to test for biological associations and correlations. In these 379 cases, LAG3HI was enriched in the ABC/UC (66%) subtype vs. LAG3LO (p=0.003). LAG3 was positively correlated with numerous immune checkpoints/effectors including CD4, CD8, PD-1, PD-L1, PD-L2, TIM-3 and CD163 (all p<0.0001, r range 0.44-0.67) consistent with an adaptive immune response. High LAG3 expression was significantly more common in EBV+ DLBCL (p=0.037).

LAG3 gene expression was highly correlated with protein expression by tissue microarray based immunohistochemistry (r=0.79, p<0.001). To determine which cells expressed LAG3, de-aggregated fresh-frozen tumor-infiltrating lymphocytes were interrogated by flow cytometry. CD4+ T-cells were ~2-fold higher than CD8+ T-cells. CD4+ T-cells were further sub-divided into 'classical' CD127LOCD25HI TREGs, CD127LOCD25LO inducible-TREGs, and CD4 non-TREGs. This showed that LAG3 was highly expressed within the CD8 and both TREG populations, but there was minimal CD4 non-TREG expression. LAG3HI CD8+ T-cells were frequently enriched in the inhibitory checkpoints PD-1 and/or TIM3 consistent with a highly dysfunctional/exhausted phenotype.

Finally, levels of soluble LAG3 (sol-LAG3) were quantified within paired plasma of patients enrolled into the ALLG NHL21 PET-adapted prospective DLBCL study. Samples taken pre-therapy and following 4 cycles of R-CHOP (at the time of interim-PET) were compared. Sol-LAG3 levels were higher in patients with DLBCL at diagnosis compared to healthy controls (p<0.0001). Interestingly patients that

became interim-PET-ve had a significant drop in sol-LAG3 levels (p=0.008) between time-points, whereas no change was observed in those that remained interim-PET+, suggesting that sol-LAG3 has utility as a disease response biomarker.

In conclusion, high expression of LAG3 in DLBCL is enriched in the non-GCB phenotype, and is associated with poor outcome independent of clinical and biological prognosticators. Dual expression of PD-L1HI/LAG3HI expression confers particularly poor outcome after conventional front-line immuno-chemotherapy. Intratumoral LAG3 expression is high on PD-1+ CD8+ and TREG subsets. Sol-LAG3 appears to a circulating disease response biomarker. The results combined indicate a key role for LAG3 within the immunobiology of DLBCL and provide a strong rationale for early phase clinical trials utilising anti-LAG3 and anti-PD1 mAb combinations.

S24: Family matters - Case study

D J Kendall[1]

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Introduction

Tracking and finding lost samples, investigating aberrant test results and problem solving is a routine part of Preanalytics.

Methods

Laboratory audit trails enable the speedy resolution of Laboratory problems, but the majority of problems occur outside the laboratory, so knowledge of sample sources and the external transport process with appropriate follow up is necessary.

Results

We have a case study following a patient's journey through ED reviewing the processes that enabled the production of timely and critical test results and those that failed.

Conclusion

Good laboratory processes followed externally benefit both the patient and hospital departments such as ED by reducing errors and shortening patient stays.

S25: Emergency cardiac troponin

G Koerbin[1]

[1]*University of Canberra, Bruce, Australian Capital Teritory*

Abstract

Cardiac troponin (cTn) is mainly used to identify patients with acute coronary syndrome (ACS). As a consequence of troponin assays with improved sensitivity, more and more persons without ACS are seen with increases in their troponin concentrations. More than 60% of individuals presenting to an ED with chest symptoms will have measurable troponin concentrations. Among patients observed in a chest pain unit, it will be common for cTn concentrations to be above the MI-detection threshold chronically, because such patients typically have either known coronary disease or multiple risk factors. The emergency room physician needs to be able to stratify patients into non-ACS conditions and those that require cardiac care. To assist in this process we need to ask:

- Does the presence of cTn always indicate necrosis?
- What is the significance of cTn in non-ACS settings?
- Why do we have different 99th percentile cut-points and how do we manage this?
- How should we use cTn in investigating ACS?

Elevations of up to 3-fold the upper reference limit (99th percentile) have limited positive predictive value for acute myocardial infarction and may be associated with a broad spectrum of disease. There is a need for a paradigm shift regarding the interpretation of troponin values. We must now consider pretest probability and delta changes. A number of algorithms have been developed to consider a rise and/or fall in cTn concentrations which may differentiate acute from chronic conditions. The greater the change (delta) the more likely an acute event has occurred. Mathematics, in particular machine learning, may also help in the assessment of patients at risk of a major adverse cardia event (MACE).

S26: a) Anti-c in pregnancy – Case studies

D Longmore[1]

NSW Health Pathology, Orange, New South Wales,Australia

Abstract

Anti-D, anti-c and anti-K (Kell) are the most clinically important antibodies in pregnancy and are the most common cause of severe Haemolytic Disease of the Foetus and Newborn (HDFN). They are responsible for causing severe foetal anaemia, stillbirths and foetal hydrops.

Anti-c is the most common cause of severe HDFN seen in our region. The success of the RhD prophylaxis protocol means that the incidence of HDFN due to anti-D is greatly reduced. The incidence of HDFN due to Anti-K is also low, with the antigen frequency only 2% in Blacks and 9% in Caucasians. The frequency of the Rhc antigen is approximately 80% in caucasians, 96% in blacks and 47% in the asian population.

The severity of HDFN due to anti-D and anti-c correlates well with the concentration of antibody in the maternal plasma. Management of these patients includes regular measurement of the maternal antibody level using titration and quantitation and screening the foetus for anaemia using MCA doppler to predict the likelihood of HDFN

The severity of Anti-K (Kell) does not correlate well with measured antibody level. Screening for foetal anaemia using MCA doppler is the most effective at predicting the likely severity of disease.

Three cases with anti-c will be presented:

First is "Mary", who presented with a known Anti-E at 18+3 wks and then developed anti-c later in the pregnancy.

Second is "Amy", G2P1. Amy presented at approx. 8 wks gestation with Anti-c, -E and -Fya detected in her initial antibody screen.

Finally, "Ruby" presented at 10+ weeks gestation. Anti-c, -s and anti-P1 were detected in her initial antibody screen.

A current patient with Anti-K is being monitored. Her case will also be presented if she delivers prior to this conference.

b) Transfusion challenges in rural and regional areas

D Longmore[1]

NSW Health Pathology, Orange, New South Wales,Australia

Abstract

The Western NSW Local Health District (WNSWLHD) covers an area of approximately 250,000 square Kms, only marginally smaller than New Zealand.

The provision of appropriate and timely transfusion of blood and blood products is a constant challenge that is directly related to the considerable distances that are involved.

Logistics, blood and blood products require specific conditions for transport, storage and handling by suitable transport networks over long distances. This affects routine and emergency supply of blood products.

Infrastructure: Adequate internet access speeds for telecommunication and videoconferencing, public transport networks for patients unable to drive. Facilities suitable for management of potential complications of transfusion. Provision of Air Services for patient and blood product transport.

Recruitment and retention of staff: Professional and social isolation and separation from family network is problematic. Employment often viewed as short term to gain required experience for employment in other more desirable areas

Experienced staff: Low patient numbers hinder the ability to maintain competency in pretransfusion testing and blood management procedures in the laboratory and the administration of blood products in the wards by medical and nursing staff.

Socio-economic: The ability of patients and carers to cover costs of travel for treatment, the ability of patients and carers to leave work or their properties, particularly in the current harsh conditions.

Cultural: The willingness of patients to leave their family support network for treatment or the ability of family to travel and stay with the patient.

Financial/budget: The higher cost of provision of services and management of blood stocks to ensure wastage is eliminated, cost of recruitment and training staff, provision of opportunities for continuing education of staff in areas of low population density.

Solutions are constantly evolving as technology changes

S27: What is genomic testing and what does it tell us?

B Lundie [1]

[1]Pathology Queensland, Brisbane, Queensland, Australia

Abstract

Genetics and genomics are often used interchangeably, however the change from genetics (the study of single genes) to genomics (the study of all of our genes and the interaction between them) requires a paradigm shift in the way that we approach the diagnosis of both rare and common diseases across most disciplines of health.

Genomics rarely exists in a vacuum; there are very few purely genetic diseases. Genomic scientists are experts in the effect of structure and variation within our genome on the function of genes and to some degree gene products. As the number of disease causing genes and the breadth of different diseases expands, genomic scientists are being challenged by the volume of knowledge required to interpret these data in the context of a patient's disease. Input from other disciplines into the interpretation of how variation influences diseases in different disciplines is critical to enable high quality, efficient pathology services. To enable this input, scientists, technicians and pathologists of all disciplines will be required to increase genomic literacy and interact collaboratively with genomic scientists, just as genomic scientist, technicians and pathologist must increase knowledge across multiple other disciplines.

In this presentation, the current state of genomics in pathology will be discussed and a basic introduction into how genomics interacts with other disciplines will be reviewed. Finally, a proposed working model for how genomics may work in the future will be demonstrated.

S28: Q fever – clinical conditions and case studies

K Lutz [1]

[1]Pathology Queensland, Brisbane, Queensland, Australia

Abstract

Q fever can present with a wide range of symptoms, varying from mild or asymptomatic infection to severe acute or chronic clinical disease. Symptomatic infection is more likely to occur in adults compared with children and in men compared with women. The incubation period for acute infection is approximately 20 days. Symptoms include a self-limited flu-like syndrome with high-grade fevers, fatigue, headache, and myalgias being the most frequent

associated symptoms. Headaches are often severe and febrile episodes with night sweats lasting several weeks are common.

Mild pneumonia may be present with a non-productive cough. Patients with hepatitis present with transaminitis and hepatomegaly, usually without jaundice. Hepatitis is more likely to occur in younger patients, while pneumonia is more commonly seen in elderly patients and those who are immunocompromised. A smaller percentage of patients may have a maculopapular rash, pericarditis and meningitis.

Laboratory findings are non-specific with transaminitis, leucocytosis with reactive lymphocytes, thrombocytopenia and raised ESR.

Chronic Q Fever is more likely to occur in patients who are pregnant, immunocompromised, have underlying vascular disease, or a prosthetic joint. Patients with underlying valvular disease are at high risk of developing endocarditis, which is the predominant manifestation of chronic Q fever. Bone and joint infections are not uncommon, particularly in children.

A number of case studies will be described, including variations of acute Q Fever presentation, and chronic Q Fever cases with bone and cardiac involvement. We describe an unusual case of chronic Q Fever with osteomyelitis of the vertebrae with an epidural abscess in a 72-year-old patient. Also, a case of recurrent osteomyelitis infection in a young child occurring over several years.

S29: Flunami 2019: more testing or more flu?

I M MacKay[1]

[1]*Public Health Virology, Forensic and Scientific Services, Queensland Health, Queensland, Australia*

Abstract

Influenza is a vaccine-preventable disease for which there are antivirals, a rarity among respiratory viruses. Despite this, recent flu seasons have varied dramatically in size and severity. Research to define the drivers of this variation is limited and reporting on the seasons is mainly to inform professionals, not the public.

Winter 2018 was the smallest influenza season in five years, but in November that year, laboratory-confirmed notifications began to climb above previous highs. The 2018 summer tide of influenza spilled into 2019 and April, May and June recorded totals that were well above any previous highest identical month. The rising tide of mostly A/H3N2 viruses occurred despite record vaccine distribution. The last time an influenza season began so early was 1995. South Africa, Chile and New Zealand also experienced early seasonal starts. Australian residential aged care facilities experienced numerous outbreaks in 2019, and most influenza deaths occurred in those over 60 years of age and among those with underlying conditions. Overall, clinical severity was not unusual.

Laboratory testing has changed over time; it is faster, more accessible and more specific. In 2017 commercial PCR-based point-of-care platforms began placement in hospital emergency departments on the East coast. As a result, test numbers have increased year-on-year for a decade. Is more testing behind the 2019 flunami? Has media attention driven more people to seek care? Could changes to travel patterns or weather explain the summer tsunami of influenza cases? What role have other co-circulating respiratory viruses played? And what has virology contributed to our understanding of the season?

Influenza seasons are complex, often poorly researched and unsatisfyingly communicated to the public they affect. This presentation will step through 2019's extraordinarily early but not severe influenza year so far.

S30: Interesting morphology cases from the Waikato QA programme

J Marks[1]

[1]*Waikato Hospital Laboratory, Hamilton, New Zealand*

Abstract

The purpose of this oral presentation will be to provide a selection of interesting morphology cases. It will include examples of the types of cases provided by the Waikato QA Morphology programme. The presentation has the capability to be open to interaction and participation from the attendees. The attendees will be able to assess the morphological features present and provide a possible diagnosis for each case, as would occur with slides from the QA program. Supplementary testing and additional information will be provided for each case with a summary of the final diagnosis.

Types of cases to be included:

Typical/classic morphology

- Allowing a diagnosis to be made based on morphology alone;
- Some cases will be pathognomonic, where the morphological features are specific for that disorder alone.

Interesting/rare cases

- Not often seen in the laboratory;
- May require supplementary tests or further information to make a diagnosis.

Unusual presentations

- Cases that may not present with a typical morphological presentation;
- They may require a differential diagnosis and further testing to confirm the diagnosis.

S31: Parechovirus Infections

M May[1,2], R Day[3], R Doyle[3], A Bernard[4], L Schlapbach[1], S Bialasiewicz[3,5], A Kynaston[1], C Hney[6], J E Clark[1,5]

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[2]*Child Health Research Centre, University of Queensland, Brisbane, Australia*

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[4]*School of Clinical Medicine, University of Queensland, Brisbane, Australia*

[5]*Pathology Queensland, Brisbane, Australia*

Introduction

Human parechovirus particularly genotype 3 (HPeV3), is an emerging infection affecting predominantly young infants. Previous work has indicated risk of long-term neurodevelopmental deficits associated with neonatal HPeV infection. Improved diagnostics are needed due to the non-specific clinical presentation. There is limited information regarding the clinical significance of HPeV viral loads.

Methods

A retrospective cohort of HPeV-affected infants was used to assess sensitivity and specificity of a HPeV real time reverse transcription polymerase chain reaction (RT-PCR) on blood and cerebrospinal fluid (CSF) as compared to a composite gold standard of clinical and laboratory parameters. Objective clinical parameters were assessed using PCR cycle threshold to detection (Ct) as a semi-quantitative measure of HPeV viral load.

Results

Between 2017-2018 blood samples were obtained from 97 infants of whom 44 had HPeV clinical infection. Eighty-three concurrent CSF samples were available. Sensitivity was 93.3 % [95%CI 82-99] for blood HPeV RT-PCR and 85% [95%CI 73.9-96.1] for CSF HPeV RT-PCR. Blood HPeV RT-PCR Ct values <25 cycles were associated with age < 28 days and < 3 days of symptoms. No statistical associations were identified between potential clinical markers of severity and Ct value.

Conclusions

HPeV RT-PCR on blood is a valuable adjunct to diagnostic testing for acute HPeV-related illness in infants. No correlation was found between markers of clinical severity and a semi-quantitative measure HPeV.

S32: a) Keeping Safe – Perspectives on laboratory and patient safety over the last half century

D Mikkelsen[1]

[1]*Counties Manukau Health Laboratories, Auckland, NZ*

Abstract

Workplace Health and Safety has been an increasing concern in both Australia and New Zealand. Both countries have significant primary industries that carry significant risks for those that work within them.

Modern Medical laboratories are relatively safe places, but have they always been so? There have been serious accidents in laboratories in the past however the trend is towards significantly improved safety for our teams.

Our work does, however have the potential to impact patient safety. Patient safety has not improved within hospitals in the same way that staff safety has.

Safety is a workplace culture issue and relies on the appropriate responses when errors are made or incidents occur. Workplace culture is the result of the many ways that the team interacts and behaves. Stressful situations related to incidents have the potential to greatly affect workplace culture.

A fair and just process of investigation and management of incidents is required in order to maintain a health learning environment.

b) Regulation of Medical Laboratory Science practitioners In New Zealand, current experience and future directions

D Mikkelsen[1]

[1]*Counties Manukau Health Laboratories, Auckland, NZ*

Abstract

Regulation of Medical Laboratory Scientists (formerly Medical Laboratory Technologists) began in 1968 under the Medical and Dental Auxiliaries Amendment Act. This act provided for the establishment of Regulatory Authorities to manage the activities of the medical laboratory profession. Medical Laboratory Technologists were required to be registered and hold a practising certificate. The act was administered on the behalf of the Ministry of Health by the Medical Laboratory Technologist Board.

In 2019 the profession is now regulated by the Medical Sciences Council of New Zealand under the Health Practitioners Competence Assurance Act 2003 (HPCA). This Council is responsible for the professions of Medical Laboratory Science (6 scopes of practice) and Anaesthetic Technology (a single scope)

The activities covered by the Medical Sciences Council include:

- Initial registration;
- Issuing Annual Practising Certificates;
- Education;
- Continuing Professional Development;
- Professional Conduct.

The Council members are appointed by the Minister of Health and the Council is composed of:

- 4 members of the Medical Laboratory Science profession;
- 2 members of the Anaesthetic Technology profession;
- 3 lay members.

The Council is supported by a Secretariat that also supports the Medical Radiation Technologists Board

Council work includes:

- Accreditation of education providers;
- Accreditation of CPD programmes;
- Maintaining systems and policies for registering new and overseas practitioners;
- Investigating mattes of Competence, Conduct and Health that impact the ability of practitioners to practise safely;
- There are 6 face to face meeting per year and 3 sub committees that meet virtually.

S33: Overview and epidemiology of Q fever

K Muir[1]

[1]*Pathology Queensland, Queensland, Australia*

Abstract

Q fever is caused by an obligate intracellular bacterium *Coxiella burnetii*. The primary reservoirs of infection are cattle, goats and sheep and is mainly an occupational disease of meat and livestock workers. The clinical features of acute infection are often mild or a self-limited flu-like illness with fatigue, headache, rigors, excessive sweating and myalgias. Acute complications include pneumonia which may cause acute respiratory distress, and hepatitis with hepatomegaly and transaminitis. Chronic Q fever occurs in a small number of patients, affecting heart, lungs and bone. Q fever endocarditis is a high risk in patients with previous heart valve damage or immunocompromised patients.

There are approximately five hundread Australian notifications each year of which nearly half are in Queensland. The notification rate for South-West Queensland region far exceeds any other area, followed the Central West and the Darling Downs. There is a male to female ratio of 2.9:1 and 70% of notifications are aged between 36 and 65 years. Most notifications are from people who live on a farm (43%) or near an abattoir (48%).

S34: a) Talking about my generation

C Nielsen[1]

[1]*Canadian Society for Medical Laboratory Science, Hamilton, Canada*

Unless you work, live and socialize alone, chances are generational differences are getting in the way of clear communication and productive relationships. We have multiple generations in the workplace, and it's causing tension. Traditionalists, Baby Boomers, Gen X, Gen Y and Gen Z are struggling to speak and be heard. This session will cover who we are, what experiences and global situations shaped our values and beliefs and how we carry these with us at home, to work and through our volunteer experiences. Tips and tricks will be shared as we find a way to be heard.

b) Simulation training in Canada

C Nielsen[1]

[1]*Canadian Society for Medical Laboratory Science, Hamilton, Canada*

Canada is experiencing a wide scale shortage of medical laboratory technologists (scientists), in part because we cannot educate enough new graduates, given the limited capacity of employers to provide clinical placements. One of the ways to increase new graduates is to decrease time spent in clinical, but how? CSMLS will present on its foray into simulation as a legitimate teaching modality. Complications can arise on program accreditation visits, so the society created a position statement on the use of sim. Through the use of forums and simulation knowledge network, CSMLS is building the foundation for Medical Laboratory Science educators, converging on a $1mill grant application. The grant will allow for the creation of a simulation database for the profession.

S35: Writing and publishing papers including for the Australian Journal of Medical Science

C Pickering[1]

[1]*Griffith University, Gold Coast, Queensland, Australia*

Introduction

Academic papers are important, not only in career development, but also as ways to share research results. As a consequence, many organisations are enhancing opportunities for their staff to publish research in journals. The Australian Institute of Medical Sciences (AIMS) is, for instance, using its Research Engagement Scheme to help facilitate researchers to go onto submit and publish their results in the Australian Journal of Medical Science (AJMS). But what's involved in writing an article, and what are some of the challenges along the way?

Methods

Based on the academic literature about writing papers, combined with personal experience including publishing over 120 academic papers, supervising more than 30 students who have gone onto publish, and running

workshops on academic publishing in Australian and overseas, this talk presents a summary of steps and related strategies for academic publishing relevant to those new to this style of writing.

Results

Key stages in preparing papers include: (1) formulating the golden thread/narrative of the paper based on key research outcomes; (2) selecting the best/most relevant journals; (3) gathering information about scope, style and structure from author instructions, but also by deconstruct relevant papers from the journal; (4) writing the different sections starting with methods, results, aims and title, and then introduction and discussion/conclusion, and finally abstract and references; (5) going through the submission process; and (6) finally dealing with reviewers' comments including their emotional impact. This process requires commitment and resilience and ends with a publication.

Conclusions

Publishing academic papers is challenging but gaining insights into the process and strategies helps, including developing resilience. Going on to publish and benefit from research is highly rewarding.

S36: Innovations in ADF transfusion practice: frozen platelets, freeze-dried plasma and whole blood

M C Reade[1]

[1]*Royal Brisbane and Women's Hospital, Queensland, Australia*

Introduction

UK military experience in Afghanistan found 25-33% of military trauma patients required a blood transfusion, of whom 50% required >10 units red cells. Providing conventional blood products in deployed hospitals is challenging due to limited shelf-life, requirement for refrigeration, time required for preparation, and difficulties in ensuring blood group compatibility without ready access to clinical laboratory facilities.

Review of current evidence

Several innovative transfusion approaches have entered military practice in response to these challenges:

Platelets cryopreserved in dimethylsulphoxide, extending shelf-life to two-four years. Supported by extensive experience but little comparative trial data, a large Australian / New Zealand clinical trial in cardiac surgery patients, supported by the Australian Defence Force and the Australian Red Cross Blood Service, has just commenced.

Low antibody-titre group O whole blood as a universal donor, either fresh or stored for 14 days, with or without leukoreduction at the point of manufacture. Unquestionably an effective method to overcome logistic challenges in supplying conventional blood components, and of at least equivalent effectiveness to component therapy, but with arguments of superiority supported largely by retrospective data of questionable validity. Several barriers exist to the conduct of a definitive trial.

Manufacturing constraints have limited utility to date, but these appear to have been resolved, and several clinical trials are underway. Potentially superior to factor concentrates.

Conclusions

Had they been introduced fifty years ago, it is likely that these products would be in civilian use today, supported by decades of experience but little comparative trial data. However, in the 'evidence-based' era, regulatory authorities require comparative trials. Clinical trial programs are underway, in many instances conducted or supported by military health services in civilian hospitals, offering substantial promise in both patient outcomes and in efficiency.

S37: National Certification Scheme for the Medical Laboratory Scientific workforce

L Ridoutt[1]

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Introduction

Improving quality standards of the pathology workforce has been explored and realised through various means. Previous efforts to incentivise workforce competence improvement has included career pathways development, increasing professional development infrastructure and enhancing on-the-job training. Appropriate recognition, in the form of certification, was identified as an important further step to motivate and reward achievement of enhanced competence.

Methods

The project undertook several actions to establish the best practice basis for development and implementation of a certification scheme. This included a literature review, case study analysis (of existing self-regulated health profession schemes in Australia) and review of overseas 'certification' type arrangements for medical scientists. The findings of these research processes were used to drive extensive consultation processes between 2017 and 2018. These included:

Full day workshops held in late 2017 and 2018 with a total of 29 participants representing all the main scientific workforce professional associations

A Delphi Conference with 59 participants representing key stakeholder interests (professional associations, union representatives, employer representatives, regulatory bodies). Two rounds of the Delphi Conference were required during 2018 to achieve sufficient consensus

A final full day workshop was undertaken in November 2018 with the participants of the first two workshops. This workshop focused on the small number of remaining elements where some elements of discord remained.

Results

A final position for all the elements of the certification scheme have been agreed along with a feasible implementation plan to bring the scheme to fruition in July 2020. Processes to establish the legal [independent] company structure that will 'own' and manage the scheme have commenced.

Conclusion

Against a background of past let-downs and fragmentation in the quest for certification / registration of the medical scientific workforce, this project proved a considerable success.

S38: a) Problem with babies: common sources of pre-analytical error in paediatric sampling

D Rudd[1]

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Introduction

Pre-analytical variables have an enormous impact on the quality of laboratory results, and have been demonstrated to result in up to 70% of all laboratory errors. The pre-analytical phase involves all of the processes occurring before the sample is analysed. These include inappropriately ordered tests, improper sample collection and transport delays. The problem with children when it comes to diagnostic pathology, is that they are not just small adults! Their size and immaturity has an impact on the collection, analysis and interpretation of their pathology results.

Methods

This presentation will give a description of the common sources of errors in paediatric sampling and how this can affect the results and interpretation.

Conclusions

Most errors in the paediatric population can be attributed to sample collection issues, phlebotomy is challenging and technically difficult and often results in haemolysed, clotted, and low-volume blood samples. Why does this matter and how much does this impact the results? What are other pre-analytical considerations in this cohort of patients?

b) Discovering the faecal microbiome of pre-term neonates

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Background

From the perspective of a Neonatal Intensive Care Unit (NICU) it is important to understand neonatal gut microbiome and its assembly immediately following birth in order to tailor treatment regimens. Understanding and preserving this delicate microbial ecosystem through evidence-based interventions could be an important link to improving health outcomes for these babies.

Aims/Hypothesis: To investigate the developing neonatal gut microbiome of pre-term neonates and probiotic interventions within the NICU of the THHS.

Methods

All pre-term babies (<32 weeks and >32 weeks) were recruited from the THHS NICU (Oct – Dec 2017). Faecal samples were collected during the first three days and just prior to discharge (140 samples from 90 babies). The microbiome was identified following DNA extraction which was optimised (Bioline Isolate Faecal DNA kit) and using amplification/16s library preparation was performed using two PCR cycles using 785F/800R primer combination targeting V3 and V4 regions (Illumina MiSeq System).

Results

The individual microbiome make up for each neonate at each time point was determined using sequencing of the16s DNA coding for the ribosomal 16s RNA (16S meta-barcoding)and this provided reproducible data. Intra individual variation in microbiota was seen between babies and the microbial diversity increased upon discharge. Increased microbial diversity was seen in the probiotic group at 35 weeks when compared to the control group.

Conclusions

Information gained from this study will contribute to the current knowledge and clinical practices undertaken to preserve the fragile microbial ecosystem of babies admitted to NICU and therefore improve the health and quality of life for these babies.

S39: POCT devices

A Sargeant[1]

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The presentation will discuss:

Current solutions in public health locations with a focus on NSW:

- some of the challenges with implementing and managing the technology;

- some of the emerging technology and how this might transform healthcare;
- a speculation of the future and how IT might help fill in the gaps in diagnostics for syndrome management.

S40: Losing one's marbles…Er macrophages. Detailing dirty secrets using imaging flow cytometry

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Abstract

Imaging flow cytometry is a powerful technique that combines the throughput of flow cytometry with the information of antigen localization revealed by microscopy. This not only allows the determination of given populations' frequencies as achieved in flow cytometry, but also antigen localization by way of quantitative image analysis. Within this presentation a brief summary of how the AMNIS ImageStream MkII instrument acquires data will be delivered, followed by an overview of the analysis that can be achieved using the associated IDEAS software. To highlight the platform's versatility, a number of application including research focused works, and diagnostic applications, will be discussed. Such examples will include the following:

- Inflammasome activation. The inflammosome is a multi-protein complex that when activated results in re-localisation of an adaptor protein named ASC into tight foci, or "ASC-speck".
- Complications of identifying tissue-resident macrophages in conventional flow cytometry. Decoration of other cells with macrophage remnants (which contain RNA) can lead to the misidentification of cells in low parametric panels as macrophage like cells. This work also reveals that the presence of bona fide macrophages with solid tissue preparations if often highly underrepresented, and highlights complications that maybe encountered in RNASeq analysis of single cells obtained from tissue preparations.
- Immuno-flowFISH for identification of chromosomal abnormalities in Chronic Lymphocytic Leukemia (CLL). Fluorescence in situ hybridization (FISH) for Chr12 trisomy, or deletion of the short arm of chromosome 17 [del(17p)], when identified in CLL immune-phenotyped CD19/CD5 double positive cells (and combined the increased numbers of cells that can be analysed) increased sensitivity and specificity over current clinical FISH testing.

S41: Using a purpose-engineered bacterial toxin to diagnose ovarian cancer

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[3]UQ Centre for Clinical Research, Faculty of Medicine, University of Queensland, Queensland, Australia

Abstract

Ovarian cancer has the highest rate of mortality among the gynaecologic malignancies. The five-year survival rate is less than 30% in women diagnosed with late stage ovarian cancer but increases to over 90% when detected in early stages. Despite decades of research, there are currently no blood biomarkers for the early detection or monitoring of ovarian cancer. Human tumour cells express a non-human form of sialic acid, N-glycolylneuraminic acid (Neu5Gc). Neu5Gc-containing glycoconjugates have been proposed as tumour biomarkers; however, sufficiently specific and practical tools for the detection of Neu5Gc have been lacking. Using a novel, purpose-engineered Neu5Gc-specific lectin, derived from a bacterial toxin, in a surface plasmon resonance based assay, we have detected significantly elevated levels of Neu5Gc glycoconjugates in serum from ovarian cancer patients at all stages of disease compared to normal controls. The literature suggests that humans cannot produce Neu5Gc due to a mutation in the enzyme responsible for its synthesis, CMAH. The origin of Neu5Gc that is detected in humans is reported to result from dietary incorporation of this non-human sugar from animal food sources, particularly red meat and dairy. Our analysis of sera from healthy, cancer-free individuals showed that they all had low levels of Neu5Gc compared to ovarian cancer patients, and that fasting and diet had no significant impact on Neu5Gc levels. Using our engineered Neu5Gc-specific lectin termed SubB2M, we aim to develop a rapid, blood-based assay for the early detection and monitoring of ovarian cancer.

S42: Competency Guideline Development - where to next for the Australian medical laboratory science workforce?

D Stanford[1]

[1]Human Capital Alliance, New South Wales, Australia

Debbie spent over 25 years working for the Australian Government on national aged care and health programs, funding systems and policy development initiatives before joining the consulting firm Human Capital Alliance. She recently played a significant role in the project to develop a certification scheme for the medical laboratory science workforce in Australia.

Achieving and maintaining competence is a core component of assuring the quality of services provided by health care professionals in Australia. Competency assessment has been one of the accreditation requirements for Australian pathology laboratories for many years yet it is widely reported by many in the Australian pathology sector that managers and employees are not confident in how to approach this activity. This presentation will outline the core components of the current Australian medical laboratory science workforce competency-based standards framework and highlight some of the key elements of effective and defensible competency-based assessment processes that should be considered in establishing clearer guidance for this activity. Useful examples and approaches from both Australia and international settings will be included.

S43: First evaluation in humans of a chemically attenuated plasmodium falciparum whole parasite blood-stage vaccine

D Stanisic[1], J Fink[2], J Mayer[2], S Coghill[2], L Gore[2], X Liu[1], I El-Deeb[1], I Rodriguez[1], J Powell[1], N Willemsen[1], S Lata De[1], M-F Ho[1], S Hoffman[3], J Gerrard[2], M Good[1]

[1]*Institute for Glycomics, Griffith University, Southport, Queensland, Australia.*

[2]*Gold Coast University Hospital, Queensland, Australia*

[3] *Sanaria Inc., Gaithersburg, Maryland, USA*

Introduction

The continuing morbidity and mortality associated with infection with malaria parasites highlights the urgent need for a malaria vaccine. The efficacy of sub-unit vaccines tested in clinical trials in malaria-endemic areas has thus far been disappointing, sparking renewed interest in the whole parasite vaccine approach. In this current study, we evaluated the safety and immunogenicity of a chemically attenuated Plasmodium falciparum whole parasite blood-stage vaccine in malaria-naïve volunteers.

Methods

Using a clinical-grade cell bank consisting of human red blood cells infected with P. falciparum (Pf) 7G8, the vaccine was manufactured in a GMP-compliant facility at Griffith University. Study participants received a single dose of the vaccine, consisting of 3 x 107 Pf parasitised red blood cells that had been treated *in vitro* with the cyclopropylpyrolloindole analogue, Tafuramycin-A. Blood samples were taken at multiple time points to assess the induced parasite-specific immune responses and to check parasite levels in the blood of the study participants.

Results

Pf blood-stage parasites that were completely attenuated were immunogenic, safe and well tolerated in malaria-naïve volunteers. Following vaccination with a single dose, species and strain transcending *Plasmodium*-specific T cell responses were induced in recipients. This included induction of *Plasmodium*-specific lymphoproliferative responses, polyfunctional T cells secreting the parasiticidal cytokines, IFN-γ and TNF, and CD3+CD45RO+ memory T cells. Pf-specific IgG was not detected.

Conclusions

This is the first clinical study evaluating a whole parasite blood-stage malaria vaccine. Following administration of a single dose of completely attenuated Pf asexual blood-stage parasites, *Plasmodium*-specific T cell responses were induced while Pf-specific antibodies were not detected. These results support further evaluation of this chemically attenuated vaccine in humans.

S44: Regional and rural transfusion case studies

T Stanton[1]

[1]*Sullivan Nicolaides Pathology, Queensland, Australia*

Regional and rural laboratories offer a unique experience for scientists, especially in regards to transfusion. The case studies presented will demonstrate the wide range of issues that regional and rural scientists are exposed to from a transfusion perspective, as well as highlighting the importance of central laboratories supporting their regional colleagues.

The first case study refers to a traumatic incident in an isolated location where blood supplies are limited. The second case study is a complex antibody investigation on a patient that a regional laboratory provides crossmatched units for on a regular basis.

The polarising cases reflect the extreme scope and pressure that regional and rural laboratories face on a regular basis. With the majority of smaller laboratories being multi-disciplined, there is a reliance on central laboratories to provide specialised assistance when required.

S45: Interesting outbreaks from non-sterile stuff: is there something in the water at Gold Coast?

M Thomas[1], P Derrington[1]

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[2]*University of Queensland, Queensland, Australia*

Abstract

Environmental bacteria are generally non-pathogenic, however when they contaminate medical devices there is

the potential for opportunistic infections which may have serious clinical consequences. Two unusual, unrelated events at Gold Coast University Hospital are presented with a description of the outbreak investigation and laboratory methods used to find and eliminate the sources, one involving bottled water contaminated at source by *Ralstonia pickettii* and the other involving ultrasound gel contaminated by *Burkholderia* spp.

S46: Quality conversations drive performance

A J Torrie[1]

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Abstract

We hold the power to shape every conversation; a chance for us to influence others and walk away with a different way of thinking.

Do you find your team is constantly asking you questions? Do you get the impression they do not want to think for themselves? Are you having repeated conversations? Does it feel like you do everyone's job for them?

If yes, it is time to have more effective conversations.

Research conducted by Judith Glaser (Conversational Intelligence, 2014) found as many as 95% of workplace verbal exchanges were telling conversations.

Drawing from his experience in health and human resources Alasdair will guide you during this session towards more productive conversations to:

- help shift the traditional 'telling' approach to a more inclusive 'asking' style;
- explore active listening;
- stretch the thinking of both parties by asking curious questions;
- assist the giving and receiving of feedback.

By using the neurosciences techniques of coaching you can influence, motivate and provide insight into workplace conversations. We can shift how we converse by asking questions rather than feeling the need to tell the answers. To discover more and judge less we should ask curious questions and shift back the ownership. However, the art of this science is knowing when to take control ('do the telling'), this occurs when addressing poor performance or behaviours.

Leaders spend 80% of their time in conversation, employees on average spend 37% of their time in meetings. Most people are thinking about what they want to say next while someone else is speaking. Communication can be defined as the exchange of information; given the complex ways we receive and perceive messages this exchange is far from straight-forward.

This session will present you with a huge leverage for more focussed thinking, more presence in the conversation and help you to target behavioural change.

S47: Measuring competence

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Abstract

Professional practice in biomedical laboratory science is fundamental to patient healthcare and requires a highly trained and competent workforce capable of investigating and monitoring disease progression and treatment. This is achieved through periods of academic learning and "on-the job" training to develop the ability to comply with standard operating procedures but then to lay the foundation for applying this to more complex and flexible situations.

Academic teaching uses learning outcomes as a measurement of a student's ability with respect to what they know and what they can do. These provide a guide expectations for both the tutor (inputs) and the student (outputs).

Can the same be said for professional training? Training carried out by experienced staff is often a process of transferring their own knowledge, experience and skill through explanation, demonstration and observation. Training is judged to be complete when an individual performs to a consistent standard and is therefore deemed as "competent". This can depend on personal and organisational standards and the measure of how competent a person is can vary between what is a minimum threshold of competence what is considered a preferred standard of practice.

Learning outcomes in training could be used to bring more structure and standardisation to the process but the relationship between learning outcomes and competence is complex ranging from being simply about performance (the ability to do a task) to the ability to transfer skills and knowledge to new situations.

This presentation will consider the application of learning outcomes in training and how they can benefit the assessment of competence in terms of roles and "fitness to practice".

S48: DR-TB or maybe melioidosis, this is the question: importance of adequate laboratory resources, beyond TB detection in the rural tropics

J Warner[1]

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Introduction

Molecular diagnostics have dramatically improved

tuberculosis (TB) positive and negative predictive value of P-TB and EP-TB diagnoses, in a clinically relevant timeframe. However, there is an imbalance between the diagnostic capacities of TB and other causes of pyrexia of unknown origin in rural communities in the tropics. Melioidosis, caused by *Burkholderia pseudomallei* is endemic in tropical regions and is increasingly reported to mimic TB. In these communities, smear negative TB and treatment failure may be mistakenly attributed to drug resistant TB (DR-TB) rather than melioidosis.

Methods

Melioidosis case detection was undertaken at two sites as part of PNG laboratory capacity building: (i) in Balimo, Western Province, a rural community with high melioidosis rates and; (ii) at the Central Public Health Laboratory (CPHL) in the national capital, Port Moresby where melioidosis reports are rare. Presenting patients were assessed as per local clinical protocols with samples submitted for appropriate bacteriological analysis.

Results

During a two-year period, 10 cases of melioidosis presented at Balimo Hospital, however 5/10 were initially diagnosed as AFB negative TB and commenced TB treatment. The case fatality rate was 40%, attributable to a delay in accurate diagnosis and directed treatment. At the CPHL, sputa from 529 suspected TB cases were cultured for *B.pseudomallei* and stained for AFB; 417 were AFB negative with one culture positive for *B.pseudomallei*, representing the predicted proportion of melioidosis cases as 4.6% (95% CI 0.19 – 24.6).

Conclusions

Melioidosis can mimic TB and without adequate diagnostic facilities, which are rare in rural health facilities, it can go undiagnosed resulting in high case fatality rates. Over use of TB drugs is further driving DR. In our embracing of the *omics*, are we forgetting the value of traditional, classical bacteriology (and don't get me started on parasitology!)?

S49: Multiplex image acquisition and analysis of histology sections for quantitative pathology

N Waterhouse[1], C Winterford[1], A Stanley[1], C Chang[1], A Masel[1], G Chojnowski[1], T Nguyen[1]

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Abstract

Approaches to sample analysis in multi-parameter flow cytometry and imaging remain strikingly distinct despite their use of remarkably similar technologies for data acquisition (e.g. fluorescent dyes, lasers, filters, and PMTs/detectors etc). This may be largely due to the different size of data sets (100s vs 1000s of events) or different parameters being measured (counting overall fluorescence of cells in a sample vs analyzing location of a fluorophore in the cell or tissue). Further, multi-parameter analysis for quantitation of immune cells is commonly used in flow cytometry but tissue pathology remains largely restricted to measuring histological parameters (size of pathology) or single colours (e.g Dab staining).

A recent surge in immunotherapy has raised interest in multi-parameter imaging to quantitate immune cells, tumour cells and other cells in distinct areas of tissues (e.g. inside and outside the tumour margins). We have therefore been evaluating the use of InForm, which is proprietary software for analysis of images obtained using the Perkin Elmer Vectra Quantitative Imaging System. The data generated is then migrated to FCS Express for visualization and analysis using standard flow cytometry strategies. The benefits of this strategy is the ability to use spectral unmixing to accurately generate and analyse multi-parameter data in different tissue areas in a way that is easily understood by immunology researchers and clinicians who are familiar with results from flow cytometry software.

S50: A meander through malaria

R Wells[1,2]

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[2]*Pathology Queensland PAH, Woolloongabba, Queensland 4102, Australia*

Abstract

Malaria is one of the most well-known and long-established infections in many countries worldwide.

It has contributed to morbidity and mortality of millions over the years and much research has been done to try and reduce the rate of infection, treat it effectively, and to produce a vaccine against infection.

This Saal-Foley lecture will take a journey through the early recognition of malaria, the growth of knowledge surrounding the infection, the measures that have been used to reduce the occurrence and to treat it, recent advances in the knowledge of the physiology and pathogenesis of the infection and the efforts to find an effective vaccine.

S51: LAMP testing for malaria

C Williams[1]

[1]*Sullivan Nicolaides Pathology, Queensland, Australia*

Abstract

Malaria infection continues to have a significant impact worldwide. The WHO World Malaria Report 2018 details that malaria continues to claim the lives of more than 435,000 people each year.

While Australia is fortunate to be declared as malaria-free, rapid and accurate diagnosis remains an important medical consideration for our region. While the gold standard in

malaria diagnosis remains thick and thin blood films, the Alethia Malaria LAMP assay offers a rapid screening test that provides both sensitivity and specificity, allowing laboratories to streamline screening for malaria.

S52: **Quality control**

P Zerafa[1]

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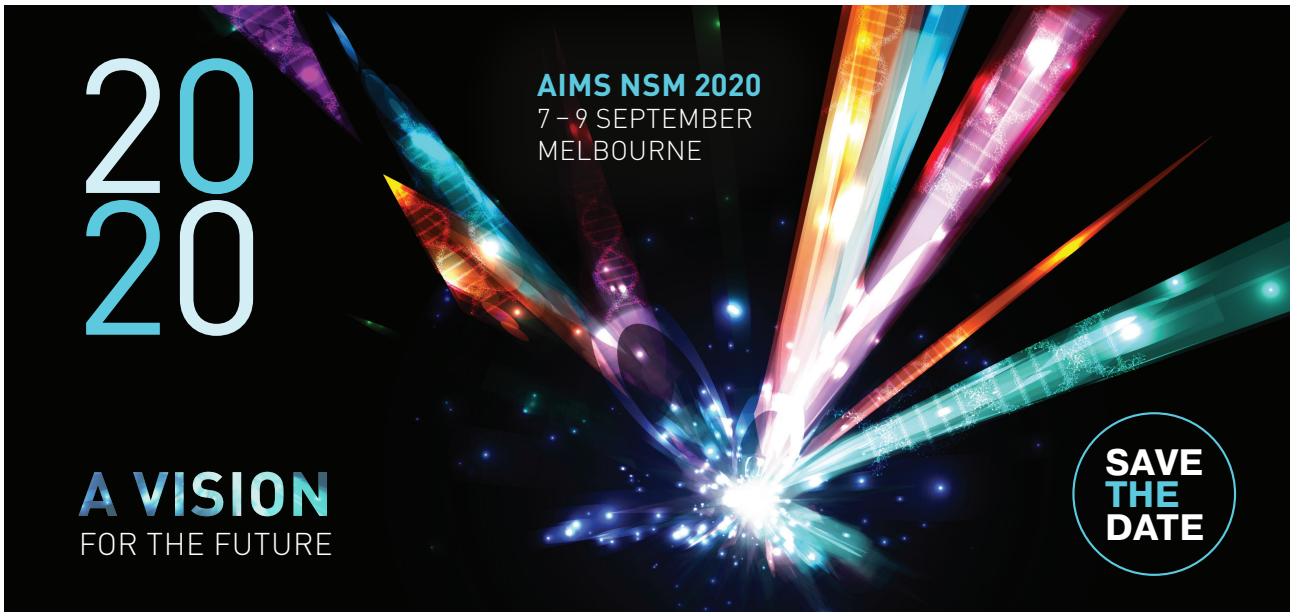
Abstract

Quality control in the coagulation laboratory as part of a state wide organisation will be discussed, covering topics including routine QC, standardised SD ranges, monitoring of state wide QC and generation of state wide mean normal PT and ISI. Routine QC includes levels of controls used, frequency of control runs, review of results and troubleshooting quality control problems, as well as EQAP. While the in depth analysis of QC performance characteristics between coagulation analysers state wide has enabled the establishment of standardised SD ranges for routine coagulation parameters. The review process of state wide coagulation internal quality control involves gathering monthly statistics and generating a standard deviation index, outlier reports are reviewed and subsequent feedback given.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Reporting critical pathology results – what is the current state of play in Australian laboratories? An opinion based on findings of a KIMMS audit

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Abstract

The Royal College of Pathologist Quality Assurance Programs recently ran a survey about how the subset of high risk results, critical results, are managed by Australian haematology, chemical pathology and microbiology laboratories. The survey was sent to 71 laboratories, 39 of which responded. The results show that most laboratories have processes in place to deal with critical results (CR) however, there are enough differences to be of concern, especially when referrers are receiving results from multiple laboratories.

Keywords: critical results, high risk results, KIMMS

Introduction

In 2007, the Royal College of Pathologists Quality Assurance Programs (RCPAQAP) introduced the Key Incident Management and Monitoring Systems (KIMMS) program to look at incidents that occur in the pre- and post-analytical phases of the request-test-report cycle. This program has been very successful in collecting data from most large, multi-disciplined laboratories and organisations in Australia (Badrick *et al* 2018).

In 2017, a second KIMMS program was introduced. Each year, KIMMS designs and runs four audits. This is done through SurveyMonkey. After the close of the audit, RCPAQAP analyses the results and sends these to all participants of the audit. The results are also written up as a poster and/or article and may be discussed at a KIMMS workshop which are held once a year. The aim of the audits is to look more deeply into pre- or post-analytical issues, with a view to seeking out root causes that are better addressed as an industry rather than as individual laboratories.

The issue of communication of critical results (CR) – defined as a result requiring immediate communication of the result irrespective of whether it is normal, significantly abnormal or critical – has been discussed for many years. Campbell and Horvath describe in detail the issues that needed to be overcome in Australia after the Australian Association of Clinical Biochemists (AACB) Critical Results Working Party ran a survey in 2011 (Campbell and Horvath 2012). Due to the diverse nature of Australian pathology laboratories, communication is not always straightforward. Unfortunately, the 2011 survey did not consider the differing situations. The 2011 survey led to a consensus Statement for the Management and Communication of High Risk (HR) Laboratory Results (Campbell *et al* 2015), which was endorsed by both AACB and The Royal College of Pathologists of Australasia (RCPA).

In 2017, the RCPA Quality Assurance Programs (RCPAQAP) ran one of their KIMMS audits to review the current state of play for critical result notification, given that the consensus statement had been available for two years. This audit, designed by the RCPAQAP KIMMS Advisory Committee, was the first step to investigate how well the consensus statement had been implemented. It looked at whether Australian laboratories had a HR results policy and to what extent some key points were followed – how critical results are identified, who receives the results and how well the notification was documented. The KIMMS advisory committee was also interested in what escalation policies were in place.

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Definitions

High risk (HR) results are defined as including significant risk results (not immediately life threatening, but of significant risk to the well-being of the patient), critical tests (those that require immediate communication irrespective of

whether normal, significantly abnormal or critical) and CR results (results that require immediate communication because they indicate a high risk of imminent death or major patient harm) (White *et al* 2014). This audit reviewed results from the CR results subset.

Escalation policy – an ordered list of alternative steps to be followed when the appropriate recipient(s) of a HR cannot be reached in a clinically appropriate time frame (Campbell *et al* 2015).

Laboratory Information system (LIS) – computer system used by pathology laboratories to store patient demographic information, referring doctor's information, results and to generate reports. Information can be recalled from the LIS to help manage laboratories – list of tests to be done, lists of abnormal results and so on. Middleware or the LIS can also add flags to results that are visible to staff on the computer screen when validating or viewing results.

Methods

A survey of 20 questions was sent via SurveyMonkey to 71 laboratories and laboratory networks. The survey covered two areas: the first half covered the role of the person answering the survey, which discipline they represented; whether they saw the communication of CR as a problem; how long since their CR policy had been updated; whether there was as escalation policy and who was involved once it was invoked; and how the laboratory monitored CR (who monitored them, who notified them and who received them). Although the survey did not directly align with the Consensus Statement for the Management and Communication of HR Laboratory Results (Campbell *et al* 2015), some key points were investigated as stated in the introduction.

For the second half of the survey participants were asked to choose a Wednesday in September 2017 and review any CR they had on that day, answering specific questions about the laboratory's actual performance against their documented processes. It is known from the KIMMS data that pathology laboratories in Australia vary greatly in size, servicing anywhere between 25,000 and 6 million patient episodes per year and thus the number of CR any laboratory produces will vary. As such, the requested number of CR to be reviewed was 10%, but this was capped at an actual number of 20.

We did not review the composition of any alert lists, whether users are involved in any way with the formulation and review of any policies, what means of communication are used (the survey specified results that are phoned), whether a system for acknowledgement of receipt of CR has been implemented or whether any procedures were in place for monitoring the outcomes of CR management.

Results

Demographics of responders

Thirty-nine responses were received from chemistry (28%), haematology (15%), microbiology (18%) and multidisciplinary (39%). Responses covered all levels of staff: executive (2%), pathologist (10%), laboratory or regional manager (34%), quality manager (20%), discipline head (8%), senior scientist (24%), and scientist (2%). No single group responded differently from any other group, an indication that there is a good understanding of CR policies by all levels of staff in Australian laboratories. The survey did not ask for any details regarding the size of each laboratory, thus it is not possible to know what percentage of pathology testing in Australia was covered by the responses.

Alert list generation

There are different ways that staff can be alerted to the fact that they have produced a CR. Eight (25%) responders relied on staff to recognize and phone a CR, six (19%) through a list generated by the LIS, and ten via a flag generated by the LIS. Seven used a combination of lists, flags and staff depending on the hour of the day. Table 1 shows who is responsible for phoning the results once they are found.

Specify who is authorised to receive CR results

As well as reviewing who was authorized to receive CR, the survey also asked who would be responsible for phoning a CR result. Twenty five out of 31 responses indicated that the person who generates, authorizes or validates the results phones them. Four responses stated that the pathologist phones CR, one response was senior staff member and one response was specialist results staff.

Of the 333 CR reviewed by respondents, 60% (202/333) were phoned directly to the referrers, their agent or someone from the unit and 27% (89/333) to ward staff. Of the remaining 13% (42/333), 30 were not phoned (15 of these were due to a pathologist's decision), five had an escalation procedure implemented, four had no record and three were unknown (i.e. no response in the survey) (Table 2).

Ensure that every CR result notification is appropriately documented

The survey looked at both what the organisation's policy was as to how results were documented (Table 3), and then how many of the CR reported in the survey were actually documented. Only four CR were reported as not being documented, although 14 of the results not phoned had no reason why and three had no responses in the survey. Taken together, this amounts to 6% (21/333) of actual CR either not phoned or having insufficient documentation.

Escalation policies

Twenty five out of 39 responders reported that they had an escalation policy. There was wide variation in replies, however, and some of these are most likely due to differing situations (hospital inpatients vs hospital outpatients vs community patients). Since the situation was not part of the question, it is difficult to draw conclusions. Four/25 policies either did not state contacting a pathologist as an option, or only as a last resort. In 16/25 replies, the pathologist was the first option. Other first options include head of department (1/25), ward staff (6/25), consultant (1/25) and medical staff (1/25).

Volume of CR results

As the survey did not ask for the total number of episodes in the time frame given (a single Wednesday in September, 2017), it is not possible to know the percentage of CR compared to total results. Interestingly, only 21 of the 39 participants (54%) could get the number of CR results from their LIS. The other 18 supplied an estimate of how many they would get in 24 hours. The number of CR varied from one to 100 (estimated) and three to 124 (actual figures), which may indicate that the estimations were not drastically incorrect.

The actual CR by analyte and discipline are shown in Table 4. In summary, 50% were from clinical chemistry, 32% from haematology and 17% from microbiology. Figure 1 shows the total number of reported CR in a day vs the number of CR investigated for this survey. Note that not many participants followed the instruction to report on 10% with a maximum cap of 20 (two out of 39) and the range of HR results reviewed was 1% to 100%.

Discussion

These results support the information obtained in the 2011 AACB survey (Campbell and Horvath 2012), although the two surveys are not directly comparable. All responders have a CR procedure (an accreditation requirement), most (92%, increased from 68% in the 2011 survey) have ongoing review of the procedure (though this survey did not ask if clinicians were involved in any review), but who should receive the result is inconsistent (Table 2), and what is done when an appropriate person in not available to accept the CR is variable.

Although the responders were low in number, the data indicate that not all laboratories have instituted some of the major recommendations from the Consensus Statement for the Management and Communication of HR Laboratory Results (Campbell *et al* 2015). The main points raised are that a number of laboratories rely on manual procedures to highlight CR, the range of people that can be given a result in the absence of the clinician immediately responsible for the patient's care is inconsistent, there is a lack of pathologist input into some escalation policies, and not all CR results are documented appropriately.

Table 1. *Showing how HR results are recognized and who phones them.*

** "Other" methods where a combination of LIS flags, LIS lists and manually recognizing results. The method was dependant on whether in or out of hours. (LIS – Laboratory Information System)*

† This person is not necessarily a pathologist

How HR results are recognized	Person who generates	Person who authorizes or validates	Pathologist	Senior staff member	Specialist results staff
LIS List (6)	1	5			
LIS flag (10)		8	1		1
Manually by staff (8)		5	2	1	
Other* (7)		6	1		

Table 2. *Role of people who received HR results*

Person who received HR result	
Referrer directly	139
Ward	89
Referrer's agent	28
Another doctor from same unit	27
Copy to doctor	4
Out of hours doctor	3
Locum	1
Escalation procedure implemented	5
HR result not phoned	30
No record	4
Survey not answered	3

Table 3*. Organisations documented methods of recording communication of CR*

Method of recording	**Number of respondents (n=31)**
Hand recorded	3
By LIS as phone record	16
In LIS as comment or note	11
In LIS as part of the phone list	1

Table 4. *HR results by analyte and department*

Discipline	**Analyte**	**Number reviewed**	**% of total reviewed**	**% of total reviewed by discipline**
Chemistry	Potassium	39	11	
	Troponin	31	90	
	Other chemistry	104	30	50
Haematology	Haemoglobin	38	11	
	Platelets	23	7	
	WCC	16	5	
	INR	5	1	
	Other haematology	25	7	32
Microbiology	Blood culture	33	10	
	Neonatal micro	12	45	
	CSF	1	<1	
	Other micro	13	4	17
Unknown		5	1	

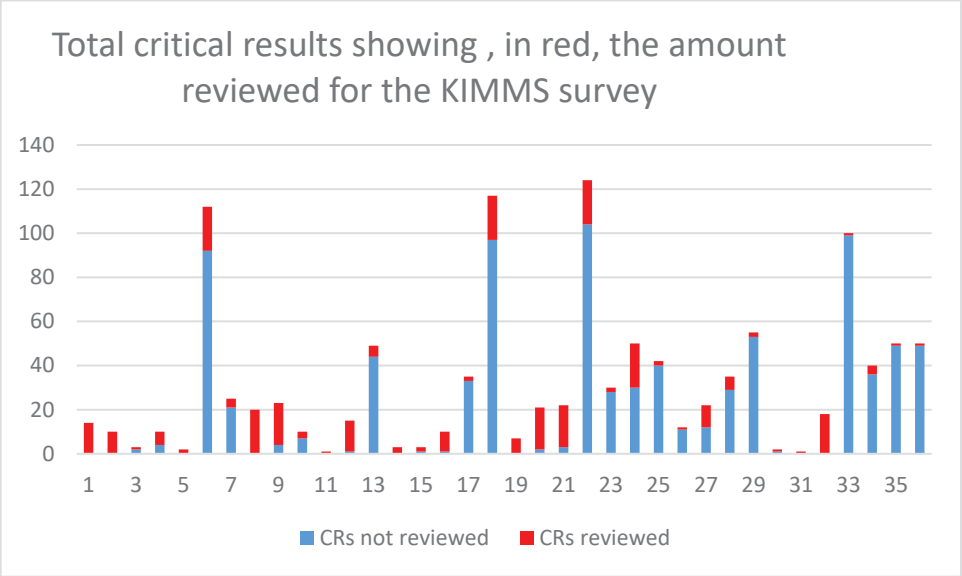

Figure 1. *The total number of Critical Results reported by each participant, broken down by those reviewed for the audit vs those not reviewed*

Conclusions

This survey supports the findings of Lam *et al* 2016 that there is still variation in this area that requires harmonisation. Future work, conducted through the AACB/RCPA Critical Results Working Party and KIMMS, will look at other analytes, with a view to formulating a national CR list. Although this will not ensure the CR are treated appropriately, it will ensure all critical results and tests are on every pathology laboratories list, and that referrers can be assured that all pathology laboratories will have appropriate procedures.

Acknowledgements

We would like to thank all people who participated in the KIMMS survey, and the KIMMS advisory committee (Lynn Nelson, Mark Mackay, Jason Graefling, Rosemary Cooper, David Porter, Michael Whiley and Allison Terrell) for their help in designing the survey.

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CASE STUDY

Placenta adhesion disorders

Yvette Beaber[1], Stacey Prystupa[1]

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Placenta adhesion disorders occur in pregnancy when the placental villi adhere to or invade the myometrium of the uterus and fail to detach after delivery. The incidence of placenta adhesion disorder is estimated to be approximately 1 in 2500 deliveries and the incidence is believed to have increased tenfold over the last decade. The severity of the adhesion of the placenta to the uterus typically determines the complications that may arise and the long-term effects of this condition (Armstrong *et al* 2004).

There are several staging subdivisions of placenta adhesion disorder: *placenta accreta* (*vera*), *placenta increta* and *placenta percreta. Placenta acretta* occurs when the placental villi are attached to the myometrium but do not invade the muscle. Placenta *incretta* is when the placental villi invades the myometrium. Placenta *percreta* is when the placental villi penetrate the full thickness of the myometrium and may also invade into adjacent structures. These categories can be further subdivided based on the extent of placental involvement: focal involves an isolated area of the placental lobe, partial includes one or more lobes and total means involvement of the whole placenta. Cases may not be able to be classified when manual removal of the placenta is attempted (Fox and Sebire 2007).

There are many risk factors that may increase the incidence of placental adhesion and these include high gravidity, previous uterine curettage, previous manual removal of the placenta, cornual implantation of the foetus, uterine fibroids, previous uterine surgery, malformed uteri, and previous caesarean section (Armstrong *et al* 2004). In the last decade, caesarean section appears to be the most important risk factor and also accounts for the increased incidence of placenta adhesion disorder due to the increased tendency to resort to a caesarean section (Fox and Sebire 2007).

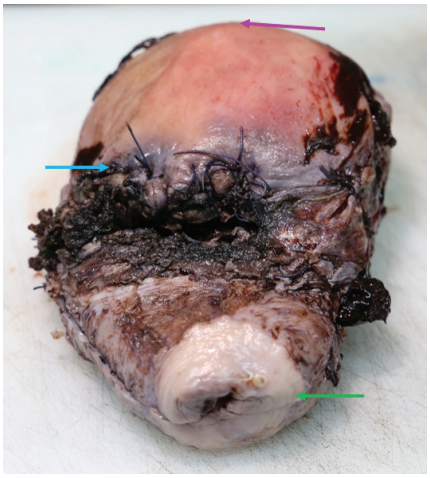

Figure 1. *Uterus. Cervix (green arrow), fundus of the uterus (red arrow) open sutured long lower line caesarean section (blue arrow). There appears to be placental villi oversewn in caesarean section.*

Address correspondence to:
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Laboratory investigations

This case is a 39-year-old female who has had two previous caesarean sections. The first was elective at full-term and the second was for a breech baby with intrauterine growth restriction. An ultrasound examination at 22 weeks for the current pregnancy revealed placenta praevia with the posterior placenta also covering the internal os of the uterus by ≥15mm. Due to the increased risk of antepartum haemorrhage, an elective caesarean was performed at 36 weeks. During the caesarean procedure the placenta was unable to be detached from the uterine wall, and there was postpartum haemorrhage, therefore a partial hysterectomy was performed.

The uterus and placenta were sent for histopathology. The uterus was 180mm from fundus to cervix, with an intercornual distance of 110mm and 80mm anterior to posterior. The right lower uterine segment wall was almost entirely replaced by the placenta. There was an 80mm caesarean incision line with placental tissue oversewn at the surface. The fundal endometrial surface displayed blood clots with no placental tissue present (Figure 1). The bisected uterus shows placental villi and blood clot adhered to the myometrium (Figure 2). The placenta was received separately to the uterus. Over half the surface area of the placenta was severely disrupted but there were no significant adherent blood clots.

The microscopic results of the uterus showed some benign proliferation of the endocervical glands, which is a condition referred to as endocervical micro-glandular hyperplasia. Notably there was also decidualised stroma which are significant changes to the cells of the endometrium in preparation for and during pregnancy. Figure 3 indicates the placental villous tissue that is in direct association with fibro-muscular stroma, without any intervening decidua. The myometrium was mildly oedematous. There was significant associated haemorrhage with blood clots throughout the uterus. The case was diagnosed as *placenta accreta*.

Hospital records indicate that the mother required several blood transfusions after a loss of four litres. One week after the caesarean section and removal of the uterus, mother and baby were discharged in good health.

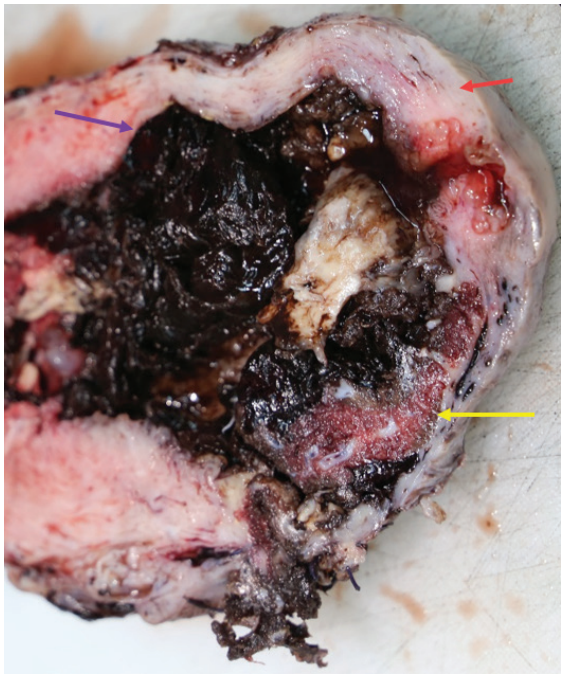

Figure 2. *Uterus bisected; cervix (red arrow), placental villi adhered to the myometrium (yellow arrow), and blood clot (purple arrow).*

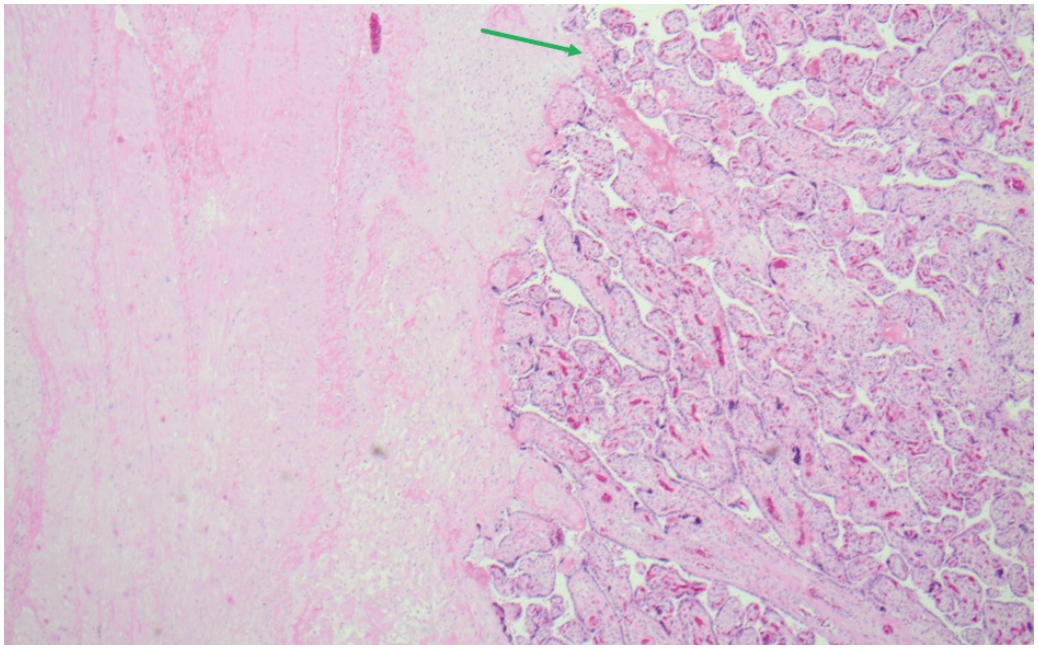

Figure 3. *H&E showing placenta accreta. Placental villi in direct association with fibro muscular stroma without intervening decidua (green arrow).*

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Questions relating to the article *'Placenta adhesion disorders'* at page 111 of this issue.

1.	The incidence of placenta adhesion disorder is estimated to be approximately 100 in 2500 deliveries.	True/False
2.	The severity of the adhesion of the placenta to the uterus typically determines the complications that may arise and the long-term effects of this condition (Armstrong *et al* 2004).	True/False
3.	Placenta *accreta* is when the placental villi invades the myometrium.	True/False
4.	Placenta *percreta* is when the placental villi penetrate the full thickness of the myometrium and may also invade into adjacent structures.	True/False
5.	Placenta adhesion disorders occur in pregnancy when the placental villi adhere to or invade the myometrium of the uterus and fail to detach after delivery.	True/False
6.	There are several staging subdivisions of placenta adhesion disorder: *placenta accreta (vera)*, *placenta increta* and *placenta percreta*.	True/False
7.	Placenta *accreta* is when the placental villi penetrate the full thickness of the myometrium.	True/False
8.	Placenta *percreta* is when the placental villi penetrate the full thickness of the myometrium and may also invade into adjacent structures.	True/False
9.	Benign proliferation of the endocervical glands is a condition referred to as endocervical micro-glandular hyperplasia.	True/False
10.	Decidualised stroma are significant changes to the cells of the endometrium in preparation for and during pregnancy.	True/False

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Acknowledgements

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Photomicrographs must have internal scale markers and the magnification must be stated. Symbols, arrows, or letters used in the photomicrographs should contrast with the background.

Cite each figure in the text in consecutive order, e.g., "Figure 1 illustrates …" or "… as shown (Figure 2)". If a figure has been published, acknowledge the original source and submit with the manuscript written permission from the copyright holder to reproduce the material. Permission is required, regardless of authorship or publisher, except for documents in the public domain.

Legends for illustrations

When symbols, arrows, numbers, or letters are used to identify parts of illustrations, identify and explain each one in the legends. The figure legend must contain a boldface (a) name ("Figure" + arabic figure number) and (b) substantive title.

Abbreviations

Use only standard abbreviations (see list of commonly used abbreviations).

Avoid abbreviations in the title. The full term for which an abbreviation stands must precede its first use in the text unless it is a standard abbreviation for a unit of measurement.

Report measurements in the units in which the measurements were made. In most countries the International System of Units (SI) is standard.

Commonly used abbreviations

Abbreviation or Symbol	Standard Units of Measurement
g	gram
g	gravity
Hz	hertz
h	hour
IU	international unit
K	kelvin
kg	kilogram
L	liter, litre
m	meter, metre
min	min
M	molar
mL	millilitre
mol	mole
N	newton
nm	nanometre
p	probability
rpm	revolutions per min
s	second
wk	week
yr	year

Additional information

The following are useful sources of information. The first two publications are used by the AJMS as standard references.

Style Manual Committee. Council of Biology Editors. *Scientific style and format: the CBE manual for authors, editors, and publishers.* 6th ed. Cambridge University Press, 1994.

Style manual for authors, editors and printers. 6th ed. John Wiley & Sons Australia Ltd, 2002.

O'Connor M, Woodford FP. *Writing scientific papers in English: an ELSE-Ciba Foundation guide for authors.* Amsterdam, Oxford, New York: Elsevier-Excerpta Medica, 1975.

Day RA. *How to write and publish a scientific paper.* Philadelphia, Institute for Scientific Information Press, 1979.

Zeiger M. *Essentials of writing biomedical research papers*. 2nd ed. New York, McGraw-Hill, 2000.

Matthews JR, Matthews RW. *Successful scientific writing: a step-by-step guide for the biological and medical sciences*. 3rd ed. Cambridge, Cambridge University Press, 2007 [Also available in eBook format.]

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